Digital Transportation
For Improved Safety, Mobility, and Efficiency

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Why Going “Digital” is Important For Transportation Now
Transportation: The Top Priority for Cities

Need for investment over the next 5-10 years by infrastructure area

Infrastructure area most important in attracting economic investment

<table>
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<th>Needing Investment</th>
<th>Attracts Economic Investment</th>
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<tbody>
<tr>
<td>Social Services</td>
<td>Water</td>
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<td>Energy</td>
<td>Health Care</td>
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<td>Water</td>
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<td>Waste Mgt</td>
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<td>Environment</td>
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<td>Transportation</td>
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Survey of public & private sector stakeholders across world’s top 25 cities

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Connected Transportation Sectors

- Connected Maritime
- Connected Roadways
- Connected Vehicle
- Connected Freight and Logistics
- Connected Aviation
- Connected Mass Transit
- Connected Rail
Connected Maritime
Business Outcomes Summary

Operational Efficiency
- Asset Tracking
- Improved Throughput

Safety/Security
- Physical and Cyber Security for passengers and cargo
- Converging safety, data, video and wireless
- Lower TCO

Higher revenue
Higher productivity
Lower downtime
Improved Throughput
Converging safety, data, video and wireless
Physical and Cyber Security for passengers and cargo
Safety/Security
Operational Efficiency
Lower TCO
Case Study: Hamburg Port Authority (HPA)

SmartPORT Hamburg
IT and Research
Port of Hamburg

- One of the largest ports in Europe
  Over 140 million tons total turnover per year
- Biggest railway port in Europe
  200 freight trains with 5000 wagons per day
- 1900 employees
- 10000 ships per year
- Connected to 900 harbors in 174 countries around the globe
- Strong growth in cruise ship tourism
VISION: Connectivity from ELBE 1 to Hamburg Harbor
6 hour journey

- RFID Container Tracking
- Wifi/Wired Internet for Passengers/Crews
- Facility Reservations
- Safety Measures for Hazardous Materials
- Improved Pre-Arrangement
- Traffic Management (Road, Rail, Water)
- Converged Network (Operational, IT, Safety/Security, etc)
- Two-Way voice communications
Traffic Management: Legacy Issue

- 4 isolated control centers for
  - River
  - Railways
  - Roads
  - movable infrastructure

- About 300 traffic sensors

- 270 km of fiber optics

- First Hot Spots (WiFi)
Traffic Management: Deployed Port Traffic Center
Traffic Management: Internet of Things

Port monitor shows current traffic situation
Integration: Traffic and Infrastructure Management
ENVIRONMENT & STRUCTURAL MONITORING
Structural: strain gauges
Measuring the strain and stress on structural steel members.

Structural: tiltmeters
Settlements and relative displacements, tilt of piers and abutments.

Structural: accelerometers
Vibration and dynamic responses due to seismic, wind and traffic loads.

Environment: air quality
Pollution level: NO, NO2, SO2, CO and PM10.

Environment: weather
Rainfall, relative humidity, air temperature, wind speed/direction.
Summary

• Improved safety and security
• Greater operational efficiencies
• Enhanced passenger experience
• Converged networks (30% reduction)
• Reduces traffic congestion 15%
• Better asset/vehicle management
• Server Virtualization (240 to 48)
• Regulatory compliance