Huawei eLTE Solution for Government

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IP Solution Director
Content

1. Government Industry Requirements & Challenges
2. Huawei Innovative eLTE Solution
3. Product Family Introduction
4. Successful Cases
Scenarios and Principal Requirement in City Life

**Public Safety Scenarios**
- City Security
  - Collaboration
  - Reliable & encrypted
- Emergency Rescue
  - Rapid response
  - Fast deployment
- Traffic Monitoring
  - Intelligent detection
  - HD video

**Municipal Scenarios**
- City Lifeline
  - Real time monitoring
  - High adaption terminal
- Environment Monitoring
  - Remote data acquisition
  - Easy maintenance
- Government Affairs
  - Mobile office
  - Broadband data service

Highly critical & Highly robust

High adaption & High performance
Overlay Different Technologies for Various Functions

Different technologies and complex networks to realize various services for the requirements of different departments.

- **Fixed network**
  - !! No mobility

- **TETRA for trunking system**
  - !! Only voice

- **Satellite for remote data transmission**
  - !! High cost

- **3G Carrier network for mobile office**
  - !! Encrypt issue and bad coverage in remote area
Can We Unify the Whole Networks?

Multi-media Trunking  +  Mobile Broadband Access  +  Massive data transmission  +  On Site Video Surveillance

Visualize collaboration  +  Mobile office  +  Robust  +  Real-time

one network

Match all the requirements.
High cost-effective and easy maintenance
Professional Communication Evolution to Broadband

Private Networks

1G Cordless Analog System: AMPS, TACS, NMT
- Service: Voice Push-to-Talk
- Analogue Trunking Radios: MPT1327

2G Narrow Band System: GSM, CDMA-IS95
- Service: Voice trunking, SMS
- Narrow Band Digital Trunking: TETRA, PDT, P25, iDen

3G Wideband System: WCDMA, CDMA2000, TD-SCDMA, WiMax

4G High-speed System: LTE - TDD/FDD
- Service: Voice & HD Video trunking, High-speed data services
- Broadband Trunking: LTE

Carrier Networks

1990
- 1G Cordless Analog System: AMPS, TACS, NMT

2000
- 2G Narrow Band System: GSM, CDMA-IS95

2010
- 3G Wideband System: WCDMA, CDMA2000, TD-SCDMA, WiMax
- 4G High-speed System: LTE - TDD/FDD

Spectrum Efficiency

Latency
LTE, the Common Choice Of Broadband Trunking

- Decided to develop LTE
- 700 MHz spectrum allocated
- 1st 4G network delivered in July 2010
- LTE deployed for navy communication

LTE for Public Safety

- CCBG (Critical Communications Broadband Group) in TTCA to specify broadband trunking standards
- TC TETRA in ETSI cooperated with 3GPP to optimize trunking functionalities
- P25 cooperated with TETRA to perform LTE broadband trunking research
- TCCA signed MoA with NPSTC to accelerate the LTE trunking standardization

USA
Canada
European Union
Spectrum allocated
Japan
Australia

April 2012
11 May 2012
21 May 2012
21 June 2012
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Professional eLTE Network Supports Government-specific Services

Critical Communication
Video Surveillance
Data Acquisition

Broadband Trunking
Public Safety
Municipal Affairs

Mobile Office

Monitor Center

All in One: Various Services in One Unified Broadband Network
Professional eLTE Network to Support Government Services

Critical Network
- Push to Video
- Collaboration for Emergency
- E2E Encryption
- Tolerance to Harsh Environment

Efficiency Network
- Outstanding Performance
- Full-band Equipment
- Flexible Application
- Open for Quick Customization

Public Safety

Municipal Affairs
**Broadband Trunking, Dispatching Visualization**

- Professional voice dispatch performance: Group call setup <300ms, pre-emptive priority call <150ms
- **All-in-one service**: voice, data & video call in one terminal to improve dispatch efficiency and fast responding to emergency.
Fast deployment in critical time, mobile command office outside

Emergency Communication Vehicle in Critical Time

Emergency Vehicle Communication

Set up <10 min

Command Center

Dispatcher
Dispatch Server
APP Server
Onsite CCTV
Broadband Trunking Handset
Vehicle Device

Satellite
Microwave

• Rich Features:
  ✓ Video Dispatching
  ✓ Push-to-Talk Group Calls, up to 256 Groups, 1024 Concurrent Users
  ✓ Direct Video Calls
  ✓ HD Video Monitoring
  ✓ Personnel/Vehicle Positioning
  ✓ Emergency Pre-Emptive Priority Call
  ✓ Soft Switch between Signal On the Move and Elevated Antenna

Fast deployment in critical time, mobile command office outside

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E2E Encryption Gives a Protected Communication

Voice Encryption

PTT Encryption

SMS Encryption

Alternative Encryption Algorithm

One Session One Secret

Key Disposal Center

BTS

eCNS

GW

PLMN

PSTN

Internet
Tolerance to Harsh Environments

**Special Designed Device**

- Broadband trunking service
- IP67, 0.5m deep water < 30 minutes
- EP680 Ex: explosion proof (Mining & Colliery: Ib)
- PoC service
- IP67 protection
- Working temperature: -20°C ~ 55°C
- IP67 protection
- Ex ic IIC T4 verified (for 5.0G only)
- Working temperature: -40°C ~ 65°C
- IP65 protection
- Working temperature: -40°C ~ 60°C

**Application Scenarios**

- High Temperatures
- Cold Weather
- Seas and Oceans
- Underground Mining

Explosion Proof/ Waterproof Handset for Harsh Environments
Professional eLTE Network Supports Government Services

Critical Network
- Push to Video
- Collaboration for Emergency
- E2E Encryption
- Tolerance to Harsh Environment

Efficiency Network
- Outstanding Performance
- Full-band Equipment
- Flexible Application
- Open for Quick Customization

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Large Capacity & Wide Coverage Beyond TETRA

<table>
<thead>
<tr>
<th>Frequency /Coverage</th>
<th>400MHz</th>
<th>800MHz</th>
<th>1.4GHz</th>
<th>1.8GHZ</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>336-500</td>
<td>806<del>824,851</del>869</td>
<td>1447~1467</td>
<td>1755~1920</td>
</tr>
<tr>
<td>Voice</td>
<td>5.96</td>
<td>5.28</td>
<td>3.44</td>
<td>3.26</td>
</tr>
<tr>
<td>Data</td>
<td>3.87</td>
<td>2.48</td>
<td>2.26</td>
<td>1.65</td>
</tr>
<tr>
<td>Urban</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Suburb</td>
<td>13.41</td>
<td>11.88</td>
<td>7.77</td>
<td>7.38</td>
</tr>
<tr>
<td></td>
<td>8.37</td>
<td>5.35</td>
<td>4.92</td>
<td>3.60</td>
</tr>
<tr>
<td>Rural</td>
<td>21.35</td>
<td>18.92</td>
<td>9.55</td>
<td>11.6</td>
</tr>
<tr>
<td></td>
<td>14.94</td>
<td>12.21</td>
<td>8.30</td>
<td>6.07</td>
</tr>
</tbody>
</table>

Antenna height: 30m  Data: 512Kbps

Core Network Capacity

<table>
<thead>
<tr>
<th>per eCNS</th>
<th>Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Users</td>
<td>100 000</td>
</tr>
<tr>
<td>Base Stations</td>
<td>500</td>
</tr>
<tr>
<td>Trunking Groups</td>
<td>2 000</td>
</tr>
</tbody>
</table>

Trunking Service Capacity per Cell

- 7 Groups
  - 1.4MHz
  - UL: 0.9 Mbps
  - DL: 4 Mbps
- 45 Groups
  - 3MHz
  - UL: 3 Mbps
  - DL: 12 Mbps
- 80 Groups
  - 5MHz
  - UL: 6 Mbps
  - DL: 22 Mbps
- 160 Groups
  - LTE TDD
  - UL: 27 Mbps
  - DL: 90 Mbps

*LTE TDD
Reliable and Seamless Experience Which Wifi Can’t Achieve

**WiFi**

- Common frequency shared by individuals and other organizations, and strong interferences
- No special advanced technologies reduce interference
- No mobility and complex network planning.

**Gap**

**User Data Rate**

**Video and data lost during the gap**

**HD video surveillance and guaranteed services**

**Strong ability to reduce the interference enable guaranteed services.**

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**Huawei eLTE**

- Specialized frequency to avoid interference.
- Advanced technologies (ICIC, IRC) to reduce interference.
- Seamless experience.

**User Data Rate**
Advanced Technology Enables Better Performance

Data Rate Comparison

- WiMAX(35:12)(2*10Mhz)
- TDD LTE(1:3)(20Mhz)
- FDD LTE (20Mhz)

Latency Comparison

- Ping latency (ms)
- Handover latency (ms)
- Round Trip (ms)

- Ultra Broadband: downlink 100Mbps, and uplink 50Mbps
- Low time delay: user plane delay <5ms and control plane delay <100ms
Multi-band Enable Quick Response to Customer Requirements

- Multiple frequency bands:
  - TDD 400Mhz/800Mhz/1.4Ghz/1.8Ghz for Broadband Trunking,
  - FDD frequencies, and TDD /2.3G/2.6G/3.5G/3.7G/5.8G for broadband data access
Flexible Networking for Different Government Application Scenarios

A. Flexible in video surveillance.

B. Flexible in RRU installation.

C. Flexible in network dimension.

Flexible in video surveillance:
- Fixed
- Handset
- Mobile

Flexible in RRU installation:
- On Tower
- Against Wall
- On the Rooftop

Flexible in network dimension:

Isolated Single Site
- One site: 6 RRUs
- DL 450Mbps, UL 300Mbps;

Small Network
- 2U core network for 60 cells
- *Available in Q3 2012*

Large Network
- 1500 eNodeB
- 200 000 users, 20 000 group calls
Open & Convergent Network Architecture Realizes Quick Customization

**Application Layer:** Open application platform for development of 3rd party

- Servers
- Log
- Location
- Video Server
- TV Wall

**Network Layer:** Open interface to interwork with PSTN, PLMN, TETRA, and Internet

- PLMN
- PSTN
- Tetra
- Internet
- eCNS
- Dispatch Server
- Dispatcher
- BBU
- RRU

**Device:** Self-product chips open to 3rd party for partnership enable a richer ecosystem

- Handset
- CPE
- Vehicle Mounted Device
- Mini PCIe Wireless Module
- USB dongle
Huawei E2E eLTE Solution Satisfies Customer Requirements

E2E eLTE Solution

- Application
- EPC
- IP Network
- NMS
- Device
- LTE
- BBU
- RRU

Satisfy Industry Customer Requirements

- World’s 1st Broadband Professional Trunking Solution
  - 100Mbps broadband trunking: video dispatch
  - Professional voice dispatch performance
  - Open and convergent network architecture

- High Performance Mobile Broadband
  - DL 100Mbps, UL 50Mbps
  - High-speed coverage
  - Ultra long-distance coverage

- High Adaptation to Industry Requirements
  - Flexible Networking
  - Multiple Frequency bands
  - Tolerance of harsh environments
Diversified Power Solutions Power the Network Anytime Anywhere

- Safer and greener power supply powers BTSs.
  - Rectifier: MTBF: 500000 hours
  - Network free from unstable/off grid.

- High efficiency boosts energy saving.
  - Powercube saves ~60% fuel & 90% maintenance
  - Flexible in configuration & expansion.

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E2E Equipments Satisfies the Requirements of Industry Users

- **Chipset**
- **Device**
- **Network**
- **Application**
- **Power supply**
Compact Core Network Customized for Industry Users

• **14U all-in-one cabinet**
• **Proper Capacity for Industry Customers:**

<table>
<thead>
<tr>
<th></th>
<th>subscribers</th>
<th>eNodeB</th>
<th>trunking groups</th>
<th>concurrent trunking groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>eCNS600</td>
<td>≤20,000</td>
<td>500</td>
<td>2,000</td>
<td>512</td>
</tr>
<tr>
<td>eCNS210</td>
<td>≤200,000</td>
<td>1,500</td>
<td>20,000</td>
<td>2,000</td>
</tr>
</tbody>
</table>

• **High Reliability:** Board backup for high reliability, MTBF ≥ 250,000 hours
• **Thermal Conditions:** 0°C ~ 45°C (operating), -5°C ~ +50°C (Extreme), -40°C ~ +70 °C (Package & Stock)

Compact Core Network, Easy Deployment, Smooth Expansion and High Reliability!
## Micro Core Network for Small Capacity Industry Users

**eSCN230**

- 2U height, ≤ 12kg: 4 network elements (MME, SGW, PGW, HSS) in one box
- High Reliability: Board backup, and NE redundancy, system availability ≥ 99.999%, MTBF ≥ 155000 hours, MTTR ≤ 1 hour
- Low Power consumption: ≤ 400W
- Working temperature: -20 °C to +55 °C

<table>
<thead>
<tr>
<th></th>
<th>Subscribers</th>
<th>eNodeBs</th>
<th>Trunking Groups</th>
<th>Throughput</th>
<th>Concurrent Trunking Groups</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>eCNS230</strong></td>
<td>≤4 000</td>
<td>20</td>
<td>5112</td>
<td>2Gbps</td>
<td>512</td>
</tr>
</tbody>
</table>

**Micro Core Network, Easy Deployment and Cost Effective**
DBS3900: Wide Coverage and Easy Deployment

**BBU:**
- 2U height, weight: ≤12kg (Max. Load)
- Max. Active User: 2000
- Power consumption: ≤300W (Max. Load), ≤150W (Light Load)
- Maximum configuration: One BBU for 6 RRU (Trunking), One BBU for 12 RRU(FDD)/18RRUs(TDD) (Broadband Access)

**RRU:**
- Frequency Bands: 400M/800M in 2013 Q3
  - FDD: 700M/800M/850M/900M/1.0G/1.8G/2.1G/2.6G
  - TDD: 400M/800M/1.4G/1.8G/2.3G/2.5G/2.6G/3.5G/3.6G/3.7G/5.8G
- Bandwidth: 5MHz/10MHz/20MHz
- Max. Output Power: 4 * 20W
- Power Supply Voltage: -48V DC, ~220V
- Weight: ≤19.5kg
- Ingress protection: IP65
- Temperature (operating): -40°C ~ +55 °C

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## Multi-shape Devices for Different Industry Applications

<table>
<thead>
<tr>
<th>Handset</th>
<th>CPE</th>
<th>Mini PCIe Wireless Module</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EP680 (400M/800M/1.4G/1.8G)</strong></td>
<td><strong>EG860 (400M/800M/1.4G/1.8G)</strong></td>
<td><strong>EM350</strong></td>
</tr>
<tr>
<td>• Trunking Voice, Data Dispatching, Video Monitoring…</td>
<td>• TD-LTE Wireless data access</td>
<td>• Standard Mini PCIe slot</td>
</tr>
<tr>
<td>• 2.4” TFT LCD</td>
<td>• LAN &amp; WiFi broadband service</td>
<td>• Easy embed chip for customization</td>
</tr>
<tr>
<td>• TD-LTE/Wi-Fi</td>
<td>• Indoor &amp; outdoor use</td>
<td>• Handy adaption for PDA, Pad, Video Camera and other devices</td>
</tr>
<tr>
<td>• IP67 Water &amp; Dust proof</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**eH811 (1.8G)**
- Android 4.0 smart phone OS
- 4.5 inches IPS touch screen, resolution: 1280 x 720 pixels
- Dimensions (H x W x D): 146 mm x 72 mm x 21 mm, weight: 300 g (with battery)
- Storage capacity: ROM: 4 GB, RAM: 1 GB
- Processor: TI OMAP4460 1.5 G + LTE MODEM
- Operating temperature: -20° C to +55° C

**EP680 Ex**
- Explosion Proof
- Oilfield: IIC T4
- Mining & Colliery: Ib

**EP680 v2**
- Optional Enhancements:
  - Direct Mode Operation (DMO)
  - Highly Secured Encryption
  - Low Frequency Adaption

**EP680 (400M/800M/1.4G/1.8G)**
- TD-LTE/Wi-Fi
- LAN & WiFi broadband service
- Indoor & outdoor use

**eA660 (1.8G/2.3G/3.7G/5.0G)**
- Dimension: 250 mm x 250 mm x 80 mm
- Power supply: POE
- Power consumption: <12W
- IP67, MIL-STD-810F
- Operating temperature: -40° C to 65° C

**eA660 Ex**
- Dimension: 250 mm x 250 mm x 80 mm
- Power supply: POE
- Power consumption: <12W
- IP67, MIL-STD-810F
- Operating temperature: -40° C to 65° C

**Mini PCIe Wireless Module**
- Standard Mini PCIe slot
- Easy embed chip for customization
- Handy adaption for PDA, Pad, Video Camera and other devices
Small & Light eOMC, Easy Deployment & Maintenance

- **E2E NE Management**: eCNS, BTS, and even for devices
- **Network Monitoring**: Visualized topology monitoring, alarm & event notification, and real-time resource usage display
- **NE Maintenance**: NE configuration, commissioning, upgrade, or even device OTA upgrade
- **Maintenance Tool Kits**: Performance analysis tool, network planning & optimization tool, comprehensive terminal programming tool
eMDS for Efficient Dispatching

- Interworking with TETRA and PSTN
- **Broadband dispatching**: Data & Voice & Video dispatching
- **Conventional voice dispatching**: PTT (Push-to-Talk) group call, direct video calls, voice broadcasting, ambience listening, voice & video recording
- **Dispatching Control**: Group hierarchy management, call retention, late entry, emergency priority call, call authorization
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Huawei eLTE Solution: Leading Commercial Progress


11 Commercial Industry LTE Networks
- Norway Tampnet: World’s 1st LTE Application in Oilfield
- China Southern Power Grid: World’s 1st LTE Application in smart gird
- China Shuohuang Railway: World’s 1st LTE Application in Railway

89 Key Roles in 100+ international standard organizations
- Chair or Vice in RAN2, RAN3, RAN4, GERAN, SA5, CT, CT1, CT3
- Chair or Vice in SG5, WP 5D WG, WP 5D SWG
- Chair or Vice Chair in WWRF, WG3, WG7, N.A. & WWRF fellow

No.1 contributions to 3GPP LTE RAN Standards in 2010 and 1H2011

Source: 3GPP, June, 2012
Government Network in Lin Ying County

Lin Ying is Located in the central of Henan province, has 821 square kilometers area and total population of 800,000.

- Owns rich historical heritage and glorious culture. Many Famous place such as “ShouChanTai, SanJueBei, XiaoShangQiao.
- Strong industrial base: the three backbone industries being pharmaceutical, food processing and heavy manufacturing.

Communication Requirement

- High-bandwidth: Mainly Video update, especially HD, and video monitor;
- Professional trunking: for public security;
- Wide coverage: Coverage radius can reach 5 km;
- Compatibility: Compatible with existing communication networks, such as fixed-line telephone and narrowband intercom.

Communication Challenge
### Government Benefits from the Solution

#### Network

**2012.06 – 1st commercialized government network**

#### Application

- Traffic video
- Control & Management center
- Crossroads video

#### Value

**The first phase**

- To cover the major area of 50km2, and 8 base stations, and 230 wireless cameras;
- Real-time video upload, Intelligent traffic control;
- The success of the first phase has laid a good foundation for the next phase of the government network;

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**Improve the traffic condition of LinYing, and enhance the manager ability of the government**
Enable Local Polices to Fully Maintain the Security Li River

About Li River
- AAAAA tourist attraction;
- World’s Top 10 Watery Wonders;
- 83km travels like a jade ribbon winding among thousands of grotesque peaks;
- Millions of tourists every year.

Challenges
- 30+ people are drowned every year in the unattended waterway.
- Deterioration of Ecosystem and local tourist industry are affected by illegal fishing, unsupervised rafting and unregulated touting behavior.
- Local police resources are stretched thin covering the area beyond the 10km waterway within Guilin city.

Requirements
- Wireless Trunking: Easy communication among different areas.
- Mobility Communication: On rescue boat.
- Video Surveillance: Real-time video.
Huawei Innovative eLTE Solution

Solution and Value

All-in-one Professional Critical Communication

- **Video Surveillance**
  - On-board mobile CCTV, immediate dispatch and response
  - 100+ fixed CCTV camera, 7*24 HD video monitor over 83km waterway
  - Emergencies, accidents and critical cases be detected and located in monitor center through surveillance network.

- **Broadband Trunking Dispatching**
  - Combine handset video and voice trunking to visualize dispatching.
  - Video stream distributes to any terminals, coordinating all troops on mission.
  - Commander can immediately contact with any police, followed by distribution of voice order, live video or suspects picture at same time.

Totally 20 base stations are used to cover 83km and each base station covers 5-7km waterway among the mountain creeks.
Government Network in Tianjin

About Tianjin

- Metropolis in northern China, the largest coastal city in northern China with population of 13,000,000.
- Hold The summer Davos Forum every year.
- M2M pioneer city.

Challenges and Requirements

- Professional communication network for different departments’ function like video surveillance, emergency rescue, dispatching, etc.
- Highly robust network which enable future M2M evolution.
- Professional network planning and rich delivery experience. Complete deployment in 3 months.
Huawei eLTE Solution For Tianjin

Solution and Value

Multi services in one network

- Unify 110, 120, 119, 122 hotline, flood/earthquake protection, water/gas/electricity monitor into one dispatching, realize “One Call, One Response” critical communication.
- Government routine dispatching and critical dispatching share a united broadband dispatching system, greatly improve the work efficiency.
- Innovative Broadband trunking service provides visualized dispatching.
- High throughput enable future M2M evolution.

E2E Solution

- 110 base stations and whole core network for Binhai and Hedong in the first phase.
- CPE and MiniPCIE card, USB dongle, handset for different applications
- Shorten delivery time.