Improved performance for the transport sector through ITS

Norman FRISCH
Business Development Transport Solutions
Huawei: A Global Company with local presence

**Global Presence**
- 150,000+ employees worldwide
- 14 regional HQ, 140+ branch offices
- 23 R&D centers, 45 training centers

**Transport sector experience**
- 16 years of ICT supply into transport sector
- 14,000km of GSM-R lines contracted globally
- Smart City, Aviation, Road & Rail projects all across the world
Challenges Faced by wireless systems for Urban Rail Transport

Service Requirements of Urban Rail Transport

**CBTC**: Bidirectional real-time transmission of train control information

**Video transfer in train and along railway**

**PIS**: Real-time broadcast of video, information, and disaster emergency

Current Challenges

1. Free & open frequencies, and lots of interference
2. No QoS guarantee mechanisms
3. More sites, and difficult maintenance in tunnel
4. 3 independent networks, and high operation costs
5. Only voice, and no **data & video dispatching**
6. No ways to guarantee better service performance in high mobility
Efficient operation

Control Centres
- Traffic Management
- Asset Assignments
- Emergency command center (ECC)
- Toll collection and accounting

Data Centres
- Cloud Computing
- Big Data processing / query
- Predictive Analytic Tools

Transmission Networks
- Wireline optical/copper
- Wireless LTE, Microwave

Sensing Network
- M2M terminals/gateways
- Detection Traffic Load, Bookings
- CCTV analytic tools

It’s all about integrated communication
Hybrid MSTP: masters Complex ICT setup along the road

1. STM-4 self-healing ring, 50 ms fast switching
2. Unified GPON access, one GPON fiber, 20+ terminals

Customer Benefits
- Unified voice and video, 622 M bps
- High reliability: 99.999%
- One access saves fiber resources
- Intelligent detection saves 1/3 of incident handling time.

Roadway services: data, voice
TDM services: video, office and other IP services
ICT technology: Hybrid MSTP
Typical demands to ICT in the Transport Sector

**VOICE trunking**
- GSM-R
- TETRA
- DMR...

**VIDEO**
- LTE
- WiFi
- WiMAX

**DATA**
- LTE
- WiFi
- TETRA

**Group Calls (VGCS/VBS)**
**Push to Talk (PTT)**
**Direct Mode (DM)**
**Priority & Pre-emption (eMLPP)**

**Push to Video**
**Vehicle to Ground video**
**Mobile & static Video surveillance**

**Asset management /tracking**
**(transporter, container, vehicle, resources..)**
**Maintenance data**
**OSS data feed**

*Specialized systems lead to multi-network scenario*
Emergency Response Communication

...ability to integrate independent networks
Transport Big Data has 4V Characteristics

**Massive Data Scale**
- Traffic data storage from TB to PB
- Traffic flow data, system log, tolling data, traffic signal control data...

**Fast Data Analysis and Processing**
- On line response within 1 second

**Various Data Type**
- Video, image, sensor data, GIS information
- Documents, image and video unstructured information accounts for 90% of traffic data

**Significant Data Value**
- Traffic simulation and planning
- Improve traffic operational efficiency
- Enhance traffic safety

Four characteristics of big data
Source from IDC
Big Data Copes With the Urban Traffic Challenge

The biggest challenge for a good decision is processing data quickly!

- Video surveillance traffic pre- and post analysis
- Massive traffic data comparison, analysis and assessment
- Predict urban traffic through traffic data based models
- Big data platform management and maintenance OM
- Modeling, Algorithm (Noah: Lifelong Machine Learning / Human Computation etc.,)
- App Engine Service Package / API
- Streaming Processing CEP/streaming
- Non-constructed, semi-constructed Processing Hadoop
- Constructed Processing MPP (Gauss)
- FusionCube
- OceanStore

**Computation-intensive Categories:**
- Server with local hard disk, data I/O on local hard disk
  - FusionCube

**Memory-intensive Categories:**
- OceanStor 9000 provides HDFS interface data I/O by centralizing on the OceanStor 9000

**Platform Layer**

**Application Layer**
Huawei eLTE Urban Rail Transport Solution: Innovation & Convergence, Changing the Future of Metro Wireless Communication

**Innovation**
- Mainstream Technology, First launch globally
- Advanced anti-interference technologies in air interface
- Multi-level QoS algorithms
- High mobility, and seamless handover algorithms

**Convergence**
- One network to bear PIS, CCTV, broadband trunking, and CBTC simultaneously
- Broadband trunking to support voice & video dispatching simultaneously
- Convergence of broadband trunking & video conferencing

**Safe Operation**
- Specialized anti-interference technologies
- Multi-level QoS algorithms
- High mobility, large coverage, and seamless handover

**Agile Dispatching**
- Visualized dispatching to ensure real scene visible, command directing up to group members
- Convergence of broadband trunking & video conferencing, and fast decision

**Convenient Travelling**
- PIS over LTE to support real-time passenger information, and news broadcast
- CCTV over LTE to know & control onsite emergency
- Telepresence over LTE: telepresence & video conferencing convergence
Efficient operation

- **Five senses - Sensing layer**
  - Vision
  - Hearing
  - Touch
  - Taste
  - Smell

- **Neural network - Network layer**
  - Internet of Things
  - Internet
  - Communication network

- **Brain - Platform layer**
  - Information convergence
  - Application convergence

- **Behavior - business application**
  - Information processing
  - Intelligent analysis

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**Specialized systems lead to multi-network scenario**

- Group Calls (VGCS/VBS)
- Push to Talk (PTT)
- Direct Mode (DM)
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- Vehicle to Ground video
- Mobile & static Video surveillance

- Asset management /tracking (transporter, container, vehicle, resources..)
- Maintenance data
- OSS data feed
Multi vs. Single-network

- Physical separation of services
- Multiple skills
- Exponential OPEX

the 90’s

- More bits per Mhz
- Abundant data bandwidth
- Easy to operate
- One fits all

today

Dispatch
PIS
Asset Management
LTE Multi-media Dispatching Improves Work Efficiency

The right person, at the right time and place to get exact information to do the right thing, How easy is that?

- Broadband trunking Push to Video, PTT
- Work order / resource assignments
- Photo & Video guidance off-site support
- Voice and data at the same time
**LTE Zhengzhou Metro Line**

**Project overview:** total length of 26.2 km for phase 1, 20 stations, 25 trains, 80km/h, 10MHz of **TDD 1.8GHz frequency**

**Target:** One technology to Substitute Multiple Networks used for Metro operation

**Services:**

- Real-time **video Surveillance** (4Mbps per train) and broadcast (8Mbps per train)
- Passenger Information Services, PIS
- Software Upgrade to voice trunking & train control

**Launched at media event:** 29 November 2013

**Passenger operation to commence in December 2013**
Xi’an Airport · China
- 1st LTE trunking on airport (2011)
- One net – One handset
- satisfies peak hour requirement 3k calls
- Increased efficiency by 500%
- Total of 175 Airports contracted

Yantai Port · China
- 1st LTE for port industry
- Voice trunking, video and TOS
- Simplified RF covers two port terminals

ShuoHuang Railway
- Multi-loco synchronization
- Cargo throughput increased
- Voice Dispatching
- Video Surveillance
Close Cooperation with Partners to Help Customers Succeed

Help Customers Succeed

Industry Partners

Consulting & Designing Partners

Partners (100+)

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Innovation & Convergence, Changing the Future of Metro Wireless Communication

Innovation & Convergence

Safe Operation, Agile Dispatch and Satisfied Customers
Innovative eLTE Solution for Zhengzhou Metro

- **Center Server**
- **PIS System**
- **Dispatcher**
- **OMC**
- **Voice & Video Servers**

**IP Network**

- **Station**
  - LCD
  - Switch
  - LTE BBU

- **Track & Train**
  - LTE RRU
  - TAU
  - Leaky Coaxial Cable or Antenna

**Innovative eLTE Solution for Zhengzhou Metro**

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