

The next industrial revolution: Moving from B-R-I-C-K-S to B-I-T-S

Understanding the Industrial Internet of Things, with a deep dive into home automation

The Industrial Internet of Things

In the third report of our series on the “Internet of Things (IoT),” the GS Global Industrials team examines the impact of IoT on Industrials. We see our sector as entering a period of profound change as the digitization wave that transformed Consumer over the past 15 years hits Industrials, with an economic impact that is likely greater.

We dive into the “Building” blocks

We expect Industrials to account for \$2tn of the \$7tn IoT TAM by 2020, impacting three main verticals: **(1) Building Automation; (2) Manufacturing; (3) Resources**. As noted in *Preparing for the next industrial revolution* (April 28), with infrastructure booms fading and rising EM competition, business models are evolving. Equipment is digitizing and becoming connected, making it a necessity to be positioned for the move from hardware to software. **We focus on Home Automation** as it is at the forefront of IoT given investment from tech names (e.g., AAPL, GOOG), propelling this nascent industry with ample runway to further digitize.

Key enablers and challenges

Increased penetration of home automation requires moving past the **“B-R-I-C-K-S”** – **“Behavioral”** resistance, **“Reliability”** of devices, **“Investment”** in technology, **“Complexity”** of installation, **“Kinds”** of competing ecosystems, and **“Security”** of personal privacy/data. Instead, promulgating IoT will rely on the proliferation of the **“B-I-T-S”** – **“Base”** of smart device users is high and ever-increasing, **“Integration”** of protocols will help standardize ecosystems, **“Technology”** is becoming cheaper and easier to use, and **“Savings”** of energy and money should attract more end-users.

Key beneficiaries and stock ideas

We believe manufacturers of electrical equipment with long standing installed bases and customer relationships will be best positioned to benefit from the software integration necessary for IoT adoption. Across our Global Industrials coverage, we highlight **Buy-rated CREE, Dahua, Daikin (CL), ETN, Hikvision (CL), Hitachi, HON, Legrand, Philips, and Schneider (CL)**.

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PM Summary: Moving from the B-R-I-C-K-S to the B-I-T-S in the next industrial revolution

The global industrial sector is poised to undergo a fundamental structural change akin to the industrial revolution, as highlighted in our note *Preparing for the next industrial revolution* (April 28, 2014). We believe this transformation takes form in the burgeoning Internet of Things (IoT). We see equipment becoming more digitized and more connected, establishing networks between machines, humans, and the Internet, thus creating new ecosystems that enable higher productivity, better energy efficiency, and higher profitability. While we are still in the nascent stages of adoption, we believe the Industrial IoT opportunity could amount to \$2tn by 2020. With this report – the third in our cross-sector series – we examine the potential opportunity and impact of IoT on the industrials landscape, with a deep dive specifically into home automation. Below are our key takeaways:

1. **IoT will be pervasive throughout industrials.** Of the total \$7tn IoT opportunity estimated by IDC by 2020, we believe that about \$2tn will relate directly to industrials. To this end, IDC estimates that the installed base of IoT is approximately 9.1bn devices currently, growing to 28.1bn by 2020. Specifically, we expect IoT to impact 3 main verticals: Building Automation, Manufacturing, and Resources. Overall, we believe IoT will improve energy efficiency, remote monitoring and control of physical assets, and productivity through applications as diverse as home security to condition monitoring on the factory floor.
2. **Structural challenges and enabling technology are prompting industrial companies to rethink business models.** With several infrastructure booms coming to an end and rising cross-border competition, we expect a movement from hardware to software to take place, as addressed in our note *Preparing for the next industrial revolution* (April 28). We note that fixed investment growth is increasingly moving towards software as opposed to traditional capital goods equipment, creating new business models that more seamlessly integrate hardware and software offerings, which support better recurring revenue streams and greater customer stickiness. We believe this shift is supported by several technology changes, namely the low cost of instrumentation, smart device penetration, big data/inexpensive processing, and cheap bandwidth/wireless coverage. Further, we expect acquisitions will be pivotal to building out capabilities at industrial companies, with a particular interest in acquiring data management and analysis.
3. **Home automation is at the forefront of IoT penetration...** We expect home automation to be at the vanguard of IoT adoption given homes account for >30% of electricity usage, have natural overlap with consumer-oriented devices (e.g., smartphones), and ample room to further digitize. While the concept of “smart homes” has existed since the 1960s, the house remains one of the few elements in our lives still governed by physical/analog solutions. To this end, the Consumer Electronics Association estimates only 10% of new homes in the United States have home automation currently. However, as the base of smartphone users grows significantly (1.9bn today to 4.0bn in 2016E, as estimated by the Goldman Sachs CommTech team), coupled with increasing digitization within the home, we expect home automation to benefit. Within home automation, we see home energy efficiency, home comfort, and security as key areas of focus for industrials.
4. **...but will require moving from B-R-I-C-K-S to B-I-T-S.** Increased penetration of home automation will require moving past the “**B-R-I-C-K-S**” – “**Behavioral**” resistance, “**Reliability**” of devices, “**Investment**” in technology, “**Complexity**” of home automation system installation and integration, “**Kinds**” of competing ecosystems, and “**Security**” of personal privacy/data. On the flip side, we believe the “**B-I-T-S**” will support the proliferation of home automation given the “**Base**” of smart device users is high and ever-increasing, “**Integration**” of protocols is beginning to take place as groups like the Industrial Internet Consortium advocate for more open protocols, “**Technology**” becomes cheaper and easier to use, and “**Savings**” of both energy and money drive end users to employ IoT.

Key leaders in the Industrial IoT with a focus on Home Automation

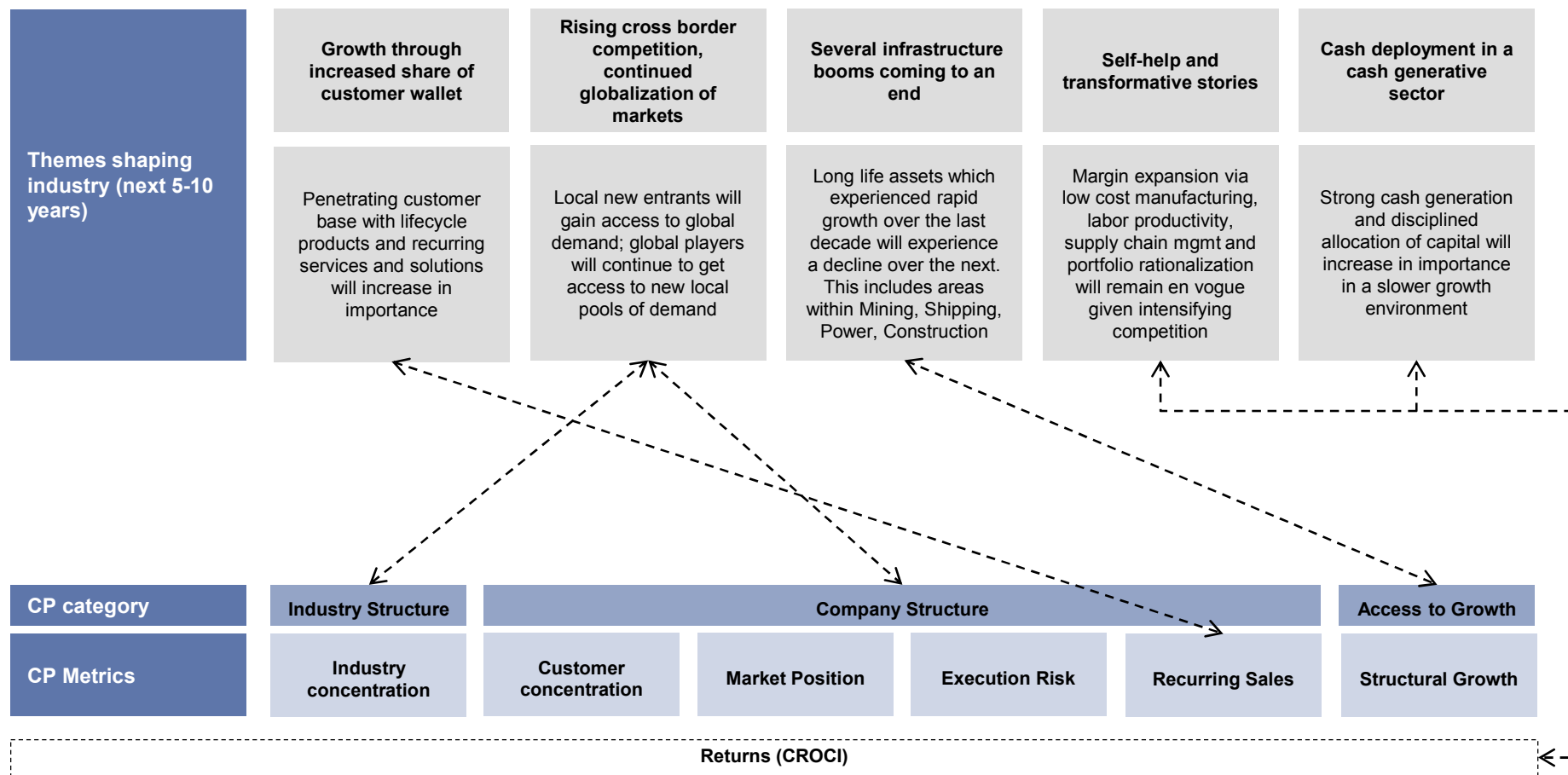
While the relevance of software as a core competency to turn home automation into reality is paramount, ultimately these systems are chosen and installed by the traditional stakeholders involved in construction (i.e., architects, contractors, electricians) rather than the end user. As such, we believe manufacturers of electrical equipment with long-standing installed bases and relationships with those stakeholders will be the biggest beneficiaries of IoT. As signaled by our Competitive Positioning framework (introduced in our note *Preparing for the next industrial revolution*, April 28 and presented in Appendix II here), we believe companies with good knowledge of their installed basis (particularly through high recurring sales and strong market position) and a superior ability to redeploy capital are better positioned, and highlight key Buy-rated winners below:

- **Cree (US Clean Energy, Lee).** Cree is a leading global manufacturer of light-emitting diode (LED) chips, components and lighting systems based on LED technology. In just the past six years, Cree has developed into a leading market share holder in the still-nascent LED lighting industry. With nearly 45% of overall revenue now derived from its lighting business, we expect to see continued growth driven by secular adoption of LED lighting.
- **Dahua (Chinese Hardware, Li).** Dahua is the second-largest video surveillance equipment vendor in China. Dahua is currently making efforts to become a complete security solution provider by expanding its product offering and developing video management/analytics capacity. However, we do not expect Dahua to start any meaningful development in the home security market in the near term.
- **Daikin (CL, Japanese Machinery, Isayama).** Daikin is a major air conditioner maker, ranking alongside US makers Carrier, Trane, and York in the air conditioning/control field and the company has been rapidly increasing its presence in the United States since its acquisition of Goodman Global in 2012. Given its expertise and vast installed base in HVAC, we believe that Daikin has a big opportunity to penetrate the temperature controls/energy efficiency markets as IoT takes shape.
- **ETN (US Multi-Industry, Ritchie).** Eaton is a global leader in power distribution and power quality and participates in many electrical applications within the building, putting it at the forefront of IoT adoption. ETN's xComfort system, a home automation system launched in 2003, helps control lighting, security/alarm, climate, water heating, shutters, and more.
- **Hikvision (CL, Chinese Hardware, Li).** Hikvision is the global No.1 video surveillance equipment vendor by revenue (US\$1.7bn in 2013) that offers recorders (NVR/DVR), surveillance cameras and video management software (VMS). Over the last two years, Hikvision has entered the home security market by launching the ezvis brand. Given its scale advantage and expertise in the professional market, we believe Hikvision is well positioned to gain share in the Chinese home security market over the long run.
- **Hitachi (Japanese Semis, Telcos & IT Services, Matsuhashi).** Hitachi is an integrated electronics maker, which has become a double-digit ROE company, through restructuring led by current management. Hitachi is gaining momentum particularly in Elevators, Train systems and Auto parts in the overseas markets.
- **HON (US Multi-Industry, Ritchie).** Honeywell is a diversified industrial company with exposure to aero, construction, energy, and autos. Given homes/buildings account for 23% of HON's revenues, we see HON as one of the biggest beneficiaries of home automation. Specifically, we expect HON to leverage its significant installed base of thermostats to increase adoption of smart thermostats, which will also open opportunities to integrate HON's security offerings.
- **Legrand (CL / CP Q1, European Electrical Equipment, Costa).** Legrand is a global specialist in electrical and digital building infrastructure with a leading position in control and command products (approximately 20% market share) that serves comfort, security, and communication applications. Legrand also enjoys a strong installed base with a large network of electricians/installers that can help the company become stickier at end users where complex installations are required; we note that it sold 3mn of connected objects in 2013.

- **Philips (CP Q1, European Electrical Equipment, Costa).** Philips is a diversified health and well-being company with one-third of revenues derived from Lighting. Its Hue offering, a connected lighting system for the home, is installed in 75 countries and enjoys strong brand preference among consumers.
- **Schneider (CP Q2, European Electrical Equipment, Costa).** Schneider specializes in energy management and over 40% of sales are related to construction. In 2009, Schneider announced the launch of Wiser Home Control, which links electrical, multimedia, and telecom equipment in one wireless solution that can be controlled remotely over the Internet.

Exhibit 1: As a reminder, we believe our Competitive Positioning framework (CP) can help identify IoT winners within our global industrials coverage

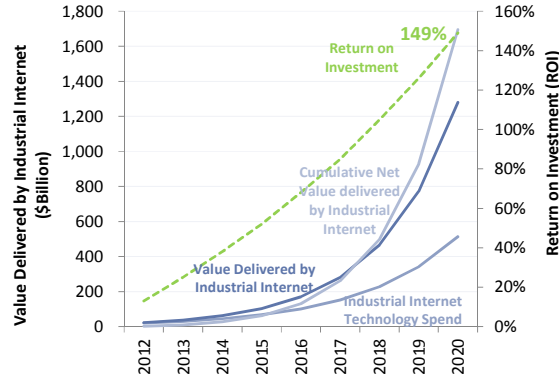
Links between the key themes shaping the global Multi-Industry sector and quantifiable metrics on which we rank our global coverage



Source: Goldman Sachs Global Investment Research.

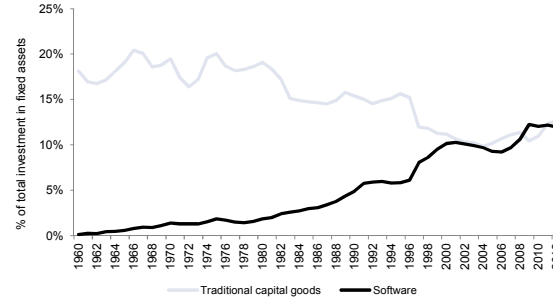
Our view in pictures

Exhibit 2: Industrial IoT is projected to deliver \$1.7 tn of cumulative value per Wikibon



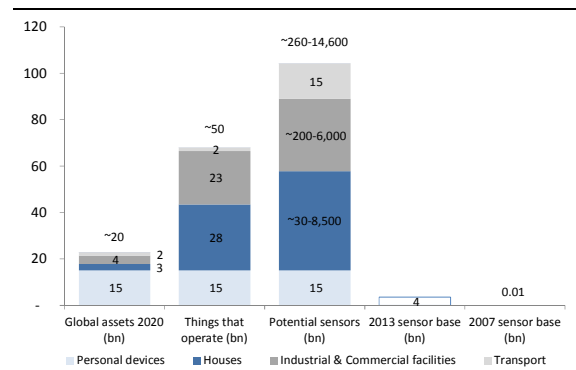
Source: Wikibon.

Exhibit 3: Investment in software is on the rise, signaling a shift away from hardware...



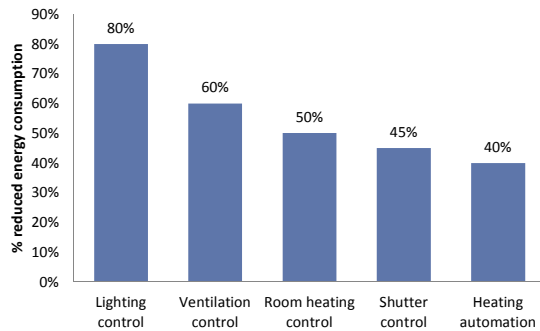
Source: BEA, Goldman Sachs Global Investment Research.

Exhibit 4: ...and we think the opportunity to digitize buildings is high



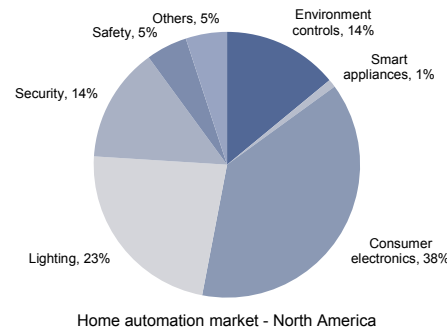
Source: GE, Ericsson, Cisco, IHS, Goldman Sachs Global Investment Research.

Exhibit 5: IoT can help reduce home energy consumption by over 40% in various applications



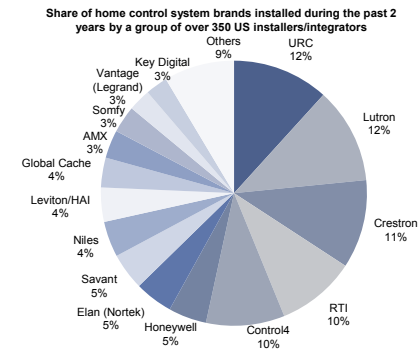
Source: ABB, Goldman Sachs Global Investment Research.

Exhibit 6: Energy efficiency, home comfort and security will be key areas of Industrial focus



Source: Goldman Sachs Global Investment Research.

Exhibit 7: Home automation touches upon many industrial companies



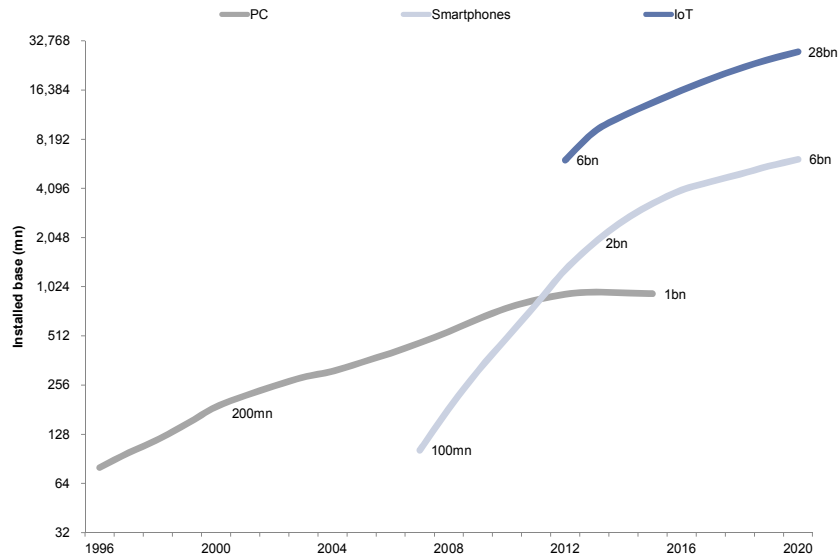
Source: CePRO, Goldman Sachs Global Investment Research.

IoT will be pervasive throughout the industrial landscape

IoT is the next mega-trend. The Internet of Things (IoT) is starting to take shape as the next mega-trend. Equipment is becoming more digital and connected, forming networks of machines and new ecosystems. While we are still in the nascent stages of adoption, we believe that the timing of the transformation will resemble that seen in the consumer sector (e.g., penetration of mobile phones went from 5% to 100% in 20 years), but the economic implications will be much bigger (we have seen estimates of 2.5-5.0x the size of the consumer internet). By its very nature, the IoT will touch a variety of different industries beyond industrials, from healthcare to consumer to oil & gas, which complements the diversification of our Multi-Industry global coverage group.

What is the IoT? The IoT connects devices such as every day consumer objects and industrial equipment onto the network, enabling information gathering and management of these devices via software in order to increase efficiency, enable new services, or achieve other health, safety, or environmental benefits. We note that several other terms have entered the vernacular, with GE citing the emergence of the “Industrial Internet” to refer to the combination of the global industrial system made possible as a result of the Industrial Revolution along with the open computing and communication systems developed as part of the Internet Revolution. Meanwhile, Cisco has coined the “Internet of Everything (IoE)” to capture the full potential of applications arising from a “network of networks” beyond the connection of physical objects and expanding to encapsulate people and processes as well.

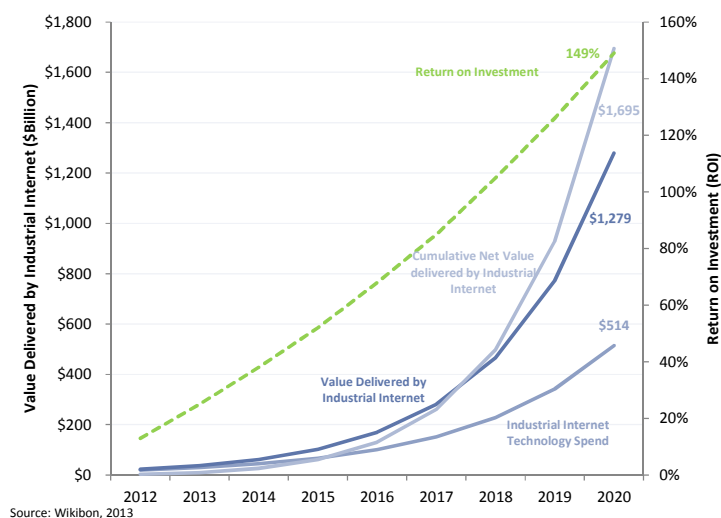
Exhibit 8: IoT emerging as the next mega-trend
 Internet subscribers over time. Note: y-axis on a logarithmic scale



Source: IDC, Ericsson, Goldman Sachs Global Investment Research.

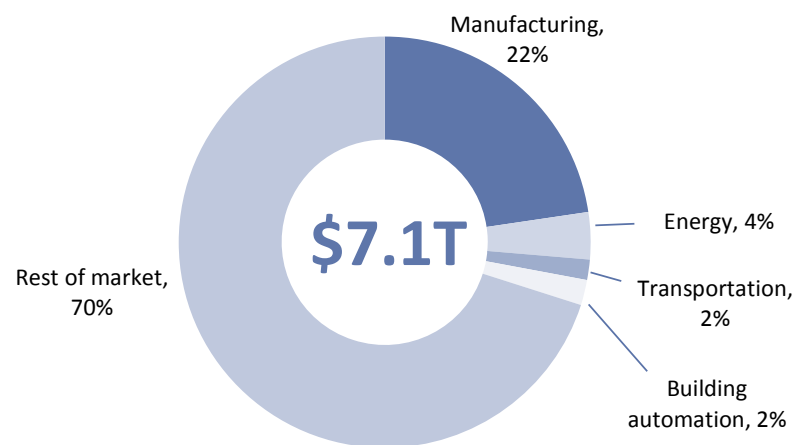
The Industrial IoT can be as large as \$2.0tn by 2020. Wikibon forecasts that \$514 bn will be invested in the “Industrial Internet” by 2020. The Wikibon report, “Defining and Sizing the Industrial Internet” from June 2013 observed that while the analysis of the digital presence we leave on the internet is focused mainly on improving the return on investment in advertising, the value created from the analysis of the data generated by networked sensors is much greater because it is aimed at increasing the efficiency of equipment, tools, and infrastructure. Wikibon estimates the cumulative value, including improved efficiency, delivered by 2020 for the Industrial Internet to be \$1.7tn. IDC, which has a much broader definition of the opportunity for IoT, estimates the potential market at \$7.1tn by 2020. Based on this estimate for the opportunity, we believe the portion most directly attributable to the Industrial Internet to be about \$2.0tn. See Exhibits 9-10.

Exhibit 9: Industrial IoT is projected to deliver \$1.7tn of cumulative value per Wikibon



Source: Wikibon.

Exhibit 10: Per IDC’s estimates, the potential market for IoT will be \$7.1tn by 2020, with Industrial sectors capturing about 30% of TAM (\$2.0tn)



Source: IDC, Goldman Sachs Global Investment Research.

As machines take over, business models will need to evolve quickly. In developed markets, the penetration of PCs, tablets, and smartphones is now almost complete as 75% of people in the United States have access to mobile broadband internet. This phenomenon has changed the way we work, communicate and consume so much that it is difficult to remember what it was like in the 1990s. As unintuitive as it sounds in the era of Facebook, Google and SAP, the vast majority of capital goods companies still interact with their installed base and customers in the same way we interacted with each other in the 1980s. For the majority of industrial companies, if equipment needs service, customers will call an onsite technician. But this is all about to change. What the IT revolution has done to how humans work and communicate over the past 20 years is now happening to machines; and it has the potential to be as revolutionary to how machines operate from day to day, as it has been for us. In our view, this is likely to disrupt many business models for the companies that produce and maintain these machines, creating business opportunities for the companies that best utilize the data and, just as it has for consumers, imply deflationary pressure on “like-for-like” products. Innovation will need to be faster and business models more agile, and, most importantly, the way capital goods companies interact with their customers will have to change.

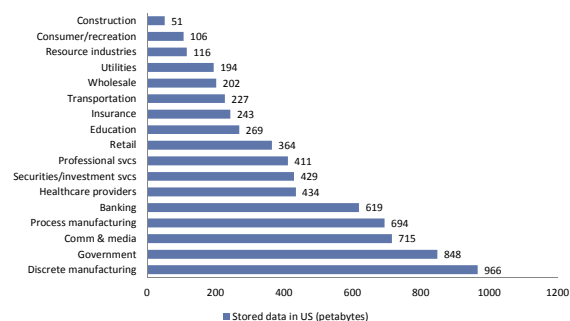
Now is the time to invest in the IoT

Structural challenges and affordable enablers will drive adoption of IoT. In our report, *“Preparing for the next industrial revolution”* (published April 28) we highlighted several themes to watch. We believe two of those themes, namely **(1) several infrastructure booms coming to an end** and **(2) rising cross-border competition** are supporting new revenue streams and more efficient cost structures. Specifically, long-lived assets, which benefitted from rapid growth in original equipment over the past decade, will start to experience a decline, especially in the mining, shipping, power and Chinese construction sectors, among others. In fact, we expect the growth rate for our sector in 2013-2016 to be half that of 2003-2006. Additionally, we see EM competition intensifying with the percentage of international sales for EM Industrials rising by over 500 bp over the past five years. As a result, **we view the movement from hardware to software as a necessity.** Fortunately, as outlined by our Global Tech team in the first report of this series, titled *“Making S-E-N-S-E of the Internet of Things (Part 1)”* on June 25, 2014, several technology changes are enabling the rise of the IoT:

- **Low cost of instrumentation.** According to SIA, the average cost of a sensor is now \$0.60 vs. \$1.30 10 years ago.
- **Smartphone penetration.** Smartphones increasingly serve as a remote control/hub for the connected home/plant.
- **Cheap bandwidth/ubiquitous wireless coverage.** The cost of bandwidth has declined by a factor of nearly 40x over the past 10 years. Further, wireless connectivity is available for free or at a very low cost.
- **Big data/inexpensive processing.** As IoT will generate large amounts of unstructured data, Big Data analytics will be key. Processing costs have declined by nearly 60x over the last 10 years, enabling more devices to analyze the data they receive. See Exhibits 11-13.

Exhibit 11: A wide swath of industries store vast amounts of data

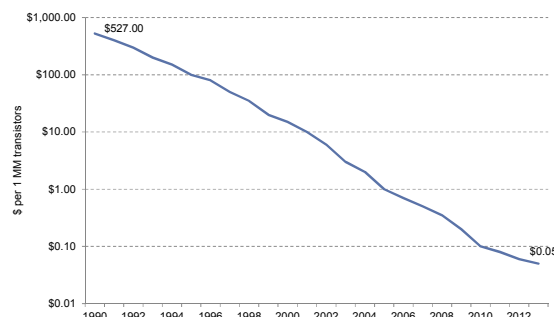
Stored data in the US, petabytes



Source: IDC; BLS; McKinsey Global Institute analysis

Exhibit 12: As the cost to compute has dropped significantly...

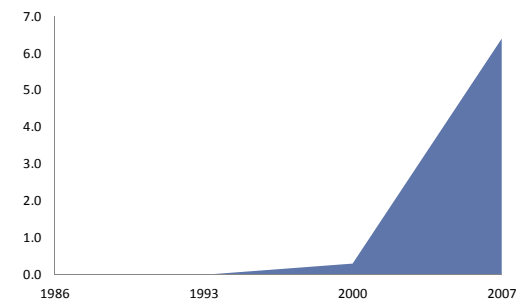
\$ per 1 MM transistors



Source: John Hagel, Deloitte, Mary Meeker, KPCB.

Exhibit 13: ...this has led to much greater computation capacity

10¹² mn instructions per second

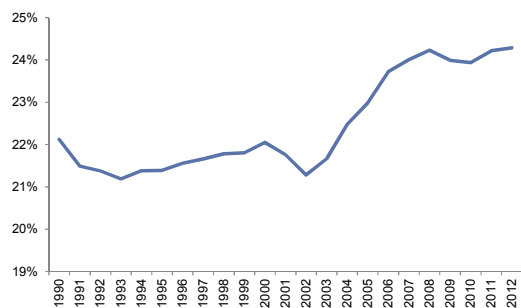


Source: Hilbert and Lopez, Goldman Sachs Global Investment Research.

The move from hardware to software has started. Fixed investment growth is increasingly moving towards software rather than traditional capital goods equipment. As a result of slowing growth and increasing EM competition, capturing the digitalization opportunity will be increasingly important for industrial companies. Luckily for the sector, some of the end markets that are still less penetrated by software are also some of the largest contributors to sector revenues and where the opportunity still abounds (e.g., construction, utilities, O&G). While this digital shift presents a new demand pool for industrial companies, it will not be free of challenges. First, the opportunities will be sought out by many, including the sector’s own customers as well as a new set of formidable competitors in the form of IT and software names (e.g., Google, IBM and SAP). Second, the speed at which the opportunity is pursued will be critical, as the more efficient use of assets triggered by better “intelligence” and increased connection of equipment through advanced networks will mean some cannibalization of demand for traditional capital goods equipment.

Exhibit 14: Fixed investment as a whole has grown steadily over the past two decades...

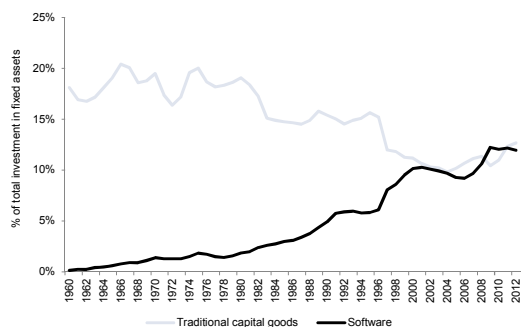
Fixed asset investment as % of global GDP



Source: Haver, Goldman Sachs Global Investment Research.

Exhibit 15: ...but its composition has shifted in favor of software

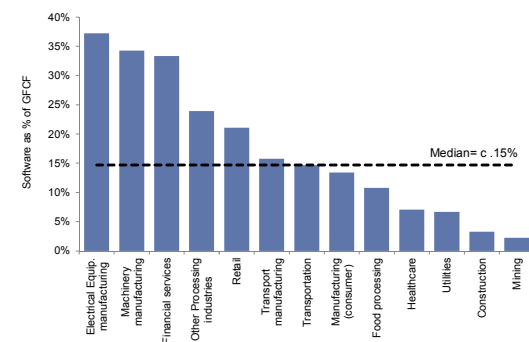
Percentage of total investment in fixed assets in the United States



Source: US Bureau of Economic Analysis, Goldman Sachs Research analysis.

Exhibit 16: Several large end markets for industrial companies have not digitalized yet

Software as percentage of gross fixed capital formation for various sectors in the United States



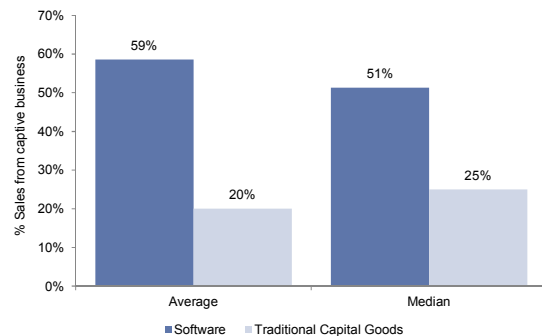
Source: US Bureau of Economic Analysis, Goldman Sachs Global Investment Research.

First-mover advantage and leveraging installed base will be key. Digitalization will affect companies in different ways. In an environment with less growth and more EM competition, installed bases will increasingly be the key competitive advantage of global capital goods companies. Those that already have a high penetration of services and maintenance on their sold equipment have a quicker lead into understanding what revenue streams can be levered/protected by better device connectivity. Taking history as a guide, we believe that whether digitalization turns out to be an opportunity or a misfortune will ultimately reflect each company’s underlying ability to reinvent itself. We see companies with good knowledge of their installed base and a superior ability to redeploy capital as better positioned (as highlighted in our Competitive Positioning metrics presented in our note *Preparing for the next industrial revolution*, April 28). Which players will be able to capture the benefits of the exponential creation of data in the industrial space remains to be seen, but three benefits are almost certain for those that can:

- **Controlling data** will probably mean **more customized value-add client interactions**. Data give companies capacity to be more proactive in addressing customer issues.
- **More frequent** client interactions most likely mean **more resilient revenue streams....**
- ...while more customized value-add client interactions usually mean **better margins and returns**.

Exhibit 17: Digitalization as a way to amplify recurring revenues

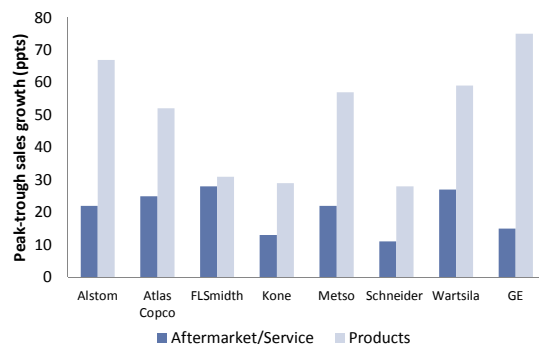
Recurring revenues as % total for our Software vs. Capital Goods coverage



Source: Company data, Goldman Sachs Global Investment Research.

Exhibit 18: Companies that succeed in leveraging digitalization to create recurring revenues will benefit from greater stability...

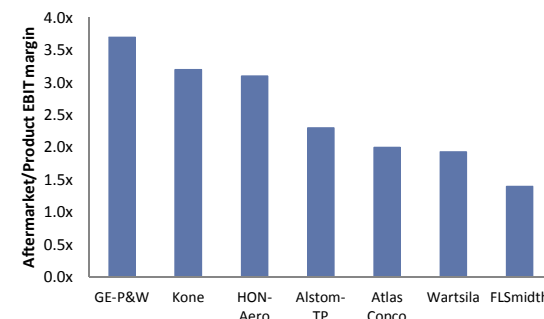
Service/aftermarket estimated peak-to-trough sales growth



Source: Company data, Goldman Sachs Global Investment Research.

Exhibit 19: ...and higher earnings

Relationship between aftermarket/service and product EBIT margin

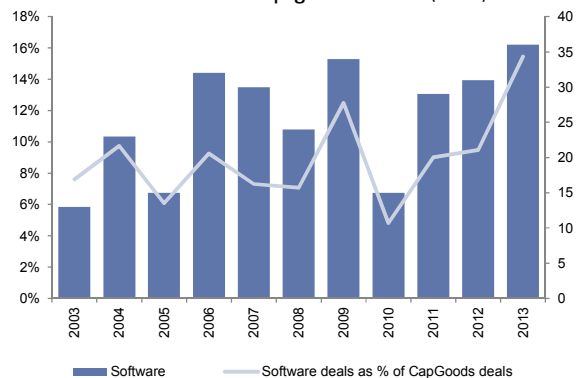


Source: Company data, Goldman Sachs Global Investment Research.

Smart use of cash will be important. We see inorganic growth as pivotal to capture the opportunities provided by the digitalization of manufacturing. In fact, 2013 saw the highest number of software deals ever by capital goods companies. The sector's still very low leverage (<1x net debt/EBITDA for FY13) and improving financial conditions make this even more likely. Deals in these areas, however, tend to be characterized by both higher multiples and more contenders, so being a disciplined cash manager would be of paramount importance. We estimate that our global multi-sector coverage has US\$210 bn of cash available from FCF (2013-15E) to spend on inorganic activity or shareholder returns, representing 13% of current market cap. We believe that managing the data generated from companies' current intelligent devices will become a growing area of focus for investment, both organic and inorganic. For those companies not yet fully switched on to their installed base, inorganic growth will be essential to prevent intermediaries from positioning themselves between OEMs and their customers. We believe two types of companies will figure more and more within corporates' target lists: (1) those that can aggregate individual machine data into single information systems covering the whole customer portfolio of assets; and (2) those offering tools to analyze the massive quantities of data generated by those intelligent devices. We highlight several examples: Honeywell's 2012 acquisition of INNCOM, a manufacturer of software-based energy management solutions within its Environmental and Combustion Control business; GE's \$100mn+ investment in Pivotal, the spin-out from EMC and VMware focused on developing data analytics offerings; ABB's Ventyx and Mincon deal; Schneider's Telvent acquisition; and Invensys IOM (also acquired by Schneider). See Exhibits 20-22.

Exhibit 20: Last year saw the highest number of software-related deals ever in Capital Goods

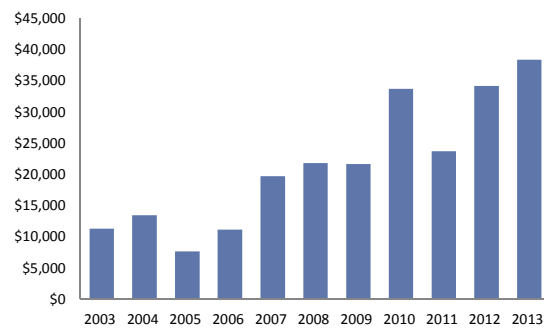
Number of deals where acquirer is a capital goods company and target is a software company (RHS); software deals as % of cap goods deals (LHS)



Source: Bloomberg, Goldman Sachs Global Investment Research.

Exhibit 21: Record cash balances should support continued M&A

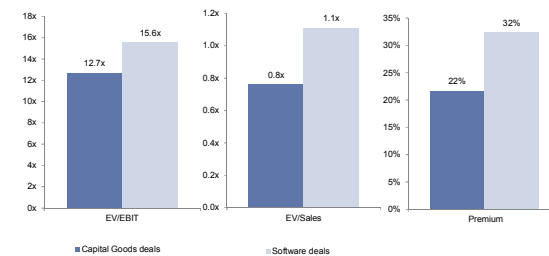
US Multis cash balances over time



Source: Company data, Goldman Sachs Global Investment Research.

Exhibit 22: Notably, software deals tend to be more expensive than capital goods ones

Trailing 12 months; median for deals over the past over last 10 years



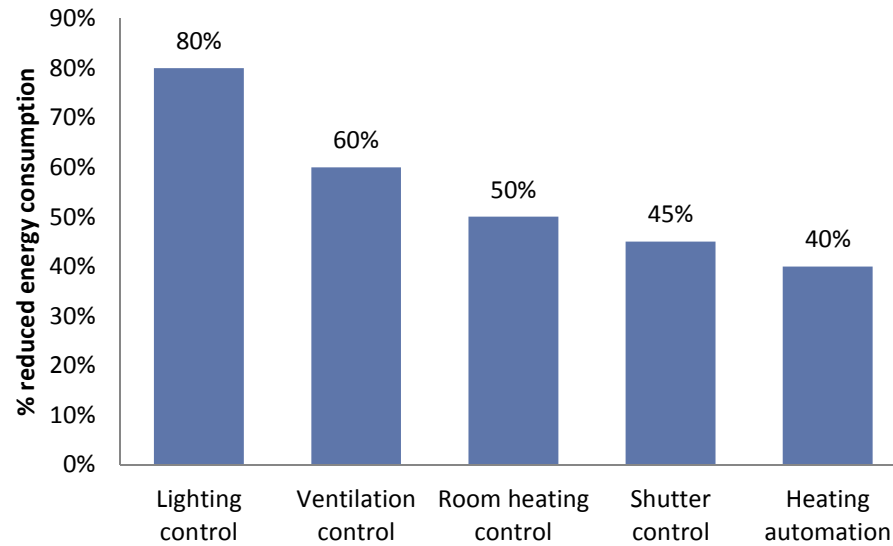
Source: Bloomberg, Goldman Sachs Global Investment Research.

Real energy savings to the end user will be a key driver of adoption. We believe IoT offers a compelling solution to reduce energy usage and costs and view energy efficiency as a key secular trend that will drive its adoption. Looking specifically within home automation, we note that some of the systems in existence can generate up to 50% energy savings, with most building control systems usually offering over 40% energy use reduction. To this end, homes remain a territory vastly underexplored in terms of application of energy saving methods. For example, lighting alone is about 14% of a typical residential building’s energy consumption, according to Schneider Electric, and up to 30% of the potential for savings in a building lighting system can be realized via active lighting control system.

We identify the following drivers that we believe will contribute to structural growth in the building efficiency market over the next few decades:

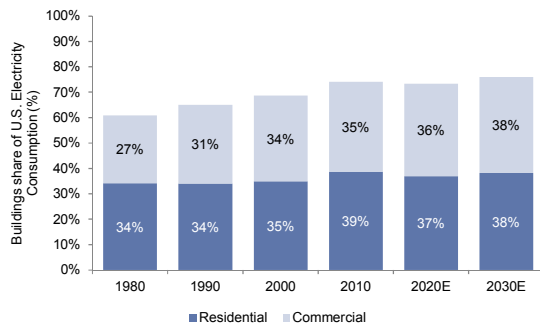
- Buildings (and residential specifically) represent one of the largest sources of electricity consumption.
- Energy consumption is set to continue to increase at about 2% pa over the next 25 years, according to the US DoE and US Energy Information Agency (EIA) estimates, and users have shown a willingness to invest in solutions.
- Though most users demand a payback time of under three years for energy efficiency investments, we expect payback times to decline as technology improves, significantly raising the attractiveness of these solutions. See Exhibits 23-26.

Exhibit 23: Building control systems usually offer over 40% electricity savings potential
 Percentage of reduced energy consumption



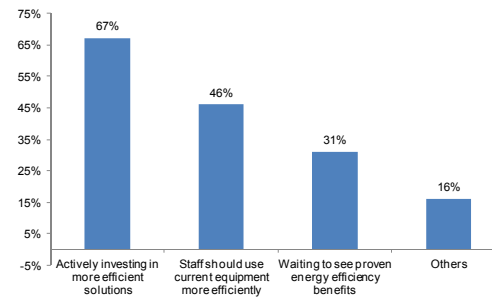
Source: ABB.

Exhibit 24: Resi represents over 30% of electricity usage which the DoE expects to increase
 Buildings share of US electricity consumption



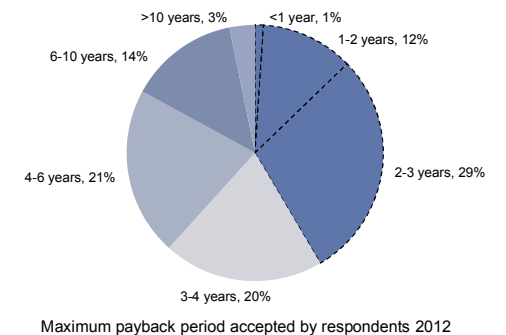
Source: US Department of Energy.

Exhibit 25: Users are willing to invest in energy efficiency solutions ...
 Survey of 250+ managers of commercial buildings housing more than 500 employees; attitude towards energy efficiency in buildings



Source: Company data, Frost & Sullivan.

Exhibit 26: ... with about 40% requiring less than three years for payback
 Johnson Controls 2012 Energy Efficiency indicator; maximum payback period accepted by respondents



Source: Johnson Controls.

New frontier of opportunities but not free from challenges

While we believe the addressable IoT market could be huge, capturing the opportunity will not be free of challenges:

Challenge #1: Can companies offset cannibalization of their own “hard” products? A critical challenge will be the ability to grow the IoT opportunity sufficiently to offset the cannibalization of traditional “hard” equipment offerings. For instance, increasing the utilization of a fleet of compressors from 50% to 80% would reduce the number of compressors needed by close to 40%, but would not materially change the service needed and would involve substantial IT investments. Further, while it is difficult to prove what the optimal level of software penetration will be by end market, it is likely that areas like mining, utilities or construction will have lower levels of software given the importance of infrastructure and big machinery, thus constraining the potential.

Challenge #2: New competitors for the industrial IoT market? Software demand is not captive to capital goods companies, with IBM, Oracle and SAP increasingly attempting to penetrate markets traditionally served by electrical and machinery makers, with the push for smart grid technology a key example. Capital Goods companies have the advantage of understanding how the physical assets of their customers work, but lag on the software side vs. the big IT providers. Another potential risk is that customers see the optimization of their asset portfolio as such an increasingly differentiated competitive advantage that they decide to take more of its responsibilities in-house. While more remote than other challenges, this cannot be totally ruled out in some areas.

Challenge #3: What will happen to the aftermarket? Simplistically, the aftermarket model is based on three pillars: (1) superior access to customers through scale, either through unique relationships with distributors or through a global service network; (2) a captive spare and ware parts business through a combination of know-how and patents; and (3) unique expertise in optimizing the performance of their machines. We believe the former two may come under pressure in this new digital world, while the latter implies an opportunity. For example, if an engine starts to communicate that it needs a new ball bearing but then also orders it from a warehouse, allowing a service engineer to connect remotely and instruct the customer how to change it themselves, the benefits of a global service network becomes less clear. When the key spare part is fixing a software bug and key “ware parts” consist of apps and not filters, how companies will charge for this, and importantly, which company will charge for it, become key questions.

Challenge #4: To charge or not to charge? As growth in tangible asset investment slows, we believe the competitive environment will become harder, making it less clear whether the access to all this newly generated data will be an extra revenue stream for manufacturers or simply a way to prevent market share erosion. Indeed, some companies such as ABB are already offering their software capabilities for free as a way to win new business, much as SKF offered its service for free before it realized it should and could charge for it. Another example is HON, which charges a fixed monthly amount for security monitoring services in addition to equipment purchases.

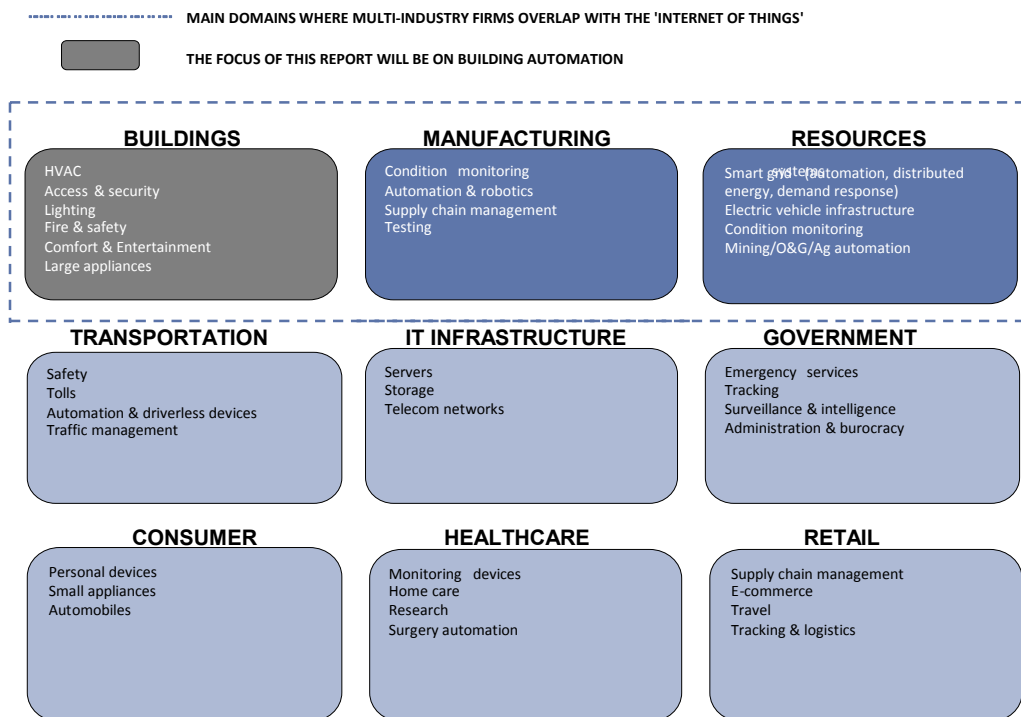
Challenge #5: Is our aging installed base too old to change? The majority of industrial assets were installed many years ago, when the potential of digital technologies was not foreseen. This results in two parallel issues. First, it might not be possible to benefit from data and intelligence to its full extent in certain end markets until a material fraction of equipment has become obsolete. For example, in the United States, the net stock of equipment from utilities is on average around 11 years old, making it too young for obsolescence as equipment lasts over 40 years, but too old to be able to benefit from meaningful connectivity. Second, the mechanisms to allow data collection and access to the devices by market participants other than the manufacturer might not be in place, making the upgrade to intelligent standards a competitive one. According to automation industry, a total replacement of a legacy system could cost over 50% more than an upgrade just in equipment and operator training costs, without even considering the months of process downtime.

Where IoT impacts industrials

While IoT spans a variety of industrial sectors, the focus of this report is on Home Automation. Previous reports in this series addressed the applications of IoT to CommTech, Semiconductors and Software. In this report, we address the impact of the IoT on the industrials space, with a deeper dive into Home Automation within the Building Automation opportunity below. We expect a series of follow-up reports touching the following topics.

- **Building Automation** focuses on improving energy efficiency and occupant comfort/utility within the home or commercial building. Key advantages include improved security, remote monitoring of devices, and energy management.
- **Manufacturing** applications of IoT could help facilities to reduce downtime through predictive maintenance, have better visibility into inventory and energy management, and improve operational efficiencies overall.
- **Resources** could benefit from real-time equipment monitoring, energy efficiency (smart meters), and fuel reduction (O&G).

Exhibit 27: With this report we address the Industrials side of the Internet of Things and take a deep-dive into Home Automation
IoT opportunities across end markets



Source: Goldman Sachs Global Investment Research.

Building Automation

The Building Automation segment focuses on improving energy efficiency and occupant comfort/utility within the home or commercial building. Key advantages include improved security, remote monitoring of devices, and energy management. While we conduct a deeper dive into home automation specifically in this report, we note the following key categories comprise Building Automation:

- (1) **Security** applications offered by Elk, GE Security, Honeywell, Assa Abloy, Bticino (Legrand), Pelco (Schneider), Simplisafe, Tyco, Canary, Dropcam (to be acquired by Google) and others can connect smart locks, alarms, and cameras to each other and the Internet. Broadly, we classify security offerings into access control (smart locks, entryway alarms, etc.) and video surveillance systems (encompassing IP-enabled and vSaaS/cloud-based cameras). Additionally, depending on the offering, security suites could stream live feed to a homeowner or building manager and be controlled remotely through smartphones or the Web.
- (2) **Space cooling/heating** comprise both HVAC systems as well as smart thermostats. Broadly, smart space cooling/heating applications can help control airflow throughout the building or house and ensure occupant comfort while also limiting wasted resources. HVAC systems use smart vents (such as EcoNet, Keen Vents) or an overarching control architecture like Honeywell's Total Connect Comfort Services or ADT Pulse to coordinate space cooling/heating throughout the structure. Meanwhile, smart thermostats by Nest (acquired by Google), Honeywell, Ecobee, Hitachi and others can learn and adjust to occupant activities.
- (3) **Lighting/controls** allow for remote access/control of switches, dimmers, adapters, and keypads, and often include LED to improve energy efficiency and aesthetic appeal. Key providers include Cree, GE, Lutron, LiteTouch, Intermatic, Insteon, Philips, and others.
- (4) **Home entertainment** systems can often be integrated with other home systems such as security, lighting, and climate control to provide a home theater or whole home audio system. Key players include Bose, Logitech, NuVo (Legrand), Soundtouch, Convergent Living, Sonos, and others.
- (5) **Smart appliances** run the gamut from smart ovens that can sense the temperature of the food you are cooking to washing machines that adjust the cycle for the type of laundry load to refrigerators that can sense when you are running low on a particular item. Key vendors include GE, LG, Samsung, Electrolux, and Bosch.
- (6) **Assisted living** can also benefit from connected devices which would allow for remote diagnosis, consultation and monitoring for ill or elderly patients. We note that the market for these types of solution is still very fragmented, though perhaps less relevant to industrials names.

These systems can be applied independently or as a full integrated system within the house, with several companies like Vantage (Legrand), Crestron, and Control4 offering integrated solutions. Lastly, we note that telecom/cable operators like Comcast, AT&T and Verizon have also entered this market and are offering home security and automation packages.

Manufacturing

The Manufacturing segment has historically been heavily instrumented in a closed, hard-wired network environment, where the upgrade of industrial sensors, controllers, and networks has been quite costly. We believe manufacturing could benefit from IoT through better remote monitoring technology that can improve machine connectivity through sensors, identify maintenance issues more proactively, and promote wireless inventory tracking in a more open architecture environment. Taken together, IoT could help manufacturing facilities reduce downtime through predictive maintenance, have better visibility into inventory and energy management, and improve operational efficiencies overall. The following key categories comprise Manufacturing:

- (1) **Condition monitoring (CM)** is the process of monitoring specific conditions within machinery, inclusive of sound, temperature, vibration, etc. in order to identify changes in normal operations. Should a change develop, CM can help owners recognize areas for preventative maintenance that can help forestall downtime. We believe CM is important as for example, based on a study by Alstom, the average cost of a failure for a conveyor belt in a mining operation can be roughly \$1.4mn/hour. Key companies include SKF, Rockwell Automation, Atlas Copco, Schneider Electric, Mitsubishi Electric and FLSmidth.
- (2) **Smart factories/machine connectivity** enables machines/equipment on the factory floor to communicate with one another to reduce production delays and improve operational efficiencies, primarily through reducing the need for manual intervention in the production line. Cisco estimates that “smart factories” represent one of the largest IoT opportunities and could yield a total value of \$1.95tn over the next 10 years as adding connectivity to manufacturing processes and applications increases factory productivity, reduces inventories with just-in-time supplies, and cuts average production and supply chain costs. Key names in this space include Rockwell Automation, Cisco, Hitachi, ABB, Siemens, Mitsubishi Electric and Schneider Electric. Of these, the latter two cite that they have approximately 200k machines connected remotely to their central systems.
- (3) **Wireless/mobile supply chain tracking** could be useful to manufacturers given the need to minimize costs related to rising freight/labor/raw materials, manage inventory levels, and promote stickiness in customer relationships. Specifically, wireless supply chain tracking could integrate RFID with advanced warehouse management systems to tag the progress of a specific SKU through production, shipping, and customer receipt. Key companies include DHL, UPS, FDX, Oracle, SAP, and Honeywell (through Intermec) on the RFID side.

While the opportunity for IoT is fairly nascent within manufacturing, the potential opportunity is significant. Manufacturing has meaningful implications for the US economy, as for each \$1.00 spent in manufacturing, another \$1.48 is added to the economy, the highest multiplier of any economic sector (per BEA). According to a December 2013 survey by the American Society for Quality, only 13% of manufacturers surveyed said that they currently use smart manufacturing within their organization. Meanwhile, ROK believes that only 15% of the devices on the manufacturing floor are actually connected to a network (with Cisco citing a lower estimate of 4%).

Resources

The following key categories comprise the Resources segment:

- (1) **Smart grids** could have many applications, from advanced demand response to line loss reduction. To the latter point, line losses are a major challenge faced by utilities as power is “lost” due to inefficiencies along the T&D grid. While the physics of power lines, voltage and distance drive much of these losses, we recognize that technology applications – software, hardware and the Internet – could reduce line losses, which over time, average roughly 8%-9% of total US power generation. We estimate these losses drive \$16bn-\$20bn in inefficiencies and every 5% reduction in line losses could save nearly \$1bn per year. Further, as renewables become an increasing portion of the power mix and require greater transmission distances, the need for reducing line losses becomes ever more apparent. Key companies range from software companies like Silver Spring Networks, eMeter, and Echelon to hardware companies that make T&D equipment like Eaton, Alstom, Hubbell, Legrand, Schneider, Siemens, Toshiba and ABB. Key utility participants include American Electric Power (largest owner of transmission in the United States) and Edison International.
- (2) **Electric vehicle infrastructure** is a burgeoning area of development for IoT as connecting vehicles and their charging stations to a shared network could help owners more efficiently and quickly find charging stations nearby. Key companies include Greenlots (global provider of open standards for EV networks), Eaton, ABB, Efacec, Coulomb, and Schneider.

Deep dive on Home Automation

The context: Moving from B-R-I-C-K-S to B-I-T-S in Home Automation

Smart homes are back in the spotlight

The concept of “smart homes” has existed since the 1960s when the first experimental system was launched, though we note that it was back in the 1800s when the first patents for the remote control were filed. Interest in smart homes was rekindled following the acquisition of smart thermostat producer Nest by Google in February, along with Apple’s announcement at the Worldwide Developers Conference of the introduction of HomeKit, a single centralized way to control various automated devices in the home through Apple’s OS. While technology like Nest or HomeKit is not entirely novel (for instance, companies like Legrand have had fully commercialized home automation hubs and solutions for years), the entrance of the major IT-ecosystem type names like Google and Apple carries the promise that this nascent industry might finally be taking off.

However, the house remains one of the few elements in our lives still governed by physical/analog solutions. We program our GPS to take us to new locations, we use our mobile phones to board planes, we run our bank accounts online, but to turn on the light we still have flip a switch, or to open a door we still have to turn a key in the lock. Smart home penetration has been hampered by prohibitive costs to homeowners, limited practicality/user friendliness of solutions, uncertain reliability and unclear user benefits. However, the declining cost of sensors and widespread Internet access are making smart home concepts easier to implement.

Home automation solutions vary widely. They can be as simple as turning off the lights automatically when a person leaves a room to more complex systems which for example can identify the people in a room and set preferred ambiances or order products when the stock of certain products in the refrigerator is low. Many manufacturers are already offering solutions that allow customers to have some degree of remote control over their equipment, but most solutions still work in silos with limited coordination between themselves, leading to sub-optimal energy consumption and limited effectiveness to the consumer given competing ecosystems.

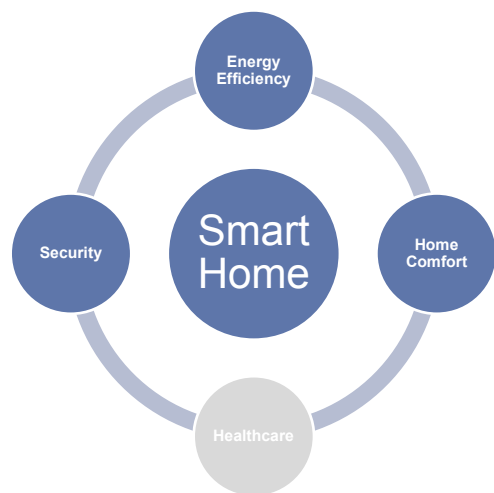
While we note that it can be difficult to delineate the various opportunities to increase automation within the home, **we identify several key domains within smart homes:**

- **Home energy efficiency/home comfort:** Encompasses automation for HVAC systems, lighting, water pumps and electrical appliances. Economic benefits are seen in terms of lower energy bills. Some of the systems in existence claim they can generate up to 50% energy savings. As another example, lighting alone is about 14% of a typical residential building’s energy consumption, according to Schneider Electric, and up to 30% of the potential for savings in a building lighting system can be realized via active lighting control systems. We also examine in greater detail the possibilities of IoT in home comfort. Given that residential structures make up over 30% of total US energy demand, of which about 30% relates to climate control, home comfort is an important area of development. Specifically, we focus on smart thermostats, where we estimate a market size of roughly \$195mn currently assuming a nearly 2% household penetration rate, with the potential to grow into a several billion dollar TAM as penetration increases.
- **Smart security:** Though the security market has been traditionally dominated by mechanical and electromechanical solutions, increasing integration with digital solutions is driving growth and making up a larger share of the security market. Specifically, we expect products like digital cameras, Video Surveillance as a Service (vSaaS), and the growth of data networks to drive adoption. Some insurance companies are already offering policy discounts to homeowners of around 20% if they install these types of systems. We estimate that the TAM on the total smart security market efficiency is approximately \$36bn.

- **Lastly, healthcare/assisted living:** Connected devices can allow things like remote diagnosis, consultation and monitoring for ill or elderly patients. While the market of providers for these types of solution is still very fragmented, we believe this is one of the areas with greater potential given the possibility of generating new business models, though perhaps with less relevance to industrials names. See Exhibits 28-29.

Exhibit 28: Energy efficiency, home comfort, and security are the 3 primary areas that impact industrials within smart homes

Key components



Source: SoftAtHome, Goldman Sachs Global Investment Research

Exhibit 29: We see multiple enablers of smart home penetration

Component description and key data points

Security	Energy Efficiency	Home Comfort	Healthcare
<ul style="list-style-type: none"> • Home security/monitoring, fire detection • Mature in NA; Europe under served • 30% of US households 	<ul style="list-style-type: none"> • Monitoring of energy consumption of house appliances/lighting/etc. • Part of Smart Grid • European goal of having 80% of households with smart meters by 2020 	<ul style="list-style-type: none"> • Primarily HVAC, but also window shades and lighting • Goal to have a single platform control the home • High end product 	<ul style="list-style-type: none"> • Remote diagnostics • Transmission of critical data to medical centers • Highly complex implementation

Source: SoftAtHome, Berg Insight, Goldman Sachs Global Investment Research

Wide adoption requires moving from the “B-R-I-C-K-S” to the “B-I-T-S”

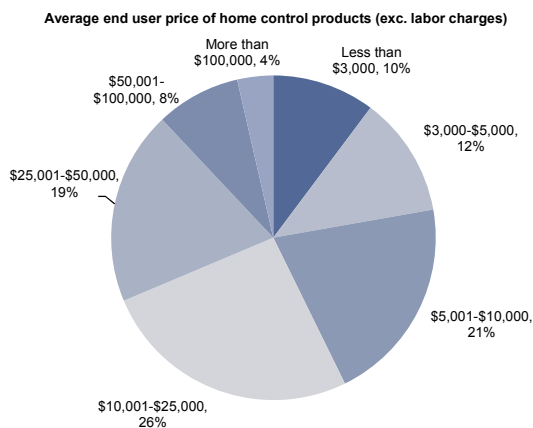
Penetration is still low right now. The Consumer Electronics Association estimates that only 10% of new homes in the United States have some form of home automation (vs. just 5% in 2010). Interestingly, out of these areas, home comfort has had the highest level of penetration, while security has seen the least adoption. Over 60% of the home automation systems in use today include audio and video components and multirooms, while just 40% include lighting control, and only less than 15% includes automated door locks, motorized lifts and access controls. While interest in home automation is quite high, we note that the market remains fairly fragmented globally across many different companies.

While there are some barriers to entry in the market, the “B-R-I-C-K-S”...

- **Behavioral:** Most of today’s homeowners were born before smartphones became ubiquitous. For example, in a recent survey by IDC, 54% of respondents said they had no interest in home automation systems, of whom close to 45% said they had no use for those systems and 35% cited that they saw no value in them. However, as more Generation X and Millennial homebuyers enter the market, we believe they will be more amenable to the frequent use of smartphones within the home. To this end, a July 2013 study by the National Association of Realtors showed that the largest group of recent buyers was Generation X Americans (born 1965-1979), followed by Millennials (born 1980-2000).

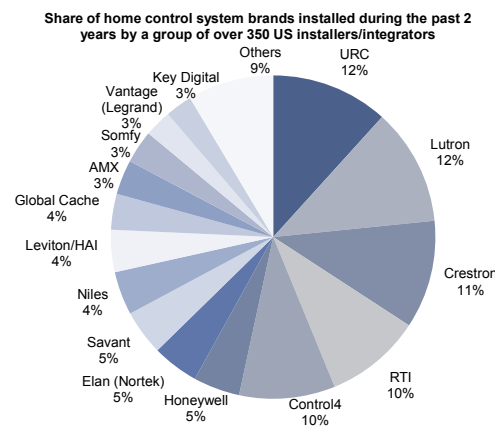
- **Reliability:** Device reliability remains variable. For instance, biometric readers (measuring unique human features to confirm identity) have been available for years and have a promising future but still a very low penetration due to their price and in many cases dubious reliability (the global market is still well under \$10bn and 70% is dominated by large-scale public sector usage). As another example, wireless connected security products, which can have very practical uses particularly in medium size buildings, are sometimes plagued by the inconsistency of data transfer and risks around data protection.
- **Investment:** Although technology is becoming cheaper, price is still the biggest barrier to further penetration of automated solutions. An overall automation system costs on average \$25,000 (about 11% of the median price of an American home at \$222k).
- **Complexity:** Installation of home automation systems is complex and normally requires a specialized installer (with DIY options generally quite involved). Further, architects and contractors have few incentives to install home automation systems given the specialized knowledge required. In fact, it takes on average 36 hours to program a typical high-end home automation system but 104 hours to perform the physical installation of a high-end system.
- **Kinds:** Home automation systems capture a vast array of often competing ecosystems that can make it difficult for the homeowner to easily and effectively integrate “smart” features throughout the home.
- **Security:** Finally, one of the key concerns consumers have with home automation (particularly that involving remote control and Internet based solutions) is privacy and how easy it will be for others (e.g., governments, manufacturers or even just hackers) to get access to personal data. See Exhibits 30-32.

Exhibit 30: Home automation systems are still quite expensive
Average end user price of home control products



Source: CePRO, Goldman Sachs Global Investment Research.

Exhibit 31: Complex and competing ecosystems make it hard for consumers
Share of home control system brands installed during the past 2 years by a group of over 350 US installers/integrators



Source: CePRO, Goldman Sachs Global Investment Research.

...on the flip side, the “B-I-T-S” could proliferate to support the growth of home automation.

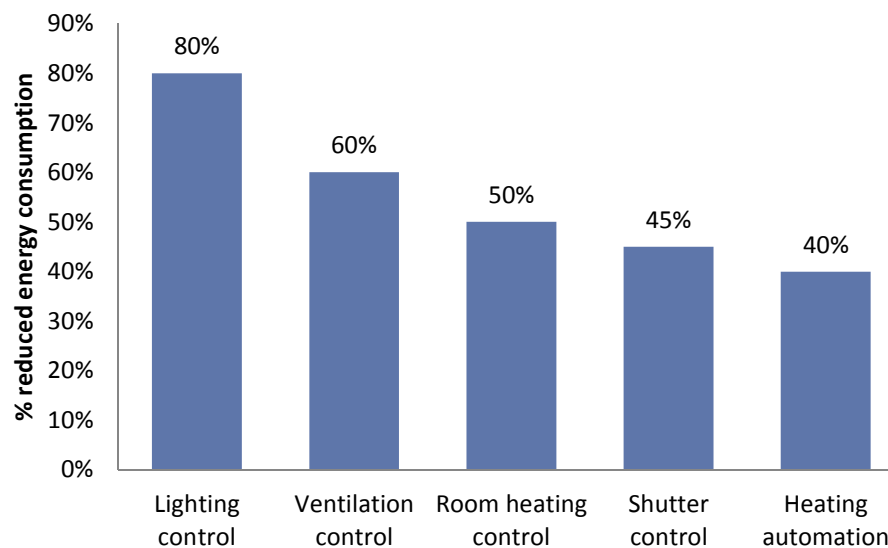
- **Base of smart device users:** There are currently 1.9bn smartphone users globally, which the Goldman Sachs CommTech team expects will grow to 4bn by 2016. As vendors focus on the development of more solutions managed through smart devices (e.g.,

Apple's HomeKit), we believe that the large installed base of smart device users will help drive adoption of IoT applications throughout the home.

- **Integration:** Some protocols are already starting to emerge as dominant such as Zigbee (used by Schneider and Legrand) and Z-wave (used by Motorola and ADT), but clearly the push for solutions around known ecosystems such as Apple or Android could also be a massive enabler of the integration of various standards and networks currently in use. Given the fragmentation of current standards, we believe that consolidation of standards or more open protocols would open the door to more widespread adoption of smart home solutions as it would simplify consumer choice.
- **Technology:** Hardware continues to become more functional, energy efficient, and user friendly as companies focus on both the usability of the device as well as the user interface. For instance, ABB cites that building control systems can offer over 40% electricity savings within various applications. Further, more seamless software offerings that either come with the hardware device or are offered as an overlay on multiple types of devices will likely make consumer choices easier. In this vein, enhanced software capabilities can make data collection and analysis more robust for the end user.
- **Savings:** More opportunity for end users to derive energy efficiency/productivity savings will be key to IoT adoption.

Exhibit 32: Building control systems can offer over 40% electricity savings potential within various applications

Percentage of reduced energy consumption



Source: ABB.

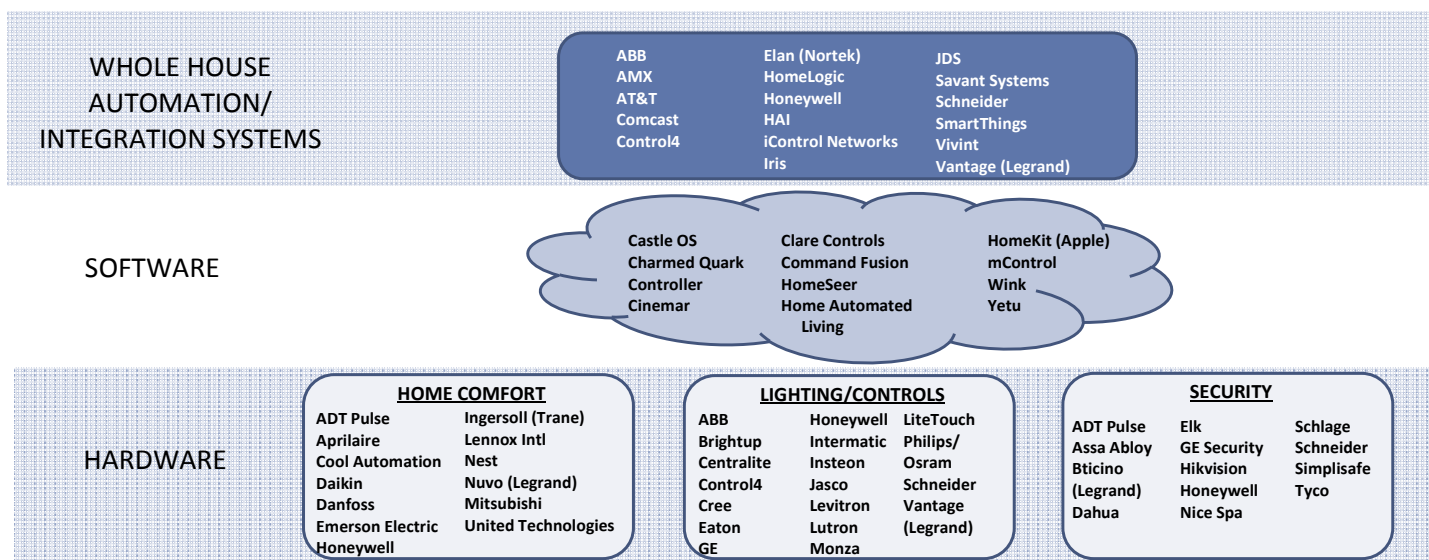
Who can turn the hype into reality?

Many companies are competing for dominance in the smart home. As opposed to areas of traditional electrical equipment, security or fixtures in the house, the competitive landscape for automated solutions is much broader than when devices only were involved. In addition to traditional point device manufacturers, telecom operators, utilities, IT/software companies as well as service providers are all trying to serve the market for integration of automation and control systems. While this might mean more pricing pressure for device manufacturers, it may also be necessary to increase end user awareness. Broadly, smart home players fall in two categories:

- **Traditional hardware/device manufacturers:** Historically, device manufacturers have tried to maintain a competitive edge by keeping close protocols and standards, which made broad adoption more difficult. With pressure to make more compatible ecosystems, traditional manufacturers will have to either face new entrants as direct competitors or try to integrate them in the value chain as partners. They will however most certainly need to be nimbler with their innovation cycles and get closer to their customer bases to prevent intermediation, which could mean loss of margin.
- **IT companies/service providers:** The entrance of service providers and IT companies has increased the number of open protocols, helping to open up the market. See Exhibit 33.

Exhibit 33: Key companies across the overall home automation landscape

Schematic of major public/private participants across home automation



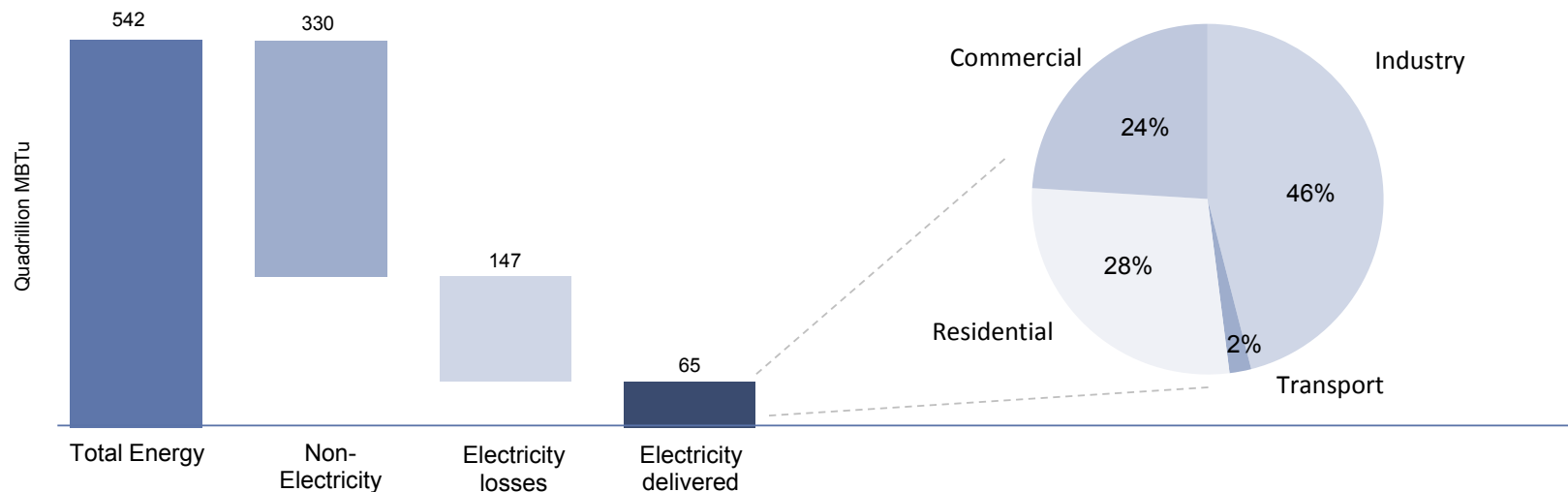
Source: Company data, Goldman Sachs Global Investment Research.

Home energy efficiency and home comfort

Buildings account for more than 50% of electricity consumed globally, mainly through heating, cooling, lighting and powering electric appliances. Intelligent building systems have the potential to significantly reduce energy consumption. To this end, per the Association of the German Electrical Industry (ZVEI), energy consumption and lighting costs in buildings of all kinds can be reduced by up to 80 percent using intelligent building systems. While 85% of corporations consider energy management in buildings as very or extremely important, up from around 35% just five years ago (according to a survey of about 3,500 companies in 16 countries sponsored by the Institute for Building Efficiency and JCI), only about 60% of corporations have actually invested in some form of energy management control, most of them just through lighting controls.

While it can be difficult to parse out home energy efficiency from interrelated applications such as home comfort, lighting controls, and security, we address the potential savings garnered from home energy efficiency, on the whole. Significant progress has been made in some particular areas, although not across the board. For example, according to McKinsey, US energy consumption per unit of floor space is down over 20% over the last 30 years and industrial energy consumption per real GDP output is also down over 40%. These gains are however small when compared with labor productivity or materials productivity improvement over the last few decades. Limited regulation and tax incentives in many places, volatile rates of return on investment, a frequent mismatch between buyers and users of equipment and human inertia to adapt are still major barriers to larger scale adoption of energy management equipment, particularly on the consumer and residential side. This is likely to take several years to change materially.

Exhibit 34: A lot of electricity is lost before it gets to buildings, but of electricity delivered, residential buildings alone represent about 30% per EIA
 Breakdown of electricity generated vs. delivered



Source: EIA, Goldman Sachs Global Investment Research.

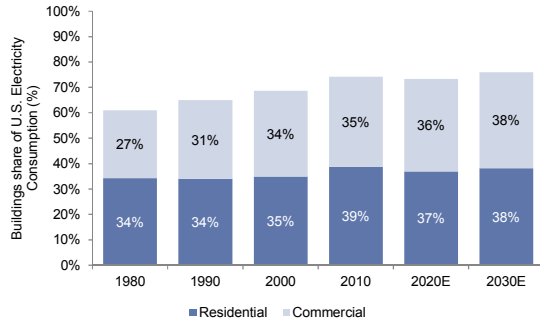
Most electricity is lost before it gets to buildings, but plenty of savings opportunities exist within the structure

Electricity is the single biggest source of energy but delivering it to end users can be an inefficient process. While about 30% of electricity consumption is residential, homes remain a territory vastly underexplored in terms of application of energy saving methods. For example, lighting alone is about 14% of a typical residential building's energy consumption, according to Schneider Electric, and up to 30% of the potential for savings in a building lighting system can be realized via active lighting control systems.

We identify the following drivers that we believe will contribute to structural growth in the building efficiency market over the next decades:

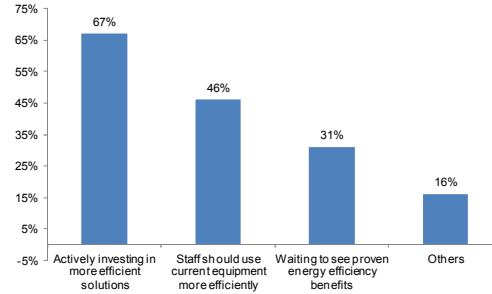
- Buildings (and residential specifically) represent one of the largest sources of electricity consumption.
- Energy consumption is set to continue to increase at c.2% pa over the next 25 years, according to the US DoE and US Energy Information Agency (EIA) estimates, and users have shown a willingness to invest in solutions.
- Though most users demand a payback time of under three years for energy efficiency investments, we expect payback times to decline as technology improves, significantly raising the attractiveness of these solutions.

Exhibit 35: Resi represents over 30% of electricity usage which the DoE expects to increase
Buildings share of US electricity consumption



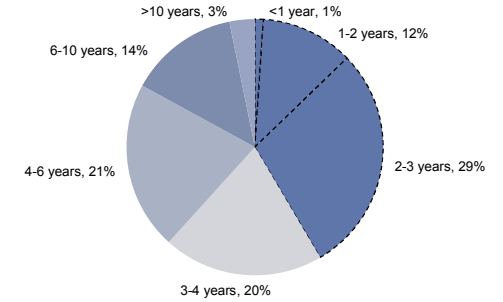
Source: US Department of Energy.

Exhibit 36: Users are willing to invest in energy efficiency solutions ...
Survey of 250+ managers of commercial buildings housing more than 500 employees; attitude towards energy efficiency in buildings



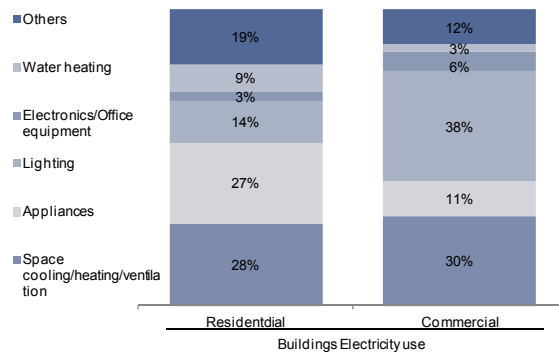
Source: Company data, Frost & Sullivan.

Exhibit 37: ... with about 40% requiring less than three years for payback
Johnson Controls 2012 Energy Efficiency indicator; maximum payback period accepted by respondents



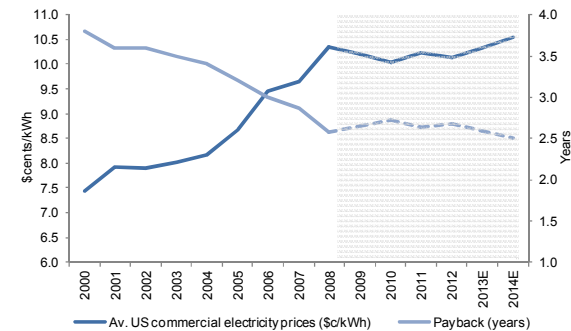
Source: Johnson Controls.

Exhibit 38: Temperature, lighting and appliances provide ample room for electricity savings in buildings
Electricity used by category



Source: EIA, Goldman Sachs Global Investment Research

Exhibit 39: Electricity price increases reduce energy efficiency paybacks
Typical energy efficiency payback for US commercial building; assumes project costs US\$1mn, 3,500MWh electricity saving; US electricity prices as per EIA forecasts



Note: Shaded area indicates extrapolation of historical profile.

Source: EIA, Schneider Electric, Goldman Sachs Global Investment Research

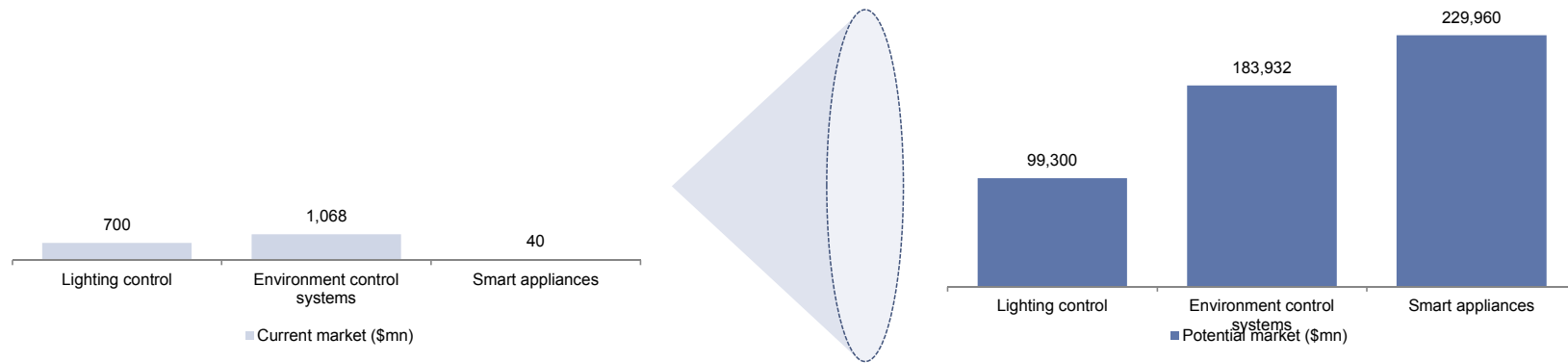
From a regional perspective, developed markets dominate

Currently, there are around 3.8mn homes that have some automation functionality installed in North America and in Europe, of which less than a quarter includes multifunction or whole-home systems. While we believe the addressable market in Europe will be larger than that in the United States, we note that the United States is a more mature market than Europe. We expect penetration

rates in the United States will remain ahead of Europe's, unless the latter region goes through a material construction boom, which our Construction teams do not forecast at the moment. See Exhibits 40-43.

Exhibit 40: The potential market for home automation in North America assuming 100% penetration is huge...

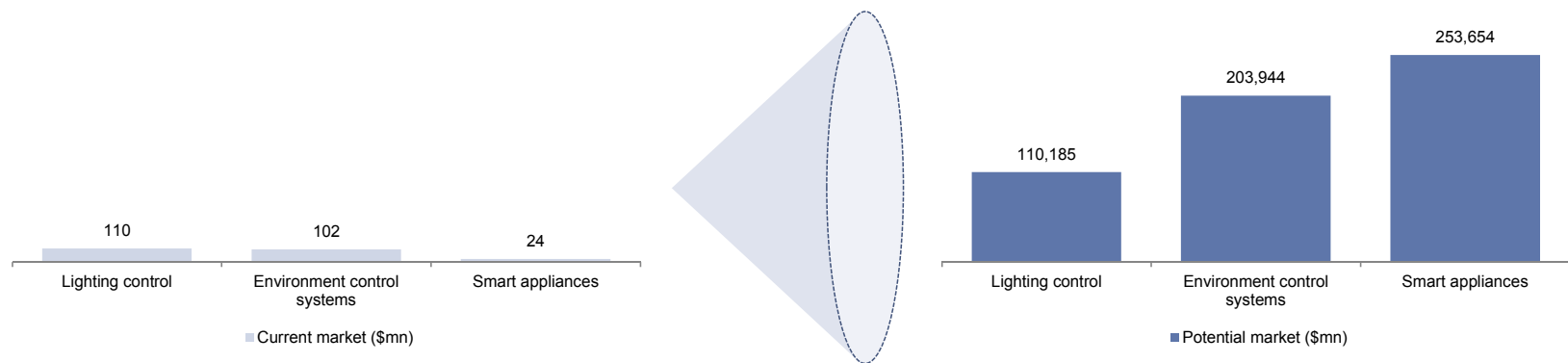
Current and potential market for home automation in North America



Source: BSria, PRNewswire, Goldman Sachs Global Investment Research.

Exhibit 41: ... and even bigger in Europe

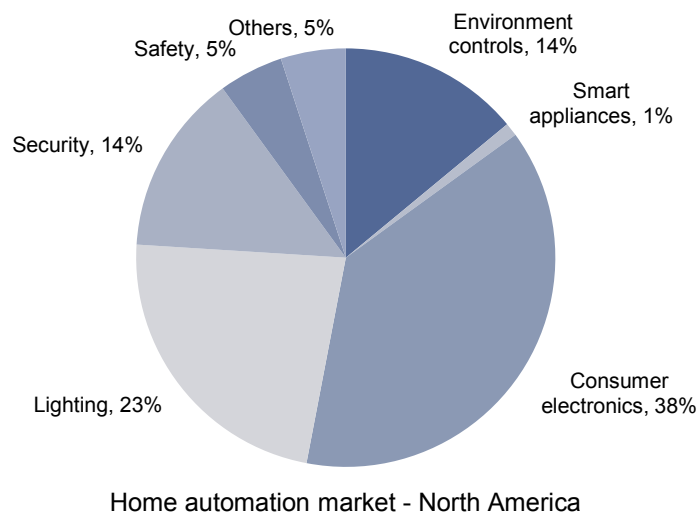
Current and potential market for home automation in Europe



Source: BSria, PRNewswire, Goldman Sachs Global Investment Research.

Exhibit 42: In NA, energy efficiency, home comfort and security will be key areas of Industrial focus...

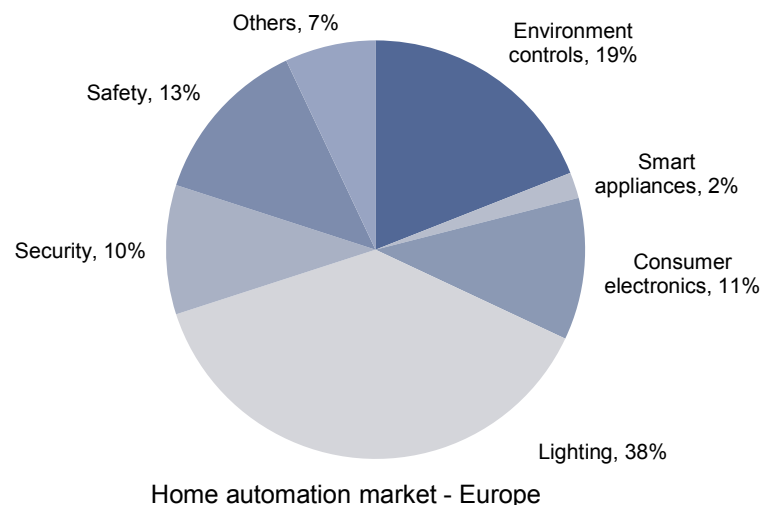
Split of current installed base in North America



Source: BSRIA Smart Home Study 2013.

Exhibit 43: ...as well as in Europe

Split of the current installed base in Europe



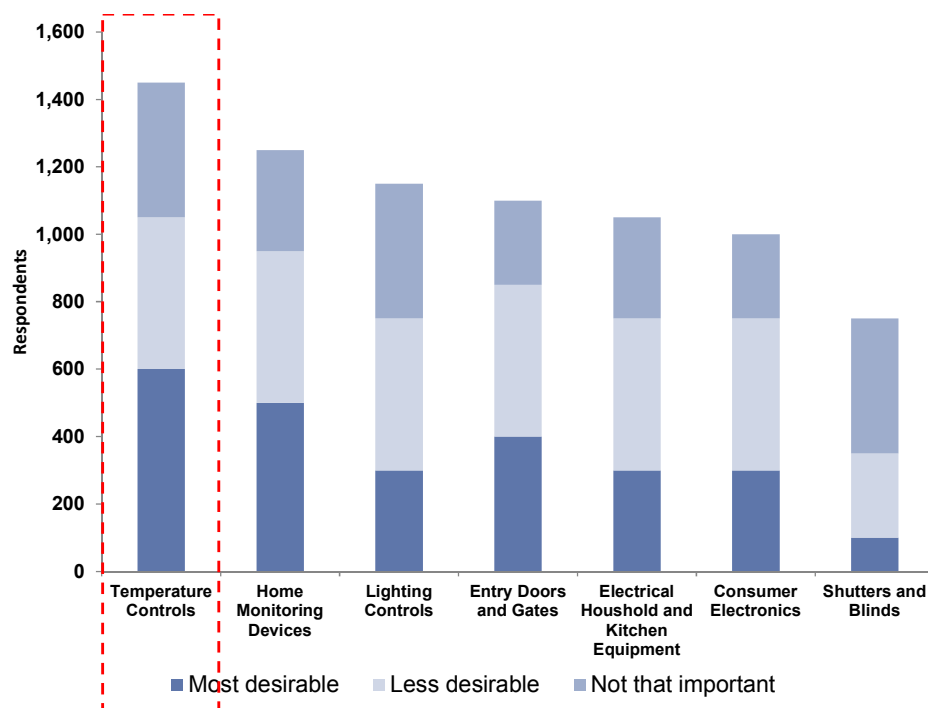
Source: BSRIA Smart Home Study 2013.

Home Comfort has been one of the first areas of adoption within smart homes

Within smart homes, home comfort has had the highest level of penetration. Recent product introductions by HVAC OEMs have moved beyond the testing phase and are beginning to be adopted by the marketplace with the introduction of smart thermostats and smoke detectors and the use of wireless-controlled heating and cooling devices. Specifically, temperature control is one of the most important factors in a connected home, per surveys of consumers. In particular, the ability to have improved air quality within the home coupled with temperature control has become increasingly important to the home owner. We also note that product designers have also begun to integrate home comfort systems with security (i.e., ADT Pulse/Nexia Home Intelligence from Trane; GOOG Nest’s pending acquisition of cloud video provider Dropcam).

Energy efficiency is the primary driver of home comfort adoption. While seasonal energy efficiency ratios (SEER) have played a large part in this historically, we believe that the next stage of home energy management will come from managing the comfort of the constituents in the home. In particular, should home comfort devices be able to regulate when HVAC systems are in use or cool a zone of the house that has outsized exposure to the sun, we believe this will save significant operating costs. See Exhibit 44.

Exhibit 44: The ability to control temperature is one of the most highly valued functionalities within the connected home
 Consumer survey of important factors in a connected home



Source: IHS Electronics & Media.

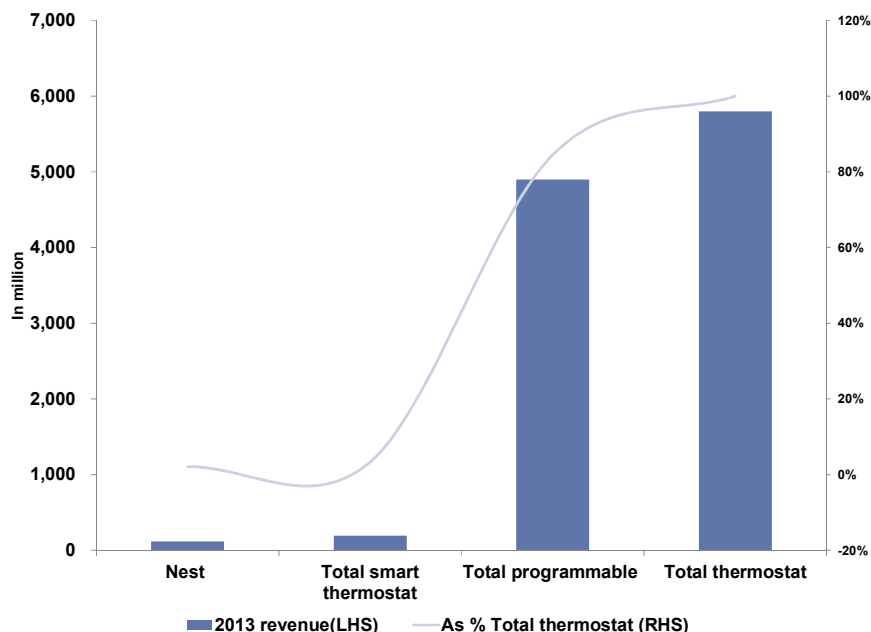
Smart thermostats have garnered increasing attention. One application of home comfort that has garnered significant attention has been the introduction of smart thermostats such as GOOG’s Nest or HON’s new Prestige offering. Unlike basic programmable thermostats that work on a setback schedule, smart thermostats monitor and react to occupant activities. From a technical standpoint, smart thermostats engage two types of sensors: 1) passive infrared motion sensors (PIR) and 2) magnetic read switches. Most of these sensors are also compatible to security products that monitor home activities. However, the penetration of smart thermostats is still minimal right now. In 2013, US shipments of smart thermostats were around 975k units or about 75% of global shipments. We estimate that the average US smart device costs around \$200 (vs. Nest: \$250). Therefore, we estimate that the total US smart thermostat market size is roughly \$195mn, at only a 2% household penetration rate.

We believe smart thermostats could enjoy increasing penetration in US households. Per Navigant, the smart thermostat market is expected to grow at a 50% CAGR through 2020 globally, with the United States accounting for more than half of the global market. We analyze the potential opportunity and believe that smart thermostats could have a \$3bn TAM if it reached 10% penetration in US homes. We take into account more than 88mn homes that have yet to install a smart thermostat at a cost of \$200/unit. To derive our estimate, we assume that smart thermostats have a 10% penetration rate of the population of US households with thermostats (about 80% of households) vs. its current 2% penetration rate. Results from the recent Consumer

Electronics Association (CEA)'s survey showed positive sentiment towards smart thermostats with 43% of US adults (about 17% of US households) expressing willingness to purchase home automation systems. Hence, we remain upbeat on the market potential for smart thermostat, and view potential upside to Navigant's \$1.4bn forecast by 2020. See Exhibits 45-46.

Exhibit 45: 2013 thermostat revenue by type, smart application remains small

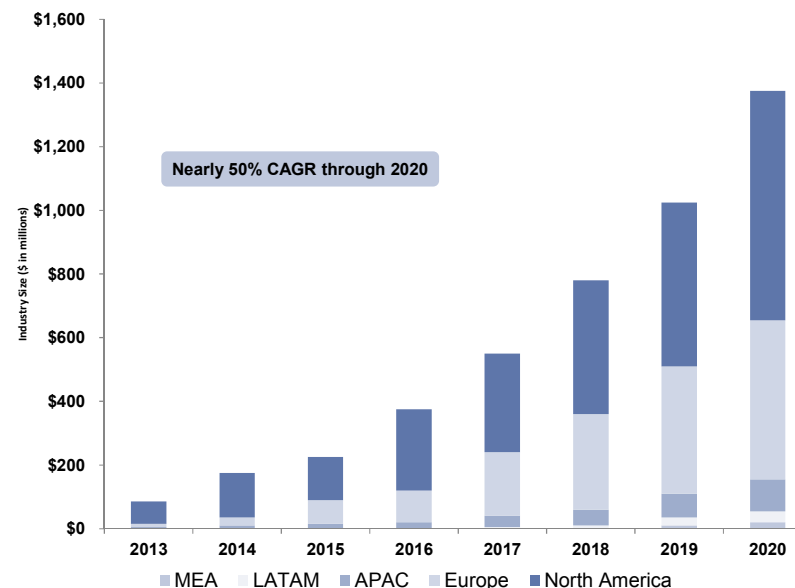
Sales in USD million



Source: Nest, ABI, Goldman Sachs Global Investment Research.

Exhibit 46: The smart thermostat market is expected to grow 50% annually through 2020, per Navigant Research

Geographic dispersion of smart thermostat market: 2013-2020E



Source: Navigant, Goldman Sachs Global Investment Research.

Key companies

Across the industrial landscape, competition for control of the home is increasing as more and more companies realize the importance of being able to provide home comfort and safety. Increasingly, we believe that investors should be focused on components of the system, particularly in HVAC applications, that can see disproportionate benefits. For the most part, across the HVAC spectrum, more and more components (thermostats, HVAC units, heat pumps, controls, etc.) are increasing the use of sensors that can communicate with one another and ultimately help control temperature/comfort inside the home. Exhibit 47 includes a list of companies that participate, as well as a short description of the products manufactured. Top names in the smart thermostat market are Honeywell, Nest, Ecobee, Trane and Emerson.

Exhibit 47: Multiple competitors are vying to gain share in the HVAC home automation market

Key competitors in the home comfort market – HVAC participants

Company Name	Ticker	Brand	Product Name	Product Description
ADT Corporation	ADT	ADT	Pulse	Managed security service, but integrates with home automation
Aprilaire (Research Products)	Private	Aprilaire	Model 8800 Thermostat	Universal communication thermostat connecting to all home automation brands/products
Cool Automation	Private	CoolMaster	Various	Communication gateway to integration with home automation systems More comm'l in nature; Supports VRF technology
Control4 Corporation	CTRL	Control4	Various	Centralized home management platform
Danfoss	SHS	Danfoss	Thermal wax actuator (TWA)	Actuator product that activates valves and floor manifolds
Ecobee Inc.	Private	Ecobee	Smart Plugs/Smart Si	Energy enhancers that measure energy consumption by appliance or whatever is plugged into an outlet
Emerson Electric Co.	EMR	Climate Tech	Smart Energy Thermostat Sensi	Programmable thermostat with app-like UI; Wireless connectivity Wi-Fi thermostat and app
Honeywell International Inc.	HON	Honeywell	Lyric Prestige Comfort Total Connect Comfort RedLINK	WiFi connected thermostat pinpoints user location through geofencing Connected programmable thermostat - Cloud connected Cloud-based app for wireless HVAC/thermostat control Wireless controllers embedded in multiple OEM products
Ingersoll-Rand Plc	IR	Trane	Nexia ComfortLink	Home intelligence device to improve comfort, efficiency, and security To be paired with Nexia; Comfort control device for HVAC
Lennox International Inc.	LII	Lennox	ICOMFORT IHARMONY	Remote access energy management system for HVAC controls Wireless zoning system to room specific controls
Mitsubishi	6503.T	Mitsubishi	M-Series cooling products	Enabled with RedLINK wireless controllers that talk to HON RedLINK gateway for seamless integration
Nest (Google)	GOOG	Nest	Nest Learning Thermostat	"Learning" Wi-Fi enabled thermostat
United Technologies Corporation	UTX	Carrier	Infinity	A suite of high performance HVAC controllers, furnaces, heat pumps, and handlers

Source: AHRI, Company data, Goldman Sachs Global Investment Research

Deep dive into smart home security**Smart home security: An overview**

Though the security market has been traditionally dominated by mechanical and electromechanical solutions (close to 80% of the market by our estimate), increasing integration with digital solutions is driving growth and making up a larger share of the security market. Specifically, we expect products like digital cameras, Video Surveillance as a Service (vSaaS), and the growth of data networks to drive growth. Based on our bottom-up analysis of the smart home security market, we believe it has a TAM of \$20bn currently, which we expect to grow at a 17% CAGR through 2017 to \$36bn, with double-digit growth in all three categories of hardware, software, and networks.

Specifically, we classify the smart home security market into two broad categories:

1. **Video surveillance:** the monitoring of the home through cameras and sensors. Within video surveillance, analog cameras are the traditional security cameras familiar to most, where a camera is mounted in the area being observed and the recorded

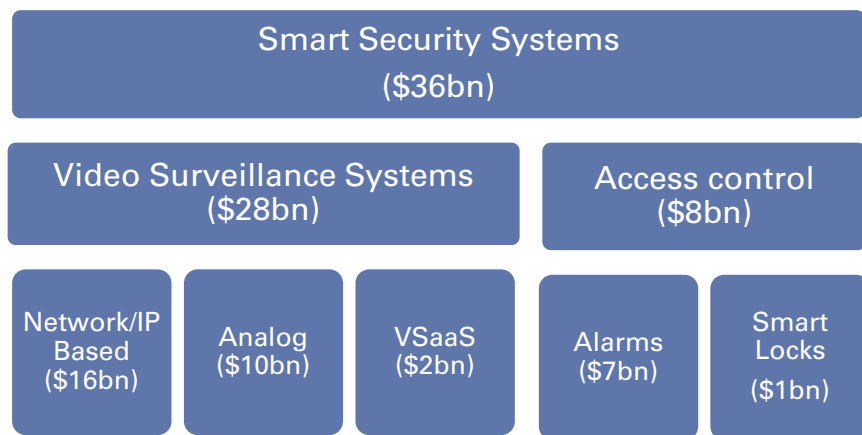
footage is kept onsite. Network/IP-based cameras also rely on a camera on-site, but stream the data to an off-site/remote location, where the data can be stored and analyzed. Lastly, VSaaS (Video Surveillance as a Service) refers either to the ability to remotely access one’s cameras, or to the ability to record video “in the cloud.”

2. **Access control:** alarms and smart locks. Alarms refer to the traditional entry alarms triggered upon intrusion into a space. Smart locks refer to smartphone-enabled door locks that can be controlled or managed remotely to lock/unlock or grant entry to specific individuals at predetermined times. Examples of smart locks: August, Assa Abloy, Lockitron, Schlage, Kevo.

We believe home security could be at the forefront of smart home penetration given several demographic considerations that will spur homeowner interest in IoT-enabled security offerings. According to the Consumer Electronics Association, only 12% of renters and 31% of homeowners own security systems. Even among those who have security systems, 2/3 of people leave them off, per ADT. Meanwhile, the National Center for Victims of Crime reports that 66% of burglaries are residential break-ins, highlighting that there remains a disconnect between the incidence of crime and the adoption of security systems. Since 2002, increased adoption of home security measures, including smart home security options, has reduced the incidences of burglaries by 11%, while larcenies have declined by 20%. However, we note that the concentration of police officers for every 100,000 residents has stayed roughly constant over the past 20 years, suggesting that demand for security systems is likely to be sustained. Exhibits 48-49 size the smart home security systems market at \$20bn in 2013, growing to \$36bn in 2017 (17% CAGR).

Exhibit 48: Smart security systems can be broadly classified into video surveillance and access controls

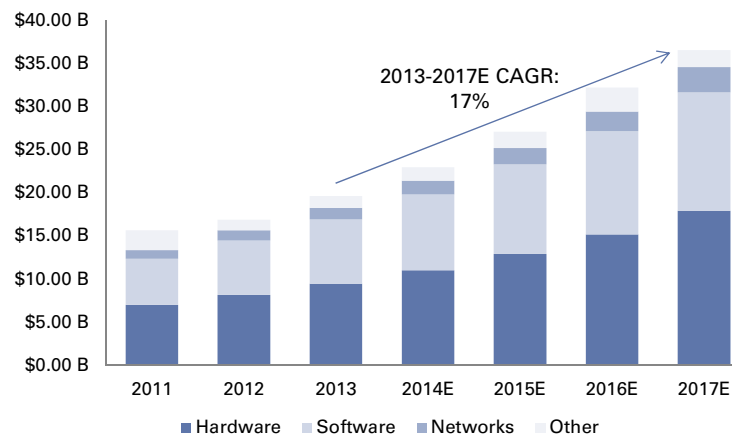
Smart security system components and TAM in 2017



Source: Goldman Sachs Global Investment Research.

Exhibit 49: We estimate a TAM of \$20bn currently, growing to \$36bn by 2017

Smart security market growth: \$ bn and % CAGR



Source: Goldman Sachs Global Investment Research.

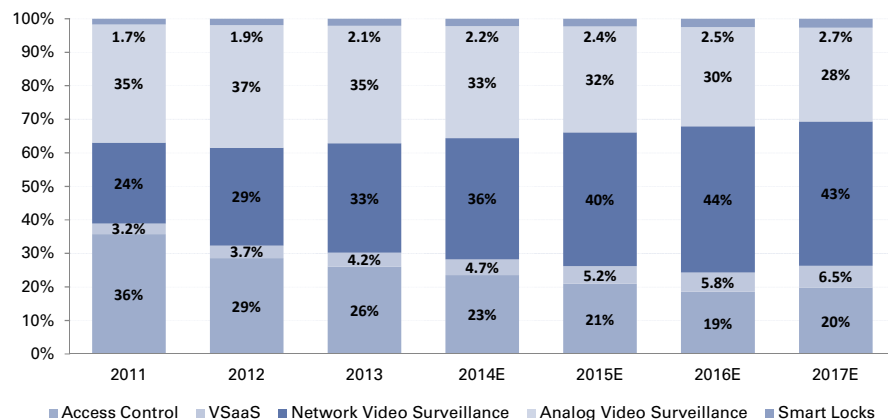
Smart home security is a fast growing market

Network/IP-based applications are growing faster than analog video/access controls. Our bottom-up analysis of the smart security market suggests that network/IP-based video surveillance/VSaaS and smart locks will grow faster than analog video surveillance and alarms, thus becoming a greater part of the home security market. Specifically, we estimate that network/IP-based video surveillance (including VSaaS) is a \$8bn market making up about 40% of the total home security market currently, but that its

share will grow to 50% by 2017 as analog video declines to 28% of the mix vs. 35% currently. Additionally, front end hardware and software (e.g. the actual cameras) are likely to outpace the back end hardware (e.g., local storage systems in a CCTV set-up). See Exhibits 50-51.

Exhibit 50: Network/IP-based devices are gaining market share vs. analog video/access controls

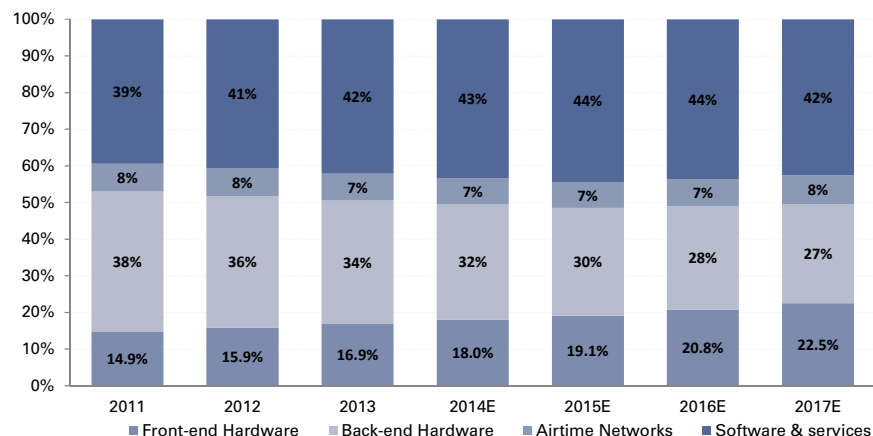
Mix of network/IP-based devices vs. access controls



Source: Markets and Markets, Home Security Solutions Market – Global Forecast & Analysis (2012-2017).

Exhibit 51: Front-end hardware and software are outpacing back-end hardware

Mix of hardware, software, and networks

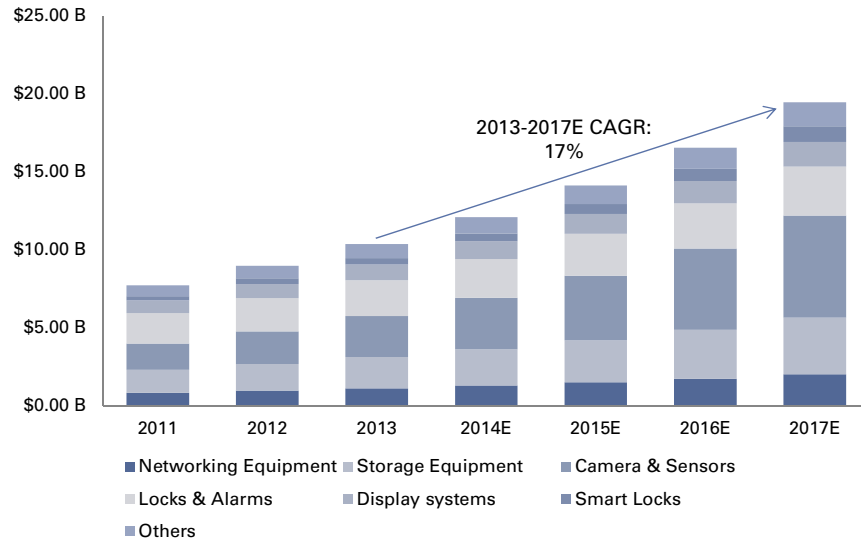


Source: Markets and Markets, Home Security Solutions Market – Global Forecast & Analysis (2012-2017).

We believe hardware has a TAM of \$10bn, growing at a 17% CAGR to \$19bn by 2017, with cameras/sensors the largest component. Hardware makes up about half of the total home security market and comprises cameras, sensors, storage, monitors, and locks. While just three years ago, non-connected hardware dominated the home security landscape, with 69% share of the hardware market, the introduction of connected offerings has caused share of connected devices to increase. By 2017, we expect connected devices to constitute almost half the total hardware market. Much of the adoption of connected hardware will be driven by connected cameras and sensors. While IP cameras currently cost about 1.5 times more than traditional analog cameras, per Frost & Sullivan, technology improvements that have reduced storage and bandwidth requirements are making connected cameras increasingly attractive to consumers. Preference for IP cameras stems from their ability to contain more information, thus enabling a quicker and more efficient response than traditional systems, higher image quality, and easier network connectivity. We estimate that sales of network cameras will outpace those of analog cameras by 2015 as the price differential between the two narrows due to better technology and greater consumer demand for more sophisticated security options drives growth.

Exhibit 52: We estimate a Hardware TAM of \$10.5bn currently, growing at an 18% CAGR through 2017

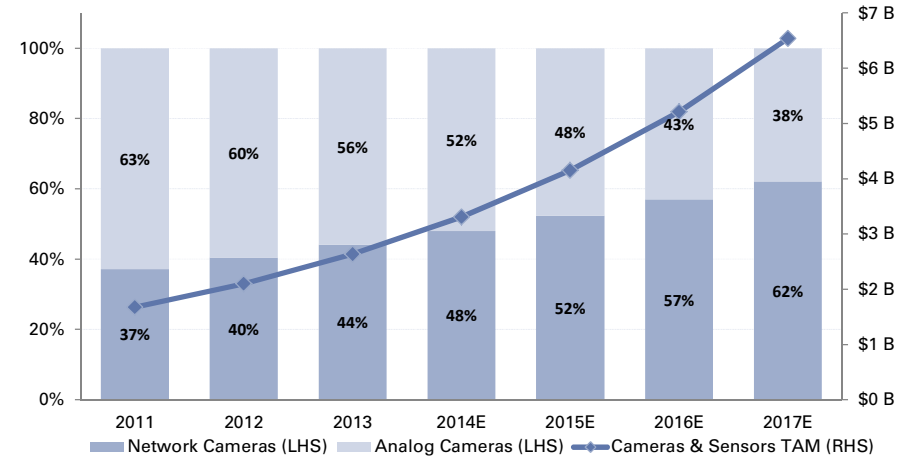
Hardware TAM



Source: Markets and Markets, Home Security Solutions Market – Global Forecast & Analysis (2012-2017).

Exhibit 53: We expect adoption of connected hardware to be driven by cameras and sensors

Network vs. analog cameras mix (LHS). TAM for cameras & sensors: \$ bn (RHS)

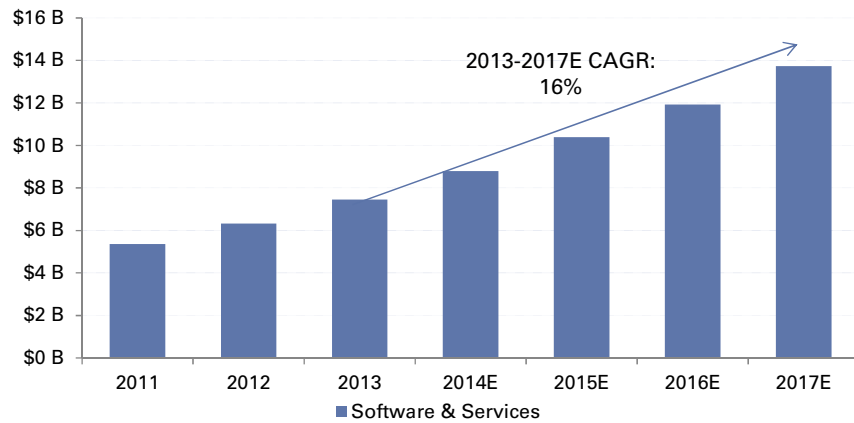


Source: ABI Research.

We believe software has a TAM of \$8bn, growing at a 16% CAGR to \$15bn by 2017. Software makes up over a third of the total home security market. We expect a 16% CAGR from 2013-2017E as software offerings keep pace with mushrooming connected hardware offerings. Much of the adoption of connected hardware will be driven by VSaaS/video analytics. Currently, an estimated 100mn surveillance cameras are in use worldwide, of which only 4% are estimated to be connected via vSaaS.

Exhibit 54: We estimate a Software TAM of \$8bn currently, growing at a 16% CAGR through 2017

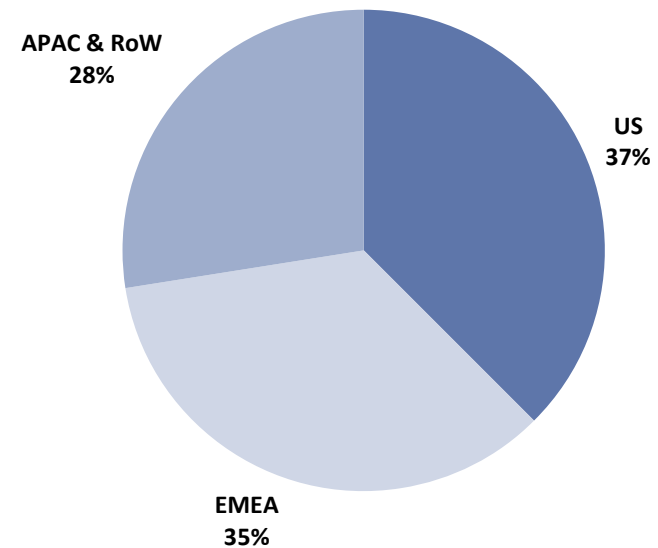
Software & services TAM



Source: Pyramid Research.

Exhibit 55: Developed markets will drive growth now, but emerging markets will be a longer-term tailwind

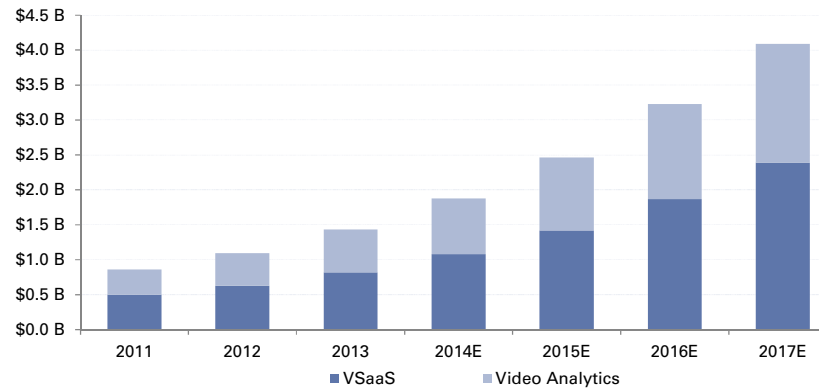
Regional breakdown of software & services market



Source: Pyramid Research.

Exhibit 56: VSaaS and video analytics will lead growth in software

VSaaS and video analytics TAM

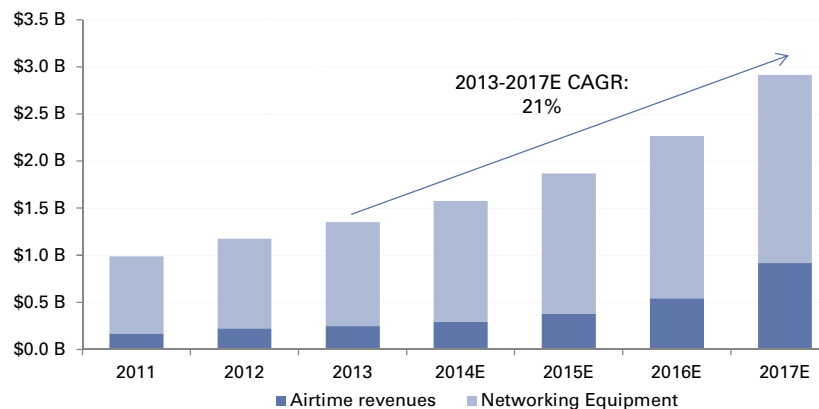


Source: Pyramid Research.

We believe networks have a TAM of \$1bn, growing at a 21% CAGR to \$2bn 2017. While currently the smallest portion of the smart home security market, networks are an important area of development, as various and often incompatible ecosystems compete for market share gains. Networks can be broadly classified into short-range (home area networks) that connect devices within the home and long-range that connects devices to external/third-party vendors and storage (e.g., VSaaS). We assign the fastest growth CAGR to networks given the vast amounts of data that connected hardware devices can generate.

Exhibit 57: We estimate a Networks TAM of \$1bn currently, growing at a 21% CAGR through 2017

Networks TAM



Source: Berg Insight

Key risks

Security: Data security and prevention of unauthorized access is, in our view, the largest barrier to more widespread adoption of smart home security technologies. As more and more security data moves into external storage and/or the cloud, consumers must cede control and access of that data to third-party vendors and as such, must trust that personal information will not be compromised by hackers or other cyber threats.

Interoperability of numerous technologies: Multiple technological platforms restrict interoperability within various smart security solutions. The many proprietary ecosystems offered creates a very fragmented consumer offering that could dis-incentivize adoption of these technologies due to the complexity involved.

Operational risks: Smart home security solutions have only been extant for about a decade and still represent a burgeoning portion of the home security market. Further, there are many technologies being introduced by new market entrants that have not traditionally played in the home security market. Thus, some offerings will need to build brand trust/loyalty.

Analytics: Most smart systems generate massive amounts of data which require complex analysis for the best response. If software analytics do not keep pace with data generated by connected hardware, then consumers will not benefit from the increased data capture/storage conferred by more advanced connected hardware systems.

Global stocks with top exposure to home automation

Assa Abloy (ASSAb.ST, Neutral): Unlocking the entrance into IoT

Covered by Daniela Costa, European Electrical Equipment analyst

Company profile

Assa Abloy is a leading provider of door opening solutions, servicing the needs for security, safety and convenience. The company is represented all over the world, in both mature and emerging markets, with leading positions in much of Europe, North America and Australia. One in every ten locks and security installations worldwide uses Assa's technology. In the fast-growing electromechanical security segment, the group has a leading position in areas such as access control, identification technology, door automation and hotel security. Assa has made a number of acquisitions in the entrance systems space over the years including Ditec Group, a leading company in automatic doors, industrial doors, high-performance doors and gate automation, and FlexiForce, a world leading manufacturer of components for entrance automation.

Exposure to Home Automation IoT

We believe Assa's exposure to IoT stands at about 15% of sales currently. Assa Abloy has various solutions to satisfy the quest for more connectivity within home equipment. Some of its flagship offering include:

- Seos – an ecosystem of interoperable products and services for issuing, delivering and revoking digital keys on smart phones, so that they can be used to open doors. Assa serves the residential market in this area with its Yale brand, the lodging segment with the Essence by VingCard. The HID Readers and Aperio cylinders are used in offices and commercial buildings to enable access to rooms and cabinets to be managed centrally.
- Aperio – smart technology that enables mechanical locks to be wirelessly linked to a new or existing access control system.
- Hi-O (Highly intelligent opening) – a new concept for electronic door locking solutions that simplifies installation, service and upgrade, based on the ISO-standard CAN data communication network. Any device, whether an electric strike, proximity reader, or door automatic, can be connected to a network through a four-wire cable. When connected, devices can automatically start sharing information. Intelligence is built into each device, instead of one centralized logic unit, creating a highly secure plug-and-play system.
- RFID credentials, tags & readers by HDI Global – Assa offers a variety of identification applications using radio frequency identification that are used from animals to automation to waste management.
- Smart cards & credentials by HDI Global – Assa offer a wide range of access control and secure identification applications that protect personal information or deliver secure transactions.

Cree (CREE, Buy): Leader in next generation, energy-efficient, and connected LED lighting

Covered by Brian Lee, US Clean Energy analyst

Company profile

Cree is a leading global manufacturer of light-emitting diode (LED) chips, components and lighting systems, and also produces semiconductor products for the power and radio frequency (RF) applications. In an ultra-competitive LED sector, Cree has differentiated itself from its scale-driven peers through a technology focused business strategy, consistently delivering best-in-class

LED products for the lighting industry that set the global standard in regards to energy efficiency (e.g., efficacy) and useful life. Today, Cree's LED chips/components are sold globally, while its LED consumer bulbs and lighting systems are primarily for the North American market. We believe we are in the early stages of a multi-year transition – driven by energy efficiency – toward LED lighting, and we see the recent acceleration in adoption continuing, leading to sales growth of at least 25%-30% annually given the still-low penetration (e.g. <5%) of the installed base globally.

Exposure to Home Automation IoT

Just in the past six years, Cree has developed into a leading market share holder in the still-nascent transition to LED lighting, with nearly 45% of overall revenue now derived from its lighting business – a segment that we expect to see continued growth driven by secular adoption of LED lighting. We expect the next wave of innovation in lighting to include not only more efficient LEDs, but also fully networked and controllable lighting solutions with enhanced functionality – including security, positioning and two-way communication – which should help deliver increased cost savings and drive adoption. We see Cree well positioned given:

- Partnership with Lutron Electronics – Cree embeds a Lutron EcoSystem microprocessor chip directly into its driver technology, enabling digitally controllable LED luminaires.
- SmartCast Technology – developed in-house, this is a self-programming wireless lighting control system that, along with Cree's OneButton Setup, enables Cree's LED luminaires to establish a secure network and learn about the environment and form groups, all of which helps in reducing energy consumption and maximize savings.

Dahua (002236.SZ, Buy): An entrant into the home video surveillance market

**Covered by Sam Li,
Asia Hardware analyst**

Company profile

Dahua is a leading video surveillance equipment vendor in China (US\$880mn revenue in 2013), the second-largest after Hikvision. It focuses on providing hardware like video recorders, surveillance cameras, and other accessories. Dahua's current strategy is to become a security solution provider in the professional market by expanding its product offering (such as access control) and developing video management/analytics capability. Most of its customers are in the professional vertical sectors including public surveillance, banking, transportation, and SME. Overseas sales accounted for 25% of total revenue in 2013, but mostly from OEM for overseas brands.

Exposure to Home Automation IoT

While still in the early stages of R&D investment in the home security market, we expect Dahua could probably launch its first home camera in 2H14, as a trial on product development for the home security market. While we believe the company's strategy for the home security market is to maintain a smaller presence for now, participation could grow when the market matures.

Daikin (6367.T, CL-Buy): A leading HVAC manufacturer's foray into home automation

Covered by Yuichiro Isayama, Japan Machinery analyst

Company profile

Daikin is a major air conditioner maker, ranking alongside US makers Carrier, Trane, and York in the air conditioning/control field. Daikin is the industry No. 1 in ductless air conditioning systems internationally, and has been rapidly increasing its presence in the United States, where ducted air conditioning systems are the mainstream, since its acquisition of Goodman Global.

Exposure to Home Automation IoT

Home automation in air conditioning systems is rapidly advancing in Japan, though still lagging some countries overseas. Daikin, which has an advantage in the air conditioning field, has recently taken an aggressive stance on entering the air conditioning control system business, including building control management. Although it has not yet established sales channels for the home automation in overseas, to the same extent it has in Japan. It is therefore attempting to differentiate itself not only via automation but also via basic/advanced technology such as inverters, Home Energy Management Systems, Building Energy Management Systems, etc.

Eaton Corp (ETN, Buy): Exposure to power management in the home

Covered by Joe Ritchie, US Multi-Industry analyst

Company profile

Eaton is a \$36bn+ market cap power management company with significant exposure to electrical, hydraulic, and mechanical applications. It is a global leader in power distribution and power quality serving the industrial, institutional, utility, commercial/resi, and OE machine builders segments. Eaton also enjoys dominant share in Class 8 truck transmissions in North America.

Exposure to Home Automation IoT

Eaton participates in many electrical applications within the building with market-leading positions in power control, power quality, circuit breakers, wiring devices, and lighting, to name a few. Resi remains a small portion of overall revenues but we believe IoT can help expand ETN's presence in the home. Specifically:

- Eaton's xComfort system, a home automation system launched in 2003, is a wireless system that attaches to existing switches to control them remotely/wirelessly.
- Eaton's Home and Room Manager is its central display and operating unit that can control security/alarm functions, heating, climate and ventilation control systems, water heating/boiler heating, lighting, shutters, and more.

Emerson (EMR, Neutral): A “Sensi”-ble solution to home comfort

**Covered by Joe Ritchie,
US Multi-Industry
analyst**

Company profile

EMR is diversified industrial company with operations in end markets like oil & gas, HVAC, datacenters and industrial automation. Within these markets, EMR has dominant positions in process automation and HVAC compressors through its Process Management and Climate Technology segments, respectively. These segments account for more than 50% of company revenue and also provide EMR with a vast, well-entrenched installed base. Additionally, given the range of EMR products/solutions, it operates at a critical position within the value chain. Specifically on process, EMR’s PlantWeb digital plant architecture and DeltaV distributed control system combined with its broad portfolio of instrumentation products position leave EMR well positioned to capitalize on the opportunity for connected facilities. On the HVAC side, compressors are the heart of the system, and also enjoys a strong position in temperature controls.

Exposure to Home Automation IoT

Within the home, Emerson is a key name in the smart thermostat space. Its Sensi Wi-Fi thermostat connects directly to the router and allows the homeowner to remotely access and control home cooling/heating through a smartphone. To this end, Emerson has partnered with various software startups, such as EcoFactor, EnergyHub, Calico Energy, and Bidgely. For example, with Bidgely, a home energy analytics start-up, Emerson’s thermostat could provide data on consumption without the need for extra hardware or sensors on each plug or appliance.

General Electric (GE, Neutral): At the forefront of the IoT revolution

**Covered by Joe Ritchie,
US Multi-Industry
analyst**

Company profile

GE has been one of the leading proponents for the widespread adoption of IoT. In November 2012, GE published a white paper outlining the potential scope and applications for IoT. While the white paper focused more on industrial applications given GE’s strong positions in end markets such as gas power generation, aviation and oil & gas, it was one of the first instances of an industrial company discussing IoT. To this end, GE was one of the founding members of the Industrial Internet Consortium, a group of industry, government, and academic members working to further the development of interconnected machines. Currently, the company has sales of \$149bn (\$107bn from Industrial) with a well-diversified geographic revenue base. Within its portfolio, GE has exposure to energy efficiency through its Power & Water, Energy Management, and Appliances and Lighting segments.

Exposure to Home Automation IoT

GE participates in multiple facets of the home. GE’s offerings range from lighting, security and home appliances, many of which work with various partners (e.g., Ingersoll Rand’s Nexia™). Several examples include:

- GE Z-Wave Wireless Lighting Control System; the GE Link bulb, a new connected LED bulb that users can control remotely via iPhone through the “Wink” app.
- Home monitoring video cameras and LED security lighting.

- Alarm systems through GE Choice Alert and intrusion alert devices offered through GE Security.
- Smart appliances through GE Brillion™, which can preheat an oven remotely or change its temperature from one's smartphone.

Hikvision (002415.SZ, CL-Buy): Video surveillance expert well prepared for home security

**Covered by Sam Li,
Asia Hardware analyst**

Company profile

Hikvision is the global No.1 video surveillance equipment vendor by revenue (US\$1.7bn in 2013). Hikvision has a broad product offering including recorders (NVR/DVR), surveillance cameras (analog/digital) and video management software (VMS), which enables it to be a solution provider for professional users in various vertical sectors. Hikvision is also strengthening its overseas presence (23% of total revenue in 2013), grew at 66% CAGR since 2011. Following its success in professional market, Hikvision entered the home security market in 2012 by launching the ezvis brand, which primarily offers home surveillance cameras (among other products) that feature remote control, live video stream, cloud storage, smart alert and two-way talk.

Exposure to Home Automation IoT

Although the company has very minor revenue contribution from the early-stage China home security market right now, we see it is well prepared for long-term development.

- Under the ezviz brand name, there is a spectrum of home products including camera, set-top box, hard-disk video recorder, alarm box, door sensor, smoke sensor, and infrared motion detector. The security products can be connected to function together and communicate with smart devices.
- It has also invested a centralized cloud storage/video analytics platform as the brain for the "smart" features on its cameras. It performs all the user behavior, pattern recognition, and data mining works on the video uploaded from both professional and home markets.
- The company is currently developing the home security solution by itself to explore potential business models (current model is hardware (camera) sales with free cloud storage of 7-days' video stream). However, the company is also very open to cooperation with internet names or consumer brands. For example, on June 26, it joined JD.com's (JD, Not Covered) newly launched home cloud platform as the video surveillance solution vendor. We believe the company will focus on its backend data platform asset, act as a video surveillance expert, and open frontend interface (such as cameras or gateways) to various consumer-facing partners.

Besides all of the above, the company also has a strong installed base in the professional market, especially in China. Such a client base could give Hikvision the potential to capture IoT opportunities outside home automation, e.g., the SME market.

Hitachi (6501.T, Buy): Integrated electronics maker with exposure across industrials

**Covered by Ikuo
Matsuhashi, Japan
Semi/Telco/IT Services
analyst**

Company profile

Hitachi is an integrated electronics maker that has become a double-digit ROE company, through restructuring led by current management. Hitachi is gaining momentum particularly in Elevators, Train systems and Auto parts in the overseas markets. For Elevators, Hitachi positions next to Mitsubishi Electric. For Auto parts, although historically the company highly relied on Nissan/Renault, there is clear evidence Hitachi's business with non-Japanese Auto vendors will accelerate in the next 3-5 years.

Exposure to Home Automation IoT

Hitachi will be exposed to IoT in various spaces, such as Elevators, Industrial systems, Auto, Transportation and others. For Auto sector, we see Auto makers are giving more credit to Hitachi as a mega-supplier, which can supply not only motile components/subsystems in the automobile and also expertise in the IT space. Although we are not sure whether this may become successful or not, we see automobile makers showing a tendency to keep a black box to themselves rather than relying too much on Google and other platforms that may make their position weaker.

Honeywell International (HON, Buy): Innovating for the next generation

**Covered by Joe Ritchie,
US Multi-Industry
analyst**

Company profile

HON is a global industrial company with exposure to end markets like aerospace, resi/non res construction, energy and autos. Over the last few years, the company has focused on long-term trends, namely (1) Energy efficiency (2) Energy generation (3) Industrial safety. On the energy efficiency side, homes and buildings have become a focus area for HON as they account for 23% of revenues. HON serves this market through its ACS segment, with products like thermostats and security systems as well as solutions for integrated security and HVAC systems. Additionally, HON is a global leader in many of these end markets, providing the company with a large installed base and strong customer relationships.

Exposure to Home Automation IoT

We see HON as one of the biggest beneficiaries of the IoT wave, particularly as it relates to home automation. HON has been aggressively introducing new products (to compete with the likes of Nest), focusing on software capabilities and working on enhancing the use experience through improved design and voice enabled products. In fact, HON recently introduced the world's first Wi-Fi thermostat with voice control. We expect HON to start integrating its products and provide users with an easier way to monitor various aspects of their homes through one application/control. Additionally, focusing on software and user interface should increase adoption rates and help HON penetrate the market further. Specifically, we note that in the smart thermostats market, HON expects to leverage its substantial existing installed base of traditional thermostats to drive penetration. Honeywell participates in a variety of home automation areas:

- Tuxedo Touch™ functions as a home security and automation controller, keypad, camera viewer, and digital picture frame all in one. This is the central hub that control's HON's Z-Wave enabled locks, shades, lighting, and more.

- Total Connect™ remote services works with Tuxedo Touch™ on a smartphone or computer to control “smart devices” remotely, enable a consumer to receive notifications of events in and around the home, notify consumers when valuable objects have been moved or allow the consumer to look in and around the home via a remote look-in video feed.
- Thermostats: Honeywell offers various smart thermostats enabled with Z-wave, which can automatically adjust every time the user arms or disarms the security system. Key brands include Prestige 2.0 Comfort, Lyric™, VisionPRO and more.

Ingersoll Rand (IR, Neutral): Nexia™ a next step in the more intelligent home

**Covered by Joe Ritchie,
US Multi-Industry
analyst**

Company profile

Ingersoll Rand is a premier commercial and residential HVAC manufacturer (about 75% of sales), with the remainder coming from Industrial power tools, golf carts, and compressed air systems. Specifically, Ingersoll has exposure to applied/unitary HVAC and mobile refrigeration on the commercial side, and on the residential side, sells through its two primary brands, American Standard and Trane. On the industrial side, Ingersoll sells compressed air systems, power tools, material handling equipment, and fluid management products.

Exposure to Home Automation IoT

Ingersoll’s Nexia™ Home Intelligence is its primary home automation offering and serves as an all-in-one home automation solution. Using Z-Wave, Nexia can connect with platform partners such as Schlage (smart locks), Trane/American Standard (HVAC), GE (lighting) and others to control multiple aspects of the home. To this end, the Nexia Bridge serves as the hub of the system, connecting to a Wi-Fi router to allow homeowners remote control of their homes. Further, Ingersoll offers a subscription-based service for \$9.99/month that allows homeowners to have access to their home even when they are away. Specifically:

- Lighting: Partnering primarily with GE, Nexia can remotely control on/off switches and dimmers on lighting within the home.
- Locks: Alongside Schlage (now part of Allegion), Nexia can remotely lock and unlock doors and also allows for keypad access so that the homeowner can assign different access codes to different users.
- Sensors: Nexia partners with both FortrezZ wireless sensors that control water temperature/water valves, as well as Schlage home motion/door and window sensors to identify intrusion
- Thermostats: Relying on its cross-selling opportunity with American Standard and Trane, Nexia can link to digital display thermostats that can control space cooling/heating remotely.
- Video: Schlage offers a variety of outdoor and indoor wired and wireless cameras that connect to Nexia.

Legrand (LEGD.PA, Buy): NuVo is not new; the largest European home automation name

Covered by Daniela Costa, European Electrical Equipment analyst

Company profile

Legrand is a global specialist in electrical and digital building infrastructures. It develops, manufactures and markets a complete range of control and command, cable management, energy distribution and Voice-Data-Image (“VDI”) products and systems. It has commercial and industrial establishments in more than 70 countries and sells a wide range of products, comprising approximately 178,000 catalogue items, in nearly 180 countries.

Within its broad product portfolio comes the control and command category, comprised of comfort, security and communication. Under this business line, the company offers products including dimmers, switches activated by infrared presence detectors, building access control systems, and fully integrated “smart” home automation systems that connect all household appliances and electrical function to a central unit, allowing the end-user to regulate security, comfort and energy consumption locally or remotely.

Exposure to Home Automation IoT

Legrand has a leading position in control and command products with approximately 20% market share for a number of applications including comfort, security and communication. It is well positioned to benefit from the growth in the home automation market as it already has a well-established position. This is complemented by its strong network of electricians/installers as in contrast to personal devices, the adoption of digital technologies at home requires a specialized installer. Legrand has invested significantly in educating a network of electricians that gives it access to the end user.

With 65%/15% of earnings for Legrand in Western Europe/North America, we believe it will be a key beneficiary of recovery in the region’s construction markets, which we see starting in 2014/15.

Lennox International (LII, Neutral): Controllability through the Ultimate Comfort System™

Covered by Samuel Eisner, US SMID Capital Goods analyst

Company profile

Lennox International is a leading provider of climate control products and solutions for the heating, ventilation, air conditioning, and refrigeration (HVACR) markets globally. The company sells its products through multiple channels including company-owned distributors, independent distributors, and direct to end user sales. The business is organized into three main operating segments, residential/commercial/refrigeration, accounting for 50%/26%/24%, respectively of 2013 revenue. Within the residential business, the company is an HVAC OEM and component supplier, selling products and services across the efficiency spectrum. In the commercial business, LII is primarily a provider of unitary HVAC equipment and products that are sold into light commercial applications. Further, the refrigeration segment is the most global segment in the company, marketing and selling backend refrigeration products to the global grocery/food service industry.

Exposure to Home Automation IoT

LII is leading product of home comfort systems that are increasingly utilizing energy efficient technologies and Wi-Fi-enabled devices in order to create the Ultimate Comfort System™. Specifically, the Ultimate Comfort System™ combines a high efficiency air-conditioned or heat pump (likely >20 SEER) coupled with a high-efficiency air handler (likely using variable speed motors to

control airflow). These products are then used to control temperatures in different zones through the use of the company's iHarmony® product while all being controlled remotely via Wi-Fi through the company's flagship iComfort Wi-Fi® thermostat.

In our view, LII is a leader in residential HVAC (which has gained share in the past few years), where we believe that the ability upsell the customer and move them to the Ultimate Comfort System™ is higher given that the company is getting more attempts at sales than some of its competitors. Further, as LII is able to pitch cost savings, we believe that the opportunity to convert on systems sales is higher. Coupled with some of the highest efficiency HVAC products in the market (LII sells HVAC units >26 SEER), we believe that this is a differentiator.

One downside of LII's product offering in the home comfort market is that the company has not yet discussed the opportunity to integrate its home management system with other systems in the home (like cable, lighting, or security). Although this could be coming in the next few years, LII could find itself lagging in the market as others, which have been highlighted in this report, appear to have already entered this segment.

Mitsubishi Electric (6503.T, Sell): Diversified electronics name in IoT

**Covered by Ikuo
Matsuhashi, Japan
Semi/Telco/IT Services
analyst**

Company profile

Mitsubishi Electric is an integrated electronics maker with strength in factory automation (FA) systems, Elevators, Air Conditioners and Auto parts. For the FA side, it is one of the top group names for Sequencers, Servo motors, NCs and laser processing devices, and very strong in Japan, Korea, Taiwan and China. For Elevators, it has a top share, not just in Japan but also in the China market, the largest market in the world. Our Sell rating is predicated on our concern about slowing smartphone spending, which is likely to become an overhang for the stock. However, the medium-term outlook for the company looks promising, considering its solid position in the above mentioned products.

Exposure to Home Automation IoT

Mitsubishi Electric is becoming a leading IoT company in spaces such as FA, Elevators and Air Conditioners in which it has a good position. For FA and Elevators, IoT technology will likely be used widely first in Japan. In Japan, we already see specific offerings have been introduced. Also eventually, we assume the China market may shift to that direction as well, in which Mitsubishi is expected to leverage on its installed base.

Philips Electronics (PHG.AS, Buy): Controlling light

**Covered by Daniela
Costa, European
Electrical Equipment
analyst**

Company profile

Philips is a diversified health and well-being company with leading positions across healthcare, lifestyle and lighting. The group is headquartered in the Netherlands, employs over 122,000 employees with sales and services in more than 100 countries worldwide.

Exposure to Home Automation IoT

Lighting represents one-third of Philips sales, making the group the world's largest manufacturer of lighting products. Philips offers Hue, a connected lighting system for the home currently adopted in 75 countries and allowing for personalization of the lighting environment with a simple push of a button. Philips has involved over 10,000 developers around the concept, leading to brand preference measured at over 26%.

Philips has joined forces in commercial building automation with ABB for energy efficiency and increased functionality. Philips' lighting systems connect seamlessly with ABB's building device controls, reducing the cost of renovation of mid-and small-sized commercial buildings. In a hotel this could mean altering the lighting scene after combining several separate rooms into a large meeting room, just through one click. Or in a shopping complex, a building manager can simply reconfigure the access, HVAC and lighting when a single unit is split into smaller ones.

Schneider Electric (SCHN.PA, CL-Buy): Energy efficiency is at the core of earnings

Covered by Daniela Costa, European Electrical Equipment analyst

Company profile

Schneider is a specialist in energy management, offering integrated solutions across multiple market segments, including energy and infrastructure, industrial processes, building automation, and data centers/networks, as well as having a broad presence in residential applications.

Under its buildings business segment, it provides building automation and security systems that target four different segments: Hotels, Hospitals, Office Buildings and Stores. Schneider is one of the world's leading companies in technical building management. It ranks fourth worldwide in building automation and video security systems. It offers a comprehensive range of automation solutions backed by design and supervision software to manage building utilities, based on open and integrated systems. These solutions make it possible to optimize installations, modernize them cost effectively, reduce maintenance costs and energy consumption and enhance comfort and security. It strengthened its activities in this area through the acquisition of Pelco, a worldwide leader in the design development and manufacture of video security systems, in 2007.

Exposure to Home Automation IoT

Close to 40% of Schneider sales are related to construction (of which about 75% is non-resi and 25% resi). In 2009, Schneider Electric announced the launch of Wiser Home Control, a fully integrated home control solution that links electrical, multimedia and telecommunications equipment to one user-friendly solution. Wiser enables users to seamlessly connect many different technologies such as lighting control, security, air conditioning, audiovisual equipment, media players, irrigation systems, motorized blinds and more — creating one simple control solution for users to enjoy. With Wiser, users also can control home equipment from anywhere and at any time via 3G mobile phones or web-enabled devices. Schneider also provides home automation products through other brands such as Clipsal, Merten, and Merlin Gerin.

Toshiba (6502.T, Neutral): Leading smart meter maker

**Covered by Ikuo
Matsuhashi, CMA,
Japan Semi/Telco/IT
Services analyst**

Company profile

Toshiba is an integrated electronics maker, particularly well known for its leading position in NAND flash memory, Nuclear system and Power meters. For NAND, together with its partner SanDisk, it is the top share name in the market. For Nuclear, with the acquisition of Westinghouse in 2006, and for power meters through the acquisition of Landis + Gyr (L+G) in 2011, Toshiba has become a global leading name for both with 30% market share.

Exposure to Home Automation IoT

Toshiba (L+G) is likely to be a top supplier of smart meters and should benefit from any incremental acceleration in the shift to smart meter from legacy meters. Leveraging the L+G channel, Toshiba also sells T&D systems, backend systems to grid companies that will contribute to a build-out of the smart grid network. The CO₂ reduction targets set in the US market may trigger actual usage of smart meters already installed and provide further opportunity.

Appendix I: Key names in the global home security market

Exhibit 58: Key names in the smart security landscape (1/3)

	Company	Type	Ticker	Location	Video Surveillance			Access Control		Networks		Software	Hardware						
					Network/IP Based	Analogue	VSaaS	Alarms	Smart Locks	Networking Equipment	Network Providers	Package & Service	Cameras & Sensors	Storage systems	Locks & Alarms	Display systems	Control Panels	Wireless modules	
1	3VR Inc.	Private		US															
2	Advanced technology video	Private		US															
3	Altronix Corporation	Private		US						✓				✓	✓			✓	
4	Amdocs	Public	DOX	US								✓							
5	American Dynamics	Private		US	✓	✓								✓	✓			✓	
6	Antaira Technologies	Private		US						✓									
7	Applied research associates Inc.	Private		US										✓					
8	Arecont Vision	Private		US	✓	✓								✓					
9	ARM Electronics	Private		US										✓				✓	
10	Arrow lock & door hardware	Private		US													✓		✓
11	Assa Abloy	Public	ASSA-B	Stockholm														✓	
12	AT&T Mobility	Public	T	US															
13	August	Private		US														✓	
14	Avigilon Corp.	Public	AVO	Canada	✓	✓	✓			✓				✓					✓
15	Axeda	Private		US									✓						
16	AXIS Communications	Public	AXIS	Sweden	✓	✓	✓			✓				✓	✓				
17	Azco Technologies	Private		US	✓			✓						✓			✓		
18	Baidu	Public	BIDU	China	✓									✓					
19	Barix AG	Private		Switzerland				✓	✓									✓	
20	Bay alarm company	Private		US				✓										✓	
21	BCD Video	Private		US															
22	Bosch Security	Public	6041.DE	Germany	✓	✓		✓	✓	✓				✓	✓				✓
23	Brivo Systems	Private		US	✓	✓													
24	Channel vision technologies	Private		US										✓	✓				
25	Cinterion (Gemalto)	Private		Germany															✓
26	Cisco systems	Public	CSCO	US						✓									✓
27	Cohu Electronics	Public	COHU	US						✓									
28	Comarch	Public	CMR	US									✓						
29	ComCables	Private		US						✓									
30	Comcast	Public	CMCSA	US	✓	✓													
31	Comnet	Private		US						✓									
32	Comprehensive Cable	Private		US						✓									
33	Comtrol Corporation	Private		US						✓									
34	Convergint Technologies	Private		US				✓											✓
35	Cooper Notification (ETN)	Public	ETN	US				✓											✓
36	Crestron electronics	Private		US															✓
37	Cyberlock Inc.	Private		US						✓									✓
38	D Link	Public	TSEC	Taiwan										✓					✓
39	Dahua	Public	002236.SZ	China	✓	✓							✓	✓	✓				✓
40	Detex Corporation	Private		US				✓	✓										✓
41	Digital Barriers	Public	DGB	UK	✓	✓				✓									✓
42	Digital Monitoring products Inc	Private		US	✓	✓		✓		✓			✓	✓					✓
43	Digital Watchdog	Private		US	✓	✓							✓						
44	Doorlock Inc.	Private		US				✓											✓

Source: Company data, Goldman Sachs Global Investment Research.

Exhibit 59: Key names in the smart security landscape (2/3)

	Company	Type	Ticker	Location	Video Surveillance			Access Control		Networks		Software	Hardware						
					Network/IP Based	Analogue	VSaaS	Alarms	Smart Locks	Networking Equipment	Network Providers	Package & Service	Cameras & Sensors	Storage systems	Locks & Alarms	Display systems	Control Panels	Wireless modules	
45	Dortronics Systems Inc.	Private		US				✓								✓			
46	DV Tel Inc.	Private		US						✓									
47	Ericsson	Public	ERIC	Sweden							✓								
48	Fiber Sensys Inc.	Private		US									✓						
49	Flir systems	Public	FLIR	US	✓	✓		✓					✓			✓			
50	Future Fibre Technologies	Private		Australia						✓								✓	
51	Genetec	Private		Canada	✓	✓	✓			✓									
52	George Risk Industries	Private		US				✓					✓			✓			
53	Geutebruck	Private		Germany									✓						
54	Goji	Private		US					✓							✓			
55	HES Inc	Private		US					✓							✓			
56	Hikvision	Public	002415	China	✓	✓		✓		✓			✓	✓		✓		✓	
57	Honeywell	Public	HON	US	✓	✓		✓		✓		✓	✓	✓		✓		✓	
58	Huawei	Private		China						✓			✓						✓
59	ICE Cable Systems	Private		US						✓									
60	iControl Networks	Private		US	✓	✓													
61	ILS Technology	Private		US								✓							
62	Infinias LLC	Private		US								✓		✓					
63	Inovonics Wireless Corporation	Private		US	✓	✓				✓			✓					✓	
64	Interlogix (UTX)	Public	UTX	US	✓	✓		✓		✓			✓	✓		✓		✓	
65	ITW Linx	Public	ITW	US						✓									
66	Jasper Wireless	Private		US								✓							
67	JVC Professional	Public	6632	Japan										✓		✓			
68	KBC Networks	Private		US						✓									
69	Kwikset	Subsidiary (Public)	SPB	US					✓							✓			
70	Lenovo	Public	0992.HK	China	✓								✓						
71	Leviton	Private		US	✓	✓													
72	Linear LLC	Private		US				✓								✓			
73	Lockitron	Private		US					✓							✓			
74	Logica	Subsidiary	GIB	Canada								✓							
75	Logitech	Public	LOGN	Switzerland	✓	✓							✓						
76	Macheen	Private		US								✓							
77	March Networks	Private		Italy	✓		✓			✓			✓	✓					
78	Matrox Graphics Inc.	Private		Canada	✓	✓										✓		✓	
79	Medeco High Security Locks	Private		US												✓			
80	Midwest Alarm Company	Private		US				✓								✓			
81	Napco Security Systems	Private		US				✓	✓							✓			
82	Nitek International	Private		US						✓								✓	
83	North American Cable Equipment	Private		US						✓									
84	Novatel Wireless	Public	NVTL	US															✓

Source: Company data, Goldman Sachs Global Investment Research.

Exhibit 60: Key names in the smart security landscape (3/3)

	Company	Type	Ticker	Location	Video Surveillance			Access Control		Networks		Software	Hardware						
					Network/IP Based	Analogue	VSaaS	Alarms	Smart Locks	Networking Equipment	Network Providers	Package & Service	Cameras & Sensors	Storage systems	Locks & Alarms	Display systems	Control Panels	Wireless modules	
85	Omnitron systems	Private		US						✓									
86	Optellios Inc.	Private		US						✓									
87	Optex Inc.	Private		US	✓	✓							✓						
88	Panasonic	Public	6752	Japan	✓	✓	✓			✓			✓	✓					
89	Paxton Access Inc	Private		US				✓								✓			
90	Plustek Technologies	Private		US										✓					
91	Raytec	Private		US									✓						
92	Red Bend	Private		US								✓							
93	Ritron	Private		US				✓								✓			
94	Safety Technologies International	Private		US				✓								✓			
95	Sagemcom	Joint Stock		France															✓
96	Samsung Techwin	Public	012450	South Korea	✓	✓				✓			✓	✓			✓		
97	Sans Digital	Private		US										✓					
98	Schlage	Private		US					✓							✓			
99	Schneider Electric	Public		France	✓	✓		✓		✓			✓		✓	✓			
100	Sierra Wireless	Public	SW	Canada						✓									✓
101	SIMcom	Subsidiary	2000.HK	Hong Kong						✓									✓
102	Sprint Corporation	Public	S	US							✓								
103	Swann Communications	Private		US	✓	✓		✓		✓			✓			✓		✓	
104	Tane Alarm Products	Private		US				✓								✓			
105	Tapeswitch Corporation	Private		US															
106	Telit	Public	TCM	UK															✓
107	T-Mobile US	Subsidiary (Public)	TMUS	Germany							✓								
108	Toshiba	Public	6502	Japan	✓	✓							✓	✓				✓	✓
109	TP-Link	Private		China						✓									
110	U.S. Cellular	Public	USM	US							✓								
111	Uplink	Private		UK															
112	Verint Systems Inc.	Public	VRNT	US	✓	✓						✓	✓						
113	Verizon Wireless	Public	VZ	US							✓								
114	Vicon Industries	Private		US						✓				✓					
115	Visonic Ltd. (TYC)	Public	VSC	Israel	✓	✓		✓					✓		✓			✓	
116	Vitek Industries	Private		US	✓	✓							✓			✓			
117	Western Digital	Public	WDC	US										✓					
118	Wipro	Public	WIPRO	India								✓							
119	ZTE	Public	000063	China															✓

Source: Company data, Goldman Sachs Global Investment Research.

Appendix II: CP positioning table

Exhibit 61: Multi-Industry CP positioning

Key metrics in CP positioning for highlighted stocks

		Industry Structure	Company Structure					Structural Growth	Final CP Score
			Customer concentration	Market Position	Recurring Sales	Project exposure	Execution Risk	Overall Company Structure Score	
Ticker	Company	Normalised for Average	Normalised for Average	Normalised for Average	Normalised for Average	% non-project business	Normalised for Average		
LEGD.PA	Legrand	28%	60%	84%	133%	100%	65%	85%	67%
PHG.AS	Philips Electronics	27%	60%	68%	106%	100%	65%	75%	60%
GE	General Electric Co.	49%	60%	61%	79%	65%	42%	61%	55%
SCHN.PA	Schneider Electric	28%	60%	45%	98%	89%	58%	65%	54%
HON	Honeywell International Inc.	44%	40%	77%	58%	88%	57%	58%	54%
EMR	Emerson Electric Co.	45%	60%	63%	50%	90%	59%	58%	52%
LII	Lennox International Inc.	35%	60%	22%	40%	100%	65%	47%	46%
ETN	Eaton Corporation Plc.	45%	40%	38%	42%	89%	58%	45%	44%

Source: Goldman Sachs Global Investment Research.

Appendix III: Price targets, methodologies, and risks for highlighted stocks

Exhibit 62: Price targets, methodology, and risks for highlighted stocks

Prices as of the close on July 14, 2014

Company	Ticker	Rating	Current Price	Price Target	Time Period	Methodology	Risks
Assa Abloy	ASSAb.ST	Neutral	Skr 353.00	Skr 340.00	12-month	13.5x 2015/2016E EV/EBIT	Volumes/pricing; F/X head/tailwinds; FCF generation; M&A
Cree	CREE	Buy	\$49.23	\$66.00	12-month	\$64 DCF (85%) / \$83 M&A on 4.4x FY15E EV/sales (15%)	Slow adoption of LED lighting; heightened ASP pressure; disruptive technology
Dahua	002236.SZ	Buy	Rmb 23.20	Rmb 40.70	12-month	1.44x PEG	Fluctuation in government spending; key tech changes; labor cost pressure
Daikin	6367.T	CL-Buy	¥6,795.00	¥7,800.00	12-month	0.6x P/B	High yen; sluggish A/C demand
Eaton	ETN	Buy	\$79.05	\$81.00	12-month	14.5x 2015E EPS	2Q restructuring slips; ESS orders remain weak; cyclical pressure; Cooper synergies disappoint; Truck share loss
Emerson Electric	EMR	Neutral	\$67.26	\$72.00	12-month	17.0x 2015E EPS	Upside: accelerating orders; higher buyback; accretive M&A; Downside: slower improvement in NP/IA; pricing pressure; execution
General Electric	GE	Neutral	\$26.66	\$28.00	12-month	15.5x 2015E EPS	Upside: higher AGP/aeroderivatives; M&A synergies; Downside: higher restructuring; Industrial margin weakness; execution
Hikvision	002415.SZ	CL-Buy	Rmb 16.00	Rmb 31.20	12-month	1.50x PEG	Fluctuation in government spending; key tech changes; labor cost pressure
Hitachi	6501.T	Buy	¥768.00	¥870.00	12-month	1.4x P/B	Decline in ROIC due to increased risk tolerance; continued inadequate profitability management on overseas projects
Honeywell	HON	Buy	\$95.74	\$105.00	12-month	17.0x 2015E EPS	Execution; unfavorable fluorines/resins pricing; D&S/S&M drag; slower non-res/O&G growth
Ingersoll Rand	IR	Neutral	\$62.23	\$64.00	12-month	17.0x 2015E EPS	Upside: acceleration in applied HVAC; potential guidance raise in 2Q; accretive capital allocation; Downside: execution; lower Industrial growth
Legrand	LEGD.PA	Buy	€ 43.16	€ 58.00	12-month	14.0x 2015/2016E EV/EBIT	Declines in Italy/France; F/X headwinds; lower cash flow generation
Lennox Intl	LII	Neutral	\$87.53	\$93.00	12-month	17.5x 2015E EPS	Upside: Release of pent-up demand; industry consolidation; Downside: Market share loss; slowing replacement demand; comm'l weakness
Mitsubishi Electric	6503.T	Sell	¥1,297.00	¥1,170.00	12-month	1.5x P/B	Weaker yen; high smartphone-related investments
Philips Electronics	PHG.AS	Buy	€ 23.46	€ 30.00	12-month	11.5x 2015/2016E EV/EBIT	Execution issues; continued restructuring; disruption in lighting industry; lower volumes/prices; F/X moves
Schneider Electric	SCHN.PA	CL-Buy	€ 66.96	€ 99.00	12-month	13.5x 2015/2016E EV/EBIT	Value-destructive M&A; lower volume/prices; higher raw mats; F/X headwinds; weaker cash flow generation
Toshiba	6502.T	Neutral	¥482.00	¥460.00	12-month	1.4x P/B	Larger-than-expected increases/decreases in NAND prices; F/X fluctuations

Source: Company data, FactSet, Goldman Sachs Global Investment Research.

Disclosure Appendix

Reg AC

We, Joe Ritchie, Daniela Costa, Samuel H. Eisner, Ikuo Matsushashi, CMA, Evelyn Chow, Sam Li, Michael Lapidès, Brian Lee, CFA and Yuichiro Isayama, hereby certify that all of the views expressed in this report accurately reflect our personal views about the subject company or companies and its or their securities. We also certify that no part of our compensation was, is or will be, directly or indirectly, related to the specific recommendations or views expressed in this report.

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