

Internet of Everything in ASEAN

Driving Value and Opportunity in Oil and Gas, Utilities, and Transportation

Joel Barbier
Puneet Kumar Bhatia
Divya Kapoor



Thankfully, IoE promises even greater innovation and transformation to come, with cost savings and increases in productivity and efficiency that would have been difficult to imagine only a few years ago.

Introduction

Once merely an intriguing future concept, the Internet of Everything (IoE) – the networked connection of people, process, data, and things – is today a pressing business and government imperative. Everywhere around us, startling new kinds of digital connections are transforming the ways in which we live, work, learn, and play. And it is increasingly crucial for organizations of all kinds to meet the challenges and seize the opportunities presented by IoE.

In the areas of oil and gas, transportation, and utilities, IoE is already driving sweeping transformation. For instance, smart grids are helping utilities to moderate their output with real-time data and predictive analysis; far-flung oil-and-gas platforms and production facilities are benefiting from remote-expert collaboration tools and machine-to-machine sensors; and connected rail lines, roads, parking lots, and bridges are raising safety and efficiency standards.

Such innovations will prove ever more crucial in coming years. By midcentury, about 70 percent of the global population will have moved to cities¹, placing an even greater drain on energy, transportation infrastructures, and other resources and services.

Indeed, up to 75 percent of all the energy that we create and consume is already being used by cities, creating a critical demand for technological solutions.²

Thankfully, IoE promises even greater innovation and transformation to come, with cost savings and increases in productivity and efficiency that would have been difficult to imagine only a few years ago. This is particularly true for cities. According to Cisco's analysis³, cities will claim 63 percent of IoE's total civilian benefits over the next decade, compared with 22 percent for states/provinces and 15 percent for federal.

Technology infrastructure and tools are essential, but it's the innovative *application of technology* that will separate winners from losers in the loE economy.

The Association of Southeast Asian Nations (ASEAN) – the political and economic community that includes Indonesia, Malaysia, the Philippines, Singapore, Thailand, Brunei, Myanmar, Cambodia, Laos, and Vietnam – is at the epicenter of many of these global megatrends. Many of the region's cities, for example, are investing in new infrastructure and services to meet the demands of rising, economically vibrant urban populations.

ASEAN's total population of more than 600 million represents 8.8 percent of the world's population, and by 2012 its nominal GDP had grown to more than \$2.3 trillion. The ASEAN community is committed to regional cooperation, economic development, environmental protection, and improvements in literacy and education. loE can make a key contribution to the region's overall transformation.⁴

A \$19 Trillion Opportunity

The world may seem highly connected already – especially considering the explosion in popularity of smartphones and tablets in recent years. However, we have only scratched the surface of what is possible through connectivity.

As of 2013, there were “only” 10 billion things connected to the Internet. By 2020, that number will swell to 50 billion. Cisco also estimates that, as of 2013, 99.4 percent of physical objects were still unconnected. Conversely, this means that only about 10 billion of the 1.5 trillion things globally have been connected.

Such numbers suggest the massive opportunity that exists in connecting the unconnected. Cisco's research in 2013 identified a staggering \$14.4 trillion in overall loE Value at Stake over the next 10 years for the private sector and a further \$4.6 trillion for the public sector. Cisco defines this \$19 trillion in total Value at Stake as the potential bottom-line value (higher revenues and lower costs) that can be created (or, in the case of the private sector, that could migrate among companies and industries) based on organizations' ability to harness loE.

Today, much of that value is not being realized. In its loE Value Index study⁵, Cisco found that of \$1.2 trillion in potential private-sector Value at Stake in 2013, only 53 percent would be realized. The unclaimed 47 percent presents a clear call to action. To begin to capture its own share of that potential value, each organization will need to carefully examine its “dark assets” and decide which are the best candidates to be “lit up” with network connectivity.

Cars, tires, roads, bridges, supply chains, jet engine parts, shoes, refrigerators, store shelves, and mine shafts – these are but a small sampling of “things” that can be transformed with smart connectivity. But loE involves more than simply embedding sensors in previously dumb objects. Technology infrastructure and tools are essential, but it's the innovative *application of technology* that will separate winners from losers in the loE economy. Winners will be organizations that successfully apply technology to improve the “people” and “process” elements of their operations.

In order to benefit from IoE, organizations must combine technology-enabled security capabilities (both logical and physical) with policies and processes designed to protect the privacy of company and customer/citizen information.

To better understand the impact of IoE, Cisco broke down the potential Value at Stake into five drivers for both the private and public sectors.

The five main drivers that will fuel \$14.4 trillion in IoE Value at Stake for the *private sector*⁶ over the next 10 years are:

- **Asset utilization (\$2.5 trillion):** IoE reduces selling, general, and administrative (SG&A) expenses and cost of goods sold (CoGS) by improving business process execution and capital efficiency.
- **Employee productivity (\$2.5 trillion):** IoE creates labor efficiencies that result in fewer or more productive man-hours.
- **Supply chain and logistics (\$2.7 trillion):** IoE eliminates waste and improves process efficiencies.
- **Customer experience (\$3.7 trillion):** IoE increases customer lifetime value and grows market share by adding more customers.
- **Innovation, including reducing time to market (\$3.0 trillion):** IoE increases return on R&D investments, reduces time to market, and creates additional revenue streams from new business models and opportunities.

Within the *public sector*⁷, the following five drivers will combine to create \$4.6 trillion in Value at Stake over the next decade:

- **Employee productivity (\$1.8 trillion):** IoE improves labor effectiveness for new and existing services.
- **Connected militarized defense (\$1.5 trillion):** IoE generates a fourfold force-multiplier effect through improved situational awareness and connected command centers, vehicles, and supplies.
- **Cost reductions (\$740 billion):** IoE improves labor efficiency and capital-expense utilization, leading to reduced operational costs.
- **Citizen experience (\$412 billion):** IoE shortens “search” times, improves the environment, and produces better health outcomes.
- **Increased revenue (\$125 billion):** IoE improves the ability to match supply with demand, while also enhancing monitoring and compliance.

These value drivers illustrate how IoE can impact every aspect of private-sector and public-sector processes – including both cost-cutting and revenue-raising activities.

But the ability to capitalize on these value drivers hinges on some key issues. In order to benefit from IoE, organizations must combine technology-enabled security capabilities (both logical and physical) with policies and processes designed to protect the privacy of company and customer/citizen information. IoE’s growth potential in the private sector over the next decade will rely heavily upon the success of these efforts. (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.)

In analysis related to its loE Value at Stake private-sector study, Cisco estimated that the oil and gas industry has an opportunity to realize \$493 billion in loE value over the next 10 years.

In the loE Value Index study, Cisco Consulting Services divided industries in terms of three readiness categories: Leading, Performing, and Pursuing. Energy and transportation were viewed as falling into the Pursuing category, or among those that currently are experiencing the most difficulty in realizing loE value. Even so, the study asserted, those firms in Pursuing industries that can incorporate loE into their operations, products, and services have strong “breakaway” potential. Pursuing industries are generally asset-intensive and, therefore, can benefit significantly from M2M connections. Firms from these industries can leapfrog rivals through strategies such as integrating sensor-based technologies and analytics throughout the value chain; creating intelligent and highly differentiated customer experiences; and by technology-enabling products to create annuity-based services.

How loE Will Impact the Oil and Gas Industry

In the oil and gas industry, success depends on smart strategies for finding hydrocarbons, no matter how deep, remote, or seemingly inaccessible. Then, once oil and gas deposits are located, the even more daunting tasks of extracting, transporting, and refining begin. Massively complex technology is at the heart of every operation, and a vast, far-flung ecosystem of employees, partners, and contractors drives its implementation.

Today, technology is providing answers to many of the challenges faced by the oil and gas industry. In particular, loE cornerstones such as mobility, collaboration, video, sensors, and analytics can play a key role in transforming the industry by enabling streamlined processes, greatly improved efficiency, and new sources of value.

In analysis related to its loE Value at Stake private-sector study, Cisco estimated that the oil and gas industry has an opportunity to realize \$493 billion in loE value over the next 10 years. But companies must first implement the necessary technologies to enable transformation.

That transformation can touch nearly every aspect of the oil and gas industry, including the exploration, development, and production of crude oil and natural gas; the shipping and trading of raw materials and products; and the refining, marketing, and selling of petroleum and petrochemical products.

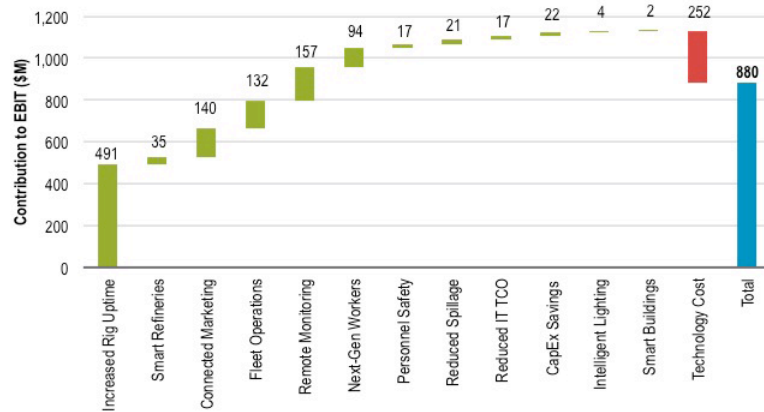
Cisco Consulting Services has studied the impact that loE transformation could have on a typical, nationally owned oil and gas company in the ASEAN region that produces about 1 million barrels of oil equivalent (BOE) per day – that is, if such a company commits to an initial investment in loE technologies.

Overall, our research found that while many oil and gas companies invest in research and development for innovation, that investment is focused mainly on their core operations. In general, ICT is not a prime area of investment. Cisco Consulting Services research shows, however, that by investing \$252 million in loE technologies, our model company would realize a total benefit of \$880 million in annual return. That averages out to 5 percent higher profits annually by 2017, along with a 0.4 percent earnings before interest and taxes (EBIT) margin improvement.

Connected oil rigs represent the largest value opportunity, with gross benefits of \$491 million, achieved by remote sensors monitoring oil rigs and machine-to-machine connections in real time to increase uptime.

Figure 1 illustrates how 12 key energy value drivers add up to \$880 million in benefits annually.

Figure 1. 12 Value Drivers Contribute to \$880 Million Annual Benefit.



Source: Cisco Consulting Services, 2014

Here are key findings behind some of the main drivers:

- Connected oil rigs represent the largest value opportunity, with gross benefits of \$491 million, achieved by remote sensors monitoring oil rigs and machine-to-machine connections in real time to increase uptime.
- Remote monitoring of oil fields represents the second-largest opportunity, with a gross benefit of \$157 million, achieved by reducing field-service trips and the productive time gained from reduced travel.
- Next-Gen Workforce offers gross benefits of \$94 million, achieved through solutions such as “bring your own device” (BYOD), mobile collaboration tools, telecommuting, and real-estate savings.
- Reduced oil spillage rates promise gross benefits of \$21 million, achieved by using sensors to monitor the exploration and transportation of oil in real time. The consequences of not adopting such technologies are considerable. In the United States, for example, civil fines for oil spills range from \$1,100 to \$4,300 per barrel of oil spilled, and cleanup costs average \$9,156 per barrel.
- Reduced capital expenses (CapEx) in upstream operations contribute gross benefits of \$22 million, achieved by reducing surplus stock, discarded scrap, and spares.
- In downstream operations, connected marketing and optimization of fleet operations drive gross benefits of \$140 million and \$132 million, respectively, driven by monitoring warehouses, higher vehicle utilization, and inventory management.
- Employee safety drives a \$17 million contribution to EBIT owing to reduced accident rates.

Cisco research predicts that IoE-related smart grid technologies represent \$757 billion in total Value at Stake over the next 10 years.

Our model ASEAN-based company is investing in IoE-related technologies, and it is important to compare its performance with peers that have chosen to concentrate on other areas of investment.

IoE benefited our model company in the following areas:

- **Rig uptime rate:** 3 percent improvement due to real-time monitoring
- **Oil spillage:** 20 percent reduction
- **CapEx in upstream operations:** 20 percent reduction
- **Travel, employee productivity:** reduced travel costs; 60 percent improvement in employee productivity due to collaboration tools such as telecommuting, video conferencing, and BYOD solutions
- **Refining capacity utilization:** 1 percent improvement
- **Electricity:** \$1.82 million savings due to smart lighting

Like many other oil and gas companies, our model organization is aiming to tap hydrocarbon deposits in international waters, far from its domestic drilling zones in the ASEAN region. Such expansion will no doubt create additional opportunities for IoE adoption in areas such as pipeline management, asset utilization, employee productivity, and supply-chain improvement. When problems arise on remote drilling rigs, the ability to connect with remote experts in real time can prove indispensable.

Moving forward, all energy companies will need to take a serious look at their “dark assets” and decide which are the best candidates to be “lit up” with network connectivity. Indeed, IoE may provide some of the best opportunities to stay competitive in a fast-changing marketplace, especially with the added complexity that will result as companies search farther afield for suitable sources of raw hydrocarbons.

IoE and Utilities: \$757 Billion Opportunity

As we have seen, global megatrends around urbanization are driving heavy demands on the world’s cities. This includes accelerating burdens on utilities as cities require ever-increasing amounts of energy. But IoE can provide important solutions.

Cisco research predicts that IoE-related smart grid technologies represent \$757 billion in total Value at Stake over the next 10 years. An effective smart grid uses network connections – from production to customers – to better understand user behavior and improve the reliability, economics, and sustainability of the production and distribution of electricity.

Utility companies today typically operate on a “best effort” infrastructure: they generate and place energy on the electrical grid without taking full advantage of their assets. This makes the grid vulnerable to faults and allows only for a one-way flow of electricity – from producers to consumers. In addition, the system is inefficient because power generation cannot be easily adapted to fast-changing energy usage cycles.

Cisco estimates that a typical electric utility company would have to make an investment of \$8.7 million to achieve a total benefit of \$21 million.

IoE will improve the electric grid by automatically detecting and repairing problems, controlling electrical flows based on real-time demand, improving generator utilization, and enabling more sustainable energy sources such as wind and solar power.

IoE enablers for utility companies include integrated network architecture, smart sensors and meters, and private cloud computing, working in concert with robust security solutions.

IoE Value at Stake from the smart grid will come mostly from improved efficiencies and increased reliability of the electrical delivery system. For this to happen, however, significant regulatory changes are required. Assuming these changes take place, utility company leaders must be ready to implement initiatives that allow for more flexibility, improved demand-side management, and the enablement of more sustainable energy sources.

Cisco estimates that a typical electric utility company would have to make an investment of \$8.7 million to achieve a total benefit of \$21 million.

As a model for how IoE can transform a specific organization, let's picture a large government-owned utility in a growing city in the ASEAN region. Our model utility caters to about 5 million customers across more than 9,000 square kilometers (about 5,592 square miles). Its revenue is more than \$6.5 billion per year, driven by a core electricity distribution service, retail electricity supply, and power generation.

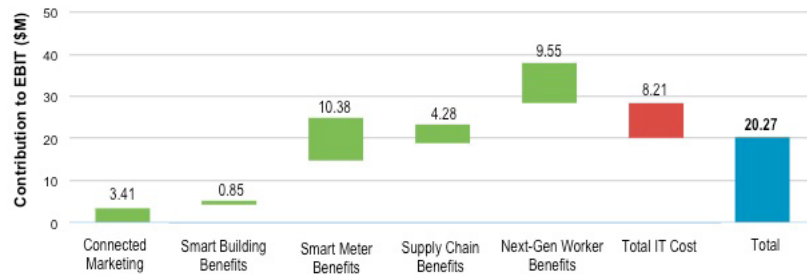
In comparison to its peers, this company is already benefiting from a willingness to adopt IoE-related technologies:

- Smart-meter adoption will greatly improve electricity distribution by monitoring customer sites in real time, leading to combined annual residential electricity savings of \$10 million.
- Reductions in travel costs, along with improvements in employee productivity, drive savings of 15 percent, enabled by adoption of collaboration tools such as telecommuting, video conferencing, and BYOD solutions.
- Adoption of IoE technologies improves the ability to target advertising to specific audiences. An adoption rate of 10 percent will generate annual benefits of \$3 million.
- Smart buildings will lead to energy savings of 15 percent and cost savings of 10 percent, stemming from improved building maintenance and management, creating a total annual benefit of nearly \$10 million.

Figure 2 illustrates how five utility value drivers combine to generate \$21 million in value annually.

Given the role it plays in overall efficiency and quality of life for so many citizens – especially in cities – the transformation of public transportation promises to have an important impact across a wide swath of the world’s population.

Figure 2. 5 Value Drivers Contribute to \$21 Million Annual Benefit.



Source: Cisco Consulting Services, 2014

Together, these IoE value drivers will transform utilities, offering more flexible and sustainable power-generation capabilities. Utilities will enjoy considerable cost savings and revenue increases, while providing better services and a cleaner and better quality of life for their customers.

Transportation in the IoE Era

Transportation is another area where IoE promises to drive innovation and deep value. Given the role it plays in overall efficiency and quality of life for so many citizens – especially in cities – the transformation of public transportation promises to have an important impact across a wide swath of the world’s population.

Again, the rise of a large, economically vibrant middle class in emerging markets, along with rapidly increasing urbanization, is creating a critical demand for more efficient transportation solutions. Traffic tie-ups, urban smog, and wasted fuel are consequences of more cars on the road, while expanding urban populations create additional demand for innovative, connected public transportation systems.

One core aspect of the overall transportation picture is parking. It is estimated that drivers spend up to 30 percent of their city driving time in the aimless quest for parking spots, taking an obvious toll in fuel costs, efficiency, and mental well-being. One study estimates that typical drivers spend 2,549 hours of their lives in the aimless, money-wasting, and gas-guzzling quest for a place to park.⁸

In its Internet of Everything Public Sector Value at Stake report⁹, Cisco estimates that smart-parking initiatives can account for \$41 billion in IoE-related public sector Value at Stake over the next decade.

Smart parking provides real-time visibility into the availability of parking spaces across a city. Residents can identify and reserve the closest available spaces; traffic wardens can recognize noncompliant usage; and the municipality can introduce variable pricing. The value impact of smart parking includes a 30 percent increase

Overall, Cisco research indicates that a transportation organization such as our model company would need to invest \$5 million to achieve a total benefit of \$12.2 million annually.

in parking rule compliance. Beyond that, it enables city data sales; reduces traffic congestion through the time required to park; and drives reductions in fuel usage. Dynamic pricing further increases revenues.

As for connected public transportation, let's imagine a large, still expanding network in a fast-growing ASEAN city. Our model transportation system includes an underground metro with seven lines that will eventually span a total length of 138 kilometers (about 86 miles); this will combine with monorail, street-level trams, and an expanded bus service. Overall, the city's public transportation system aims to become the main source for moving 50 percent of the city's population by 2020.

In comparison to many other cities, our city's model system is still in an initial construction phase, but the city is investing heavily in such IoE-related technologies as automatic train protection systems, automatic train control systems, autopilot systems, and area-signaling systems.

IoE-related benefits are expected in the following areas:

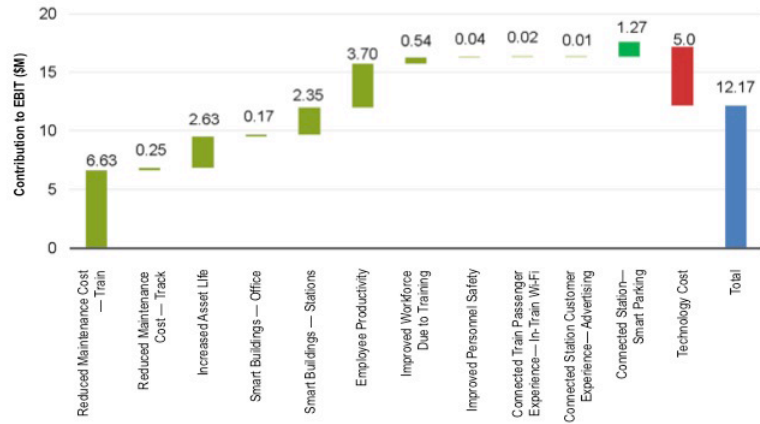
- Due to adoption of predictive and preventive management, the metro will be able to reduce its maintenance costs by 20 percent for tracks and 2 percent for trains.
- Smart-building technologies will enable office buildings and metro stations to reduce their energy and maintenance/management costs by 15 percent and 10 percent, respectively.
- Adoption of mobile collaboration and telecommuting technologies will increase employee productivity by 0.4 percent and 5 percent, respectively.
- Adoption of remote-expert capabilities (enabling, for example, maintenance or repair expertise via video) will help the metro to improve productivity by 12 percent.
- Services such as Wi-Fi and connected valet parking will boost revenue by \$0.02 million and \$1.3 million, respectively, based on enhanced customer experiences.
- Using collaboration tools to train the workforce will result in faster time to proficiency and improved training, contributing \$0.54 million to the IoE opportunity.
- Safety is an important component of railway operations. Our value model assumes only modest improvement in personnel safety compared to current high levels. These gains are achieved by deploying IoE sensors to avoid accidents, providing a benefit of \$0.04 million.

Overall, Cisco research indicates that a transportation organization such as our model company would need to invest \$5 million to achieve a total benefit of \$12.2 million annually.

Figure 3 illustrates how 11 drivers combine to create this value in transportation.

Overall, connected transportation promises better safety and security, improved utilization of assets, greater operational efficiency, and reduced delays and breakdowns.

Figure 3. 11 Value Drivers Contribute to \$12.2 Million Annual Benefit.



Source: Cisco Consulting Services, 2014

Overall, connected transportation promises better safety and security, improved utilization of assets, greater operational efficiency, and reduced delays and breakdowns.

In any expanding, vibrant urban environment, efficient transportation is crucial to economic growth and citizen well-being. IoE is the way to make it happen.

Conclusion and Call to Action

As we have seen, challenges facing the oil and gas, utilities, and transportation industries will only increase as global megatrends continue to accelerate.

Yet, business and public-sector leaders alike have a unique opportunity to “act” rather than “react.” In many organizations, it is essential for leaders to start identifying the “dark assets” that are most ripe to be lit up with IoE connectivity and transformation.

Here are five steps that will begin the IoE journey:

- Determine which IoE capabilities their organizations have today.
- Harness the complementary insights of both service and IT leaders.
- Identify major IoE opportunity areas and establish an IoE vision.
- Reach out to other organizations to share the benefits of IoE platforms.
- Build an “IoE culture” by helping employees imagine the possibilities of connecting the unconnected.

Oil and gas, transportation, and utilities all stand to benefit immensely from the IoE revolution. They must act now, however, to realize the cost savings, efficiencies, and innovation that IoE promises.

The IoE economy is arriving fast. And it is contingent on all organizations to meet the sweeping waves of transformation. This is particularly true in the ASEAN region, where the challenges of rapid transformation are already apparent. IoE can smooth the transition while creating new sources of value.

Oil and gas, transportation, and utilities all stand to benefit immensely from the IoE revolution. They must act now, however, to realize the cost savings, efficiencies, and innovation that IoE promises.

Endnotes

1. Source: World Health Organization (WHO), 2014, <http://bit.ly/Jem9XC>
2. Source: American Association for the Advancement of Science (AAAS), AAAS Atlas of Population & Environment, <http://bit.ly/PKorkv>
3. "Internet of Everything: A \$4.6 Trillion Public-Sector Opportunity: More Relevant, Valuable Connections Will Boost Productivity, Revenue, and Citizen Experience, While Cutting Costs," Cisco, January 2014, <http://bit.ly/1aSGlzn>
4. "ASEAN Statistics Leaflet: Selected Key Indicators, 2012," <http://bit.ly/1fUxgSx>
5. "Internet of Everything (IoE) Value Index: How Much Value Are Private-Sector Firms Capturing from IoE in 2013?," Cisco, May 2013, <http://bit.ly/N090Dc>
6. "Embracing the Internet of Everything To Capture Your Share of \$14.4 Trillion: More Relevant, Valuable Connections Will Improve Innovation, Productivity, Efficiency & Customer Experience," Cisco, February 2013, <http://bit.ly/19VH4F1>
7. "Internet of Everything: A \$4.6 Trillion Public-Sector Opportunity: More Relevant, Valuable Connections Will Boost Productivity, Revenue, and Citizen Experience, While Cutting Costs," Cisco, January 2014, <http://bit.ly/1aSGlzn>
8. *The Telegraph*, May 27, 2013, <http://bit.ly/M6Yo4R>
9. "Internet of Everything: A \$4.6 Trillion Public-Sector Opportunity: More Relevant, Valuable Connections Will Boost Productivity, Revenue, and Citizen Experience, While Cutting Costs," Cisco, January 2014, <http://bit.ly/1aSGlzn>




Americas Headquarters
Cisco Systems, Inc.
San Jose, CA

Asia Pacific Headquarters
Cisco Systems (USA) Pte. Ltd.
Singapore

Europe Headquarters
Cisco Systems International BV Amsterdam,
The Netherlands

Cisco has more than 200 offices worldwide. Addresses, phone numbers, and fax numbers are listed on the Cisco Website at www.cisco.com/go/offices.

 Cisco and the Cisco logo are trademarks or registered trademarks of Cisco and/or its affiliates in the U.S. and other countries. To view a list of Cisco trademarks, go to this URL: www.cisco.com/go/trademarks. Third party trademarks mentioned are the property of their respective owners. The use of the word partner does not imply a partnership relationship between Cisco and any other company. (1110R)