Nokia Deployable LTE Solutions, Experience & References

Timo Bakker & Joachim Gloeckler, September 26th 2017
Part 1- Introduction

NOKIA TODAY
A long history of successful change

1871

Siemens Com

Motorola Solutions

Alcatel-Lucent
A financially strong leader

<table>
<thead>
<tr>
<th>Category</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revenue</td>
<td>€26.6 bn</td>
<td>Mobile RAN, Cloud RAN, Core, Virtual Core, Airframe, Microwave Transport, Services</td>
</tr>
<tr>
<td>R&amp;D spend</td>
<td>€4.5 bn</td>
<td>Fixed Access Fibre &amp; Copper (including NGPON2), Home Devices, Services</td>
</tr>
<tr>
<td>Net cash²</td>
<td>€10 bn</td>
<td>ION IP Routing (edge, core, aggregation), Packet Core, Optical Transport, Video &amp; CDN, Services</td>
</tr>
<tr>
<td>Employees</td>
<td>106 000</td>
<td>A&amp;A OSS, Cloud, Orchestration, Security, Payment, Analytics, IoT, Policy &amp; Charging, Services</td>
</tr>
</tbody>
</table>
Delivering Nokia solutions to enterprises and public sector

Serving 4 segments and multiple sub-segments

**Government**
- Public Safety
- Defense
- Government Broadband
- Smart Cities/Smart Government

**Energy**
- Utilities
- Oil, Gas & Mining
- Mining
- Utility Broadband

**Transportation**
- Railways
- Highways
- Aviation/Airports
- Maritime

**Large Enterprises**
- Financial
- Healthcare
- Automotive
- Retail

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Public sector customer references around the world

Public safety: More than 55 mission critical networks and IP transformation worldwide

Defense: Serving more than 30 mission critical networks around the world

Broadband initiative: More than 20 Broadband programs worldwide

Smart government.smart city: More than 10 City Networks worldwide

Australia New Zealand Poland Argentina Colombia Ecuador Argentina Canada Congo Brazza Ghana Colombia UAE Ghana St Africa Canada Chattanooga, USA USA France France
Nokia in Defense References
30+ Defense Mission Critical Networks in the World
### IP transformation for Netherlands MoD (NAFIN)

**NAFIN - Netherlands Armed Forces Integrated Network**

**DEFENSE IP MIGRATION 2012**
Transformation of End of Life network to an End to End next generation IP/MPLS infrastructure

<table>
<thead>
<tr>
<th>CHALLENGES</th>
<th>SOLUTION</th>
<th>NOKIA ROLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>▪ Dutch Defense budget under pressure: cost reduction program of 1B €</td>
<td>▪ Efficiency and OPEX saving by migrating to next generation technologies</td>
<td>▪ Providing the equipment delivery (7750-SR, 7705-SAR, 1830-PSS) design, migration, integration, project management and maintenance services</td>
</tr>
<tr>
<td>▪ Need to replace an End Of Life network (Cisco and Nortel)</td>
<td>▪ Dedicated, Secured, Highly Available, Integrated Optics and IP/MPLS network linking more than 250 military installations in the land, sea and air services.</td>
<td>▪ Direct touch with MoD and partnership with HP for Installation and Commissioning where Defense accreditation is mandatory</td>
</tr>
<tr>
<td>▪ Customer is looking for improved armed forces efficiency</td>
<td>▪ Upgrade with the most advanced and integrated IP/MPLS technology under a single coherent management system (5620 SAM)</td>
<td>▪ 8 Years contract</td>
</tr>
</tbody>
</table>

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Federal ministry of interior (Politie Nederland), Holland

Nationwide network management tooling to improve the TETRA mobile radio network for The Netherlands emergency services

Challenges
- Harmonize the disjointed UMS C2000 network
- Reduce the tedious & expensive problems of incomplete notifications visibility due to alarms, etc

Solutions
- Fault Management Integrated nationwide TETRA Motorola network
- Performance Management national TETRA network
- Operation Support System (OSS) umbrella management based on a 7 year services frame contract

Benefits
- Improved customer excellence by better visibility & control of the nationwide emergency control network during crisis
- Increased automation from the solution which is comprised of event management and reporting systems enabling automatic ticketing creation through a service desk
- Limiting of safety & security risks by real time data analysis E.g. Track & trace lost hand sets, pre-estimate network capacity related to talk groups and real-time PTT analysis
Nokia in the press September 25th – Telecom Paper

Nokia gaat Android firmware schrijven voor politie en hulpverleners

maandag 25 september 2017 | 08.35 CET | Nieuws

Nokia breidt de ViTrust critical communications portfolio uit met nieuwe diensten rondom mission-critical LTE. Bij ViTrust draait het om communicatie voor overheden en veiligheidsdiensten over bestaande LTE-netwerken, maar met extra garanties voor veiligheid, beschikbaarheid en prioriteit.

Nokia biedt adviesdiensten voor overheden die communicatienetwerken willen inrichten en aanpassen aan veleisende omgevingen. Niet alleen in de netwerken zijn aanpassingen en speciale SLA's nodig, het is vaak ook nodig om de apparaten voor de gebruikers te voorzien van speciale software.

Nokia’s device software customization service adviseert gebruikers die hun apps en applicaties willen ontwikkelen zodat ze kunnen draaien op Android toestellen. De nadruk ligt op de naadloze werking in multi-vendor LTE netwerken, over verschillende typen apparatuur en nodes. Via crowdsourcing maakt Nokia hiervoor kaarten van de mobiele geving op diverse locaties, die

Device sw build on AOSP (Android Open Source Project)
Network Hierarchy in Defense

- **Infrastructure Networks**
- **Base/Deployable Networks**
- **Battlefield Networks**

**Strategic**

**Operational**

**Tactical**

**Joint Integrated Architectures**

**Survivability**

**Security Confidentiality**

**Projection Capability**

**EMSEC Tempest**

**Anti-Tamper**

**Anti-Jamming**

Adressable segment by COTS based Products
Nokia Solution for Defense
Defense Ultra-Broadband IP-based Communications Network

Empower defense forces everywhere with ultra-broadband IP-based modern networking.
Nokia Solution for Defense

LTE for Defense: portfolio highlights

Empower defense forces everywhere with ultra-broadband IP-based modern networking.
Nokia E2E portfolio for mission and business critical networks
Including rapidly deployable compact network solutions

Public Safety Devices
With pre-integrated 3GPP compliant mission critical applications

3GPP public safety LTE radio
Small Cells / Macro Cells

Public Safety Group Communications solution
3GPP compliant push-to-talk and push-to-video server & dispatch console

Compacted LTE Solutions
Small Cell and Macro Cell based deployable systems

Reliable Backhaul Network
Microwave / Optical backhaul and routers

Management Systems
Network, device & user management

Professional services
Nokia initiative on devices
Remote Patient Monitoring using Withings

Solution consists of:

- Monitoring devices (based on Withings)
- Connectivity and device management
- Medical data cloud infrastructure
- Relevant insights for care teams
- Visualizations for care team and patients
- System deployment and technical support
Unmanned aerial vehicles open the door for new use cases

Use cases

• Situational awareness
• Intelligent monitoring and surveillance
• Search and rescue
• Study and exploration
• Transport and delivery, e.g. medical supplies in remote areas
• Flying eNodeB
• WiFi hotspot in the sky

Enabled by

• Location
• Mobility
• Data security
• Big data analytics
Part 2- Private LTE portfolio

Deployable Solutions
Dramatic increase of natural disaster events

From 1980–2010

+200% Flood events

+50% Earthquake / Tsunami events

Number of people reported affected by natural disasters 1900-2011
## Impact on communication network during disasters

Introduce a need for rapidly deployable solutions

<table>
<thead>
<tr>
<th>Event</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Japan earthquake</td>
<td>15000 base stations unusable</td>
</tr>
<tr>
<td>(2011)</td>
<td>1.5 months until full service restoration</td>
</tr>
<tr>
<td>Katrina Hurricane</td>
<td>Public safety networks experienced massive outages</td>
</tr>
<tr>
<td>(2005)</td>
<td>3 millions subscribers lines out of service</td>
</tr>
<tr>
<td>Hurricane Sandy</td>
<td>25% of the cells in the affected areas lost service</td>
</tr>
<tr>
<td>(2012)</td>
<td></td>
</tr>
</tbody>
</table>

...  

2017: Hurricane, Flood, Earth Quake, Lands Slip --- You have seen the pictures in the news!
Nokia E2E portfolio for mission and business critical networks
Including rapidly deployable compact network solutions

<table>
<thead>
<tr>
<th>Public Safety Devices</th>
<th>3GPP public safety LTE radio</th>
<th>3GPP public safety LTE core</th>
<th>Public Safety Group Communications solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>With pre-integrated 3GPP compliant mission critical applications</td>
<td>Small Cells / Macro Cells</td>
<td>EPC, IMS, HSS, PCRF</td>
<td>3GPP compliant push-to-talk and push-to-video server &amp; dispatch console</td>
</tr>
<tr>
<td>Compact LTE Solutions</td>
<td>3GPP compliant mission critical applications</td>
<td>eMBMS, Interworking Gateways</td>
<td>Management Systems</td>
</tr>
<tr>
<td>Small Cell and Macro Cell based deployable systems</td>
<td></td>
<td></td>
<td>Network, device &amp; user management</td>
</tr>
<tr>
<td>Reliable Backhaul Network</td>
<td></td>
<td></td>
<td>Professional services</td>
</tr>
<tr>
<td>Microwave / Optical backhaul and routers</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Coverage and capacity exactly where needed
With small cell and macro cell based deployable systems

Temporary
Portable solutions for extending coverage in remote or underground locations with limited macro network reach and in peak load situations such as mass events.

Stationary
Small system setups in key locations to guarantee coverage and capacity for dedicated users.

Disaster recovery
Establish communications capabilities in disaster areas where macro network is compromised.
Deployable LTE solutions
Standalone network embedding LTE radio, core and applications

Nokia Ultra Compact Network
• Up to 400 active users
• Up to few km range
• About 5 minutes setup time
• ~ 25 kg
• Multiple form factors

Nokia Compact Network
• Up to 1000 active users per cell
• Up to 60km range
• About 15 minutes setup time
• ~ 60 kg
Solution / Use Case Mapping
A non exhaustive view

<table>
<thead>
<tr>
<th>Mission Critical</th>
<th>Emergency</th>
<th>Rural coverage</th>
<th>Events</th>
</tr>
</thead>
<tbody>
<tr>
<td>(police, firefighters, NGOs, EMS)</td>
<td></td>
<td></td>
<td>Private network for enhanced operational efficiency</td>
</tr>
<tr>
<td>Business critical</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(oil&amp;gas, mining, enterprises)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Integrated hosting of broadband applications
For better situational awareness

Push-to-video

Real-time HD on drones

Mapping

Bio-Vital Monitoring
Benefits for mission critical operators

1. Instant LTE broadband services as a first step towards nationwide broadband networks deployment
2. Service recovery within minutes in disaster/recovery situations
3. LTE coverage extension in rural and remote locations
4. Additional capacity in peak load situation for example at events
5. Improve coverage in buildings when the regular network has to penetration
LTE Public Safety Network deployment scenarios

Hosted public safety (A)

Public safety over MBB (B)

MVNO public safety (C)

RAN sharing for public safety (D)

Private LTE for public safety (E)
Part 3- Ultra Compact Network

Solution presentation
Nokia E2E portfolio for mission and business critical networks
Including rapidly deployable compact network solutions

Public Safety Devices
With pre-integrated 3GPP compliant mission critical applications

3GPP public safety LTE radio
Small Cells / Macro Cells

Public Safety Group Communications solution
3GPP compliant push-to-talk and push-to-video server & dispatch console

Compact LTE Solutions
Small Cell and Macro Cell based deployable systems

Reliable Backhaul Network
Microwave / Optical backhaul and routers

Management Systems
Network, device & user management

Professional services

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Nokia Ultra Compact Network vs Nokia Compact Network positioning

**Ultra Compact Network - Ideal for standalone deployments and portability use cases**

- Small cell based eNodeB with integrated Micro Core
- Integrated computing platform for system SW and applications
- Integrated O&M touchscreen display for non-technical users and remote configuration possible via wi-fi connected device
- Fully ruggedized, shock proof, water protected, suitable for tough environments
- Autonomous operations with batteries, runtime swapping of batteries
- Capacity up to 400 users

**Compact Network - Ideal for small networks or compact deployments such as system-on-wheels**

- Macro cell based eNodeB
- Zero footprint Flexi BTS Server for system module release 3 (FSMF) to host Micro Core and applications
- Additional Ethernet-connected device needed for O&M
- Expansion capability (up to 10 eNodeB connections)
- Designed for outdoor deployments, water protected and dust proof
- Integrated power supply; battery operation as an option
- Capacity up to 5000 users

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Ultra Compact Network
Establish reliable communications in minutes

Components

Nokia Flexi Zone small cell HW and SW for eNodeB functionality

Micro core for Evolved Packet Core functions, including IMS, HSS & PCRF

Application hosting capability (PTV, Video, others, ...)

Micro cell performance

Battery pack,

Easy operation,

One man portable solution

Backhaul connectivity support
Nokia Ultra Compact Network
Easy to operate by non-telco personal

Embedded display interface
Easy basic network configuration
(backhaul, radio)
Local provisioning of SIMs

Antenna kits
Optional rolling masts
Magnetic GPS and LTE antennas

Optional connection to any backhaul
Wi-Fi / LTE optional backhaul
Any IP based backhaul (satellite, microwave ...)
Nokia Ultra Compact Network
High performance Flexi Zone small cell based solution

Supported bands
B3, B25, B1, B4, B7, B38, B40, B41, B14, B28-R3

• In operation in over 100 commercial networks
• LTE or TD-LTE
• 2x5W output power

“Macro-Like” small cell
Leading performance, form factor, capacity & KPIs thanks to powerful macro SoC & macro software parity

“Nokia’s Flexi Zone is definitely the most ambitious hetnet proposal”
Nokia Ultra Compact Network
Fully ruggedized for tough environments

Components

- Nokia Flexi Zone micro small cell HW and SW for eNodeB functionality
- Virtualized Micro Core for Evolved Packet Core functions including MME, HSS & PCRF
- Application hosting with high performance computing platform, integrated Nokia Group Communications PTT/PTV solution
- Simplified operation and maintenance touchscreen display for non-technical users
- Selection of LTE and GPS antennas
Nokia Ultra Compact Network release 17
Graphical User Interface with simplified operations

- Easy operation, configuration and subscriber management with touchscreen
- Local provisioning of users, USIMs and profiles
- Simple wizard-like functions guide users through selected operational steps
- Automated logical flows trigger configuration parameter changes and updates to all related components
- GUI has the same look and feel for all different components
- Fault management with alarms
Nokia Ultra Compact Network
Flexible deployment options

Options

- Available in portable, rack-mounted and vehicle mounted packaging
- Optional LTE modem, cable, satellite or microwave backhaul connection
- Optional battery pack with possibility to swap individual batteries during runtime

Intel XEON, 8 Cores, Type D1539
16 threads, 8 * 1.60 GHz
max turbo 2.20 GHz, 12MB cache
32GB ECC RAM
128 GB industrial SSD internal
Via external accessible CFAST Slot
additional SSD can be added
Nokia Ultra Compact Network
Target architecture

- Module-based architecture
- Virtualization for SW components
- Easy upgrade and extension
# Nokia Ultra Compact Network release 17

## Use case 1: Independent deployable LTE network

<table>
<thead>
<tr>
<th>Independent network operations</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standalone network provides all services for user equipment and has integrated user management functionality.</td>
<td>Nokia Flexi Zone eNodeB with embedded Micro Core</td>
</tr>
<tr>
<td>Data services are available to run customer specific applications connected to the LTE network.</td>
<td>Simplified O&amp;M interface</td>
</tr>
<tr>
<td>Typically used for temporary coverage and capacity, for example in disaster recovery areas or when there is outage in the LTE network.</td>
<td>Local data services</td>
</tr>
<tr>
<td>The deployable LTE network can be connected via Ethernet interfaces to locally installed servers.</td>
<td>Backhaul connection</td>
</tr>
<tr>
<td>LTE modem, cable, satellite or microwave backhaul connection enables access to the internet and remote services for voice and data applications.</td>
<td></td>
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</tbody>
</table>

Extended connectivity

- Data services are available to run customer specific applications connected to the LTE network.
- Typically used for temporary coverage and capacity, for example in disaster recovery areas or when there is outage in the LTE network.
- The deployable LTE network can be connected via Ethernet interfaces to locally installed servers.
- LTE modem, cable, satellite or microwave backhaul connection enables access to the internet and remote services for voice and data applications.
Nokia Ultra Compact Network release 17

Use case 2: Independent deployable LTE network with applications

#### Independent network operations with PTT/PTV

- Standalone network provides all services for user equipment and has integrated user management functionality.
- Pre-installed Nokia Group Communications solution allows local users to communicate with PTT/PTV application reliably without connection to the backhaul network.
- Typically used for temporary coverage and capacity, for example in disaster recovery areas or when there is outage in the LTE network.

#### Extended connectivity

- LTE modem, cable, satellite or microwave backhaul connection to a larger overlay LTE network, access to the internet and remote services for voice and data applications.
- Users can switch between the overlay network and the local network with support of dual-sim devices.

#### Components

- Nokia Flexi Zone eNodeB with embedded Micro Core
- Simplified O&M interface
- Integrated Nokia Group Communications PTT/PTV
- Backhaul connection
Nokia Ultra Compact Network release 17
Packaging option 1: backpack

Backpack

- System module and integrated eNodeB grouped into one single frame inside a backpack for easy transportation
- Includes storage space for optional accessories
- Shock-mounted and water resistant, IP64 certified housing and connectors
- Available in different variants based on the number of interfaces
- Integrated batteries for minimum 2 hour runtime, individual swap of drained batteries
Nokia Ultra Compact Network release 17
Packaging option 2: vehicle-mounted

- A vibration protection plate ensures vibration-shock protection in a moving vehicle
- IP64 certified metal / aluminium housing
- A magnetic, single-housed antenna solution available for integrated Wi-Fi, GPS and LTE backhaul modems
- Typically connected to car inverter for power supply; battery option available
Nokia Ultra Compact Network release 17
Packaging option 3: rack-mounted

Rack-mounted

• Modules designed to fit in a standard 19" inch rack
• Ruggedized certified housing for safe transportation
• Can be used for a stationary system set-up in a specific location
• Trolley type housing for easy one person transportation optionally available
• Battery operations option
# Nokia Ultra Compact Network release 17

## Specifications *

| **Throughput** | Downlink throughput target: 140 Mbit/s  
Uplink throughput target: 70 Mbit/s |
<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td><strong>Users</strong></td>
<td>Capacity target: 400 concurrent active users</td>
</tr>
</tbody>
</table>
| **Operations** | System start-up time: up to 5 minutes  
Autonomous operations on batteries targets: 2 hours  
Operational temperature: – 20°C to +49°C |
| **Dimensions** | Smallest form factor (backpack): 73cm x 43 cm x 30 cm  
Weight (backpack): 25-30 kg |
| **Supported bands** | FDD BC1, BC3, BC4, BC7, BC25, BC14**, BC28-R3**  
TDD BC38, BC40, BC41 |

* release target figures, to be confirmed for product General Availability  
** based on availability from Small Cell
Part 4- Nokia Compact Network

Solution presentation
Compact Network vs Ultra Compact Network positioning

Compact Network - Ideal for small networks or compact deployments such as system-on-wheels

- Macro cell based eNodeB
- Zero footprint Flexi BTS Server for system module release 3 (FSMF) to host Micro Core and applications
- Additional Ethernet-connected device needed for O&M
- Expansion capability (up to 10 eNodeB connections)
- Designed for outdoor deployments, water proof and dust proof
- Integrated power supply; battery operation as an option
- Capacity up to 5000 users

Ultra Compact Network - Ideal for standalone deployments and portability use cases

- Small cell based eNodeB with integrated Micro Core
- Integrated computing platform for system SW and applications
- Integrated O&M touchscreen display for non-technical users and remote configuration possible via wi-fi connected device
- Fully ruggedized, shock proof, water proof, suitable for tough environments
- Autonomous operations with batteries, runtime swapping of batteries
- Capacity up to 400 users
Nokia Compact Network – Value Proposition

Based on Nokia LTE macro base station

- Fully autonomous, transportable high capacity LTE network
- Low latency applications hosting capability
- Multi eNodeB support
- Works in tough environment
- Easy to operate

Features

- Application hosting with high performance computing platform
- Micro core for Evolved Packet Core functions. Including IMS lite, HSS & PCRF
- Support connection for up to 10 eNodeBs
- Simplified Web based network management
Compact Network
Carrier grade performance for mobile units

Features

- Nokia LTE macro cell based solution
- Micro core for Evolved Packet Core functions. Including IMS Light, HSS & PCRF
- Application hosting with performance computing platform, integrated Nokia Group Communications PTT/PTV solution
- Support connection for up to 10 eNodeBs
- 2TX MIMO configuration
- Very high output RF power
- Mobile Edge Computing (MEC)
- Local breakout
- Public Safety QCIs
## FBSA module support

### Zero-footprint deployment with Flexi Multiradio 10

<table>
<thead>
<tr>
<th>Product</th>
<th>Nokia Flexi BTS Server Module FBSA</th>
</tr>
</thead>
</table>
| **CPU Features**         | Second Generation Intel Xeon Technology  
64bit instruction set (with AVX, AES-NI)  
Hyperthreading / Virtualization (VT-x, VT-d)  
Speedstep & advance idle power states |
| **Operating system**     | Linux with KVM Hypervisor           |
| **Memory Subsystem**     | Two channel DDR-3 with 16GB ECC protected memory |
| **Storage subsystem**    | 400GB high endurance SSD (ensures lifetime reliability) |
| **Interfaces**           | Dimensions: 42(H) x 219.5(W) x 333(D) mm  
Mass: 3.4 Kg |
| **Interfaces**           | 2 x 1000BaseT  
2 x 10GE SFP+ |
| **Input Power**          | 1 x DC power input (-48V)            |
| **Power consumption**    | ~140W (during heating and maximal traffic)  
~55W (maximal traffic)  
~30 Watt (no traffic) |
| **Mounting Options**     | Integrated to Flexi Multiradio 10 Module or FBXA |
Compact Network 17 Target Architecture

Nokia microcore and Nokia Group Communications in virtual environment
Use case, no coverage or insufficient capacity (isolated operation)

Deployable eNBs provides local service for PS users
Use case, no coverage or insufficient capacity

Deployable eNBs provides service for PS users (with centralized services)
Use case, no coverage or insufficient capacity

Deployable eNBs provides service for PS users (with centralized services)
Radio sites in one section are connected via MW links

One eNB is equipped with core functionality and Group Communication solution

This ensures secure communication for the PS Agency when other infrastructure is down

MicroCore is Capable to support up to 10 eNBs for better coverage and capacity
Compact Network HW products overview
High-level design

Optional elements
Public Safety Base Station
Minimum footprint mobile solutions
Part 5- Use Cases
Airborne Solution for Emergency Services & Disaster Recovery
UAV - Challenges and Solutions

Compact and light Base Station/Small Cell
- Nokia Flexi Zone Micro/Pico

Network Backhaul
- Nokia Ultra compact Network in a Box
- Data Tethering from the ground
- Satellite backhaul to other CN or other NIB
- In-band LTE or WiFi

UAV Motor Power (eg. Multicopters)
- Tethering (copper pair) from the ground

Small Cell power source
- Powered by UAV batteries and tethering (copper pair) from the ground
Public Safety Base Station
Proof-of-Concept: Multicopter UAV

Flexi Zone Pico BTS mounted under drone

LTE live-camera drone "client"

Power and backhaul tether

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Public Safety Base Station
Proof-of-Concept: Balloon UAV
Backup
Optional components

• FPBC is a Lithium Battery Back up Solution designed for all Flexi BTS based platforms

• FPRB Flexi Power Rectifier common IP65 rectifier solution for all Flexi BTS based platforms, no air filters

• Module Front and Back Cover kit FMCA for Nokia Compact Network
Compact Network 17
Use-case 1 – Independent deployable LTE network

- Main objective is to establish complete and independent network. No external coverage is available or by operation decided to run the network without external connectivity.
- The network provides data services
- Direct communications can be established by corresponding Ue APPS
Compact Network 17
Use-case 2 – Independent deployable LTE network with local Ethernet connections

- Objective is to establish complete and independent network.
- This use case enables an independent network operation with local attached services via additional server.
- The network provides access between the devices and external systems.
- Priority for services are enabled via Rx interface support.
- The network provides data services.
- Direct communications can be established by corresponding Ue APPS.
Compact Network 17
Use-case 3 – Independent deployable LTE with backhaul remote connection

- Enable an independent network operation with connectivity remote services via external server.
- The network provides access between the devices and external systems. Direct communications can be established by corresponding Ue APPS.
- Transport routing connects the remote location to Ue via SGi. Priority for services are enabled via Rx interface support.
- For security reasons VPN concept can be applied to isolate the traffic from the UCN network and remote servers from the transport connection.
Compact Network 17
Use-case 4 – Independent deployable LTE with backhaul connection to internet

- Enable an independent network operation with connectivity to internet and remote services via external server.
- The network provides access between the devices and external systems.
- Direct communications can be established by corresponding Ue APPS.
- Transport routing connects the remote location to Ue via SGi.
- Priority for services enabled via Rx interface support.
- Access to Internet requires support by public available DNS or NTP server.
Compact Network 17
Use-case 5 – Independent deployable LTE network with multiple eNBs
Compact Network 17

Use-case 6 – Independent deployable LTE with remote internet connection and multiple eNBs
Compact Network 17

Use-case 7: Independent deployable LTE with remote connection and multiple eNBs
Compact Network 17
Use-case 8: Independent deployable LTE with remote internet connection and multiple eNBs
Compact Network 17

Use-case 9: Independent deployable LTE with remote internet connection and multiple eNBs
Compact Network 17
Use-case 10: Independent deployable LTE network with virtual installed Apps

- Main item in this use case is a complete independent operation of the network.
- No external coverage is available or by operation decided to run the network without external connectivity.
- The network provides data services
- Direct communications can be established by corresponding Ue APPS.
- Local installed virtualized application extend the capability and services of the CN network
Compact Network 17
Use-case 11: Independent deployable LTE network with virtual installed Apps and local Ethernet connections

- Use case enables an independent network operation with local attached services via additional server or access by terminals.
- The network provides access between the devices and external systems.
- Priority for services are enabled via Rx interface support.
- Direct communications can be established by corresponding Ue APPS.
- Local installed virtualized application extend the capability and services of the CN network.
Compact Network 17
Use-case 12: Independent deployable LTE with backhaul virtual installed Apps and remote connection

- Use case enables an independent network operation with connectivity remote services via external server.
- The network provides access between the devices and external systems.
- Direct communications can be established by corresponding Ue APPS.
- Local installed virtualized application extend the capability and services of the CN network
- Transport routing connects the remote location to Ue via SGi. Priority for services are enabled via Rx interface support
Compact Network 17
Use-case 13: Independent deployable LTE with backhaul virtual installed Apps and connection to internet

- Use case enables an independent network operation with connectivity to internet and remote services via external server.
- The network provides access between the devices and external systems. Direct communications can be established by corresponding Ue APPS.
- Local installed virtualized application extend the capability and services of the CN network.
- Transport routing connects the remote location connect to Ue via SGi. Priority for services are enabled via Rx interface support.
- Access to Internet requires support by public available DNS or NTP server.
- For security reasons VPN concept can be applied to isolate the traffic from the CN network and remote servers from the transport connection.
Compact Network 17

Use-case 14: Independent deployable LTE network with virtual installed Apps and multiple eNBs
Compact Network 17
Use-case 15: Independent deployable LTE network with virtual installed Apps and local Ethernet connections and multiple eNBs
Compact Network 17
Use-case 17: Independent deployable LTE with backhaul virtual installed Apps and remote connection use case
Compact Network 17
Use-case 18: Independent deployable LTE with backhaul virtual installed Apps and connection to internet
Smart devices are the new Swiss Army knives for first responders

But key challenges need to be addressed

Legacy devices
Voice

Smart devices
Video/Rich Data
Voice
Sensor gateway
Database access
Applications
Reporting
GIS

Challenges:
Usability
Reliability
Performance
Security

The need for tailor-made Android software designed for Public safety agency requirements
A tailormade user experience across multivendor Android devices for mission critical operations

**Tailored UI**
across multivendor Devices for uniform user experience

**Always On**
Group Comms Suite as native bootloader

**Secure**
Security hardened
Controlled access

**Optimized**
Service performance
Enhanced battery life

**Pre-Integrated**
with Nokia Advanced Command Center

**Reliable**
HA Dual APN
active-active support

For internal use