Cisco Connected Mass Transit

For Improved Safety, Mobility, and Efficiency
Today’s Speakers

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Vice President, IoE Vertical Business Solutions
Cisco

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Global Transportation Executive
Cisco

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Solution Architect
Cisco

Mikel Gindy
Business Development Sales Manager, Austria
Cisco

Boris Karsch
VP Strategy
Cubic Transportation Systems
Industrial Revolutions

- Canals
- Railroads
- Steam
- Electricity
- Internet

Digital Revolution
CONNECTING THE UNCONNECTED TO GENERATE BUSINESS VALUE

NETWORKED CONNECTION OF PEOPLE, PROCESS, DATA, THINGS

PEOPLE

PROCESS

DATA

THINGS
<table>
<thead>
<tr>
<th>Obstacle</th>
<th>Percentage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complex Integration</td>
<td>56%</td>
<td>prefer fully integrated and validated solution over separate best-of-breed vendors</td>
</tr>
<tr>
<td>Need to Automate Extraction of Insights and Resulting Actions</td>
<td>42%</td>
<td>pick analytics tools as most important enabler</td>
</tr>
<tr>
<td>Data Overload</td>
<td>40%</td>
<td>say data management is #1 capability they need to improve</td>
</tr>
<tr>
<td>Expanded Security Vulnerability</td>
<td>76%</td>
<td>cite security is an important element of IoT implementation</td>
</tr>
<tr>
<td>Siloed Networks</td>
<td>25%</td>
<td>have experienced increased network strain when implementing IoT initiatives</td>
</tr>
</tbody>
</table>

Cisco’s Unique Value for the Digital Journey

Integration

Business Processes

Vertical-specific Digital Solutions

Apps Transformation

Analytics and Applications

Large Ecosystem of Technology Partners

Infrastructure

Manage Data from Edge to Cloud

Distributed Intelligence

End-to-End Security

Integrated Security Throughout

Unified Connectivity

Purpose-built, Simply Managed Network

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Why Going “Digital” is Important For Transportation Now
Challenges and Trends Driving Change in Transportation

- **Safety**
  - Increasing connectivity
  - Increasing TCO
  - Proprietary networks

- **Mobility**
  - Urbanization and congestion
  - Aging population
  - Global supply chains

- **Environment**
  - Safety and security
  - Disparity between regions
  - Sustainability

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Connected Transportation Sectors

- Connected Maritime
- Connected Aviation
- Connected Rail
- Connected Roadways
- Connected Freight and Logistics
- Connected Mass Transit

Diagram showing various transportation sectors connected to each other and to management centers.
Cisco Connected Mass Transit Benefits

- Enable V2X communication
- Improve passenger/worker safety
- Reduce urban congestion
- Regulatory compliance
- Real-time passenger information
- Better asset and vehicle monitoring and management

- Protect infrastructure investment
- Collaboration across agencies
- Maintain mass transit schedules
- New opportunities for innovative passenger services, mobile apps and business models

Connect Disparate Transit Systems into One Converged Infrastructure
Solution Business Architecture

Connected Bus

Connected Yard

Connected Bus Stop
Validated Designs
Why They Really Do Matter

Proven - Tested - Faster Time to Market - Reduced Risk - Less Need for Lengthy PoC
Services Help Ensure the Success of Each Solution

Customer Benefits

• Mitigate Deployment Risk
• Create a Flexible and Scalable Architectural Foundation
• Accelerate Deployment of Solution
• Address New Consumption Models
• Formulate Customer Strategy
Cisco and Our Partners
-Creating Value for Transportation Customers

Strategy: Integrate Cisco® TSS technology with solutions from key global partners to create new value for transportation customers by providing safety, mobility, efficiency, connectivity, and converged networks.
## Cisco Connected Mass Transit Partners

<table>
<thead>
<tr>
<th>Partner</th>
<th>Description</th>
<th>Product*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Advantech</strong></td>
<td>High performance, High quality, and Ruggedized Computing Platform</td>
<td>ARK2151v</td>
</tr>
<tr>
<td><strong>Cubic</strong></td>
<td>Real-time payment and information solutions, live passenger info, city management solutions, revenue management and Automated Fare Collection (AFC). Integrated systems for transportation and traffic management allow travelers to choose the best way to travel and pay for their journeys.</td>
<td>NextBus NextCity™ NextFare</td>
</tr>
<tr>
<td><strong>Davra Networks</strong></td>
<td>The RuBAN™ system provides a comprehensive Network Management System and a Data Analytics and Management platform for monitoring Vehicle performance and metrics.</td>
<td>RuBAN™</td>
</tr>
<tr>
<td><strong>Sonim</strong></td>
<td>Ruggedized Android Smartphone, purpose built for mission critical communications. LTE, Wi-Fi, and push-to-talk (PTT) ready, with Cisco Instant Connect</td>
<td>XP6/XP7</td>
</tr>
<tr>
<td><strong>Trapeze</strong></td>
<td>TransitMaster,™ an Information Management system for real-time data messaging managed by several software components running on one or more computers. It provides communication between host computers located in a dispatch center and Integrated VehicleLogic Units (IVLUs) onboard vehicles.</td>
<td>TransitMaster™</td>
</tr>
</tbody>
</table>

* 3rd party components are provided by and supported by the partners listed for each product.
Connected Mass Transit

• Greater safety, coordination between trams -24/7 video security
• Network reliability in harsh environments and across systems.
• Scalability - supports 500 simultaneous Wi-Fi users and 20 + gigabytes of 3G wireless traffic per tram per month.
• Cisco Industrial Ethernet connectivity for stations, ticketing machines and digital displays.
• Optimized scheduling - wireless transmission of shift/driver data
• Proactive maintenance extends tram life and reduces downtime
  Power consumption, temperature, braking distance, etc. transmitted via sensor to operation control center.
  (Application by Cisco Gold Certified Partner Kapsch)

"LINZ AG has had a strategic relationship with Cisco for the past decade, so we decided to build on our existing Cisco network and channel its agility and simplicity to incorporate new security, mobile, and analytics technologies that help us achieve our goals and gain greater business insight." - Georg Linhard, Project Manager, LINZ AG TELEKOM

Business Outcome Summary

• 100 million passengers per year with 150,000 Wi-Fi logins/month
• Reduced Energy consumption by 10% and carbon dioxide output 85 tons
• Automatic notification of 400 ticketing machines
  • helps eliminate return trips for parts, saves hours of tech time
Connected Mass Transit Architecture

Wei Zou, Solution Architect
Connected Mass Transit
System Overview & Solution Components
Connected Mass Transit - High-Level Architecture

Internet Service Provider

Mobile Service Provider

3G/LTE Network

Operations Center

- ASR 1000
- ASA 5500-X
- Cisco Nexus Switches
- Cisco Nexus Switches
- Davra RuBAN™
- Cisco Instant Connect
- VSOM
- Trapeze

IP/MPLS Metro Network

Yard

- ASR 903
- Cat3850
- IW3700
- IW3700

Vehicle

- IR829
- IE4K/2K
- VLU

Bus Stop

- Passenger Information Display (PID)

Server

- IW3700

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Connected Mass Transit: Onboard Network

- **IR829 Mobile Router**
  - Offboard: LTE + 5GHz 802.11n
  - Onboard: 2.4GHz 802.11n

- **IE 4000 / 2000 Ethernet Switch**
  - 100 Mb or Gigabit Ethernet with PoE
  - IE4000 for > 4 PoE

- **Video Surveillance**
  - 2-8 IP Cameras, IP66/IK10 rated
  - 360° (7070) and 720p WDR (3050)
  - Server for VSM
  - CAD/AVL link for Panic Button
Connected Mass Transit: Bus Stop

- **IR829 Infrastructure**
  - Gigabit Ethernet with PoE
  - Uplink: LTE
  - Users: Wi-Fi

- **Video Surveillance**
  - One IP 3050 Camera with onboard storage

- **Route ETA display**
  - Driven by Cisco Digital Signage or partner.
Connected Mass Transit: Yard Network

- **IW3700 Access Points**
  - Centralized or FlexConnect
  - Wired for Building-mounted, Wireless bridge to Pole-mounted
  - 5GHz Wi-Fi link to Vehicle
  - GE with PoE for Pole-mounted IP Camera

- **Catalyst 3850 Switches**
  - GE w/ PoE to APs and IP Cameras
  - 10 GE Uplinks to Metro Network
  - Stackable for redundancy
Cisco Connected Mass Transit Solution Capabilities

- Passenger Wi-Fi
- IP Video Surveillance
- Telematics / Predictive Maintenance
- Voice Communications
- Automated Fare Collection (AFC)
- Computer Aided Dispatch (CAD)
- Automatic Vehicle Location (AVL)

- Onboard System Peripheral
- Fleet Management
- Driver Behavior Monitoring
- Real-time Passenger Information
- Digital Signage
- Location Based Services
- Wireless Bulk Data Transfer
- Mobile apps
RuBAN™ – An IOT Service Delivery Platform

- Network Management
  - including Zero Touch Provisioning
- Asset Monitoring
  - Station Assets, Track Infrastructure Monitoring, Physical Security Integration
- Vehicle Telematics
- Route replay, Route optimization
- Vehicle Tracking and Geo Fencing
- Application Builder
- Management Report Portal
- Policy and Rules Management
RuBAN™ – An IOT Service Delivery Platform
• Telecommunications transforming transportation payments and information systems

• Contactless bank-card payments
• Real-time payments - account-based and contactless bankcards

• Better information

• Improving the customer experience through innovation
Summary

- Improved safety and security
- Greater operational efficiencies
- Enhanced passenger experience
- Converged networks to cut costs
- Reduces traffic congestion
- Lowers pollution and carbon footprint
- Better asset/vehicle management
- New business models
- Regulatory compliance