

Internet of Everything in the Public Sector

Generating Value in an Era of Change



Cisco predicts that \$4.6 trillion of value will be “at stake” in the public sector over the next decade, driven by “connecting the unconnected” through the Internet of Everything.

How does Cisco define the Internet of Everything, and how is it different from the “Internet of Things”?

Cisco defines the Internet of Everything (IoE) as the networked connection of people, process, data, and things. The benefit of IoE is derived from the compound impact of connecting people, process, data, and things, and the value this increased connectedness creates as “everything” comes online.

IoE is creating unprecedented opportunities for organizations, individuals, communities, and countries to realize dramatically greater value from networked connections among people, processes, data, and things.

By comparison, the “Internet of Things” (IoT) refers simply to the networked connection of physical objects (doesn’t include the “people” and “process” components of IoE). IoT is a single technology transition, while IoE comprises many technology transitions (including IoT).

Cisco estimates that 99.4 percent of physical objects that may one day be part of the Internet of Everything are still unconnected. Cisco predicts that **\$4.6 trillion of value will be “at stake” in the public sector over the next decade**, driven by “connecting the unconnected” through the Internet of Everything. These connections can be people-to-people (P2P), machine-to-people (M2P), and machine-to-machine (M2M). (When the estimated \$4.6 trillion in Value at Stake for the public sector is combined with the Value at Stake for the private sector – \$14.4 trillion – the overall global IoE Value at Stake reaches \$19 trillion.)

How do you define IoE “Value at Stake” for the public sector?

For the public sector, Cisco defines IoE Value at Stake as “the potential value that can be created by public-sector organizations based on their ability to harness IoE over the next decade (2013-2022).”

More than perhaps any technological advance since the dawn of the Internet, the Internet of Everything holds tremendous potential for helping public sector leaders address their many challenges, including the gap separating citizen expectations and what governments are actually delivering.

Cisco's public sector Value at Stake estimate includes:

- Benefits for agencies, employees, and citizens
- Quantified citizen outcomes (such as reduced traffic congestion, crime, etc.)
- Hard cost savings, increased revenues, and productivity gains
- Allowances for implementation and operational costs

The public sector Value at Stake estimate *does not include*:

- Privately owned citizen services
- Private sector impact from public expenditure

How were the IoE leaders profiled in the research selected?

Cisco and Cicero Group conducted extensive web-based research into public sector organizations' use of IoE, spanning the 40 use cases that made up Cisco's earlier economic model on public sector Value at Stake (see below). Where applicable, we also worked closely with Cisco's sales teams – who are often in a good position to comment on a given jurisdiction's IoE strategy – to learn more informally about the programs and projects the research team uncovered in the course of its web research. At that point, we contacted the jurisdictions we felt represented the cutting edge of IoE across the 40 IoE use cases to invite them to participate in this research project.

In general, we sought instances of IoE where: there was a high degree of alignment and relevance to at least one – but preferably multiple – IoE use cases; the capabilities had been deployed for a minimum of 12 months, so as to capture “lessons learned” and available metrics of success; there were clear signposts of “connecting the unconnected,” meaning new and better connections across people, process, data, and things that resulted in new operating models, citizen services, or other important organizational changes; the project(s) in question had reached a large-scale rollout (or were extremely scalable and mature pilots); and where there was a high level of integration between a given project and other related efforts.

Are these jurisdictions Cisco customers?

In some cases, the jurisdictions interviewed are Cisco customers. In fact, in some cases, Cisco has played a central role in a given organization's IoE journey. In other instances, Cisco does not have a commercial relationship with the public sector organization interviewed. The jurisdiction profiles completed in this project are not intended to serve as “Cisco” case studies, but rather as profiles of trailblazing IoE excellence that could impart valuable learnings for other public sector (and private sector) organizations. As they are not meant to serve as marketing material, these profiles make no mention of any role played by Cisco, and they do not name any other technology vendors involved.

Our goal has been to foster a leadership dialogue about IoE and to facilitate best-practice sharing.

How was the research conducted?

The research was comprised of in-depth interviews with knowledgeable public sector officials from the jurisdictions in question. In some instances, multiple officials were interviewed to arrive at a complete picture of the organization's IoE strategy, solutions, and results. Often, this involved interviews with stakeholders from the IT function (e.g., CIO), but also encompassed government officials, strategists and project coordinators, and private sector technology partners. For all jurisdictions, we sought participants who, together, could speak to the organization's experiences from both a strategic and a technical standpoint. In virtually all cases, the in-depth interviews were conducted in the participant's native language, either by telephone or via Cisco® TelePresence®.

When was the research conducted?

Interviews with public sector officials began in December 2013 and concluded in May 2014.

What kinds of public sector organizations are represented in the research?

Many different types of public sector organizations are represented in this research: federal, state/provincial, and local governments; hospitals; universities; utilities; and non-governmental organizations (NGOs). Jurisdictions were drawn from all around the planet, with an eye to ensuring representation of IoE leadership from both the developing and developed world.

Why did Cisco undertake this research?

Cisco has devoted considerable time and resources over the past 18 months to defining, sizing, and understanding the IoE opportunity. Our research has spawned multiple waves of insights (for more information, please visit <http://www.internetofeverything.com>). In recent months, conversations with our customers have made clear the need for additional detail on how organizations can capitalize on this unique market transition. To that end, we have directed additional market research and consulting resources to address this fast-moving space. We believe the insights gleaned from our research can help inform organizations' efforts to generate value for their constituents by showcasing real-world examples of how IoE has been put into practice, the critical success factors, the pitfalls, and lessons learned from those organizations in the vanguard of IoE implementation. Our goal has been to foster a leadership dialogue about IoE and to facilitate best-practice sharing.

Who conducted the interviews?

Interviews were conducted by consultants from the Cicero Group. Cicero Group, headquartered in Salt Lake City, Utah, is a leading data-driven strategy consulting and research firm delivering services to clients in 47 countries and 14 languages. Cicero delivers strategies and insights to empower organizations to achieve their financial and operational objectives. Cicero's efforts focus on the effective

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convergence of research, data, strategy, and implementation. Cicero professionals come from a wide variety of backgrounds, including business, academia, government, and the nonprofit sector. In nearly all instances, interviews were conducted in the participant's native language.

What is the relationship between this research and the earlier economic model on public sector Value at Stake?

The qualitative research developed in this project flows directly from the public sector Value at Stake analysis released by Cisco in January 2014 (for more information, please visit <http://bit.ly/1aSGlzn>). That economic model took a “bottom-up” approach to estimate the Value at Stake for public sector organizations over a 10-year span. This means that rather than using a single figure (a “proxy” for what could happen), Cisco economists researched and modeled the impacts of each of the 40 use cases identified. When Cisco and Cicero Group developed the list of jurisdictions thought to be IoE leaders, we considered how these organizations aligned to the taxonomy of use cases identified in the economic model. This ensured good coverage of nearly all key areas of value.

What are the sources of the \$4.6 trillion in Value at Stake for the public sector over the next 10 years?

Cisco's analysis shows that most of the potential Value at Stake (70 percent, or \$3.2 trillion) will be agency-specific (for example, connected education, healthcare, and defense), while 30 percent (\$1.4 trillion) will be driven by cross-agency adoption of IoE (such as “future of work,” travel avoidance, and smart buildings).

There are five main drivers of the \$4.6 trillion in IoE Value at Stake for the public sector:

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

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

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The \$4.6 trillion in IoE Value at Stake for the public sector is equivalent to about one-third of the expected civilian labor productivity growth over the next 10 years. Worldwide public sector labor productivity increases by around 3 percent each year. Dividing the civilian value generated each year by the expected annual salary costs provides a 1 percent improvement annually. The remaining productivity growth is likely due to increased training and use of unconnected (“dark”) assets.

How did Cisco calculate the \$4.6 trillion of public sector Value at Stake for the next 10 years?

Cisco calculated the IoE Value at Stake for the public sector by taking a bottom-up approach considering the value created by 40 use cases – both agency-specific and cross-agency. 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. Finally, care was taken not to double-count value across use cases.

IoE Value at Stake is based on net value: for each use case, we considered both the benefits and costs of new connections. Our use cases reflect the projected result of the application of technology – in this case, public sector transformation driven by the Internet of Everything.

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

Cisco’s IoE Value at Stake calculations are based on the following 40 use cases spanning the public sector spectrum, encompassing education, culture and entertainment, transportation, safety and justice, energy and environment, healthcare, defense, and next-generation work and operations:

AGENCY-SPECIFIC USE CASES

Education

- Connected learning
- Smart exams

Culture and Entertainment

- Smart lotteries
- Connected museum

Transportation

- Smart parking
- Public transportation
- Smart toll booths
- Road pricing
- Bridge maintenance
- Subway train control
- Smart streetlighting

This challenge has contributed to an increasing gap between citizen expectations and what governments can actually deliver.

Safety and Justice

- Disaster response
- Wildfire suppression
- Correction visits
- Video surveillance
- Connected offender transport

Energy and Environment

- Water management
- Smart grid
- Waste management
- Particulate monitoring
- Gas monitoring

Healthcare

- Inpatient monitoring
- Preventive care
- Authenticated pharma
- Hospital assets
- Drug compliance
- Chronic disease monitoring

Defense

- Connected militarized defense
- Connected assets

CROSS-AGENCY USE CASES

Next-Generation Workforce

- Mobile collaboration
- BYOD
- Telework
- Virtual desktop
- Travel avoidance

Operations

- Smart buildings – schools
- Smart buildings – non-education buildings
- Fleet management
- Smart payments
- Cybersecurity

Why should governments focus on IoE now?

Governments at the city, state/province, and federal levels confront a similar dilemma worldwide: how to meet increased citizen expectations in the face of reduced or flat budgets. This challenge has contributed to an increasing gap between citizen expectations and what governments actually deliver. In addition, a large set of other issues needs to be addressed across federal, city/state/local, healthcare, defense, and education.

IoE offers governments the opportunity to make significant advances in citizen services.

More than perhaps any technological advance since the dawn of the Internet, the Internet of Everything holds tremendous potential for helping public sector leaders address their many challenges, including the gap currently separating citizen expectations and what governments are actually delivering.

IoE offers governments the opportunity to make significant advances in citizen services. For example, IoE will enable governments to create services that leverage Big Data and crowdsourcing to expand the power of machine-to-machine communications for citizen delivery. Large organizations, government departments, and cities can benefit directly from the same new technologies that are transforming supply-chain management and logistics in the private sector. Similarly, they can build on the potential of mobile technology to develop “smart working” for their employees, resulting in significant cost savings. “Smart building” strategies can also reduce costs, while generating a positive environmental impact.

The transformational impact of IoE in the public sector will be realized through wholesale transformation of the way services are designed and how they utilize information to meet the needs of citizens more effectively.

Immediate IoE benefits will occur in the domain of statistical services and the availability of near-real-time data pertaining to various citizen behaviors – their location, the way goods are moved across borders, citizens’ consumption habits, and their future intentions. When applied to large populations, Big Data and the associated analytics will increasingly enable predictive modeling and, as a result, improvements to public infrastructure. These capabilities will also allow better anticipation of emerging trends, short-term fluctuations in demand driven by external factors (such as weather conditions or public events), and better management of emergency responses. In safety and security, predictive modeling is already being used to help deploy policing resources for greater effectiveness in fighting crime.

These developments are already driving sector-specific IoE infrastructure programs – such as smart grid, smart metering, early-warning systems, and critical-infrastructure protection – that support governments’ strategic policy objectives.

Where should governments focus to begin their IoE journey?

As with the Internet itself, IoE technologies will transcend national boundaries, so it will be important for governments to work together to promote international collaboration and governance. Governments will need to focus on three key areas: 1) economic development, 2) service delivery and efficiency, and 3) policy and regulation.

At the most general level, governments might begin by asking these questions:

As promoter of economic development

- Is the economic environment in the country/city/region/sector conducive to innovative investment? Do we have the necessary infrastructure – technology, markets, and skills?

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- Are there effective relationships among government, industry, and the research community?

As provider of services

- How does the public want services delivered, and how can we enable citizens to share in leading change?
- How can we develop incremental programs for IoE so that we gain the necessary experience in implementing innovative programs?
- How can we acquire the skills and knowledge necessary for success?
- Which new governance or business models may be required in an IoE environment?

As policymaker and regulator

- How can we promote open debate about the acceptability of new systems, particularly in relation to privacy, safety and security, and resilience?
- How can we ensure that all citizens benefit?
- How can we create an open-standards system that supports a dynamic and competitive market?

What are the first steps governments can take?

To capture more value in the IoE economy, organizations must take a strategic approach that involves: 1) investing in high-quality technology infrastructure and tools, 2) adopting and following inclusive practices, and 3) developing effective information-management practices. Please refer to Cisco's related paper on the IoE Value Index (<http://bit.ly/N090Dc>) for additional context on how organizations can go about extracting value from IoE.

Public-sector leaders have a unique opportunity to "act" rather than "react" to the IoE opportunity. To get started, public-sector leaders should:

- 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

Cisco Consulting Services is helping governments and enterprises worldwide capture the value IoE can generate for their organizations, customers, and citizens. To learn more, send an email to ioeconsulting@cisco.com or visit the following website: <http://bit.ly/R4SCCK>

No company in the world understands the loE market transition better than Cisco, or is more uniquely positioned to help its customers take advantage of it.

How will loE impact Cisco's business?

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

Will Cisco provide loE services for customers?

Yes. We have aligned much of our Cisco Consulting Services organization to help businesses capture more value in the loE economy, and Cisco uses business and IT consulting together to drive the people and process changes necessary to implement loE.

Cisco Consulting Services is leading the charge by helping organizations make the right technology bets and pursue the strategies that will enable breakthrough products and services. Cisco Consulting also developed the groundbreaking research and insights that sized the loE opportunity and showed how organizations across the world and in various industries are benefiting from loE.

The loE Value Index (<http://bit.ly/N090Dc>), for example, is used as a benchmark to identify the required loE capabilities that will drive increased business value for enterprise customers. It's the only piece of primary research of its kind in existence today, and it helps our customers understand where to begin their loE transformation. We are now engaging with customers to estimate the value each organization can generate from loE and provide a specific roadmap for unlocking that value.

No company in the world understands the loE market transition better than Cisco, or is more uniquely positioned to help its customers take advantage of it.

Where can I learn more about loE?

You can learn more about this analysis, and the opportunities presented by loE, at: <http://www.internetofeverything.com>



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