City Challenges

Cities are facing rapid urbanization, economic constraints, and environmental sustainability.

Rapid growth puts pressure on city infrastructure, making it harder to maintain citizen quality of life.

There’s a greater need to manage carbon footprint and improve sustainability.

Boosting the livability index is more crucial than ever to retain and attract trade, commerce, and talent.

The ability to improve city infrastructure management is crucial to defining and achieving social, environmental, and economic success.
Cities traditionally address these challenges in silos. This Fragmented Approach Is Inefficient. Citizens are uninspired. The challenges are not solved.
## Current State of Urban Services Technology

<table>
<thead>
<tr>
<th>Multi Vendor System</th>
<th>No Standardization on Data Models and APIs for City Infrastructure Devices</th>
<th>Lack of Common Data Infrastructure and Information Sharing</th>
<th>Fragmented Application Eco System</th>
</tr>
</thead>
<tbody>
<tr>
<td>While enables competitive environment for vendors, creates fragmented operations</td>
<td>Parking solution can be based on sensors or video analytics. No common data model</td>
<td>City Safety Operations does not have real-time view of Outdoor Lighting</td>
<td>Different Applications leveraging different data sources and models.</td>
</tr>
<tr>
<td>Each vendor brings their own device to cloud offering leading to lack of single, common operations capability</td>
<td>Multiple Lighting vendors bring in different interfaces for Adaptive LED lighting management and operations</td>
<td>Parking Operations can benefit from real-time traffic information and location services</td>
<td></td>
</tr>
</tbody>
</table>
Parking Challenges
Lighting Challenges
Traffic & security Challenges
Economic Results for Cities

- Attract Talent
- Attract Local Business
- Cooperation with education
- Reduced Energy Bills
- Efficient Budgets
- Citizens satisfaction

Outcomes
City Operating Model

System Management, Apps and Dashboards

Data Centre / Cloud Layer

City Layer

Street Layer
Solution Components

1. Cisco Infrastructure/Core Networking
2. Cisco Data Plan
3. 3rd Party Sensors
4. 3rd Party Apps and Services
The Platform Enables Multiple Smart City Use Cases

Citizen Engagement App
Parking Enforcement App

Cisco Smart+Connected™ Digital Platform

MS Azure cloud
Cisco Digital Network Architecture for Cities

Lighting Cloud
Parking Cloud
Traffic Cloud
Environmental Cloud

Cisco 819 with IoX
Parking Sensors
Parking and Traffic Flow Sensors
Cisco IR 910 with LoRa Module
Parking Sensor with Simtech LoRa
Smart Lights and Cisco Smart+Connected Nodes
Cisco Digital Network Architecture for Cities
Traffic Cloud
Environmental Cloud

Parking and Traffic Flow Sensors
Smart+Connected Digital Platform – What It Does

Aggregate Sensor Data from multiple sensors/sensor types regardless of backhaul through integration

Normalize the aggregated data to a common data model and build a Digital Model for the City

Expose APIs for local and global ISVs, Applications and City Systems to manage City infrastructure & services
What should a city do?

1 - Find a visionary leader
2 - Move beyond planning
3 - Begin pilots that prove value
4 - Understand the costs and benefits
5 - Explore available funding options
6 - Improve internal support
7 - Explore technology options
8 - Start mobilizing technology
9 - Learn from peers
10 - Find the right partners
Connected Transportation
## You Can with Cisco Validated Solutions

<table>
<thead>
<tr>
<th>Solutions</th>
<th>Use Cases</th>
<th>Customer Wins</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cisco Connected Rail</strong></td>
<td>- Positive Train Control (PTC)</td>
<td>- Physical security onboard trains, in stations and trackside</td>
</tr>
<tr>
<td>(Connected Train, Station, Trackside)</td>
<td>- Passenger Wi-Fi</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Stations-as-a-Service (StaaS)</td>
<td>- Improved wayfinding and passenger services</td>
</tr>
<tr>
<td></td>
<td>• Real-time monitoring of road, weather, traffic conditions</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Proactive Maintenance Alerts</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Traffic Signal Prioritization (TSP)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Live incident alerts and video</td>
<td></td>
</tr>
<tr>
<td><strong>Cisco Connected Roadways</strong></td>
<td>• Safer, less congested roads</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Centralized traffic management</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Better roadway utilization</td>
<td></td>
</tr>
<tr>
<td><strong>Cisco Connected Mass Transit</strong></td>
<td>• Connected vehicles, yard, stops and stations</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Live video surveillance</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Better passenger experience</td>
<td></td>
</tr>
</tbody>
</table>

Cisco IoT System Provides the Underlying Network Infrastructure
Subway Internet Access
Moscow subway - Where we did that project

• Moscow subway was open at May 15th, 1935
• Nowadays it consist of 12 lines, 313.1 km long (2 ways), 188 stations
• 44 stations are objects of cultural and historical heritage
• 6.73 million passengers is an average number which is transferred on a daily basis through subway. Max number is 9.3 million (registered at Nov 29th, 2012)
• Train speed is up to 80 Kmph
Tunnel environment

• Harsh, dusty environment inside tunnel filled with electrically conducted dust made by running contacts (contact electric pair)

• Two times a year all tunnels are flushed with water for cleaning purposes

• Tunnels are different from materials and configuration point of view, even at the same line

• Antenna orientation toward moving train requires custom-made restrain system and hermetic boxes for RF equipment
Installation environment
Performance results

• 100 Mbps an average TCP throughput (was 46, then 65 Mbps)
• AP distance range is extended up to 360 m (was 260 m at most)
• No L3 roaming impact on the throughput
London Tube

http://www.gizmodo.co.uk/2017/02/heres-what-tfl-learned-from-tracking-your-phone-on-the-tube/
London Tube

- 54 out of 270 stations
- Route Tracking
- In-Station Tracking
- Advertising Potential
Public Bus Transport: Telemetry Integration

- Camera IP
- Multimedia
- Encoder
- Camera IP
- WiFi
- Analytics
- Server Video
- TV System
- (ECU)
- Sensor
- Lights
- Switches
- motor
- Battery
- PDM

- 829
- IE2000U

- 4G+GPS
- WiFi

- Public Bus Transport: Telemetry Integration
- Camera IPCamera IPMultimediaCamera IPPDMSensorIE2000UAnalyticsWiFiServer VideoTV System(ECU)SensorLightsSwitchesMotorBatteryPDM
Connected Bus Stations
Transportation management
RuBAN: An IOT Service Delivery Platform
RuBAN™ Vehicle to Vehicle Network Vendors
RuBAN™ Driver Management
# RuBAN™ Vehicle Telematics

## Maintenance Report

### Electronic Control System

<table>
<thead>
<tr>
<th>Module</th>
<th>Description</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCM</td>
<td>Suspension Control Unit</td>
<td>0/100</td>
</tr>
<tr>
<td>CTM</td>
<td>Central Timing Module</td>
<td>0/50</td>
</tr>
<tr>
<td>ACU</td>
<td>Airbag Control Unit</td>
<td>0/50</td>
</tr>
<tr>
<td>PSCU</td>
<td>Power Steering Control Unit</td>
<td>0/50</td>
</tr>
<tr>
<td>BMS</td>
<td>Battery Management System</td>
<td>1/50</td>
</tr>
<tr>
<td>SCU</td>
<td>Start Control Unit</td>
<td>0/50</td>
</tr>
<tr>
<td>BCM</td>
<td>Body Control Module</td>
<td>0/50</td>
</tr>
<tr>
<td>GEM</td>
<td>General Electronic Module</td>
<td>0/4500</td>
</tr>
<tr>
<td>ECU</td>
<td>Engine Control Unit</td>
<td>0/13500</td>
</tr>
<tr>
<td>TCU</td>
<td>Transmission Control Unit</td>
<td>0/50</td>
</tr>
<tr>
<td>BCM</td>
<td>Brake Control Module</td>
<td>0/50</td>
</tr>
<tr>
<td>CCU</td>
<td>Convenience Control Unit</td>
<td>0/500</td>
</tr>
<tr>
<td>DCU</td>
<td>Door Control Unit</td>
<td>0/100</td>
</tr>
<tr>
<td>HMI</td>
<td>Human Machine Interface</td>
<td></td>
</tr>
<tr>
<td>BCM</td>
<td>Brake Control Module</td>
<td>0/100</td>
</tr>
</tbody>
</table>

### Tyre Pressure

- **Coolant Temperature**: +2°C
- **Oil Pressure**: -15 PSI
- **Battery Voltage**: -2V

### System Status

- **Fault**: GA4026
- **Overhead Light Dead**: Lost connection to main battery
RuBAN™ Physical Security
Main User Interface

Route 27
Departed: 6:44AM Due: 11:20AM

Next Junction - Dame Street
Time To Junction: 0:34
Light Changes In: 2:10

Prioritize Route

Click To View

Delayed
Behind
On Time
Prioritized
Transportation and crowd analysis
Cisco CMX - Gain Insights & Innovate

DETECT
- Presence and location detection
- Visibility (Wi-Fi, BLE)

CONNECT
- Easy Wi-Fi login, custom or social
- Zone-based, custom splash pages

ENGAGE
- App-based mobile engagement
- Context-aware in-venue experiences
Reference

SIGNAL Festival

13. – 16.10.2016, Praha 1,2,3
What is Signal Festival?

- The SIGNAL festival is a light festival, the largest cultural event in the Czech Republic, bringing modern art and new technology.

- HOW MANY: approx. 600 000 visitors
- WHERE: Prague City Center
HOW DID WE DO IT?

- 19 Cisco Outdoor Aps – 1532
- WLC 5520
- Cisco CMX presence
- Cisco CMX location
- Cisco CMX cloud

SERVICES provided:
- WIFI HOTSPOT
- EMAIL HARVESTING
- CMX – MEASURING/ANALYTICAL TOOL
Visitors of the Festival, detected throughout whole day
Visitors of the Festival

578,137
Total Visits

36,044
Repeat Visitors - 06%

542,093
New Visitors - 94%

Daily Trend

# of Visits

Oct 13   Oct 14   Oct 15   Oct 16

200k
100k

Or compare data to: Previous
Individual installations throughout the day
Time dedicated to individual installation

Dwell Time Breakdown

- 05.2% 0-5min
- 67% 5-25min
- 26% 25-50min
- 01.3% 50-120min
- 00.3% >120min

Dwell Time Breakdown of All Visits (?)

Average Dwell Time

- 18MINS
- 25mins Repeat Visitors
- 18mins New Visitors

Average Dwell Time of All Visits (?)

Daily Trend

- # of Visits
- Avg Dwell Per Visit (min)

Or compare data to: Previous
Paths analysis
Free – WI-FI as a public service

Enjoy free WI-FI on Signal Festival

Please kindly enter your email address. We will inform you about interesting news. By providing your email address you agree to process the data for crowd counting purposes.

Sponsored by

OR COMPARE DATA TO: PREVIOUS
Portál, preferovaný jazyk
On Saturday, Oct 15\textsuperscript{th} 2016, the average visitor visited 5 installations and this was his \textbf{favorite path}:

1. Kampa
2. Piazetta
3. Národní
4. Karlovo náměstí
5. Náměstí Míru
BUSINESS OUTCOME

- FESTIVAL OPTIMISATION
  - LOWERING THE NUMBER OF INSTALLATIONS
  - ADJUSTMENT OF CATERING/SOUVENIR STALLS
  - MONETISATION
- AUDIENCE
  - PRECISE NUMBERS
  - ADJUSTMENT OF FESTIVAL ROUTE
- SPONSOR IMPACT
- LOBBYING
  - ECONOMIC IMPACT STUDY
Thank you.