Role of Internet of Things (IoT) in Economic Development

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The Internet of Things - IoT

- Changing Environment
- Applications Spread
- Challenges to IoT Adoption
- Hierarchical Architecture
- Conclusion
Changing Business Environment

Explosion of Connected Devices

By 2015: **25 billion** connected IP devices vs. **7.2 billion** people
Cisco IBSG, April 2011

By 2014: Managed mobile M2M services market will be **$20B.**
ABI Research, 2010

By 2015: M2M traffic will grow by **258%.**
Cisco Visual Networking Index, 2011
Defining the Internet of Things

“The point in time when more “things or objects were connected to the Internet than people”
A Technology Avalanche is Building!

IoT will change everything
IoT Hierarchy

Information & Analysis Apps
- Tracking Behavior
- Enhanced Situational Awareness (weather, traffic, sensor networks, sonic sensors/gunfire)
- Sensor-Driven Decision Analytics (oil & gas, retail sensors, health care)

Automation & Control Apps
- Process Optimization (Mfg lines)
- Optimized Resource Consumption (i.e. energy, water)
- Complex Autonomous Systems (mimics human reactions - detect or prevent auto crashes or “phantom jams”)

Technologies
- Robotics, Environmental sensors, Vehicle Telematics, RFID, IP light bulbs, LBS, LOC sensors
What is M2M communication?

M2M Definition:
M2M improves business process efficiency & productivity

Source: Ericsson
A Broad Set of Applications
1 Trillion Connected Devices by 2020!

Energy Saving (I2E)
Enable New Knowledge
Predictive maintenance
Food & H2O Quality
Smart Grid
Transportation and Connected Vehicles
Intelligent Buildings
Healthcare
Enhance Safety & Security
Industrial Automation
Improve Productivity
Defense
Smart Home
Global Sensor Network
Health
Smarter Transportation

- The typical U.S. traffic signaling system is 30 to 40 years old.
- Fully utilizing smart traffic technology could cut fuel consumption on urban roadways by as much as 20 percent.
- Reducing accidents, saving lives.
The Intelligent Traffic Management system in New York City utilizes wireless technology to relieve congestion and route traffic around unexpected events in real time.
Smarter Cars
Smarter Transportation Tracking

Connecting Buses and Trains to Apps

Making parking easier

Thinking “inside the box” to track FedEx packages
Smarter Security

• By 2020 there are projected to be almost half a billion connected devices in the security sector alone
Smarter Agriculture

Using sensors to improve and expand application of precision agriculture could reduce water use by 11 to 50 percent.
Smarter Buildings
Smarter Homes

• By 2014, 70% of all consumer electronic devices are expected to be connected to the Internet

• Home automation system to increase from 1.8 million to 12 million systems a year within 5 years
Smarter Cities

By increasing the technology embedded in city processes and infrastructure, IDC estimates that it’s not impossible to see:

- Reduction in carbon emissions of: 25%
- Energy savings of: 50%
- Reduction in crime rates by: 20%
- Reduction in traffic jams of: 20%
Smarter Health Care

- Asthma inhalers
- Smart Pill Bottle Caps
- Digital Cardiac Monitors
- Digital Band-Aids
- "Electronic Skin" Patches

Monitor Health Wirelessly
Smarter Payments

ATMs – early M2M example

Vending Machines – order when empty

Connected payments
Smarter Businesses

- When machines talk, businesses listen
- Improving factory agility, intelligence, efficiency and control
- Remotely controlling machines
- Alerts on equipment performance before it fails
- Navigate warehouses and inventory control
IoT – Defining the Layers

Network – supported services

Fixed and mobile communication protocols

Applications layer

Middleware layer

Internet layer

Access Gateway layer

Access Networks

Edge Technology layer

Edge-technology data capture and Networks
The IoTs Hierarchical Architecture

- **Data Center**
  - Hosting IoT analytics
  - Core
    - IP/MPLS, Security, QoS, Multicast
  - Thousands

- **Multi-Service Edge**
  - 3G/4G/LTE/WiFi
  - Dozens of Thousands

- **Embedded Systems and Sensors**
  - Low power & bandwidth, smart things
  - Millions

- **IoTs Innovation**
  - Ruggedized Platform
  - Hosted/App, Distributed Intel.

- **Network Management**

- **Distributed Intelligence: FOG Computing**

- **Energy**
  - Smart Cities
  - Connected Cars
  - Healthcare

- **Data Center Computing, Storage, Networking**
  - Cloud Computing Services/Apps Delivery Support

- **Mobility and Infrastructure Routing, Distributed Data Center/Fog Service Delivery Support**

- **Edge Routing, Wireless/Mobile AP, Fog Computing/Storage, Industrial Ethernet**

- **Rich (Mobile) Client**

- **Edge Stack, Routing**
M2M End-to-End Architecture

Applications
- mHealth/Fleet Management/Industrial Automation

Business Applications
- SAP/Oracle

Business

Systems Integrator

Carrier SP M2M Cloud Services

Asset (Sensor) & M2M GW (Edge Computing)

3G/4G M2M GW
- #m Sensors: 1 M2M GW

Sensor # 1
Sensor # n
Sensor # x

3G/4G/WiFi

GPS M2M GW

3G/4G/WiFi

GPS M2M GW
Machine-to-Machine Use Case Scenario

Case Study: Mobile CPE for Areas as Diverse as ATMs and Emergency Vehicles

The Requirement
- Ruggedized router in small form factor w/ IOS
- Easy to deploy & manage

How
- 819 IOS-based M2M gateway w/ 3G, dual SIM
- Shock/vibe, humidity, splash water, temp, dust

Benefit
- Open up new use cases: ATM machines, emergency vehicles, oil pipelines, save lives and reduce emergency services’ response times
Barriers & Challenges to IoT Adoption

**Business Challenges**
- Sensors business value
- IoT applications must be profitable

**Policy Challenges**
- Data security, data privacy issues
- Legal challenges for poor automated decisions

**Technology Challenges**
- Developing energy sources for millions – or billions of sensors
- Establishing a common set of standards
- Technologies must evolve for free flow of data between sensors and networks
- Transition to IPv6
- Enhanced software apps will be needed
Case Study - Egypt

- Current Subsidies 2012/2013 –

- Petroleum materials: 70.0 billion EGP
- Food commodities: 26.0 billion EGP
- Electricity: 5.0 billion EGP
- Health services: 0.7 billion EGP
Conclusion

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*Cisco IBSG, April 2011*

M2M should be used to solve critical economic challenges

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Need to develop legal framework for information security and privacy, national and regional
THANK YOU