Стратегия и концепция совмещенного LTE+2G+3G радиодоступа

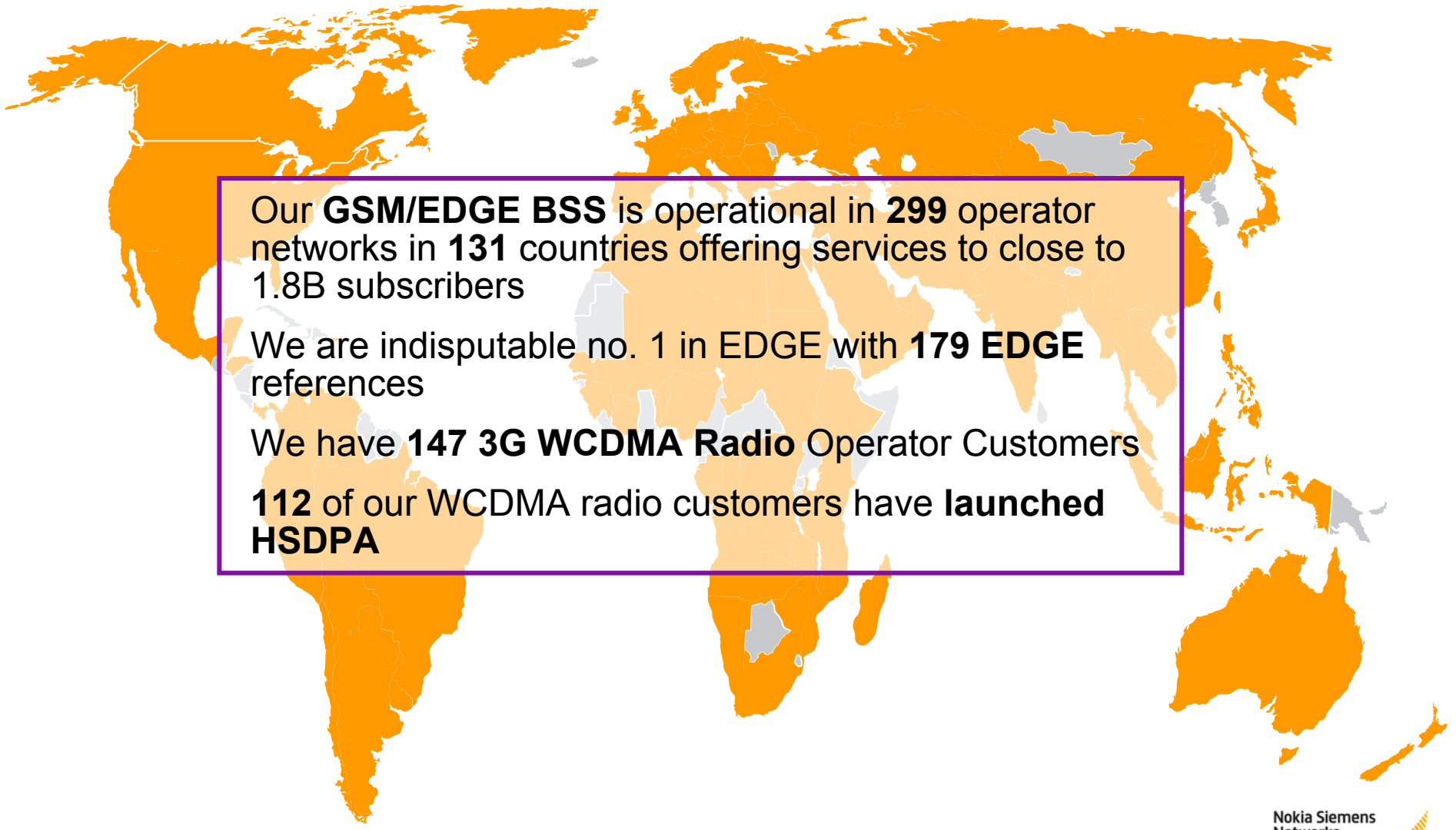
Михаил Старовойтов
Москва, 26 мая 2009 года

LTE Russia & CIS 2009

Тенденции рынка. Различные поколения 3GPP и не-3GPP технологий будут сосуществовать на рынках в обозримом будущем.

Delivering Radio Access on a global scale

366 radio customers in 149 countries



Our **GSM/EDGE BSS** is operational in **299** operator networks in **131** countries offering services to close to 1.8B subscribers

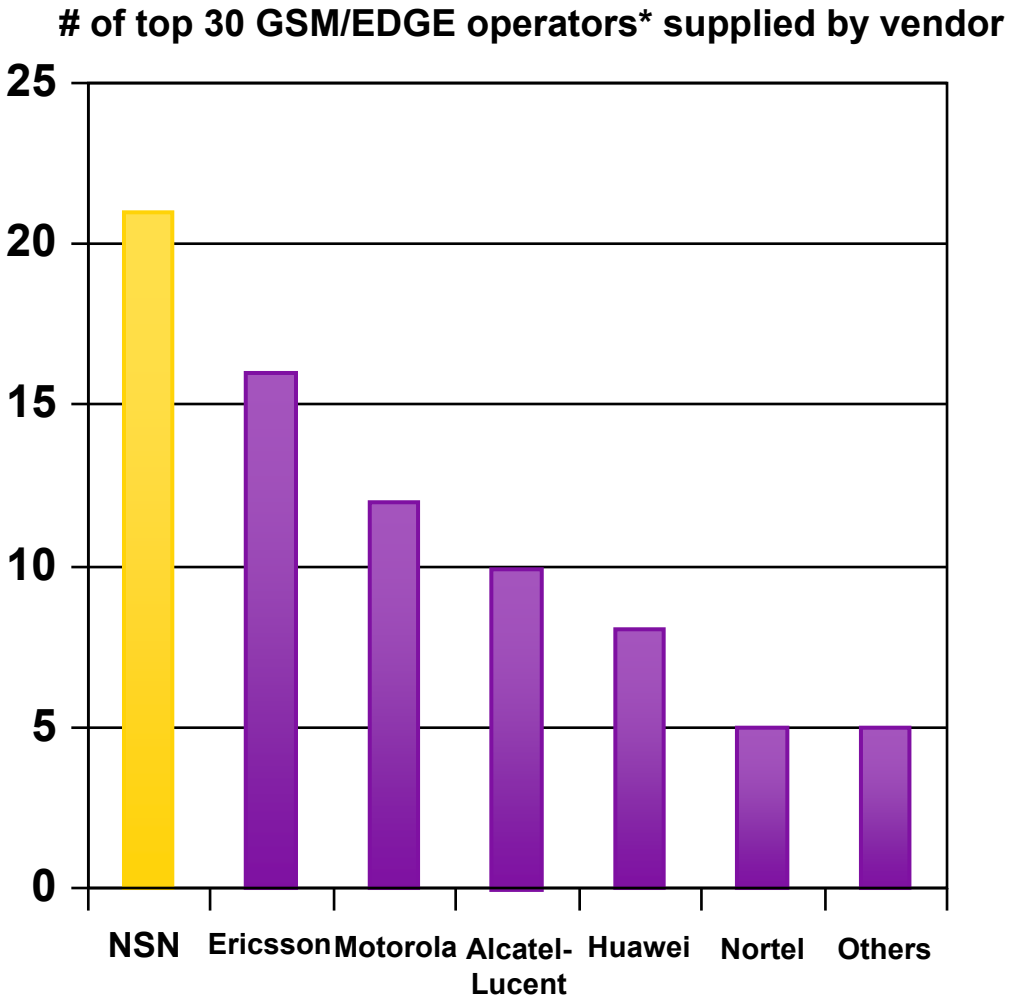
We are indisputable no. 1 in EDGE with **179 EDGE** references

We have **147 3G WCDMA Radio** Operator Customers

112 of our WCDMA radio customers have **launched HSDPA**

GSM/EDGE track record

- 299 GSM radio customers in 131 countries
- 179 EDGE customers
- Our GSM/EDGE radio serving close to 1.8 billion subscribers
- Suppying 21 of 30 biggest GSM/EDGE operators*
- Delivery record of 200.000 TRX in one month achieved July 2008**

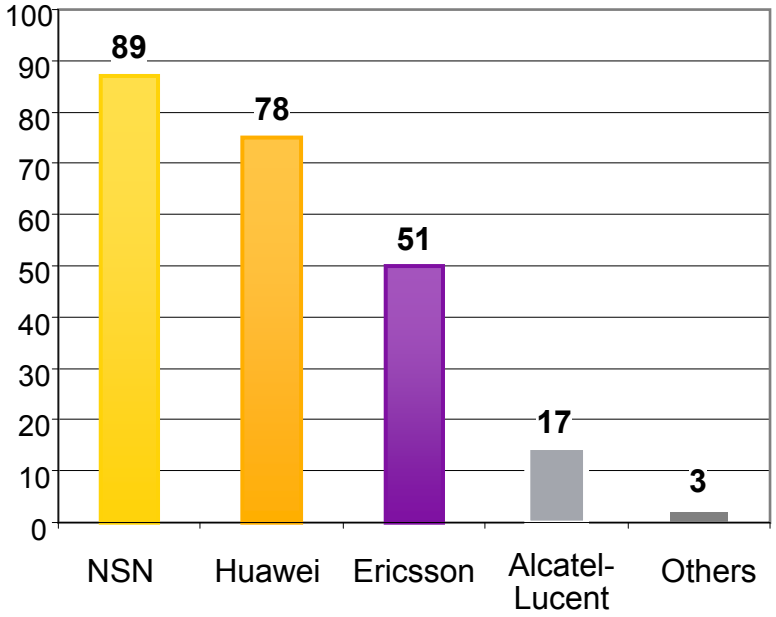


*Biggest operators by number of subscribers, status Dec 2008 / Informa Telecoms & Media WCIS database

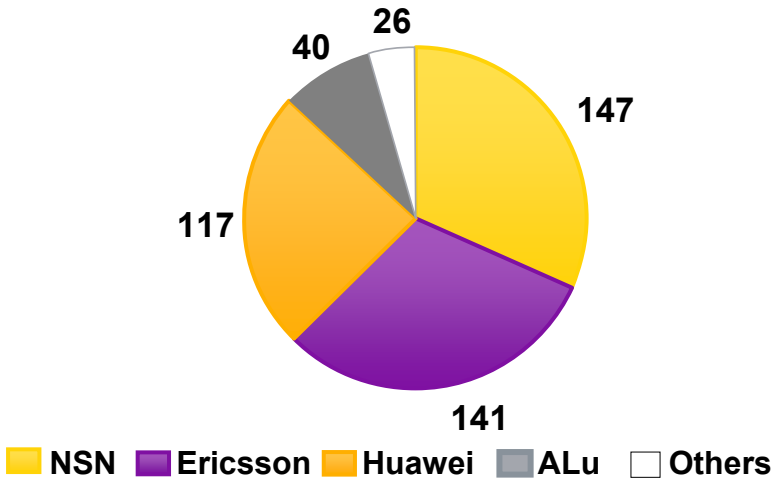
** NSN Press release Oct 20 2008

NSN is the leader in WCDMA Radio Business

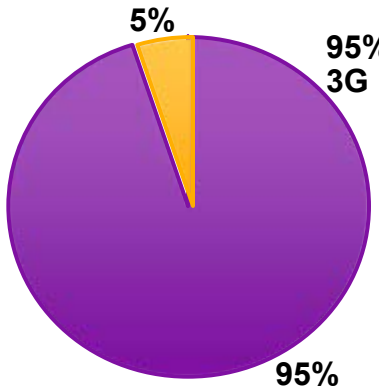
Contracts Won in 2007 & 2008



NSN has most WCDMA Radio Customers



Customers Rely on NSN



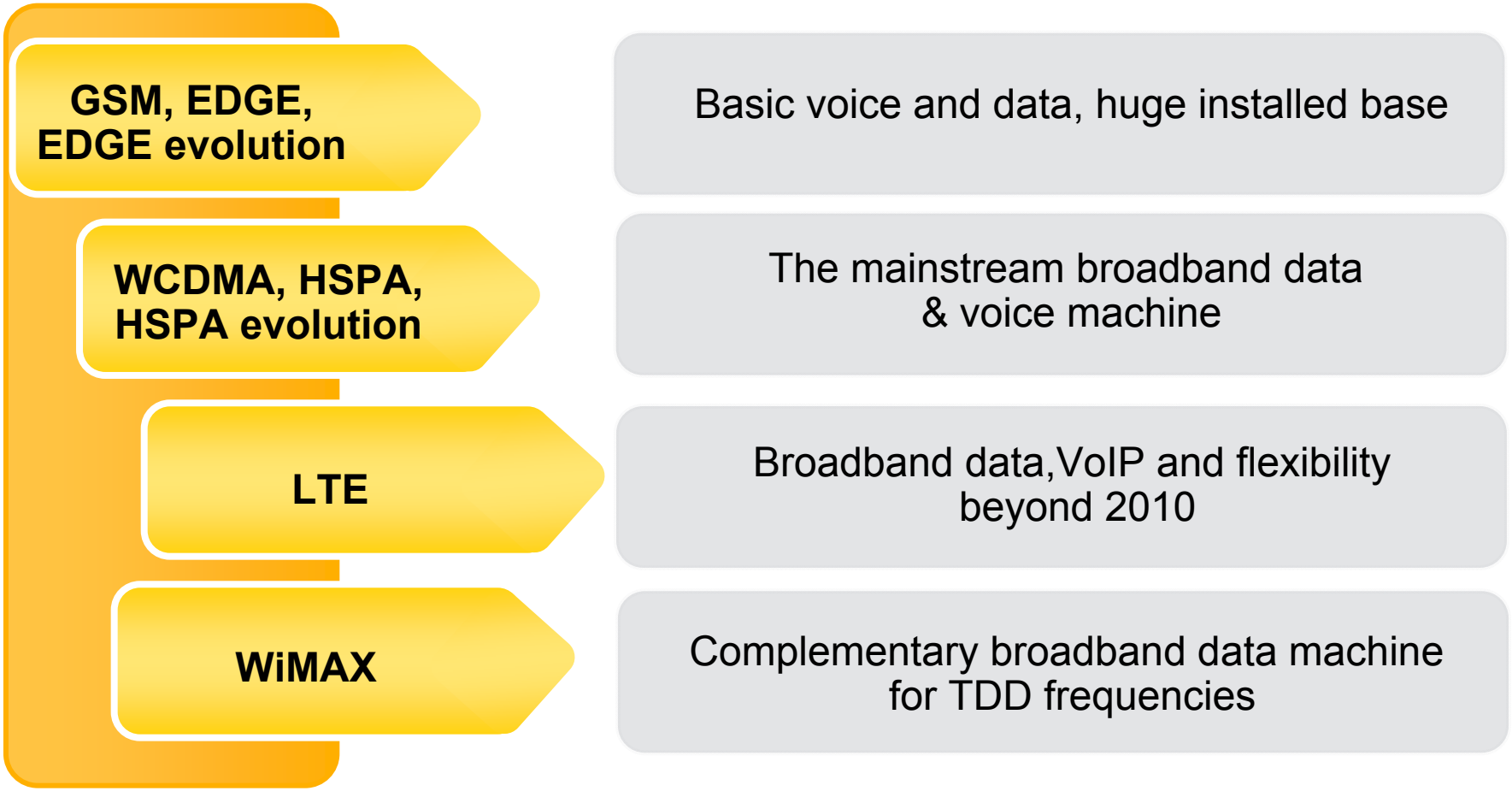
95% of ex-Siemens or NEC 3G radio continue with NSN

Strong NSN WCDMA References

- 147 WCDMA Radio customers
- 18 of 25 biggest WCDMA operators
- Over half the world's 310 million* WCDMA / HSPA subscribers connected by Nokia Siemens Networks

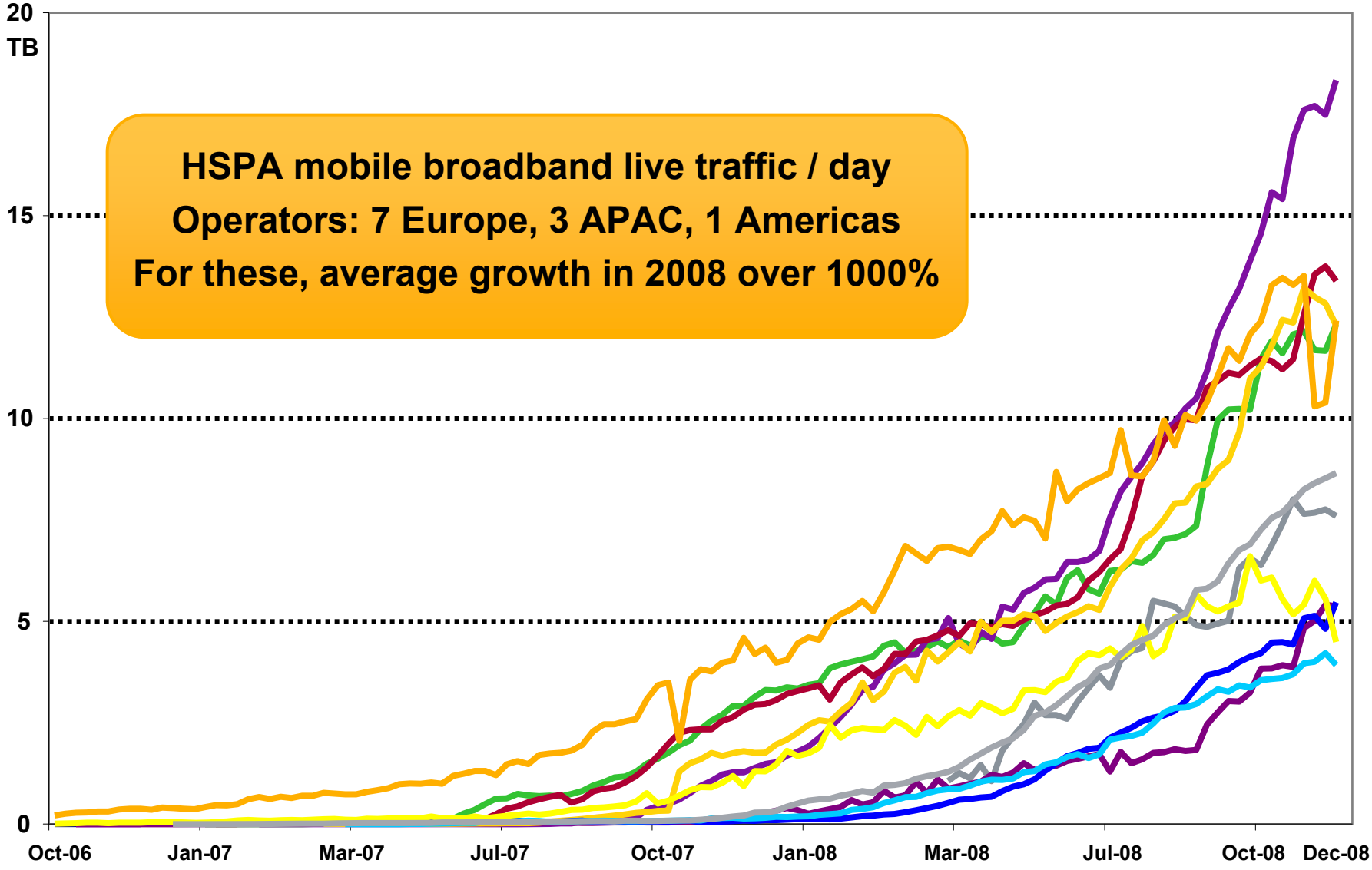
* Subs estimate of Informa, Feb '09

The future is more multiradio than ever



The networks need to support this evolution

Demand for mobile broadband is there



Source: NSN analysis

Two tracks of Mobile Broadband

Laptops/PC's

Smart-phones

Different feature set required – NSN focuses on both

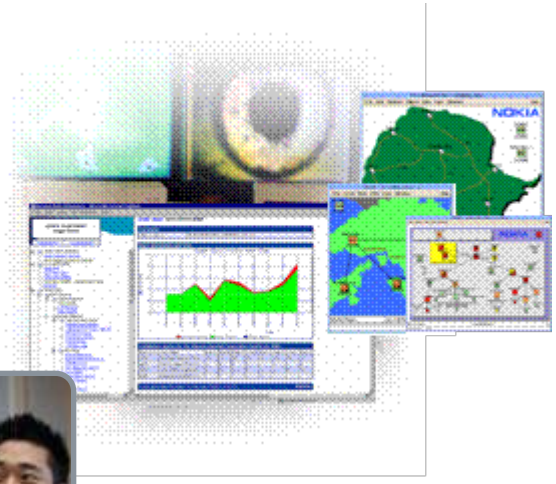
- Penetration growing fast
- Driven by peak data rates
- High data consumption
- No CS voice
- QoS mgmt becomes critical

- Majority of 3G users
- Multiple app's always-on
- Less data consumption
- Peak data rates not driving
- Battery life and set-up times

Market leader in OSS and SON features

SON = Self Optimized Networks

- BTS Plug-and-Play
- Automatic scrambling code allocation
- Inter-system (GSM) neighborcell configuration
- Automatic 3G neighborcell detection and reporting
- Remote antenna downtilts
- Load balancing 2G-3G
- BTS carrier shut-down for power saving



- **NetAct is integrated management system for all current and future radio networks**
- **Enables multilayer, multivendor, multiradio optimization**
- **250 NetAct customers**

Award Winning Flexi Multiradio Base Station

GLOBAL MOBILE AWARDS 2009

Winner –
best technology advance

"A worthy winner, based on the successful Flexi concept, incorporating new baseband and radio technology that enables operators to migrate from 3G/HSPA through to LTE, and NSN's commitment to how it will support this type of migration strategy."

Platforms for common evolution

Flexi Multiradio BTS

- Modular
- Integrated Ethernet transport
- 1 Gbps throughput
- GSM/HSPA/I-HSPA/LTE

Multicontroller

- Modular
- Ethernet switching and transport
- 35 Gbps throughput
- GSM and HSPA

Versatile, Modular, Scalable, Lightweight and future proof platforms

Towards simpler sites for multiradio networks






"Flexi BTS site concept saves more money at greenfield sites than the price of the BTS itself" , COO of operator in APAC

"The reason for our low CAPEX/revenue ratio is this new BTS concept called Flexi BTS", CEO of North American operator




Nokia Siemens Networks

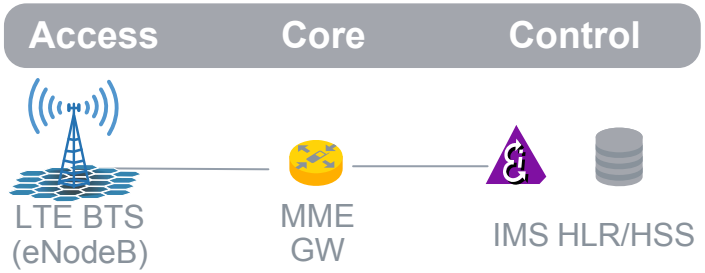
Стратегия и решения Nokia Siemens Networks по совмещенному LTE+2G+3G оборудованию радиодоступа для всех 3GPP стандартов.

LTE Overview

LTE / SAE introduces the mechanism to fulfill the requirements of a next generation mobile network

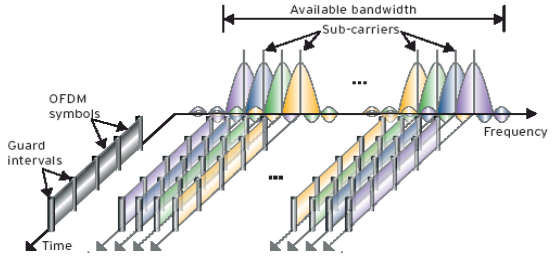
Flat Overall Architecture

- 2-node architecture
- IP routable transport architecture



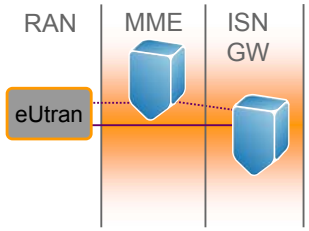
Improved Radio Principles

- peak data rates [Mbps] 173 DL , 58 UL
- Scalable BW: 1.4, 3, 5, 10, 15, 20 MHz
- Short latency: 10 – 20 ms

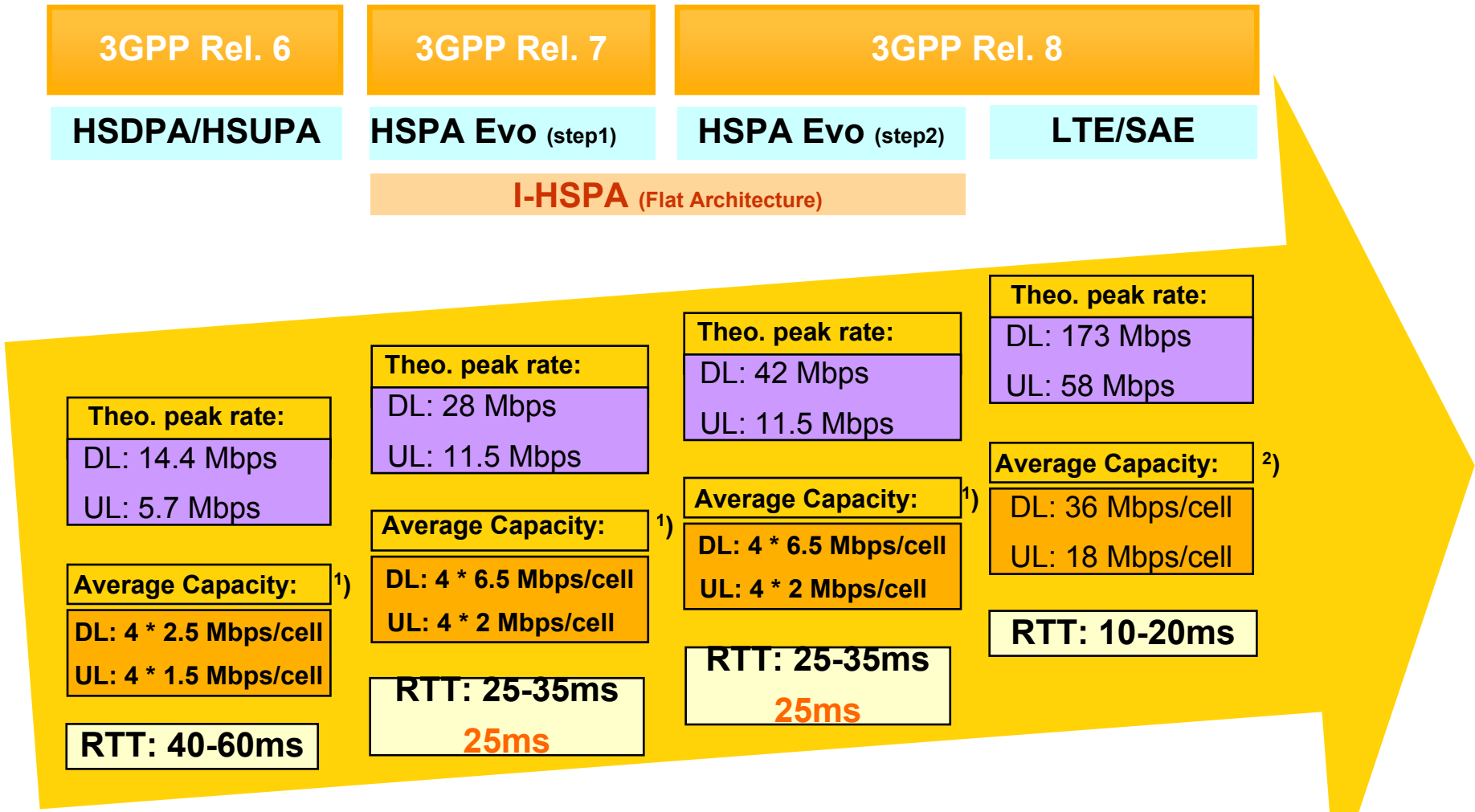


New Core Architecture

- Simplified Protocol Stack
- Simple, more efficient QoS
- UMTS backward compatible security



Overview of 3GPP Evolution



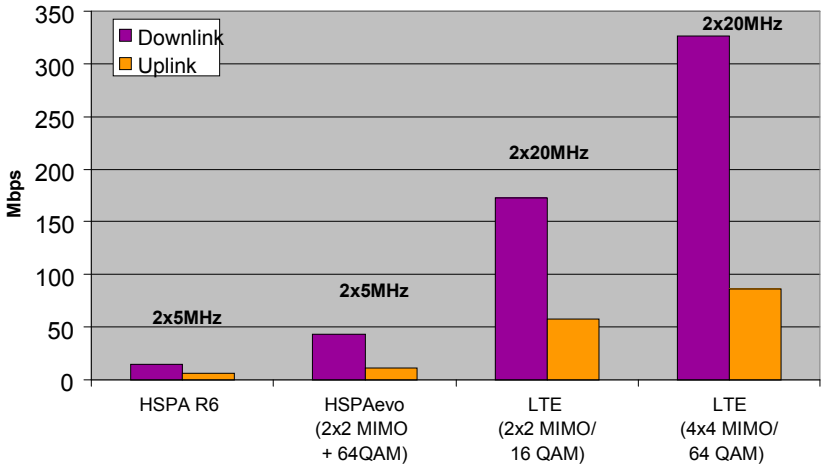
[1]) HSPA capacity values normalized to 4 carriers (2 * 20MHz in total)

[2]) LTE values according to Nokia and Nokia Siemens Network simulations for NGMN performance evaluation report V1.3 (macro cell, full buffer, 500m ISD, pedestrian speed, 2x2 MIMO)

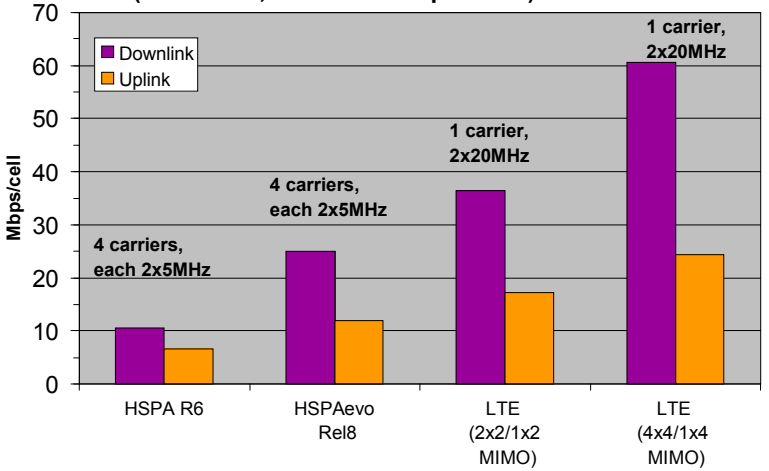
Comparison of Throughput and Latency

LTE shows excellent performance

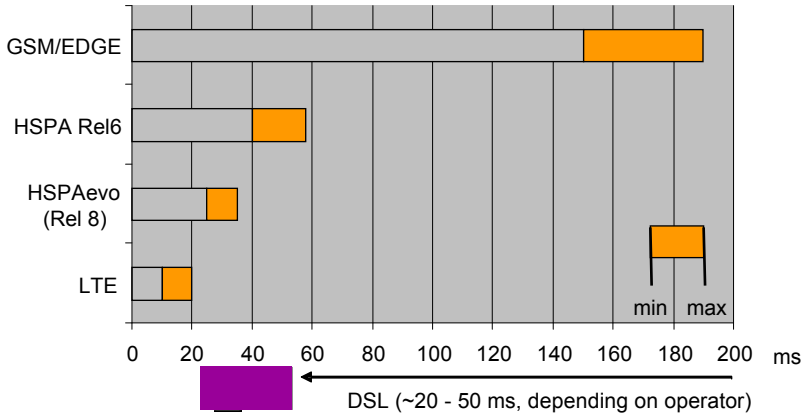
Max. peak data rate *



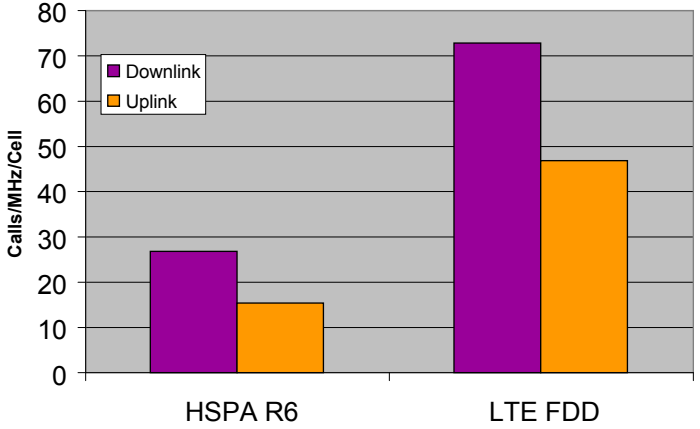
Average cell throughput (macro cell, 2*20MHz or equivalent) *



Latency (Rountrip delay) **



VoIP capacity *



* LTE values according to Nokia and Nokia Siemens Network simulations for NGMN performance evaluation report V1.3 (macro cell, full buffer, 500m ISD, pedestrian speed)

** Server near RAN

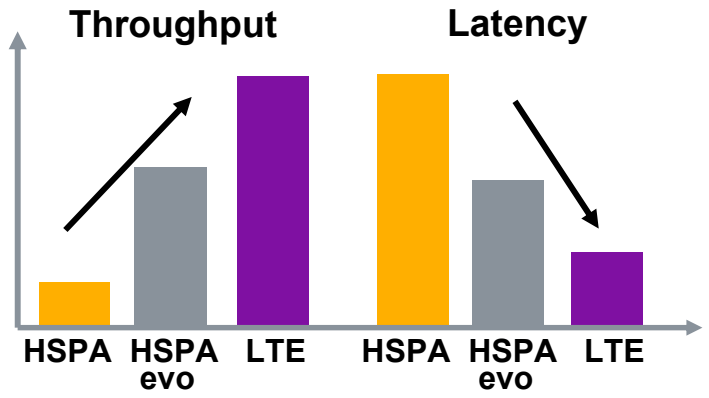
Key benefits for operators and end-user

Investment Protection

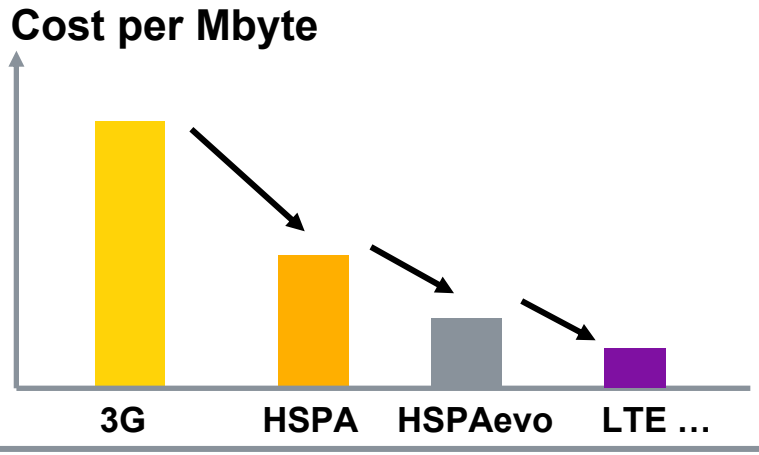
Re-use of

- Sites and infrastructure
- Backhauling
- Frequency bands

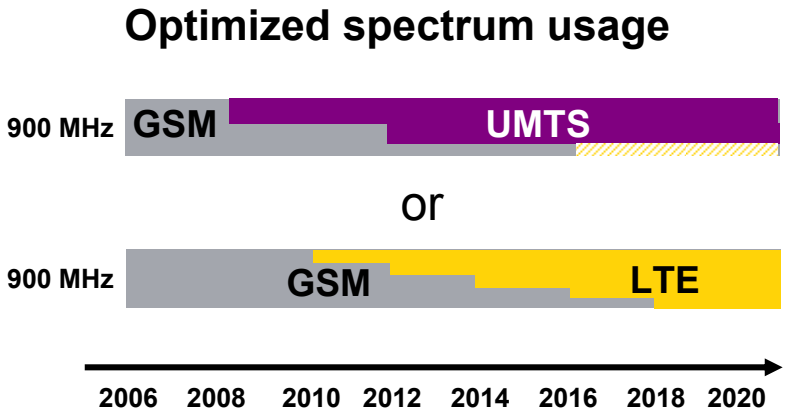
User experience → ARPU



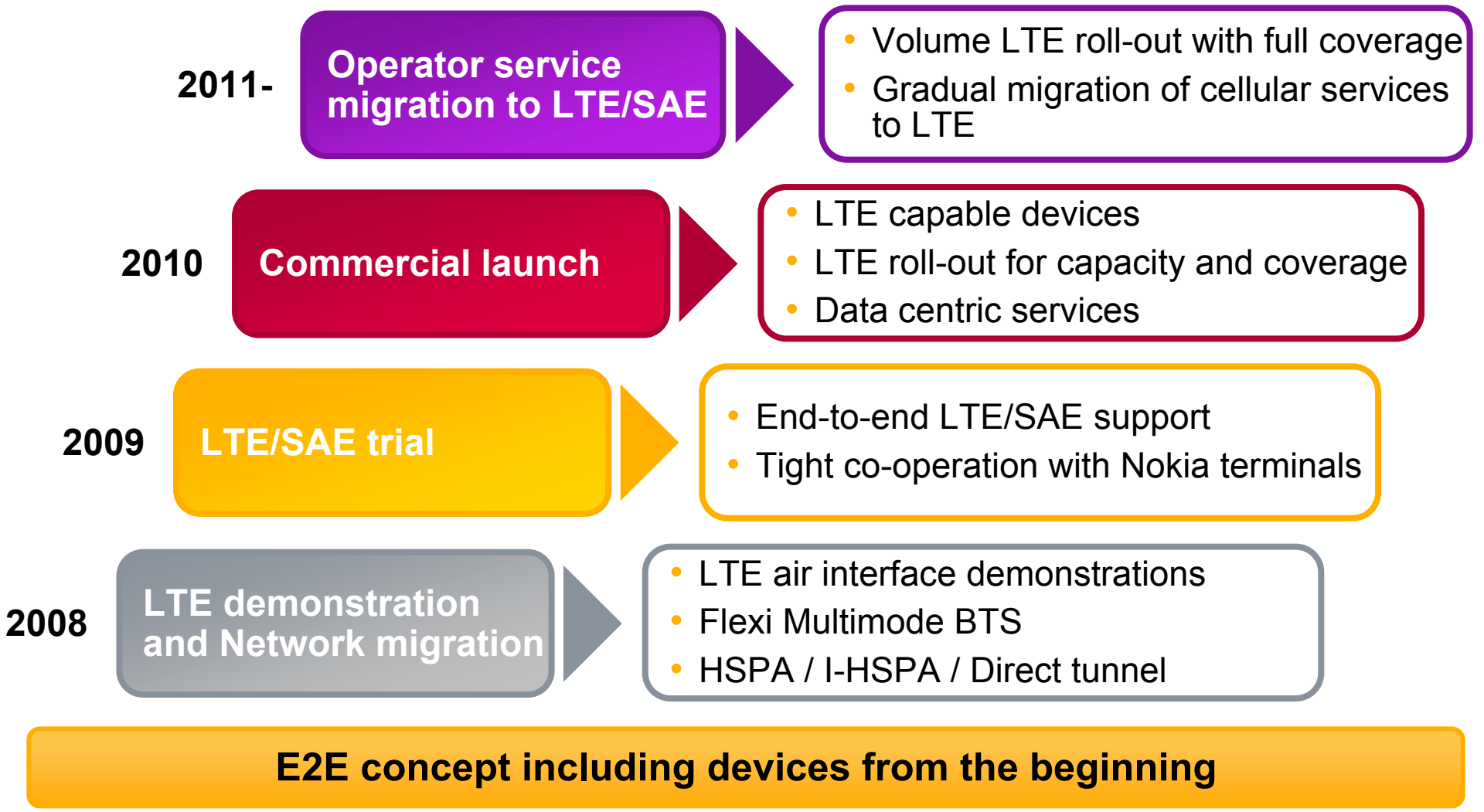
Low Costs



Scalable bandwidth



A head start for network migration towards LTE/SAE with Nokia Siemens Networks



E2E concept including devices from the beginning

Flexi Multiradio BTS

Scope and Terminology

- Detailed SW release schedules for GSM/EDGE (RGxx), WCDMA/HSPA (RUxx) and LTE (RLxx) are explained in separate roadmap documents

HW module: Single Mode

GSM or WCDMA

SW: Single Mode

Flexi BTS module operates in one radio mode.

SW can not change the operational mode to another radio access mode.

HW module: Multiradio

GSM and WCDMA and LTE

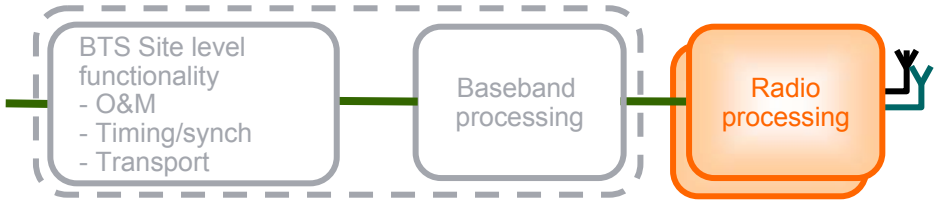
SW: Dedicated mode

Flexi BTS module operates in one radio mode at a time but can be changed to other operational mode by SW.

SW: Concurrent mode

Same Flexi BTS module operates simultaneously in two or more radio access modes.

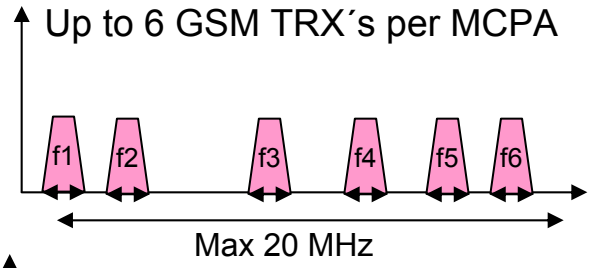
Flexi Multiradio BTS - RF Module

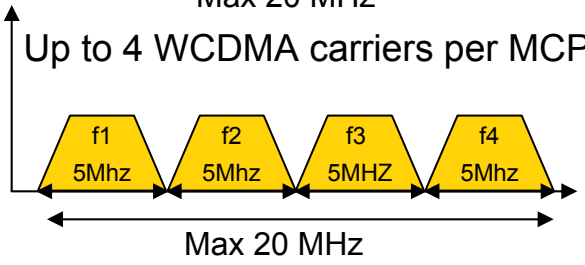


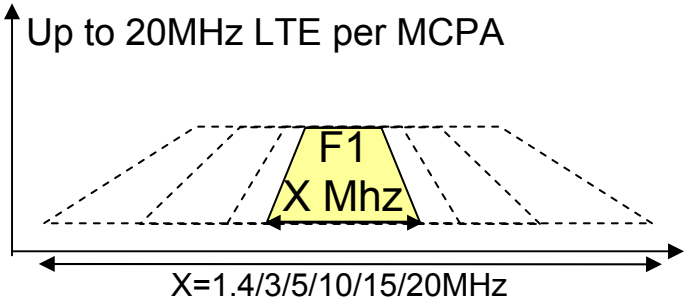
Flexi 3-sector RF Module

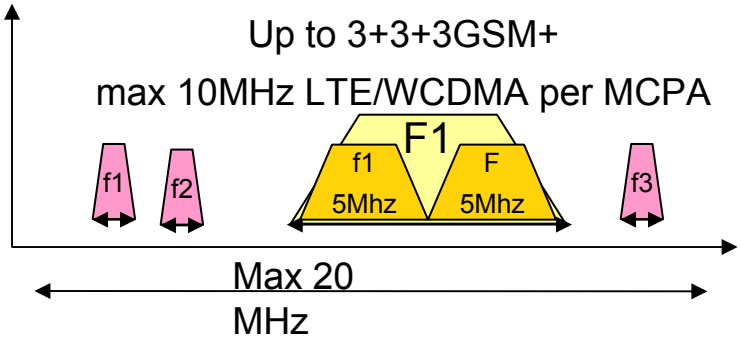
- 60 W output power per sector
- HW supports GSM, WCDMA and LTE operation at relevant frequency bands
- Single-band, Multi-carrier operation
- MIMO support (3 sector MIMO with 2 RF Modules)
- HW supports following SW operating modes
  - dedicated modes: GSM, WCDMA, LTE
  - GSM-WCDMA concurrent mode
  - WCDMA-LTE concurrent mode
  - GSM-LTE concurrent mode
  - GSM-WCDMA-LTE concurrent mode

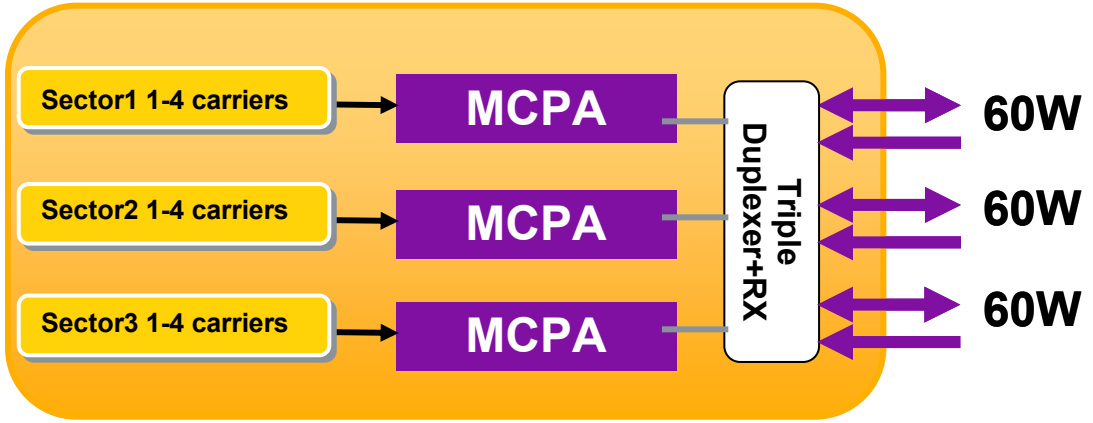
Flexi Multiradio 3-Sector 60W RF Module: example for 900/1800 Band







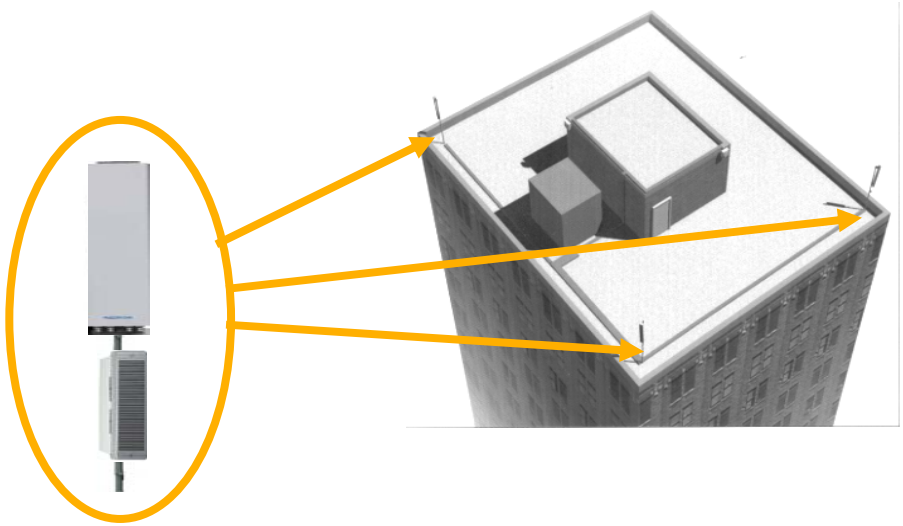




Frequency/ Bandwith	**900MHz 15 MHz**	**1800MHz 20MHz**
GSM TRX´s	**6+6+6**	**6+6+6**
WCDMA carriers	**3+3+3**	**4+4+4**
LTE bandwith	**1.4/3/5/10 (HW supports 15)**	**1.4/3/5/10/15/20**
Concurrent mode(s) supported by HW: 3+3+3GSM+10MHz LTE or WCDMA	**GSM/LTE, GSM/WCDMA, GSM/WCDMA/LTE, WCDMA/LTE**	**GSM/LTE, GSM/WCDMA, GSM/WCDMA/LTE , WCDMA/LTE**
Output power /sector	**60W**	**60W**

Figures are design targets

Flexi RF Module: Distributed site



Feederless and distributed site architecture

Flexi 3-sector RF Module in distributed sites

- 60 W output power per antenna input
  - 120 W to one cross-polarized antenna
- MIMO support with a single RF Module
  - 120 W per sector

Distributed Site Example Flexi LTE 1+1+1 Multimode BTS 2x2 MIMO

Easier Installation with 2X2 MIMO

Less wind load and weight

One optical and DC cable to tower

Optional 4 way UL diversity

Flexi RF Module can be installed close to antenna for performance gains such as:

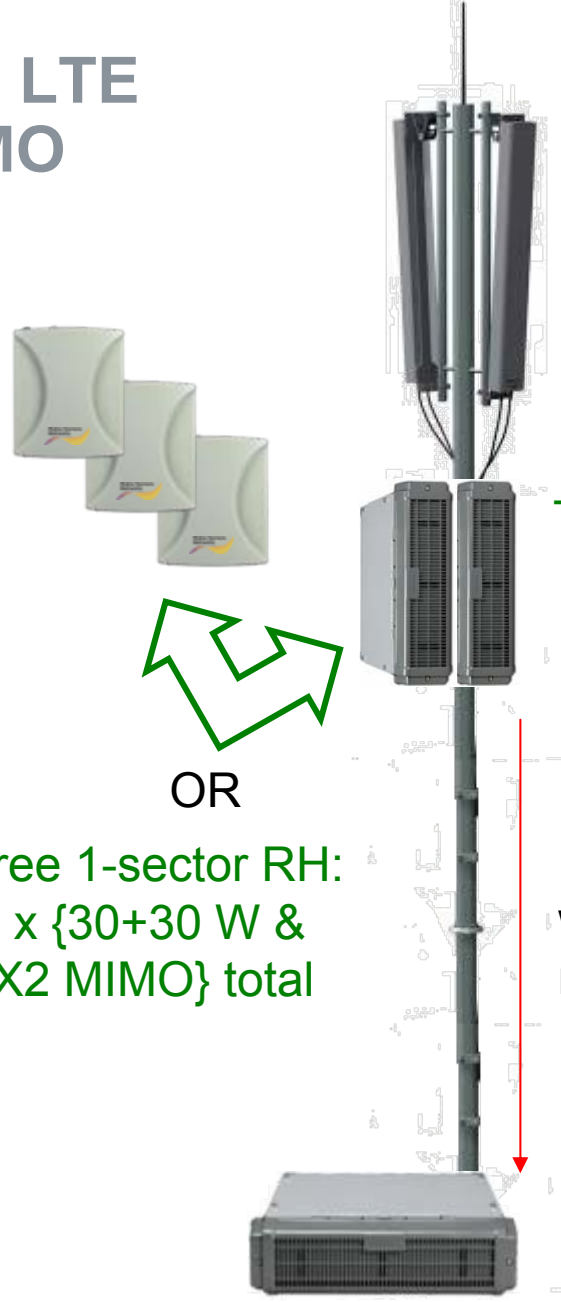
- 2dB better RX sensitivity than specified in TR 36.804 without MHA (at RF Module antenna connector)

Improved TX performance

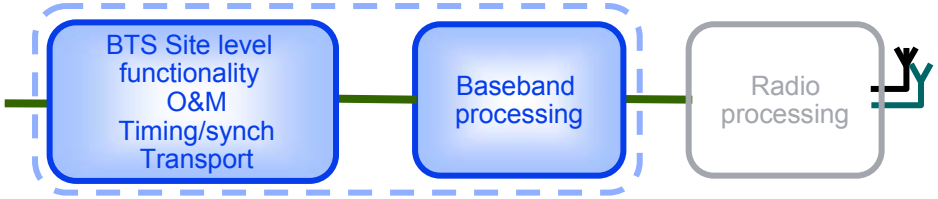
⇒ No need for MHAs

⇒ no feeders

⇒ easy dual band



Flexi Multiradio BTS - System Modules



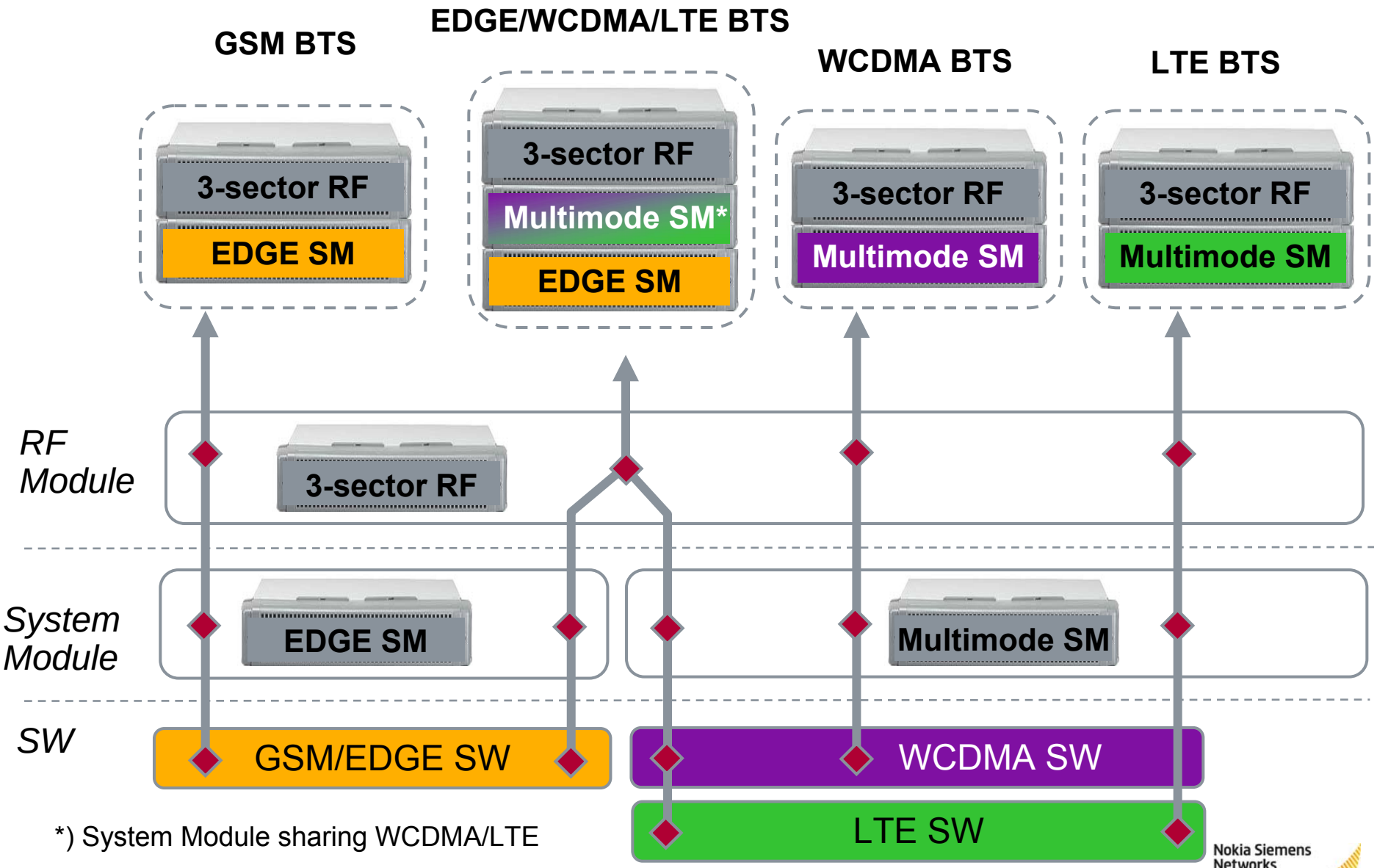
Flexi Multimode System Module

- HW supports following SW operating modes
  - WCDMA dedicated mode
  - LTE dedicated mode
  - WCDMA-LTE concurrent mode under study
- Multiband support
  - RF Modules for different frequency bands can be connected to same System Module

Flexi EDGE System Module

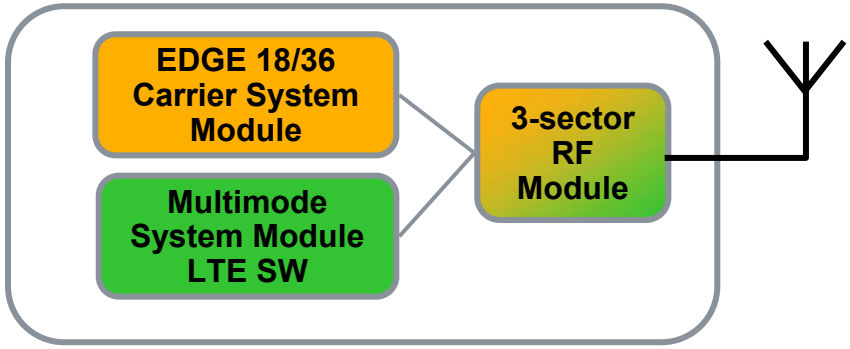
- Performance optimized for single mode operation
- 18 carrier and 36 carrier variants
- Multiband support
  - RF Modules for different frequency bands can be connected to same System Module

Flexi Multiradio BTS – Product Concept

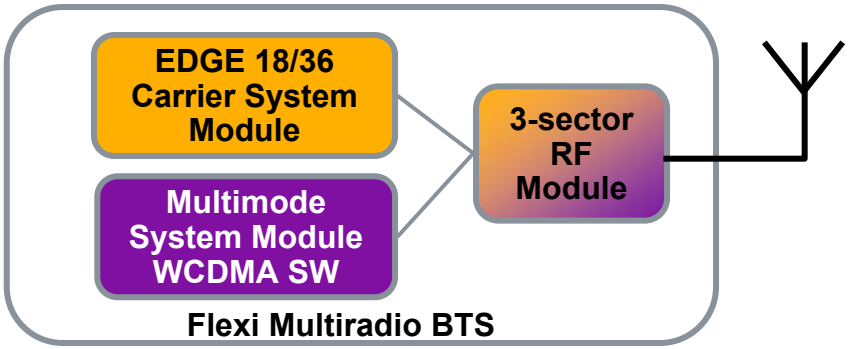


*) System Module sharing WCDMA/LTE

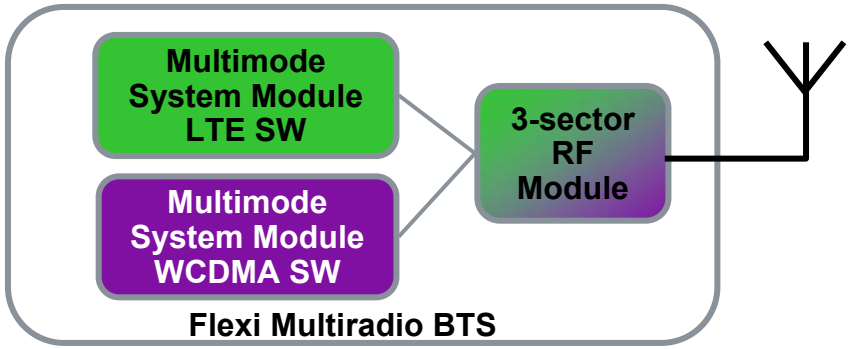
Flexi Multiradio BTS in Concurrent Mode Operation



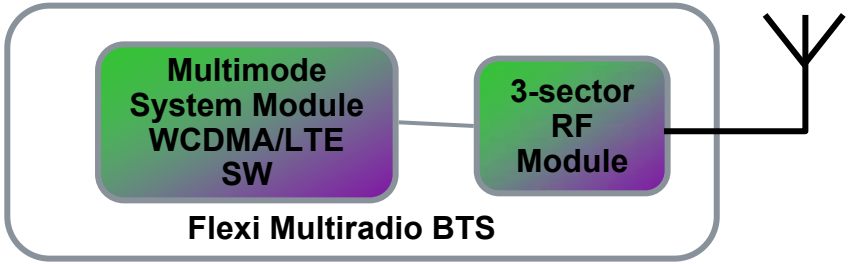
RF Module sharing
GSM-LTE



RF Module sharing
GSM-WCDMA

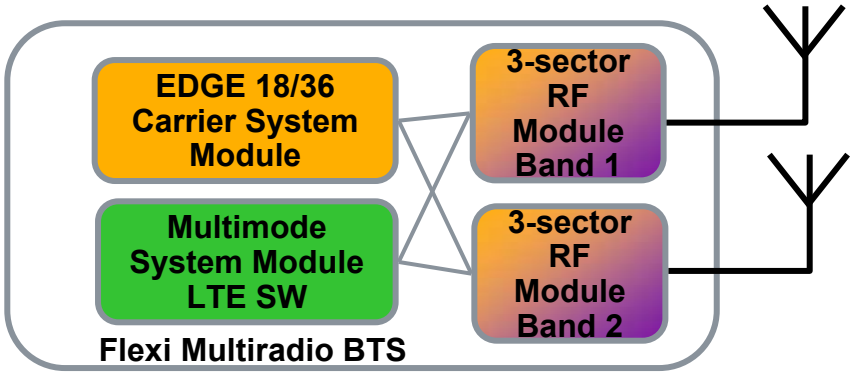


RF Module sharing
WCDMA-LTE

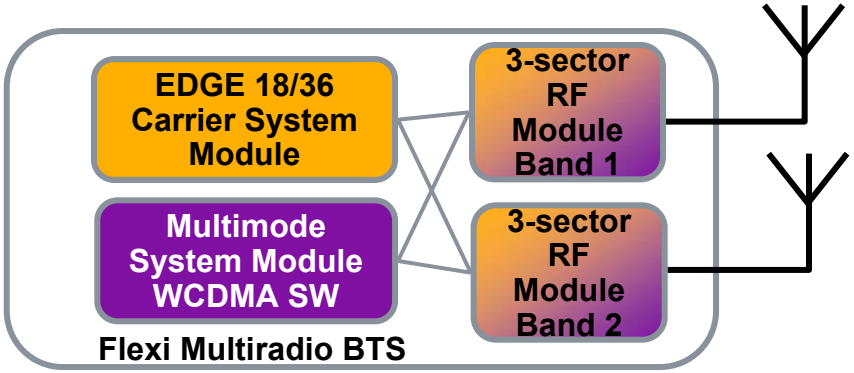


RF and System
Module sharing
WCDMA-LTE

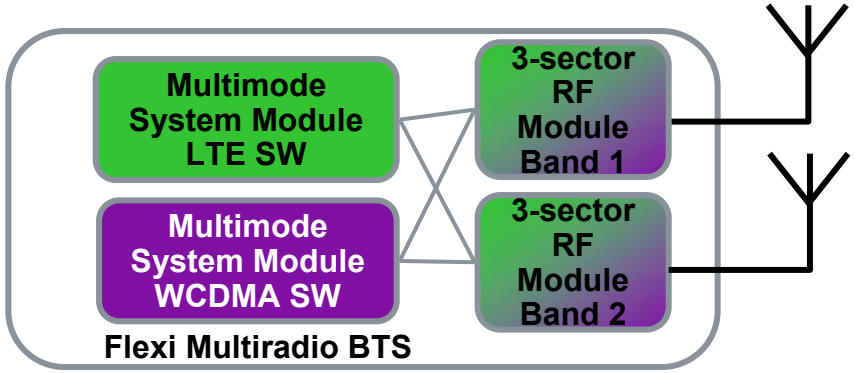
Flexi Multiradio BTS in Concurrent Mode Operation with multiple frequency bands - Examples



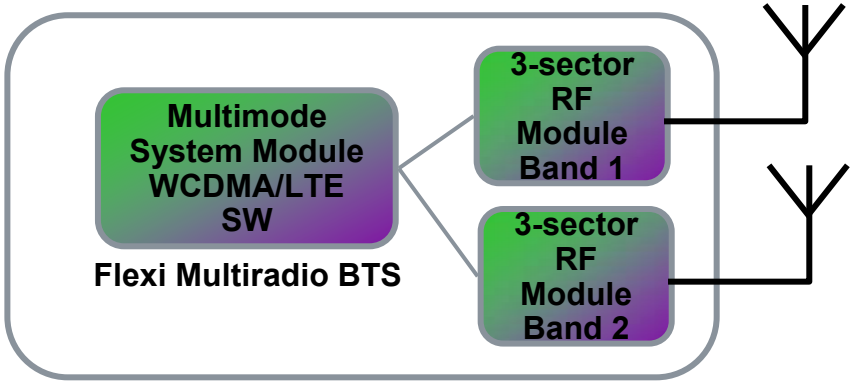
RF Module sharing
GSM-LTE



RF Module sharing
GSM-WCDMA

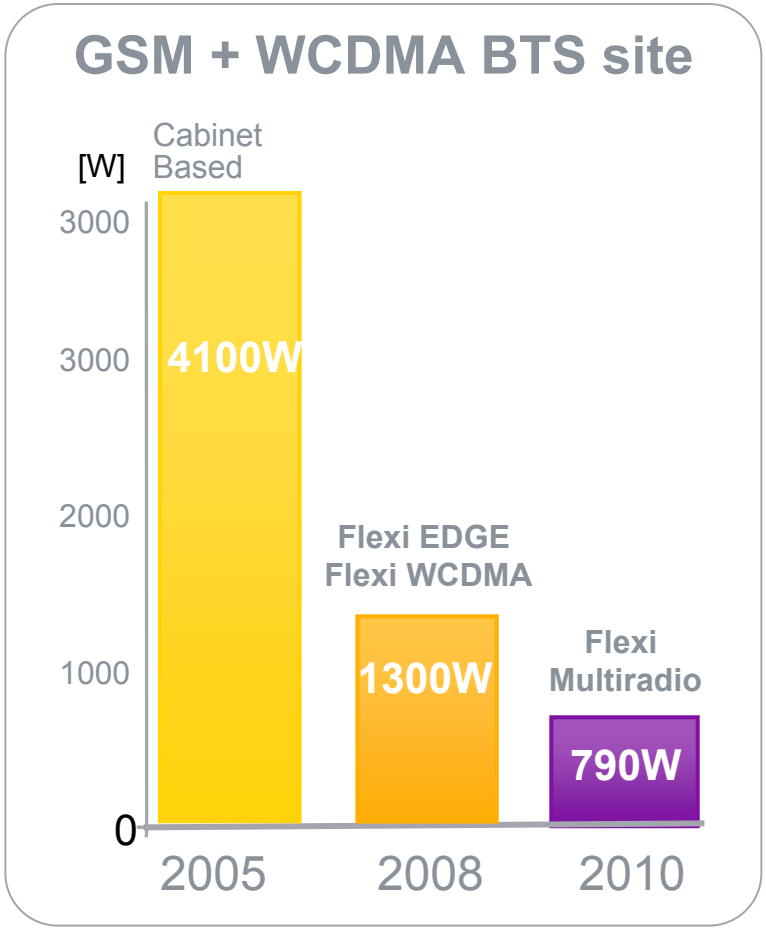


RF Module sharing
WCDMA-LTE



RF and System
Module sharing
WCDMA-LTE

Number one in energy efficiency



Based on 1+1+1 WCDMA BTS and 4+4+4 GSM BTS

climate savers

A WWF business partnership

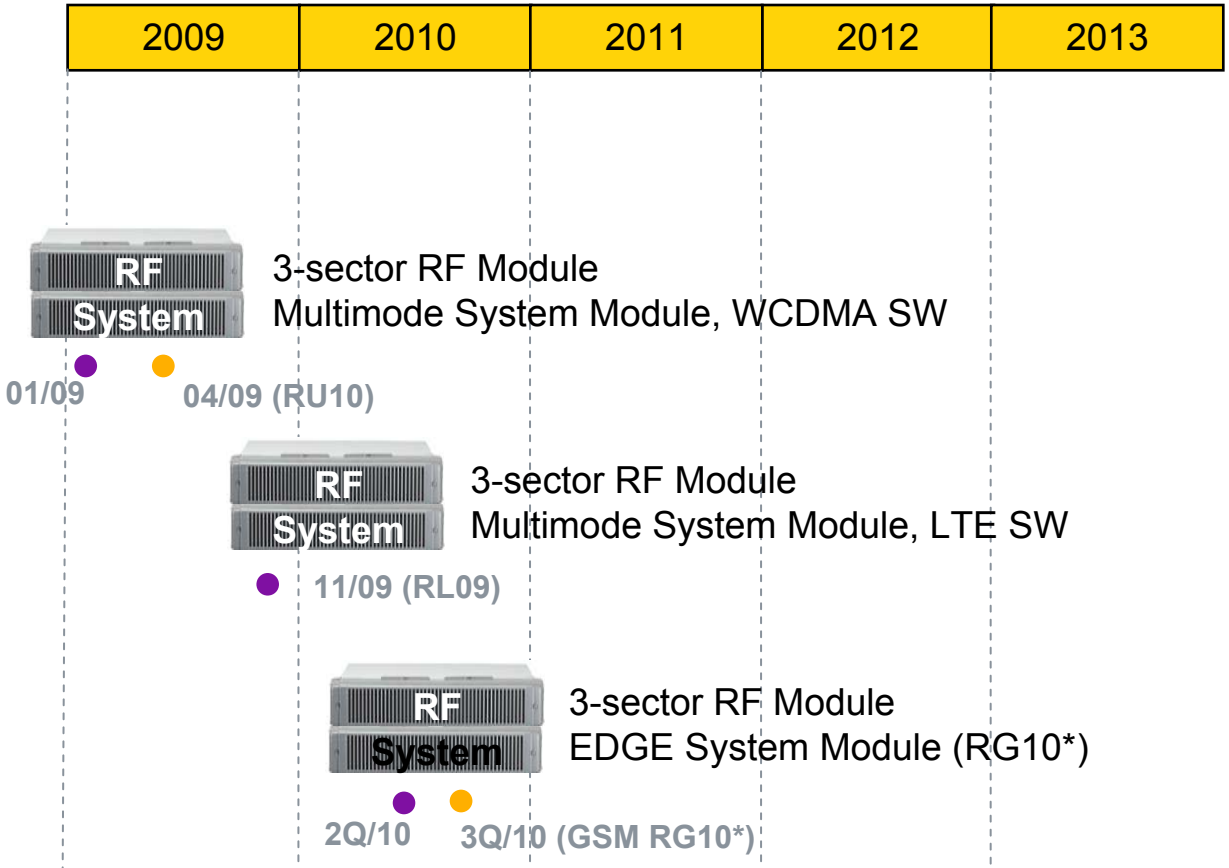
Nokia Siemens Networks

Roadmaps

Flexi Multiradio BTS

RF Modules, RRHs and System Modules

Flexi Multiradio BTS – Dedicated operational modes



*) *on top feature*

- *CP: limited commercial availability*
- *C5: full commercial availability*

Software for RF module sharing with WCDMA-GSM concurrent mode will come in 3Q/2010 for 900 MHz and 4Q/2010 for 1800 MHz diapazones.

Flexi Multiradio BTS System Modules – HW Characteristics

Module name	Supported technologies	HW capacity	Comments
Flexi Multimode System Module (FSMD)	WCDMA, HSPA+ and LTE	Up to 500 CE in WCDMA; LTE 3 cells à 10 MHz with MIMO	Multiband support; two System Modules can be chained for capacity extension
Flexi Multimode System Module (FSME)	WCDMA, HSPA+ and LTE	Up to 750 CE in WCDMA; LTE 3 cells à 20 MHz with MIMO	Multiband support; two System Modules can be chained for capacity extension
Flexi EDGE 18 carrier System Module (ESMB)	GSM	Up to 18 TRXs	Flexi Multiradio BTS; single mode operation; multiband support
Flexi EDGE 36 carrier System Module (ESMC)	GSM	Up to 36 TRXs	Flexi Multiradio BTS; single mode operation; multiband support

CE=channel elements in WCDMA use, actual capacity depends on SW release

HSPA+: 64 QAM DL, 16 QAM UL, Flexible RLC, Continuous Packet Connectivity, Frequency Domain Equalizer, Interference Cancellation, CS Voice over HSPA,…

Flexi RF Modules – HW Characteristics (FDD)

Module name	Supported technologies	LTE modulation bandwidth	Comments
Flexi RF Module Triple 2100 (FRGF)	WCDMA/LTE	1.4, 3 MHz and 5 MHz	HW is LTE prepared*; SW support will be decided according to market demand
Flexi RF Module Triple 2100 (FRGP)	WCDMA/LTE	Up to 20 MHz	HW ready for concurrent mode operation
Flexi RF Module Triple 2600 (FRHA)	WCDMA/LTE	Up to 20 MHz	HW ready for concurrent mode operation
Flexi RF Module Triple 1.7/2.1 (FRIE)	WCDMA/LTE	Up to 20 MHz	HW ready for concurrent mode operation
Flexi RF Module Triple 1800 (FXEA)	GSM/WCDMA/LTE	Up to 20 MHz	HW ready for concurrent mode operation
Flexi RF Module Triple 1900 (FXFA)	GSM/WCDMA/LTE	Up to 20 MHz	HW ready for concurrent mode operation
Flexi RF Module Triple 900 (FXDA)	GSM/WCDMA/LTE	Up to 15 MHz	HW ready for concurrent mode operation
Flexi RF Module Triple 850 (FXCA)	GSM/WCDMA/LTE	Up to 15 MHz	Covers also iDEN and Japanese 800 band; HW ready for concurrent mode operation
Flexi RF Module Triple 1500 (FRKA)	WCDMA/LTE	Up to 20 MHz	HW ready for concurrent mode operation
Flexi RF Module Triple 800EU (FRMA)	WCDMA/LTE	Up to 15 MHz	European Digital Dividend band 790-862 MHz , HW ready for concurrent mode operation

* 5 MHz in concurrent mode under study

Flexi Multiradio Base Station
Perfect match for multiradio future

- Easy to install, small, modular, weatherproof
- 6+6+6 GSM, 4+4+4 WCDMA, 1+1+1 LTE@20MHZ
- Any combination of the 3 technologies - concurrently
- High output power 3 x 60 W RF
- Energy efficient: 790 W for common WCDMA/GSM site

GLOBAL MOBILE AWARDS 2009 Winner!