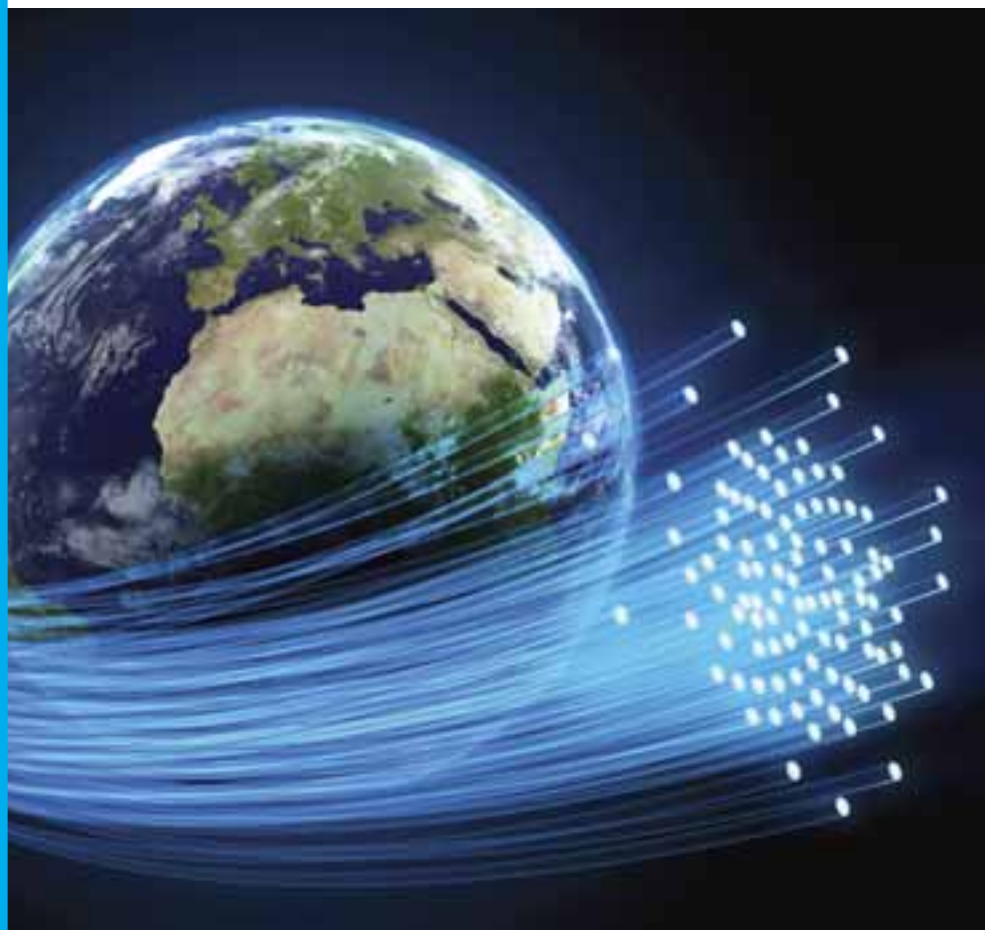


Global Technology Outlook

“Internet of Things”: Beyond the Hype

Barclays Global Technology
Equity Research



Barclays Capital Inc. and/or one of its affiliates does and seeks to do business with companies covered in its research reports. As a result, investors should be aware that the firm may have a conflict of interest that could affect the objectivity of this report.

Investors should consider this report as only a single factor in making their investment decision.

This research report has been prepared in whole or in part by equity research analysts based outside the US who are not registered/qualified as research analysts with FINRA.

PLEASE SEE ANALYST CERTIFICATION(S) AND IMPORTANT DISCLOSURES BEGINNING ON PAGE 99.

BARCLAYS GLOBAL TECHNOLOGY EQUITY RESEARCH

U.S. Technology

Ben A. Reitzes

Global Sector Coordinator
U.S. IT Hardware & Data Networking
+1 212 526 9517
benjamin.reitzes@barclays.com
BCI, New York

Amir Rozwadowski

U.S. Telecom Services
+1 212 526 4043
amir.rozwadowski@barclays.com
BCI, New York

Darrin D. Peller

U.S. IT Consulting &
Computer Services
+1 212 526 7144
darrin.peller@barclays.com
BCI, New York

Raimo Lenschow, CFA

U.S. Software
+1 212 526 2712
raimo.lenschow@barclays.com
BCI, New York

Christopher D. Merwin, CFA

U.S. Internet
+1 212 526 7778
chris.merwin@barclays.com
BCI, New York

Blayne Curtis

U.S. Semiconductors
+1 617 342 4101
blayne.curtis@barclays.com
BCI, New York

European Technology

Andrew M. Gardiner, CFA

European Technology Hardware;
Software & IT Services
+44 20 3134 7217
andrew.gardiner@barclays.com
Barclays, London

Youssef Essaegh

European Technology Hardware;
Software & IT Services
+44 20 3134 7250
youssef.essaegh@barclays.com
Barclays, London

Joseph Wolf

Israel Technology;
U.S. Communications Infrastructure
+1 212 526 3392
joseph.wolf@barclays.com
BCI, New York

Gerardus Vos

European Technology Hardware;
Software & IT Services
+44 20 3134 6690
gerardus.vos@barclays.com
Barclays, London

David Kaplan

Israel Technology
U.S. Software
+972 3 623 8747
david.kaplan@barclays.com
Barclays, London

James Goodman

European Technology Hardware;
Software & IT Services
+44 20 3134 1038
james.a.goodman@barclays.com
Barclays, London

Japan Technology

Masahiro Nakanomyo

Japan Precision Instruments
+ 81 3 4530 2962
masahiro.nakanomyo
@barclays.com
BSJL, Tokyo

Asia ex-Japan Technology

Kent Chan

Head of Equity Research
for Taiwan and China
+886 2 663 84688
kent.chan@barclays.com
BCSTW, Taiwan

Anand Ramachandran, CFA

Asia ex-Japan Telecom Services;
Software & IT Services
+65 6308 3895
anand.ramachandran@barclays.com
Barclays Bank, Singapore

SC Bae

Asia ex-Japan IT Hardware;
LCD Displays; Semiconductors;
Wireless Equipment & Products
+82 2126 2932
SC.Bae@barclays.com
BCSL, Seoul

Kirk Yang

Asia ex-Japan IT Hardware;
Wireless Equipment & Products
+852 290 34635
kirk.yang@barclays.com
Barclays Bank, Hong Kong

Dale Gai

Asia ex-Japan IT Hardware
Wireless Equipment & Products
+886 2 6638 4697
dale.gai@barclays.com
BCSTW, Taiwan

Sunwoo Kim

Asia ex-Japan IT Hardware;
LCD Displays
+822 2126 2934
sunwoo.kim@barclays.com
BCSL, Seoul

Andrew Lu

Asia ex-Japan Semiconductors
+886 2 6638 4698
andrew.lu@barclays.com
BCSTW, Taiwan

Jamie Yeh

Asia ex-Japan IT Hardware;
LCD Displays; Semiconductors
+852 290 34670
jamie.yeh@barclays.com
BCSTW, Taiwan

Alicia Yap, CFA

Asia ex-Japan Internet & Media
+ 852 2903 4593
alicia.yap@barclays.com
Barclays Bank, Hong Kong

Bhuvnesh Singh

Asia ex-Japan Software &
IT Services
+ 91 22 6719 6314
bhuvnesh.singh@barclays.com
BSIPL, Mumbai

EXECUTIVE SUMMARY

Ben Reitzes
+1 212 526 9517
Benjamin.reitzes@barclays.com
BCI, New York

Looking beyond the hype in “IoT” still yields a few real investments: The “Internet of Things” or IoT is considered a network infrastructure, driven by the dramatic increase in connected devices that are linked to the internet. The connected devices are typically physical objects that have sensors embedded in them, which provide specific information (whether about its location, the condition of the environment, the condition of the subject or some other pre-determined variable). We have hesitated in writing about this theme so far since it seems like a lot of hype without a clear data roadmap. At the end of the day, it seems the real money over the long term is in the data and services that enable companies to be more efficient and allow individuals to live better lives.

Size of the opportunity is somewhat foggy: There is a real challenge in defining the IoT market in terms of units. We believe defining IoT is not particularly practical considering the ambiguity in defining the “unit” at the basis of most forecasts, but we consider “things” as networked devices (including both wired and wireless devices) which encompass existing trends such as wireless local area networking (WLAN) connectivity and new devices/trends such as wearables. The topology of the network seems to matter very little, what matters is that the device or object is part of a larger wired or wireless network.

Gadgets and wearables are the clearest unit trend for IoT with the largest investments through 2015: Many investors think of gadgets when they think of IoT and we see some clear opportunities through 2015. We do see volatile product cycles for gadgets, however, as hardware preferences may change quickly. The wearables market could turn out much like the way tablets played out. Fitness bands and Android watches are in the market now with marginal success but we expect Apple to be the first to perfect the category. In the wearables category, beyond Apple, our teams see Hon Hai, Lenovo, Zhen Ding, HTC, AAC, Sunny Optical, LG Display, SEMCO, TPK, Baidu, Qihoo, Silicon Labs and Maxim as ways to gain exposure.

Data lifecycle management a longer term opportunity: We see a strong likelihood that IoT will yield a significant increase in data creation, fueling the need for investments in analytics, data management and web services. We believe that analytics could become embedded in the fabric of day-to-day decision making as analytics-driven organizations and consumers use the output to optimize outcomes. Key services include payments, location based solutions and security. We believe stocks with exposure include Oracle, Microsoft, Splunk, LogMeIn, PTC, Salesforce.com, Alliance Data, Visa, Mastercard, SAP, Google, Amazon, Wirecard, Monetise, Baidu, Aruba, Tencent and NXP.

Some established tech OEMs may struggle: While there are many established vendors who think they are going to win share in the IoT, we believe there are challenges in creating a clear revenue stream. In fact, the IoT could be a threat to established vendors given its leverage of the cloud and its fragmentation that gives rise to new competition. For example, IBM, Cisco and Intel are just a few companies that come to mind that discuss IoT quite a bit, yet likely won’t derive enough revenue from IoT over the next few years to offset specific challenges elsewhere.

As always, we appreciate your feedback and look forward to working with you in the future.

Regards,

Ben A. Reitzes, Global Sector Coordinator – Barclays Technology Equity Research

CONTENTS

Summary of investment views and key recommendations	6
Introduction	8
Sector performance	29

U.S. TECHNOLOGY

U.S. Software.....	36
Raimo Lenschow: Still early, but several themes in software to benefit from IoT	
U.S. IT Hardware & Data Networking.....	38
Ben Reitzes: Cloud and software defined data center hurting much of “old tech”; IoT unlikely to serve as an offset	
U.S. Semiconductors.....	42
Blayne Curtis: Semis have been an outperformer, but we remain selective for the rest of the year	
U.S. Internet.....	45
Chris Merwin: Reiterate positive view on category leaders	
U.S. Consulting & Computer Services	48
Darrin Peller: Selective approach on Payment names; continued growth in demand for IT Services	
U.S. Communications Infrastructure.....	50
Joseph Wolf: Focused on Optical and LCD	
U.S. Telecommunications Services.....	51
Amir Rozwadowski: More bars...on more devices	

EUROPE AND ISRAEL TECHNOLOGY

European Software & IT Services	57
Gerardus Vos: Still waiting for estimate progression	
European Technology Hardware	59
Andrew Gardiner: Top-line growth should support value creation in 2014	
Israel Technology	61
Joseph Wolf & David Kaplan: Focused on LCD, data monetisation and cash returns	

ASIA EX-JAPAN TECHNOLOGY

Asia Strategy.....	63
Kent Chan: Sanguine on the Longer Term Impact of IoT	
Korea Technology.....	64
SC Bae: Well positioned to benefit from broader range of IoT opportunities	
Asia ex-Japan IT Hardware.....	68
Kirk Yang: Taiwan IT near bottom; IoT opportunity in data centre, device and network supply chains	

Asia ex-Japan Semiconductors 73
 Andrew Lu & SC Bae: Multiple drivers in addition to cyclical recovery

Asia ex-Japan Wireless Equipment 75
 Dale Gai: Implications to supply chain on IoT outlook

Asia ex-Japan LCD Displays 78
 SC Bae, Jamie Yeh & Sunwoo Kim: Numerous catalysts to drive LCD cycle in 2H14

Asia ex-Japan Internet & Media 81
 Alicia Yap: Investment for future growth

India IT Services 83
 Bhuvnesh Singh: One for the long haul

Asia ex-Japan Telecom Services 85
 Anand Ramachandran: Integrated with lots of spectrum; the best mix

Japan Precision Instruments 88
 Masahiro Nakanomyo: Japan’s precision industry not riding the IoT wave

APPENDIX 91

SUMMARY OF TECHNOLOGY VIEWS AND RECOMMENDATIONS

Industry view / Analyst	Investment view	Company recommendations
U.S. Software <i>Positive</i> Raimo Lenschow	We continue to prefer names with true exposure to the following structural themes: cloud, software defined infrastructure and Big Data. We recommend investors exercise caution when assessing companies that abruptly pivot their strategies to better align with one of the aforementioned structural trends.	Our top picks are Red Hat and PTC. RHT is a leader in infrastructure software and should benefit from the proliferation of open source software. PTC is a beneficiary of an improving macroeconomic environment; it has a leading IoT strategy, leveraging the software platform acquired through ThingWorx.
U.S. IT Hardware & Data Networking <i>Neutral</i> Ben Reitzes	We believe IT spending conditions are generally improving, especially in the developed world. The improvement in sentiment could be the result of an increase in budgets following several years of tightening. CIOs have been sweating existing assets at higher utilization rates for years. However, the relative strength of software and networking vs. traditional hardware is becoming more obvious due to growth in the cloud.	Our top picks are HP and Juniper. For HP, we believe it could gain share in x86 servers at the expense of IBM/Lenovo, which could also help support sales of 3PAR storage gear. For JNPR, we expect to see strength in its service provider business, driven by mobile carrier investments in IP infrastructure as well as content/cable providers and web 2.0 customers. We also see opportunities for margin self help in the IOP.
U.S. Semiconductors <i>Neutral</i> Blayne Curtis	Semis have outperformed the S&P YTD as they offer a better relative value vs. other growth areas in Tech. We see this reversing. While we agree an improving economy does benefit semis, we believe global semi revenue growth will remain below the 7-8% 20-year CAGR given the continued secular headwinds in PC, consumer and mobile. We see little upside to estimates for most names as the Street is already modeling this improving scenario.	Our top picks are NXPI and CAVM. NXPI should continue to re-rate as it is now de-levered and aggressively buying back stock. NXPI also has several multi-year revenue drivers including core ID (China and US), mobile payments (AAPL and Samsung), RF, and Autos. CAVM is levered to the TD-LTE rollout at China Mobile with continued share gains at NSN and Huawei. The data center is the next leg of growth.
U.S. Internet <i>Positive</i> Chris Merwin	Despite the recent sell-off, we believe fundamentals for the sector remain sound. Local is a key focus, where we expect to see momentum for vertical and horizontal platforms that facilitate the ad buying process. We believe there is still a disconnect between time spent online and share of ad dollars. We expect this gap will close, driving sustainable improvements in monetization for local ad platforms over a multi-year period.	Our top picks are Activision and HomeAway. We believe ATVI is well positioned for positive estimate revisions due to a robust product pipeline, the potential for incremental capital returns, and cyclical tailwinds. We are constructive on HomeAway as we believe the recently launched Pay-Per-Booking product will be incremental to its subscription business.
U.S. IT Consulting & Computer Services <i>Neutral</i> Darrin Peller	We believe Payment names continue to benefit from strong secular growth trends, with global economic recovery serving as a tailwind. That said, valuations continue to keep us selective on a relative basis, with a focus on sustainable EPS growth, strong free cash flow generation, and/or potential positive catalysts.	Our top picks are Visa, MasterCard, Fiserv and Fidelity National Information Services. V and MA have solid fundamentals and are well positioned for 2H14. FISV and FIS are both set for solid top-line growth and mid-teens earnings growth, with the Payments segment acting as a tailwind for both names.
U.S. Communications Infrastructure <i>Neutral</i> Joseph Wolf	As data traffic grows, speeds increase, and low latency requirements increase, we see optical fiber-based connections taking more share of the data center interconnect market. Also, we see cable service providers offering converged services to customers, which should help some in the space.	Our top picks are Corning and Finisar. Finisar should see benefits from a stronger telecom business and wavelength selective switching. Corning has a significant opportunity given strength across its business segments. Also, it has a sizeable buyback and dividend and should see margins expand in 2014.
U.S. Telecom Services <i>Neutral</i> Amir Rozwadowski	We view the U.S. Telecom Services market as a mix between a few near-term special situations and mid-term ways to capitalize on an intensifying competitive landscape, and seeking out the best means to capitalize on seemingly insatiable mobile data traffic growth. Longer term, we see the market as optimally positioned to benefit from increased penetration of connected devices as their broader external adoption should enable Telcos to benefit from their role as key pipe suppliers.	We continue to prefer the tower names over the carriers as we expect the former to continue to benefit from rising data traffic growth as operators look to differentiate their networks through improved service quality. Our top tower picks remain American Tower and SBA Communications though we believe Crown Castle is also positioned to benefit from healthy secular demand trends.
European Software & IT Services <i>Neutral</i> Gerardus Vos & James Goodman	European technology has had a muted start to 2014, with a rotation into value combining with FX pressure and EM weakness. However, we believe the disruptive force of hyperconnectivity will continue to shape the sector and, in Europe, we most prefer stocks with exposure to cyclical growth, secular trends or restructuring opportunity.	SAP is showing success in transitioning to a platform vendor, increasing its share of the IT wallet and improving earnings quality. We anticipate the valuation multiple to re-rate towards European software leaders. We continue to back Capgemini, which should expand gross margins as it benefits from cyclical recovery.

Industry view/Analyst	Investment View	Company Recommendations
European Technology Hardware <i>Neutral</i> Andrew Gardiner & Youssef Essaegh	The best performing stocks in 2013 were the self-help stories, with little to no growth expectations, but deep structuring programs supporting bottom-line growth. Now, we look for real top-line growth to justify more momentum in estimates and stock performance in 2014. The key themes where we see the most potential are cyclical, payment, mobility and Big Data.	Our top picks are ARM and Infineon. For ARM, we see a recovery in the smartphone market, content increase and tech transitions in smartphones, and adoption in new areas. For Infineon, the automotive cycle is going full speed and supports sales, while sales towards industrials segments gradually recover, leaving strong revenue growth and margin expansion for FY2014.
Israel Technology <i>Positive</i> Joseph Wolf & David Kaplan	We believe that the LCD market turned positive in 2013 and that 2014 could see margin expansion. Orbotech should benefit from a market recovery and is capitalizing on extension opportunities in adjacent markets, including touch screen, IC assembly and packaging, and UV laser drilling. Meanwhile, trends in spending by Telcos and focus on technologies to monetize data usage like the connected car and sponsored data are positive for DOX.	Our top picks are Amdocs and Orbotech. DOX's recent results boost our confidence in its ability to sustain growth across its business while maintaining buybacks and dividends. We also favor Orbotech, which should benefit from a market recovery. The company is also benefiting from improvements in business conditions, especially in flat panel displays.
Asia ex-Japan IT Hardware <i>Neutral</i> Kirk Yang	We are turning more constructive in 2H14 on the Asia ex-Japan IT Hardware sector due to a new product launch cycle, with iPhone 6 in particular. We look for share price strength on total tech shipment growth which has shifted to smartphone and tablets from NBs and desktop PCs.	Our top picks are Asustek and Hon Hai. We like Asustek as we believe it has the right smartphone strategy with the introduction of competitive products this year and continued market share gains. We also like Hon Hai as iPhone 6 will be one of the best product cycles for Apple in recent years.
Asia ex-Japan Semiconductors <i>Positive</i> Andrew Lu & SC Bae	We are positive on an Asia ex-Japan Semiconductor sector recovery in 2H14-2015 driven by Apple AP orders, fingerprint SiP, iWatch IC, 64bit ARM, and 4G upgrades. Apart from upside on earnings, we see stronger-than-expected cash flow to drive more dividend payout.	We are positive on TSMC given its 20nm High K Metal Gate and 16nm FinFET ramp for customers starting 2Q14E. We also like ASE as it is adding fingerprint sensor/iWatch/AP exposure to Apple in 2H14.
Asia ex-Japan Wireless Equipment <i>Positive</i> Dale Gai	We are positive on the Asia ex-Japan Wireless Equipment sector on its iPhone 6 cycle from 2H14 to 1H15. We expect a 10-30% y/y sales growth during the cycle for iPhone 6 supply chain makers, with significant earnings growth due to operating leverage.	Our top picks are Largan and Catcher. We see upside for Largan given prospects for new iPhone model that could use OIS in their cameras and increased market share in China smartphone. We like Catcher as we see stronger earnings outlook for 2H14-1H15E driven by metal casing demand for major smartphone models.
Asia ex-Japan LCD Displays <i>Positive</i> SC Bae, Jamie Yeh & Sunwoo Kim	We are positive on the Asia ex-Japan LCD Displays sector as ongoing oversupply of commodity panel is likely to ease from 1Q14 following inventory clearance during year-end promotions. In 2014, we believe the Apple product cycle is likely to significantly boost specialty panel demand and related components.	Our top picks are LG Display, Radiant, Novatek and Lumens. We favor LG Display for its attractive valuation and business opportunities in the Apple product cycle and UHD TV. We like Radiant, Novatek and Lumens as we expect them to be primary beneficiaries of resolution upgrades in smartphones and 4K2K TVs.
China Internet* <i>Positive</i> Alicia Yap	We believe the transition-to-mobile revolution should benefit most of China's internet companies. We expect top-line growth to reaccelerate and margins to gradually improve. Five key themes we see in 2014 are: 1) IPO momentum and M&A activity continuing; 2) online payment/internet finance gaining more focus; 3) more promising mobile games monetization; 4) relatively positive sentiment supporting online advertising demand; and 5) the eCommerce turf war extending into social, mobile, O2O and logistics.	Our top picks are Baidu, Tencent and Qihoo. We applaud Baidu's latest mobile strategies and see synergies from its improved LBS offering via map and Nuomi integration. Tencent is well positioned to capture the opportunities in mobile internet, leveraging its mobile user platform on WeChat. We like Qihoo's execution and believe catalysts could come from ramping PC search monetization, mobile assistant app store revenues and the upcoming release of mobile search-related products and services.
Asia ex-Japan Software & IT services <i>Neutral</i> Bhuvnesh Singh	We remain positive on the sector as we expect industry revenue growth to accelerate in FY15, led by an improving demand environment in the US and market share gains in Europe. Indian providers are also increasingly focusing on digital technologies such as cloud, mobility and analytics to drive revenue growth.	Our top picks remain Infosys and HCL Tech. We favor Infosys given the significant scope of margin expansion and attractive valuations. We believe that HCL Tech will continue to deliver stable revenue growth led by deal wins in infrastructure and application management space.
Japan Precision Instruments <i>Neutral</i> Masahiro Nakanomyo	We do not foresee significant advances by major markets (office equipment, digital cameras, and SPE) during FY3/15. We expect the office equipment market to continue to post slight volume gains, but face ongoing price declines for equipment and consumables. We remain concerned about a slowdown by semiconductor capex during the 2H14 for SPE businesses.	Our top picks are Topcon and Omron. Topcon core competence is precise location identification using GPS data and machine control technologies. It contributes significantly to construction and farming machinery operation efficiency. We think Omron is well positioned for benefiting from the IoT trend with its business domains management space.

*Industry view is for the wider Asia ex-Japan Internet & Media industry. Source: Barclays Research.

GLOBAL TECHNOLOGY OUTLOOK

Ben Reitzes
+1 212 526 9517
Benjamin.reitzes@barclays.com
BCI, New York

The “Internet of Things” is about the data – the rest is quite foggy

Welcome to the *Barclays Global Technology Outlook*, where we outline our top picks and key themes for 2014 and beyond. In 2014, there seems to be a lot of buzz around the concept of the “Internet of Things” or IoT. This report aims to move beyond the hype and assess what we really know. The global tech teams also provide some lists of stocks to invest in along the way.

What is the IoT? Usually IoT is considered a network infrastructure, driven by the dramatic increase in connected devices that are linked to the internet. The connected devices are typically physical objects that have sensors embedded in them, which provide specific information, whether about its location, the condition of the environment, the condition of the subject or some other pre-determined variable. The device is typically considered to be uniquely identifiable and intelligence is derived from the combination of sensors and microcontrollers. Some of the devices have self-configuring capabilities that can sense aspects of the real world, such as the temperature or the presence or absence of a human and act on it. Wireless communication capabilities allow the devices to be connected to the network, leading to the ability to control many of our everyday activities remotely, reducing the need for human intervention. This infrastructure has the potential to blur the boundaries between physical and virtual objects amongst people, devices and things.

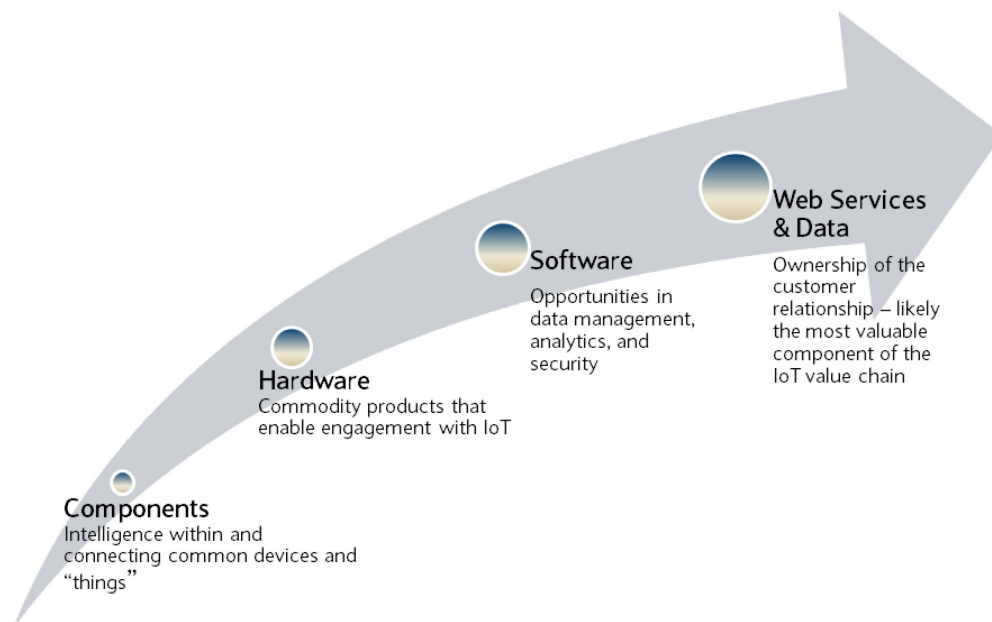
*IoT seems like a lot of hype
without a clear data roadmap
- but there seems to be
investable opportunities in
devices and data lifecycle
management*

Despite the fancy definition, we have hesitated in writing about this theme so far since it seems like a lot of hype without a clear data roadmap. Also, some of the companies we cover that are proponents of the theme don't even seem to have prospects for revenue growth over the long term to take advantage of it. As a result, we believe the real value in the theme is telling investors quickly what we think we know – and what we don't know – and how we will try to make money over the near term and long term around this concept. At the end of the day, it seems the real money over the long term is in the data and services that enable companies to be more efficient and allow individuals to live better lives.

In the chart below, we outline what we believe is the IoT value chain.

FIGURE 1

The customer interaction and data represent the key to the Internet of Things



Source: Barclays Equity Research

We are unsure of the role handsets may play in this trend over the long term, but so far it seems like it’s the center of most ideas. For example, Apple seems likely to use the iPhone (and iOS) as a processing and authentication hub for its own IoT companion devices and for other devices that have approved apps within the Apple App store. However, Google may take a different angle with the cloud and a more open operating system taking a bigger role since it can’t control all the hardware. To that end, we see the potential for cannibalization of handsets by objects in an IoT ecosystem, if those objects can strip the compute and security aspects of the phone of its importance (i.e., can access the internet from a car dashboard) and access intelligence directly from the cloud.

Either way, it is pretty clear that some semis, components and select supply chain companies are likely to see a lift from the wide range of devices that will be launched in 2014 and 2015 (e.g., the wearables cycle). We also see tailwinds for certain software applications that will be instrumental in managing and securing the huge volume of data coming from users interacting with many more networked devices in the course of a day. And finally, we believe web services firms that produce social networking and (often free) personal services platforms can shine in the IoT era – simply from a function of providing so many more opportunities for users to link to well known platforms (think Facebook, Google, Amazon, etc).

Hard to quantify IoT – but think big

For consumers, the proliferation of connected devices has driven services and capabilities that are increasingly embedded within familiar products, especially tablets and smartphones. Consumers now expect to be constantly in touch and continuously informed, changing the way connected devices are used in the real world. As for the commercial opportunity, IoT has the potential to fill corporate blind spots that exist within the current static business model. The data that IoT will generate will be more intelligent and

IoT is hard to quantify with data – but think of billions of connected devices, including appliances, cars, machines, gadgets and more...

increasingly analyzable. Real-time data from networked objects will provide enterprises the opportunity to address challenges modern society faces. We believe that businesses will pay for intelligence that makes them more efficient and knowledgeable about their customers.

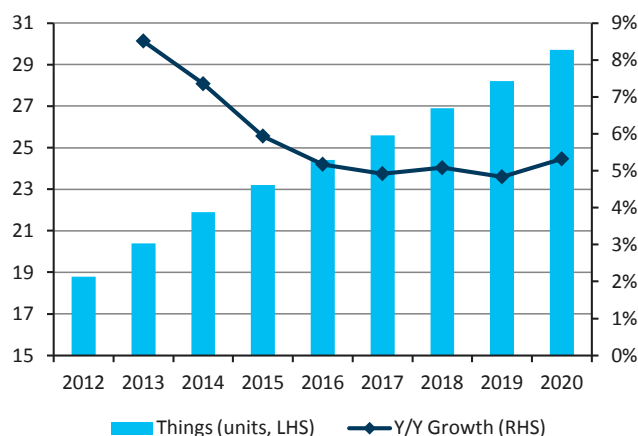
There is a real challenge in defining the IoT market in terms of units. We believe defining IoT is not particularly practical, considering the ambiguity in defining the unit as a basis for most forecasts. Both IDC and Gartner peg “things” (the units) as networked devices, including both wired and wireless devices. The topology of the network seems to matter very little – what matters is that the device or object is part of a larger wired or wireless network. While conceptually this is very easy to understand, we do believe there are some serious limitations that hinder the credibility of these forecasts.

First, the definition of a “thing” is likely to change over time, and therefore the unit assumption may be very difficult to properly size. However, the last few years would point to an environment of constantly evolving form factors and connected devices. The smartphone only really gained popularity after 2007, but in those few short years has completely redefined the computing landscape. The same could also be said for tablets, to a lesser degree. We believe the “thing” that forms the basis for these forecasts may continue to evolve and change. In some cases, the “thing” might be still only be a concept product. Or the “thing” may not even be on the radar of most tech companies, obviously a significant limitation in trying to forecast. Below we show some industry data and the market for “things” looks massive. What is clear is that the forecast will change a lot and the “things” will produce a lot of data.

The installed base of “things” is potentially massive, but also not that practical

FIGURE 2

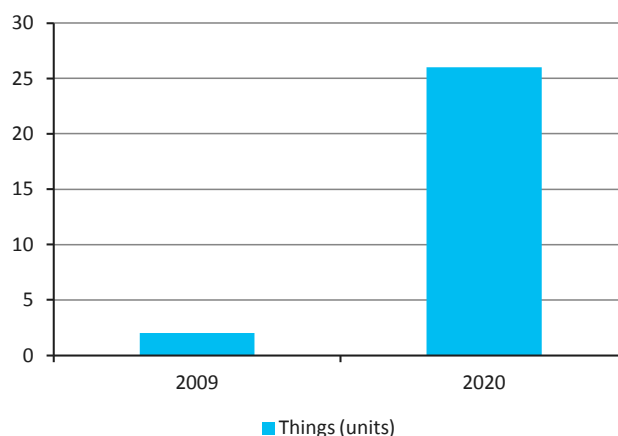
IDC - IoT installed base growth (billions of units)



Source: IDC

FIGURE 3

Gartner – IoT installed base growth (billions of units)



Source: Gartner

We acknowledge that the unit potential from the IoT market could be large in aggregate, perhaps even as large as the charts above. Data from the Association of Home Appliance Manufacturer’s points to about 10 million refrigerators sold annually in the United States. Similarly, each year about seven million microwaves are sold in the United States. However, we believe the unit opportunity could be several hundred million units globally just in appliances alone that can be connected. In other categories, such as wearables, we see low hanging fruit from industries which haven’t fully appreciated the ramifications of IoT. Watches may be an example. Wearables should continue to expand as a subcategory of IoT, and there are many different avenues for the technology to evolve over time and capture new unit opportunities. The growth of networked devices also depends on a range of secular factors beyond the

control of tech companies, where the underlying customer habits are changing for the “thing” today. As an example, the connected car seems to be a major focus point for companies hoping to create an environment of “always on” connectivity.

Finally, we believe it could be difficult for companies to really get a strong handle on what the dollar opportunity is outside of clear niches. As much as the unit opportunity is indeterminate, so is the selling price. And while clearly products with networked functionality should be more expensive than non-networked offerings, it is difficult to really measure if the markets are inelastic enough to tolerate the higher ASPs, especially in a world where customers are increasingly accustomed to deflation within the technology universe.

It starts with gadgets – wearables a big wave for investors into 2015

It seems devices & wearable computing are set for a big build cycle through 2015

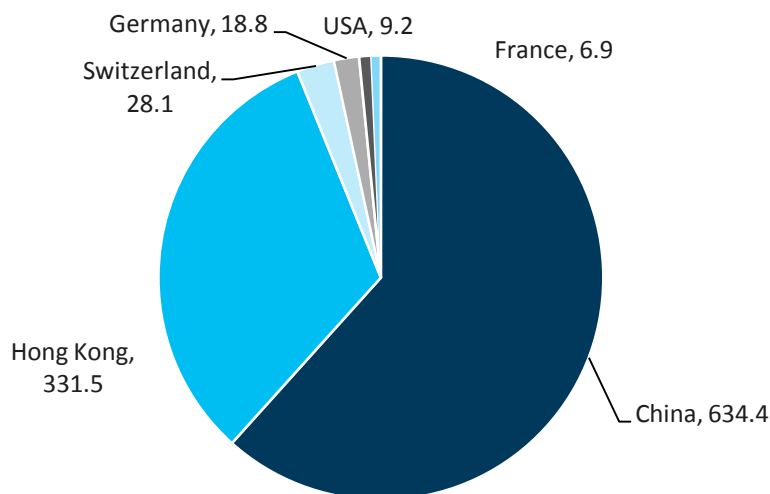
Many investors think of gadgets when they think of IoT. We see volatile product cycles for gadgets as hardware preferences may change quickly. The wearables market could turn out to be very typical for Apple, much like tablets played out. We expect Apple to be the first to perfect the watch category, then Android imitators will likely emerge and the market could commoditize thereafter. Apple is likely counting on the iWatch’s unique style and health/life improvement applications to provide years of competitive differentiation and margin, while also helping iPhone sales. In anticipation of the iWatch and its imitators, it seems wearable computing is set for a big build cycle and will be the most obvious battlefield for IoT at first.

Although the category of wearable computing has been around in various iterations for some time and is admittedly broad, we believe that tech companies take existing ideas (like products from Pebble) and integrate them into a broader ecosystem, creating an experience complementary with existing consumer electronics. Wearable computing could encompass devices ranging from health monitors to complex watches to prosthetics. However, we focus our attention on the wearable computing segment that takes traditional accoutrements, or variations thereof and connects them with a mobile ecosystem to promote an exchange of data from the device to the ecosystem and vice versa.

For example, the watch seems to be the one area that everyone is excited about. Shipments are about 1 billion per year, heavily concentrated in China and Hong Kong.

FIGURE 4

Global watch shipments by country (shipments in millions)



Source: Swiss Watch Federation

Even with some doubts, we believe wearables will have a big gadget build cycle through 2015 as the market embarks on this still relatively new frontier. Below we list some companies that we believe are worth investing in for the short term within the first big wearable wave that should play a big role in bringing the IoT theme to life.

FIGURE 5

Barclays best ideas for the wearable cycle

Industry Analyst	Company	Ticker
U.S. IT Hardware Ben Reitzes	Apple	AAPL
U.S. Semiconductors Blayne Curtis	NXPI, Avago, Qualcomm Silicon Labs	NXPI, AVGO, QCOM SLAB
Asia ex-Japan IT Hardware Kirk Yang	Hon Hai, Lenovo	2317-TW, 992-HK
Asia ex-Japan Semiconductors SC Bae and Andrew Lu	ASE, Chroma Richtek	2311-TW, 2360-TW 6286-TW
Asia ex-Japan Wireless Equipment Dale Gai	Zhen Ding, HTC AAC, Sunny Optical	4958-TW, 2498-TW 2018-TW, 2382-TW
Asia ex-Japan LCD Displays SC Bae, Jamie Yeh & Sunwoo Kim	LG Display, SEMCO, TPK	034220-SE, 009150-SE 3673-TW
Asia ex-Japan Internet & Media Alicia Yap	Baidu, Qihoo	BIDU, QHOO

Source: Barclays Equity Research

Data and industrial applications may be where the real profit is long term for investors

We believe appreciation for IoT is quite strong among web services companies who benefit from higher levels of user engagement on their platforms, and who will invest heavily in analytics software to make sense of it all. Established technology companies seem to appreciate the benefits of IoT from an ecosystem extension, where Android, for instance,

can now filter into an assortment of products in the home and companies, providing additional data on users and opening up more time for search and social networking, which are core to web services companies. Payments and location services also should play a significant role in the IoT landscape.

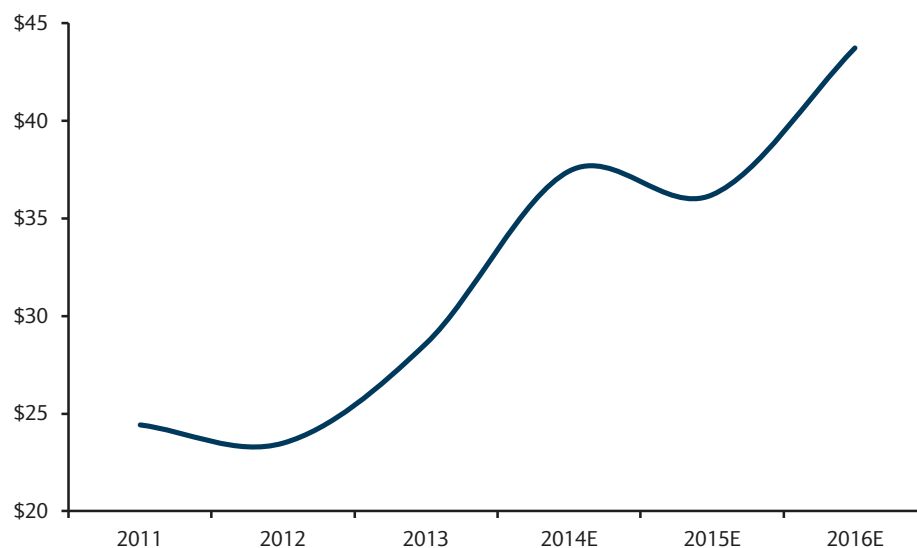
Software – real opportunities around analytics

We see a strong likelihood that IoT will yield a significant increase in data creation, fueling the need for investments in analytics. According to IDC, analytics combines 1) management and analytic applications; 2) intelligence and analytic tools; and 3) data warehousing platforms. Leaders in this area like IBM and SAP have made significant investments in all of these areas to ensure complete solutions. We believe that analytics is becoming embedded in the fabric of day-to-day decision making as analytics-driven organizations and consumers use the output to optimize outcomes. As shown in the exhibit below from Gartner, spending in the Big Data spending category continues to grow at north of a 10% growth rate.

For additional information on the software implications, please see sector specific sections at the back of this report.

FIGURE 6

IT spending related to Big Data (\$in billions)



Source: Gartner

Analytics presents another obvious opportunity from IoT

Big Data analytics aims to help enterprises gain further insight into its operations from all the unstructured data that it is creating. New technology continues to focus on extracting value from the unstructured data created within an organization. According to IDC, Big Data is commonly defined as new technologies and architectures designed to extract value from a large volumes of a wide variety of data. We believe that due to advancements in system (server) and storage resources, new software capabilities (predictive analytics) can now provide greater insight on the fast growing portion of unstructured data. By some estimates, unstructured data represents 80% of the data created (emails, documents, and videos) and is growing at a significantly faster rate than traditional structured data (data confined to the traditional database). EMC and other market research firms have previously stated that the growth in unstructured data will outpace the growth of structured data by a factor of 3x by 2020. Growth of this magnitude requires a new set of technologies that can not only store this data but also process it at high speeds, enabling analysis and insight. We

believe that IBM could be one of the bigger beneficiaries of this trend given its position in markets that are participating in the shift to Big Data technologies.

To that end, analytics, which has traditionally been associated with structured data, is making its way into the unstructured data world, and will serve a key role within IoT. Analytics technology (typically software) enables customers to get deeper insights from its data – analytics turns data into information.

FIGURE 7

Data lifecycle stocks which would benefit from IoT

Industry Analyst	Company	Ticker
U.S. IT Hardware Benjamin Reitzes	Aruba	ARUN
U.S. Software Raimo Lenschow	Oracle, Microsoft, Splunk, LogMeIn, PTC, Salesforce.com, Informatica	ORCL, MSFT, SPLK, LOGM, PTC, CRM, INFA
U.S. IT Consulting and Computer Services Darrin Peller	Alliance Data, Visa, Mastercard	ADS, V, MA
European Software & IT Services Gerardus Vos	SAP, Wirecard, Monitise	SAP, WDIG-XE, MONI-LN
Asia ex-Japan Internet & Media Alicia Yap	Baidu, Tencent	BIDU, 700-HK

Source: Barclays Research

A closer look at the real opportunities

With our concerns around characterizing the total opportunity aside, there are specific consumer and commercial opportunities where we believe IoT – or something in the shape of IoT – is likely to come to fruition. For consumers, the proliferation of connected devices has driven services and capabilities that reinforce their modern lifestyle and are increasingly embedded within familiar products. Consumers now expect to be constantly in touch and continuously informed, changing the way connected devices are used in the real world. Consumers have effectively become more empowered through hyperconnectivity.

This connectivity has fragmented the traditional purchasing experience as consumers are better informed. They increasingly know what they want and are more in control of their purchase experience as they have found smarter ways to evaluate products and services via their connected devices. Within their decision journey, consumers are deciding not only how, but where and when they engage with a brand. This poses a great challenge to eCommerce companies regarding their marketing campaigns and customer engagement.

An opportunity is therefore created for companies to use the data created by the hyperconnected consumers to provide a targeted offering – the right content to the right person at the right time via the right channel.

For additional research please see [Hyperconnected World: The Digital Invasion](#). Also please note the Barclays Select Series 2014: HyperConnected World Conference on June 26 in London ([click for link](#)).

Case study: connected household

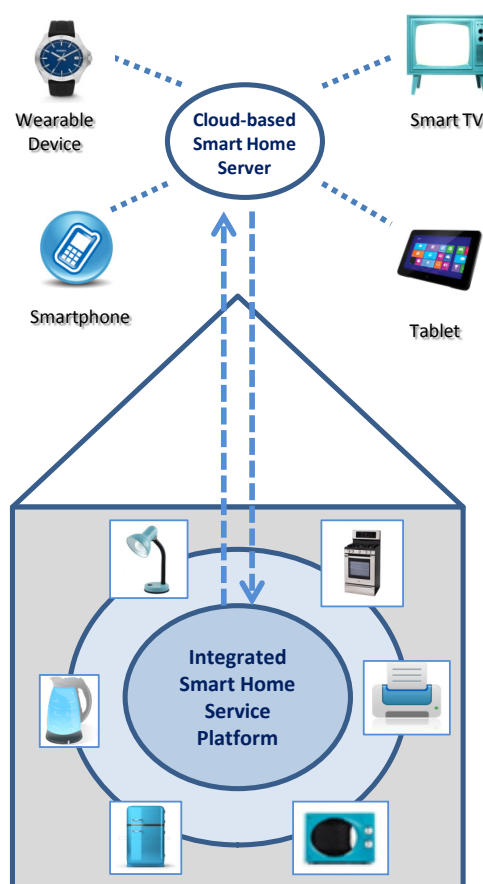
Samsung's Smart Home Platform which debuted at CES 2014 illustrates how the IoT could be implemented into a household in the future by having an integrated platform which would allow connected devices, such as refrigerators and lighting, to be controlled via a cloud-based home server. This would allow a homeowner to use their smartphone remotely

Google seems to be building the most compelling IoT backbone for the long term

to switch on lighting whilst travelling abroad, and the connected refrigerator being able to alert the homeowner's smartphone when it needs restocking.

Google's recent \$3.2bn acquisition of Nest offers strong evidence of the emerging importance of IoT, in our view, providing Google with a credible foothold in the realm of connected devices within the urban household. Nest's product offerings include a smart-thermostat, capable of profiling household heating patterns over the internet based on consumer preferences. This allows the consumer to control the temperature of his household via his smartphone, allowing the consumer to alert the thermostat to have the house at a certain temperature by a certain time. If successful, Google would not only have the potential to leverage on Nest's expertise within the connected home device market but also the ability to utilize the data that has been captured so far. Data regarding consumer user behavior could further enhance Google's capability in developing connected device offerings to the market, something other key players in the industry are keen to get involved with.

FIGURE 8
Connected household



Source: Barclays Research

Wearables – the next big trend

We believe that wearable computing is set to become the first real obvious battlefield for IoT

As the mobility and smartphone markets have matured, leading tech companies are now jockeying for position for the next big trend. We believe that wearable computing is set to become the next field of competition for tech companies. Although the category of wearable computing has been around in various iterations for some time and is admittedly broad, we believe that Apple can take existing form factors and integrate them into a broader ecosystem

creating a best of breed user experience, similar to what it did with the iPod.

Wearable computing could encompass devices ranging from health monitors to complex watches to prosthetics. However, we focus our attention on the wearable computing segment that takes traditional accoutrements, or variations thereof, connects them with a mobile ecosystem and promotes an exchange of data from the device to the ecosystem and vice versa. For example, we look at current iterations of wearable computing such as Google Glass, i'm watch and Pebble watch as forms of enabling a mobile ecosystem and data on a wearable device. We also notice devices like the Jawbone UP, Nike FuelBand and the Fitbit Flex which combine devices with apps and platforms to contribute to quantifying action and tracking one's self. Apple seems ready to enter the wearable computing sector just as it is gaining significant traction and mainstream interest; with Nike as a partner (Nike recently opted to discontinue the fuel band in April 2014). For example, the sixth generation iPod nano which came in a square touch screen form factor that could be adapted with a wrist band to make it a watch appeared to be Apple's first serious foray into wearable computing. We believe any move from Apple into wearable computing will utilize a much more streamlined version of iOS and provide a comprehensive integration with the Apple ecosystem (especially iPhone and iCloud) that most other types of wearable computing cannot offer.

Apple should be the first to "perfect" the watch – others should follow

We imagine Apple's wearable computing device to be firmly tied into existing infrastructure making it easy for consumers to link together existing iPhones and iPad and other devices that choose to integrate with the App store. In addition, we imagine wearable computing devices acting as a form of augmented relationship with iCloud. Similar to how an iPod nano would sync music from a computer and then be used as a mobile media player and watch, we could see a more advanced version utilizing the resources of the iPhone to add content and apps to the device. We also could see wearable computing devices leveraging the cellular data connections of iPhones and iPads through Bluetooth to provide internet connectivity so the actual wearable device does not have to be equipped with power draining cellular chipsets. We believe this arrangement could lead to a user experience that is greater than the sum of its parts and force the Google ecosystem to emulate it quickly.

There are already early entrants in the modern version of wearable computing. There are watches, wrist bands and dongles that connect smart mobility devices that provide information ranging from text messages to weather as well as relaying fitness information. However, many of the existing pushes into wearable computing are from a platform with a core competency trying to engage in smart mobility rather than a mobile device company bringing different apps to a device open for customization. For example, the existing fitness monitors bring their own features and allow them to be shared via a connection either through a wireless or physical connection. Also, smart watches from i'm watch and Pebble are extenders of a user's mobile device. However, we believe that Apple has a competitive advantage with its App Store environment which allows users to radically customize the use cases for their devices as well as have a direct and seamless integration with their existing hardware. The competitors that we believe present the biggest challenge to Apple are those that provide an enhanced reality part of an established ecosystem.

The competition in the wearable computing market that we believe is most formidable comes from Google given their array of web services and already highly established methods of disseminating data. Although Samsung could become an avid competitor in wearable computing, similar to the competition in smartphone, we believe it is more likely for a conflict to develop between Apple and Google alone. Although Samsung has the resources and industrial prowess to likely build devices that are highly similar to Apple's and has access to the Android operating system, we believe access to integrating personal

information will be the key part of any battle in wearable computing. Presenting a well organized selection of personal data will be important for wearable computing and we believe it will be owners of such data that will be able to capitalize the most from wearable computing. For example, Google would know a user's search history, email topics and calendar of events which would allow up-to-date augmented forms of data presentation. Apple conversely could open its APIs and glean more insight into its users. We imagine Apple being able to display on wearable computing certain songs that are played in certain areas as well as bring together the functions of a wearable device with specially developed apps. On the other hand, pure hardware manufacturers may be at a disadvantage as they do not have access to the same level of user data.

With an already existing mobile device infrastructure, an improving web services platform and user preference data; we believe Apple is poised to bring wearable computing into the mainstream. While the company faces competition, we believe that from a consumer device standpoint, it is best positioned compared to most other device manufactures.

Google is collecting images and data – and learning about users, which could lead to significant revenue streams around IoT and more...

Wearable computing could be implemented in many different ways. However, we believe that given recent media reports, Apple is most likely to find traction with a smart watch. We believe the sixth generation iPod nano could have been merely a trial run to determine the optimal form factor for a small, wrist mounted screen. However, as Google Glass has shown there are other possibilities including glasses, clothing, rings and attachments to existing devices. We believe that Apple's push toward a smart watch will allow Apple to enter the wearable computing market at a reasonable price and with a device that will see a high rate of interaction. For example, in a consumer survey of IDC, the items that were worn most frequently were wrist watches and prescription glasses. Also, according to the survey, the most important characteristic to consumers for both smart watches and glasses was price. Therefore, we believe compared to Google's offering, Apple may have a leg up if it can present a reasonably priced offering.

However, Google's Glass implementation, although highly conspicuous, is more conducive to taking pictures and videos on the fly as well as providing a heads up display of information and directions. We believe Google's Glass program presents a strong competitor if not a game changer in terms of wearable computing, but expect it will be targeted at a different market than Apple's offering. We also believe Google will expand search into new areas by cataloguing visual imprints. Syncing the company's data with the company's wearable offerings could open the door to predictive technologies that alter cognitive behavior based on data. We believe Google could have a leg up in web services for perhaps even the next few decades.

Enterprise data is where the real sustainable profit may be

Enterprise applications may prove to be the more stable revenue stream over the long term vs. consumer gadgets

The IoT has the potential to fill corporate blind spots that exist within the current static business model. The data that IoT will generate will be more intelligent. Real-time data from networked objects will provide enterprises the opportunity to address challenges modern society faces.

Per McKinsey Global Institute (2013), there are distinct types of applications that are emerging for enterprises, which include:

- a) **Ability to track behavior:** If products have sensors embedded within them, enterprises can track and monitor the movement of the product. For example, being able to monitor identification tags on products as they move through the supply chain. If the data is analyzed correctly by the enterprise, this should improve inventory management.

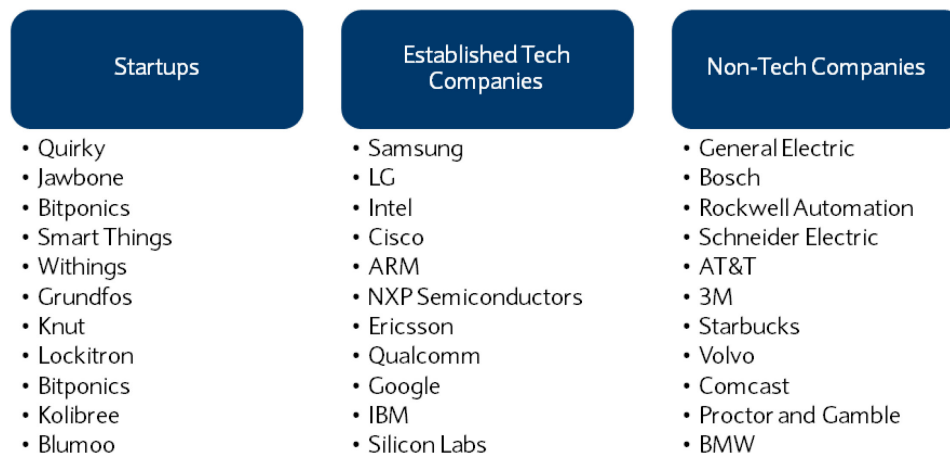
- b) **Enhanced situational awareness:** Real-time data can provide heightened awareness, thus helping enterprises with their decision making processes. For example, allowing soil moisture to be monitored on a real-time basis so that the enterprise knows how to adjust the water supply in order for the soil to be nurtured appropriately.
- c) **Sensor-driven decision analytics:** within this subset, the IoT has the opportunity to support more complex planning and decision making. For example, retailers could analyze sensor readings from the shop floor to determine which store displays have proved more popular. Simulations on such behavior would allow the enterprise to determine the optimal retail layout to improve revenue. This is the theory behind Bluetooth Low Energy beacons.
- d) **Process optimization:** The ability for sensors to generate and act on data automatically within a process, without the need for human intervention would allow decision making to occur more efficiently and to greater accuracy. For example, the ability to move the direction of a product on an assembly supply if its weight is not appropriate.

Productivity advantages embraced by both tech and non-tech companies

We believe non-tech companies also understand the opportunity in adopting IoT across their businesses. To that end, a consortium of industrial giants, including AT&T, Cisco, General Electric, IBM and Intel recently announced plans to cooperate to create engineering standards for objects, sensors and large computing systems in some of the world's largest industrial assets, such as oil refineries, factories or harbors. The White House and other United States governmental entities were also involved in the creation of the group, which is expected to enroll other large American and foreign businesses. The group, called the Industrial Internet Consortium, hopes to establish common ways that machines share information and move data. Creating standards for things like the electricity levels within small machines, or the kinds of radio technology a railroad might use to signal track conditions, can increase the size of the potential market and speed product development.

FIGURE 9

IoT participation is running from startups to non-tech companies



Source: Company Websites, Barclays Research

The main driver of IoT adoption is hyperconnectivity

We see several drivers behind the growth of IoT. We describe a couple of the key drivers to adoption for both consumers and enterprises and the motivations for tech companies pushing the trend.

IoT is driven by increased connectivity

Expands the opportunities for data creation and user engagement

We believe appreciation for IoT is quite strong among web services companies who benefit from higher levels of user engagement on their platforms. Established technology companies seem to appreciate the benefits of IoT from an ecosystem extension, where Android, for instance, can now filter into an assortment of otherwise mundane products in the home and companies, providing additional data on users and opening up more time for search and social networking, which are core to web services companies. Also, we believe IoT provides a barrier to exit for web services users who utilize a consistent OS throughout their different networked devices (i.e., an iOS customer is more likely to stay within Apple's universe).

One area where we see IoT expanding aggressively, for example, is the "connected car." This year most auto brands have some sort of offerings linking Android or iOS to their branded passenger vehicles. Our sense from our checks is that the Android ecosystem is working quickly to catch up to Apple in terms of alliances and capitalizes on its advantages of being tied to Google Maps. Recall that last June, Apple announced that nine different auto OEMs were planning to deploy iOS in the car (Apple "CarPlay"). As for Android, the Open Automotive Alliance announced at CES this year that Audi, GM, Hyundai, Honda, Google and NVIDIA were forming a group specifically focused on driving Android adoption in cars. The potential downside to Android in connected cars is that it could lead to further fragmentation of the OS, which could lend complexity and benefit Apple. We believe in-car infotainment and navigation are important battle grounds in the next few years since consumers increasingly want their cars to be compatible with their smart devices and ready to start making choices with that in mind. The connected car example highlights how companies are co-opting normal "things" to extend their ecosystem at the benefit of their core businesses. In short, we believe this is at the heart of the shift toward IoT.

Provides scope for real-time monitoring and optimization

We believe IoT will provide a platform for real-time monitoring and real-time optimization technologies. Tangibly, we see manifestations of that theme ranging from Nest's products to new categories of wearables. We believe IoT will be a key part of the smart metering trend that could emerge as a component of IoT over time and can be fed into automatic optimization platforms which tweak larger systems for better performance and cost savings.

Fitness and health is one sub-vertical where we believe companies were monitoring can see rapid growth. Health conscious customers are looking to make adaptations to their lifestyles even in small ways to reshape lifestyles in healthier directions. At CES this year, for example, we noticed innovations around using the Galaxy smartphone as a data collection device for cycling and using the peddling of a bike to power the phone. LG unveiled a fitness band (LifeBand Touch) and a set of earphones with biometric tracking capabilities (Heart Rate Earphones). We also noticed a similar product from Garmin (Vivofit) and Intel (Smart Earbuds). In terms of watches, we believe there was interest this year in smart watches from Pebble and also still Samsung's Galaxy Gear, though the Galaxy Gear remains limited by the need to keep the device tethered to the Galaxy Note line. We believe these devices plus a whole host of similar ones that are already in the marketplace point to the emergence of analytics blending with common objects and things in both the commercial and consumer spheres.

Cloud opens the door to more functionality

IoT is really made possible by the emergence of cloud computing, which ties systems together to provide a scalable and elastic IT fabric that can be used in private by corporations to really enable the IoT. The basic cloud technologies consist of software as a service (SaaS) applications that are hosted outside of the company's data center by a third-party provider who uses the internet to access the service. Infrastructure as a service (IaaS) provides computing and storage capacity that can be utilized for various enterprise applications. In essence, the public cloud provides a utility service (in the form of computing capacity); much like the power company or the water company provides electricity or water.

Some challenges seen monetizing the opportunity – some companies overplaying their hand?

IoT adoption may face some hurdles like high costs of connectivity in some places

Applications face much cheaper non-connected substitutes

While connectivity is expected to add a level of differentiation for common, everyday goods, customers may be slow to embrace new offerings given the relative costs with unconnected alternatives. Some of the functionality could be considered superfluous and not worth the additional expenditure. Moreover, price for common connected products can be twice as expensive and the products customers are more familiar with and cheaper may suffice. One, perhaps even odd example would be Oral-B's new connected toothbrush which incorporates Bluetooth connectivity and syncs with either iOS or Android products. The price of a normal electric toothbrush is around \$100. The price of the Bluetooth connected version is \$219. The number of clever inventions could be theoretically endless, but we are cautious on the ability of the market to successfully commercialize many of the innovations that could be coming.

Low barriers to entry for some

One interesting feature of IoT is that the exploitation of specific niches is not always capital intensive and often it builds on pre-existing technology platforms in order to minimize cost. With much of the enablement infrastructure in place (i.e., networking, computing), the solutions for IoT are often incremental enough to require only a few million dollars of total start-up funding. To that end, we would point to the significant growth of new companies in the area which have flourished on rather small capital raises.

Many small IoT players have access to capital through crowd funding

Also interestingly, some of the largest crowd funding projects have been directed at products which could be considered part of the IoT, diminishing the funding limitations for entrepreneurs who have new concepts to bring to market (see chart below). We believe crowd funding could be key to this space in the future and also lead to sustained fragmentation. Platforms that could act as enablers include such sites as Kickstarter and Quirky. We believe this area could be harder for big technology companies to dominate simply by leveraging their existing product portfolios, current customer relationships and deeper financial resources.

FIGURE 10
Select crowd funded IoT projects

Company	Project	Capital Raised	No. Contributors
Pebble	Smartwatch	\$10,266,845	68,929
Scanadu Scout	Healthcare scanner	1,664,574	8,523
Canary	Home security device	1,961,862	7,461
Kreyos	Smartwatch	1,502,828	11,723
CST-01	Smartwatch	1,026,292	7,658

Source: Kickstarter and Kreyos

Privacy and security remain risks for adopters

IoT could drive an explosion in end points. IDC estimates 212 billion end points by 2020. Cyber criminals are well aware of these trends, and thus an emerging pattern among cyber criminals has been to target and exploit employee-owned devices to access corporate data. Two prominent examples of this include the RSA and Google Aurora attacks, both of which started through a single, compromised user endpoint and expanded to causing substantial damage. As we previously shared, this challenge has become even more amplified over the last few years as the number of internet-enabled devices has increased and is projected to increase even further through the broader IoT trend.

IoT adoption may be impacted by security risks – more devices mean more threats

At its most basic form, endpoint security is an approach that requires each computer or endpoint to comply with a predefined set of standards or policies prior to being granted access to the corporate network; this could be key for IoT to allay concerns over privacy and security. Endpoint security solutions are typically deployed in a client/server model, implying that a centrally managed server hosts the security software with a separate client installed on each individual device. When the client attempts to access the network, the server essentially authenticates both the client and the user and ensures that it complies with enterprise IT policies such as using an updated operating system, web browser, VPN client, etc.

Endpoints come in the form of laptops, desktops, tablets, servers, smartphones, netbooks and other mobile devices. While endpoint security has historically been siloed between corporate and consumer endpoints, the lines between these two segments are blurring as more consumer devices require access to the corporate network. The rise of tablets and smartphones in the enterprise as well as the broader bring your own device (BYOD) trend has led to a number of complications for enterprise IT departments. As more devices come onto the corporate network, IT departments can no longer approach security from a network-only perspective and the more stringent network security policies need to extend to all physical endpoints.

Carriers have trouble monetizing the entire ecosystem

As the IoT grows, we believe the basis for connectivity could increasingly move from cellular networks to Wi-Fi networks, posing problems for the major carriers. We believe these companies could have difficulty monetizing all of the new devices that enter the customers' ecosystem and effectively hollow out the importance of the smartphone network. We believe carriers will likely turn to up-selling additional services like connectivity to multiple devices (connected home, connected cars, tablets, etc.) as a way to capitalize on the growth of IoT. As a consequence, we believe that service providers' priorities (both wireless and wireline) will increasingly shift toward focusing more on content and network quality to optimize profits.

Components, hardware and infrastructure uncertainty with IoT

In our view, sectors like hardware are prime for commoditization. On the other hand, the volumes of data and the secure management of that data are likely to be high-value areas, where we believe investors could see healthy secular tailwinds.

Components – building blocks of the IoT

The increased use of semiconductors, like sensors, microcontrollers, and connectivity, in industry devices create a new generation of smart devices, controllable by the mobile device. For example, a community smart car network where one could rent a car from owners in the vicinity. The car would be fully digital (with automatic billing to the mobile based on mileage, driving style, etc.) and the digital locks and ignition would be controlled by the mobile. This would vastly increase the utilization of a capital good and could significantly reduce car ownership in urban areas.

Companies in the sector do seem to perceive a large volume opportunity in the IoT. At its recent analyst day, Qualcomm discussed the likelihood of 25 billion connected devices by 2020. The ecosystem of connectivity is likely to expand from devices to machines, people (wearables), objects and places. Intel recently recast its segments to include a business dedicated to the IoT (although more a renaming of existing efforts in areas such as embedded processing and software in auto infotainment and Point-of-Sale terminals). We believe the difficulty for vendors is whether the higher volume is really significant from a dollar standpoint. A typical wearable device could have a few dollars of sensor content but that is likely not a significant needle mover for most listed component companies. We highlighted Maxim as a play on sensors on the back of their Samsung GS5 win but barring a massive unit build from AAPL, we focus on some smaller names such as Silicon Labs that would still be able to see a meaningful benefit from even builds of even 5-10mn units.

The area that is the most meaningful driver today for IoT is connectivity, specifically Wi-Fi. Vendors such as Broadcom and Qualcomm have been riding this trend for years on the back of WLAN adoption in PCs, TVs, and STBs and we see additionally opportunities as WLAN segments such as home automation and autos. Over time we see the MCU vendors participating more on the radio side as low power WLAN, BT Smart, and Zigbee roll out to more devices.

Hardware – likely on the fastest route to commoditization

More broadly, we are seeing a hollowing out of hardware, a trend we expect to persist as more value shifts to social networking and cloud/web services which become more pervasive in the Internet of Things. Facebook's recently announced purchase of WhatsApp for up to \$19 billion confirms this shift, in our view, and many investors are likely already aware that this shift is under way.

Hardware struggles to capture value in the IoT long term

Hardware is already seeing the biggest challenges emerge in IoT as companies face disruptive forces from both new form factors and a distributed on-demand compute architecture. The shift to IoT underscores the fact that certain types of hardware solutions are potentially being viewed as gateways to new technology services. This change in perspective is altering how consumer and businesses view IT budgeting, which could also place pressure on profitable hardware maintenance streams as well. A major consequence of this shift is that certain forms of hardware (PCs, smartphones) could get hollowed out or commoditized over time if organizations begin to delegate more workloads to the IoT.

The dollar opportunity emanating from IoT sensors is likely not a significant needle mover for most listed component companies

Second, unlike the traditional model that utilizes name brand IT equipment, the build out of IoT is being done with cheap hardware and new form factors. These projects, funded by mega-cap tech companies to VCs to even crowd funders, are emerging on a massive scale. These projects are taking non-traditional appliances and devices and utilizing open-source technologies to build the basis of innovative IT solution providers in a variety of niche areas. The major implication for hardware spending is that while IoT was once considered to be a clear total addressable market (TAM) expansion opportunity for OEMs, it may actually be cannibalistic if equipment continues to decentralize or even become obsolete through ubiquitous connectivity within familiar objects or things.

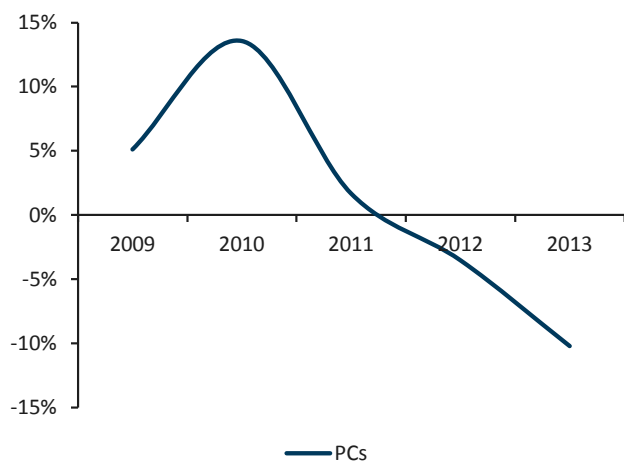
Web services companies, like Google, understand the importance of gaining a foothold in the next form factors in order to not miss the next mobile

Web services companies, like Google, understand the importance of gaining a foothold in the next form factors in order to not miss the next mobile. Google has released products such as Google Glass, which is a display-worn like a pair of glasses that provides much of the same data provided by a smartphone and a watch introduced as Android wear. Google also has purchased Nest as another lever to the IoT strategy. Facebook's purchase of Oculus will likely provide connection between social media and virtual reality at some point, even if the concept is still in the early stages. We believe these companies understand the value of using an underlying form factor to sweep users into their platforms.

The rise of the IoT has already had a fairly significant impact on the IT hardware industry with the most profound impact on the PC market in particular. Although the rate of the PC market decline has sort of stabilized in 2014, the market has been impacted for several years due to cannibalization from smartphones and tablets, and soon more form factors could surround users. However, we are seeing smartphones and tablets decelerate in the near term given market saturation. We believe the handset OEMs are having and will have a difficult time adapting to the architecture of the Internet of Things.

FIGURE 11

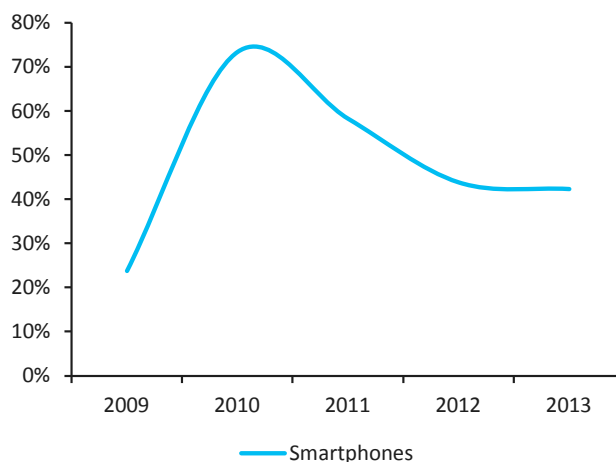
Annual change in PC unit demand (%)



Source: IDC and Barclays Equity Research Estimate

FIGURE 12

Annual change in smartphone unit demand (%)



Source: IDC and Barclays Equity Research Estimates

Wi-Fi ubiquity may be necessary to drive IoT

Networking & telco equipment – Wi-Fi a significant beneficiary

Wi-Fi has always been a preferred method of connectivity, with what started as computer notebooks (laptops), evolved to smartphones and tablets, and now we are seeing an increasing number of new devices that are connected to the internet via Wi-Fi, ranging from refrigerators to health monitoring systems. We expect this trend to continue driven by faster access speed (.11ac), more regulatory support, new services (i.e., location based marketing), and more ubiquitous coverage offered by cable and hotspot providers. As such,

we continue to view Wi-Fi as a key enabler of IoT, especially in areas like the connected home (thermostats, alarms, lighting) and healthcare, and believe wireless infrastructure vendors like Aruba remain key beneficiaries. Note that while wireless is the most common access method, it does have its shortcomings, as its signals have limited range. IoT will ultimately leverage a combination of other radio technologies as well, including both 4G/LTE and lower power methods such as Bluetooth Smart, Zigbee, and low power WLAN.

FIGURE 13

Barclays WLAN hardware market model (units & revenue)

Units ('000's)													
Calendar Year	2012	1Q13	2Q13	3Q13	4Q13	2013	1Q14E	2Q14E	3Q14E	4Q14E	2014E	2015E	2016E
Total	100,090	26,434	27,212	29,493	29,686	112,826	29,117	29,873	31,771	33,936	124,696	137,261	150,111
Y/Y	10.7%	10.6%	8.1%	16.5%	15.5%	12.7%	10.2%	9.8%	7.7%	14.3%	10.5%	10.1%	9.4%
Q/Q	-	2.8%	2.9%	8.4%	0.7%	-	-1.9%	2.6%	6.4%	6.8%	-	-	-
Enterprise	7,492	2,061	2,436	2,628	2,447	9,573	2,423	2,641	2,905	3,050	11,019	12,527	13,973
Y/Y	24.3%	33.0%	21.2%	34.7%	23.6%	27.8%	17.6%	8.4%	10.5%	24.6%	15.1%	13.7%	11.5%
Q/Q	-	4.0%	18.2%	7.9%	-6.9%	-	-1.0%	9.0%	10.0%	5.0%	-	-	-
% of Total	7.5%	7.8%	9.0%	8.9%	8.2%	8.5%	8.3%	8.8%	9.1%	9.0%	8.8%	9.1%	9.3%
SOHO	92,426	24,324	24,714	26,807	27,179	103,024	26,635	27,168	28,798	30,814	113,416	124,440	135,818
Y/Y	9.6%	9.0%	6.9%	15.0%	14.9%	11.5%	9.5%	9.9%	7.4%	13.4%	10.1%	9.7%	9.1%
Q/Q	-	2.8%	1.6%	8.5%	1.4%	-	-2.0%	2.0%	6.0%	7.0%	-	-	-
% of Total	92.3%	92.0%	90.8%	90.9%	91.6%	91.3%	91.5%	90.9%	90.6%	90.8%	91.0%	90.7%	90%
Outdoor Mesh Node	172	49	62	58	60	229	59	64	67	72	262	295	320
Y/Y	74.0%	67.8%	83.2%	17.3%	1.6%	33.5%	19.5%	2.2%	16.2%	20.0%	14.1%	12.6%	8.7%
Q/Q	-	-16.7%	26.2%	-6.7%	3.6%	-	-2.0%	8.0%	6.0%	7.0%	-	-	-
% of Total	0%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0%
Value (\$ millions)													
Calendar Year	2012	1Q13	2Q13	3Q13	4Q13	2013	1Q14E	2Q14E	3Q14E	4Q14E	2014E	2015E	2016E
Total	7,517	1,975	2,109	2,193	2,190	8,466	2,132	2,229	2,395	2,640	9,397	10,371	11,325
Y/Y	17.1%	17.9%	13.9%	10.4%	9.3%	12.6%	8.0%	5.7%	9.2%	20.6%	11.0%	10.4%	9.2%
Q/Q	-	-1.5%	6.8%	4.0%	-0.2%	-	-2.6%	4.6%	7.4%	10.2%	-	-	-
Enterprise	3,455	896	1,001	1,032	1,046	3,975	1,005	1,063	1,145	1,275	4,488	5,000	5,531
Y/Y	21.1%	21.2%	14.9%	14.2%	11.2%	15.0%	12.2%	6.1%	11.0%	21.8%	12.9%	11.4%	10.6%
Q/Q	-	-4.8%	11.8%	3.0%	1.4%	-	-4.0%	5.7%	7.8%	11.3%	-	-	-
% of Total	46.0%	45.4%	47.5%	47.0%	47.8%	47.0%	47.1%	47.7%	47.8%	48.3%	47.8%	48.2%	48.8%
SOHO	3,809	1,008	1,019	1,084	1,068	4,179	1,058	1,089	1,166	1,272	4,585	5,021	5,428
Y/Y	12%	13.2%	9.8%	6.5%	9.7%	9.7%	4.9%	6.9%	7.6%	19.1%	9.7%	9.5%	8.1%
Q/Q	-	3.5%	1.1%	6.4%	-1.4%	-	-1.0%	3.0%	7.0%	9.1%	-	-	-
% of Total	51%	51.0%	48.3%	49.4%	48.8%	49%	49.6%	48.9%	48.7%	48.2%	48.8%	48.4%	47.9%
Outdoor Mesh Node	252	71	88	78	75	312	70	77	84	93	324	350	365
Y/Y	52.3%	58.3%	68.6%	17.9%	-16.0%	23.7%	-2.3%	-12.4%	8.0%	24.6%	3.8%	7.9%	4.5%
Q/Q	-	-19.9%	24.0%	-12.3%	-3.6%	-	-6.9%	11.2%	8.1%	11.3%	-	-	-
% of Total	3.4%	3.6%	4.2%	3.5%	3.4%	3.7%	3.3%	3.5%	3.5%	3.5%	3.4%	3.4%	3.2%

Source: Company Reports, Barclays Research Estimates, Dell'Oro

More government support is also a tailwind for more Wi-Fi coverage. U.S. regulators have recently voted to open unlicensed spectrum for radio technologies like Wi-Fi and Bluetooth. The additional spectrum will boost capacity and allow users to realize the faster speeds of newer technologies like 802.11ac. It also means more spectrum for application like iBeacon, which run on Bluetooth and are a key driver for the IoT. Further, the U.S. government is also considering more funding for schools to improve Wi-Fi connectivity. Improvements could come in the form of upgrading cabling or increasing Wi-Fi coverage with more/better access points. While anecdotal, we believe issues similar to this underscore the importance of wireless access for an increasing number of critical applications.

Cable operators are also now offering much more comprehensive Wi-Fi solutions outside of the home to help improve the wireless roaming experience and create a stickier customer base. For example, in April, Time Warner Cable launched its Hotspot 2.0 Wi-Fi network,

IoT could be a threat to established vendors near term given the fragmented nature of the opportunity

which is the first large scale rollout of the technology by any operator. Hotspot 2.0 effectively enables wireless hotspots to act similarly to cellular networks with seamless handoff between connections and access portals. Further, in an April filing with the FCC, Comcast revealed that it is considering creating a Wi-Fi-based mobile network that will leverage its massive hotspot deployments along with pooled resources from home gateways within certain neighborhoods. Specifics of a possible “Wi-Fi-first” deployment were not given, but Comcast could partner with a cellular provider to offer a hybrid Wi-Fi/cellular service or sell Wi-Fi capacity to existing carriers to offload traffic in dense areas.

While there are many established vendors who think they are going to win share in the IoT, we believe the challenges of gaining a foothold could be harder than they think. The IoT could be a threat to established vendors near term given the fragmented nature of the opportunity. We believe this may afford some big OEMs less control over the direction of technology and inject another level of disruption alongside the cloud, mobile and social themes we have highlighted in past research.

- **IBM:** While we believe the company does have a leading position in the software analytics space, we believe sales are tied to the mainframe cycle. The solution set required to manage data from IoT is likely much different than IBM’s current product offerings. We also believe customers simply don’t think of IBM as offering a solution in this space, and we are cautious on whether or not this can be an area where IBM can play in a way that doesn’t eventually become commoditized.
- **Cisco:** Broadly speaking, we do believe that IoT and more application and data over the internet is generally a positive for Cisco, as the network increases in strategic value and helps to support the wireless business which has been losing share as of late. However, this has also been the case for many years as consumers and enterprises have shifted application consumption from on-premise, to the cloud. Further, many of the new applications enabled by micro-sensors will likely be very low bandwidth relative to other mediums like smartphones and tablets, and therefore the incremental infrastructure investment may not move the needle as Cisco thinks. Also network costs may force customers to consider new technologies that are more modular, less proprietary and factor in inputs from the public cloud.
- **Intel:** The company recently re-bucketed its business to create an IoT segment but nearly all of this revenue today is from embedded processors in auto infotainment and Point-of-Sales terminals, not entirely what people typically think of as IoT. Intel is working on a smaller processor (Quark) to penetrate more portable/consumer devices but we believe this will be difficult to penetrate such an entrenched ARM camp.

It is hard to declare incumbents like Cisco as a winner from IoT

Vendor focus: Cisco's IoT vision still vague; more connectivity needed but incremental investment may not move the needle

Cisco has been very vocal around IoT and has emerged as the primary spokesperson with respect to the opportunity and implications for the IT ecosystem. In short, with more “things” being connected to the internet under the umbrella of IoT, Cisco is positioning itself as the key provider of the networking infrastructure to support increasing data traffic. It's still very early days, but the company has been aggressively marketing and messaging its IoT vision and is trying to gain support from its peers. In March, it was announced that Cisco has teamed up with GE, AT&T, IBM, and Intel to form the Industrial Internet Consortium (IIC), which is aiming to drive IoT standards and promote interoperability, security and general best practices. We also note that Cisco has invested in \$100mn to fund early stage IoT technologies.

Cisco often cites figures in the trillions of dollars when discussing what's at stake for users and enablers of IoT, particularly in verticals like government (connected cities), healthcare, manufacturing, and energy. While the opportunity is certainly substantial, it is still unclear how Cisco really plans to monetize IoT in a way that can meaningfully drive revenue growth. Broadly speaking, we do believe that IoT and more applications and data over the internet are generally a positive for Cisco, as the network increases in strategic value. However, this has also been the case for many years as consumers and enterprises have shifted application consumption from on-premise, to the cloud. Further, many of the new applications enabled by micro-sensors will likely be very low bandwidth relative to other mediums like smartphones and tablets, and therefore the incremental infrastructure investment may not move the needle. We do believe that lack of a standardized communication protocol and security will be major obstacles to IoT in the near term, especially in the wake of Heartbleed Bug.

We look at ways Cisco will likely monetize IoT:

Traditional networking infrastructure: The need for more connections in unconventional locations should benefit Cisco's core portfolio of routers, switches, wireless access points, and security products. The company has ruggedized versions of each to suit use cases like light poles in cities, manufacturing plants, or oil fields/rigs.

Services: Fundamentally, IoT is a different type of architecture and deployment model relative to traditional IT implementations. As such, Cisco has the opportunity to provide consulting services to customers looking to rollout IoT initiatives, with the intent of pulling hardware sales through over time. The company has frequently discussed its goal of providing more services and continues to acquire bolt-on technologies to create a more comprehensive services portfolio. For example, JouleX, acquired last year, provides energy management solutions, which will be critical in IoT.

Fog computing: One of the more interesting solutions that Cisco is bringing to market is fog computing (a layer down from cloud), which is based on its new routing operating system, IOx (combination of Ciscos IOS and Linux). Fog computing essentially moves compute and analytics processes to the edge of the network versus having to be processed in the cloud. By keeping the data closer to the source, users can capture the benefit of IoT as decisions can be made closer to real time. IOx will be available later this year.

The cloud: Cisco recently announced its plans to build a global “Intercloud”, which includes investment of \$1 billion over the next two years. We believe the company can use its cloud to power its IoT vision, as the “things” connect back to a central location.

Cisco's Intercloud concept is essentially a "cloud of many clouds" that will leverage infrastructure of service provider partners as well as some of its own to create a global distributed OpenStack cloud environment aimed at the enterprise. The goal is not for Cisco to become a public cloud or infrastructure-as-a-service vendor (i.e., AWS, Google, Rackspace), but rather to create a large, federated cloud that can enable cloud applications and workload mobility between private, public and hybrid clouds.

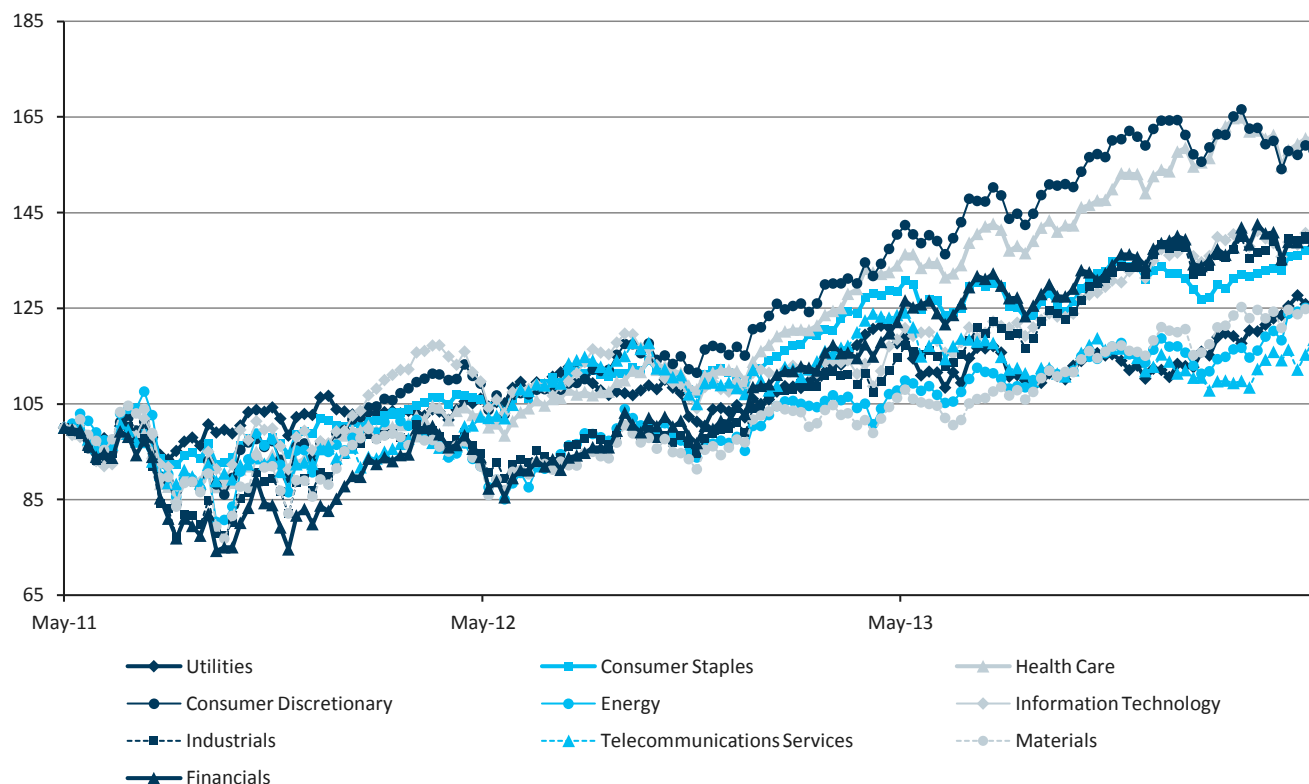
Cisco's Intercloud intends to tie many disparate clouds together to create one large cloud. The strategy will rely heavily on service providers that have or are looking to offer cloud-based services to customers. Cisco plans to install and operate the cloud infrastructure within its partners' data centers and provide network connectivity and security among other services. Cisco will build its own data centers to implement Intercloud, but will also invest in its partners' existing infrastructure to facilitate the rollout. We believe Cisco's willingness to invest, while partially self-serving, should instill some confidence in its partners, as Cisco is willing to bear risk on this investment as well. Once the cloud is deployed, service providers and Cisco can offer applications like collaboration, security, and desktop-as-a-service to end customers. From a technical perspective, Intercloud will leverage Cisco's ACI hardware and OpenStack as the cloud orchestration and management platform. OpenStack will allow interoperability between Cisco's cloud and large public providers like AWS and Azure that do not support OpenStack, but have APIs.

Sector performance analysis

We highlight the performance of the tech sector as well as specific industries compared to the market and relevant industries. We have also included a list of some of the leaders and laggards in selected sectors of the technology industry for recent periods.

FIGURE 14

The S&P 500 Information Technology sector has slightly outperformed YTD



Source: Thomson ONE. Prices as of May 9, 2014.

FIGURE 15

Barclays global technology composite valuations by subsector

Barclays Global Technology Composites	NTM P/E	5-Yr Med.	EV/FWD Sales	5-Yr Med.
U.S. Software	22.7x	21.5x	2.9x	3.4x
U.S. IT Hardware & Data Networking	11.3x	11.7x	1.6x	1.2x
U.S. Semiconductors	14.9x	14.1x	2.5x	2.8x
U.S. Internet	39.4x	26.3x	2.6x	2.3x
U.S. IT Consulting & Computer Services	17.2x	14.7x	2.8x	2.3x
U.S. Telecom Services	13.3x	14.4x	3.6x	3.3x
U.S. Communications Infrastructure	12.9x	13.3x	1.2x	1.4x
European Software & IT Services	18.6x	13.1x	3.5x	2.5x
European Technology Hardware	19.8x	15.1x	1.6x	1.1x
Israel Technology	15.7x	19.4x	2.5x	2.1x
Asia ex-Japan IT Hardware	13.4x	11.7x	0.3x	0.3x
Asia ex-Japan Semiconductors	13.8x	12.5x	1.8x	1.5x
Asia ex-Japan Wireless Equipment	12.3x	11.3x	0.6x	0.8x
Asia ex-Japan LCD Displays	13.3x	10.6x	0.6x	0.7x
Asia ex-Japan Internet & Media	26.0x	15.1x	3.0x	3.9x
Asia ex-Japan Software & IT Services	12.7x	12.3x	1.8x	1.9x
Japan Internet	18.3x	16.7x	1.1x	1.4x
Japan Precision	14.0x	14.9x	0.7x	0.7x

Source: ThomsonOne. Data as of 5/9/14.

Rotation toward value continues

The figure below summarizes group valuations relative to historical averages across the tech sector for both price to earnings and enterprise value to sales ratios. The majority of the Barclays global technology sectors are trading above their five-year median P/E values. Year-to-date, the tech sector has largely tracked the S&P 500. The S&P Information Technology Index is up about 1% year-to-date (as of 5/9/14). Looking at our Barclays Global Technology Composites, a few sectors outperformed the market YTD, including Semis, European Software & Services and European Hardware. We also note that some high-beta sectors, like Internet, have started to underperform recently.

Since about March 18, it has been clear that the market is shifting into relative value from high-beta shares, benefiting many stocks in our hardware groups on a relative basis that generally have long-term secular concerns. On the other hand, a number of large cap tech companies have provided notable stability, even despite secular concerns at virtually all of these businesses. We believe valuation has been a source of support. As long as investors remain concerned about valuations in high growth categories, we believe large cap and “cheap” tech could benefit from a steady sector rotation from investors looking to remain in the market, but want a greater level of defense in their portfolios.

FIGURE 16
Index performance summary

Market Indices	1-Month %	3-Month %	6-Month %	1-Year %	QTD	YTD %
S&P 500	3.5%	3.3%	6.3%	15.0%	0.3%	1.6%
Japan Nikkei 225	1.4%	-4.4%	-3.0%	-3.1%	-4.6%	-13.1%
Hong Kong Hang Seng Index	-3.2%	-0.1%	-2.8%	-4.5%	0.5%	-4.5%
Taiwan TWSE Index	-1.1%	3.5%	7.5%	6.4%	-0.5%	2.3%
Korea KOSPI Index	-1.6%	1.5%	-1.5%	1.0%	-1.0%	-2.3%
Singapore Straits Times Index	0.8%	6.2%	1.3%	-6.4%	1.1%	1.7%
Shanghai Composite	-3.6%	-2.7%	-3.5%	-8.6%	1.0%	-3.0%
UK FTSE 100	4.4%	2.6%	1.9%	3.4%	3.8%	1.5%
Germany DAX Index	4.2%	1.7%	6.9%	17.2%	1.5%	1.6%
DJ Euro Stoxx 50	2.2%	2.9%	4.9%	14.3%	0.7%	2.7%

Technology Indices	1-Month %	3-Month %	6-Month %	1-Year %	QTD	YTD %
NASDAQ Composite Index	1.8%	-3.1%	3.9%	18.5%	-3.0%	-2.5%
Computer Index	2.4%	-1.1%	7.1%	22.2%	-2.0%	-0.5%
PHLX / Semiconductor Index (SOX)	2.8%	4.8%	14.4%	23.6%	-1.8%	7.7%

S&P 500 Economic Sectors	1-Month %	3-Month %	6-Month %	1-Year %	QTD	YTD %
Utilities	1.2%	7.0%	9.6%	6.2%	1.8%	10.9%
Consumer Staples	4.0%	7.5%	4.2%	7.7%	3.4%	3.2%
Health Care	3.7%	0.4%	8.5%	19.7%	-1.3%	4.1%
Consumer Discretionary	2.5%	-1.1%	0.9%	12.5%	-1.4%	-4.5%
Energy	5.6%	11.3%	8.8%	15.9%	5.0%	5.2%
Information Technology	2.9%	1.0%	7.4%	17.9%	-0.8%	1.1%
Industrials	4.0%	4.1%	6.8%	22.4%	1.3%	0.9%
Telecommunications Services	3.7%	7.8%	1.8%	-4.2%	3.4%	2.7%
Materials	3.6%	5.2%	8.4%	17.9%	0.8%	3.2%
Financials	2.9%	1.9%	6.1%	14.0%	-2.0%	0.1%

Source: FactSet, Barclays Research. Prices as of 5/9/14.

FIGURE 17

Sector index performance summary

Barclays Global Technology Composites	1-Month %	3-Month %	6-Month %	1-Year %	QTD	YTD %
U.S. Software	-5%	-12%	-1%	16%	-8%	-10%
U.S. IT Hardware & Data Networking	-6%	-9%	-13%	-21%	-8%	-5%
U.S. Semiconductors	-1%	8%	17%	24%	-3%	11%
U.S. Internet	-9%	-16%	0%	15%	-12%	-12%
U.S. IT Consulting & Computer Services	4%	2%	2%	13%	4%	0%
U.S. Telecom Services	-2%	6%	14%	-7%	-3%	-2%
U.S. Communications Infrastructure	-17%	-14%	-11%	4%	-19%	-12%
European Software & IT Services	2%	7%	15%	34%	1%	8%
European Technology Hardware	4%	4%	5%	20%	2%	6%
Israel Technology	-4%	-6%	3%	11%	-7%	-5%
Asia ex-Japan IT Hardware	-4%	3%	5%	-6%	-3%	1%
Asia ex-Japan Semiconductors	4%	13%	15%	25%	5%	12%
Asia ex-Japan Wireless Equipment	-3%	12%	9%	-1%	-3%	5%
Asia ex-Japan LCD Displays	-5%	9%	4%	-32%	-3%	2%
Asia ex-Japan Internet & Media	-4%	-3%	5%	25%	-6%	-2%
Asia ex-Japan Software & IT Services	0%	-15%	-17%	-1%	-7%	-21%
Japan Internet	-12%	-16%	-8%	-8%	-12%	-25%
Japan Precision	-2%	-1%	0%	4%	-2%	-9%

Source: FactSet, Barclays Research. Prices as of 5/9/14.

FIGURE 18

Technology sector leaders year-to-date

Sector	Company and Price Return
U.S. Software	LogMeIn 30%, Fortinet 10%
U.S. IT Hardware & Data Networking	CDW Corp. 29%, Tech Data 24%
U.S. Semiconductors	Triquint 80%, RF Micro 75%
U.S. Internet	Zillow 22%, Activision 16%
U.S. IT Consulting & Computer Services	VeriFone 30%, InterDigital 20%
U.S. Telecom Services	CommScope 34%, American Tower 11%
U.S. Communications Infrastructure	Corning 20%, Arris Group 20%
European Software & IT Services	Temenos 21%, Cielo 20%
European Technology Hardware	Dialog Semi 35%, STMicroelectronics 22%
Israel Technology	Amdocs 15%, Orbotech 9%
Asia ex-Japan IT Hardware	LG Innotek 37%, Lumens 32%
Asia ex-Japan Semiconductors	Inotera Memory 55%, Gigasolar 48%
Asia ex-Japan Wireless Equipment	Largan Precision 60%, Catcher Technologies 33%
Asia ex-Japan LCD Displays	TPK 24%, AU Optronics 14%
Asia ex-Japan Internet & Media	Info Edge 19%, E-Commerce 16%
Asia ex-Japan Software & IT Services	HCL 101%, Tech Mahindra -2%
Japan Internet	CyberAgent -12%, Gurunavi -16%
Japan Precision	ULVAC Inc. 33%, TOPCON 18%

Source: Thomson ONE. Data as of 5/9/14.

FIGURE 19

Technology sector laggards year-to-date

Sector	Company and Price Return
U.S. Software	Cornerstone -26%, Imperva -59%
U.S. IT Hardware & Data Networking	NetApp -18%, Gigamon -39%
U.S. Semiconductors	Entropic -30%, MagnaChip -31%
U.S. Internet	HomeAway -21%, Vistaprint -28%
U.S. IT Consulting & Computer Services	Xoom Corp. -21%, CoreLogic -21%
U.S. Telecom Services	8x8 Inc. -14%, Sprint -17%
U.S. Communications Infrastructure	Mellanox -20%, Emulex Corp -27%
European Software & IT Services	AtoS -7%, SAP AG -10%
European Technology Hardware	ASML -13%, ARM Holdings -17%
Israel Technology	Radware -8%, Allot Communications -13%
Asia ex-Japan IT Hardware	Samsung Electronics -11%, Skyworth -15%
Asia ex-Japan Semiconductors	Jinko Solar -5%, Neo Solar -17%
Asia ex-Japan Wireless Equipment	Lite-On Technology -2%, Flexium -20%
Asia ex-Japan LCD Displays	Iljin Disp... -17%, Cheil Industries -28%
Asia ex-Japan Internet & Media	Youku -30%, Sina Corp. -42%
Asia ex-Japan Software & IT Services	Mphasis -10%, Tata Consultancy -62%
Japan Internet	GMO Internet -32%, DeNA -41%
Japan Precision	JEOL Ltd. -24%, Dainippon -29%

Source: Thomson ONE. Data as of 5/9/14.

FIGURE 20
U.S. Software



Source: Thomson ONE, Prices as of May 12, 2014.

FIGURE 21
U.S. IT Hardware & Networking



Source: Thomson ONE, Prices as of May 12, 2014.

FIGURE 22
U.S. Semiconductors



Source: Thomson ONE, Prices as of May 12, 2014.

FIGURE 23
U.S. Internet



Source: Thomson ONE, Prices as of May 12, 2014.

FIGURE 24
U.S. IT Consulting & IT Services



Source: Thomson ONE, Prices as of May 12, 2014.

FIGURE 25
U.S. Telecom Services



Source: Thomson ONE, Prices as of May 12, 2014.

FIGURE 26

U.S. Communications Infrastructure



Source: Thomson ONE, Prices as of May 12, 2014.

FIGURE 27

European Software & IT Services



Source: Thomson ONE, Prices as of May 12, 2014.

FIGURE 28

European Technology Hardware



Source: Thomson ONE, Prices as of May 12, 2014.

FIGURE 29

Israel Technology



Source: Thomson ONE, Prices as of May 12, 2014.

FIGURE 30

Asia ex-Japan IT Hardware



Source: Thomson ONE, Prices as of May 12, 2014.

FIGURE 31

Asia ex-Japan Semis



Source: Thomson ONE, Prices as of May 12, 2014.

FIGURE 32

Asia ex-Japan Wireless Equipment



Source: Thomson ONE, Prices as of May 12, 2014.

FIGURE 33

Asia ex-Japan Internet



Source: Thomson ONE, Prices as of May 12, 2014.

FIGURE 34

Asia ex-Japan LCD & Displays



Source: Thomson ONE, Prices as of May 12, 2014.

FIGURE 35

Asia ex-Japan Software & Services



Source: Thomson ONE, Prices as of May 12, 2014.

FIGURE 36

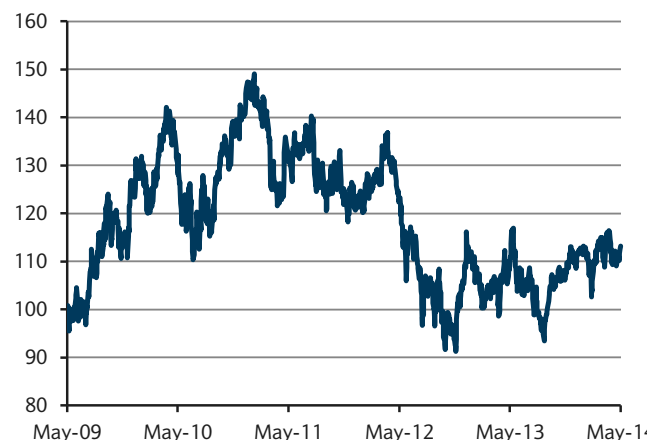
Japan Internet



Source: Thomson ONE, Prices as of May 12, 2014.

FIGURE 37

Japan Precision Instruments



Source: Thomson ONE, Prices as of May 12, 2014.

U.S. Technology

U.S. SOFTWARE

Raimo Lenschow
+1 212 526 2712
raimo.lenschow@barclays.com
BCI, New York

Still early, but several themes in software to benefit from IoT

- **Recent correction for high growth software names remains biggest topic for investors:** While software remains a top priority for CIOs, valuations for several, disruptive high-growth software names have meaningfully pulled back since early March and even though absolute valuations remain high, we still see plenty of investor appetite to own structural themes in the space.
- **Analytics, platform, and cloud services vendors will be the primary beneficiaries of IoT:** While the broader market for IoT is still early with the longer-term implications still mostly unknown, we believe potential beneficiaries are vendors that address the theme from an analytics, platform, or cloud services perspective. Further, we would advise caution when assessing companies that abruptly pivot their strategies toward IoT.
- **Our top picks are Red Hat and PTC:** Red Hat is benefitting from the broader adoption of open source in the enterprise while PTC stands to benefit from improved macro given its exposure to the industrial goods and electronics markets. Additionally, PTC has a compelling IoT strategy helped by its acquisition of ThingWorx, the leading platform to create connected devices for the manufacturing sector.

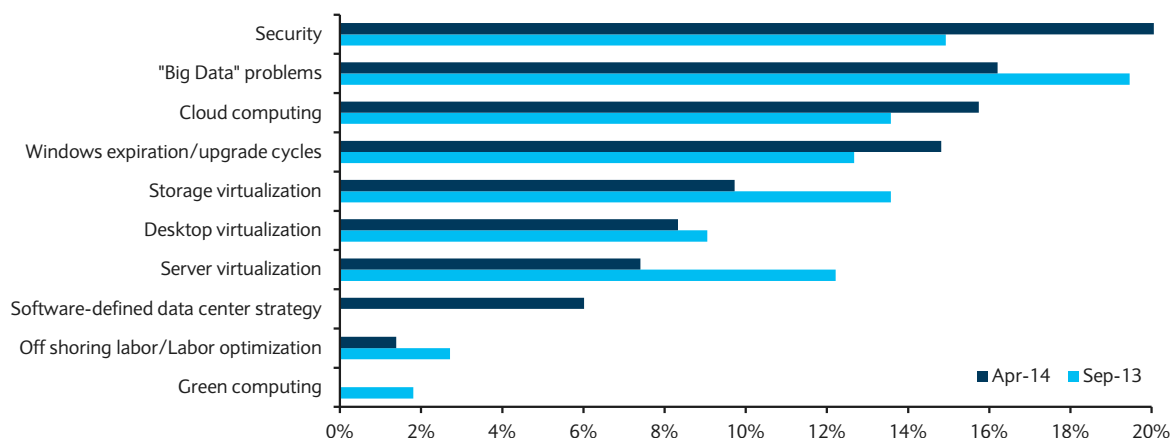
Despite recent sell-off, disruptive software names likely to emerge as dominant long-term players in the sector

Industry View
POSITIVE

Software remains the top technology spending priority for CIOs, which we believe to be generally reflective of the broader migration of value from hardware to the software layer. Specifically, Big Data, security and cloud computing remain the key themes in the software space and have consistently ranked as the top three themes in past CIO surveys. However, several disruptive, high-growth software names have meaningfully pulled back over the last few months, but nevertheless we reiterate our view that many of these names will likely emerge as dominant long-term players in the software space and should benefit from the underlying trends. We recommend ServiceNow, Palo Alto Networks, and NetSuite at these levels as their relative valuations are now more attractive within the high valuation group.

FIGURE 38

What are the biggest trends likely to drive your spending decisions in 2014 (pick two)?



Source: Barclays CIO Survey, April 2014

Still early but analytics, platform, and cloud services should see incremental value from IoT

The Internet of Things is an emerging theme within the software sector with a number of companies in our space claiming at least partial ownership of the theme. While we acknowledge that the monetization is still in its nascent stages, particularly within software, given that there are broad based implications for the sector, we would expect this theme to be a major focal point for software vendors going forward. We believe that early use cases around the internet of things seem to benefit vendors that approach the theme from an analytics, platform, or cloud services perspective.

Given the notion that data generated by connected/internet-enabled devices will ultimately transform industries through improved productivity and cost efficiencies, we believe this creates incremental opportunities for analytics vendors such as Splunk, which already specializes in finding ‘needle-in-a-haystack’ data. Splunk is arguably the best positioned vendor within machine-generated data analytics and hence addressing the incremental IoT opportunity is simply just an extension of the company’s existing model. Second, we have seen platform vendors which help developers create connected devices and/or services as early beneficiaries of the theme. Here, we note PTC, LogMeIn, Oracle and Microsoft, all of which have created extensible platforms for IoT, albeit from slightly different angles. Oracle and Microsoft have obvious advantages as their IoT strategies are built upon well used platforms (Java and Windows) that tightly integrate with their respective cloud services.

We would also highlight PTC as a compelling opportunity to gain exposure to the IoT theme. Specifically, the company’s acquisition of ThingWorx was a natural complement to PTC’s service lifecycle management business, in our view. Utilizing the ThingWorx platform customers can leverage the trove of sensor data from products in the field. Some examples of early use cases are predictive maintenance and automatic product updates through software as the customer would receive timelier data around product status and usage. Finally, we would highlight Salesforce.com as a vendor to likely benefit from increased connectivity and IoT adoption. The company’s strategy leverages its set of APIs on the Salesforce1 platform which creates better customer connections with applications and services. Organizations can leverage data from Salesforce on how, where, and why customers are purchasing certain products, and thus create more tailored/informed sales and go-to-market strategies.

Top Picks

Red Hat (RHT) – Red Hat is our top pick as the company stands to benefit from the broader adoption of open source within the enterprise. While the company’s distribution of OpenStack is relatively early on in the product lifecycle, we are already seeing increased customer interest and momentum in the industry, which should generally bode well for the company in FY15.

PTC (PTC) – PTC is our top pick to gain exposure to the broader interest in IoT applications in the sector. In addition to its core business benefitting from an improved manufacturing cycle, the company has a sound strategy for monetizing connected devices in the field. While we are not expecting material revenue contribution in FY15 given the subscription revenue profile, we believe PTC is well positioned to capitalize on the opportunity as IoT theme matures.

U.S. IT HARDWARE & DATA NETWORKING

Cloud and software defined data center hurting much of “old tech”; IoT unlikely to serve as an offset

Ben Reitzes
+1 212 526 9517
Benjamin.reitzes@barclays.com
BCI, New York

- **Spending seems stable and more optimistic for 2H14; Hardware may see muted growth:** Our research indicates relatively stable demand trends, with potential for a better 2H. We believe spending is being led by the U.S. enterprise and an improvement in Europe, while emerging markets remain uncertain, particularly in China and Russia. We believe traditional hardware vendors face significant secular headwinds that could limit top-line outperformance as we move through 2014.
- **Unclear how IoT can drive growth:** Hardware is already seeing the biggest challenges emerge in IoT as companies face disruptive forces from both new form factors and a distributed on-demand compute architecture. The shift to IoT underscores the fact that certain types of hardware solutions are potentially being viewed as gateways to new technology services. We believe Apple can benefit but some networking vendors, namely Cisco, lack a clear monetization strategy. Aruba seems to be a purer play on IoT.
- **Shift to value supporting large cap hardware:** We have seen sentiment shift in favour of relative value and away from high-beta growth stocks – benefiting many stocks in our hardware groups on a relative basis. As long as investors remain concerned about valuations in high growth categories, we see large cap tech support from shareholder return strategies despite secular threats.

IoT unlikely to stem other secular headwinds in Hardware but cash return helps

Industry View
NEUTRAL

Recent checks, company reports, and results from CIO and VAR surveys suggest that IT spending was stable to start the year, with a more optimistic view for 2H14, despite some mixed results from the hardware space. We believe trends in the U.S. remain relatively healthy, especially in the enterprise, while Europe seems to have improved as well. Emerging markets remain an uncertainty and we believe the environments in China and Russia are particularly challenging for some. We also believe concerns stemming from the NSA revelations continue to impact certain enterprise players – especially IBM and Cisco. We believe Federal trends have improved slightly since the fall but will remain choppy as we move throughout the year.

We would note that our semi-annual CIO survey, completed in March and April, did suggest improved spending expectations in 2014, with 2H acceleration in both the U.S. and Europe. The improvement in sentiment could be the result of an increase in budgets following several years of budget tightening, macroeconomic stabilization and equipment refreshes as CIOs have been sweating existing assets. While the feedback from the channel and IT decision makers was positive, we are not expecting a broad-based acceleration in spending across the board and believe some areas of networking like wireless and distributors will benefit more than others. Although some hardware companies have company-specific catalysts that should support shares, overall we expect the sector to continue to see disruption from emerging technologies such as the cloud and the software-defined data center. We believe there are some major headwinds that could pressure top-line growth for large caps like Cisco, EMC, and IBM. As such, many hardware players continue to tout the

“Internet of Things” as a significant opportunity; however, we have yet to see a clear and viable monetization strategy and believe much of the value will come from analytics and applications, not hardware.

IoT could accelerate commoditization in much of hardware

It is still unclear to us how IoT can become a driver of long-term growth for some hardware and networking companies given the potential for commoditization in certain markets. Hardware is already seeing the biggest challenges emerge in IoT as companies face disruptive forces from both new form factors and distributed on-demand compute architectures. The shift to IoT underscores the fact that certain types of hardware solutions are potentially being viewed as gateways to new technology services. A major consequence of this shift is that certain forms of hardware (PCs, smartphones) could get hollowed out or commoditized over time if organizations begin to delegate more workloads to the IoT.

Unlike the traditional model that utilizes name brand IT equipment, IoT is being built with cheap hardware and new form factors. These projects are taking on taking non-traditional appliances and devices and utilizing open-source technologies to build the basis of innovative IT solution providers in a variety of niche areas. The major implication for hardware spending is that while IoT was once considered to be a clear total addressable market (TAM) expansion opportunity for OEMs, it may actually be cannibalistic if equipment continues to decentralize or even become obsolete through ubiquitous connectivity within familiar “objects” or “things.”

The rise of the IoT has already had a fairly significant impact on the IT hardware industry with the most profound impact on the PC market in particular. Although the rate of the PC market decline has sort of stabilized in 2014, the market has already been impacted for several years due to cannibalization from smartphones and tablets, and soon, more form factors that could surround users. However, we are seeing smartphones and tablets decelerate in the near term given market saturation.

IoT fuels need for more Wi-Fi; strategy from incumbents still unclear

We do believe that IoT and more applications and data over the internet is generally a positive for networking infrastructure vendors, as the network increases in strategic value. However, data growth has also been present for many years as consumers and enterprises have shifted application consumption from on-premise, to the cloud. Further, many of the new applications enabled by micro-sensors will likely be very low bandwidth relative to other mediums like smartphones and tablets, and therefore the incremental infrastructure investment may not move the needle as much as some believe (i.e., Cisco). For now we believe key incumbents like Cisco will offer more solutions within its core networking portfolio (routing, switching, security) that cater to IoT connectivity. Longer term though, we believe Cisco will need to develop a more comprehensive analytics and cloud strategy to really benefit from IoT.

Wi-Fi is best positioned to benefit from IoT. Wi-Fi has always been a preferred method of connectivity, with what started as computer notebooks (laptops), evolved to smartphones and tablets, and now we are seeing an increasing number of new devices that are connected to the internet via Wi-Fi, ranging from refrigerators to health monitoring systems. We expect this trend to continue driven by faster access speed (.11ac), more regulatory support, new services (i.e., location based marketing), and more ubiquitous coverage offered by cable and hotspot providers. As such, we continue to view Wi-Fi as a key enabler of IoT, especially in areas like the connected home (thermostats, alarms, lighting) and healthcare, and believe wireless infrastructure vendors like Aruba remain key beneficiaries. Note that while wireless is the most common access method, it does have its

shortcomings, as its signals have limited range. IoT will ultimately leverage a combination of other radio technologies as well, including 4G/LTE and Bluetooth.

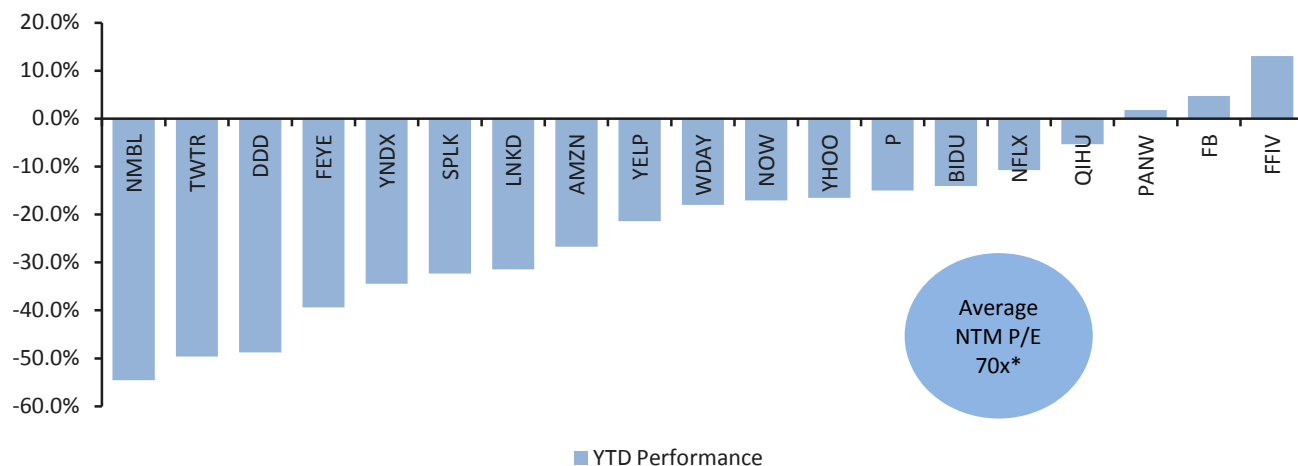
Valuation offers support for large cap hardware anyway though – cash return rewarded

Since mid-March, we have seen sentiment shift in favor of relative value and away from high-beta, growth stocks, benefiting many stocks in our hardware groups on a relative basis that generally have long-term secular concerns. A number of large cap tech companies have provided stability, even despite secular concerns at virtually all of these businesses. HP, for example which we rate Overweight has performed best, up 17% YTD driven by good earnings, a higher dividend and a favorable valuation. Among the group, we believe valuation has been a source of support. The average NTM P/E of the group is 12x, and many of these names also offer solid balance sheets which provide a second layer of support. As long as investors remain concerned about valuations in high growth categories, we believe large cap tech could benefit from a steady sector rotation from investors looking to remain in the market, but want a greater level of defense in their portfolios. However, we continue to favor HP over Apple and IBM at this time given its valuation.

Conversely, shares of a wide range of high growth companies have experienced sharp pullbacks (see chart below). Worst hit have been Nimble Storage (-55% YTD), Twitter (-47% YTD), and 3-D (-48% YTD). Of the companies listed, the ones with earnings sport an average P/E of 70x NTM EPS while nine companies either have a level of profitability too small or negative to offer a reliable P/E. We also note Biotech has been a strong underperformer, which leads us to believe the issue is really one of investor confidence and not a sector-specific concern per se. By way of reference, the S&P is +2.6% for the year, while the NASDAQ is -0.8%.

FIGURE 39

YTD Performance of High Growth Tech Companies



Source: Thomson One, Barclays Research. Data as of 5/13/14.

*Excludes P/Es of unprofitable and nominally profitable companies

Key picks include HP and Juniper

While we remain concerned with headwinds caused by cloud and more software defined solutions, we believe several companies should still benefit from company specific drivers and better execution. We rate HP Overweight as we believe there are server share gains to be had and room for more cash return. In networking, we continue to view Juniper as well positioned from a fundamental demand perspective and should also benefit from execution on cost cutting and cash return plans implemented under new management.

HP (HPQ) – We believe HP stands to benefit from three key tailwinds. First, we believe HP could gain share for several quarters in x86 servers at the expense of IBM/Lenovo, which could also help support sales of 3PAR storage gear. Second, while outsourcing is a concern, execution could improve in maintenance (Technology Services) and remains solid in printing and in PCs. Third, free cash flow has recovered nicely and the company seems well positioned for growing buybacks and dividends as it returns “at least” 50% of free cash flow to shareholders. At a minimum, if HP just hits the next few quarters, we believe shares should trade in line with or better than printing and imaging companies, which argues for a multiple of 10x.

Juniper (JNPR) – We believe Juniper is making good initial progress in its turnaround strategy under new management. We believe a streamlined product set and a cloud-centric vision should resonate with key service provider, enterprise and government customers. We also believe the company has made very good initial progress in terms of cost cutting and it is well on its way to showing EPS power of over \$2.00 per share over the next year. We are also pleased with the level of cash return thus far.

U.S. SEMICONDUCTORS

Semis have been an outperformer, but we remain selective for the rest of the year

Blayne Curtis
+1 617 342 4101
blayne.curtis@barclays.com
BCI, New York

- **Semis outperform the S&P 500 despite the broader tech sell off:** Semis have outperformed the market YTD (SOX +10% vs. S&P 500 +3%) despite the broader sell off in tech, as semis offer a better relative value vs. higher growth areas in tech that are leveraged to an improving macro environment. Some valuations have trended slightly lower such as analog and programmable logic devices (PLDs), now 18-19x CY15 EPS (vs. 20x before the sell off), but for the most part are largely flat over the last month, a sizeable outperformance vs. broader tech.
- **Improving macro is a tailwind but we see limited multiple expansion:** Though we acknowledge business trends have improved with global ISM in expansionary territory, we believe longer-term global semi revenue growth is likely to remain well below the 7-8% 20-year CAGR many point to as positive themes given that autos and IoT are tempered by declining PC and consumer markets and maturation of smartphones.
- **Our top picks are NXP Semiconductors NV (NXPI), Qualcomm (QCOM), Avago (AVGO), and Silicon Laboratories (SLAB):** NXPI remains our top pick as we see estimates moving toward \$6/share in 2015 on the back of multiple revenue drivers and aggressive buybacks. For QCOM, we believe its lead in LTE is sustainable and see increasing platform content (WLAN, RF, etc). AVGO is levered to significant growth in FBAR/BAW filters (35%+ CAGR) with the rollout of LTE in Europe and China, and we see the potential for higher synergies from the LSI acquisition. Finally, SLAB is one of our top names levered to IoT (15% of sales), as the company has the lowest power MCU, strong CMOS radio expertise, leadership in Zigbee (home automation) and new sensors with early wins in wearables (likely iWatch).

Industry View
NEUTRAL

IoT – A bit of a catch all term for existing opportunities, dissecting older trends and a few new ones

The Internet of Things has now penetrated into the messaging for nearly every semiconductor company and has developed into a catch all for most trends in semis. Yet, it is difficult to pin down which of these trends are actually incremental and, more importantly, material to the overall semi market. Within the many existing trends categorized under the IoT umbrella, the two largest are: 1) the overall adoption of wireless connectivity (WLAN, BT, etc.) and 2) the proliferation of cellular – both existing trends now relabeled as IoT. For new markets, we generally look at 100mn units as the magic number to make a segment material and most consumer products never make it to this level. The wearable/smartwatch market is really the only new consumer device with any new material traction. However, with many in the semi supply chain suggesting roughly 40mn units this year and fairly low semi content in each device, wearables are still a long way from being material for semis. We highlight few names that are small enough to see a material uplift but the list is small.

Increasing connectivity: WLAN and BT LE penetrating consumer devices, white goods, autos, and home automation

While the focus over the last year plus has been on the term “IoT”, many of the trends that are now lumped under that umbrella have been going on for some time. Clearly, a very positive trend but one that has been in the run-rate for connectivity levered names for some

time. The largest and oldest is connectivity, which has been a large driver for nearly the last 10 years. PCs are at close to 100% connectivity penetration today and now most new TVs, set-top boxes, and home gateways come standard with WLAN.

For us, the next leg of adoption of WLAN is within the home, either home automation (smart thermostats, smart lighting and security) or white goods (refrigerator, washing machine, etc). While a significant total unit opportunity, the uptake will not be as sharp as we saw for PCs and video-driven applications, as there are few compelling use cases to drive adoption (smart thermostats are cool but not needed). From a semi perspective, we see less of an opportunity for the traditional connectivity vendors (Broadcom, Qualcomm, Marvell) in these new areas (white good, home automation) over the long run as we believe the MCU vendors will eventually integrate the connectivity themselves. The focus for these new markets will be on cost as there is not really a use case to push bandwidth improvements (i.e., 802.11ac, 2x2, etc). All of the MCU vendors have acquired connectivity assets over the last couple years: Atmel acquired Ozmo (Wi-Fi), Silicon Lab acquired Energy Micro (low power 32bit ARM MCUs and radios) and Ember (ZigBee), and Microchip acquired Standard Microsystems (embedded connectivity products). Over time we expect the MCU suppliers to include the connectivity as essentially a throw-in to the MCU sales, which is similar to what happened to analog content, further dampening the incremental content based on the IoT theme.

Cellular: The next frontier for connected devices, but may take some time to develop

The inclusion of cellular connectivity in devices is another existing trend (e.g., PCs, tablets) but we are starting to see cellular push further into new areas such as asset tracking and automobiles. Using autos as an example, after early adoption from premium auto manufacturers such as Audi and Tesla, more are now adding cellular connectivity. This is definitely a positive headline for cellular modem suppliers, however, autos are a fairly small market in terms of unit volume (~70mn/year), and even assuming ~\$30 package from QCOM, the total TAM is not material vs. nearly 2bn handsets.

Wearables: A new trend, but small units and content limit the beneficiaries

With an iWatch likely coming, we believe it makes sense to take a look at the wearable opportunity for semi companies. The wearables category is certainly one of the newest segments in electronics, shipping ~20mn units in 2013 and expected to reach 40mn in 2014. While the incremental units are starting to become more material (still far from the magic 100mn units), the total semi content within devices so far is extremely low. In the table below, we highlight the semi content in two popular wearables: the Fitbit One (\$3 of semi content) and Samsung Galaxy Gear Fit (\$7-8). The Gear Fit is a watch vs. a fitness band and includes more robust connectivity (WLAN vs. BT LE) and additional sensors. The GS5 started a trend toward health/vitals monitoring with the inclusion of a pulse/oxy sensor, which is supplied by Maxim Integrated. Analog Devices secured the bio-sensor content in the Samsung Galaxy Gear Fit, and we see potential for SLAB in this category as well with its recently announced UV Index Sensors. The Gear Fit also includes a 6-axis gyro/accelerometer vs. just an accelerometer in the fitness band. In terms of impacts to semi names, the impact for most names is fairly small. Sensors are the largest component and could have an impact for smaller names but for larger companies like MXIM and ADI, sensors in wearables are just a modest plus. In connectivity, we have the same position as in white goods, with the low-power MCU eventually integrating the connectivity. Outside of devices, many of the backend of the devices offers little boost to the overall ecosystem as well. In order to frame the incremental data generated by a wearable device, we measured the file size generated by a Fitbit wristband capturing minute-by-minute data for a typical

adult. This information on an annual basis, which is essentially a log of the user's steps and nutritional activities, is easily stored in a file that is 1.4-1.5MB. To put this into perspective, this is just 35-40% of a typical MP3 (4MB needed for a 4-minute song). Once again this is an additive trend, but not enough to drive any noticeable upside for most semi names.

FIGURE 40

Semiconductor content in wearables

Fitbit One			
Supplier	Initial Markings	Description	ASP
ADI	8304AED42oW	Accelerometer	\$0.60
Measurement Specialties	MS5607-02BA03	Altimeter	\$0.50
Nordic	NRFD	Bluetooth LE Connectivity IC	\$1.00
STMicro	STM32L151	ARM-based SoC MCU	\$0.70
Total Content			\$2.80

Samsung Gear Fit (SM-R350)			
Supplier	Initial Markings	Description	ASP
Broadcom	BCM4334WKUBG	Dual-band 802.11n, Bluetooth 4.0+HS, FM Receiver Combo	\$2.50
Invensense	MP65M	6-Axis Gyroscope / Accelerometer	\$1.20
ADI	Unidentified	Biosensor - Pulse/Oxy IC	\$1.50
Maxim	MAX77836	Micro-USB interface controller / Li+ Battery Charger	\$0.50
Melfas	8FM006A	Touchscreen Controller	\$0.60
STMicro	32F439ZIY6S	32-bit ARM Cortex CPU (180MHz)	\$0.70
Texas Instruments	1211A1	USB Transceiver	\$0.35
Total Content			\$7.35

Source: Barclays Research Estimates

Key U.S. Semiconductor picks

- **NXP Semiconductors (NXPI):** We believe NXPI is one of the best positioned names in our group, and see estimates continuing to drive toward \$6/share in 2015. We expect top-line growth driven by NFC/Mobile Payment wins at Samsung and Apple (mobile payments also a broader IoT theme), paired with a strong RF tailwind and a reacceleration in core ID, all of which is boosted by aggressive buybacks (25mn share authorization). NXPI should also benefit in other areas of IoT with Auto to infrastructure connectivity on the horizon.
- **Qualcomm (QCOM):** For QCOM, we believe its two-year lead on LTE is sustainable with competitors forced to seek 3G replacement SKUs (rather than high-end devices) where pricing is already competitive. Moreover, we expect continued cash generation and shareholder returns to bolster shares (75% FCF back to shareholders target). QCOM is levered to IoT with its Wi-Fi capabilities and should benefit from cellular connectivity over time on both the chip-side (QCT) and royalties (QLT).
- **Avago (AVGO):** AVGO is levered to one of the biggest growth drivers in mobility with its FBAR/BAW filters (30%+ CAGR), which are a necessity for the frequency bands used in LTE in Europe and China. We also see the potential for higher synergies from the LSI acquisition beyond the \$200mn/year management suggests, as well as the potential sale of the Flash business (aids in paying down debt) adding further upside to estimates.
- **Silicon Laboratories (SLAB):** We see multiple drivers for top line growth in CY14 including Energy Micro (revenue to more than double), Zigbee, timing and automotive audio. SLAB is one of our top names levered to IoT as the connected home is only getting started where the company is levered to Zigbee, with roughly \$2 of content per device. This is also paired with an incremental opportunity in wearables with its recently announced sensor products.

U.S. INTERNET

Christopher D. Merwin
+1 212 526 7778
chris.merwin@barclays.com
BCI, New York

David Lee
+1 212 526 9436
david.lee3@barclays.com
BCI, New York

Reiterate positive view on category leaders

- **Growth sell-off is valuation driven and is not tied to fundamentals:** We believe the recent sell-off in the internet sector has largely been beta-driven and does not reflect a change in the underlying fundamentals, which remain sound, in our view. Local remains a key focus for us, and we expect to see continued momentum for both vertical (Zillow) and horizontal (Yelp) platforms. These platforms facilitate the ad buying process for B2B customers and provide differentiated experiences that will keep consumers engaged. We continue to see a disconnect between monetization and time spent online, particularly for the local category, and believe that eventual share shift of ad dollars online should drive sustainable improvements in monetization for the sector over a multi-year period.
- **Our top picks are Activision (ATVI) and HomeAway (AWAY):** We believe ATVI has the most favorable risk/reward of any stock in our coverage. It currently trades at 16.0x 2014 EPS, a 1x discount to its comps. We believe a robust product pipeline and incremental return of capital could drive upside to Street estimates. For AWAY, we believe its pay-per-booking (PPB) listings product will continue to be incremental to the core subscription business and will help accelerate y/y listings growth in 2014 to 16% from 7% in 3Q13, prior to the PPB product launch. We expect management will invest in traffic to drive incremental contacts to new PPB listings, which will be a likely source of positive estimates revisions in 2015. We believe valuation is attractive at 18.0x 2015 EBITDA, about in line with the group at 17.4x, although we believe AWAY should command a premium given its competitive advantage of traffic generation through search engine optimization and a better margin structure than its peers.

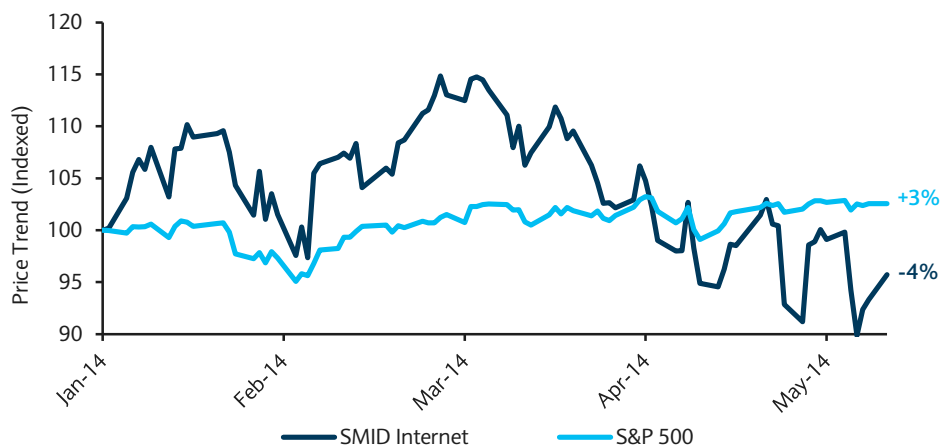
In light of recent price volatility, we favor low multiple names with compelling risk reward

Industry View
POSITIVE

The SMid-Cap internet sector has underperformed the market YTD; our coverage universe is down 4%, while the S&P is up 3%. We believe the sell-off in the last few months was largely beta-driven and does not necessarily reflect a change in underlying fundamentals of the group. While we think it's too early to call the bottom for a group that still retains optically high valuations, we do think the recent dislocation has provided an opportunity to own certain low multiple names that offer compelling risk/reward. In the near term, we favor category leaders with defensive valuation multiples like HomeAway and Activision.

FIGURE 41

Recent sell-off could provide an attractive entry point for certain low multiple stocks



Source: Thomson Reuters, Barclays Research. Data as of 5/12/14.

Note: our SMID-Cap internet index is a market cap-weighted average closing price for AWAY, IACI, SFLY, OPEN, TRLA, VPRT, YELP, Z, and ZNGA

Expect investments to drive the next leg of growth

At the end of 2013, most of the companies in our coverage universe announced initiatives to invest incrementally in growth. In some case, these investments reflect a growing need to differentiate product offerings amidst heightened competition, slowing levels of traffic growth that need to be augmented through search engine marketing (SEM), or the increasing cost of customer acquisition due to market saturation. But for others, we believe these investments reflect an effort to faster penetrate a large and growing total addressable market, which we think should be viewed positively. We expect that Yelp, Zillow, and HomeAway will ramp their sales and marketing spend throughout 2014 in order to better position themselves for long-term growth. Zillow is planning to invest \$65mn in a national marketing campaign in 2014, up from \$39mn in 2013, while Yelp is expanding its sales force, both domestically and internationally. And we expect HomeAway will ramp up marketing spend in 2014 after it finishes testing SEM as a new source of traffic acquisition.

IoT should increase data aggregation and the ability to better target users

In the internet sector, we believe the Internet of Things isn't so much a driver of incremental growth for advertising, eCommerce or subscription-based businesses, but rather an example of greater connectivity across devices, cars, TVs, and in-home products. We believe the primary benefit of IoT for the internet companies is that we as consumers will be more engaged with multiple devices, which could facilitate data aggregation about our behavioral patterns – data that could be leveraged by larger ad platforms like Google (Not Rated) to serve increasingly targeted ads. In our coverage universe, we believe IoT would be most relevant for local ad companies, such as Yelp.

Top Picks

Activision (ATVI): We believe ATVI has the most favorable risk/reward of any stock in our coverage given its promising product pipeline in 2014, the potential for incremental capital returns, and cyclical tailwinds from the new-generation console cycle. Activision released its first ever free-to-play (FTP) title *Hearthstone* earlier this year, which reportedly had 10 million users one month into its launch, and is developing two more, *Call of Duty Online* and *Heroes of the Storm*, that could be released later this year. We believe Street estimates do not fully

reflect the monetization potential from these three titles, as this is the first time ATVI is developing a game using a FTP model. In addition, we expect Activision to generate more than \$1.5bn in free cash flow in the next three years, which we believe could be returned to shareholders, initially through a buy-in of 83mn shares still owned by Vivendi. Lastly, we believe valuation is compelling at 16.0x 2014 EPS, which is at a 1x discount to peers.

HomeAway (AWAY): We are constructive on AWAY due to the early success of its new PPB product and the potential for an investment in SEM later this year that could improve monetization for PPB listings and drive upside to 2015 revenue estimates. Since PPB was launched in 4Q13, HomeAway reaccelerated listings growth substantially to 25% y/y in 4Q13 from 7% y/y in 3Q13. At the same time, the number of subscription listings at HomeAway increased sequentially to ~819,000 in 4Q13 from 773,000 in 3Q13, evidence that the PPB business has so far been incremental to the core subscription business despite concerns about cannibalization. HomeAway has been testing SEM as an additional channel for traffic acquisition, and we expect the company will ramp up its marketing spend in the latter half of 2014. Driven by the incremental supply of listings from PPB and the increase in demand for bookings from the ramp up in SEM, we believe there could be upside to Street's expectations in the coming quarters. We believe valuation is supportive at 18.0x 2015 EBITDA as compared to the comps at 17.4x, given a competitive advantage of traffic generation through SEO and a better margin structure than its peers.

U.S. IT CONSULTING & COMPUTER SERVICES

Selective approach on Payment names; continued growth in demand for IT Services

Darrin D. Peller
+1 212 526 7144
darrin.peller@barclays.com
BCI, New York

- **We believe Payment names continue to benefit from strong secular growth trends and slow, global economic recovery.** That said, valuations keep us selective on a relative basis, with a focus on sustainable EPS growth, strong free cash flow generation, and/or potential positive catalysts.
- **We believe that the outlook for the IT Services space remains stronger in 2014 than last year.** Companies have been showing greater demand for both outsourcing and consulting projects, with the latter driven by improving discretionary spend. Further, we have seen the EMEA region improve on macro trends and also demonstrate a structural shift toward outsourcing/offshoring, particularly in Continental Europe. We recognize that some companies still remain cautious in their IT budget allocations, but we believe that this trend should continue to ameliorate in 2014-15. We also see continued tailwind from next-gen solutions, such as cloud and mobile.
- **Key picks include Visa, Total Systems, Fidelity National Information, Fiserv, and Cognizant.**

Industry View
NEUTRAL

Secular growth trends continue to benefit Payments names

Underlying volume and transaction drivers a function of a slow, global economic recovery

Visa and MasterCard recently provided updated spend metrics through April, which continued to demonstrate a slow, global economic recovery.

- **Visa:** Through April 21, U.S. payment volume growth was up 12% y/y (vs. 9% in F2Q), with U.S. credit payment volume growth of 14% y/y (vs. 11% in F2Q) and U.S. debit payment volume growth of 11% y/y (vs. 7% y/y in F2Q), with V benefitting from the timing of Easter (in April of 2014 vs. March of 2013). Cross-border volume growth mildly decelerated to 7% y/y constant currency (vs. 8% in F2Q), with a U.S. growth rate of 8% y/y (vs. 7% y/y in F2Q) and rest of world growth rate of 7% y/y (vs. 8% y/y in F1Q). With respect to growth in processed transactions, management noted that it accelerated to 14% y/y in April (vs. 11% y/y in F2Q). While Easter timing had an impact on growth trends, we also believe there is more consumer sentiment and weather related acceleration occurring beneath these trends.
- **MasterCard:** Through April 28, each of the company's business drivers were in-line to slightly better in April compared to 1Q. Cross-border volumes grew 17% y/y on a constant currency basis (in-line with 1Q), U.S. processed GDV grew 11% y/y (an acceleration of ~2% vs. the growth rate seen in 1Q due to improvements in consumer and commercial credit), rest of world processed GDV grew 16% y/y constant currency (essentially in-line with 1Q) and processed transaction growth remained at 14% y/y.

Expect meaningful decline in originations in 2014

On the mortgage processing front, Mortgage Bankers Association (MBA) estimates total originations at ~\$1.065 trillion in 2014. This represents a ~60% y/y decline from 2013 total originations of \$1.75 trillion, mostly driven by slower refi activity. We see this refi trend resulting in ~\$70-80mn EBITDA impact for Corelogic, though at the same time expect the

company to offset it with cost takeouts, incremental EBITDA from recently acquired deals, as well as share gains.

Continued demand in the IT Services space

We continue to see demand for low-cost offshore outsourcing solutions both in North America and in Continental Europe. In particular, this is a recent phenomenon in Europe: over the last two to three years, we've seen Western European companies increasingly shift toward outsourcing solutions, a trend that we believe near term will be an important tailwind for both Cognizant and Accenture, which derive about 15% and 40% of revenues from Europe, respectively.

We also believe that next-gen solutions, such as mobile and analytics, continue to provide a meaningful tailwind, particularly within the Financial Services vertical. While the base in terms of absolute dollars is small (just a few percentage points of total revenues for Accenture and Cognizant), growth rates for these social, mobile, analytics, and cloud services (SMAC) solutions have been in solid double digits in recent years. We believe that for Cognizant SMAC-related revenue growth rates have been as high as 40-50% y/y.

Third, we see discretionary spend picking up in key verticals, which is a vital driver behind consulting growth. Further, with the economy improving in Europe, we have seen some previously "on hold" consulting projects translate into new bookings. Overall, consulting has been improving across the board in banking, retail, manufacturing, and telecom sectors.

Key picks

We continue to favor companies with strong organic growth potential driven by sustainable secular trends and proven business model resilience. Key picks include:

Visa (V): We continue to see conservatism in Visa's fiscal 2014 outlook, particularly around volume assumptions and incentives expectations embedded in the company's outlook. We think longer-term sustainable growth in the mid-high teens for EPS supports consistent valuation above recent levels.

Fiserv (FISV): We believe that FISV is well-positioned for the outer years, with strong top-line growth (about 85% of revenue is recurring) and several incremental wins that should drive further top-line growth acceleration, mid-teens earnings growth, and generous share buybacks.

Fidelity National Information (FIS): We believe that FIS should see solid revenue and EPS traction in 2015, driven by an anniversary of investments and term fees, as well as consistent buybacks. Further, we expect the international segment of the company (~20% of total revenues) to provide meaningful support to the top line.

Total Systems (TSS): We believe the company's high FCF yield (almost 9% on 2015 estimates) provides support for a company with material second half potential. In particular, we see headwinds in the company's merchant acquiring business rolling off in 3Q14 and tailwinds from new business in card issuer processing as well as Netspend opportunities rolling on in 2H14 and into 2015 driving upside.

Cognizant (CTSH): While the company saw a shift toward discretionary spend during 1Q14 (and lower outsourcing than usual), we believe the company's 16.5% top-line guidance for the year remains conservative, and see potential acceleration into 2015, particularly as outsourcing may pick up in the second half, healthcare spend resumes around ACA, and Europe and SMAC initiatives continue to support growth.

U.S. COMMUNICATIONS INFRASTRUCTURE

Focused on Optical and LCD

Joseph Wolf
+1 212 526 3392
Joseph.Wolf@barclays.com
BCI, New York

- **Optical taking share from copper in the data center:** As data traffic grows, speeds increase and low latency requirements expand, we see optical fiber-based connections taking more share of the data center interconnect market. We believe that investors are beginning to reward Finisar for its more datacom-leveraged business and that the stock should continue to outperform peers (including JDS Uniphase) with its more telecom-centric portfolios. We see the 1G-10G-40G-100G transitions in the data center as a multi-year trend that favors optical over copper and expect sales and margins to remain strong in 2014.
- **Delivering the converged internet:** An increasing amount of bandwidth is being consumed on mobile devices. We believe that companies involved in growth of these devices will continue to benefit. Corning and Orbotech benefit on the display and inspection sides of these small, but increasingly complex devices.
- **An era of cash return:** Corning is a good example of a tech company returning cash to investors. Orbotech and Radware have also announced new share buybacks.

Industry View

NEUTRAL

Exploring the IoT opportunity

We believe it is too early to quantify the Internet of Things (IoT) direct opportunity with regard to our coverage universe, which has limited direct consumer electronics exposure. However, we do see two potential indirect areas of growth: 1) Corning could see an increase in demand if homes get new monitors in addition to TV sets as kitchen or control appliances and 2) companies in the interconnect space should benefit in the data center as the handling of all the data and the analytics is a significant outcome of IoT.

Top picks: GLW and FNSR

Corning (GLW): 1Q performance beat our estimates driven by higher-than-expected revenues in optical communications and environmental. 2Q outlook points to continued positive momentum across the board. The continued share buyback, \$600 million remains on a \$2 billion plan, is supportive as well. 1Q display results were hampered by technical production issues at a Korean customer and a significant price decline that was anticipated. 2Q guidance is for price declines to return to normal and for a lift in volumes as the Korean customer issues are resolved. Growth in large screen TVs and tablets are the main growth engines. The gorilla glass channel was impaired by excess inventory in 2013. Since that issue is resolved, GLW sees 30% volume growth with normal price reductions in 2014 and new product launches and touch laptops driving growth. As the 30% growth does not include low-end mobile, which is a 2015 story for GLW, or non-mobile applications for gorilla glass that could drive significant volumes, we see continued opportunity in this segment.

Finisar (FNSR): We are not surprised by the continued strength in the datacom business, recent Dell'Oro figures in the 10GB/E market point to a multi-year potential growth story. The stability/recovery on the telecom side of business also bodes well for a CY14 story. Customer Ciena reported its January quarter on March 6 and its guidance for sequential revenue growth and commentary on the market also points to near-term positive trends on both sides of the business. In January, Finisar moved to acquire u2t Photonics to broaden its portfolio in 100G. This specific deal is targeted at the telecom side of the business; we expect FNSR to have 100G product, in line with the market in datacom as well. In the short run, the deal adds revenues but dilutes gross margins. We expect that to improve by the end of fiscal 2015. On March 3, FNSR introduced a tunable RF over fiber transceiver in small form factor for deployment in small cell and satellite deployments.

U.S. TELECOM SERVICES

More bars...on more devices

Amir Rozwadowski
+1 212 526 4043
amir.rozwadowski@barclays.com
BCI, New York

Sandeep Gupta
+1 212 526 0972
sandeep.a.gupta@barclays.com
BCI, New York

Arindam Basu
+1 212 526 2308
arindam.basu@barclays.com
BCI, New York

- **In the near to mid-term, we view the U.S. Telecom Services market as a mix between a few near-term special situations, and mid-term ways to capitalize on an intensifying competitive landscape, and seeking out the best means to capitalize on seemingly insatiable mobile data traffic growth.** Our preferred special situation name is T-Mobile (Overweight).
- **We therefore retain our preference for the tower names over the carriers as we expect the former to continue to benefit from rising data traffic growth as operators look to differentiate their networks through improved service quality.** Our top tower picks remain AMT (Overweight) and SBAC (Overweight).
- **Longer term, we consider the U.S. Telecom Services market is well positioned to benefit from the broader deployment of connectivity to multiple devices (i.e., the Internet of Things) enabling them to benefit from their role as key “pipe” suppliers.**

Industry View
NEUTRAL

Near term: special situations vs. industry fundamentals

Thus far, 2014 has already been remarkable for the U.S. Telecom Services industry. At a high level, we have seen significant merger and acquisition activity and the rise of an increasingly dynamic competitive environment in which operators are looking to adopt new means (subsidy free handset plans, early upgrades and ETF promotions) and emphasize old ways (i.e., network quality) to garner the support of subscribers.

In our view, we don't expect this elevated level to dissipate anytime soon. Competition is unlikely to ease in the near to medium term, capital intensity is less likely to diminish, and each operator seems to be gearing up for the next phase in their own respective strategies to win over the attention – and more importantly the wallets – of the subscriber community. For example, after Verizon's 1Q regional share was impacted by increased competitive pressure, the company outlined a proactive approach toward targeting susceptible subscribers to limit the overall impact of competitive initiatives. These initiatives include more attractive and targeted pricing plans, marketing programs outlining the carrier's data service quality and on-going focus on improving network quality and efficiency.

For AT&T, having closed the acquisition of LEAP, near-term focus is likely to be directed in two areas. Competitive responses in the postpaid arena and a material ramp toward leveraging its new assets in targeting prepaid subscribers. In the former bucket, we expect the company to continue to focus on marketing its EIP program “Next”, which should allow the business to improve margins and remain competitive against similar promotions from competitors. On the latter initiative, the carrier has indicated that it plans to aggressively push the Cricket brand acquired from Leap leveraging its own nationwide network as a means to differentiate the service vs. other prepaid brands in the market.

Sprint is expected to push forward with its tri-band Spark network into additional markets as it looks to steadily build momentum on its network ahead of what we expect will be a bigger push to gain share in the back half of 2014 and into 2015. Lastly, we believe T-Mobile is looking to continue its recent momentum in the market by relying on its successful un-carrier strategy which clearly continues to resonate with subscribers.

Given this competitive backdrop, we believe carriers are unlikely going to be able take their foot off the gas with respect to network investment as service quality is likely to remain the

best possible means for operators to drive subscriber retention today and possible subscriber acquisition in the future. We note that during their recent 1Q results, all four carriers reiterated their full year capex outlook for 2014. From a strategic outlook point of view, despite a period of significant M&A activity over the last 12 months (such as T-Mobile's acquisition of MetroPCS; Softbank's acquisition of Sprint; Sprint's acquisition of Clearwire; and AT&T's acquisition of Leap, in addition to several tower-based transactions), we note that the broader industry environment remains rife with reports of further potential consolidation including scope for a potential Sprint/T-Mobile merger and AT&T's potential acquisition of DirecTV.

In our view, investors should approach the U.S. Telecom Services market through several lenses; examining a few near-term special situations, assessing mid-term ways to capitalize on what seems to be an intensifying competitive landscape and seeking out the best means to capitalize on the longer term and seemingly insatiable demand for mobile data.

Near term: special situations

AT&T potentially looking at DirecTV, may imply diminishing interest in Europe

On the special situation front, we believe one of the premier questions at the top of most investors' minds is what strategy could AT&T employ to improve its cash flow generation and mitigate some concerns around its ability to cover its dividend commitment in the coming years. While the focus during 4Q13 was primarily directed toward whether or not AT&T will look to do a transaction in Europe (for further color, please see our recent notes entitled "[AT&T: Strategic Decisions Likely to Take Precedence over Earnings](#)" October 16, 2013), in recent weeks, there has been increased market speculation around the fact that AT&T may actually be looking to do a transaction closer to home, and potentially acquire DirecTV ("AT&T Has Approached DirecTV About Possible Acquisition" Wall Street Journal, May 1, 2014).

Suffice to say, we believe investor focus, and thus share performance, is likely to focus on whatever strategic alternatives the company pursues. Of the options available to AT&T, we believe that entering Europe still remains a possibility though we recognize that the options are a bit more diverse now that DirecTV seems to be on the table. Specifically, press reports noted that the AT&T's interest in DirecTV may have been driven by the Comcast/Time Warner deal that was announced in February. While it seems unclear whether the two companies are in direct talks, we note that AT&T's management has been vocal at recent financial conferences that they view the Comcast/Time Warner deal as industry-redefining, thereby potentially refocusing prioritization in the U.S. vs. international endeavors. Moreover, given the possible subscriber reach of the joint entity (26 million vs. Comcast/Time Warner's combined 30 million), opportunity for potential synergies (SG&A, potential content offload/fixed line capacity savings) and cross selling opportunities, we can see why AT&T might be examining a potential acquisition of the asset. While it is early to comment on whether AT&T's potential interest in DirecTV potentially closes the door on any transaction the carrier may look to do in Europe, we do note that the company recently outlined that the window for a wireless deal in Europe may be closing ("AT&T Says Window for a Wireless Deal in Europe May Be Closing", Bloomberg, March 12, 2014).

Irrespective of its implications on whether or not AT&T does a transaction in Europe, we believe that press reports around the carrier's interest in DirecTV continue to support our view that M&A activity at the carrier remains very much on the table as management is potentially looking for means to diversify its business away from its maturing U.S. wireless business and improving its cash generation capabilities.

Despite regulatory uncertainty, Sprint continues to remain interested in T-Mobile

During Softbank's (Sprint's majority owner) recent quarterly results, Sprint's Chairman Masayoshi Son provided incremental commentary which indicated that his desire to seek out further consolidation in the U.S. wireless market is unlikely to dissipate anytime soon. Specifically, Mr. Son reiterated his belief that further consolidation is necessary in order to empower Sprint with sufficient scale to compete with the leading regional carriers. While Mr. Son recognizes that the regulatory hurdles are high, he noted that a number of transactions in the market, including Comcast/Time Warner and speculation around AT&T seeking out a potential merger with DirecTV may require regulators to think about the competitive landscape and its evolution over the longer term. In our view, Mr. Son continues to seem motivated to seek out further consolidation in the U.S. Wireless market. While his commentary implied that Sprint could remain a competitive standalone entity, the benefits of scale are necessary for it to achieve the full potential of the asset in order to compete with the larger two regional carriers.

Mr. Son's commentary dovetails with Sprint's CEO Dan Hesse's comments to Bloomberg ("Sprint CEO Says Strong No. 3 Needed amid Price Wars", 05/06/2014, Bloomberg) where he highlighted that ongoing price wars alone are unlikely to improve the competitive environment in the U.S. Instead the industry needs a stronger No. 3 that would drive the top two carriers to react more aggressively to any promotions or pricing changes. Furthermore, Mr. Hesse also interestingly indicated that he would not necessarily look to run a combined Sprint/T-Mobile entity. As highlighted in our recent report, (for more color, please refer to our recent note entitled "[U.S. Telecom Services: The Wireless Consolidation Playbook](#)" dated April 28, 2014), we believe that positioning a deal in a way where T-Mobile management would be in charge of the combined entity is likely to have the best likelihood in securing favorable regulatory reception. The FCC clearly views T-Mobile as a maverick, given its actions have led to increased price competition. Thus, we believe the FCC would be less supportive of a deal that could potentially take out a maverick from the market. A deal where the combined entity is still run by T-Mobile's current management, however, seems to be positioning a combination as enabling T-Mobile to further compete rather than be eliminated from the market.

At present however, despite the benefits of a Sprint/T-Mobile merger highlighted by the company, the FCC's stand on a potential transaction has been less accommodating. We believe this is largely unsurprising given the FCC has been particularly vocal in the past months highlighting its view that the U.S. should be a 4-carrier market in order to preserve competition. Specifically, FCC Chairman Tom Wheeler recently commented that he views most wireless markets in the U.S. as competitive and that he also sees the need to preserve this competition going forward. Moreover our D.C. checks suggest that the Department of Justice views T-Mobile's recent progress as a vindication of its decision to block the proposed sale to AT&T as it has enabled the creation of a more competitive marketplace for consumers. That said, we note that while T-Mobile has had recent success in terms of market share gains, when taking a step back and looking at the share dynamics of the broader industry, the postpaid share position of the top two carriers vs. combined Sprint/T-Mobile has remained broadly unchanged. In other words Sprint's on-going share loss somewhat tempers T-Mobile's share gains, thereby keeping the share dynamics between the big two and the smaller two effectively the same. Therefore, it is possible for Softbank/Sprint to argue that further consolidation may be the only way to shake up the broader market share in the industry – in particular if Sprint continues to lose subscribers in the coming quarters. Insight on whether that argument would resonate with regulators, however, is limited.

Mid-term: competitive landscape

T-Mobile's momentum likely to continue...for now

Over the last few quarters, T-Mobile's initiatives have certainly made their mark on the U.S. Telecom Services market. While the debate on the relative quality of their rising subscriber base continues (although abating) it is clear, as evidenced by their increased share of industry net additions that the company's un-carrier strategy is resonating with subscribers. Whether or not T-Mobile's strategy will be successful in the long run remains to be seen, in particular given the recent pick up in competitive activity as T-Mobile's market share gain have not gone unnoticed. That said the carrier has been proactive in terms of launching targeted marketing campaigns and based on our checks, it seems that the company's recent momentum in the market is likely to continue – in particular as the company increases its focus on tablets and connected devices.

Near-term risks for T-Mobile include increased competitive pressures. AT&T has increased its focus on the lower end of the market (an area where T-Mobile benefitted from early gains), given the carrier recently closed its acquisition of Leap. In addition, as outlined previously, Verizon, having lost subscribers in the first quarter of 2014, has highlighted a renewed push in marketing initiatives where the carrier expects to position itself as a quality data service provider while closing the pricing gap between itself and competitors including T-Mobile and AT&T. Sprint is unlikely to emerge as a material competitive threat until its network is better equipped, which will be unlikely until the back half of this year. That said recent commentary from T-Mobile management seems to suggest the carrier continues to see favorable subscriber momentum in the market. We thus retain our near-term constructive bias on the shares and look for improved visibility on organic margin expansion as the primary driver of our longer-term view. Moreover, should Sprint make a bid for T-Mobile, while both stocks are likely to benefit given the accretive nature of such a transaction, we prefer T-Mobile over Sprint given regulatory uncertainty around such a transaction being approved.

Longer term: stick with mobile traffic plays; towers best positioned

Longer term, we retain our preference on the tower operators over the carriers given the former's leverage to mobile data traffic growth. While share performance has been volatile over the last few quarters as tower stocks were hit by a number of exogenous issues (i.e., exchange rate volatility, rate fears), ultimately healthy fundamentals won out as the tower names posted strong results during 1Q and raised full-year guidance, thereby quelling concerns on the pace of demand. Their respective outlooks were corroborated by commentary from each of the major domestic carriers which indicated the pace of upgrade activity is unlikely to diminish anytime soon. In the interim, the tower companies have taken the appropriate steps in investing in their business through a number of key underutilized acquisitions (some domestic some international) that can be exploited as carriers look to further expand and densify their networks in order to support rising mobile data traffic growth.

As such, we believe that data consumption trends are likely to continue to grow unabated in the long term, more so with increased penetration of connected devices. And though we expect an increasing number of small cells to be deployed in order to improve networks in key regions (mostly metro areas where the traffic to population density ratio is favorable), we do not believe their deployment will displace macro sites, but rather augment them. Thus, as we expect network investment to continue, we retain our favorable view on the tower companies. Our preferred picks are American Tower and SBA Communications. However, we recognize that Crown Castle is well positioned to benefit from healthy secular demand trends as well. Moreover, its improving cash return policies (the recent introduction of a dividend) is likely to serve as an attractive quality to some investors.

Multiple levers to benefit as “Internet of Things” moves mainstream

We believe that the U.S. Telecom Services market has multiple levers that it can utilize in order to benefit from broader adoption of connected devices. These include significance of pipes (or access routes) in the IoT network infrastructure; the integration of connected devices onto telecom networks as a means to optimize traffic management; improve the user experience and reduce network latency.

The pipes: A critical component of IoT network infrastructure

The increased proliferation of connected devices has driven services and capabilities that reinforce their modern lifestyle and are increasingly embedded within familiar products. Consumers now expect to be constantly in touch and continuously informed, changing the way connected devices are used in the real world. While it is difficult to call out a winner from a long-term point of view in the hardware and to a certain extent services space, we do believe that continuing adoption of connected devices is likely to be contingent on their ability to generate intelligent, real-time data to address challenges that modern society faces. In that context, we believe that wireless carriers are likely to play a key role in driving the adoption of connected devices, given the critical role the networks are likely to play in facilitating a 'connected, real-time environment'. Moreover, in an environment of maturing voice and text revenues as well as limited scope for growth in number of subscribers (given we are already beyond the high-growth phase of smartphone adoption), the broader penetration of connected devices and demand for IoT network infrastructure will likely present an incremental revenue opportunity for carriers. We note that carriers have already taken the first step toward addressing the market opportunity – all four nationwide carriers today allow subscribers to share data allowance amongst host devices such as tablets, laptops and connected devices. We believe that as the penetration of connected devices grows, it is likely to drive users to opt for higher data buckets potentially supporting ARPU development for the carriers. Moreover, carriers are likely to continue to invest in their networks to support the expected growth in data-driven connected devices such as wearable computers to ensure optimum service levels. We believe this further supports our long-term constructive view on towers as on-going investments from carriers to buildout their IoT network infrastructure, is likely to continue to drive tower demand for the long term.

Europe and Israel Technology

EUROPEAN SOFTWARE & IT SERVICES

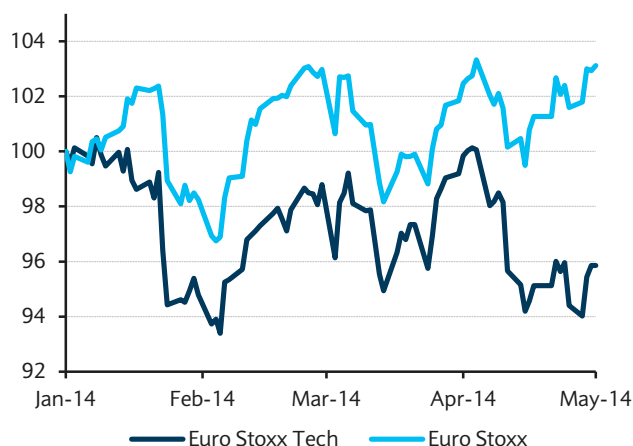
Still waiting for estimate progression

Gerardus Vos
+44 (0)20 3134 6690
gerardus.vos@barclays.com
Barclays, London

James Goodman
+44 (0)20 3134 1038
james.a.goodman@barclays.com
Barclays, London

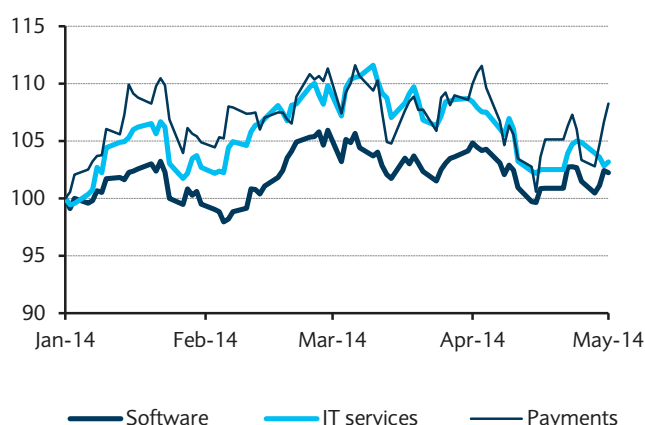
- **European Software & IT Services has had a muted start to 2014 as the rotation out of growth stocks into value has impacted the sector, combined with little of the earnings progression needed to justify the valuation multiple rerating of 2013.**
- **We favour sector exposure falling into the categories of i) cyclical growth; ii) secular exposure (Hyperconnectivity and Payments); and iii) restructuring opportunity.**
- **Our recommendations are structured along those themes with cyclical stock picks like Capgemini and Temenos; secular picks drive our general bullish stance on payments, and finally in SAP we see a restructuring opportunity.**

FIGURE 42
Euro Stoxx Tech vs Euro Stoxx



Source: DataStream, Barclays Research. Data as of 5/1/2014.

FIGURE 43
Coverage subsector performance YTD (rebased)



Source: DataStream, Barclays Research. Data as of 5/1/2014.

Industry View
NEUTRAL

Hyperconnected world – changing interaction with machines

In a hyperconnected world, nothing happens in a vacuum – every purchase, message, sensor reading, web click, tweet, lab test, QR scan, GPS location, credit card transaction, inventory movement and much more is captured and stored at a granular level in databases throughout the world.

With M2M2H (machine-to-machine-to-human) communications, retailers, manufacturers and suppliers are able to monitor supply and demand, manage inventory and get products shipped when and to where they are needed. This can be accomplished by using tags and sensors, which reduce human handling to a minimum and make supply chains faster and more efficient.

Increasingly governments, companies and individuals are recognising that data is interrelated and interconnected through previously undetected relationships and patterns. The sheer amount of data and Big Data is increasingly becoming cliché, and in itself the massive accumulation is not that interesting. It is not about adding to the data it is about what you take away from it. That is easier said than done and one must therefore develop and deploy new technologies that interrogate the data by providing smarter tools for analysis, visualisation and distribution.

This all has resulted so that the data layer has become more complex and that after twenty years of limited innovation, the current rapid change will result in significant opportunities for new players, whilst legacy data vendors could struggle.

How does one play these trends in Europe?

From a software perspective, SAP has an interesting position in the IoT/Big Data opportunity via its in-memory architecture, HANA. However, it is not a pure play and for this stock to work, one also needs to buy into a successful transition to the cloud. Whilst we are convinced it has chosen the right strategy and has executed well, its communication strategy has been poor, resulting, we believe, in some disengagement with the story, demoting it to a quarterly trading stock.

There is another way to play indirectly the IoT/Big Data trend in Europe and this is via the payment names. These vendors are sitting on a large amount of valuable payment data (although not all in their ownership) and many are currently building eCommerce/ targeted ad solutions on their payment platforms. We favour Ingenico, Cielo and Optimal Payments.

Top picks

Temenos – encouraging execution and a positive backdrop

Temenos is one of the few software names in our coverage that is demonstrating materially positive earnings momentum. Execution has been undoubtedly strong and with the pipeline clearly building, we believe Temenos will grow licence revenues ahead of its peer group. In addition, a material relicensing opportunity is due to begin, cross-sell is building and large deals are returning. Together this could drive double-digit licence growth for the coming decade, and we continue to see Temenos as a key beneficiary of an improvement in the financial services backdrop.

Capgemini – gross margin momentum building, cyclical beneficiary

Our positive stance on Capgemini is based on an improving cyclical backdrop benefiting the gross margin outlook for the business. We believe gross margin gains will be driven by industrialisation improvements, stable unit costs, stable pricing and improving utilisation and see recent data points as supportive of this outlook. Utilisation is particularly encouraging, having jumped 110bp in 1Q14. We remain above consensus, anticipating Cap to hit a 9.9% operating margin in FY15 and remain Overweight.

SAP – strategy solid, but look for licence stability and better communication

We believe that, most importantly, SAP is demonstrating momentum in its transition to the cloud. The overall growth rates for the business are resilient given this transition and maintenance remains solid. However, we believe licence volatility is holding the shares back. We continue to advise investors to look through this transition to a higher quality revenue stream, expecting the earnings to be rerated towards the more highly-value software names in Europe as success in this transition becomes more evident.

EUROPEAN TECHNOLOGY HARDWARE

Top-line growth should support value creation in 2014

Andrew M. Gardiner, CFA
+44 (0)20 3134 7217
andrew.m.gardiner@barclays.com
Barclays, London

Youssef Essaegh
+44 (0)20 3134 7250
youssef.essaegh@barclays.com
Barclays, London

Hiral Patel
+44 (0)20 3134 1618
hiral.patel@barclays.com
Barclays, London

- **We continue to seek real top-line growth to justify estimate momentum and stock performance in 2014.** We believe European technology valuations are relatively full following a 30% multiple expansion in 2013.
- **The key drivers in 2014 for stocks where we see the greatest potential are those with the most advantageous exposure to cyclical, secular and restructuring driven growth.**
- **Our top picks are Infineon and ARM, where we see encouraging growth trends within the underlying verticals and on the latter, increasing adoption in new areas boosting the already-strong growth we continue to expect in its current markets.**

Looking for growth

Cyclicality to drive much-awaited momentum within the semiconductor market

Encouraging data points around the overall semiconductor market lead us to believe the recovery in 2014 will be healthier than previously anticipated, particularly for end markets such as automotive. We believe there is potential for this to pick up further steam as the macroeconomic picture, hence spending, improves in Europe. In key verticals such as Automotive and Industrials, Infineon should be a key leader in 2014 given its large exposure. We also continue to advocate for ARM as we anticipate a return to positive estimate momentum in 2H14. We remain broadly cautious on telecom infrastructure, but with IP routing and optical transport, we believe Alcatel-Lucent has more potential upside as ultra broadband spending continues.

Secular growth continues to benefit Payment names...

As a key structural growth theme, we expect more underlying growth from ePayments as it continues to cannibalise cash. In emerging markets, the core card payment network is still building at a strong double-digit pace (supporting our Overweight calls on Gemalto and Ingenico). In mature markets, the eventual launch of NFC m-wallet services provide potential upside to technology vendors Gemalto and further support for volume growth for processors such as AtoS, Ingenico, and Wirecard.

....Hyperconnectivity to drive the Internet of Things

The Internet of Things trend, for names within European Technology Hardware, is more derivative and we think long term. That said, IoT should increase semiconductor demand, ultimately benefiting semiconductor tool vendor ASML, high performance low energy chip designer ARM and connectivity vendors such as CSR and Dialog and to a lesser extent Imagination. The pull towards the cloud will also drive a transformation of networks, supporting further spending on edge routing and fibre optics for ultra broadband, two key drivers for Alcatel-Lucent.

As we highlighted in our recently published Hyperconnected World report (*HCW: The Digital Invasion*), this secular theme is accelerating and we remain positive on the aforementioned names within Europe.

Industry View
NEUTRAL

Top picks

Infineon - the right semiconductor exposure at the right time

We believe Infineon is well placed to benefit from a gradually improving global economy given its exposure to structural as well as cyclical growth. In contrast to current market expectations, we believe there are credible grounds for Infineon to exhibit operating leverage particularly as revenue growth improves from current levels given the healthier outlook for the semiconductor market.

Within the revenue mix, Infineon generates 45% of its revenue from automotive semiconductors, 25% from low power industrials, and 20% from high power industrial markets. This gives Infineon the exposure to benefit from the various mini-cycles within the overall semiconductor market. To date, Infineon has started 2014 well, with all divisions enjoying improving sales and encouraging book-to-bill, in particular within the Auto and Industrial verticals. We expect automotive semis to remain a solid grower given structural trends of rising silicon content per car, but see most upside potential from high power industrials as the economy recovers in 2014/15.

In our view, Infineon is a stock that provides both growth and value, a rare combination in European Technology. We find Infineon inexpensive ahead of the positive estimate momentum we expect over the next two years. We call for 2.0x FY15E EV/sales and 18x P/E, which we think fair for our expectations of FY15/16E 16%/19% EBIT margin and 25% EPS CAGR.

ARM - new cycles starting, remaining at the heart of the Internet of Things

With the boom in smartphones, faster mobile broadband and more connected devices (Internet of Things), the cloud is playing a gradually more important role in consumers and enterprise, and we expect ARM to benefit from these trends.

ARM is best known today for the use of its IP in smartphones but there are plenty of other areas it is preparing to ramp into. We think 2014 is the year it could increase its presence in microcontrollers and networking and make tangible progress towards commercial roll-outs in servers. Several key vendors announced they will be using ARM IP going forward, including Broadcom for networking, Applied Micro and LSI for servers, or STMicro and others ramping up ARM architecture with 32-bit microcontrollers. While we expect the market share gain to be gradual, we believe a few extra 100bp a year is sufficient to sustain a 20% CAGR through 2016 of ARM chip volume growth.

ARM continues to be a clear growth story and we model 18% revenue CAGR from 2012-16E. With over 90% gross and 50% operating margins and a high degree of cash conversion, ARM remains one of the more compelling stories in our sector. We believe ARM's premium multiples of 28x/22x 2015/16E P/E are justified given the company's long-term positioning, growth, profitability and cash flow. Its ability to return increased cash to shareholders just sweetens the story that much more, in our view.

ISRAEL TECHNOLOGY

Joseph Wolf
+1 212 526 3392
joseph.wolf@barclays.com
BCI, New York

David Kaplan
+1 212 412 1443
David.kaplan@barclays.com
Barclays, London

Tavy Rosner
+972 3 623 8628
Tavy.rosner@barclays.com
Barclays, London

Focused on LCD, data monetisation and cash returns

- **The turning point in the LCD cycle:** We continue to believe that the LCD market is turning and that 2014 could see margin expansion. Orbotech looks set to benefit from a market recovery and is taking advantage of the extension opportunities in adjacent markets, which include touch screen, IC assembly and packaging, and UV laser drilling. The company is also benefiting from improvements in business conditions, especially in flat panel displays, which we believe bottomed in 2012. We like ORBK when both LCD and printed circuit boards are growing, which is the case right now.
- **Data monetization and cash returns:** We believe trends in spending by Telcos and focus on technologies to monetize data usage such as the connected car and sponsored data are positive for Amdocs in the near and long term. The company also is a good example of tech companies returning cash to investors.

Exploring the IoT opportunity

We believe it is too early to quantify the Internet of Things direct opportunity with regard to our coverage universe, which has limited direct consumer electronics exposure. We do see two potential indirect areas of growth: 1) ORBK could see an increase in demand if homes get new monitors in addition to TV sets as kitchen or control appliances and 2) if the devices incorporate audio and video then CEVA could participate.

Top picks: DOX, ORBK

Amdocs (DOX): Amdocs' solid cash flow, product innovation and global positioning are all key factors to our OW rating. While clearly not as high growth as some of the other companies in the Enterprise Software space, DOX continues to post solid results across geographies, in particular North America and Europe. The Softbank investment in Sprint led to some questions about whether or not Softbank would implement its own legacy systems at Sprint or continue to use DOX. Having chosen DOX is a credible achievement that in our view may lead to some further implementations. More importantly, the Sprint renewal is another example of how DOX successfully builds long-term and deep relationships with its customers.

Orbotech (ORBK): 2014 is shaping up to be a 10% growth year for the company. ORBK's FPD results echo commentary from GLW (which we also rate OW) that the display market is doing well. In fact, the potential competition that Corning noted on its conference call from China is good for GLW as it can supply its equipment to all panel and glass makers. 1Q results in FPD were strong enough to overcome a slow start to the year in PCB and the balanced business is a distinct advantage for ORBK. Newer end markets, solar in particular, also contributed in 1Q with sales recorded from the plasma enhanced vapor deposition tool. ORBK characterized end markets as improving; China's 4G cellular infrastructure is a major opportunity for ORBK and its customers, we believe. FPD activity is surprising to the upside as China invests, large size TVs replace older models, and UHD activity begins. ORBK has new FPD product that will be delivered later this year and into 2015 with strong bookings continuing in 2Q. With the strong revenues supported by continued improvement in GM and OM, we see revenue and EPS growth continuing.

Industry View
POSITIVE

Asia Technology

ASIA STRATEGY

Kent Chan
+886 2 663 84688
kent.chan@barclays.com
BCSTW, Taiwan

From the Asian technology supply chain and consumer electronic brands perspective, we are incrementally more sanguine on the longer-term impact of IoT as compared to our global colleagues, and believe semiconductor manufacturing services, data storage/server infrastructure suppliers will benefit from the sheer volume of IoT over time; meanwhile, select Korean and Chinese branded consumer electronics and select China internet companies may also benefit, albeit impacting a small percentage of earnings.

Although IoT's impact will be dispersed ranging from consumer electronics to home appliances, and industrial/commercial applications making the direct end product plays hard to identify. However, we expect a low common denominator sector winner is semiconductor manufacturing services. Moreover, Andrew Lu expects a surge in semi unit volumes, albeit at low ASPs, but if fab utilization levels are sustained at the lower end, it should bolster the high-end Apple business and the mass market China smartphone business; thus, we feel confident in our call for record high free cash generation by the Taiwan semiconductor sector in the medium term where we believe stocks will continue to re-rate.

Amongst the Korean consumer electronics brands Samsung and LGE in particular, SC Bae and team expect IoT to help leverage the consumer electronics, home appliances and semi/component manufacturing capabilities. More directly exposed companies like LG Innotek is already manufacturing smart-lighting and connected-car parts and though the exposure in Korea remains small, Korean tech, appliances and auto industries may leverage these synergies into end-market applications and products more directly than Taiwan.

In the Asian hardware supply chain, Kirk Yang and Dale Gai's sectors will be most fragmented from a component supplier perspective, and as such both see the server/storage suppliers as a long-term winner in the expected explosion of data creation, storage, and transferred/analyzed from IoT. And though, there will be selected opportunities amongst the wearable consumer electronics supply chain, these should remain fragmented and very small at this time. Alicia Yap concurs with this view despite initial attempts by Baidu, Qihoo and Alibaba to launch their own wearable devices.

Our team in Asia is more sanguine, we share the challenges highlighted by our global teammate with regard to forecasting dollar value of opportunity and identifying investible ideas with enough IoT earnings impact at this time. As such, our preference for the semiconductor manufacturing services and server storage supply chain represents a lowest common denominator exposure to what we believe will be very high volume but low ASP product opportunity, that coincides with our tech strategy preference based on the improving medium-term fundamentals and where IoT success will be additive rather than a dependent.

KOREA TECHNOLOGY ¹

Korea Tech: Well positioned to benefit from a broader range of IoT opportunities

SC Bae

+82 2 2126 2932

sc.bae@barclays.com

BCSL, Seoul

Sunwoo Kim

+822-2126-2634

sunwoo.kim@barclays.com

BCSL, Seoul

- **We believe Samsung Electronics (005930 KS; OW; PT W1.75mn) and LG Electronics (066570 KS; EW; PT W75,000, both covered by SC Bae) will have unique opportunities in IoT in that both companies have strength in both traditional mobile devices (smartphones and wearable devices) and appliances (white goods and TVs), which might be one of the key areas of IoT.** We also like LG Innotek (011070 KS, OW, PT W145,000, covered by Sunwoo Kim) as it does not only make telecom-related components, but also offer smart-lighting and connected-car parts. According to Machina research, market size of IoT-related home appliance will reach USD120bn by 2022, which is second largest application following that of smart car, which will likely to grow to USD150bn during the same period.
- **We believe IoT will be positive for Korean set brand manufactures in that 1) IoT itself will increase the value profile of the products, helping the replacement cycle and ASP curve and 2) Korean set brand might be able to create some synergies between the devices, applications and components by leveraging its vertically and horizontally integrated business model.** On the other hand, components such as memory, flexible display, sensors, RF module and AP, who would be beneficiaries on a proliferation of IoT are also in the areas where Korean manufactures have a competitive edge, especially for memory and flexible display.

Near term: Incremental benefits expected rather than a disruption for memory and flexible display

In the near term, until the ecosystem for major applications are prepared enough, we expect the positive impact from proliferation of IoT to remain rather incremental. We believe server DRAM and 3D NAND flash will get benefits from rising demand for the data center. In addition, plastic OLED and related components such as flexible battery, flexible PCB and ultra small passive components would also become beneficiaries from the expansion of wearable devices driven by Samsung and Apple.

Long term: Positive impacts on the replacement cycle and ASP trend for TV and appliances; emergence of smart lighting and connected car

On a longer-term horizon, we believe the value profile of TV and home appliances would be significantly enhanced thanks to IoT should they be ideally designed. We think TV has a great potential to be upgraded as an information/entertainment hub of home, replacing desktop PC or game console if it successfully integrates the functions that desktop PC and game console currently possess.

Considering that the ASP of mobile phone has increased by more than three times since it has evolved into more than a simple talking machine, we believe the ASP profile of TV could also show meaningful progress in the long run, if it could successfully evolve into more than a content-consuming gadget. In this regard, we expect to see how Apple will redefine the TV down the road with its new product launch. On the other hand, the value profile of white goods can also be enhanced, although not as much as TV. It would be fascinating for any

Industry View¹

POSITIVE

¹Industry view is for the wider Asia ex-Japan Semiconductor and LCD Displays industries.

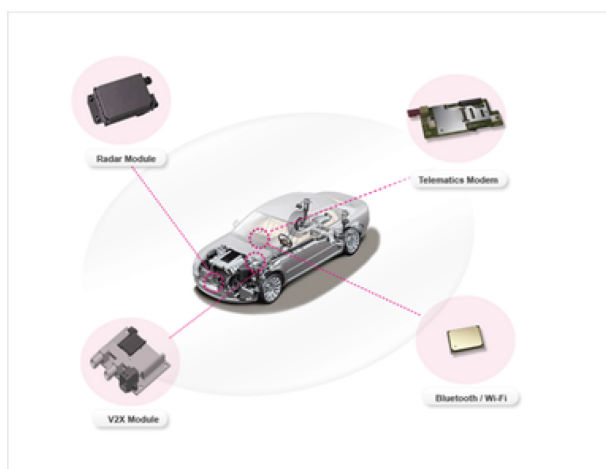
consumers, if he/she can control the temperature, humidity, luminance of the rooms via one single device without too much extra costs burden.

LG Electronics has recently developed white goods that can communicate with a human through an internet messenger system “Line” so that a consumer can turn on an air conditioner through a smartphone or TV by sending messages such as “Turn-on and set room the temperature at 20 degree” or so. We think this type of improvement on consumer convenience may motivate them to pay more for white goods, eventually.

On top of existing electronics devices, we believe the IoT will emerge in existing applications for daily-use such as lighting and automobiles. We think that life will become much more efficient and environmentally friendly based on the transformation. We define the smart lighting as a combination of high efficiency light source and automated control system, so that the energy consumption could be significantly reduced based on the consumer/industrial/commercial activity. We note that a significant number of sensors/network chips/communication systems will be used to build the system in the long run, considering that there are currently around 60bn lighting lamp globally, on an installation basis.

A “connected car” is a vehicle that is equipped with internet access based on a wireless network. This allows the car to share internet access with other devices both inside as outside of the vehicle. Based on the proliferation of smartphones, more and more consumers can easily connect their mobile device to their cars for various purposes such as finding the location of the car, activating climate control and unlocking the car. With the emergence of EVs (Electric Vehicle), we also believe there will be a transformation in the “connected car” based on 1) infotainment system; 2) embedded telematics; 3) assisted driving and autopilot; and 4) cloud-driven software updates and Big Data collection. In this regard, we expect continued uptrend in the number of network-related components, such as network modules, sensors and camera modules, used in the connected car.

FIGURE 44

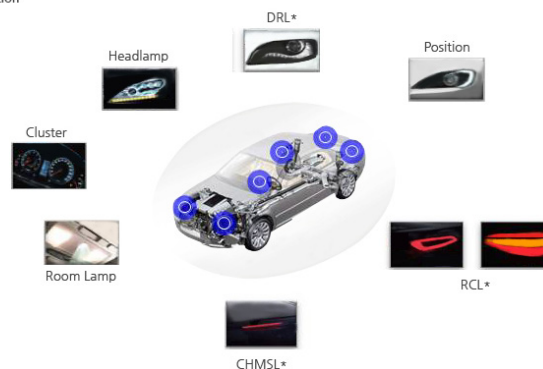
LG Innotek – Network modules used in a car

Source: Company data, Barclays Research

FIGURE 45

LG Innotek – More LEDs are used in automobiles

Ramp Composition



Note: *DRL: Daytime running lighting, CHMSL: Center high mounted stop lamp, RCL: Rear combination lamp

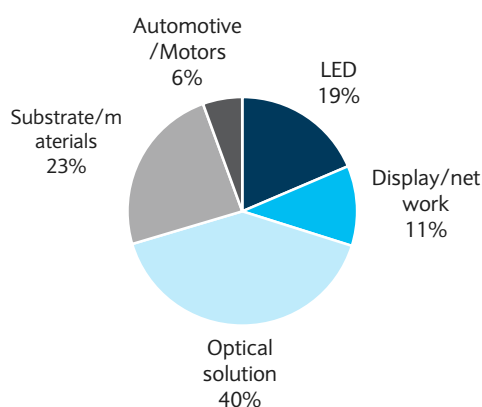
Source: Company data, Barclays Research

Stock recommendations

Samsung Electronics, LG Electronics, LG Display, SK Hynix and LG Innotek to emerge as long-term winners

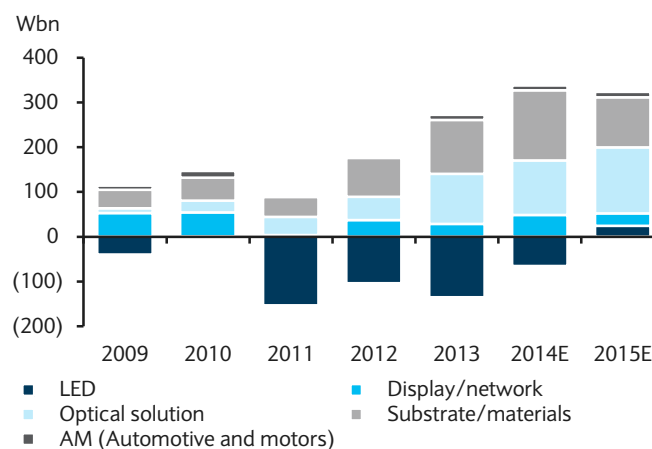
Following mobile phone, we believe TVs and home appliances will get smarter by being connected with the internet in the long run, and Samsung Electronics and LG Electronics will get broader based benefits by leveraging its significant market share in TVs and appliances and the technological synergies with its existing mobile devices. LG Display is also expected to emerge as one of the key beneficiaries given it is considered one of the main suppliers of iWatch and Apple TV. Memory demand profile will also be significantly boosted in the long term as any kind of internet-conducted device would require memories to some degree and demand for data center will also likely grow to support the Big Data scheme. We focus on LG Innotek as well as the company is well positioned to benefit from the IoT trend given its various component product-mix including network (RF/Wi-Fi) modules, LEDs, sensors, camera modules, touch screens and automotive components (motors and battery management system).

FIGURE 46
LG Innotek – Sales breakdown (2014E)



Source: Company data, Barclays Research estimates

FIGURE 47
LG Innotek – Operating profit to continue to recover



Source: Company data, Barclays Research estimates

FIGURE 48

Potential beneficiaries of IoT in Korea Tech space

Company	Ticker	Mkt Cap(US\$mn)	*Note
Samsung Electronics	005930 KS	193,567	Home appliance, Smart robot, security solution, DRAM(TSV), NAND(3D), Batteries, Flexible Display, RF modules
SK HYNIX INC	000660 KS	28,540	Semiconductors - DRAM/NAND
LG CHEM LTD	051910 KS	16,653	Batteries
LG ELECTRONICS INC	066570 KS	10,801	Home appliance, Smart robot, Smart car
LG DISPLAY	034220 KS	9,604	Flexible Display
SAMSUNG SDI	006400 KS	6,615	Batteries
SAMSUNG ELECTRO-MECHANICS	009150 KS	4,784	RF modules
SAMSUNG TECHWIN	012450 KS	2,961	Smart robot
LG INNOTEK	011070 KS	2,388	Network modules, FPCB, Smart Car, Smart lighting
WONIK IPS	030530 KS	834	3D NAND related equipment
EO TECHNICS	039030 KS	786	Flexible display related equipment
PARTRON	091700 KS	696	RF modules
SOULBRAIN	036830 KS	620	3D NAND related chemicals, Batteries materials
AHNLAB INC	053800 KS	508	Total security solution
SAPPHIRE TECHNOLOGY	123260 KS	297	Security (sapphire wafer)
CRUCIALTEC	114120 KS	260	Security (fingerprint sensor)
GIGALANE	049080 KS	213	Rf modules, MEMS sensor
AP systems	054620 KS	201	Flexible display related equipment
MDS TECHNOLOGY	086960 KS	193	Smart car - embedded software
TES	095610 KS	121	3D NAND related equipment
TLI INC	062860 KS	100	MEMS sensor(Micro Electro Mechanical System)

Source: Barclays Research

ASIA EX-JAPAN IT HARDWARE

Taiwan IT near bottom; IoT opportunity in data centre, device and network supply chains

Kirk Yang
+852 2903 4635
kirk.yang@barclays.com
Barclays Bank, Hong Kong

Dale Gai
+886 2 663 84697
dale.gai@barclays.com
BCSTW, Taiwan

Ric Cheng, CFA
+852 2903 4792
ric.cheng@barclays.com
Barclays Bank, Hong Kong

- **The overall tech outlook remains soft and global PC demand continues to decline y/y; we expect 2Q14 to be weak.** We maintain our cautious view on the Asia ex-Japan IT Hardware industry as we do not see many potential catalysts in 1H14.
- **For 2H14, we believe demand for NBs might return as tablet demand matures due to lack of innovations (similar to the issues faced by PCs in the past few years).** We maintain our long-term negative view on Taiwan's IT hardware sector but believe 2014 could be relatively better due to promising product cycles (the prospective iPhone 6, China 4G and even low-priced NBs). Our top picks, keeping the 2H14 outlook in mind, are Hon Hai (OW; on iPhone 6) and Asustek (OW; on ZenFone/NB).
- **We believe IoT will present both risks and opportunities for existing smart device vendors.** In our view, the first beneficiaries could be companies that have a strong foothold in the data centre and network infrastructure supply chain.

Industry View

NEUTRAL

Still bearish on Asia Tech Hardware, but might near bottom

We remain defensive on the outlook for the PC industry given decelerating tech demand in 1Q14 and our expectation for this to continue in 2Q14. We see few potential catalysts for the remainder of 1H14, especially given disappointing Chinese New Year tech demand and likely soft sales for the iPhone 5s/5c (the exception has been the low-end 4s, which boosted CY1Q14 shipments). Although 1Q14 PC demand was still down 4% y/y and we expect it to continue to decline over the next several quarters, we believe this weakness might start to moderate due to easier comps. Given tablet demand saturation, we believe demand for NBs might return in 2H14 (back-to-school), especially for low-priced 2-in-1 detachable touch NBs, possibly triggering a new "netbook" boom, similar to that of 2007-09.

Key picks

Asustek (2357 TT; OW; PT NT\$400): Asustek is our top pick in the Asia PC space as we believe it has now achieved the appropriate smartphone strategy with the introduction of competitive products this year and continued market share gains, especially at the expense of Acer (UW). We are positive on the strong NB and ZenFone outlook and believe Asustek should be able to meet its sales target of 5-10mn units for 2014, up from 1.5mn last year, especially with the promotional help from China's three telecom operators and with more operators expected to launch in 2H14.

Hon Hai (2317 TT; OW; PT NT\$105): After being cautious for most of 2013, we are more optimistic on Hon Hai this year due to the potential iPhone 6 cycle. We upgraded our rating for Hon Hai in March 2014 ([click here](#) for the report), as we believe consensus expectations for prospective iPhone 6 shipments may be too low at around 57mn units for CY4Q14. We believe iPhone shipments could surpass 70mn, given that we expect Apple to introduce two new larger-screen models (4.7-inch and 5.5-inch). As Hon Hai is the major assembler for Apple, comprising over 85% of shipments currently, we see upside potential for its share price, especially given what we view as its low valuation – currently trading at around 10x 2015E EPS.

Valuation and risks

Asustek: Our 12-month price target of NT\$400 for Asustek is based on our target P/E of 12x applied to our EPS estimate for 2015 of NT\$33.33, higher than the current multiple for the notebook EMS/ODMs of 7-10x, but in line with that of the branded PC companies. The key risks our price target, in our view, include the following: 1) a slowdown of the China/Europe PC market and a faster-than-expected deterioration of Asustek's NB business as the European and Asian markets account for c80% of its total revenue; 2) a repeat of issues experienced in 2Q13, such as poor inventory control, forex losses and write-offs, that could significantly reduce future earnings; 3) Asustek's key new product, low-priced tablets not reaching economies of scale, which would mean margins could continue to be under pressure; and 4) its smartphone business does not reach breakeven scale.

Hon Hai: Our price target for Hon Hai of NT\$105 is based on a target P/E of 11x our 2015 EPS estimate of NT\$9.54. Our target P/E of 11x is the historical average over the past five years. Risks which may impede the achievement of our price target include: 1) the company's over-reliance on its largest customer, Apple, which could lead to earnings fluctuations on product transitions; 2) issues related to labour resource planning; 3) potential operating risk; 4) order allocation risk (e.g., more iPad mini and low priced iPhone orders potentially being shifted to Pegatron); and 5) the outlook for the overall PC industry.

Implications of IoT for Asia ex-Japan IT Hardware sector

From a hardware perspective, IoT represents a proliferation of "Internet-connected" smart gadgets (for example, wearable, smart home solutions/appliances) and, in our view, should be a potential opportunity for Asia IT manufacturers. While the current offerings of IoT-related devices are mostly to do with smart home and smart city applications, we believe IoT could create a much wider range of new IT categories long term, and could possibly compete with mainstream IT products (PCs, smartphones and tablets) for the same consumer wallet, and hence be a swing factor for brands/NB ODMs that need to reposition their product lines. Therefore, we believe the more imminent opportunities lie among companies that are strongly positioned in the networking and server business which is the key infrastructure for IoT. Among the potential IoT beneficiaries under our coverage, we like Lenovo (OW) for its branded x86 servers (upon the completion of its x86 deal with IBM) and network storage business, Hon Hai (OW) for its broad manufacturing expertise, and Delta (OW) for its strong position networking components business.

IoT both an opportunity and a threat to existing smart device vendors

Market research firm IDC estimates the number of internet-connected devices at 30.1bn by 2020, which is more than 20 times the annual shipment of 1.5bn smart devices (PCs and smartphones) sold in 2013. We believe this estimated growth in internet-connected devices would not only represent an increase in quantity but also, more significantly, a sharp increase in the number of device categories, which we believe could be a disruptive factor to the existing mass volume smartphone/tablet markets. While we believe smartphones and tablets should be an integral part of IoT ecosystem, it remains uncertain whether there will be cannibalization or competition for the consumer wallet. We believe this could present an opportunity as well as a threat to existing smartphone/tablet brands, which would likely need to reposition themselves for the new industry environment.

Data centre and network infrastructure supply chain companies likely to be early beneficiaries

According to Cisco, network traffic will grow at a CAGR of 23% from now to the end of 2017, and IoT could lead to growing data traffic to meet the need to connect additional devices. On the other hand, demand for data centres would also benefit from the need to

store data gathered from IoT devices. Currently, most IoT applications in China are concentrated in the smart city and smart home areas. Therefore, we believe potential beneficiaries could be companies that manufacture the key physical components that would support a surge in data flow caused by IoT.

FIGURE 49

IoT-related business of Asia ex-Japan IT Hardware coverage universe

Company	Ticker	Rating	IoT-related business lines (2014E sales contribution)
Brand			
Acer	2353.TW	UW	iGware (indirect sales contribution)
Asustek	2357.TW	OW	ASUSWeb (indirect sales contribution)
Lenovo	0992.HK	OW	x86 server (potential 10-15% of sales after IBM x86 server deal completed), LenovoEMC (<2%)
ODM/EMS			
Compal	2324.TW	OW	White-brand servers (<3%)
Hon Hai Precision	2317.TW	OW	Networking business at CNSBG business group (6%)
Pegatron	4938.TW	EW	Limited direct business
Quanta	2382.TW	UW	White-brand servers, with Google, Facebook, Amazon and Rackspace as key customers (<10%)
Wistron	3231.TW	UW	White-brand server for data centres (7%)
Component			
Delta Electronics	2308.TW	OW	Networking business (14%)

Source: Barclays Research, Company reports

Lenovo, Hon Hai and Delta appear best positioned for IoT

Among our coverage universe, we identify Lenovo, Hon Hai and Delta as appearing best positioned for IoT. We like Lenovo (OW) for its branded x86 servers (upon deal competition with IBM) and its network storage solutions business (LenovoEMC). We believe Lenovo would be in a strong position to capture potential demand for servers and network storage, particularly due to its strong branding and distribution network in China. We also like Hon Hai (OW) for its manufacturing expertise in a diversified range of products and its increasing focus on network business. In addition, we like Delta (OW) for its strong position in the networking components business as well as its 4G telecom power business.

On the other hand, while Quanta (UW) might be the most successful white box server provider among the Taiwan ODMs based on its relatively better server sales exposure at around 10%, this might not be significant enough to offset weakness in the NB market, which we estimate will still contribute 66% of its 2014 sales. Other Taiwan NB ODMs, such as Compal and Wistron, face similar issues of high exposure to NB business.

Wearables could be both an opportunity and a threat for Asian IT brands

We also notice that wearable devices become an emerging trend due to increasing popularity among consumers. Common types of wearable devices include action sports camera, smart glass, smartband and smartwatches. Most wearable devices are introduced by well-known international IT brands such as Sony, Samsung, LG and Motorola who are active in the smart watches and wearable sports action camera market.

At the moment, the involvement of Asian IT hardware companies in wearable devices are mainly in assembly and components areas such as PCB, casing and battery. As illustrated in Figure 50, Hon Hai is a key manufacturer of smart glass and action cameras.

In our view, the rise of the wearable devices, like other IoT devices, is a mixed bag for Asia IT brands. It poses a new opportunity for IT brands to diversify their existing PC or smartphone business and tap into a new market. For instance, Acer recently announced a launch of its

first smart band product “Liquid Leap” in 3Q14 while Huawei has also launched its first smartband “TalkBand B1”. On the other hand, managing a wide portfolio of wearable devices could increase costs and there is new competition in each product category. Wearable device is different from each other in terms of form factors and specifications. This might lead to increasing R&D costs (with little cost synergies among different wearables) and selling and marketing expense (to target different groups of customers with different channels and marketing strategies) for existing IT brands which only need to manage either tablet, smartphone or PC.

While international IT brands, such as Samsung, LG and Sony, have a presence across different wearable devices, we notice that there is a group of wearable IT brands specializing in each wearable category and they are often the leading vendors. For instance, Nike, Fitbit and Jawbone are key players in the smartband market while GoPro is a dominant vendor in action sports camera. As a result, while we are optimistic that wearables and other IoTs could bring new opportunity, we remain uncertain if Asian brands are able to compete effectively in catching up with the incumbents by replicating their past successes in the trend of PCs and smartphones.

FIGURE 50

Latest wearable devices

Company	Product	Assembly	Display	Processor	Memory	Storage	Weight	Battery	Heart rate sensor	Voice control	Pedo-meter	Price	Other features	Launch time
Action sports camera														
GoPro	HERO 3 (White)	Chicony	--	Ambarella A7-B0-RH (camera SOC)	512MB	microSD up to 64GB	TBD	1,050mAh	--	--	--	\$200	5MP / 3 fps burst, water resistant	Oct-13
GoPro	HERO 3+ (Black)	Chicony, Hon Hai	--	TBD	TBD	microSD up to 64GB	TBD	1,180mAh	--	--	--	\$400	12MP / 30 fps burst, water resistant	Oct-13
Sony	HX - A500	TBD	--	TBD	TBD	TBD	TBD	TBD	--	--	--	TBD	crystal engine pro system,	2Q14
Smart glass														
Google	Class 2	Hon Hai (US plant)	640x360	1GHz TI OMAP 4430	1GB	16GB	42g	750mAh	--	Yes	--	\$1,500	5MP camera	Apr-14
Smartband														
Acer	Liquid Leap	TBD	TBD	TBD	TBD	TBD	TBD	TBD	Yes	TBD	Yes	TBD	TBD	3Q14
Fitbit	Flex	Flextronics	--	STM ARM Cortex M3 Microcontroller	TBD	TBD	13g	5 days	Yes	--	Yes	\$80	water resistant	May-13
Jawbone	UP24	TBD	--	TBD	TBD	TBD	19-23g	7 days	Yes	--	Yes	\$150	TBD	Mar-14
LG	Lifeband Touch	Inhouse	TBD	TBD	TBD	TBD	TBD	TBD	Yes	--	Yes	TBD	water resistant	2H14
Nike	FuelBand SE	TBD	--	Ti and STM Microcontrollers	TBD	TBD	29-35g (with link)	4 days	Yes	--	Yes	\$149	water resistant	Oct-13
Samsung	Galaxy Gear Fit	Inhouse	1.84", 432x128 (244 ppi)	TBD	TBD	TBD	27g	210mAh	Yes	--	Yes	\$200	water resistant	Feb-14
Huawei	TalkBand B1	Inhouse	1.4", TBD (TBD)	TBD	TBD	TBD	15g (earphone) 20g(band)	93mAh (earphone)	TBD	TBD	Yes	\$135	water resistant, NFC	Feb-14
Sony	SmartBand SWR10	TBD	--	TBD	16KB	256KB	20-21g	35mAh	TBD	TBD	TBD	\$106	water resistant	Feb-14
Sony	SmartBand Wrist Strap SWR110	TBD	--	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	2H14
Smartwatch														
Apple	iWatch	Quanta	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	4Q14
HTC	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	4Q14
LG	G Watch	Inhouse	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	water resistant	3Q14
Motorola	Moto 360	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	3Q14
Qualcomm	Toq	TBD	1.55", 288x192 (223 ppi)	STM 200MHz ARM Cortex M3	TBD	2GB	91g	3 days	--	--	--	\$300	TBD	Sep-13
Samsung	Galaxy Gear	Inhouse	1.63", 320x320 (277 ppi)	800MHz Exynos chipset	512MB	4GB	74g	315mAh	--	--	--	\$300	1.9MP camera, water resistant	Sep-13
Samsung	Galaxy Gear 2	Inhouse	1.63", 320x320 (277 ppi)	1GHz Dual-core	512MB	4GB	68g	300mAh	Yes	Yes	Yes	\$300	2MP camera, water resistant	Feb-14
Samsung	Galaxy Gear 2 Neo	Inhouse	1.63", 320x320 (277 ppi)	1GHz Dual-core	512MB	4GB	55g	300mAh	Yes	Yes	Yes	\$200	water resistant	Feb-14
Sony	SmartWatch 2	TBD	1.6", 220x176 (176 ppi)	200MHz ARM Cortex M3	TBD	TBD	123g	3 days	--	--	--	\$200	water resistant	Sep-13

Source: Company data, Barclays Research

China IoT industry overview

According to China's Ministry of Information and Technology figure, China's IoT market size is estimated to reach RMB500bn (US\$80bn) by 2015, and could further rise to RMB1 trillion (US\$166bn) by 2020. The Chinese government has identified IoT as an emerging strategic industry and has pointed out several applications of IoT including smart city, healthcare and food safety. For instance, Chengdu Internet of Things Technology Institute in China's

Sichuan province is developing a healthcare system involving a telephone booth-sized “health capsule” where citizens from remote areas could get a diagnosis and prescription from a doctor in a distant hospital. As for the food safety application, IoT could be used to track and trace food production from the field through the food supply chain and in food-processing environments by monitoring the condition of livestock and crops.

An example of smart city solutions widely adopted in China is a traffic management system that uses sensors embedded in pavements, license plate-reading systems, social media feeds, and video cameras to respond and resolve traffic incidents in real time. This creates an opportunity for IT hardware companies and their supply chain, data centers, smart city system solutions providers and smart city design firms as well as smart city operators. As illustrated in Figure 51, we notice that a number of domestic companies are actively engaging in the areas in smart city solutions.

However, we see China’s smart city buildout still remains at its infancy stage and it would take five to 10 years to see any meaningful rollout in the Internet of Things. Currently, there are 193 trial cities that have been approved by China’s urban planning authorities to develop their smart cities programmes, while many other cities have submitted applications for smart city program. The support from the Chinese central government is keen, with China Development Bank having promised a loan of no less than RMB 440bn for nationwide smart city construction.

FIGURE 51
IoT-related stocks in HK/China

Company	Ticker	IoT-related business lines
Smart City		
Aerospace Changfeng	600855.SS	Smart city and safety city solutions
Allwin Telecom	002231.SZ	IoT sensor
Clou Electronics	002121.SZ	Smart grid, smart power meter
Datang Telecom	600198.SS	IoT solutions
Digital China	0861.HK	Smart city solutions and operators
Dongfang Electronics	000682.SZ	Smart grid
Sample Technology	1708.HK	Intelligent traffic solutions
Tsinghua Tongfang	600100.SS	IoT application center (smart city solution, security industry)
United Electronics	002642.SZ	Big data solution, intelligent camera
Wonders Group	300168.SZ	Smart city design
Smart Home		
Anjubao	300155.SZ	Smart home solutions
Geeya	300028.SZ	Tri-web integration
Hikvision	002415.SZ	Intelligent IP camera

Source: Company, Barclays Research

ASIA EX-JAPAN SEMICONDUCTORS

Multiple drivers in addition to cyclical recovery

Andrew Lu
+886 2 663 84698
andrew.lu@barclays.com
BCSTW, Taiwan

SC Bae
+82 2 2126 2932
sc.bae@barclays.com
BCSL, Seoul

- We are positive on the Asia ex-Japan semiconductor sector in 2014, estimating sales growth of >15% y/y and EPS growth of >30% y/y due to the cyclical recovery, mix change that should drive GPM/ROE expansion and multiple drivers like 20nm SoC/16nm FinFET+ for Apple APs, fingerprint SiPs, iWatch ICs, and 64bit ARM smartphones, micro servers, networking processor migration (see our report *Andrew on Semis: 64bit ARM*), 3G to 4G upgrades and various wearable ICs.
- We like TSMC for its 20nm HKMG and 16nm FinFET+ ramp for foundry customers and MediaTek on its Octa cores, 64bit, 4G SoC introduction to boost ASP, margin, and shares gains.

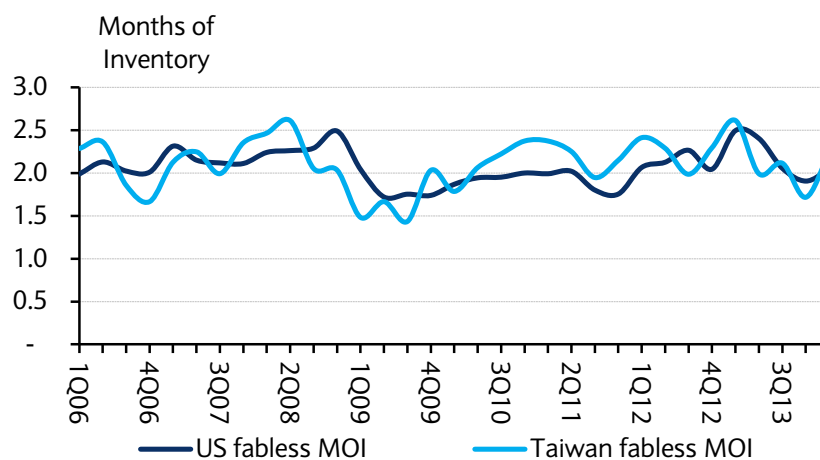
Industry View
POSITIVE

Multiple drivers to emerge

Beyond a cyclical upturn: Benefitting from seasonal demand recovery coupled with inventory replenishment, Asia ex-Japan foundry/OSAT/fabless vendors are guiding 10-20% q/q sales growth in 2Q14. This is better than their customers' sales guidance of 5-15% q/q growth and suggests some new products inventory build-up. We estimate Asia ex-Japan foundry/OSAT/fabless sales growth of >15% y/y in 2014 and EPS growth of >30% y/y, driven by global smartphone shipment growth of 25% y/y in 2014 and 17% y/y in 2015E; new applications like fingerprint SiPs for iPad and for Android devices; and smart watch/glass ICs, 64bit ARM, and 4G LTE upgrade in China.

FIGURE 52

Months of inventory (MOI) for US/Taiwan fabless vendors



Source: Bloomberg, TEJ, Barclays Research

Key drivers/outlook

Positive catalysts for vendors in 2014-16E: We expect Apple to shift some of ARM AP production orders from Samsung/SEMCO to TSMC (foundry) starting in 2Q14E and then to ASE/Amkor/Stats-ChipPAC for outsourced semiconductor assembly and test (OSAT) service and Unimicron/Kinsus for substrate service starting in 2H14E due to the whole supply chain shift. We expect Apple to use TSMC's 20nm High K Metal Gate (HKMG) throughout 2014 and 16nm FinFET in 2H15E. However, we are not ruling out the possibility that competitor GlobalFoundries can also cut into the supply chain and offer 14nm FinFET

foundry service to Apple in 2015E (if GF can ramp up 14nm FinFET yield to TSMC's 16nm FinFET+ yield rate level), considering Samsung recently announced it had licensed the 14nm FinFET process and shared a common design rule with GlobalFoundries.

In addition to Apple AP orders, we expect smartphones in ex-China emerging markets to outgrow the China market and developed countries given its low penetration rate of less than 10%. We think Apple might apply its fingerprint sensor technology to all other portable devices in 2H14E after it applied on iPhone 5S in 2013. Android smartphone vendors are looking for other radio frequency capacitive type of fingerprint sensors from Validity/Synaptics and fingerprint cards. Smart glasses and watches should be equipped with extremely low-power CPU, Wi-Fi, Bluetooth, sensors, and LCD display/driver for battery life extension. ARM baseband low power 64bit micro server CPU, 64bit smartphone AP, and 64bit networking processor should be widely introduced in 2014-16E by using TSMC's 20nm HKMG and 16nm FinFET+ technologies. 3G to 4G LTE upgrade in China should also add some sales growth for vendors.

Negative catalysts for vendors in 2014-16E: PC/notebook shipment y/y decline of 6-8% in 2014-16E is negative for vendors. Feature phone shipment y/y decline of 20-25% in 2014-16E might continue. The saturated smartphone market in developed countries might result in single-digit ppt shipment growth with >10% y/y decline in ASP for next few years, which may pressure supply chain vendors' ASP and margins. In addition, competition from Intel, Samsung, and GlobalFoundries will not end soon as they see TSMC as major competitor in the future. Intel might form a dedicated foundry business model as it started for Altera already. Samsung is likely to expand in-house usage of smartphone IC production but cut outside smartphone IC purchasing from TSMC's smartphone IC customers.

A plateau, not a decline, should follow the increase in the DRAM: We believe recent strength of the DRAM spot price is due to SK Hynix's product shift toward mobile DRAM from PC DRAM and a longer inventory building process than we had expected for PC OEMs after the company's fire accident at Wuxi fab in China. However, we estimate that this ongoing strength will not be sustained beyond May because we believe the other DRAM makers are moving in the other direction and that more output will come into market in May. While we do not expect the DRAM industry to repeat the same pattern of a sharp decline following a peak this time, given the oligopoly that exists in the industry, we believe DRAM ASP will show moderate decline as much as first tiers' cost-cutting pace (20-25% annually) and the DRAM makers' profitability will likely depend on their ability to cut costs, which is getting more difficult now. We see moderate market share gains for Samsung Electronics in the DRAM industry owing to its superior cost structure.

Key Picks

TSMC: We expect TSMC to lead in 20nm HKMG and 16nm FinFET+ migration, driven by Apple switching orders, which should turn up the yield rate of production for other customers as well. In addition, given 20nm HKMG capacity is 95% convertible to 16nm FinFET+ and the back-end design rule between 20nm and 16nm are similar, these suggest a steep learning curve on design and yield rate improvement for customers migrating to 16nm FinFET+ at lower a capex requirement than TSMC's competitors. Lastly, we believe TSMC may have over-depreciated its capacity and book value by >100%, suggesting its 2014-16E P/BV is not as expensive as Bloomberg's consensus assumed.

MediaTek: For the next 2-3 years after rolling over Octacore, 64bit, 3G/4G SoC, we expect: 1) emerging markets (ex-China) to drive shipments of MediaTek's smartphone ICs; 2) blended ASP in the China market to increase on the migration of Octacore/64bit AP and 5 mode 4G; 3) MediaTek reach its stated goal to gain shares from developed countries from 2-3% of shipment in 2014E to >5% in 2015E; and 4) ASP and margin to expand.

ASIA EX-JAPAN WIRELESS

Implications to supply chain on IoT outlook

Dale Gai
886 2 6638 4697
dale.gai@barcap.com
BCSTW, Taiwan

Ric Cheng
+852 2903 4792
Ric.cheng@barcap.com
Barclays Bank, Hong Kong

Industry View
POSITIVE

- **We see two main opportunities under the Internet of Things theme from portable wireless devices:** 1) the next stage of smartphone upgrades, driven by component innovations such as MEMS/acoustics, NFC/antenna and multi-dimension cameras, in the next 5-10 years and 2) incremental volume growth, especially from Apple's prospective watch, dubbed the iWatch by the media, in 2014-15. However, the roadmap for wearables remains ambiguous as we do not see any major sales contributions in the next 2-3 years for the supply chain.
- **On the other hand, we believe the more imminent opportunities lie among 1) consumer networking vendors positioned for the industrial and smart-home applications and 2) server and storage component players benefitting from the increasing Big Data infrastructure.** We see clear monetizable trends in select applications going forward under the IoT, such as sensors in engines, refrigerators, LED lighting devices and industrial PCs.
- **In Figure 53, we summarize the IoT-related businesses of our Asia ex-Japan Wireless Equipment coverage universe.** Within our coverage, we do not estimate that any company will have more than 5% of its sales related to IoT in 2014-16. However, Sunny Optical (OW) and AAC Tech (EW) look relatively better positioned, in our view, given the likely increase in the adoption of 3D cameras and MEMS/vibrator components, respectively, in 2016.

FIGURE 53

Asia ex-Japan IT Hardware coverage universe – business related to the Internet of Things theme

Company	Ticker	Rating	IoT-related business lines
Smart phone brand			
HTC	2498.TW	UW	Likely to launch wearable devices in 4Q14 (1% of sales contribution)
Wearable components			
Zhen Ding	4958.TW	OW	Likely to land orders from prospective iWatch (1-2% sales contribution in 2015)
AAC Tech	2018.HK	EW	Possible sales contributions from MEMS applications for IoT devices in 2016
Sunny Optical	2382.HK	OW	Possible sales contributions from 3D camera applications for IoT devices in 2016

Source: Company reports, Barclays Research estimates

Wearable devices – a fragmented market but increases total accessible market for MEMS, camera and FPC makers

According to IDC, global shipments of wearable devices are to reach 19mn in 2014 and 112mn in 2018. Although the overall market related to IoT remains vague in this initial stage, we believe wearables will become the first mainstream application with a strong demand cycle driven by Apple's prospective launch of a so-called iWatch in late 2014 or 2015. In Figure 54, we highlight the major wearable devices that have been or are expected to be launched in 2014 from current smartphone brands, based on our canvassing of the market.

FIGURE 54

Potential wearable device roadmap for global smartphone brands

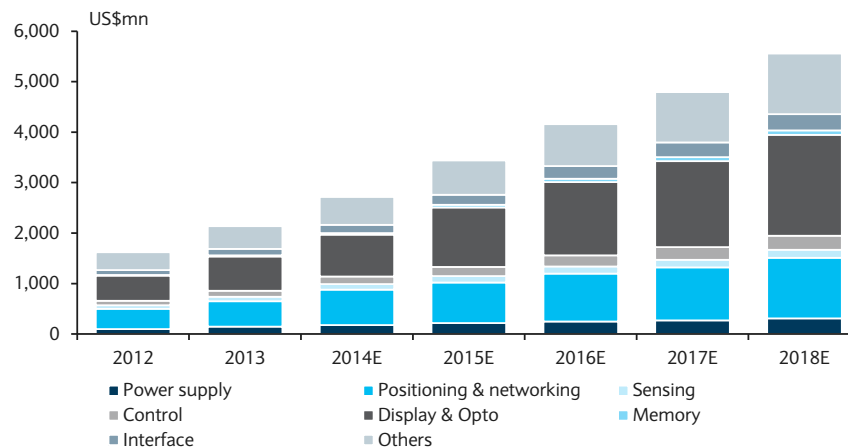
OEM	Product model	Prospective launch time
Apple	So-called iWatch	Likely 4Q14
Samsung	Gear 2 and Gear Fit	1Q14
Sony	Smartband SWR10	1Q14
LG	G Watch	Likely 2H14
HTC	2-3 watches	Likely 4Q14

Source: Company reports, media reports, Barclays Research assumptions

The growing market size of wearable devices will increase the component demand including power supply, positioning and networking, sensing, control, display and optical, memory and interface components as the chart below demonstrated. According to Markets and Markets (a research intelligence firm) in 2013, the total addressable market size of wearable components in 2012 was about US\$1.7bn, with 22% CAGR in 2012-18E on these major components. The largest portion of these components is display, accounting for 40% of the market size, followed by wireless chipset (such as GPS, Wi-Fi) about 25% according to Markets and Markets estimate.

We expect the proliferation of the wearable devices to in turn drive demand for Asia ex-Japan Hardware components, including MEMS/sensors, cameras (like Google Glass) and FPCs in the next 5-10 years. Although sales contributions are to remain low, compared with more than 1.0bn units in the addressable market for smartphones in 2014, we believe the success of wearable penetration will be incrementally positive to these component companies.

FIGURE 55
Market size on wearable device components, 2012-18E



Source: Markets and Markets, 2013

Smart grid – next growth driver for Asia networking sector

Aside from the wearable devices, we believe the networking segment will become the second largest beneficiary of the IoT theme. In networking products for IoT, the smart grid industry appears as the main catalyst in the next 3-5 years. A smart grid is a modernized electrical grid that uses digital information and communications technology to gather and act on information, such as information about the behaviors of suppliers and consumers, in an automated fashion to improve the efficiency, reliability, economics, and sustainability of the production and distribution of electricity. In our view, there will be few technologies involved in the smart grid applications:

- Integrated communications – technology such as fiber-optics will allow for real-time control, information and data exchange to optimize system reliability, asset allocation and security.
- Smart meter – a smart grid replaces analog mechanical meters with digital meters that record usage in real time. Smart meters could provide a communication path extending from generation plants to electrical outlets (smart socket) and other smart grid-enabled devices. In Taiwan, Wistron Neweb is the leading company in smart grid ODM for European clients.

Smartphone sector – stronger 2Q14 outlook from Asia and upside globally from prospective iPhone 6 units in 2H14

China smartphones – weaker sell-through demand in 1Q14 due to 3G/4G transition: In our view, the 4G/LTE adoption in China will remain in the early stage in 1Q14. We expect only limited 4G smartphone models to be available, with low penetration rates in urban areas. Demand for iPhones from China Mobile appears lacklustre, according to our retail channel checks. However, due to new 4G models for China Mobile plus the strong demand through the internet channel, we expect strong component builds into 2Q14, especially from octa-core processors and 13MP cameras.

Apple supply chain strength into 2H14: We expect momentum for iPhone 6 builds starting from end-2Q14. In general, sales of iPhone supply chain companies in Asia ex-Japan were in line with their historical patterns due to Apple's inventory adjustments with declines of about 20-30% q/q. We also expect flattish iPhone orders in 2Q14 with most of the strength from low-priced models (iPhone 4s). According to our checks with component makers, the mass production of iPhone 6 components should start to ramp up from late June, slightly ahead of the previous cycle for the iPhone 5, and we are positive on the sales momentum into 2H14. We believe there remains upside on Apple supply chain in both 2H14 and 1H15 if the sell-through of the iPhone 6 exceeds market expectations. Thus, we believe that the leading Apple supply chain stocks are still in the upward earnings revisions cycle, not only from the volumes but also ASP/margins based on rising component costs for iPhone 6 models.

Key picks

Largan (3008 TT; OW; PT NT\$2,400): Largan's margin strength in 1Q14 proved to be not only from its stronger pricing power but also from its improved manufacturing efficiency, which we believe has been underestimated. We expect its 2Q14 sales to rise 41% q/q mainly from non-Apple smartphone clients. Our PT is based on our target P/E of 18x, which is the high-end of Largan's five-year P/E band, as we believe the re-rating will be supported by its market position and the structural technology migrations in handset camera lenses.

Catcher (2474 TT; OW; PT NT\$300): We reiterate our Overweight rating and our 12-month price target of NT\$300 as Catcher's bullish outlook during its 1Q14 conference call supported our positive investment themes: 1) higher capex for prospective iPhone 6 order wins; 2) the upward trend for metal casing adoption; and 3) limited margin risk on tight supply in the next 6-12 months. We reiterate Catcher as one of our top picks (along with Largan) in the Apple component supply chain as our PT represents a P/E of 13x for 2014-15E EPS. However, we have not yet factored in these upside risks: 1) stronger iPhone 6 sell-through with the possibility of rush orders in 1H15; 2) greater GPM from higher output scale and yield rates; and 3) orders from new customers. We believe the expected upcycle for the metal casing industry in 2014-15 could continue to re-rate the stock as the company outgrows the industry.

ASIA EX-JAPAN LCD DISPLAYS

SC Bae

+82 2 2126 2932

sc.bae@barclays.com

BCSL, Seoul

Jamie Yeh

+886 2 663 84689

jamie.yeh@barclays.com

BCSTW, Taiwan

Sunwoo Kim

+82 2 2126 2934

sunwoo.kim@barclays.com

BCSL, Seoul

Sang Uk Kim

+82 2 2126 2937

sanguk.kim@barclays.com

BCSL, Seoul

Numerous catalysts to drive LCD cycle in 2H14

Commodity panel recovery to continue into 2H14 on size migration/PDP termination

- **We expect ongoing tight supply of commodity panels to continue into 2H14 following short-term seasonal weakness during June-July.** We expect panel prices to be flat or show a slight increase as the year progresses, while we think costs are likely to continue to decline due to falling raw material costs and a higher utilisation rate.
- **We expect a demand recovery from developed countries in North America and Europe due to a likely macro recovery and replacement cycle and continued size migration toward larger TVs owing to 4Kx2K penetration and replacement demand.** This should drive mid-single-digit percentage of unit demand growth and low teen percentage of area demand growth in 2014.
- **On the supply side, we believe new supply growth on a global basis will be limited at c4-5% in 2014 as there should be no new capacity additions outside China and some capacity will be lost in Korea due to the conversion to LTPS line.** On the other hand, we expect Panasonic and Samsung SDI to stop production of PDP in Mar/Aug, respectively, which should result in a 6-7% reduction in global flat TV panel production. We believe this will support a continued tighter supply of TV panels into 2015, despite some expansion of LCD panel capacity in China.

Industry View

POSITIVE

A big year for specialty panels supported by the Apple product cycle

We continue to believe size and resolution migration of smartphones will be driven by Apple during 2H14-2015. We expect the area for panels per unit of the iPhone 6 will increase by 50-60% on average due to the 4.7" screens in Sep/Oct and 5.5" screens we expect to be offered in 4Q14 or 1H15. We also believe that Apple will add a larger-sized tablet (12.9") in 1H15, which will be 78% larger than the current 9.7" model, on an area basis. On the Android front, high-end smartphones will start to adopt QHD panels starting from 2H14 and mid-end smartphones will migrate to 4-5" HD720 from 3" WVGA screens; tablets will migrate to retina (300 ppi and above) for mid- to high-end models and to 200 ppi for low-end devices.

OLED penetration into tablet size to begin

In the organic light emitting diode (OLED) space, we expect OLED's penetration into tablet size to begin in 2H14 as Samsung will start to use it in their high-end tablet PCs with c5-6mn volume annually. We think such a trend will accelerate in 2015 as OLED will be rolled out in an unbreakable form factor (plastic display). In terms of TV application, we expect the LG camp will continue to drive the proliferation of OLED TV starting with China market in 2H14.

LED lighting enters the volume growth stage; price competition to persist

We believe the LED industry will continue to recover given its: 1) continued improvements in efficiency and affordability; 2) favourable government regulations for LED lighting (a more significant addressable market for LEDs vs. the LED TV market, which was quickly saturated); 3) positive impact from UD TV penetration; and 4) more disciplined supply expansion. However, we believe brand lighting makers will continue to compete on pricing as the majority of demand source shifts to residential use, where consumers are more sensitive to pricing, from commercial/industrial use. Hence, we prefer mid-tier LED makers who are newly entering the lighting market, as they could leverage volume growth to improve earnings, despite a weakening ASP.

Top picks for 2014

LG Display (034220 KS; OW; PT W35,000; covered by SC Bae): We believe the stock is set for a continued recovery in 2H14 and into 2015 given: 1) what we consider to be a very attractive valuation in a historical context, trading at 0.9x 2014E P/B and 0.8x 2015 P/B; and 2) significant business opportunities in the Apple product cycle including larger-sized iPhone, higher-resolution iPad, and potential launch of Apple TV. On a longer-term basis, we believe that the company is one of the very few reliable suppliers of flexible OLED solutions for Apple, which should help drive a valuation re-rating.

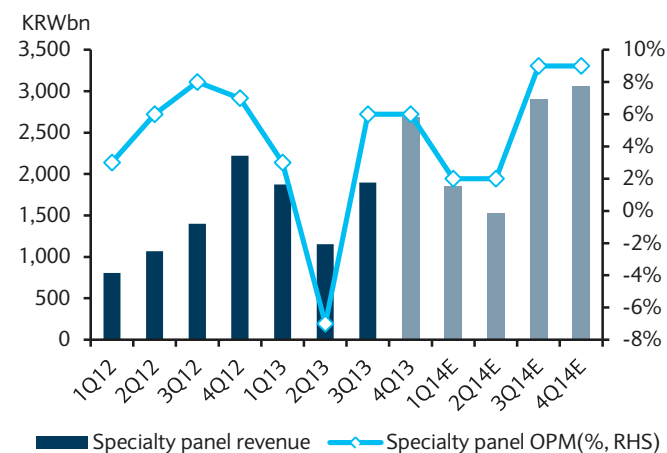
Novatek (3034 TT; OW; PT TWD165; covered by Jamie Yeh): Novatek is our top pick in display because the company continues to benefit from UHD (4K2K TV), which uses 2-3 times the number of driver ICs compared with Full HD TV. We expect to see a 5-10% penetration rate in 2014E globally, and China, in particular, should see 15-20% penetration. For smartphones, we believe the migration to 4G LTE will enlarge screen size and intensify the need for high-resolution displays. New smartphone models usually start with 4-5" and HD720, where we expect more content per box and less competition for Novatek. Finally, we believe Novatek's SOC business will grow when its major Korean customer (Samsung Electronics) uses more of Novatek's TV controller IC products.

Radiant (6176 TT; OW; PT TWD173; covered by Jamie Yeh): We like Radiant given: 1) strong sales momentum, for which company guidance indicates a split of 35-40%/60-65% in sales for 1H14/2H14 thanks to normal seasonality from tablet products and new products segment; 2) a 6% yield profile on a NT\$7 cash dividend; and 3) expectations that Radiant will penetrate into smartphone applications (iPhone) in 4Q14, spurring stronger growth in 2015 and 2016. We believe the trend for high-resolution will continue, and demand for bigger smartphones makes Radiant better prepared to penetrate these new areas of growth.

Lumens (038060 KQ; OW; PT KRW20,000; covered by Sunwoo Kim): We like Lumens along with LG Innotek (011070 KS; OW) in the Korea LED space. We believe this mid-tier packaging firm will be able to ride LED lighting demand growth given its cost competitiveness and also its position in the industry considering the expected supply chain diversification of leading LED bulb makers. We expect continued price cuts to LED bulbs and think mid-tier firms who can offer cost advantages in the manufacturing process will be added to the brand lighting makers' supply chain. Thus, we believe Lumens should find new opportunities in the LED lighting packaging market, and we forecast its lighting revenue to grow by a 69% CAGR until 2016E. We also believe the proliferation of UHD (4K2K) will have a more meaningful impact on Lumens' earnings in 2015 as it is one of the main LED BLU suppliers for Samsung Electronics' LCD TVs. A key stock catalyst would be the addition of major lighting customers.

FIGURE 56

LG Display – specialty panels revenue vs. OPM (%)

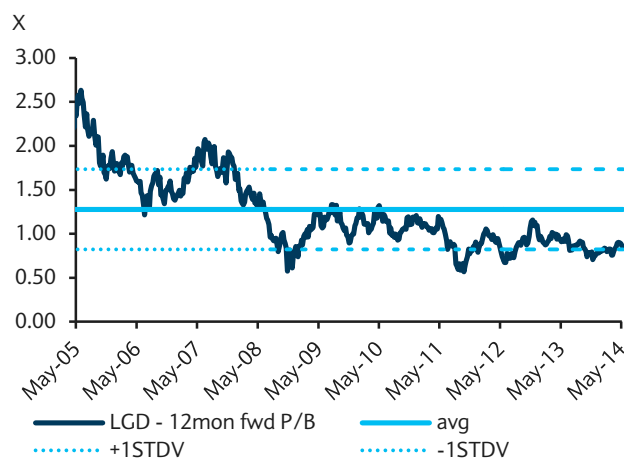


Note: Specialty panel business is mostly derived from Apple.

Source: Company data, Barclays Research estimates

FIGURE 57

LG Display – historical P/B band

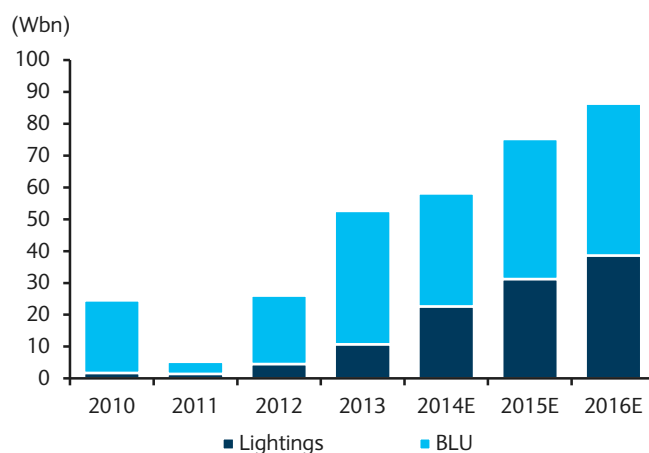


Notes: Data as of 13 May 2014.

Source: Company data, Thomson Reuters Datastream, Barclays Research estimates

FIGURE 58

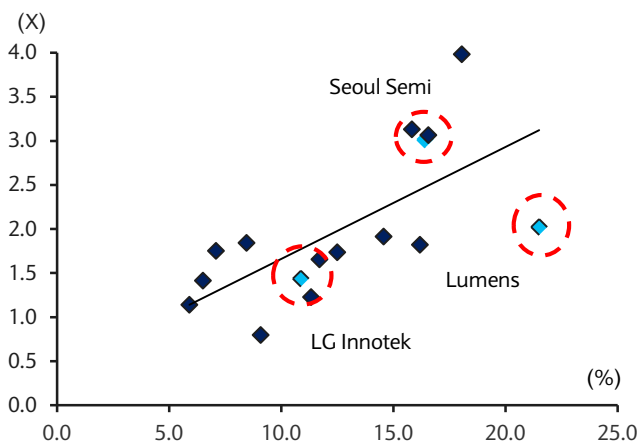
Lumens – OP breakdown, 2010-16E



Source: Company data, Barclays Research estimates

FIGURE 59

P/B vs ROE valuation comparison among global LED upstream peers



Notes: ROE based on 2015E. Data as of 13 May 2014.

Source: Bloomberg consensus, Barclays Research estimates

ASIA EX-JAPAN INTERNET & MEDIA

Investment for future growth

Alicia Yap
+852 2903 4593
Alicia.yap@barclays.com
Barclays Bank, Hong Kong

Joyce Zhou
+852 2903 2512
Joyce.zhou@barclays.com
Barclays Bank, Hong Kong

Gregory Zhao
+852 2903 3295
Gregory.zhao@barclays.com
Barclays Bank, Hong Kong

- **Positive on China Internet sector; five key themes in 2014:** We believe the transition-to-mobile revolution should benefit most of the China Internet companies we cover, especially those that have clear mobile strategies and strong market positions. We see five key themes for the sector in 2014: 1) IPO momentum and M&A activity continuing; 2) online payment/Internet finance gaining more focus; 3) more promising mobile games monetization as competition intensifies; 4) relatively positive sentiment supporting online advertising demand; and 5) the eCommerce turf war extending into social, mobile, O2O and logistics.
- **Top picks: Baidu, Tencent and Qihoo (all OW):** We view Baidu's latest mobile strategies positively and see further potential synergies from its improved LBS (location-based services) offerings for merchants via map location functions and the Nuomi integration as well as from the ramping of revenue from its mobile search offering, all of which should bode well for a stronger 2014. We believe Tencent remains well positioned to capture the emerging opportunities in mobile internet growth in the next few years, leveraging its sticky, integrated mobile user platform on WeChat. We remain positive on Qihoo's execution ability and believe further catalysts could come from ramping PC search monetization, mobile assistant app store revenues and the upcoming release of various mobile search-related products and services.

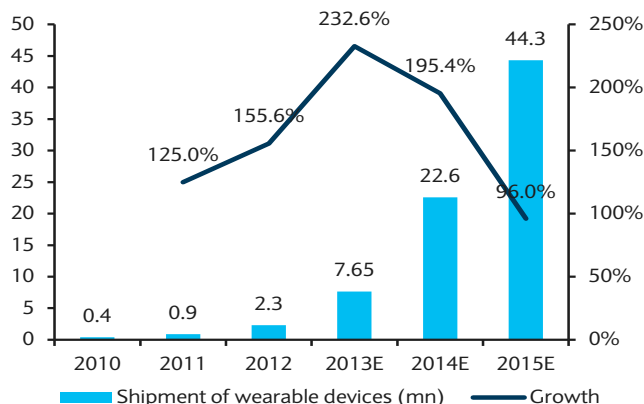
Industry View
POSITIVE

IoT creates long-term opportunities for data/cloud services

The Internet of Things or IoT is still a new concept in China. Leading China internet companies, such as Baidu, Qihoo and Alibaba, are jumping on this concept by launching their own wearable devices, such as smart wristbands and smart watches, but with everything to be connected to the internet; we expect demand for data storage, data analysis and cloud services to increase in the coming years. Among our China Internet sector coverage, Baidu and Tencent are the two companies that we believe have made the most significant investment in cloud computing infrastructure in the past two years. Besides Baidu and Tencent, Alibaba Group and Qihoo have also made substantial investments in their cloud servers and data centres. On 16 January 2014, 3CPP (China Cloud Computing Promotion and Policy Forum) announced the first group of 10 companies to receive Trusted Cloud Service Certification, including internet companies Alibaba, Baidu, Tencent and Sina.

FIGURE 60

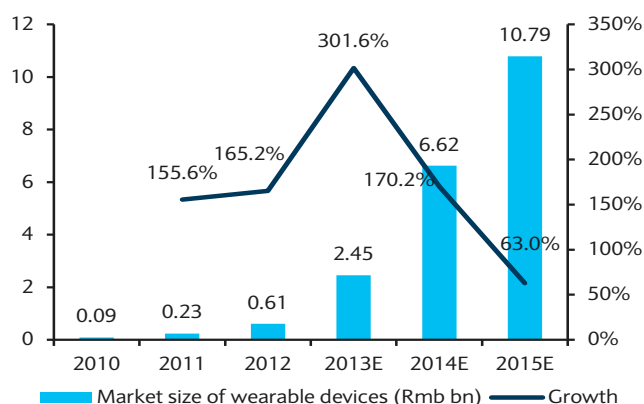
China wearable device shipments and growth



Source: Analysys International estimates, Barclays Research

FIGURE 61

Market size of wearable devices in China



Source: Analysys International estimates, Barclays Research

Top Picks

Baidu – multiple partnership for hardware, aimed at data/cloud services

Baidu has cooperated with several partners to launch connectable hardware. In May 2013, Baidu and Codoon announced the launch of their first wearable product, the Codoon Wristband. Since then, Baidu has been involved in various products such as smart watches, bathroom scales and blood pressure monitors, all of which are supported by the open data platform provided by Baidu Cloud and the data can be shared among different terminals such as PCs and mobiles. According to news reports (TechWeb, 6 January 2014), one of its products, the MuMu Blood Pressure Monitor, achieved over 100,000 shipments in the first month after its launch. Baidu has also launched a series of smart home appliance products such as smart routers, smart Wi-Fi and web-cameras, all supported by Baidu Cloud.

Baidu has developed a set of free tools for developers as a way to encourage them to build their apps using Baidu's cloud computing services. In this way, if more developers are putting their apps on Baidu's cloud and relying on Baidu's free storage for their mobile content and service offerings, Baidu has stated that it hopes this would then create a large enough content database that the app developers would have to rely on Baidu's search technology to push their apps to users. For 2014, Baidu has highlighted that mobile and cloud is one of the company's five strategic areas for investment. We believe Baidu will continue to work with different partners to further penetrate different categories of connectable hardware for its data storage and cloud services.

Tencent – open platform to attract partners with social needs

Tencent has not aggressively entered the connectable hardware market. However, it continues to invest in server infrastructure as it operates one of the largest online game and social networking platforms in China, and it has indirectly become one of the largest storage service providers for Chinese internet users to provide a smooth service for picture upload, transfer and sharing on QQ, Qzone, and now on WeChat. To cope with further increased demand for storage, Tencent is aggressively investing in its cloud platform and network infrastructure. Specifically, in September 2013, the company announced a plan to open its cloud platform, which covers network operating systems, virtual technologies and operations & maintenance for social and gaming products. Tencent has stated that it aims to serve more developers and partners, and potentially evolve into a Big Data, cloud computing ecosystem. We believe the open platform strategy could attract connectable hardware companies to develop software on its platform to leverage Tencent's strong social network, including QQ and WeChat, to connect each individual user's hardware devices via the virtual network and allow them to share using experience, which could even help promote these companies' products on these platforms.

Qihoo – leverage security, target smart home platform provider

Qihoo has leveraged its strong position in the security segment to enter the wearable product market with its first product launched in October 2013 as a smart wristband for parents to track children's location. In addition, Qihoo announced that it has developed a router product that is integrated with security software and services provided by Qihoo. Currently, the product is under testing and is expected to be launched soon (Sina Tech, 19 Feb 2013). According to a news report (Yicai.com, 14 April 2014), Qihoo's router can support the connection of 50-60 devices and it targets to act as a platform provider to different connectable home appliances. On 17 March, Qihoo announced that it would cooperate with TCL on a smart air purifier, and on 13 April, the company also announced that it would cooperate with Aux on smart air-conditioners. For both of these, Qihoo said that it would help develop the mobile apps that connect to Qihoo's cloud platform.

INDIA IT SERVICES*

Bhuvnesh Singh
+91 22 6719 6314
Bhuvnesh.singh@barclays.com
BSIPL, Mumbai

Hitesh Das
+91 22 6719 6213
hitesh.das@barclays.com
BSIPL, Mumbai

Industry View

NEUTRAL

*Industry view is for the wider Asia
ex-Japan Software & IT Services
industry

One for the long haul

- **March 2014 revenue growth numbers for the top four Indian IT services companies trended below Bloomberg consensus estimates.** We see weakness in verticals such as Retail and Manufacturing and geographies such as India and the US as the key reasons for the disappointment. However, management commentary continued to be positive on demand trends and deal pipeline as we head into FY15. This view is further supported by positive commentary from Accenture (increase in bookings guidance) and ISG (acceleration in project awards).
- **Looking ahead, despite near-term concerns such as a weak March quarter or a strengthening rupee, we believe that underlying fundamentals remain strong and sector valuation is not expensive (17x forward P/E).** Infosys and HCL Tech remain our top picks in the sector, rated Overweight.

Quarterly earnings review

The Mar 2014 quarter (4QFY14) was relatively weak (+1.6% q/q average US\$ revenue growth) for the top four Indian IT companies due to vertical- and geography-specific issues: 1) weakness in Retail and Manufacturing verticals (-0.6% and 0.7% q/q growth, respectively) and 2) a slowdown in Indian (delay in decision making) and US revenues (Retail slowdown).

However, deal signings remain strong and FY15 guidance reflects healthy demand trends. TCS reported winning eight large deals, HCL Tech signed deals worth US\$1bn, while Infosys won large deals worth US\$0.7bn. Management commentary was generally positive on discretionary spending with digital technologies a key driver of spend. The improved environment is also highlighted by sharp growth in Accenture's outsourcing bookings (+25% q/q) and ISG's expectation of ACV (Annual Contract Value) of project awards to increase in the high single digits in CY14 (vs. -18% y/y in CY13).

Based on Infosys' guidance (7-9% y/y US\$ revenue growth in FY15 and a 2.2-2.9% cumulative quarterly growth rate [CQGR]) and TCS' commentary of FY15 being a better year than FY14 (c4.6% CQGR, based on our estimates), ask rates for q/q revenue growth in FY15 are higher than in FY14. Wipro's 2Q FY15 revenue guidance is likely to be strong, in our view.

Analytics – one of the key pillars of growth

Given the proliferation of smart devices, enterprises are increasingly looking at ways to use and analyse large volumes of data to attain business objective through increased revenues and profits. This trend is providing increasing opportunities to Indian Outsourcing Providers (IOPs) to bring together the best of technologies and tools to deliver business-focused solutions to clients. NASSCOM estimates the Big Data outsourcing opportunity to increase to US\$1bn by 2015.

Recent management commentary from IOPs during our recent Tech Tour (please refer to our 18 March 2014 note, *Tech Tour – Meet the Stalwarts 2.0: Key Takeaways*) also suggested that the key focus for IT vendors appears to be building scale and capabilities in emerging areas of mobility, cloud, Big Data and social media. While growth over the medium term will be led by traditional services, the strategic reason behind this focus is to

drive non-linear revenue growth (delinking revenue growth from employee efforts). IT companies are making an effort to retrain and re-skill employees in newer technologies and improve their talent acquisition process. Deal sizes are currently smaller (US\$2-10mn) but the quantum of deals is expected to increase in the future.

For example, Infosys has created a Big Data platform called BigDataEdge, which enables real-time discovery of data across both internal systems and external sources. The platform includes a rich visual interface with more than 50 customizable dashboards and 250 built-in algorithms. Wipro on the other hand has acquired minority stakes in two analytics firms Opera Solutions and Promax to boost its service offerings.

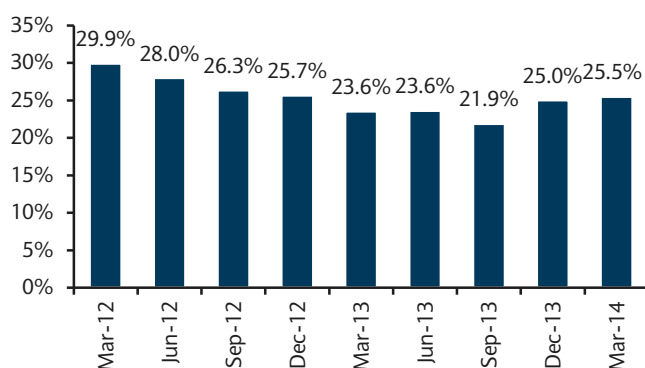
Key picks

Infosys (INFO IN; OW; PT: Rs3,960) and HCL Tech (HCLT IN; OW; PT: Rs1,615) remain our top picks in the sector. For Infosys, we believe that revenue stabilization (as win rates improve) coupled with a margin revival should be the first step towards better performance for the company. The CQGR of revenue growth implied by the upper end of FY14 US\$ revenue guidance (c2.9%) suggests an improvement over the actual CQGR delivered for the past four quarters (2.5% q/q). We expect margins to expand on the back of continuing cost optimization measures (subcontracting costs declines 90bps q/q) and improving utilization. Deals won improved sharply q/q to US\$700mn and Infosys signed 20 new deals in cloud/Big Data and 15 deals in mobility offerings.

HCL Tech continues to witness healthy momentum in its infrastructure services offering. Moreover, the software services segment, which witnessed muted growth in FY13 (c5% US\$ y/y revenue growth) seems to be back on track with c2.2% CQGR growth over the previous two quarters (December 2013 and Mar 2014). Continuing business efficiencies and lower G&A have aided margin expansion of c80bp as well over the past three quarters, despite the impact of wage hikes. HCL won 12 large multi-year deals in Manufacturing and Financial Services in the Mar 2014 quarter with TCV (Total Contract Value) greater than US\$1bn. Going forward, we believe that strong order book and operational improvements should drive stronger revenues and resilient margins.

FIGURE 62

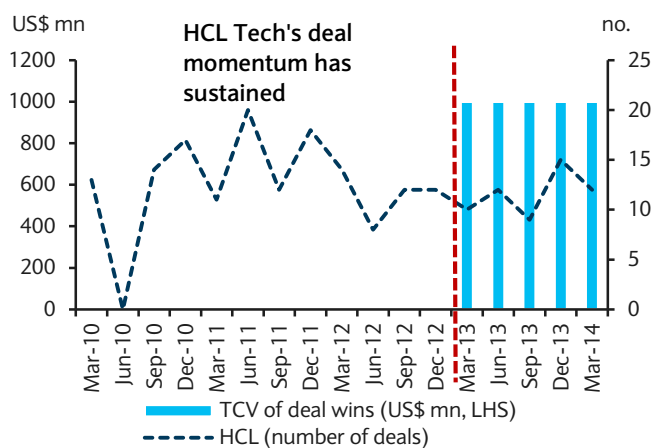
Infosys: EBIT margin expansion continued



Source: Company data, Barclays Research

FIGURE 63

HCL Tech: Deal wins have remained consistent



Source: Company data, Barclays Research

ASIA EX-JAPAN TELECOM SERVICES

Integrated with lots of spectrum; the best mix

Anand Ramachandran
+65 6308 3895
anand.ramachandran@barclays.com
Barclays Bank, Singapore

- **Internet of Things is still at an infant stage in Asia ex-Japan, but we see it as driving a growth opportunity for telecom operators in the long run as it expands operators' addressable markets significantly.**
- **Whilst materially higher data usage prospects (through connected devices) bode well for another leg to data revenue growth, operators' ability to provide customers with one shop stop solutions to manage their connected devices' world could be another significant growth and value driver.**
- **We generally see integrated operators as better placed versus wireless-only operators, with spectrum resources likely to be a key differentiator into the longer term. SingTel, HKT and PT Telkom (all rated OW) are three of our top picks in AEJ Telecom Services that have both.**

Industry View
NEUTRAL

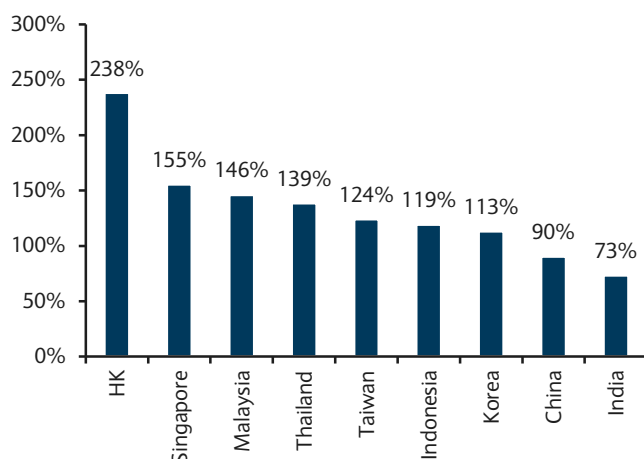
Significant expansion of addressable markets

The current addressable markets for telecom operators are mostly mobile phones, tablets and physical premises (which require fixed line and broadband connection). With the proliferation of Internet of Things (IoT), operators' addressable markets could expand significantly, to cars, electronics, transpiration, utilities, etc. We believe this could drive the mobile penetration rate to be multiples of the current rate in future.

We acknowledge that only some devices would require dedicated connections (i.e., cars, as other devices could piggy-pack on existing connections). Either way, we expect operators to benefit. For example, we believe most of the home devices/electronics would be connected through Wi-Fi, and this presents a material growth opportunity, especially for Asia ex-Japan operators, given the broadband household penetration remains low in the region (not to mention the even lower fibre penetration rate). Overall, we expect broadband penetration to increase in emerging Asia countries (Indonesia, Thailand, etc.) from the current low base, and for subscribers to upgrade to fibre in developed Asian markets (Hong Kong, Singapore, etc.), and that both should be positive growth drivers for operators in the short term.

FIGURE 64

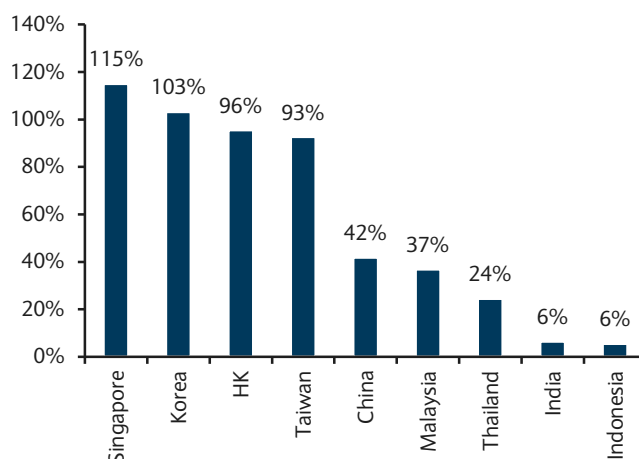
AEJ Telco – mobile population penetration rate (%)



Note: Data as of YE 2013.
Source: Company data, Barclays Research

FIGURE 65

AEJ Telco – broadband household penetration rate (%)



Note: Data as of YE 2013.
Source: Company data, Barclays Research

Operators' ability to become 'smart pipe' remains key

Two challenges for AEJ operators are likely to continue: 1) maximizing traffic capacity and quality of service of networks and 2) monetization of network services. Beyond this, we believe the key on monetising IoT lies in operators' ability to become 'smart pipes', i.e. the ability to provide value added services – including data collection, storage, and analytics – on top of providing basic connectivity alone. Operators' ability to provide customers with one shop stop solutions to manage their connected devices' world could be another significant growth and value driver. In the short term, we see operators as focusing more on government and big enterprise customers, in order to leverage advantages on scale, and also the ability to address concerns surrounding national security. We outline some current IoT applications in AEJ as follows:

- China Telecom currently operate an IoT application platform which provides services on city traffic management, environmental data collection and monitor, smart metering and vending machine remote management, etc.
- SingTel introduced the "Solution for an Urbanised Future (SURF)" initiative in 2012. SURF aims to seamlessly integrate seven emerging technologies to help build integrated solutions for enterprises and smart cities, namely big data and analytics, security, identification and access, M2M (machine to machine), sensing technology, mobility, enterprise social networks, and cloud computing.

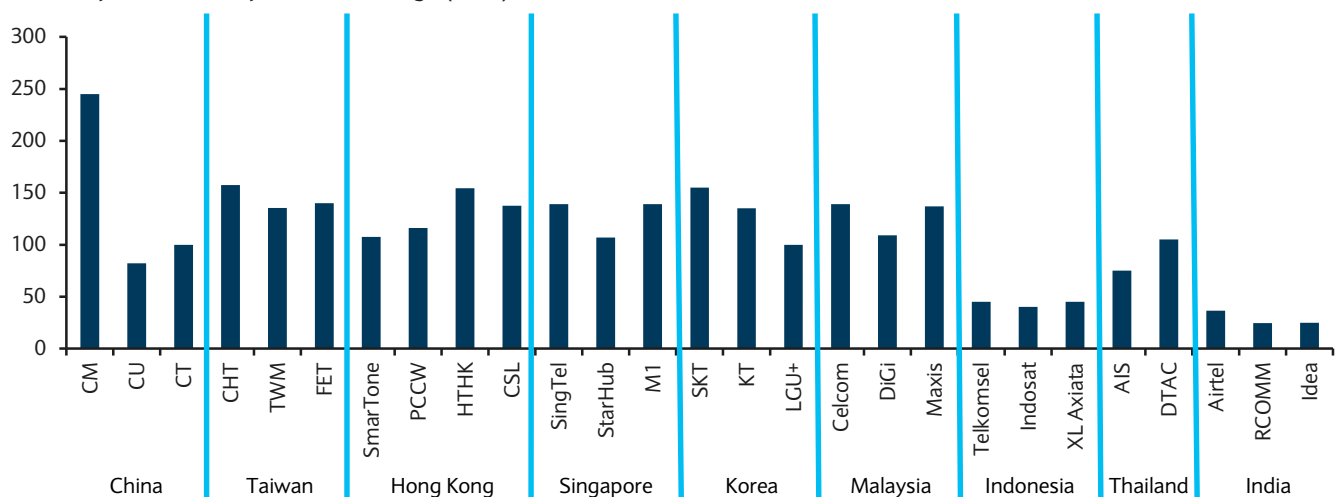
Integrated operators with larger spectrum resources should be relatively better positioned

With significant expansion in data usage expected, we see operators' ability to manage data traffic as key, and that depends on spectrum resources. In our view, the more spectrum resource an operator has, then the better placed that operator is. Over time, as technology progresses, the differences between various spectrum bands should diminish and only quantity will matter, in our view.

Furthermore, generally speaking, we would prefer integrated operators to wireless only for the obvious transmission and backbone infrastructure advantages that integrated operators come with. This is likely to be more pronounced in emerging markets versus developed markets.

FIGURE 66

Asia ex-Japan Telcos – spectrum holdings (MHz)



Source: Company data, Country regulators, Barclays Research

FIGURE 67

Asia ex-Japan Telecom Services (Neutral) – top picks

	AIS	Bharti Airtel	DTAC	HKT	PT Telkom	SingTel	SKT
	ADVANC TB	BHARTI IN	DTAC TB	6823 HK	TLKM IJ	ST SP	017670 KS
Market cap (US\$ bn)	21.2	21.2	8.6	6.9	20.6	48.1	17.6
Avg. 3m trading volume (US\$mn)	43	27	11	5	23	47	40
Stock price (Lcy)	232.00	317.55	118.50	8.36	2,350	3.77	223,000
Rating	OW	OW	OW	OW	OW	OW	OW
Price target (Lcy)	250.00	389.00	130	9.20	2,400	3.90	260,000
Total shareholder return*	13.0%	22.8%	11.9%	15.5%	6.2%	7.9%	20.8%
Valuations (2013/14E)	(FY15/16E)		(FY15/16E)				
Recurring P/E (x)	17.5/15.4	21.4/15	19.2/15.6	21.2/14.8	13.2/12.2	15.1/14	12.9/10.8
EV/EBITDA (x)	10.4/9.2	5.5/4.9	8.8/7.7	9.4/7.7	5.6/5.2	6.9/6.4	5/4.4
P/B (x)	13.7/12.9	1.8/1.7	7.5/7.6	1.7/1.7	3.6/3.2	2.2/2.1	1.1/1.1
Dividend yield (%)	5.7/6.5	0.6/1.3	4.7/5.8	6.1/7.1	4.4/4.8	4.6/5	4.2/4.2
CAGR (2013-16E)	(FY14-17E)		(FY14-17E)				
Revenue	7.7%	7.1%	5.5%	13.4%	5.3%	0.5%	2.4%
Recurring EPS	15.9%	64.4%	22.2%	21.5%	7.8%	7.9%	22.9%
EBITDA	11.4%	9.4%	13.8%	19.1%	5.6%	4.0%	5.4%

Notes: Priced as at market close of 12 May 2014. *Total shareholder return includes potential upside to our price target and the current year dividend yield.

Stock ratings: OW: Overweight; EW: Equal Weight; UW: Underweight. For full disclosures on each covered company, including details of our company-specific valuation methodology and risks, please refer to <http://publicresearch.barcap.com>

Source: Bloomberg, Barclays Research estimates

JAPAN PRECISION INSTRUMENTS

Japan's precision industry not riding the IoT wave

Masahiro Nakanomyo
 +81 3 4530 2962
 masahiro.nakanomyo@barclays.com
 BSJL, Tokyo

- **Japanese precision equipment companies started a new fiscal year in April.** While earnings for these companies in FY3/14 improved, particularly due to support from a weaker yen, we do not foresee significant growth in major markets such as office equipment, digital cameras, and SPE in FY3/15. We expect the office equipment (copier) market to continue to see slight volume gains, but also face ongoing price declines for equipment and consumables. We remain concerned about a slowdown in semiconductor capex during the second half of the year for SPE businesses. While medical equipment supports relatively high expectations, we envision sluggish momentum in FY3/15 after an upbeat FY3/14 fueled by rush demand prior to medical fee revisions and the consumption tax hike in the domestic market.
- **We think a gap may exist between our perception and investors' views on interchangeable-lens cameras (ILCs).** Underlying ILC sales have been undershooting previous year levels since 2HFY3/14. It is unclear to us at this point whether the trend reflects a structural change in consumer behavior linked to the improving image quality of smartphones, or a cyclical downturn within the context of a supply glut in 2012, inventory adjustments during 2013, and price hikes from the second half of 2013. We see the potential for an earnings recovery at Canon (7751, OW) and Nikon (7731, OW) that exceeds investor expectations if the cyclical scenario proves to be correct. Furthermore, the ILC adoption rate in emerging countries is still in the lower single digits, and these markets offer untapped growth potential. We believe the ILC market could recover if camera companies release products with easy-to-use image output methods that allow them to coexist with smartphones, such as expanding the number of models with Wi-Fi.

Industry View
NEUTRAL

Office equipment industry pursuing business model change

The Internet of Things (IoT) trend is acting as a direct headwind for the office equipment industry. Inclusion of smartphones and tablets in corporate business systems is curtailing print volume, particularly in developed countries. While office equipment companies are responding with improved cloud-based printing interfaces and other enhancements, it will be difficult to halt the slowdown of growth in existing businesses. Companies are also trying to convert their business domains to a solutions format amid these conditions, but they have yet to adequately establish business models that are capable of replacing their existing businesses.

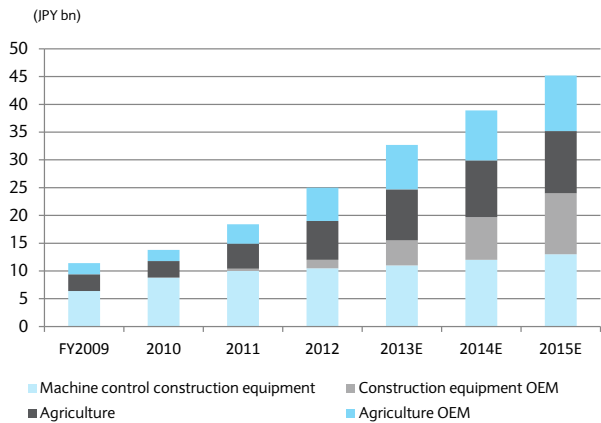
Key Picks

Topcon (7732, OW): Precise location identification using GPS data and machine control technologies contribute significantly to construction and farming machinery operation efficiency, as well as productivity improvement for civil engineering tasks and increased farming output. We expect steady expansion of OEM business with major construction and farming equipment firms. Additionally, Topcon is working with US-based Autodesk in the Building Information Modeling (BIM) area and released a new product this year. We think growth in this business is set to ramp up. Topcon has rolled out a cloud-based product platform and is supplying value-added services for existing surveying equipment. We expect

a variety of business opportunities because of the strong affinity for construction and farming machinery businesses with cloud services.

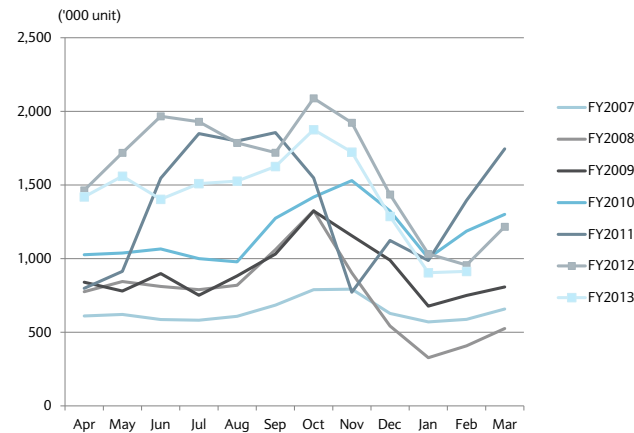
Omron (6645, OW): We think Omron’s business domains are well positioned to benefit from the IoT trend. We foresee wider adoption of wearable devices and advanced driving assistance systems (ADAS) in health devices and automotive parts. We also expect mainstay factory automation (FA) control equipment to become part of the IoT trend at a system level. Omron handles a wide range of system devices, including sensors, switches, and programmable logic controllers (PLCs). While it has not generated major sales from the wearable and ADAS areas yet, basic technology development is steadily progressing and we expect these businesses to ramp up.

FIGURE 68
Topcon machine control OEM revenue forecast



Note: Barclays Research estimates after FY2013
Source: Prepared by Barclays Research based on company data

FIGURE 69
Interchangeable-lens camera monthly shipment trends



Source: Prepared by Barclays Research based on CIPA data

Appendix

Barclays Hardware end market analysis

We estimate smartphone unit growth will decelerate in 2014 driven by maturation in developed markets, plus a softer macro environment in key emerging markets. We estimate smartphone unit growth will decelerate to 25% in 2014. For 2015, we estimate the market will increase 17%. While our growth forecasts don't change much for the out-years, we believe mix and pricing could have more of an adverse impact in 2015-16. We don't see much help from subsidies, which have likely peaked at these levels.

FIGURE 70

Barclays smartphone model

Units in ('000)													
Calendar Year	2012	1Q13	2Q13	3Q13	4Q13	2013	1Q14E	2Q14E	3Q14E	4Q14E	2014E	2015E	2016E
Worldwide	680,108	210,046	225,326	250,232	282,252	967,856	281,683	293,582	304,382	329,936	1,209,584	1,412,015	1,535,708
Y/Y	44%	43%	47%	46%	36%	42%	34%	30%	21.6%	17%	25%	17%	9%
Q/Q		1%	7%	11%	13%		0%	4%	4%	8%			
North America	126,847	30,932	32,730	33,812	40,760	138,235	32,608	32,608	34,238	42,798	142,252	144,979	146,399
Y/Y	18%	12%	29%	8%	-5%	9%	5%	0%	1%	5%	3%	2%	1%
Q/Q		-28%	6%	3%	21%		-20%	0%	5%	25%			
% of Total	19%	15%	15%	14%	14%	14%	12%	11%	11%	13%	12%	10%	10%
Europe	147,784	39,240	40,137	42,310	51,458	173,145	45,283	45,283	45,283	51,170	187,019	196,070	198,908
Y/Y	26%	18%	16%	18%	17%	17%	15%	13%	7%	-1%	8%	5%	1%
Q/Q		-11%	2%	5%	22%		-12%	0%	0%	13%			
% of Total	22%	19%	18%	17%	18%	18%	16%	15%	15%	16%	15%	14%	13%
Japan	32,180	8,733	7,462	6,860	7,996	31,050	8,795	7,036	7,388	8,127	31,346	31,339	31,273
Y/Y	29%	0%	14%	-16%	-8%	-4%	1%	-6%	8%	2%	1%	0%	0%
Q/Q		0%	-15%	-8%	17%		10%	-20%	5%	10%			
% of Total	5%	4%	3%	3%	3%	3%	3%	2%	2%	2%	3%	2%	2%
Asia Pacific	278,982	103,721	111,952	128,164	131,572	475,409	146,045	154,807	162,548	167,424	630,824	777,795	867,912
Y/Y	74%	79%	74%	77%	56%	70%	41%	38%	27%	27%	33%	23%	12%
Q/Q		23%	8%	14%	3%		11%	6%	5%	3%			
% of Total	41%	49%	50%	51%	47%	49%	52%	53%	53%	51%	52%	55%	57%
Rest of World	94,316	27,420	33,046	39,085	50,467	150,018	48,953	53,848	54,925	60,418	218,143	261,833	291,216
Y/Y	48%	41%	45%	62%	81%	59%	79%	63%	41%	20%	45%	20%	11%
Q/Q		-2%	21%	18%	29%		-3%	10%	2%	10%			
% of Total	14%	13%	15%	16%	18%	16%	17%	18%	18%	18%	18%	19%	19%

Source: Gartner, Barclays Research Estimates

FIGURE 71

Global smartphone market share, 1Q10–4Q13

Worldwide Smartphone Unit Share Trends												
Vendor	2011Q1	2011Q2	2011Q3	2011Q4	2012Q1	2012Q2	2012Q3	2012Q4	2013Q1	2013Q2	2013Q3	2013Q4
Samsung	12.4%	15.8%	20.9%	23.2%	27.6%	29.7%	32.1%	31.1%	30.8%	31.7%	32.1%	29.5%
Apple	16.9%	18.2%	15.0%	23.6%	22.5%	18.8%	14.3%	20.9%	18.2%	14.2%	12.1%	17.8%
Huawei Tech	2.5%	2.5%	3.9%	4.0%	3.6%	3.5%	4.5%	4.2%	4.4%	4.2%	4.7%	5.7%
ZTE	0.9%	1.9%	2.5%	3.2%	3.1%	4.1%	4.5%	4.0%	3.8%	4.3%	3.7%	4.0%
LG Electronics	4.1%	4.6%	4.0%	3.6%	3.4%	3.8%	4.1%	3.9%	4.8%	5.1%	4.8%	4.5%
Lenovo	0.2%	0.1%	0.3%	0.7%	1.7%	2.8%	4.1%	3.8%	3.6%	4.7%	5.1%	4.6%
Blackberry	13.0%	11.7%	11.0%	8.8%	6.8%	5.2%	5.2%	3.5%	3.0%	2.7%	1.8%	0.6%
Nokia	25.7%	20.9%	16.0%	12.1%	9.1%	7.6%	4.2%	3.4%	2.8%	3.1%	3.4%	2.9%
Sony	0.0%	0.0%	0.0%	0.0%	3.7%	3.5%	3.9%	3.4%	3.7%	4.0%	3.8%	3.6%
HTC	9.3%	10.2%	10.3%	7.2%	5.2%	6.0%	4.9%	3.2%	2.5%	2.6%	2.2%	1.8%

Source: Gartner

FIGURE 72

Barclays tablet model

Units in (000)	2011	2012	1Q13	2Q13	3Q13	4Q13	2013	1Q14E	2Q14E	3Q14E	4Q14E	2014E	2015E	2016E
Apple iPad Forecast	40,497	65,736	19,477	14,617	14,079	26,035	74,208	21,609	17,287	17,806	28,639	85,341	93,302	101,075
q/q change			-15%	-25%	-4%	85%		-17%	-20%	3%	61%			
y/y change	174%	62%	65%	-14%	0%	14%	13%	11%	18%	26%	10%	15%	9%	8%
% Unit Share	58%	46%	40%	32%	30%	34%	34%	36%	31%	30%	34%	33%	32%	31%
Other Tablets	29,562	77,664	29,723	30,483	33,521	50,865	144,592	38,149	39,293	42,044	54,657	174,143	199,599	220,743
q/q change			-20%	3%	10%	52%		-25%	3%	7%	30%			
y/y change	821%	163%	250%	171%	61%	37%	86%	28%	29%	25%	7%	20%	15%	11%
Total Tablet Forecast	70,059	143,400	49,200	45,100	47,600	76,900	218,800	59,758	56,580	59,850	83,295	259,483	292,901	321,818
q/q change			-18%	-8%	6%	62%		-22%	-5%	6%	39%			
y/y change	289%	105%	142%	59%	37%	28%	53%	21%	25%	26%	8%	19%	13%	10%

ASP (\$)	2011	2012	1Q13	2Q13	3Q13	4Q13E	2013	1Q14E	2Q14E	3Q14E	4Q14E	2014E	2015E	2016E
Apple iPad Forecast	\$ 582	\$ 500	\$ 449	\$ 436	\$ 435	\$ 460	\$ 448	\$ 435	\$ 430	\$ 430	\$ 450	\$ 438	\$ 418	\$ 392
q/q change			-4%	-3%	0%	6%		-5%	-1%	0%	5%			
y/y change	-6%	-14%	-15%	-15%	-14%	-1%	-10%	-3%	-1%	-1%	-2%	-2%	-5%	-6%
Other Tablets	\$ 429	\$ 347	\$ 320	\$ 315	\$ 310	\$ 290	\$ 306	\$ 285	\$ 280	\$ 275	\$ 265	\$ 275	\$ 255	\$ 239
q/q change			-3%	-2%	-2%	-6%		-2%	-2%	-2%	-4%			
y/y change	5%	-19%	-16%	-15%	-11%	-12%	-12%	-11%	-11%	-11%	-9%	-10%	-7%	-6%
Total Tablet Forecast	\$ 518	\$ 417	\$ 371	\$ 354	\$ 347	\$ 348	\$ 354	\$ 339	\$ 326	\$ 321	\$ 329	\$ 329	\$ 307	\$ 287
q/q change			-3%	-15%	-6%	-2%		-2%	-8%	-5%	1%			
y/y change	-11%	-19%	-21%	-23%	-16%	-9%	-15%	-9%	-8%	-7%	-5%	-7%	-7%	-7%

Value (in \$ millions)	2011	2012	1Q13	2Q13	3Q13	4Q13	2013	1Q14E	2Q14E	3Q14E	4Q14E	2014E	2015E	2016E
Apple iPad Forecast	\$ 23,567	\$ 32,850	\$ 8,746	\$ 6,374	\$ 6,124	\$ 11,976	\$ 33,220	\$ 9,400	\$ 7,434	\$ 7,657	\$ 12,887	\$ 37,377	\$ 38,999	\$ 39,604
q/q change			-18%	-27%	-4%	96%		-22%	-21%	3%	68%			
y/y change	157%	39%	40%	-27%	-14%	12%	1%	7%	17%	25%	8%	13%	4%	2%
Other Tablets	\$ 12,693	\$ 26,920	\$ 9,511	\$ 9,602	\$ 10,392	\$ 14,751	\$ 44,256	\$ 10,872	\$ 11,002	\$ 11,562	\$ 14,484	\$ 47,921	\$ 50,934	\$ 52,726
q/q change			-22%	1%	8%	42%		-26%	1%	5%	25%			
y/y change	865%	112%	194%	131%	43%	20%	64%	14%	15%	11%	-2%	8%	6%	4%
Total Tablet Forecast	\$ 36,260	\$ 59,770	\$ 18,257	\$ 15,976	\$ 16,516	\$ 26,727	\$ 77,476	\$ 20,272	\$ 18,436	\$ 19,219	\$ 27,371	\$ 85,298	\$ 89,933	\$ 92,330
q/q change			-20%	-73%	-10%	67%		-24%	-76%	-5%	48%			
y/y change	246%	65%	92%	23%	15%	17%	30%	11%	15%	16%	2%	10%	5%	3%

Source: IDC, Gartner, Barclays Research Estimates

See PCs under pressure long term but stable in corporate

While the market continues to contract, there seems to have been a temporary reprieve from a corporate refresh driven by the expiration of support for Windows XP. Additionally, our checks suggest emerging market demand remains soft when compared to developed markets, a theme that still seems true from reports in the 1Q earnings season. We believe the tilt toward corporate PC demand could point to better ASPs, better revenues and potentially better margins for PC vendors over the near term.

Given ongoing cannibalization from tablets and smartphones as well as macroeconomic pressures, we estimate PC unit growth will be -7% in 2014, including 2Q14 PC unit decline of 5% y/y (-1% q/q). The 2Q forecast follows a still challenging market in 1Q14 when PC units declined 4% y/y. For 3Q14, we estimate PC units will fall 7% y/y and grow only 4% q/q, still somewhat soft for the start of back-to-school. For all of 2015, our estimates factor in a loss of momentum given a further shift in interest toward smartphones and tablets which further cannibalizes notebook demand. For 2015, we estimate a PC unit decline of 6% and for 2016 we estimate a PC unit decline of 5%.

FIGURE 73

Barclays Research PC unit model

Units in ('000)													
Calendar Year	2012	1Q13	2Q13	3Q13	4Q13	2013	1Q14E	2Q14E	3Q14E	4Q14E	2014E	2015E	2016E
Worldwide	351,019	76,770	75,651	79,913	82,772	315,106	72,946	71,857	74,586	74,786	294,175	276,790	261,574
Y/Y	-4%	-13%	-12%	-10%	-6%	-10%	-5%	-5%	-7%	-10%	-7%	-6%	-5%
Q/Q		-13%	-1%	6%	4%		-12%	-1%	4%	0%			
U.S.	66,181	14,349	15,611	16,625	16,888	63,473	14,252	14,365	14,791	15,306	58,714	54,247	50,234
Y/Y	-8%	-12%	-2%	0%	-3%	-4%	-1%	-8%	-11%	-9%	-7%	-8%	-7%
Q/Q		-18%	9%	6%	2%		-16%	1%	3%	3%			
% of Total	19%	19%	21%	21%	20%	20%	20%	20%	20%	20%	20%	20%	19%
Western Europe	56,910	11,899	10,524	11,692	14,390	48,504	11,321	10,214	10,879	12,634	45,048	42,998	40,406
Y/Y	-6%	-20%	-20%	-12%	-7%	-15%	-5%	-3%	-7%	-12%	-7%	-5%	-6%
Q/Q		-23%	-12%	11%	23%		-21%	-10%	7%	16%			
% of Total	16%	15%	14%	15%	17%	15%	16%	14%	15%	17%	15%	16%	15%
Japan	15,568	4,117	3,367	3,790	4,345	15,620	4,807	4,086	4,086	4,026	17,003	16,282	15,275
Y/Y	-1%	-5%	-13%	2%	18%	0%	17%	21%	8%	-7%	9%	-4%	-6%
Q/Q		12%	-18%	13%	15%		11%	-15%	0%	-1%			
% of Total	4%	5%	4%	5%	5%	5%	7%	6%	5%	5%	6%	6%	6%
Asia Pacific	120,717	26,892	27,224	28,021	25,987	108,124	24,536	24,829	25,663	23,316	98,344	92,028	86,931
Y/Y	-2%	-11%	-10%	-11%	-10%	-10%	-9%	-9%	-8%	-10%	-9%	-6%	-6%
Q/Q		-7%	1%	3%	-7%		-6%	1%	3%	-9%			
% of Total	34%	35%	36%	35%	31%	34%	34%	35%	34%	31%	33%	33%	33%
Rest of World	91,643	19,513	18,926	19,785	21,162	79,386	18,030	18,364	19,167	19,504	75,065	71,234	68,728
Y/Y	-1%	-15%	-15%	-16%	-8%	-13%	-8%	-3%	-3%	-8%	-5%	-5%	-4%
Q/Q		-15%	-3%	5%	7%		-15%	2%	4%	2%			
% of Total	26%	25%	25%	25%	26%	25%	25%	26%	26%	26%	26%	26%	26%

Source: IDC, Gartner and Barclays Research Estimates

FIGURE 74

Worldwide printer unit model (in '000)

Calendar Year	2012	1Q13	2Q13	3Q13	4Q13	2013E	1Q14E	2Q14E	3Q14E	4Q14E	2014E	2015E	2016E
Worldwide	109,179	24,850	24,970	26,967	30,394	107,180	25,481	24,169	25,667	29,120	104,437	100,768	96,859
Y/Y	-10%	-9%	-2%	2%	1%	-2%	3%	-3%	-5%	-4%	-3%	-4%	-4%
Q/Q		-17%	0%	8%	13%		-16%	-5%	6%	13%			
U.S.	23,111	5,284	5,269	5,753	6,709	23,015	5,455	5,318	5,606	6,217	22,596	21,873	21,296
Y/Y	-11%	-4%	2%	1%	0%	0%	3%	1%	-3%	-7%	-2%	-3%	-3%
Q/Q		-21%	0%	9%	17%		-19%	-3%	5%	11%			
% of Total	21%	21%	21%	21%	22%	21%	21%	22%	22%	21%	22%	22%	22%
Western Europe	22,381	4,984	4,657	5,743	6,920	22,304	5,380	4,470	5,036	6,318	21,204	19,985	19,551
Y/Y	-15%	-14%	4%	4%	6%	0%	8%	-4%	-12%	-9%	-5%	-6%	-2%
Q/Q		-24%	-7%	23%	21%		-22%	-17%	13%	25%			
% of Total	20%	20%	19%	21%	23%	21%	21%	18%	20%	22%	20%	20%	20%
Japan	7,831	1,519	1,466	1,623	2,709	7,317	1,573	1,443	1,438	2,656	7,111	6,741	6,390
Y/Y	3%	-14%	-9%	0%	-4%	-7%	4%	-2%	-11%	-2%	-3%	-5%	-5%
Q/Q		-46%	-3%	11%	67%		-42%	-8%	0%	85%			
% of Total	7%	6%	6%	6%	9%	7%	6%	6%	6%	9%	7%	7%	7%
AP & ROW	55,856	13,063	13,577	13,848	14,056	54,544	13,072	12,938	13,587	13,928	53,526	52,168	49,622
Y/Y	-9%	-9%	-4%	3%	1%	-2%	0%	-5%	-2%	-1%	-2%	-3%	-5%
Q/Q		-6%	4%	2%	1%		-7%	-1%	5%	3%			
% of Total	51%	53%	54%	51%	46%	51%	51%	54%	53%	48%	51%	52%	51%

Source: IDC, Gartner, Barclays Research Estimates

Barclays' outlook for HDDs reflects a near-term improvement in corporate PC segment, stable growth in the enterprise and relatively firm pricing. Although we believe many traditional IT hardware vendors have been disrupted as a result of increased cloud adoption, Seagate and WD are two of only a handful of companies that have limited risk from this disruption, in our view. The hollowing out of storage is a trend that emerged in 2013, and we believe this will accelerate in 2014 as the software-defined movement becomes more prominent throughout tech. HDD vendors benefit in this transition by offering a key technology component or a toll that enables the cloud. We estimate that 2014 HDD unit shipments will

total 532 million units, down 3.5% y/y and estimate a further 3% decline in 2015 to 516 million units.

FIGURE 75

Barclays HDD unit model

Calendar Year	2011	2012	1Q13	2Q13	3Q13	4Q13E	2013E	Estimates							
								1Q14E	2Q14E	3Q14E	4Q14E	2014E	2015E	2016E	2017E
Disk Drive Units (in thousands)															
Mobile Units	277,886	272,741	62,136	61,938	60,808	61,216	246,098	57,543	56,392	58,084	59,826	231,844	220,431	211,610	203,168
Desktop Units	208,113	179,647	43,456	39,859	42,294	43,526	169,135	40,914	40,096	40,497	40,902	162,410	153,473	147,358	141,450
Enterprise Units	54,762	61,491	15,890	17,038	16,966	16,873	66,767	17,379	18,074	18,436	19,357	73,246	80,546	86,024	92,080
Consumer Electronics Units	81,396	64,668	14,415	14,491	20,082	20,785	69,773	17,668	16,608	16,608	14,116	64,999	61,316	57,414	54,974
Total Units	622,157	578,547	135,897	133,325	140,150	142,400	551,773	133,504	131,170	133,624	134,202	532,499	515,765	502,406	491,672
Year/Year change															
Mobile	0.1%	-1.9%	-10.6%	-14.3%	-11.5%	-1.6%	-9.8%	-7.4%	-9.0%	-4.5%	-2.3%	-5.8%	-4.9%	-4.0%	-4.0%
Desktop	NM	-13.7%	-6.6%	-15.0%	1.9%	-2.7%	-5.9%	-5.8%	0.6%	-4.2%	-6.0%	-4.0%	-5.5%	-4.0%	-4.0%
Enterprise	NM	12.3%	0.4%	-3.8%	29.8%	13.4%	8.6%	9.4%	6.1%	8.7%	14.7%	9.7%	10.0%	6.8%	7.0%
Consumer Electronics	-7.7%	-20.6%	-1.1%	-28.4%	26.4%	48.8%	7.9%	22.6%	14.6%	-17.3%	-32.1%	-6.8%	-5.7%	-6.4%	-4.2%
Total	-4.5%	-7.0%	-7.2%	-15.1%	0.7%	4.9%	-4.6%	-1.8%	-1.6%	-4.7%	-5.8%	-3.5%	-3.1%	-2.6%	-2.1%
Quarter/Quarter change															
Mobile			-0.2%	-0.3%	-1.8%	0.7%		-6.0%	-2.0%	3.0%	3.0%				
Desktop			-2.8%	-8.3%	6.1%	2.9%		-6.0%	-2.0%	1.0%	1.0%				
Enterprise			6.8%	7.2%	-0.4%	-0.5%		3.0%	4.0%	2.0%	5.0%				
Consumer Electronics			3.2%	0.5%	38.6%	3.5%		-15.0%	-6.0%	0.0%	-15.0%				
Total			0.1%	-1.9%	5.1%	1.6%		-6.2%	-1.7%	1.9%	0.4%				
Disk Drive ASPs (\$ per unit)															
Mobile ASPs	\$48.13	\$53.62	\$48.55	\$47.29	\$47.11	\$48.53	\$47.87	\$48.05	\$47.57	\$47.09	\$46.62	\$47.32	\$45.81	\$44.78	\$43.45
Desktop ASPs	\$47.40	\$60.96	\$53.52	\$51.45	\$52.50	\$53.88	\$52.87	\$52.26	\$51.74	\$51.22	\$50.71	\$51.48	\$49.34	\$46.67	\$44.37
Enterprise ASPs	\$121.39	\$143.76	\$143.41	\$143.78	\$136.98	\$136.11	\$140.02	\$133.38	\$132.05	\$132.05	\$130.73	\$132.02	\$127.47	\$124.32	\$123.08
Consumer Electronics ASPs	\$38.90	\$47.81	\$44.53	\$42.95	\$41.73	\$42.78	\$42.87	\$41.49	\$41.08	\$40.67	\$39.85	\$40.82	\$38.04	\$35.37	\$34.30
Total Average ASPs	\$53.13	\$64.83	\$60.80	\$60.39	\$58.84	\$59.70	\$59.92	\$59.58	\$59.66	\$59.27	\$59.29	\$59.45	\$58.69	\$57.88	\$57.61
Year/Year change															
Mobile	4.3%	11.4%	-18.4%	-12.2%	-7.5%	-2.5%	-10.7%	-1.0%	0.6%	0.0%	-3.9%	-1.1%	-3.2%	-2.2%	-3.0%
Desktop	NM	28.6%	-18.2%	-15.8%	-13.1%	-4.8%	-13.3%	-2.3%	0.6%	-2.4%	-5.9%	-2.6%	-4.2%	-5.4%	-4.9%
Enterprise	NM	18.4%	-4.9%	-0.2%	-3.3%	-1.2%	-2.6%	-7.0%	-8.2%	-3.6%	-4.0%	-5.7%	-3.4%	-2.5%	-1.0%
Consumer Electronics	-15.6%	22.9%	-10.3%	-10.3%	-11.6%	-8.1%	-10.3%	-6.8%	-4.4%	-2.5%	-6.8%	-4.8%	-6.8%	-7.0%	-3.0%
Total	3.5%	22.0%	-13.5%	-7.7%	-4.8%	-2.7%	-7.6%	-2.0%	-1.2%	0.7%	-0.7%	-0.8%	-1.3%	-1.4%	-0.5%
Quarter/Quarter change															
Mobile			-2.5%	-2.6%	-0.4%	3.0%		-1.0%	-1.0%	-1.0%	-1.0%				
Desktop			-5.5%	-3.9%	2.0%	2.6%		-3.0%	-1.0%	-1.0%	-1.0%				
Enterprise			4.2%	0.3%	-4.7%	-0.6%		-2.0%	-1.0%	0.0%	-1.0%				
Consumer Electronics			-4.3%	-3.5%	-2.9%	2.5%		-3.0%	-1.0%	-1.0%	-2.0%				
Total			-0.9%	-0.7%	-2.6%	1.5%		-0.2%	0.1%	-0.7%	0.0%				

Source: IDC, Gartner & Barclays Research Estimates

Networking Infrastructure: Wi-Fi is an enabler and beneficiary of IoT – waiting for more robust monetization strategy from larger incumbents

Broadly speaking, we believe that IoT and more applications and data over the internet is generally a positive for infrastructure vendors, as the network increases in strategic value. However, this has also been the case for many years as consumers and enterprises have shifted application consumption from on-premise, to the cloud. We also believe many of the new applications enabled by micro-sensors will likely be very low bandwidth relative to other mediums like smartphones and tablets, and therefore the incremental infrastructure investment may not move the needle. Further, we believe that lack of a standardized communication protocol and security will be major obstacles to IoT in the near term, especially in the wake of Heartbleed Bug. We would like to see a more comprehensive monetization strategy from Cisco, among others, as it is still unclear how IoT can drive incremental revenue growth.

We believe Wi-Fi is a key enabler and beneficiary of IoT. Wi-Fi has always been a preferred method of connectivity, wirelessly connecting “things” to the internet, including laptops, smartphones and tablets. IoT is simply an extension of this and now we are seeing an increasing number of new devices that are connected to the internet via Wi-Fi, ranging from

refrigerators to health monitoring systems. We expect this trend to continue driven by faster access speed (.11ac), more regulatory support, new services (i.e., location based marketing), and more ubiquitous coverage offered by cable and hotspot providers. Note that while wireless is the most common access method, it does have its shortcomings, as its signals have limited range. IoT will ultimately leverage a combination of other radio technologies as well, including 4G/LTE and Bluetooth.

FIGURE 76

Barclays WLAN hardware market model (units & revenue)

Units (000's)													
Calendar Year	2012	1Q13	2Q13	3Q13	4Q13	2013	1Q14E	2Q14E	3Q14E	4Q14E	2014E	2015E	2016E
Total	100,090	26,434	27,212	29,493	29,686	112,826	29,117	29,873	31,771	33,936	124,696	137,261	150,111
Y/Y	10.7%	10.6%	8.1%	16.5%	15.5%	12.7%	10.2%	9.8%	7.7%	14.3%	10.5%	10.1%	9.4%
Q/Q	-	2.8%	2.9%	8.4%	0.7%	-	-1.9%	2.6%	6.4%	6.8%	-	-	-
Enterprise	7,492	2,061	2,436	2,628	2,447	9,573	2,423	2,641	2,905	3,050	11,019	12,527	13,973
Y/Y	24.3%	33.0%	21.2%	34.7%	23.6%	27.8%	17.6%	8.4%	10.5%	24.6%	15.1%	13.7%	11.5%
Q/Q	-	4.0%	18.2%	7.9%	-6.9%	-	-1.0%	9.0%	10.0%	5.0%	-	-	-
% of Total	7.5%	7.8%	9.0%	8.9%	8.2%	8.5%	8.3%	8.8%	9.1%	9.0%	8.8%	9.1%	9.3%
SOHO	92,426	24,324	24,714	26,807	27,179	103,024	26,635	27,168	28,798	30,814	113,416	124,440	135,818
Y/Y	9.6%	9.0%	6.9%	15.0%	14.9%	11.5%	9.5%	9.9%	7.4%	13.4%	10.1%	9.7%	9.1%
Q/Q	-	2.8%	1.6%	8.5%	1.4%	-	-2.0%	2.0%	6.0%	7.0%	-	-	-
% of Total	92.3%	92.0%	90.8%	90.9%	91.6%	91.3%	91.5%	90.9%	90.6%	90.8%	91.0%	90.7%	90%
Outdoor Mesh Node	172	49	62	58	60	229	59	64	67	72	262	295	320
Y/Y	74.0%	67.8%	83.2%	17.3%	1.6%	33.5%	19.5%	2.2%	16.2%	20.0%	14.1%	12.6%	8.7%
Q/Q	-	-16.7%	26.2%	-6.7%	3.6%	-	-2.0%	8.0%	6.0%	7.0%	-	-	-
% of Total	0%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0%
Value (\$ millions)													
Calendar Year	2012	1Q13	2Q13	3Q13	4Q13	2013	1Q14E	2Q14E	3Q14E	4Q14E	2014E	2015E	2016E
Total	7,517	1,975	2,109	2,193	2,190	8,466	2,132	2,229	2,395	2,640	9,397	10,371	11,325
Y/Y	17.1%	17.9%	13.9%	10.4%	9.3%	12.6%	8.0%	5.7%	9.2%	20.6%	11.0%	10.4%	9.2%
Q/Q	-	-1.5%	6.8%	4.0%	-0.2%	-	-2.6%	4.6%	7.4%	10.2%	-	-	-
Enterprise	3,455	896	1,001	1,032	1,046	3,975	1,005	1,063	1,145	1,275	4,488	5,000	5,531
Y/Y	21.1%	21.2%	14.9%	14.2%	11.2%	15.0%	12.2%	6.1%	11.0%	21.8%	12.9%	11.4%	10.6%
Q/Q	-	-4.8%	11.8%	3.0%	1.4%	-	-4.0%	5.7%	7.8%	11.3%	-	-	-
% of Total	46.0%	45.4%	47.5%	47.0%	47.8%	47.0%	47.1%	47.7%	47.8%	48.3%	47.8%	48.2%	48.8%
SOHO	3,809	1,008	1,019	1,084	1,068	4,179	1,058	1,089	1,166	1,272	4,585	5,021	5,428
Y/Y	12%	13.2%	9.8%	6.5%	9.7%	9.7%	4.9%	6.9%	7.6%	19.1%	9.7%	9.5%	8.1%
Q/Q	-	3.5%	1.1%	6.4%	-1.4%	-	-1.0%	3.0%	7.0%	9.1%	-	-	-
% of Total	51%	51.0%	48.3%	49.4%	48.8%	49%	49.6%	48.9%	48.7%	48.2%	48.8%	48.4%	47.9%
Outdoor Mesh Node	252	71	88	78	75	312	70	77	84	93	324	350	365
Y/Y	52.3%	58.3%	68.6%	17.9%	-16.0%	23.7%	-2.3%	-12.4%	8.0%	24.6%	3.8%	7.9%	4.5%
Q/Q	-	-19.9%	24.0%	-12.3%	-3.6%	-	-6.9%	11.2%	8.1%	11.3%	-	-	-
% of Total	3.4%	3.6%	4.2%	3.5%	3.4%	3.7%	3.3%	3.5%	3.5%	3.5%	3.4%	3.4%	3.2%

Source: Dell'Oro, Barclays Research Estimates

FIGURE 77

Barclays global Level 2 & Level 3 networking value model

Parts (000's)													
Calendar Year	2012	1Q13	2Q13	3Q13	4Q13	2013	1Q14E	2Q14E	3Q14E	4Q14E	2014E	2015E	2016E
Total	407,402	99,141	105,862	112,169	114,642	431,815	104,854	109,737	115,011	122,371	451,974	462,986	465,956
Y/Y	3%	2%	4%	9%	9%	6%	6%	4%	3%	7%	5%	2%	1%
Q/Q	-	-5%	7%	6%	2%	-	-9%	5%	5%	6%	-	-	-
Modular	23,954	5,136	5,735	6,170	6,286	23,328	5,707	5,677	5,727	5,864	22,975	21,882	21,724
Y/Y	-10%	-10%	-6%	0%	5%	-3%	11%	-1%	-7%	-7%	-2%	-5%	-1%
Q/Q	-	-14%	12%	8%	2%	-	-9%	-1%	1%	2%	-	-	-
% of Total	6%	5%	5%	6%	5%	5%	5%	5%	5%	5%	5%	5%	5%
Fixed	383,448	94,005	100,127	105,999	108,356	408,487	99,147	104,060	109,284	116,507	428,999	441,104	444,232
Y/Y	4%	3%	4%	9%	10%	7%	5%	4%	3%	8%	5%	3%	1%
Q/Q	-	-5%	7%	6%	2%	-	-8%	5%	5%	7%	-	-	-
% of Total	94%	95%	95%	94%	95%	95%	95%	95%	95%	95%	95%	95%	95%

Value (\$ millions)													
Calendar Year	2012	1Q13	2Q13	3Q13	4Q13	2013	1Q14E	2Q14E	3Q14E	4Q14E	2014E	2015E	2016E
Total	21,141	5,114	5,495	5,706	5,904	22,219	5,304	5,544	5,805	6,220	22,873	23,439	23,806
Y/Y	5%	2%	2%	10%	6%	5%	4%	1%	2%	5%	3%	2%	2%
Q/Q	-	-8%	7%	4%	3%	-	-10%	5%	5%	7%	-	-	-
Modular	6,873	1,454	1,616	1,723	1,738	6,531	1,530	1,583	1,645	1,785	6,543	6,645	6,732
Y/Y	-5%	-13%	-7%	0%	0%	-5%	5%	-2%	-5%	3%	0%	2%	1%
Q/Q	-	-16%	11%	7%	1%	-	-12%	3%	4%	9%	-	-	-
% of Total	33%	28%	29%	30%	29%	29%	29%	29%	28%	29%	29%	28%	28%
Fixed	14,268	3,660	3,879	3,983	4,166	15,688	3,774	3,961	4,160	4,435	16,330	16,794	17,074
Y/Y	11%	10%	6%	15%	9%	10%	3%	2%	4%	6%	4%	3%	2%
Q/Q	-	-4%	6%	3%	5%	-	-9%	5%	5%	7%	-	-	-
% of Total	67%	72%	71%	70%	71%	71%	71%	71%	72%	71%	71%	72%	72%

Source: Dell'Oro, Barclays Research Estimates

FIGURE 78

Barclays global application delivery controller (ADC) market model (units & revenue)

Units (000's)													
Calendar Year	2012	1Q13	2Q13	3Q13	4Q13	2013	1Q14E	2Q14E	3Q14E	4Q14E	2014E	2015E	2016E
Total	80	22	24	25	26	98	25	27	28	31	111	125	138
Y/Y	26.5%	22.8%	23.4%	23.3%	18.3%	21.8%	12.1%	10.5%	13.8%	18.5%	13.8%	12.3%	10.3%
Q/Q	-	3.1%	8.4%	2.7%	3.1%	-	-2.3%	6.8%	5.8%	7.4%	-	-	-
Physical	66	16	17	17	17	66	16	17	18	19	70	74	77
Y/Y	12.0%	0.7%	-1.1%	-1.2%	1.7%	0.0%	1.6%	1.3%	7.8%	12.2%	5.8%	5.3%	4.5%
Q/Q	-	-3.9%	5.3%	-2.3%	3.0%	-	-4.0%	5.0%	4.0%	7.0%	-	-	-
Virtual	14	6	7	8	9	31	9	10	11	11	41	51	60
Y/Y	239.7%	171.2%	181.8%	138.4%	72.8%	128.0%	38.4%	31.2%	25.4%	30.8%	31.0%	24.2%	18.8%
Q/Q	-	26.1%	16%	14%	12.0%	-	1.0%	10.0%	9.0%	8.0%	-	-	-

Value (\$ millions)													
Calendar Year	2012	1Q13	2Q13	3Q13	4Q13	2013	1Q14E	2Q14E	3Q14E	4Q14E	2014E	2015E	2016E
Total	1,594	382	398	413	435	1,627	413	429	449	487	1,777	1,915	2,040
Y/Y	13.3%	-0.5%	2.3%	0.7%	5.6%	2.1%	8.3%	7.8%	8.7%	11.9%	9.2%	7.8%	6.5%
Q/Q	-	-7.4%	4.2%	3.8%	5.4%	-	-5.0%	3.8%	4.6%	8.5%	-	-	-
Physical	1,512	348	359	367	390	1,464	367	378	393	425	1,563	1,651	1,728
Y/Y	10.8%	-5.8%	-3.9%	-5.5%	2.5%	-3.2%	5.6%	5.4%	7.0%	8.8%	6.8%	5.6%	4.7%
Q/Q	-	-8.6%	3.1%	2.5%	6.3%	-	-5.9%	2.9%	4.0%	8.1%	-	-	-
Virtual	82	34	39	45	44	163	46	51	55	62	214	264	311
Y/Y	95.6%	142.0%	148.6%	115.7%	42.8%	98.7%	36.0%	30.0%	22.4%	38.8%	31.5%	23.3%	17.9%
Q/Q	-	8.1%	16.3%	15.8%	-1.9%	-	3.0%	11.1%	9.0%	11.2%	-	-	-

Source: Dell'Oro, Barclays Research Estimates

FIGURE 79

Barclays routing market model (units & revenue)

Units ('000's)													
Calendar Year	2012	1Q13	2Q13	3Q13	4Q13	2013	1Q14E	2Q14E	3Q14E	4Q14E	2014E	2015E	2016E
Total	1,619,947	382,486	418,781	481,562	477,078	1,759,907	449,915	467,353	469,417	472,298	1,858,983	1,935,370	2,009,676
Y/Y	2.1%	-1.7%	5.0%	16.2%	14.3%	8.6%	17.6%	11.6%	-2.5%	-1.0%	5.6%	4.1%	3.8%
Q/Q	-	-8.3%	9.5%	15.0%	-0.9%	-	-5.7%	3.9%	0.4%	0.0%	-	-	-
Enterprise	1,331,147	312,737	330,641	383,956	370,303	1,397,637	351,788	363,124	363,124	363,922	1,441,957	1,479,142	1,510,570
Y/Y	-1.6%	-3.7%	-0.6%	12.8%	11.1%	5.0%	12.5%	9.8%	-5.4%	-1.7%	3.2%	2.6%	2.1%
Q/Q	-	-6.2%	5.7%	16.1%	-3.6%	-	-5.0%	3.2%	0.0%	0.2%	-	-	-
% of Total	82.2%	81.8%	79.0%	79.7%	77.6%	79.4%	78.2%	77.7%	77.4%	77.1%	77.6%	76.4%	75.2%
Service Provider	288,800	69,749	88,140	97,606	106,775	362,270	98,127	104,229	106,293	108,377	417,025	456,228	499,106
Y/Y	23.0%	8.5%	32.7%	31.4%	27.4%	25.4%	40.7%	18.3%	8.9%	1.5%	15.1%	9.4%	9.4%
Q/Q	-	-16.8%	26.4%	10.7%	9.4%	-	-8.1%	6.2%	2.0%	2.0%	-	-	-
% of Total	17.8%	18.2%	21.0%	20.3%	22.4%	20.6%	21.8%	22.3%	22.6%	22.9%	22.4%	23.6%	24.8%
Value (\$ millions)													
Calendar Year	2012	1Q13	2Q13	3Q13	4Q13	2013	1Q14E	2Q14E	3Q14E	4Q14E	2014E	2015E	2016E
Total	12,671	2,916	3,433	3,506	3,463	13,317	3,235	3,434	3,528	3,652	13,849	14,375	14,759
Y/Y	-1.1%	-5.8%	8.4%	12.2%	5.5%	5.1%	11.0%	0.0%	0.6%	5.5%	4.0%	3.8%	2.7%
Q/Q	-	-11.2%	17.7%	2.1%	-1.2%	-	-6.6%	6.2%	2.7%	3.5%	-	-	-
Enterprise	3,405	828	912	944	942	3,626	895	924	942	963	3,724	3,816	3,908
Y/Y	-0.3%	-2.0%	6.9%	10.2%	10.8%	6.5%	8.1%	1.3%	-0.2%	2.2%	2.7%	2.5%	2.4%
Q/Q	-	-2.6%	10.1%	3.5%	-0.2%	-	-5.0%	3.2%	2.0%	2.2%	-	-	-
% of Total	26.9%	28.4%	26.6%	26.9%	27.2%	27.2%	27.7%	26.9%	26.7%	26.4%	26.9%	26.5%	26.5%
Service Provider	9,265	2,087	2,521	2,562	2,521	9,691	2,340	2,510	2,586	2,689	10,125	10,559	10,851
Y/Y	-1.4%	-7.3%	8.9%	13.0%	3.6%	4.6%	12.1%	-0.4%	0.9%	6.7%	4.5%	4.3%	2.8%
Q/Q	-	-14.2%	20.8%	1.6%	-1.6%	-	-7.2%	7.3%	3.0%	4.0%	-	-	-
% of Total	73.1%	71.6%	73.4%	73.1%	72.8%	72.8%	72.3%	73.1%	73.3%	73.6%	73.1%	73.5%	73.5%

Source: Dell'Oro, Barclays Research Estimates

FIGURE 80

Barclays global storage systems market model

Value in \$M						ESTIMATES							
Calendar Year	2009	2010	2011	2012	2013	1Q14E	2Q14E	3Q14E	4Q14E	2014E	2015E	2016E	2017E
Worldwide External Storage													
Value	\$ 17,961	\$ 21,287	\$ 23,570	\$ 24,669	\$ 24,548	\$ 6,040	\$ 5,991	\$ 6,018	\$ 6,771	\$ 24,821	\$ 25,314	\$ 25,818	\$ 26,333
Y/Y	-10.6%	18.5%	10.7%	4.7%	-0.5%	1%	1%	5%	-1%	1.1%	2.0%	2.0%	2.0%
Q/Q						-12%	-1%	0%	13%				
DAS	\$ 3,475	\$ 3,023	\$ 2,699	\$ 2,562	\$ 2,301	\$ 539	\$ 496	\$ 501	\$ 516	\$ 2,051	\$ 1,825	\$ 1,666	\$ 1,571
Y/Y	-16%	-13%	-11%	-5%	-10%	-5%	-9%	-15%	-13%	-11%	-11%	-9%	-6%
Q/Q						-9%	-8%	1%	3%				
DAS % of \$ Ttl	19%	14%	11%	10%	9%	9%	8%	8%	8%	8%	7%	6%	6%
SAN	\$ 9,146	\$ 10,357	\$ 11,841	\$ 12,584	\$ 12,592	\$ 3,049	\$ 3,018	\$ 3,048	\$ 3,506	\$ 12,621	\$ 12,815	\$ 13,092	\$ 13,234
Y/Y	-17%	13%	14%	6%	0%	-2%	-2%	8%	-1%	0%	2%	2%	1%
Q/Q						-14%	-1%	1%	15%				
SAN % of \$ Ttl	51%	49%	50%	51%	51%	50%	50%	51%	52%	51%	51%	51%	50%
NAS	\$ 3,534	\$ 5,280	\$ 5,873	\$ 6,120	\$ 6,312	\$ 1,633	\$ 1,633	\$ 1,633	\$ 1,796	\$ 6,696	\$ 6,971	\$ 7,182	\$ 7,425
Y/Y	4%	49%	11%	4%	3%	13%	10%	5%	-2%	6%	4%	3%	3%
Q/Q						-11%	0%	0%	10%				
NAS % of \$ Ttl	20%	25%	25%	25%	26%	27%	27%	27%	27%	27%	28%	28%	28%
iSCSI	\$ 1,806	\$ 2,627	\$ 3,157	\$ 3,403	\$ 3,343	\$ 820	\$ 845	\$ 836	\$ 953	\$ 3,454	\$ 3,703	\$ 3,878	\$ 4,103
Y/Y	21%	45%	20%	8%	-2%	-2%	3%	7%	6%	3%	7%	5%	6%
Q/Q						-9%	3%	-1%	14%				
iSCSI % of \$ Ttl	10%	12%	13%	14%	14%	14%	14%	14%	14%	14%	15%	15%	16%

Source: IDC, Gartner & Barclays Research Estimates

FIGURE 81

Barclays total server spending model(x86, UNIX, mainframe, \$ in millions)

Calendar Year	2012	1Q13	2Q13	3Q13	4Q13	2013	1Q14E	2Q14E	3Q14E	4Q14E	2014E	2015E	2016E
Worldwide	\$ 39,334	\$ 9,113	\$ 9,764	\$ 10,226	\$ 11,497	\$ 40,599	\$ 9,845	\$ 9,722	\$ 9,982	\$ 10,951	\$ 40,500	\$ 39,859	\$ 38,743
Y/Y	3%	-1%	3%	3%	7%	3%	8%	0%	-2%	-5%	0%	-2%	-3%
Q/Q		-15%	7%	5%	12%		-14%	-1%	3%	10%			
North America	\$ 16,522	\$ 3,676	\$ 4,311	\$ 4,429	\$ 5,090	\$ 17,506	\$ 4,153	\$ 4,174	\$ 4,299	\$ 4,785	\$ 17,411	\$ 17,286	\$ 17,084
Y/Y	3%	0%	6%	5%	13%	6%	13%	-3%	-3%	-6%	-1%	-1%	-1%
Q/Q		-19%	17%	3%	15%		-18%	0%	3%	11%			
% of Total	42%	40%	44%	43%	44%	43%	42%	43%	43%	44%	43%	43%	44%
Western Europe	\$ 7,364	\$ 1,817	\$ 1,713	\$ 1,782	\$ 2,148	\$ 7,459	\$ 1,918	\$ 1,765	\$ 1,798	\$ 2,037	\$ 7,517	\$ 7,179	\$ 6,896
Y/Y	-6%	0%	-3%	2%	6%	1%	6%	3%	1%	-5%	1%	-5%	-4%
Q/Q		-11%	-6%	4%	21%		-11%	-8%	2%	13%			
% of Total	19%	20%	18%	17%	19%	18%	19%	18%	18%	19%	19%	18%	18%
Japan	\$ 3,660	\$ 918	\$ 684	\$ 936	\$ 832	\$ 3,370	\$ 867	\$ 694	\$ 828	\$ 790	\$ 3,179	\$ 3,077	\$ 2,972
Y/Y	2%	-8%	-16%	-6%	-3%	-8%	-6%	1%	-12%	-5%	-6%	-3%	-3%
Q/Q		7%	-26%	37%	-11%		4%	-20%	19%	-5%			
% of Total	9%	10%	7%	9%	7%	8%	9%	7%	8%	7%	8%	8%	8%
Asia Pacific	\$ 7,523	\$ 1,745	\$ 2,099	\$ 2,068	\$ 2,251	\$ 8,162	\$ 1,943	\$ 2,116	\$ 2,027	\$ 2,171	\$ 8,258	\$ 8,150	\$ 7,762
Y/Y	13%	6%	14%	5%	9%	8%	11%	1%	-2%	-4%	1%	-1%	-5%
Q/Q		-15%	20%	-1%	9%		-14%	9%	-4%	7%			
% of Total	19%	19%	21%	20%	20%	20%	20%	22%	20%	20%	20%	20%	20%
Rest of World	\$ 4,265	\$ 957	\$ 958	\$ 1,011	\$ 1,177	\$ 4,102	\$ 964	\$ 973	\$ 1,030	\$ 1,168	\$ 4,135	\$ 4,166	\$ 4,028
Y/Y	2%	-6%	-4%	0%	-5%	-4%	1%	2%	2%	-1%	1%	1%	-3%
Q/Q		-23%	0%	6%	16%		-18%	1%	6%	13%			
% of Total	11%	10%	10%	10%	10%	10%	10%	10%	10%	11%	10%	10%	10%

Source: IDC, Gartner & Barclays Research Estimates

ANALYST(S) CERTIFICATION(S):

We, Raimo Lenschow, CFA, Ben A. Reitzes, Blayne Curtis, Christopher D. Merwin, CFA, Darrin D. Peller, Joseph Wolf, Amir Rozwadowski, Gerardus Vos, James Goodman, Andrew M. Gardiner, CFA, Youssef Essaegh, David Kaplan, Kirk Yang, SC Bae, Andrew Lu, Dale Gai, Sunwoo Kim, Jamie Yeh, Alicia Yap, CFA, Bhuvnesh Singh, Masahiro Nakanomyo, Kent Chan and Anand Ramachandran, CFA, hereby certify (1) that the views expressed in this research report accurately reflect our personal views about any or all of the subject securities or issuers referred to in this research report and (2) no part of our compensation was, is or will be directly or indirectly related to the specific recommendations or views expressed in this research report.

IMPORTANT DISCLOSURES

When an equity research report covers six or more subject companies, Barclays generally does not include specific conflict of interest disclosures regarding the subject companies and instead provides the reader with instructions about how to view or obtain the applicable conflict of interest disclosures. In order to comply with the requirements of the Korea Financial Investment Association, specific disclosures about subject companies with securities listed on the Korea Exchange are included herein. To access important disclosures, including, where relevant, price targets, regarding other companies that are the subject of this research report, please send a written request to: Barclays Research Compliance, 745 Seventh Avenue, 14th Floor, New York, NY 10019 or refer to <http://publicresearch.barclays.com> or call 1-212-526-1072.

The analysts responsible for preparing this research report have received compensation based upon various factors including the firm's total revenues, a portion of which is generated by investment banking activities.

Research analysts employed outside the US by affiliates of Barclays Capital Inc. are not registered/qualified as research analysts with FINRA. These analysts may not be associated persons of the member firm and therefore may not be subject to NASD Rule 2711 and incorporated NYSE Rule 472 restrictions on communications with a subject company, public appearances and trading securities held by a research analyst's account.

Analysts regularly conduct site visits to view the material operations of covered companies, but Barclays policy prohibits them from accepting payment or reimbursement by any covered company of their travel expenses for such visits.

In order to access Barclays Statement regarding Research Dissemination Policies and Procedures, please refer to <https://live.barcap.com/publiccp/RSR/nyfipubs/disclaimer/disclaimer-research-dissemination.html>. In order to access Barclays Research Conflict Management Policy Statement, please refer to: <http://group.barclays.com/corporates-and-institutions/research/research-policy>.

The Corporate and Investment Banking division of Barclays produces a variety of research products including, but not limited to, fundamental analysis, equity-linked analysis, quantitative analysis, and trade ideas. Recommendations contained in one type of research product may differ from recommendations contained in other types of research products, whether as a result of differing time horizons, methodologies, or otherwise.

Materially Mentioned Stocks (Ticker, Date, Price)

AAC Technologies Holdings (2018.HK, 14-May-2014, HKD 43.00), Equal Weight/Positive, J

Acer Inc. (2353.TW, 14-May-2014, TWD 19.15), Underweight/Neutral, J

Activision Blizzard, Inc. (ATVI, 14-May-2014, USD 20.28), Overweight/Positive, C/J/K/M/N

Alcatel-Lucent (ALUA.PA, 14-May-2014, EUR 3.02), Overweight/Neutral, C/D/F/J/K/L/M/N/O

Amdocs Ltd. (DOX, 14-May-2014, USD 47.09), Overweight/Positive, J/K/N

American Tower Corp. (AMT, 14-May-2014, USD 88.76), Overweight/Neutral, A/C/D/J/K/L/M

Apple, Inc. (AAPL, 14-May-2014, USD 593.87), Equal Weight/Neutral, A/C/D/J/K/L/M/N

ARM Holdings PLC (ARM.L, 14-May-2014, GBP 8.91), Overweight/Neutral, C/D/J/K/L/N

ASML Holding NV (ASML.AS, 14-May-2014, EUR 59.35), Overweight/Neutral, C/J

Asustek Computer Inc. (2357.TW, 14-May-2014, TWD 303.00), Overweight/Neutral, J

AT&T (T, 14-May-2014, USD 36.39), Equal Weight/Neutral, A/C/D/J/K/L/M/N/O

AtoS (ATOS.PA, 14-May-2014, EUR 60.70), Rating Suspended/Neutral, D/E/F/J/K/L/M/N

Other Material Conflicts: The Corporate and Investment Banking division of Barclays is providing investment banking services to Atos SA in relation to its announced spin off of the Worldline Unit. The rating, price target and estimates (as applicable) for Atos previously issued by the Firm's Research Department have been temporarily suspended due to Barclays' role in this potential transaction.

Avago Technologies Ltd. (AVGO, 14-May-2014, USD 68.51), Overweight/Neutral, C/D/E/J/K/L/M

Baidu, Inc. (BIDU, 14-May-2014, USD 156.02), Overweight/Positive, C/F/J

Canon Inc. (7751.T, 14-May-2014, JPY 3320), Overweight/Neutral, C/J/O

Capgemini (CAPP.PA, 14-May-2014, EUR 51.32), Overweight/Neutral, D/J/K/L/M/N

Catcher Technology Co., Ltd. (2474.TW, 14-May-2014, TWD 262.00), Overweight/Positive, J

CEVA, Inc. (CEVA, 14-May-2014, USD 13.90), Overweight/Positive, J/K/M/N

Cielo (CIEL3.SA, 14-May-2014, BRL 38.77), Overweight/Neutral, J

Cisco Systems, Inc. (CSCO, 14-May-2014, USD 22.81), Equal Weight/Neutral, A/C/D/J/K/L/M/N

IMPORTANT DISCLOSURES CONTINUED

Cognizant Technology Solutions (CTSH, 14-May-2014, USD 48.59), Overweight/Neutral, C/J/K/M

CoreLogic, Inc. (CLGX, 14-May-2014, USD 27.54), Overweight/Neutral, C/J/K/M

Corning Inc. (GLW, 14-May-2014, USD 21.19), Overweight/Neutral, C/D/J/K/L/M/N/O

Crown Castle International Corp. (CCI, 14-May-2014, USD 77.28), Equal Weight/Neutral, A/C/D/J/K/L/M

CSR plc (CSR.L, 14-May-2014, GBP 5.86), Underweight/Neutral, J/K/M/N

Delta Electronics Inc. (2308.TW, 14-May-2014, TWD 185.50), Overweight/Neutral, J

Dialog Semiconductor (DLGS.DE, 14-May-2014, EUR 20.57), Overweight/Neutral, D/J/K/L/M

Other Material Conflicts: The Corporate and Investment Banking Division of Barclays Bank Plc is providing equity advisory services to Dialog Semiconductor PLC

EMC Corp. (EMC, 14-May-2014, USD 25.80), Equal Weight/Neutral, A/C/D/J/K/L/M/N/O

Fidelity National Information Services (FIS, 14-May-2014, USD 54.29), Overweight/Neutral, A/C/D/J/K/L/M/N/O

Finisar Corp. (FNSR, 14-May-2014, USD 22.54), Overweight/Neutral, C/J

Fiserv Inc. (FISV, 14-May-2014, USD 60.49), Overweight/Neutral, C/J

Gemalto (GTO.AS, 14-May-2014, EUR 78.00), Overweight/Neutral, C/J/K/N

HCL Technologies (HCLT.NS, 14-May-2014, INR 1411.40), Overweight/Neutral, D/J/K/L/M

Hewlett-Packard (HPQ, 14-May-2014, USD 32.97), Overweight/Neutral, A/C/D/J/K/L/M/N/O

HomeAway, Inc. (AWAY, 14-May-2014, USD 31.52), Overweight/Positive, C/J

Hon Hai Precision Industry Co., Ltd. (2317.TW, 14-May-2014, TWD 88.20), Overweight/Neutral, D/J/K/L/M

HTC Corp. (2498.TW, 14-May-2014, TWD 163.00), Underweight/Positive, D/J/K/L/M

IBM Corp. (IBM, 14-May-2014, USD 188.72), Equal Weight/Neutral, A/C/D/J/K/L/M/N

Infineon Technologies AG (IFXGn.DE, 14-May-2014, EUR 8.75), Overweight/Neutral, C/D/J/L

Infosys Ltd. (INFY.NS, 14-May-2014, INR 3254.10), Overweight/Neutral, D/J/K/L/M

Ingenico (INGC.PA, 14-May-2014, EUR 64.21), Overweight/Neutral, J/K/M/N

Juniper Networks (JNPR, 14-May-2014, USD 24.61), Overweight/Neutral, A/D/E/J/K/L/M

Largan Precision Co., Ltd. (3008.TW, 14-May-2014, TWD 1900.00), Overweight/Positive, J

Lenovo Group Ltd. (0992.HK, 14-May-2014, HKD 8.69), Overweight/Neutral, A/D/J/K/L/M

LG Display (034220.KS, 14-May-2014, KRW 28100), Overweight/Positive, J/K/M/N

LG Electronics (066570.KS, 14-May-2014, KRW 68900), Equal Weight/Positive, E/J/K/L/M/N

LG Innotek (011070.KS, 14-May-2014, KRW 117500), Overweight/Neutral, J/K/M/N

LogMeIn, Inc. (LOGM, 14-May-2014, USD 42.23), Equal Weight/Positive, C/D/J/K/L/M

Lumens Co., Ltd. (038060.KQ, 14-May-2014, KRW 13850), Overweight/Neutral, J

Mail.ru (MAILRq.L, 14-May-2014, USD 30.29), Overweight/Positive, D/J/L

MediaTek Inc. (2454.TW, 14-May-2014, TWD 504.00), Overweight/Positive, J

Microsoft Corp. (MSFT, 14-May-2014, USD 40.24), Overweight/Positive, A/C/D/J/K/L/M/N

NetApp, Inc. (NTAP, 14-May-2014, USD 34.57), Equal Weight/Neutral, C/J

NetSuite Inc. (N, 14-May-2014, USD 73.53), Overweight/Positive, A/C/D/J/L/O

NIKON Corp. (7731.T, 14-May-2014, JPY 1567), Overweight/Neutral, J

Novatek Microelectronics Corp. (3034.TW, 14-May-2014, TWD 144.50), Overweight/Positive, J

NXP Semiconductors NV (NXPI, 14-May-2014, USD 59.54), Overweight/Neutral, A/C/D/J/K/L/M

OMRON Corp. (6645.T, 14-May-2014, JPY 3685), Overweight/Neutral, J

Optimal Payments (OPAY.L, 14-May-2014, GBP 3.57), Overweight/Neutral, F/J/K/M

Oracle Corp. (ORCL, 14-May-2014, USD 41.88), Overweight/Positive, C/D/J/K/L/M/N/O

Orbotech (ORBK, 14-May-2014, USD 14.33), Overweight/Positive, D/E/J/K/L/M

Palo Alto Networks (PANW, 14-May-2014, USD 60.13), Overweight/Positive, C/J/O

PTC Inc. (PTC, 14-May-2014, USD 35.10), Overweight/Positive, J/K/N

Qihoo 360 Technology Co., Ltd. (QIHU, 14-May-2014, USD 82.24), Overweight/Positive, C/J

QUALCOMM, Inc. (QCOM, 14-May-2014, USD 80.41), Overweight/Neutral, C/D/J/K/L/M/N

IMPORTANT DISCLOSURES CONTINUED

Quanta Computer Inc. (2382.TW, 14-May-2014, TWD 80.50), Underweight/Neutral, J

Radiant Opto-Electronics Corp. (6176.TW, 14-May-2014, TWD 117.00), Overweight/Positive, J

Red Hat Inc. (RHT, 14-May-2014, USD 49.39), Overweight/Positive, C/J/O

Salesforce.com Inc. (CRM, 14-May-2014, USD 51.88), Overweight/Positive, C/J/K/M

Samsung Electronics (005930.KS, 14-May-2014, KRW 1415000), Overweight/Positive, D/J/K/L/M/N

SAP AG (SAPG.DE, 14-May-2014, EUR 56.27), Overweight/Neutral, C/D/F/J/K/L/M/N/O

SBA Communications Corp. (SBAC, 14-May-2014, USD 100.84), Overweight/Neutral, A/C/D/J/K/L/M

Other Material Conflicts: The Corporate and Investment Banking division of Barclays is providing investment banking services to Oi SA (“OIBR”) in relation to the definitive agreement with SBA Communications (“SBAC”) in which SBAC will have exclusive use rights for 2,113 towers in Brazil. The rating, price target and estimates (as applicable) on Oi SA do not incorporate this potential transaction.

The Corporate and Investment Banking division of Barclays is providing investment banking services to Oi S.A. (OIBR) in relation to their proposed sale of 2,007 wireless tower assets to SBA Torres Brasil, Limitada, a subsidiary of SBA Communications Corp. (SBAC). The rating, price targets and estimates (as applicable) issued by the Firm’s Research Department on Oi S.A. and SBA Communications Corp. do not reflect this potential transaction.

ServiceNow, Inc. (NOW, 14-May-2014, USD 47.57), Overweight/Positive, J

Silicon Laboratories, Inc. (SLAB, 14-May-2014, USD 43.69), Overweight/Neutral, C/J

SK Hynix (000660.KS, 14-May-2014, KRW 42100), Overweight/Positive, J/K/M

Splunk Inc. (SPLK, 14-May-2014, USD 43.70), Equal Weight/Positive, C/J

Sunny Optical Technology (2382.HK, 14-May-2014, HKD 8.77), Overweight/Positive, J

T-Mobile US Inc. (TMUS, 14-May-2014, USD 32.84), Overweight/Neutral, C/D/F/J/K/L/M

Temenos (TEMN.S, 14-May-2014, CHF 30.70), Overweight/Neutral, A/D/J/K/L/N

Tencent Holdings Ltd. (0700.HK, 14-May-2014, HKD 514.00), Overweight/Positive, A/C/D/E/J/L

TOPCON CORP. (7732.T, 14-May-2014, JPY 1910), Overweight/Neutral, J

Total System Services Inc. (TSS, 14-May-2014, USD 31.67), Overweight/Neutral, C/J/K/N

TSMC (2330.TW, 14-May-2014, TWD 122.00), Overweight/Positive, D/J/K/L/M

Verizon (VZ, 14-May-2014, USD 48.01), Overweight/Neutral, A/C/D/F/J/K/L/M

Visa Inc. (V, 14-May-2014, USD 209.86), Overweight/Neutral, J/K/M/N

Wirecard (WDIG.DE, 14-May-2014, EUR 30.86), Equal Weight/Neutral, D/J/K/L/M/N

Yandex (YNDX, 14-May-2014, USD 29.95), Overweight/Positive, J

Yelp, Inc. (YELP, 14-May-2014, USD 54.61), Overweight/Positive, J

Zhen Ding Technology (4958.TW, 14-May-2014, TWD 86.80), Overweight/Positive, J

Zillow, Inc. (Z, 14-May-2014, USD 98.70), Overweight/Positive, C/J

Other Material Conflicts

The Corporate and Investment Banking division of Barclays is providing investment banking services to Comcast Corp. (CMCSA, CMCSK) in relation to their definitive agreement to merge with Time Warner Cable (TWC). The ratings, price targets and estimates on Comcast Corp. (CMCSA, CMCSK) and Time Warner Cable (TWC) previously-issued by the Firm’s Research department have been temporarily suspended due to Barclays’ role in the potential transaction.

The Corporate and Investment Banking division of Barclays Bank PLC is providing investment banking services to Altice SA and Numericable in relation to their potential acquisition of SFR from Vivendi SA. The ratings, price targets and estimates, for Numericable, as previously issued by the Firm’s Research department have been temporarily suspended due to Barclays’ role in this potential transaction. The ratings, price targets and estimates for Vivendi SA do not include this potential transaction.

Disclosure Legend:

A: Barclays Bank PLC and/or an affiliate has been lead manager or co-lead manager of a publicly disclosed offer of securities of the issuer in the previous 12 months.

B: An employee of Barclays Bank PLC and/or an affiliate is a director of this issuer.

IMPORTANT DISCLOSURES CONTINUED

- C: Barclays Bank PLC and/or an affiliate is a market-maker and/or liquidity provider in equity securities issued by this issuer or one of its affiliates.
- D: Barclays Bank PLC and/or an affiliate has received compensation for investment banking services from this issuer in the past 12 months.
- E: Barclays Bank PLC and/or an affiliate expects to receive or intends to seek compensation for investment banking services from this issuer within the next 3 months.
- F: Barclays Bank PLC and/or an affiliate beneficially owned 1% or more of a class of equity securities of the issuer as of the end of the month prior to the research report's issuance.
- G: One of the analysts on the coverage team (or a member of his or her household) owns shares of the common stock of this issuer.
- H: This issuer beneficially owns 5% or more of any class of common equity securities of Barclays Bank PLC.
- I: Barclays Bank PLC and/or an affiliate has a significant financial interest in the securities of this issuer.
- J: Barclays Bank PLC and/or an affiliate trades regularly in the securities of this issuer.
- K: Barclays Bank PLC and/or an affiliate has received non-investment banking related compensation from this issuer within the past 12 months.
- L: This issuer is, or during the past 12 months has been, an investment banking client of Barclays Bank PLC and/or an affiliate.
- M: This issuer is, or during the past 12 months has been, a non-investment banking client (securities related services) of Barclays Bank PLC and/or an affiliate.
- N: This issuer is, or during the past 12 months has been, a non-investment banking client (non-securities related services) of Barclays Bank PLC and/or an affiliate.
- O: Barclays Capital Inc., through Barclays Market Makers, is a Designated Market Maker in this issuer's stock, which is listed on the New York Stock Exchange. At any given time, its associated Designated Market Maker may have "long" or "short" inventory position in the stock; and its associated Designated Market Maker may be on the opposite side of orders executed on the floor of the New York Stock Exchange in the stock.
- P: A partner, director or officer of Barclays Capital Canada Inc. has, during the preceding 12 months, provided services to the subject company for remuneration, other than normal course investment advisory or trade execution services.
- Q: The Corporate and Investment Banking division of Barclays Bank PLC, is a Corporate Broker to this issuer.
- R: Barclays Capital Canada Inc. and/or an affiliate has received compensation for investment banking services from this issuer in the past 12 months.
- S: Barclays Capital Canada Inc. is a market-maker in an equity or equity related security issued by this issuer.

All statements in this report attributable to Gartner represent the authoring research analysts' interpretation of data, research opinion or viewpoints published as part of a syndicated subscription service by Gartner, Inc., and have not been reviewed by Gartner.

Each Gartner publication speaks as of its original publication date (and not as of the date of this presentation). The opinions expressed in Gartner publications are not representations of fact, and are subject to change without notice.

Guide to the Barclays Fundamental Equity Research Rating System:

Our coverage analysts use a relative rating system in which they rate stocks as Overweight, Equal Weight or Underweight (see definitions below) relative to other companies covered by the analyst or a team of analysts that are deemed to be in the same industry (the "industry coverage universe").

In addition to the stock rating, we provide industry views which rate the outlook for the industry coverage universe as Positive, Neutral or Negative (see definitions below). A rating system using terms such as buy, hold and sell is not the equivalent of our rating system. Investors should carefully read the entire research report including the definitions of all ratings and not infer its contents from ratings alone.

Stock Rating

Overweight - The stock is expected to outperform the unweighted expected total return of the industry coverage universe over a 12-month investment horizon.

Equal Weight - The stock is expected to perform in line with the unweighted expected total return of the industry coverage universe over a 12-month investment horizon.

Underweight - The stock is expected to underperform the unweighted expected total return of the industry coverage universe over a 12-month investment horizon.

Rating Suspended - The rating and target price have been suspended temporarily due to market events that made coverage impracticable or to comply with applicable regulations and/or firm policies in certain circumstances including where the Corporate and Investment Banking Division of Barclays is acting in an advisory capacity in a merger or strategic transaction involving the company.

Industry View

Positive - industry coverage universe fundamentals/valuations are improving.

Neutral - industry coverage universe fundamentals/valuations are steady, neither improving nor deteriorating.

Negative - industry coverage universe fundamentals/valuations are deteriorating.

IMPORTANT DISCLOSURES CONTINUED

Below is the list of companies that constitute the “industry coverage universe”:

Asia ex-Japan Internet & Media

Baidu, Inc. (BIDU)	Changyou.com Ltd. (CYOU)	China Mobile Games & Entertainment Group (CMGE)
CJ CGV (079160.KS)	CJ Hellovision (037560.KS)	Ctrip.com International Ltd. (CTRP)
Daum Communications (035720.KQ)	E-Commerce China Dangdang Inc. (DANG)	Info Edge (India) Ltd. (INED.NS)
Interpark INT (108790.KQ)	Just Dial Ltd. (JUST.NS)	KT Skylife (053210.KS)
MakeMyTrip (MMYT)	Naver Corp. (035420.KS)	NetEase, Inc. (NTES)
Perfect World Co., Ltd. (PWRD)	Qihoo 360 Technology Co., Ltd. (QIHU)	Qunar (QUNR)
Renren Inc. (RENN)	Sina Corp. (SINA)	Sohu.com Inc. (SOHU)
Television Broadcasts Ltd. (0511.HK)	Tencent Holdings Ltd. (0700.HK)	Youku Tudou Inc. (YOKU)

Asia ex-Japan IT Hardware

Acer Inc. (2353.TW)	Asustek Computer Inc. (2357.TW)	Compal Electronics Inc. (2324.TW)
Delta Electronics Inc. (2308.TW)	Epistar Corporation (2448.TW)	Hon Hai Precision Industry Co., Ltd. (2317.TW)
Lenovo Group Ltd. (0992.HK)	LG Innotek (011070.KS)	Lumens Co., Ltd. (038060.KQ)
Pegatron Corp. (4938.TW)	Quanta Computer Inc. (2382.TW)	Samsung Electro-Mechanics (009150.KS)
Samsung SDI (006400.KS)	Skyworth Digital Holdings Ltd. (0751.HK)	Wistron Corporation (3231.TW)

Asia ex-Japan LCD Displays

Advanced Process Systems (054620.KQ)	AU Optronics Corp. (2409.TW)	Cheil Industries (001300.KS)
G-TECH Optoelectronics Corp. (3149.TW)	Iljin Display (020760.KS)	Innolux Corp. (3481.TW)
LG Display (034220.KS)	Radiant Opto-Electronics Corp. (6176.TW)	Seoul Semiconductor (046890.KQ)
SFA Engineering (056190.KQ)	TPK Holding Co., Ltd. (3673.TW)	Wintek Corporation (2384.TW)

Asia ex-Japan Semiconductors

Advanced Semiconductor Engineering (2311.TW)	Chipbond Technology (6147.TWO)	Chroma ATE Inc. (2360.TW)
Elan Microelectronics (2458.TW)	Gigaset (3691.TWO)	Hermes Microvision Inc. (3658.TWO)
Inotera Memories, Inc. (3474.TW)	Jinko Solar (JKS)	Kinsus Interconnect Technology (3189.TW)
MediaTek Inc. (2454.TW)	Nan Ya Printed Circuit Board (8046.TW)	Neo Solar (3576.TW)
Novatek Microelectronics Corp. (3034.TW)	Phison Electronics (8299.TWO)	Powertech Technology (6239.TW)
Richtek Technology (6286.TW)	Samsung Electronics (005930.KS)	Siliconware Precision Industries (2325.TW)
SK Hynix (000660.KS)	TSMC (2330.TW)	United Microelectronics Corp. (2303.TW)
Vanguard International Semiconductor (5347.TWO)	Visual Photonics Epitaxy Co., Ltd. (2455.TW)	Win Semiconductors Corp. (3105.TWO)

Asia Ex-Japan Software & IT Services

HCL Technologies (HCLT.NS)	Infosys Ltd. (INFY.NS)	MindTree (MINT.NS)
Mphasis (MBFL.NS)	Tata Consultancy Services (TCS.NS)	Tech Mahindra (TEML.NS)
Wipro Limited (WIPR.NS)		

Asia ex-Japan Wireless Equipment & Products

AAC Technologies Holdings (2018.HK)	BYD Electronics (0285.HK)	Casetek Holdings Limited (5264.TW)
Catcher Technology Co., Ltd. (2474.TW)	FIH Mobile Ltd. (2038.HK)	Flexium Interconnect (6269.TW)
HTC Corp. (2498.TW)	Largan Precision Co., Ltd. (3008.TW)	LG Electronics (066570.KS)
Lite-On Technology Corp. (2301.TW)	Sunny Optical Technology (2382.HK)	Tripod Technology Corp. (3044.TW)
Unimicron Technology Corp. (3037.TW)	Zhen Ding Technology (4958.TW)	ZTE Corporation (0763.HK)

European Software & IT Services

Amadeus (AMA.MC)	AtoS (ATOS.PA)	Aveva (AVV.L)
Capgemini (CAPP.PA)	Cielo (CIEL3.SA)	Computacenter Plc. (CCC.L)
Dassault Systèmes (DAST.PA)	Fidessa (FDSA.L)	Hexagon AB (HEXAb.ST)

IMPORTANT DISCLOSURES CONTINUED

Indra (IDR.MC)	Micro Focus (MCRO.L)	Monitise (MONI.L)
Optimal Payments (OPAY.L)	PayPoint (PAYP.L)	Sage Group Plc (SGE.L)
SAP AG (SAPG.DE)	Software AG (SOWG.DE)	Temenos (TEMN.S)
Wirecard (WDIG.DE)		
European Technology Hardware		
Aixtron SE (AIXGn.DE)	Alcatel-Lucent (ALUA.PA)	Anite (AIE.L)
ARM Holdings PLC (ARM.L)	ASML Holding NV (ASML.AS)	CSR plc (CSR.L)
Dialog Semiconductor (DLGS.DE)	Ericsson (ERICb.ST)	Gemalto (GTO.AS)
Imagination Technologies (IMG.L)	Infineon Technologies AG (IFXGn.DE)	Ingenico (INGC.PA)
Logitech International SA (LOGN.S)	Nokia (NOK1V.HE)	Pace plc (PIC.L)
Spirent (SPT.L)	STMicroelectronics NV (STM.PA)	TomTom NV (TOM2.AS)
Israel Technology		
Allot Communications, Ltd. (ALLT)	Amdocs Ltd. (DOX)	CEVA, Inc. (CEVA)
EZchip Semiconductor (EZCH)	Nice Systems (NICE)	Orbotech (ORBK)
Radware Ltd. (RDWR)		
Japan Internet		
CyberAgent Inc. (4751.T)	DeNA Co., Ltd. (2432.T)	GMO Internet Inc. (9449.T)
Gree Inc. (3632.T)	Gurunavi Inc. (2440.T)	Kakaku.com Inc. (2371.T)
Mixi Inc. (2121.T)	NEXON (3659.T)	Rakuten Inc. (4755.T)
Yahoo! JAPAN (4689.T)		
Japan Precision Instruments		
Canon Inc. (7751.T)	Canon Marketing Japan Inc. (8060.T)	Citizen Holdings Co., Ltd. (7762.T)
Dainippon Screen Mfg. Co. Ltd. (7735.T)	FUJIFILM Holdings Corp. (4901.T)	GS Yuasa Corporation (6674.T)
Hitachi High-Technologies Corp. (8036.T)	HORIBA Ltd. (6856.T)	Hoya Corp. (7741.T)
JEOL Ltd. (6951.T)	Konica Minolta Inc. (4902.T)	NIKON Corp. (7731.T)
Olympus Corp. (7733.T)	OMRON Corp. (6645.T)	Ricoh Co., Ltd. (7752.T)
Seiko Epson Corp. (6724.T)	Shibaura Mechatronics Corp. (6590.T)	Shimadzu Corp. (7701.T)
Tamron Co., Ltd. (7740.T)	Tokyo Electron Ltd. (8035.T)	TOPCON CORP. (7732.T)
ULVAC Inc. (6728.T)		
Russian Internet & Media		
CTC Media (CTCM)	Mail.ru (MAILRq.L)	Yandex (YNDX)
U.S. Communications Infrastructure		
Arris Group (ARRS)	Corning Inc. (GLW)	Emulex Corp (ELX)
Finisar Corp. (FNSR)	JDS Uniphase Corp. (JDSU)	Mellanox Technologies (MLNX)
QLogic Corp. (QLGC)		
U.S. Data Networking		
Aruba Networks Inc. (ARUN)	Cisco Systems, Inc. (CSCO)	F5 Networks, Inc. (FFIV)
Gigamon Inc. (GIMO)	Juniper Networks (JNPR)	
U.S. Internet		
Activision Blizzard, Inc. (ATVI)	HomeAway, Inc. (AWAY)	IAC/InterActiveCorp (IACI)
King Digital Entertainment Plc. (KING)	OpenTable, Inc. (OPEN)	Shutterfly, Inc. (SFLY)
Trulia Inc. (TRLA)	Vistaprint N.V. (VPRT)	Yelp, Inc. (YELP)
Zillow, Inc. (Z)	Zynga Inc. (ZNGA)	
U.S. IT Consulting & Computer Services		
Acacia Research Corp. (ACTG)	Accenture Plc (ACN)	Alliance Data Systems Corp. (ADS)
Cognizant Technology Solutions (CTSH)	Computer Sciences Corp. (CSC)	CoreLogic, Inc. (CLGX)
EPAM Systems Inc (EPAM)	Fidelity National Information Services (FIS)	Fiserv Inc. (FISV)

IMPORTANT DISCLOSURES CONTINUED

FleetCor Technologies, Inc. (FLT)

MasterCard Inc. (MA)

Vantiv, Inc. (VNTV)

Western Union Co. (WU)

U.S. IT Hardware

Apple, Inc. (AAPL)

EMC Corp. (EMC)

IBM Corp. (IBM)

NetApp, Inc. (NTAP)

Violin Memory (VMEM)

U.S. Semiconductors

Altera Corp. (ALTR)

Avago Technologies Ltd. (AVGO)

Cirrus Logic Inc. (CRUS)

Freescale Semiconductor Holdings (FSL)

M/A-COM Technology Solutions Holdings, Inc. (MTSI)

Maxim Integrated Products (MXIM)

NXP Semiconductors NV (NXPI)

Silicon Laboratories, Inc. (SLAB)

Texas Instruments, Inc. (TXN)

U.S. Software

Autodesk Inc. (ADSK)

Citrix Systems (CTXS)

Demandware (DWRE)

Five9, Inc. (FIVN)

Imperva Inc. (IMPV)

LogMeIn, Inc. (LOGM)

NetSuite Inc. (N)

Paycom (PAYC)

Red Hat Inc. (RHT)

Sapiens International Corp (SPNS)

Symantec Corp. (SYMC)

TIBCO Software (TIBX)

Workday Inc. (WDAY)

U.S. Telecom Services

8x8 Inc. (EGHT)

AT&T (T)

NII Holdings (NIHD)

T-Mobile US Inc. (TMUS)

Global Payments Inc. (GPN)

RPX Corporation (RPXC)

VeriFone Systems Inc. (PAY)

Xoom Corp. (XOOM)

CDW Corp. (CDW)

Fusion-io Inc. (FIO)

Ingram Micro Inc. (IM)

Seagate Technology (STX)

Western Digital Corp. (WDC)

Analog Devices (ADI)

Broadcom Corp. (BRCM)

Cypress Semiconductor Corp. (CY)

Integrated Device Technology, Inc. (IDTI)

MagnaChip Semiconductor (MX)

Montage Technology Group Ltd. (MONT)

QUALCOMM, Inc. (QCOM)

Skyworks Solutions, Inc. (SWKS)

Triquint Semiconductor (TQNT)

CA Technologies (CA)

Cornerstone OnDemand Inc. (CSOD)

Ellie Mae Inc. (ELLI)

Fleetmatics Group, PLC (FLT)

Informatica Corp. (INFA)

Magic Software Enterprises Ltd. (MGIC)

Oracle Corp. (ORCL)

PTC Inc. (PTC)

Salesforce.com Inc. (CRM)

ServiceNow, Inc. (NOW)

Tangoe Inc (TNGO)

Varonis Systems, Inc. (VRNS)

America Movil (AMX)

CommScope Holding Co., Inc. (COMM)

SBA Communications Corp. (SBAC)

Verizon (VZ)

InterDigital, Inc. (IDCC)

Total System Services Inc. (TSS)

Visa Inc. (V)

Electronics for Imaging (EFII)

Hewlett-Packard (HPQ)

Lexmark International (LXK)

Tech Data Corp. (TECD)

Xerox Co. (XRX)

Atmel Corp. (ATML)

Cavium Inc. (CAVM)

Entropic Communications Inc. (ENTR)

Intel Corp. (INTC)

Marvell Technology Group, Ltd. (MRVL)

NVIDIA Corp. (NVDA)

RF Micro Devices (RFMD)

Spansion Inc. (CODE)

Xilinx, Inc. (XLNX)

Check Point Software Technologies Ltd. (CHKP)

DealerTrack Holdings (TRAK)

FireEye (FEYE)

Fortinet Inc. (FTNT)

Intuit Inc. (INTU)

Microsoft Corp. (MSFT)

Palo Alto Networks (PANW)

Qlik Tech (QLIK)

SAP AG (SAP)

Splunk Inc. (SPLK)

Teradata Corp. (TDC)

VMware Inc. (VMW)

Distribution of Ratings:

Barclays Equity Research has 2630 companies under coverage.

45% have been assigned an Overweight rating which, for purposes of mandatory regulatory disclosures, is classified as a Buy rating; 55% of companies with this rating are investment banking clients of the Firm.

38% have been assigned an Equal Weight rating which, for purposes of mandatory regulatory disclosures, is classified as a Hold rating; 48% of companies with this rating are investment banking clients of the Firm.

15% have been assigned an Underweight rating which, for purposes of mandatory regulatory disclosures, is classified as a Sell rating; 44% of companies with this rating are investment banking clients of the Firm.

IMPORTANT DISCLOSURES CONTINUED

Guide to the Barclays Research Price Target:

Each analyst has a single price target on the stocks that they cover. The price target represents that analyst's expectation of where the stock will trade in the next 12 months. Upside/downside scenarios, where provided, represent potential upside/potential downside to each analyst's price target over the same 12-month period.

Barclays offices involved in the production of equity research:

London

Barclays Bank PLC (Barclays, London)

New York

Barclays Capital Inc. (BCI, New York)

Tokyo

Barclays Securities Japan Limited (BSJL, Tokyo)

São Paulo

Banco Barclays S.A. (BBSA, São Paulo)

Hong Kong

Barclays Bank PLC, Hong Kong branch (Barclays Bank, Hong Kong)

Toronto

Barclays Capital Canada Inc. (BCCI, Toronto)

Johannesburg

Absa Bank Limited (Absa, Johannesburg)

Mexico City

Barclays Bank Mexico, S.A. (BBMX, Mexico City)

Taiwan

Barclays Capital Securities Taiwan Limited (BCSTW, Taiwan)

Seoul

Barclays Capital Securities Limited (BCSL, Seoul)

Mumbai

Barclays Securities (India) Private Limited (BSIPL, Mumbai)

Singapore

Barclays Bank PLC, Singapore branch (Barclays Bank, Singapore)

IMPORTANT DISCLOSURES CONTINUED

LG Display (034220 KS / 034220.KS)

KRW 28100 (14-May-2014)

Stock Rating

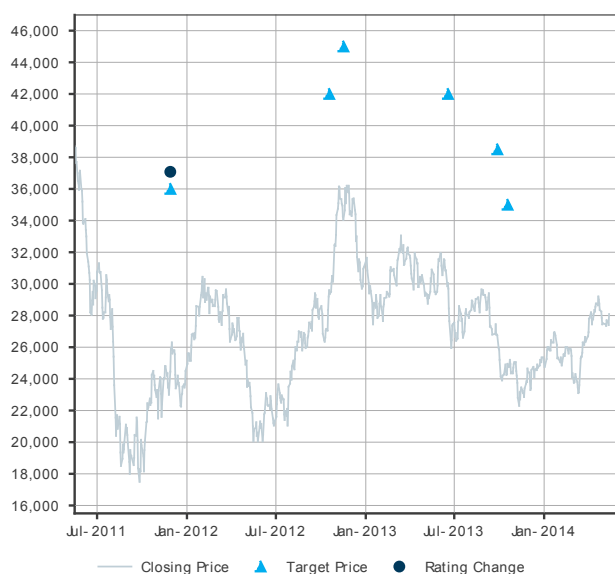
OVERWEIGHT

Industry View

POSITIVE

Rating and Price Target Chart - KRW (as of 14-May-2014)

Currency=KRW



Date	Closing Price	Rating	Adjusted Price Target
18-Oct-2013	24950		35000
27-Sep-2013	26750		38500
18-Jun-2013	30050		42000
16-Nov-2012	34050		45000
18-Oct-2012	29600		42000
28-Nov-2011	24450	Overweight	36000

Source: Thomson Reuters, Barclays Research

Historical stock prices and price targets may have been adjusted for stock splits and dividends.

Source: IDC, Barclays Research

[Link to Barclays Live for interactive charting](#)

J: Barclays Bank PLC and/or an affiliate trades regularly in the securities of LG Display.

K: Barclays Bank PLC and/or an affiliate has received non-investment banking related compensation from LG Display within the past 12 months.

M: LG Display is, or during the past 12 months has been, a non-investment banking client (securities related services) of Barclays Bank PLC and/or an affiliate.

N: LG Display is, or during the past 12 months has been, a non-investment banking client (non-securities related services) of Barclays Bank PLC and/or an affiliate.

Valuation Methodology: Our 12-month price target of W35,000 for LG Display is based on a target P/B multiple of 1.1x, the historical average P/B over the last three-years, applied to our 2014E BVPS. We believe the target multiple reflects our expectations of an upcycle in specialty panels (accounting for c30% of revenue) combined with a recovery cycle in commodity panels (accounting for c70% of revenue).

Risks which May Impede the Achievement of the Barclays Research Price Target: Key downside risks to our LG Display price target include: 1) Steeper than expected KRW appreciation; and 2) mis-execution in specialty panel production.

IMPORTANT DISCLOSURES CONTINUED

LG Electronics (066570 KS / 066570.KS)

KRW 68900 (14-May-2014)

Stock Rating

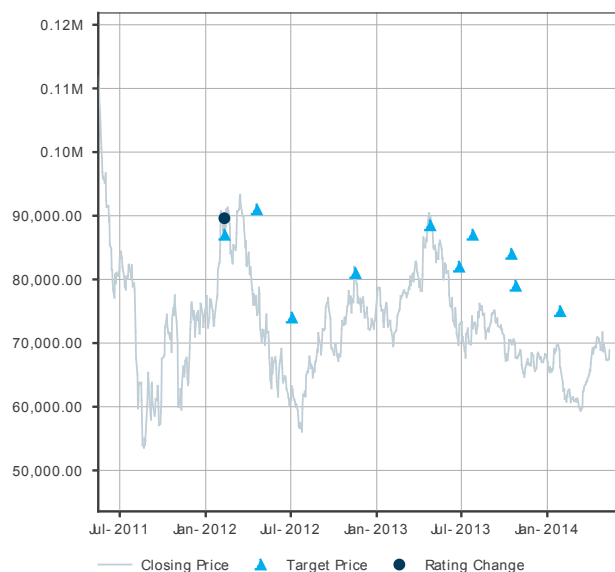
EQUAL WEIGHT

Industry View

POSITIVE

Rating and Price Target Chart - KRW (as of 14-May-2014)

Currency=KRW



Date	Closing Price	Rating	Adjusted Price Target
28-Jan-2014	66200		75000
25-Oct-2013	67700		79000
16-Oct-2013	70100		84000
25-Jul-2013	72400		87000
26-Jun-2013	71300		82000
25-Apr-2013	88500		88500
16-Nov-2012	80500		81000
03-Jul-2012	63200		74000
19-Apr-2012	75500		91000
10-Feb-2012	86900	Equal Weight	87000

Source: Thomson Reuters, Barclays Research

Historical stock prices and price targets may have been adjusted for stock splits and dividends.

Source: IDC, Barclays Research

[Link to Barclays Live for interactive charting](#)

E: Barclays Bank PLC and/or an affiliate expects to receive or intends to seek compensation for investment banking services from LG Electronics within the next 3 months.

J: Barclays Bank PLC and/or an affiliate trades regularly in the securities of LG Electronics.

K: Barclays Bank PLC and/or an affiliate has received non-investment banking related compensation from LG Electronics within the past 12 months.

L: LG Electronics is, or during the past 12 months has been, an investment banking client of Barclays Bank PLC and/or an affiliate.

M: LG Electronics is, or during the past 12 months has been, a non-investment banking client (securities related services) of Barclays Bank PLC and/or an affiliate.

N: LG Electronics is, or during the past 12 months has been, a non-investment banking client (non-securities related services) of Barclays Bank PLC and/or an affiliate.

Valuation Methodology: Our 12-month price target of W75,000 for LG Electronics is based on our target P/B of 1.24x applied to our BVPS estimates for 2014. Our target multiple is the historical 3-year average newly including year 2013. We use a P/B valuation based on historical multiples due to our expectations of better volume growth for the UHD TV and OLED TV business and gradual recovery of smartphone business

Risks which May Impede the Achievement of the Barclays Research Price Target: The key downside risk that could keep our price target from being achieved, in our view, is a delayed recovery of the telecom division, due to weak execution. The key upside risk, in our view, is a stronger-than-expected turnaround of the handset division. In addition, we believe the general risks to the OLED sector include the following: 1) worse-than-expected execution of OLED development, especially for TV applications; 2) a lower-than-expected ASP premium over LCD; and 3) the emergence of an alternative technology, such as crystal LEDs, that could have a competitive edge in initial investment cost and power consumption.

IMPORTANT DISCLOSURES CONTINUED

LG Innotek (011070 KS / 011070.KS)

KRW 117500 (14-May-2014)

Stock Rating

OVERWEIGHT

Industry View

NEUTRAL

Rating and Price Target Chart - KRW (as of 14-May-2014)

Currency=KRW



Source: Thomson Reuters, Barclays Research

Historical stock prices and price targets may have been adjusted for stock splits and dividends.

Source: IDC, Barclays Research

[Link to Barclays Live for interactive charting](#)

J: Barclays Bank PLC and/or an affiliate trades regularly in the securities of LG Innotek.

K: Barclays Bank PLC and/or an affiliate has received non-investment banking related compensation from LG Innotek within the past 12 months.

M: LG Innotek is, or during the past 12 months has been, a non-investment banking client (securities related services) of Barclays Bank PLC and/or an affiliate.

N: LG Innotek is, or during the past 12 months has been, a non-investment banking client (non-securities related services) of Barclays Bank PLC and/or an affiliate.

Valuation Methodology: Our 12-month price target for LG Innotek (LGI) of W145,000 is based on a target P/B multiple of 1.85x applied to our 2015E BVPS, in-line with the company's average valuation multiple during the previous peak cycle in 2009-10. We see this target multiple as justified given increased visibility on LED earnings improvement and also given LGI appears to be entering into a sustainable growth trajectory with 2014E/15E/16E ROE of 8%/11%/16%.

Risks which May Impede the Achievement of the Barclays Research Price Target: Keys downside risks to our W145,000 price target on LG Innotek include: 1) stronger-than-expected ASP pressure from key customers; 2) higher-than-expected raw material costs; 3) worse-than-expected R&D capability for key products, such as package substrates, TSP and camera modules – could weigh on the ability of the company to secure a high enough level of production yield; 4) slower-than-expected penetration of the LED lighting market; and 5) continued appreciation of the Korean won.

IMPORTANT DISCLOSURES CONTINUED

Lumens Co., Ltd. (038060 KQ / 038060.KQ)
KRW 13850 (14-May-2014)

Stock Rating

OVERWEIGHT

Industry View

NEUTRAL

Rating and Price Target Chart - KRW (as of 14-May-2014)

Currency=KRW



Date	Closing Price	Rating	Adjusted Price Target
24-Apr-2014	13650	Overweight	20000

Source: Thomson Reuters, Barclays Research

Historical stock prices and price targets may have been adjusted for stock splits and dividends.

Source: IDC, Barclays Research

[Link to Barclays Live for interactive charting](#)

J: Barclays Bank PLC and/or an affiliate trades regularly in the securities of Lumens Co., Ltd..

Valuation Methodology: We derive our price target for Lumens of W20,000 by applying its historical upcycle multiple of 2.9x to our 2015E BVPS of W6.852. We believe it should show 18-19% ROE – the best among its peers – in the next three years, higher than the 9-13% ROE seen during its previous peak (2009-2011). Historically, Lumens traded at a higher P/B valuation relative to its peers during the 2009-11 period when LED was adopted to TV BLU, as the company is geared to BLU packaging (i.e. 80-90% of TV BLU sales vs 30-40% for peers). However, despite its continued earnings recovery in 2012-2013, the market appeared to disregard the improvement as Lumens was considered an ex-growth company given the saturated LED BLU market. We think that as mid-tier packaging makers participate in the booming LED market from 2014, and the company increases its LED revenue from general lighting applications, the fair value of Lumens should re-rate and that the valuation gap with global peers will narrow.

Risks which May Impede the Achievement of the Barclays Research Price Target: Keys downside risks to our W20,000 price target on Lumens include: 1) potential irrational behaviour by the Chinese government to raise its subsidy program for local LED makers; 2) slowdown in UD penetration for Samsung TV (Lumens supplies roughly 40-50% of LED BLUs for Samsung Electronics TVs); 3) delay in adoption of AC-based LED; 4) any continuation of issues at subsidiaries (the company had W11.3bn of equity method loss in 2013); and 5) failure in securing production yield for new technologies such as flip-chip packaging.

IMPORTANT DISCLOSURES CONTINUED

Samsung Electronics (005930 KS / 005930.KS)
KRW 1415000 (14-May-2014)

Stock Rating

OVERWEIGHT

Industry View

POSITIVE

Rating and Price Target Chart - KRW (as of 14-May-2014)

Currency=KRW



Date	Closing Price	Rating	Adjusted Price Target
06-Jan-2014	1307000		1750000
12-Jul-2013	1312000		1900000
10-Jun-2013	1425000		2100000
05-Apr-2013	1505000		2200000
14-Nov-2012	1355000		2000000
30-Apr-2012	1390000		1800000
15-Mar-2012	1250000		1500000
30-Jan-2012	1115000		1300000
08-Nov-2011	970000	Overweight	1250000

Source: Thomson Reuters, Barclays Research

Historical stock prices and price targets may have been adjusted for stock splits and dividends.

Source: IDC, Barclays Research

[Link to Barclays Live for interactive charting](#)

D: Barclays Bank PLC and/or an affiliate has received compensation for investment banking services from Samsung Electronics in the past 12 months.

J: Barclays Bank PLC and/or an affiliate trades regularly in the securities of Samsung Electronics.

K: Barclays Bank PLC and/or an affiliate has received non-investment banking related compensation from Samsung Electronics within the past 12 months.

L: Samsung Electronics is, or during the past 12 months has been, an investment banking client of Barclays Bank PLC and/or an affiliate.

M: Samsung Electronics is, or during the past 12 months has been, a non-investment banking client (securities related services) of Barclays Bank PLC and/or an affiliate.

N: Samsung Electronics is, or during the past 12 months has been, a non-investment banking client (non-securities related services) of Barclays Bank PLC and/or an affiliate.

Valuation Methodology: Our 12-month price target of W1.75mn for SEC is based on a cyclical context historical P/B valuation. In our valuation, we apply a target P/B multiple of 1.65x to our 2014 BVPS estimate of W1,028,696. Our target multiple is the stock's historical average for the past 5 years.

Risks which May Impede the Achievement of the Barclays Research Price Target: We believe the key risks preventing our 12-month price target of W1.75mn from being achieved include the following: 1) Poor execution in plastic OLEDs – this would likely not only impact the OLED division's earnings dynamics but also earnings of the telecom division. 2) Mis-execution in developing 14nm FinFET would cause margin erosion in the System LSI division after Apple's diversification of its vendors to TSMC. 3) Apple's aggressive pricing strategy at the cost of its own profitability could cause meaningful deterioration of Samsung's smartphone margin. 4) Steeper-than-expected KRW appreciation.

IMPORTANT DISCLOSURES CONTINUED

SK Hynix (000660 KS / 000660.KS)

KRW 42100 (14-May-2014)

Stock Rating

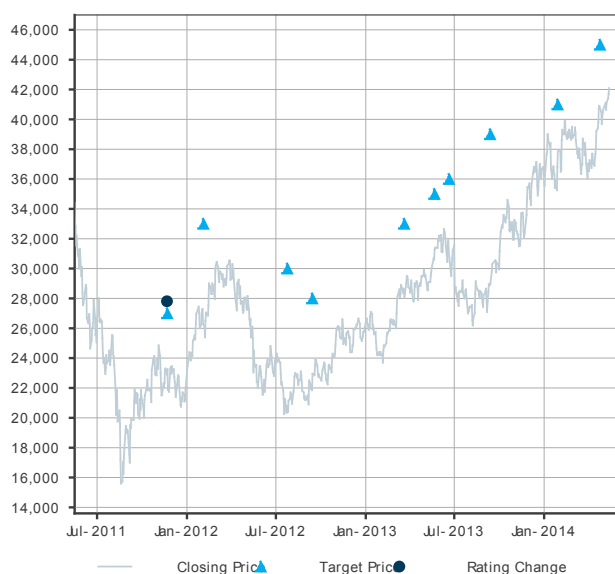
OVERWEIGHT

Industry View

POSITIVE

Rating and Price Target Chart - KRW (as of 14-May-2014)

Currency=KRW



Date	Closing Price	Rating	Adjusted Price Target
25-Apr-2014	40750		45000
28-Jan-2014	36800		41000
12-Sep-2013	28900		39000
20-Jun-2013	31050		36000
21-May-2013	30600	Overweight	35000
20-Mar-2013	28600		33000
13-Sep-2012	21850		28000
24-Jul-2012	20800		30000
03-Feb-2012	26300		33000
21-Nov-2011	22900	Overweight	27000

Source: Thomson Reuters, Barclays Research

Historical stock prices and price targets may have been adjusted for stock splits and dividends.

Source: IDC, Barclays Research

[Link to Barclays Live for interactive charting](#)

J: Barclays Bank PLC and/or an affiliate trades regularly in the securities of SK Hynix.

K: Barclays Bank PLC and/or an affiliate has received non-investment banking related compensation from SK Hynix within the past 12 months.

M: SK Hynix is, or during the past 12 months has been, a non-investment banking client (securities related services) of Barclays Bank PLC and/or an affiliate.

Valuation Methodology: Our 12-month price target of W45,000 for SK Hynix is based on our target P/B multiple of 1.91x, which we apply to the average of our BVPS estimates for 2014 and 2015. Our target multiple corresponds to the historical average for the past six years as we expect the company's ROE profile will track its historical average ROE for the next few years. We believe P/B provides a cyclical context.

Risks which May Impede the Achievement of the Barclays Research Price Target: The key downside risks to our price target, in our view, include: 1) weaker smartphone demand and DRAM content growth than we expect; 2) more aggressive capex at competitor Samsung in an effort to gain market share; and 3) poor execution by SK Hynix in its 25nm DRAM and 16nm NAND migration.

DISCLAIMER:

This publication has been prepared by the Corporate and Investment Banking division of Barclays Bank PLC and/or one or more of its affiliates (collectively and each individually, "Barclays"). It has been issued by one or more Barclays legal entities within its Corporate and Investment Banking division as provided below. It is provided to our clients for information purposes only, and Barclays makes no express or implied warranties, and expressly disclaims all warranties of merchantability or fitness for a particular purpose or use with respect to any data included in this publication. Barclays will not treat unauthorized recipients of this report as its clients. Prices shown are indicative and Barclays is not offering to buy or sell or soliciting offers to buy or sell any financial instrument.

Without limiting any of the foregoing and to the extent permitted by law, in no event shall Barclays, nor any affiliate, nor any of their respective officers, directors, partners, or employees have any liability for (a) any special, punitive, indirect, or consequential damages; or (b) any lost profits, lost revenue, loss of anticipated savings or loss of opportunity or other financial loss, even if notified of the possibility of such damages, arising from any use of this publication or its contents.

Other than disclosures relating to Barclays, the information contained in this publication has been obtained from sources that Barclays Research believes to be reliable, but Barclays does not represent or warrant that it is accurate or complete. Barclays is not responsible for, and makes no warranties whatsoever as to, the content of any third-party web site accessed via a hyperlink in this publication and such information is not incorporated by reference.

The views in this publication are those of the author(s) and are subject to change, and Barclays has no obligation to update its opinions or the information in this publication. The analyst recommendations in this publication reflect solely and exclusively those of the author(s), and such opinions were prepared independently of any other interests, including those of Barclays and/or its affiliates. This publication does not constitute personal investment advice or take into account the individual financial circumstances or objectives of the clients who receive it. The securities discussed herein may not be suitable for all investors. Barclays recommends that investors independently evaluate each issuer, security or instrument discussed herein and consult any independent advisors they believe necessary. The value of and income from any investment may fluctuate from day to day as a result of changes in relevant economic markets (including changes in market liquidity). The information herein is not intended to predict actual results, which may differ substantially from those reflected. Past performance is not necessarily indicative of future results.

This material has been issued and approved for distribution in the UK and European Economic Area ("EEA") by Barclays Bank PLC. It is being made available primarily to persons who are investment professionals as that term is defined in Article 19 of the Financial Services and Markets Act 2000 (Financial Promotion) Order 2005. It is directed at, and therefore should only be relied upon by, persons who have professional experience in matters relating to investments. The investments to which it relates are available only to such persons and will be entered into only with such persons. Barclays Bank PLC is authorised by the Prudential Regulation Authority and regulated by the Financial Conduct Authority and the Prudential Regulation Authority and is a member of the London Stock Exchange.

The Corporate and Investment Banking division of Barclays undertakes U.S. securities business in the name of its wholly owned subsidiary Barclays Capital Inc., a FINRA and SIPC member. Barclays Capital Inc., a U.S. registered broker/dealer, is distributing this material in the United States and, in connection therewith accepts responsibility for its contents. Any U.S. person wishing to effect a transaction in any security discussed herein should do so only by contacting a representative of Barclays Capital Inc. in the U.S. at 745 Seventh Avenue, New York, New York 10019.

Non-U.S. persons should contact and execute transactions through a Barclays Bank PLC branch or affiliate in their home jurisdiction unless local regulations permit otherwise.

Barclays Bank PLC, Paris Branch (registered in France under Paris RCS number 381 066 281) is regulated by the Autorité des marchés financiers and the Autorité de contrôle prudentiel. Registered office 34/36 Avenue de Friedland 75008 Paris.

This material is distributed in Canada by Barclays Capital Canada Inc., a registered investment dealer and member of IIROC (www.iiroc.ca).

Subject to the conditions of this publication as set out above, the Corporate & Investment Banking Division of Absa Bank Limited, an authorised financial services provider (Registration No.: 1986/004794/06. Registered Credit Provider Reg No NCRCP7), is distributing this material in South Africa. Absa Bank Limited is regulated by the South African Reserve Bank. This publication is not, nor is it intended to be, advice as defined and/or contemplated in the (South African) Financial Advisory and Intermediary Services Act, 37 of 2002, or any other financial, investment, trading, tax, legal, accounting, retirement, actuarial or other professional advice or service whatsoever. Any South African person or entity wishing to effect a transaction in any security discussed herein should do so only by contacting a representative of the Corporate & Investment Banking Division of Absa Bank Limited in South Africa, 15 Alice Lane, Sandton, Johannesburg, Gauteng 2196. Absa Bank Limited is a member of the Barclays group.

In Japan, foreign exchange research reports are prepared and distributed by Barclays Bank PLC Tokyo Branch. Other research reports are distributed to institutional investors in Japan by Barclays Securities Japan Limited. Barclays Securities Japan Limited is a joint-stock company incorporated in Japan with registered office of 6-10-1 Roppongi, Minato-ku, Tokyo 106-6131, Japan. It is a subsidiary of Barclays Bank PLC and a registered financial instruments firm regulated by the Financial Services Agency of Japan. Registered Number: Kanto Zaimukyokuchō (kinsho) No. 143.

Barclays Bank PLC, Hong Kong Branch is distributing this material in Hong Kong as an authorised institution regulated by the Hong Kong Monetary Authority. Registered Office: 41/F, Cheung Kong Center, 2 Queen's Road Central, Hong Kong.

Information on securities/instruments that trade in Taiwan or written by a Taiwan-based research analyst is distributed by Barclays Capital Securities Taiwan Limited to its clients. The material on securities/instruments not traded in Taiwan is not to be construed as 'recommendation' in Taiwan. Barclays Capital Securities Taiwan Limited does not accept orders from clients to trade in such securities. This material may not be distributed to the public media or used by the public media without prior written consent of Barclays.

This material is distributed in South Korea by Barclays Capital Securities Limited, Seoul Branch.

All equity research material is distributed in India by Barclays Securities (India) Private Limited (SEBI Registration No: INB/INF 231292732 (NSE), INB/INF 011292738 (BSE) | Corporate Identification Number: U67120MH2006PTC161063 | Registered Office: 208 | Ceejay House | Dr. Annie Besant Road | Shivsagar Estate | Worli | Mumbai - 400 018 | India, Phone: + 91 22 67196363). Other research reports are distributed in India by Barclays Bank PLC, India Branch.

Barclays Bank PLC Frankfurt Branch distributes this material in Germany under the supervision of Bundesanstalt für Finanzdienstleistungsaufsicht (BaFin).

This material is distributed in Malaysia by Barclays Capital Markets Malaysia Sdn Bhd.

This material is distributed in Brazil by Banco Barclays S.A.

This material is distributed in Mexico by Barclays Bank Mexico, S.A.

Barclays Bank PLC in the Dubai International Financial Centre (Registered No. 0060) is regulated by the Dubai Financial Services Authority (DFSA). Principal place of business in the Dubai International Financial Centre: The Gate Village, Building 4, Level 4, PO Box 506504, Dubai, United Arab Emirates. Barclays Bank

PLC-DIFC Branch, may only undertake the financial services activities that fall within the scope of its existing DFSA licence. Related financial products or services are only available to Professional Clients, as defined by the Dubai Financial Services Authority.

Barclays Bank PLC in the UAE is regulated by the Central Bank of the UAE and is licensed to conduct business activities as a branch of a commercial bank incorporated outside the UAE in Dubai (Licence No.: 13/1844/2008, Registered Office: Building No. 6, Burj Dubai Business Hub, Sheikh Zayed Road, Dubai City) and Abu Dhabi (Licence No.: 13/952/2008, Registered Office: Al Jazira Towers, Hamdan Street, PO Box 2734, Abu Dhabi).

Barclays Bank PLC in the Qatar Financial Centre (Registered No. 00018) is authorised by the Qatar Financial Centre Regulatory Authority (QFCRA). Barclays Bank PLC-QFC Branch may only undertake the regulated activities that fall within the scope of its existing QFCRA licence. Principal place of business in Qatar: Qatar Financial Centre, Office 1002, 10th Floor, QFC Tower, Diplomatic Area, West Bay, PO Box 15891, Doha, Qatar. Related financial products or services are only available to Business Customers as defined by the Qatar Financial Centre Regulatory Authority.

This material is distributed in the UAE (including the Dubai International Financial Centre) and Qatar by Barclays Bank PLC.

This material is distributed in Saudi Arabia by Barclays Saudi Arabia ('BSA'). It is not the intention of the publication to be used or deemed as recommendation, option or advice for any action (s) that may take place in future. Barclays Saudi Arabia is a Closed Joint Stock Company, (CMA License No. 09141-37). Registered office Al Faisaliah Tower, Level 18, Riyadh 11311, Kingdom of Saudi Arabia. Authorised and regulated by the Capital Market Authority, Commercial Registration Number: 1010283024.

This material is distributed in Russia by OOO Barclays Capital, affiliated company of Barclays Bank PLC, registered and regulated in Russia by the FSFM. Broker License #177-11850-100000; Dealer License #177-11855-010000. Registered address in Russia: 125047 Moscow, 1st Tverskaya-Yamskaya str. 21.

This material is distributed in Singapore by the Singapore branch of Barclays Bank PLC, a bank licensed in Singapore by the Monetary Authority of Singapore. For matters in connection with this report, recipients in Singapore may contact the Singapore branch of Barclays Bank PLC, whose registered address is One Raffles Quay Level 28, South Tower, Singapore 048583.

Barclays Bank PLC, Australia Branch (ARBN 062 449 585, AFSL 246617) is distributing this material in Australia. It is directed at 'wholesale clients' as defined by Australian Corporations Act 2001.

IRS Circular 230 Prepared Materials Disclaimer: Barclays does not provide tax advice and nothing contained herein should be construed to be tax advice. Please be advised that any discussion of U.S. tax matters contained herein (including any attachments) (i) is not intended or written to be used, and cannot be used, by you for the purpose of avoiding U.S. tax-related penalties; and (ii) was written to support the promotion or marketing of the transactions or other matters addressed herein. Accordingly, you should seek advice based on your particular circumstances from an independent tax advisor.

© Copyright Barclays Bank PLC (2014). All rights reserved. No part of this publication may be reproduced or redistributed in any manner without the prior written permission of Barclays. Barclays Bank PLC is registered in England No. 1026167. Registered office 1 Churchill Place, London, E14 5HP. Additional information regarding this publication will be furnished upon request.

