Internet of Everything Opportunities for Bulgaria

Plamen Nedeltchev, Ph.D., Distinguished IT Engineer
John Manville, SVP Cisco IT.
Christopher Reberger, Director Cisco Consulting
Ewan Morrison, Communication manager, Integrated Marketing.

Introduction

The Internet of Everything (IoE) which Cisco defines as the networked connection of people, processes, data and things, is transforming industries, countries, and communities and serves as the foundation for a global economic opportunity. The impact of IoE may be compared to the impact of the European industrial revolution of 18th century.

Approximately half of the world's population will have network access by 2020, by which time there will be 50 billion physical objects connected to the Internet. The real power of the IoE is not the connections, but the outcomes they make possible. The outcomes will enable individuals, businesses, governments and other organizations to either do things they couldn't before, or to do things they currently do better, faster, and more safely.

This paper provides an outline of the current IoE opportunity, building on the Internet of Things (IoT), and includes a detailed analysis of the opportunities in both the public and private sector for Bulgaria.

Value at Stake

Cisco defines value at stake as the combination of net new revenues, cost savings, and the value that migrates to organizations and industries that take advantage of new connection based capabilities. With this definition IoE represents a material economic opportunity for both the public and private sectors. A conservative, "bottom up" economic analysis conducted by Cisco Consulting Services, focusing on use cases that can be operationalized in the short to medium term, estimates a global "value at stake" of $19 trillion over 2013-2022.

For the global private sector, Cisco estimates the value at stake to be $14.4 trillion. This equates to a 21% aggregate increase in corporate profits over 2013 - 2022. Cisco estimates that

approximately 60% of the global value at stake will be net new value that is created, while the other 40% is "up for grabs," to be claimed by the businesses and organizations that take better advantage of IoE connections at the expense of those that don't.

For the public sector, Cisco estimates the value at stake to be $4.6 trillion. This is derived from increased efficiency and related cost savings, improved citizen experiences, and greater revenue opportunities.

The economic analysis behind these estimates, as well as the use cases included, are described in detail in two white papers published by Cisco Consulting Services in 2013 and 2014.

Internet of Things

The IoE is a high level, broader concept that covers connections between people, processes and data in addition to "things". The IoT, an important subset of the IoE, is described by New York Times reporter Steve Lohr, as "billions of digital devices, from smartphones to sensors in homes, cars, and machines of all kinds [that] will communicate with each other to automate tasks and make life better."

Consumers have grown accustomed to purpose-built communications devices such as PCs and smartphones. With the IoT, things with diverse purposes, from soccer balls to ambulances can be equipped with intelligent sensors that collect and share information. Today, the examples of the IoT are visible in the form of remote home-monitoring technologies; so-called "wearables" such as Google Glass or Nike Fitbit; self-tracking tools; sensor-rich fabric; intelligent energy and power systems; autonomous vehicles; retail tracking and automated inventory-management systems. Some examples of the value of IoT include:

- A smart-lighting solution in the United Kingdom has resulted in a seven percent reduction in crime.
- Immersive video conferencing in the United States has resulted in a 15-percent cost savings due to travel avoidance. A "smart garbage" solution in Finland with sensors in garbage containers has resulted in a 30-percent reduction in waste-collection costs.
- A video-communications solution in one U.S. court system has resulted in a $950 savings per court appearance by avoiding the need to transport prison inmates to court and enabling them to attend virtually instead.

In Bulgaria, the value of the IoE is being demonstrated by Eleven Accelerator venture Fund (Fund 11), which is supporting the creation of unique drones. It is also evident in Chelopech, where an enterprise company was able to implement networked sensor technology to increase its production from half a million to two million tons annually, while also increasing quality without increasing headcount or required resources.

Similarly, countries like South Korea and Mexico are investing to take advantage of IoE opportunities and Israel has declared its intent to be the first "digital country." Cities such as Barcelona, Amsterdam are also realizing the power of the IoE to improve the lives of their citizens and increase efficiency, public safety and generate high wage jobs.

The 10th International Conference on Frontiers of Information Technology (2012) found IoE applications in almost every aspect of our daily life:

- Prediction of landslides and other natural disasters.
- Industry applications such as managing a fleet of cars and their environmental impact.
- Water-scarcity monitoring.
- Smart homes with energy-consumption management, interaction with appliances, detecting emergencies, home safety and finding things easily, home security etc.
- Medical applications for saving lives or improving the quality of life.
- Agriculture applications such as a network of sensors to monitor and share information about water, seeds, fertilizer, and pest-control mechanisms that respond to specific local conditions and indicate actions.
- Intelligent transport systems such as non-stop electronic highway tolls, mobile emergency command and scheduling, transportation law enforcement, vehicle rules violation monitoring, environmental pollution reduction, anti-theft systems, traffic congestion reduction, traffic incident reporting, and more. Interestingly, some of these efforts were pioneered by the Ministry of Transportation of Bulgaria in the 1990s.
- Smart city solutions such as monitoring air quality, discovering emergency routes, efficiently municipal control and management of light, traffic, parking, waste, watering and more.
- Smart metering and monitoring.
- Smart wind-turbine maintenance and remote monitoring of gas and water as well as environmental metering and monitoring.
- Smart security and surveillance of spaces, people and assets such as infrastructure and equipment.

Public Sector Opportunities in Bulgaria

The overall Value at Stake in the public sector in Bulgaria is estimated at $2.8B as shown in **Figure 1**. It will result from IoE's ability to help public-sector organizations manage assets, optimize performance, and create new business models. Cisco's economic analysis estimates that 70 percent of that value will come from agency-specific implementations, while 30 percent will derive from cross-agency use cases.

The five primary drivers of IoE Value at Stake for the public sector are: 1) employee productivity, 2) connected defense, 3) cost reduction, 4) citizen experience, and 5) increased

revenue. More than two-thirds of IoE's Value at Stake for the public sector (69 percent) will be powered by citizen-centric connections (person-to-person, machine-to-person or person-to-machine). Cities will generate almost two-thirds (63 percent) of IoE's overall public-sector value at stake.

Opportunity	**Estimated Value [$M]**	**Opportunity Area**	**Estimated Value [$M]**
Video Surveillance	$52	Virtual Desktop	$8
Smart Parking	$46	Particulate Monitoring	$11
Smart Street Lighting	$55	Disaster Response	$6
Waste Management	$15	Smart Buildings	$146
Road Pricing	$16	Correction Visits	$2
Public Transport	$23	Bridges Maintenance	$3
Offender Transport	<$1	Fleet Management	$26
Telework	$165	Local Metro	$15
BYOD	$114	Travel avoidance	$145
Connected Museum	NA	Smart Tollbooths	<$1
Connected Learning	$169	Chronic disease	$53
Gas Monitoring	$51	Inpatient Monitor	$2
Water Management	$63	Counterfeit drugs	<$1
Smart Xmission Grid	$150	Cyber Security	$71
Mobile Collaboration	$1,332	Drug Compliance	$4

Figure 1. Bulgaria's $2.8B public sector IoE opportunity detail

To maximize value creation, cities should combine uses cases as much as possible rather than approaching them individually. The winning IoE strategy in the public sector includes two major groups of opportunities:

- **People/Citizens:**
    - Telework,
    - Smart Parking,
    - Smart Street Lighting,
    - Addressing Chronic Disease,
    - Water Management

- **Cities**
    - Mobile Collaboration,
    - Connected Learning,
    - Smart Grid,

- Smart Buildings,
- Travel Avoidance
- Waste Management

Figure 2 shows the commonality of city-based use cases that share a ruggedized field area network infrastructure. Based on this set of opportunities a city of Barcelona was able to generate new value and be more efficient, and generate 46 thousands new jobs in 2012 and 2013 and city of Tashkent was able to solve significant traffic problems remotely monitoring the traffic, predicting and identifying traffic jams and facilitating preemptive enforcement.

Figure 2. Bulgaria IoE transformation is maximized when cities combine IoE use cases.

The capital of Bulgaria, Sofia, is home and workplace for 16% of the population of the country and contributes around 36% of GDP. Cisco Consulting Services estimates the IoE opportunity for Sofia at $0.81B, where 90% of the value at stake will be generated from the following 10 use cases: 1. Mobile Collaboration, 2. Telework, 3. Travel, 4. Bring your own device. 5. Connected Learning. 6. Smart buildings. 7. Cyber Security. 8. Water management. 9. Smart Street Lighting and 10. Fleet management.

IoE offers governments the opportunity to make significant advances in citizen services while also being more efficient. For example, Sofia can leverage “big data” analytics and

crowdsourcing to expand the power of machine-to-machine communications for citizen delivery.

Private Sector Opportunities in Bulgaria

The overall Value at Stake in the private sector in Bulgaria is estimated at $7.6B as shown in **Figure 3**. The major opportunities for the private sector are in asset utilization, employee productivity, and supply chain, improving customer experience, and reduced time to capabilities through innovation. For Bulgaria, the value falls into two main categories:

- **Cross – Industry Use Cases:**
  - Future of Work (Improved collaboration, mobility etc.)
  - Time-to-Market
  - Supply Chain Efficiency
  - Travel Avoidance

- **Vertical Industry-Specific Use Cases:**
  - Smart Grid
  - Connected Marketing/ Advertisement
  - Smart Factories
  - Physical/ Logical Security

Opportunity	**Estimated Value [$M]**	**Opportunity**	**Estimated Value [$M]**
Smart Grid	$1,066	Smart Buildings	$188
Connected Commercial Vehicles	$324	Wealth Management	$245
Smart Farming	$197	Next-Gen Retail Bank Branches	$11
Physical/ Logical Security	$586	Next-Gen Vending Machines & Digital Malls	$27
Smart Factories	$907	Connected Gaming/ Entertainment	$348
Connected Private College Education	$12	Connected Marketing/ Advertisement	$1,048
Business Process Outsourcing	$399	Digital Signage	$21
Innovative Payments	$337	Virtual Attendants	$87
Future of Work	$619	Time-to-Market	$554
Travel Avoidance	$280	Supply Chain Efficiency	$325

Smart Grid	$1,066	Smart Buildings	$188
Connected Commercial Vehicles	$324	Wealth Management	$245
Smart Farming	$197	Next-Gen Retail Bank	$11

Figure 3. Bulgaria: $7.6B private sector IoE opportunity detail

Large organizations, government departments and the larger cities in Bulgaria can benefit directly from new technologies that transform supply-chain management and logistics in the private sector. Similarly, they can build on the potential of mobile technology to develop "smart working" practices for their employees, resulting in significant cost savings and increased productivity.

Recommendations:

Specifically, based on the existing predictive analytics model, the investment opportunities of Bulgaria include the following opportunities:

- **Invest in digitalization in the public and private sectors**. Digitization (the mass adoption of connected digital services by consumers, enterprises, and governments) has emerged as a key economic driver that accelerates growth and facilitates job creation. Cisco estimates that an increase of 10 percent in a country's digitization score fuels a 0.75% growth in its per capita GDP. Digitization creates jobs, with a 10-point increase in the digitization score leading to a 1% drop in the unemployment rate. Based on the analysis conducted by Cisco consulting services, the major opportunities are energy, healthcare, manufacturing, public sector, retail and transportation. Every successful business today is being digitalized. The research shows that 46% of the business leaders are planning to proceed with the opportunities of IoE technologies in the next 6 to 18 months because of expectations of "operational efficiency" effectively digitalizing asset utilization, employee productivity, supply chain, improving customer experience and reducing time to capabilities (market) through Innovation. That creates the private sector dimension of IoE around "connecting the unconnected", "building an IT infrastructure on the top of the cyber-physical infrastructure", or "integrate of Information (IT) and Operational technologies (OT)" which accelerates the overall digitalization and operational efficiency.

- **Recognize the Importance of national policy leadership in digitalization.** With one-third of the world's population online the need for coordination between government policies and commercial strategies in the rollout and use of information and communication technologies (ICTs) has never been greater. Most countries now recognize the importance

of policy leadership and a clear cross-sectoral vision that can maximize the economic and social returns of ICT. There is a need for national policy leadership in highlights the role of digitalization in the national development, provide an enabling environment for private investment, coordinate dialogue, and encourage work across different sectors and ministries. Over the last few years, policy decision makers, communication ministries, and national regulators have made broadband a policy priority around the following best practices:

- Plans should be cross-sector across a range of different sectors
- A coordinating agency responsible for implementing the plan, in conjunction with other stakeholders may be required
- Plans should make the case for broadband, specific to the needs and economic structure of that country, based on market analysis and benchmarking
- Plans should be developed in consultation with, and based on consensus with, a broad range of stakeholders.

In addition, comprehensive digitalization plans can typically be characterized in the following ways:

- Many plans emphasize an important role for public- private partnership.
- Plans should consider both demand- and supply- side considerations. This may mean supporting the development of human skills, literacy, and demand among, for example, schools and small- and medium-sized enterprises, as well as taking into account the role of government in driving demand.
- Plans should look forward 5 to 10 years, as it may often be difficult to predict technological evolution over longer time horizons.
- Plans should be broadly technology-neutral.

- **Investing into future-proof infrastructure such as broadband and Information and communication technologies (ICT) conversion.** Bulgaria enjoys a geographically strategic position on the old Roman road between Western Europe and the Middle East, and has a unique opportunity to be the digital hub between two worlds. For Europe, a significant proportion of growth is likely to come from knowledge-based industries, underpinned by ICT. The European Commission's Europe 2020 vision describes a future for the region in the Digital Agenda. The foundation for digital prosperity is fiber access, often referred to as superfast broadband - "[broadband] infrastructure, the backbone of the entire Internet ecosystem, is an irreplaceable prerequisite. It creates the platforms upon which users, and organizations experience the Internet, and upon which entrepreneurs and businesses innovate."

  According to the Broadband Commission, a joint body of the United Nations Educational, Scientific and Cultural Organization (UNESCO) and the International Telecommunication Union (ITU), every 10 percent increase in broadband penetration results in additional

growth of 1.3% in GDP. Similarly, in a 2011 study across 33 countries found that doubling the broadband speed for an economy increases GDP by 0.3%.

- **Invest in 3G/4G mobile services**. Bulgaria has high mobile network and fixed network penetration. Using detailed information provided by Cisco on mobile data usage between 2005 and 2010 in 14 countries for which historical disaggregated data is available, mobile data usage for each 3G connection in a country can be calculated. This analysis finds a positive correlation between the volume of mobile data used by each 3G connection and increases in economic growth. On average, across the sample of 14 countries considered, if countries doubled their consumption of mobile data per 3G connection between 2005 and 2010, they would have experienced a growth rate of GDP 0.5% each year. This effect grows linearly with the initial level of data usage per 3G connection in the country: countries with a higher average level of mobile data consumption per 3G connection experience a larger impact on GDP per capita growth from increasing this consumption. Countries such as Russia, the United Kingdom, and the Republic of Korea, which are characterized by a higher level of data usage per 3G connection, experience an increase in GDP per capita growth of up to 1.4%. The effect is more limited for countries that are still developing mobile data usage.

- **Invest in ICT based health technologies.** Understanding the challenges to the adoption and effective use of ICT in health systems, along with their broader economic impacts, is critical to achieving their widespread penetration and to realizing the potential benefits. There is strong evidence that ICT implementation can result in healthcare that is higher quality, safer, and more responsive to patients' needs as well as more efficient. The organization for Co-operation and Development (OECD) considers digitalized health (e-health) one of the six most promising lead markets of the European Union. The greater adoption of health ICTs can play an important role in efficiency and cost reduction, improved healthcare delivery, reduced medical errors and improved patient safety, improved management of chronic diseases. The step by step buildup of the system can include 1. Provider-centric electronic records systems 2. Patient-centric electronic records systems. 3. Health information exchange and 4. Telehealth.

- **Invest in Big Data as a Big Opportunity for Inclusive Growth.** According to research by MIT, companies that inject big data and analytics into their operations show productivity rates and profitability that are 5% – 6% higher than those of their peers. Bulgaria's educational system has consistently delivered high level outcomes in mathematics, physics and science education. This creates an opportunity for high wage employment in big data analytics, data and network forensics, security, privacy, safety and integrity. Gartner estimates that, by 2015, big data will directly create 4.4 million IT jobs globally. With the application of high-performance analytics to big data, public and private organizations can obtain decision support in hours instead of days and weeks. In simple terms, this will enable businesses to move away from the traditional intuitive management approach, which we would

characterize as “fail and fix” or “fail fast” to one we would characterize as “predict to prevent” and “predict to perfect.”

Conclusion:

Based on Cisco’s economic analysis, IoE will contribute almost 26% more revenue globally in the next 10 years. Public-sector leaders in the world are realizing that majority of services are becoming digital and, as a result, are trying to take advantage of this unique opportunity rather than react to it.

To start, public-sector leaders can start the process by calling a “round table” discussion with the leaders of the IT, business and academic communities with international participation. The objectives of these discussions could be to:

- Identify major IoE opportunity areas and establish an IoE vision for them
- Reach out to other organizations to share the benefits of IoE platforms
- Work to build an “IoE culture” to explore the possibilities and benefits of connecting the unconnected.

The projected numbers for Bulgaria are lower than other larger countries. For businesses, organizations, and governments that fully embrace the Internet of Everything, however, the benefits can be materially greater.

Considering the specific opportunities of Bulgaria in the energy industry, new opportunities around IoE-enabled smart grid and “smart building” strategies can reduce costs while generating a positive environmental impact. IoE enabled tourism with technologies like mobile collaboration and connected marketing and advertisement can encourage the generation of new revenue streams for targeted advertisement and provide more choices for users and customers. Bulgaria’s agriculture industry has been one of the country’s strongest, and is culturally and emotionally woven into the way of living of Bulgarian people. Using smart sensors and other networked and Big Data technologies can help to improve food quality and quantity and ecological control. It can be used to create higher returns for a variety of agricultural products and segments and can open new opportunities for jobs and markets.

Smaller countries, which are more nimble and have fewer barriers to change, may provide leading examples for more established economies to follow, showing what can be done with high-level leadership that is committed to improving public services and private sector efficiency.