The Internet of Everything
and Smart Cities
The Only Constant Is Change

Technology Transitions

- Mobility / Video
- Cloud
- New Breed of Apps
- Internet of Things
- Big Data & Analytics

YOU

Business Implications

- Growth and Productivity Opportunities
- New Business Models
- User Experience & Expectations
- Globalization
- Security & Regulatory Compliance
The Internet of Everything

People
Connecting people in more relevant and valuable ways.

Process
Delivering the right information to the right person (or machine) at the right time.

Data
Leveraging data into more useful information for decision making.

Things
Physical devices and objects connected to the Internet and each other for intelligent decision making.

People-to-People + People-to-Machine + Machine-to-Machine

Source: Cisco Internet Business Solutions Group, 2012

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IoE for City and Citizens

Sensors/Machines Infrastructures Open Data

Data from City

Smart Infrastructure Secure Smart Engine

Data from Citizen

Open Innovation Ecosystem

Apps/Services For Citizen

Digital FootPrint Social Media CrowdSourcing

Parking Water Waste
Buildings Lighting

public

private
IoE for Cities
Drivers

• Empower Mayors and City officials with a number of technology tools for improved management and oversight of their city
• Ensure cities can support their growth in a modular and sustainable way
• Incentivize a new multi-partner & multi-service eco-system in the city
• Avoid a vendor ‘lock-in’ by keeping the architecture open
• Improve flexibility to do business throughout the city with a hyper-connected model
• Allow better control over the proliferation of intelligent “things” : sensors, smart phones, smart devices, intelligent vehicles, etc
The IoE for Cities Key Functions

Interconnect
People
Sensors
Machines
Across the city
indoor and outdoor

Transport
Data between
devices, people,
applications

Store Data
from device,
people, application

Create
semantic
around data

Interpret,
correlate,
analyze data

Share Data
with people,
machines,
applications

Field Area Network
Sensors Network
Municipal Network
Collaboration

Messaging
Web Service
Publish/
Subscribe

In-Memory
Store
Persistent
Store

Data Models
Meta-Data
Ontology

Event
Processing
Data Mining
Analytics

Publishing
Services
Notification
Services
The IoE for Cities has an evolutionary approach ...

<table>
<thead>
<tr>
<th>Parking optimization</th>
<th>Prevention of natural risks</th>
<th>City lighting</th>
<th>Pollution/ Environment</th>
<th>Waste management</th>
<th>Virtual City Hall</th>
</tr>
</thead>
</table>
| • Better manage available parking spots, in a context of huge congestion and impossibility to create enough new spots  
• Improve fee collection and fight park anarchy  
• Better match electric charge station number to the demand  
• Better manage of-regulated places  
• Consider user aspirations for more services : guidance, payment, info…)  
• Satisfy commerce aspiration for synergies : promotional tickets | • Prevent and save sensitive data with private players | • Manage Energy consumption  
• Create modularity per area : lighting of certain spaces / at certain time and real needs  
• Introduce real time management of defects and effective maintenance | • Defend air purity  
• Inform citizen on civic behaviors  
• Inform citizen on weather forecasting  
• Send visitors specific recommendations when needed  
• Support new business using environment data provided by public services (not necessarily for free)  
• Introduce noise monitoring | • Reduce what still represents one of the heaviest costs of the city  
• Better handle recycling  
• Create the perception of the “clean city” | • Bring the city hall closer to its citizens  
• Better integrate public services to the day-to-day life of citizens (City hall in a mall)  
• Better manage public service costs  
• Create a multi channel administration  
• Create a sense of the “ubiquitous” city |
### Primary set of Technologies (New Investment)

- **Parking optimization**
  - A network of sensors providing real-time status on parking spot availability
  - A multi-service kiosk for payment and information
  - Smart Phone App for
  - An outdoor Field Area Network
  - Video camera for special zone
  - Data Center Resources
  - Data Collection Service
  - Back-end Applications

- **Prevention of natural risks**
  - Environment Sensors
  - Analytics

- **City lighting**
  - Smart devices on street light pole
  - Monitoring/Control Application

- **Pollution/Environment**
  - Pollution (air, noise) sensors
  - Analytics application

- **Waste management**
  - Waste sensors in containers
  - Monitoring/Reporting application

- **Virtual City Hall**
  - Enhanced collaboration POD
  - Video enabled contact center
  - Back-end applications

### Reused Components

- **Generic**
  - From parking deployment: Sensor Network infrastructure, Field Area Network, Data Collection Service, Back-end applications, multi-service kiosk
  - From parking: environment sensors to be used for risk prevention and pollution
  - From city lighting: light pole to host Field Area Network, continuous power to Field Area Network devices
  - From Virtual City Hall/Parking: Core Network

- **Specific**
  - Field Area Network
  - Multi-service kiosk
  - Data Center/Core
  - Sensor Network Infrastructure

- **Specific**
  - Street light infrastructure (light pole)
  - Power

- **Specific**
  - Data Center
  - Video Contact Center
“Traditional” IP Networks Are Not IoT-Ready Yet

- Bandwidth Constraints
- Highly Unreliable
- Limited resources: power, memory and CPU processing
- Extremely High Scale Network (100’s of millions of devices)

Innovation and cooperation are required to overcome these challenges—a new industry-agnostic, distributed network architecture + new protocols
### Field Area Network – Open Standards Reference Model

<table>
<thead>
<tr>
<th>Application Layer</th>
<th>Transport Layer</th>
<th>Network Layer</th>
<th>Mgmt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Web Services, EXI, SOAP, RestFul, HTTPS/CoAP</td>
<td>UDP/TCP</td>
<td>IPv6 RPL</td>
<td>802.1x / EAP-TLS &amp; IEEE 802.11i based Access Control</td>
</tr>
<tr>
<td>SCADA IEC 61850, 60870 DNP3/IP, Modbus/TCP,…</td>
<td></td>
<td>IPv6 over PPP (RFC 5072)</td>
<td>IP or Ethernet Convergence SubL.</td>
</tr>
<tr>
<td>DNS, NTP, IPfix/Netflow, SSH RADIUS, AAA, LDAP, SNMP,… (RFC 6272 IP in Smart Grid)</td>
<td>Security (DTLS/TLS)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Data Link Layer**

<table>
<thead>
<tr>
<th>LLC</th>
<th>MAC</th>
<th>Physical Layer</th>
</tr>
</thead>
<tbody>
<tr>
<td>IEEE 802.15.4 MAC enhancements</td>
<td>IEEE 802.15.4 including FHSS</td>
<td>IEEE 802.15.4 2.4GHz, 915, 868MHz DSSS, FSK, OFDM</td>
</tr>
<tr>
<td>IEEE P1901.2 802.15.4 frame format</td>
<td>IEEE P1901.2 NB-PLC OFDM</td>
<td>IEEE 802.11 Wi-Fi 2.4, 5 GHz, Sub-GHz</td>
</tr>
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<td>IEEE 802.11 Wi-Fi 2.4, 5 GHz, Sub-GHz</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IEEE 802.3 Ethernet UTP, FO</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IEEE 802.3 Ethernet UTP, FO</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2G, 3G, LTE Cellular</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2G, 3G, LTE Cellular</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IEEE 802.16 WiMAX 1.x, 3.xGHz</td>
</tr>
</tbody>
</table>

- **Open Standards** – at all levels to ensure interoperability and reduce technology risk for utilities
- **Future proofing** – common application layer services over various wired and wireless communication technologies

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Cisco IoT Connectivity Platform

- Location
- Identity + Policy
- Aggregation
- Security
- Mobility
- Lightweight IPv6

- Scale + Reliability
- Resource orchestration
- Difficult networks
- Privacy + Security
- Service Provider M2M
- ASICS + Software

- Data Aggregation
- Video Analytics
- Streaming Data
- Data Federation
- Embedded analytics

- Determinism
- Safety
- Latency
- Virtual Machine Control

Cisco IoT Platform

- Data Center
- Intelligent Network
- Cloud
IoE for Cities pilots

- Cisco, the City of Nice and several ecosystem partners are deploying a pilot in the city covering the following:
  - Mobility and Parking Management
  - Street Lighting Management
  - Waste Management
  - Environment Management
  - Virtual Citizen Services
- Pilot is deployed on a unified open infrastructure using key technologies: wireless mesh sensors (802.15.4), outdoor wifi, video camera with analytics, virtualized data center, distributed data collection, advanced analytics (location, vehicle flow, environment), etc.
City of Nice, City of Barcelona and Cisco Unveil the World's First Virtual City Hall Services
Please come and visit Spot Mairie during @ Nice Innovative City!

- **Connected Boulevard on-site demo**
  Several city operators sharing a converged Internet-of-everything-platform-for-cities (parking, adaptive street lighting, waste management, air quality, opendata…)

- **Make your own experience of Spot Mairie!**

http://www.innovative-city.fr/?lang=en
IoT Standards and Forums
Internet of Everything for Cities

- The IoE for Cities aims to deliver Innovative and Sustainable Services of public interest for the citizens
- Services to enhance, ease, secure citizens life but also to foster local economy
- Services are built on the concepts of Open Data and Open infrastructures, where municipal ICT assets and public Data are made available across a Municipal Area Network
- The IoE for Cities shall be Data-Centric enabling Data to flow across the city between things, spaces and people
- The IoE for Cities Architecture enables open innovative ecosystems to develop innovative services for the citizens
Thank you.