The Internet of Everything
Global Private Sector Economic Analysis

Value at Stake is the potential bottom-line value that can be created, or that will migrate among companies and industries, based on their ability to harness the Internet of Everything over the next decade.

How do you define "Internet of Everything"?

The Internet of Everything (IoE) brings together people, process, data, and things to make networked connections more relevant and valuable than ever before – turning information into actions that create new capabilities, richer experiences, and unprecedented economic opportunity for businesses, individuals, and countries.

Cisco estimates that 99.4 percent of physical objects that may one day be part of the Internet of Everything are still unconnected. With only about 10 billion out of 1.5 trillion things currently connected globally, there is vast potential to "connect the unconnected."

Cisco predicts that $14.4 trillion of value will be "at stake" over the next decade, driven by "connecting the unconnected" (people-to-people, people-to-machines, machines-to-machines, etc.) via the Internet of Everything.

What do you mean by "Value at Stake" in the "Internet of Everything Economy"?

Value at Stake is the potential bottom-line value that can be created, or that will migrate among private-sector companies and industries, based on their ability to harness the Internet of Everything over the next decade. Cisco predicts that this Value at Stake will be **$14.4 trillion** for companies and industries worldwide over the next 10 years.

More specifically, over the next 10 years, the Value at Stake represents an opportunity to increase global aggregate corporate profits by about 21 percent.

In other words, from 2013 through 2022, $14.4 trillion of value (*net profit*) will be "up for grabs" for private-sector businesses globally – driven by the Internet of Everything (IoE). IoE will both *create* new value and *redistribute* (migrate) value, based on how well companies take advantage of the opportunities that IoE presents. Those that harness IoE best will reap this value in either of two ways:

$14.4 trillion of value will be "up for grabs" for private-sector businesses globally – driven by the Internet of Everything.

- By capturing new value created from technology innovation
- By gaining competitive advantage and grabbing market share against other companies less able to transform and capitalize on the IoE market transition

Value at Stake ***includes:***

- Shifts of benefits among competing firms in an industry
- Shifts of benefits among different industries
- New-to-the-world revenue growth from innovation
- Cost savings from more efficient processes
- Allowances for implementation costs

Value at Stake ***does not include:***

- Extent of losses at firms that don't transform
- Consumer or government benefits
- Social benefits
- Value estimates for reduced risk of operations

Where did the term "Internet of Everything" (IoE) originate?

The "Internet of Everything" terminology has been used frequently by technology analysts and research firms over the past couple of years. IoE is generally viewed as the next phase of the "Internet of Things," another common term among technology analysts and research firms. Cisco did not coin the "Internet of Everything," although our definition of IoE – combining people, process, data, and things – does differ somewhat from those of other technology companies and research/analyst firms.

Is Cisco working with other technology companies on this initiative, or is Cisco doing this independently?

IoE is a major market transition that, by its very definition, will attract the participation of many companies. However, Cisco is pursuing its research on IoE independently. Of course, Cisco and its partners will be working with customers to bring IoE to life.

How does Cisco's concept of the "Internet of Everything" differ from Qualcomm's?

Qualcomm uses the expression "Internet of Everything" as an umbrella term to define both the market opportunity associated with increasingly pervasive connectivity and new sources of information, especially machine-to-machine (M2M) and next-generation connected consumer devices, as well as the company's own wide-ranging solutions in this area. With an ecosystem of M2M technology partners, Qualcomm offers wireless technologies and chipsets for numerous industry-focused IoE applications, spanning passenger-car telematics, smart energy and security, industrial and enterprise automation, consumer M2M devices, and others. Cisco's work on the Internet of Everything Economy explores the economic and strategic

It's urgent for companies to start understanding how to harness the Internet of Everything – both to realize its value and to address the competitive risk.

implications of IoE innovations for companies, and looks at many of the same kinds of applications, such as smart buildings and factories, smart energy grids, intelligent vehicles, and connected healthcare and patient monitoring.

What is the difference between Value at Stake and Internet Market Sizing (Total Addressable Market, or TAM)?

Value at Stake is a forecast of the potential bottom-line value that can be created or that will migrate among companies and industries globally based on their ability to harness the Internet of Everything over the next decade. Cisco estimates this value to be $14.4 trillion over the next 10 years.

By contrast, the Internet Market Size, or total addressable market (TAM), is projected to reach $4.1 trillion in annual revenue for all participating vendors by 2016. Beyond relevant information and communications technologies (ICT), it includes e-commerce and advertising. Cisco will address $258 billion (6 percent) of this Internet market (source: Cisco, 2012).

What is the risk to companies that don't transform using the Internet of Everything?

It is about competitiveness–you can't win if you don't play. Without investing in the connections and network capabilities that matter, companies will not be able to capture the IoE Value at Stake. Companies that do not embrace the IoE market transition are at a competitive disadvantage. It's urgent for companies to start understanding how to harness the Internet of Everything – both to realize its value and to address the competitive risk.

As mentioned earlier, Cisco estimates that the Value at Stake in the Internet of Everything Economy will be $14.4 trillion for private-sector businesses globally over the next 10 years. By comparison, current annual corporate profits represent a value of $6.8 trillion globally, so we are talking about 2.1X annual corporate profits worldwide (as stated earlier, this represents an opportunity to increase global corporate profits by an estimated 21 percent over the next decade). From another perspective, companies worldwide could lose more than a year of total profits between 2013 and 2022 if they do not start harnessing IoE.

Why now? Which factors are driving the new Internet of Everything Economy?

A combination of five primary factors will accelerate adoption of the Internet of Everything:

1. Reduced Costs
   - Network capacity is becoming affordable, removing bottlenecks on information flows.
   - Cost of connecting devices is dropping fast.

Most of this value will come from transforming industry-specific business processes and value chains with capabilities driven by the Internet of Everything.

2. Technology architectures are making adoption easier
   - Increasing numbers of workers are migrating to smartphones and connected devices.
   - Cloud is fueling market entry of technology players.
   - Networks have become "smarter," with intelligence at the edge.
3. Next generation of users with different expectations
   - Next generation of workers expects video, mobile, visual, virtual, and social collaboration.
   - Number of consumer options is increasing rapidly.
4. "Winner takes all" framework / platform dynamics
5. Disintermediation / reintermediation
   - Disintermediation: Removal of intermediaries in a supply chain ("cutting out the middle man") due to IoE
   - Reintermediation: Based on IoE, some intermediaries who had previously been removed from the supply chain will be reintroduced.

What are the sources of the $14.4 trillion in Value at Stake over the next 10 years?

Cisco's analysis shows that most of this value will come from transforming industry-specific business processes and value chains with capabilities driven by the Internet of Everything. Of the $14.4 trillion in estimated Value at Stake over the next decade, $9.5 trillion will come from *industry-specific value* (for example, smart grid, connected commercial vehicles), and $4.9 trillion will result from *cross-industry value* (for example, the "future of work"/telecommuting and travel avoidance).

Companies will benefit from five primary drivers (domains) of Value at Stake:

1. Asset productivity and cost reductions
   - SG&A and CoGS reduction from improved business process execution
   - Improved capital efficiency
   - Examples: smart buildings, smart factories, travel cost savings
2. Employee productivity
   - Improved labor efficiency
   - Fewer or more productive man-hours
   - Examples: future of work (telecommuting), BYOD, mobility
3. Supply-chain and logistics efficiency
   - Improved process efficiency
   - Reduced supply-chain waste
   - Examples: Smart grid energy efficiency

Cisco's "bottom-up," use-case-based analysis delivers differentiated insights by industry.

4. Innovation
   - Improved RD&E speed
   - New business models and sources of revenue
   - Examples: Faster time to market
5. Customer experience
   - Improved customer lifetime value
   - Additional market share (more customers)
   - Examples: connected marketing and advertising, connected education

How did Cisco calculate the $14.4 trillion of Value at Stake for the next 10 years?

Cisco calculated the Value at Stake by taking a "bottom-up" approach using the sum of the value created by 21 enterprise use cases in the *private-sector domain only* (consumer and public sector use cases were excluded) over the next 10 years (2013-2022). Value at Stake is based on net value: for each use case, we considered both the connections *benefits* and *costs*.

Our use cases reflect the *projected result* of a business application of technology – in this case, business transformation driven by the Internet of Everything. This differs from typical "case studies," which represent the actual results of the *application* of technology. Cisco's Value at Stake calculation encompasses both *industry-specific* and *cross-industry* use cases.

What is the advantage of taking a bottom-up approach to measuring Value at Stake?

Cisco takes a broad approach that first identifies a large number of use cases, and then determines the industries to which specific Internet of Everything Economy use-case benefits will apply. Cisco's wide scope enables strategists and marketers to see where the greatest impact will occur, across a broad range of industries and use cases.

Cisco's "bottom-up," use-cased-based analysis delivers differentiated insights by industry. The use-case orientation allows Cisco to base its Value at Stake calculations on technologically feasible transformations that, we believe, are more practical than the approaches taken by others.

Cisco's study will also include the creation of an IoE Value Index that will quantify the value of connections ("information flows") across five enterprise domains. When completed in May 2013, the Index will measure the extent and quality of these information flows for companies around the world. The Index will be based on an extensive survey of approximately 8,000 business and technical decision makers from both large and midsized companies in the world's 12 largest economies.

Cisco's wide scope enables strategists and marketers to see where the greatest impact will occur, across a broad range of industries and use cases.

Why did Cisco base its analysis on Value at Stake rather than, for example, GDP?

There are two reasons GDP is not the appropriate metric for Value at Stake:

First, GDP is not the *sum total* of private-sector output; it is adjusted to remove the impact of *primary* and *intermediate* inputs. (For example, in car production, GDP would include just the end product: the finished automobile. GDP does not account for the *primary* automobile manufacturing inputs, such as steel, rubber, glass, and plastic; or for the *intermediate* inputs, such as the engine, radio, and seats.) Because we are also interested in the IoE impact of these earlier stages of production, comparing the Value at Stake with GDP does not make sense. Value at Stake is comparable with economy-wide corporate revenues or profits, and we encourage these comparisons.

Second, many of the Value at Stake use cases involve a migration of business among industry sectors or among competing firms, and these displacements also are not included in GDP. The only parts of Value at Stake that GDP covers are the areas that involve totally new products or services.

How is Cisco's study different from GE's "Industrial Internet" Report, which was released in November 2012?

According to the GE Report, titled *"Industrial Internet: Pushing the Boundaries of Minds and Machines,"* the world is on the threshold of a new era of innovation and change with the rise of the "Industrial Internet." GE defines the Industrial Internet as "an intelligent network of interconnected machines that can extract data and find meaning where it did not exist before."

The report states that in the United States alone, the Industrial Internet *could boost average incomes by 25 to 40 percent over the next 20 years* and lift growth back to levels not seen since the late 1990s. If the rest of the world achieved half of the U.S. productivity gains, the Industrial Internet *could add from $10 to $15 trillion to global GDP* – the size of today's U.S. economy – over the same period.

Like GE's report, Cisco's study is focused on determining the value that comes from connecting more devices, data, and people. Cisco's initiative, however, revolves around the premise of *"Value at Stake."* In a business context, this is the *potential bottom-line value that can be created or will migrate among companies and industries in the emerging "Internet of Everything Economy" based on their ability to harness the Internet of Everything over the next decade* (by 2022).

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But there are other significant differences between GE's and Cisco's studies, primarily in methodology:

- GE's report covers just four "industries" – transportation, healthcare, manufacturing, and "other" – and identifies use cases in each of these areas. Cisco, on the other hand, takes a broader approach that first identifies a large number use cases, and then determines the industries to which specific Internet of Everything Economy use-case benefits will apply. Cisco's wide scope enables strategists and marketers to see where the greatest Internet of Everything Economy impact will occur, across a broad range of industries and use cases.
- GE's report looks at overall GDP impact, while Cisco's study is based on *Value at Stake* for enterprises (see definition of "Value at Stake" earlier in this FAQ).
  - The GE report takes a "top-down" approach, where assumptions on productivity predict the GDP impact; as a result, it delivers insights by a narrow set of industries and geographies.
  - By contrast, Cisco's "bottom-up," use-case-based analysis delivers differentiated insights by industry. The use-case orientation allows Cisco to base its Value at Stake calculations on technological transformations that will have a measurable financial impact.

Which industry-specific and cross-industry use cases did Cisco employ to make its Value at Stake calculations?

Cisco's Value at Stake calculations are based on the following 21 use cases:

Industry-Specific Use Cases:

Smart grid
Smart buildings
Connected ground vehicles (commercial vehicles only)
Smart farming
Smart factories (factory automation)
Wealth management
Next-generation retail bank branches
Improved medical management
Physical and IT security
Digital malls (next-generation vending machines)
Connected marketing & advertising
Digital signage
Business process optimization (BPO) and related processing services
Virtual attendants
Connected payments
Connected gaming and entertainment
Connected private college education (virtual private education)

Five use cases will constitute 57 percent of the total Value at Stake for the next 10 years.

Cross-Industry Use Cases:

Future of work/telecommuting
Travel avoidance
Faster new product introduction and time to market
Supply-chain efficiency

How do you know that this use-case list is complete?

To be as accurate as possible, Cisco calculated the Value at Stake by taking a bottom-up approach considering the value created by more than 50 use cases in the *private sector domain only* (consumer and public sector use cases were excluded) – both industry-specific and cross-industry – and consolidating them into the 21 most material ones. To our knowledge, Cisco is the only company to take this approach when evaluating the opportunity offered by the Internet of Everything. A top-down analysis was also performed as a cross-check to validate the completeness and order of magnitude of the more thorough bottom-up approach.

Our selection of use cases is based on secondary and academic research on the Internet of Everything, systematic analysis of business process and technology enablers, and Cisco IBSG's extensive thought leadership and deep vertical industry expertise.

The use cases share several common characteristics:

- Quantifiability
- Materiality
- Discreteness
- Reflect intelligence in network
- Not currently connected or upgrading existing connections

Which use cases will drive the most Value at Stake?

Five use cases will constitute 57 percent of the total Value at Stake for the next 10 years:

- Factory automation
- Internet advertising/e-marketing
- Future of work/telecommuting
- Time to market
- Logical and physical security

Which industries drive the most Value at Stake?

The following five industries will drive more than 60 percent of the Value at Stake over the next 10 years:

While machine-to-machine connections are increasingly important, person-to-person and person-to-machine connections still represent the majority of the Value at Stake.

- Manufacturing, 27%
- Retail trade, 11%
- Information, 9%
- Finance and insurance, 9%
- Healthcare, 7%

Which types of connections matter most?

While machine-to-machine connections are increasingly important, person-to-person and person-to-machine connections still represent the majority of the Value at Stake (55 percent of connections will be either M2P or P2M + P2P).

How will Value at Stake be distributed geographically over the next 10 years?

Over the next 10 years, Cisco believes that Value at Stake in the Internet of Everything Economy will be distributed in the following way across the globe:

- United States, 32%
- Europe, 30%
- China, 12%
- Japan, 5%
- Canada, 3%
- Rest of World, 18%

Can you provide an example of how Value at Stake was calculated for a particular use case?

Certainly. To illustrate how Value at Stake was calculated, we'll use the example of the "Connected Commercial Ground Vehicles" use case. Cisco's analysis considered two factors: 1) lower costs for fleet owners and 2) the potential revenue increase for service providers. We also projected the penetration of commercial ground vehicles as a percentage of the total global commercial fleet – from lower penetration today (6.3 percent) to estimated penetration of 24.5 percent by 2022. Using research, we then estimated the IoE benefits per commercial vehicle (including fuel efficiency and driver productivity) at $970 annually. From these benefits, we deducted one-time and recurring costs. We also considered SP revenue opportunities. Based on the same penetration numbers, the analysis also considered new revenue opportunities for SPs, including connectivity and value-added services. To estimate the Value at Stake for SPs, we assumed a conservative average margin of $12-$15 monthly. The overall Value at Stake number – $347 billion – reflects the combined net present value of the benefits for fleet owners and service providers. We believe Cisco is the only company to take this kind of use-case-driven, bottom-up approach to evaluate the opportunity offered by the Internet of Everything.

In the context of IoE, companies will extend the network into every aspect of their decision making.

How will IoE impact Cisco's business?

IoE is a great opportunity for Cisco and its customers. Cisco stands to benefit from IoE because, in the context of IoE, companies will extend the network into every aspect of their decision making. Cisco's unmatched expertise in network technology transitions makes it uniquely positioned to help customers capture the value of IoE. *Only Cisco has the ability to build, manage, and secure an IP-based platform with open standards – from the cloud to end devices.*

How important are security and privacy to the Internet of Everything Economy?

Robust security capabilities (both logical and physical) and privacy policies are critical enablers of the Internet of Everything Economy. The IoE Value at Stake projections are based on increasingly broad adoption of IoE by private-sector companies over the next decade. This growth could be inhibited if technology-driven security capabilities are not combined with policies and processes designed to protect the privacy of both company and customer information.

IoE security will be addressed through network-powered technology: devices connecting to the network will take advantage of the inherent security that the network provides (rather than trying to ensure security at the device level). Privacy, on the other hand, will require that companies combine technology with effective processes and policies. To benefit from IoE, firms will need to identify new privacy models that meet company and customer expectations.

Does Cisco have a specific point of view regarding privacy and security in the Internet of Everything Economy?

In the coming years, the Internet of Everything Economy will create new opportunities to transform the world around us – in education, healthcare, manufacturing, commerce, transportation and other sectors. With those new opportunities will come new challenges, especially with respect to the data privacy and security. To help ensure consumer confidence, it will be incumbent upon IT companies to continue to demonstrate leadership by example in the use and protection of personal information, especially as new technologies and applications are developed. Ultimately, the means by which personal information is protected will be a function of global standards, norms, laws, and the privacy policies of individual companies, but Cisco strongly believes that several principles will help guide policymakers to achieve an effective balance among economic, privacy, security, and other societal interests:

- Companies should be encouraged to inform customers about their privacy practices and to provide choices that help ensure that customers can control how data that relate to them are used.
- Any national laws and regulations should be consistent with internationally recognized principles to ensure that trade and cross-border flows of information are not hindered.

Governments should not mandate the use of specific technologies or business models.

- At every level – whether state, provincial, national, or regional – governments should develop and adopt data protection policies that meet the needs of a global economy. While cultural and geographic differences exist and will continue to exist, an efficient and thriving global economy requires the mutual recognition of different approaches to data protection.
- Governments should not mandate the use of specific technologies or business models. Overly burdensome policies can become barriers to trade and hinder new technology development and innovations in areas such as education, healthcare, finance, commerce, and entertainment.
- In addition to any legal frameworks in place, industry should adopt voluntary, self-regulatory measures to protect consumer data, strengthened by innovative tools to provide consumers with choices to protect their personal data and understand how it is collected and used, and meaningful penalties should companies violate their obligations. Several successful industry-led initiatives, such as the Online Privacy Alliance and TRUSTe, have achieved a reasonable balance between consumer protection and business requirements.

In addition, cybersecurity has become a critical issue. Cisco believes that governments can help decrease cybersecurity threats by:

- Raising consumer and industry awareness of the importance of network security
- Deepening public-private partnerships to secure critical infrastructure
- Removing legal and operational barriers to information sharing in order to enable collective response by public- and private-sector actors
- Educating users about best practices
- Using best practices to secure their own systems and strengthening coordination among public-sector security institutions
- Funding long-term research and development
- Adhering to the global standard for product assurance, the Common Criteria
- Aggressively enforcing the laws against cybercrime and prosecuting criminals that use or attempt to use the network for theft, fraud, extortion, or other crimes
- Increasing cooperation at an international level with other governments, law enforcement agencies, and the private sector on the socialization of best practices, conduct of cyber incident exercises, and international prosecution of cybercrime

Cisco does not believe that governments should regulate security technologies. In general, regulation:

- Stifles innovation by picking and choosing specific technology, rather than letting market competition develop the best and most advanced solutions
- Does not advance quickly enough to keep pace with current industry needs and newly posed threats

Developing sound approaches to privacy and security will ultimately require a balance between consumer protection and business requirements.

- May actually decrease Internet security by slowing innovation where security threats are constantly evolving

Additionally, Cisco believes that country-specific product regulation undermines the global product assurance regime, the Common Criteria, and the global standards that promote interoperability and security.

In the coming years, issues around data protection are going to become more prominent, not less. Developing sound approaches to privacy and security will ultimately require a balance between consumer protection and business requirements. Cisco will continue to work with policymakers at all levels to ensure that the personal information of customers is protected and that privacy-enhancing innovation is not stunted.

How will IoE affect employment globally?

A March 2012 joint study between Microsoft and IDC showed that 14 million jobs involving cloud and cloud services will be created over the next three years, with just under half of these in China and India. Of course, the study stressed the gross – rather than *net* – impact of these services; the net impact is sure to be much less, if not negative, in the short run.

There is no doubt that a significant amount of technological displacement of jobs is currently occurring in the United States and other developed countries. The economics of factory automation, using apps to create and replicate intellectual property, and the development of tremendous labor efficiency tools – all IoE use cases – are compelling, proven, and low risk. Adoption is high and escalating. Cisco analysis of Bureau of Labor Statistics occupation data indicates that this trend has not fully run its course.

The first wave of the IoE trend, using technology for cost cutting, represents the "lowest-hanging fruit." Fortunately, this is finite process; costs can be cut only so far. However, the second wave of IoE will be able to reverse this trend as firms use the same tools for revenue-generation purposes: new products and services, new markets, and new types of customer experiences. Implementing these areas will be much harder than merely cutting costs, as corporate cultures, processes, and employee skill sets need to change. The faster that firms harness these IoE enablers, the more quickly they will be on winning side of the IoE industry and competitor shifts. Once this process begins to take hold, IoE itself will also be viewed as a job enabler.

Why did Cisco choose to focus just on enterprises in its study, rather than also including consumers and the public sector?

In its study, Cisco was looking to break new ground on the potential value of connections in the evolving Internet of Everything Economy. Previous studies have looked at the impact on the public sector and consumers, but Cisco is the first to measure the value of these connections specifically for private-sector companies, based on 21 industry-specific and cross-industry use cases. The private-sector-

Based on each company's score, we will identify areas in which it should invest to improve connectedness and maximize value.

specific orientation also aligns with Cisco's strong market presence and technology offerings in the private-sector arena.

What are the next steps in Cisco's Internet of Everything Economy research and analysis?

After the results of Cisco's "Value at Stake" analysis are published following the World Economic Forum in January 2013, Cisco will enter the next phase of the project. In this phase, we will conduct primary research with a large number of business and technical decision makers around the world to address two key questions:

- How connected are companies today (analysis will be based on the five primary drivers of Value at Stake: 1) asset productivity and cost reductions; 2) employee productivity; 3) supply-chain and logistics efficiency; 4) innovation; and 5) customer experience)?
- What are the average and best-in-class levels of connectedness in each of those five dimensions?

In this phase, we *will not be "device counting."* Instead, we'll be striving to understand the impact of "information flows" — "what kind of information can you bring to bear as an organization?" After this phase, we will be able to describe the current state of connectedness among private-sector organizations globally.

This study will encompass approximately 7,500 respondents in 12 of the largest economies around the world. The study will enable us to create an IoE Value Index so that enterprises can measure their current readiness to harness the Internet of Everything to create valuable connections. Countries to be surveyed will include Australia, Brazil, Canada, China, France, Germany, India, Japan, Mexico, Russia, the United Kingdom, and the United States.

In the final phase of this project, we'll do two things:

1. Apply the model formed in the "Value at Stake" phase to the empirical information we gathered in the IoE Value Index phase. Based on each company's score, we will identify the areas in which it should invest to improve connectedness and maximize value.

2. Identify the **business and technology architectures** that organizations must consider to become connected and extract value from that connectedness. We will include recommendations on how to compete in an increasingly connected world, what will determine the winners and losers, and so on.

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