ARM’s IoT Vision

The Internet of Things (IoT) is the next evolution of the Internet where billions -- perhaps trillions -- of devices of all types and capabilities are connected through **Internet Protocol** and **Web Services**.
Merging of Our Digital and Physical Worlds

Mobile Computing

Connectivity

Intelligent "Things"

Wireless Infrastructure

Servers
Connected Intelligence

Smart Infrastructure

Environmental
Home Automation
Identity & Tracking
Farming
Connected Car
Energy Grid
Social & Local
Building Management
Logistics & Shipping
Healthcare

CONFIDENTIAL
M2M → IoT Evolution

Silos of Things

Internet of Things

Services

The Web

Things
IoT Building Blocks = Sensors + Microcontrollers + Wireless Communications

Position
Movement
Temperature
Pressure
Gesture
Light
Body / Blood characteristics
Other

Integrated in an object
Attached to an object
Wearable
Ingestible

Lots of data
Hub
Cloud
Other

Control
Sends data

Source: Morgan Stanley
IoT Inhibitors vs. Drivers

**Growth Inhibitors**
- Fragmentation
- Legacy systems
- Proprietary standards
- Application complexity
- Security / privacy concerns

**Growth Drivers**
- Ubiquitous M2M / IoT applications
- Standardization initiatives
- Improved efficiencies (real time data)
- Enhanced customer experiences
- Operational efficiencies
- Cost reduction
- Robust security solutions
- MNO / MVNO push
- Public sector advocacy / regulation
- Application enablement platforms
- Business case efficacy / ROI
- IPv6
Smart Lighting Application

6LoWPAN mesh technology over sub-GHz 802.15.4
End-to-end solution with web integration and security

IPv6 will be an important driver for the success and growth of IoT
Diego to Save More than a Quarter of a Million Dollars Annually with GE Smart Lighting Technology

First U.S. City to Adopt GE’s LED Street Lighting Solution with LightGrid™ Wireless Controls for Decorative Downtown Lighting
Wireless control eliminates need for dedicated control wiring, associated switch legs, traveler wires and other raw materials.

Wireless installs present zero-to-little disruption to business operations.

System installs more quickly, producing labor saving (20% - 80% of installation cost*)

Easy commissioning

* Source: Schneider Electric (TAC)
Self-healing mesh network → Improved performance and customer satisfaction

Over-the-air (OTA) software upgrades of nodes / endpoints → Monitor, troubleshoot and correct problems → Greater network uptime

Predictive maintenance → An intelligent network will reduce the number of physical visits necessary for troubleshooting and maintenance

Replacement cost reduction → Optimize spare parts inventory
By installing a wireless mesh control network over a wide area, lighting expenditures can be reduced by ~50%*

Lighting accounts for about 1/3 of the electricity used in commercial buildings.

Case studies show that adding wireless lighting control system can reduce lighting energy by ~65%**

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** Outdoor Lighting Business Case

** Energy Savings

<table>
<thead>
<tr>
<th>Solutions</th>
<th>Single Space Energy Savings*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Occupancy/Vacancy sensing</td>
<td>20–60% lighting</td>
</tr>
<tr>
<td>Daylight harvesting</td>
<td>20–60% lighting</td>
</tr>
<tr>
<td>Personal control</td>
<td>10–20% lighting</td>
</tr>
<tr>
<td>Plug load control</td>
<td>35% plug load</td>
</tr>
</tbody>
</table>

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* Source: Lutron
** Source: California Energy Commission
Street lights have seldom been *individually metered*

Each local utility charges municipal customers an *estimated* monthly fee (an algorithm that seldom favors the municipality)

A large part of anticipated municipal customer cost savings will be driven by the fact municipalities can now show exactly how much energy each street light consumes

A common motivator for U.S. municipal customers is the ability to demand actual *usage-based charging*
April 23, 2013

Los Angeles Extends Testing of GE LightGrid (TM) Outdoor Wireless Controller for Streetlights


GE LightGrid Demo
LightFair
23-25 April 2013
Philadelphia, PA
Conclusion

Virtually any physical “thing” – such as outdoor lighting – can be connected to the Internet

- Improve efficiency
- Improve quality of life
- Enable new products, new services and new business models

IoT will be enabled by new technologies offered by ARM partners

- Low-power MCUs, wireless, sensors and IP stacks
- Enabling intelligence, connectivity and data security from low-cost sensor nodes to gateways to servers
- Easy-to-use hardware and software development environment

Standards are essential

- Only an open and standards-based IoT ecosystem will thrive
Thank You

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