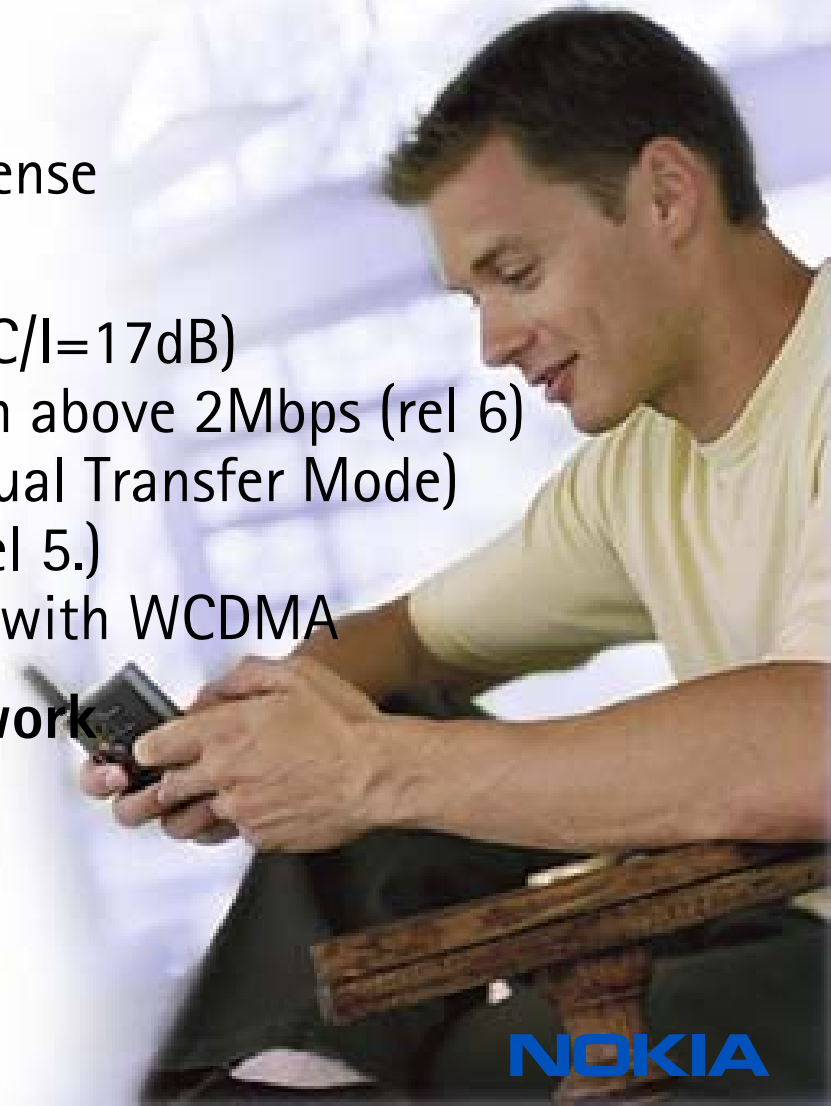


Mobile Multimedia with EDGE

EDGE in Brief

What is EDGE

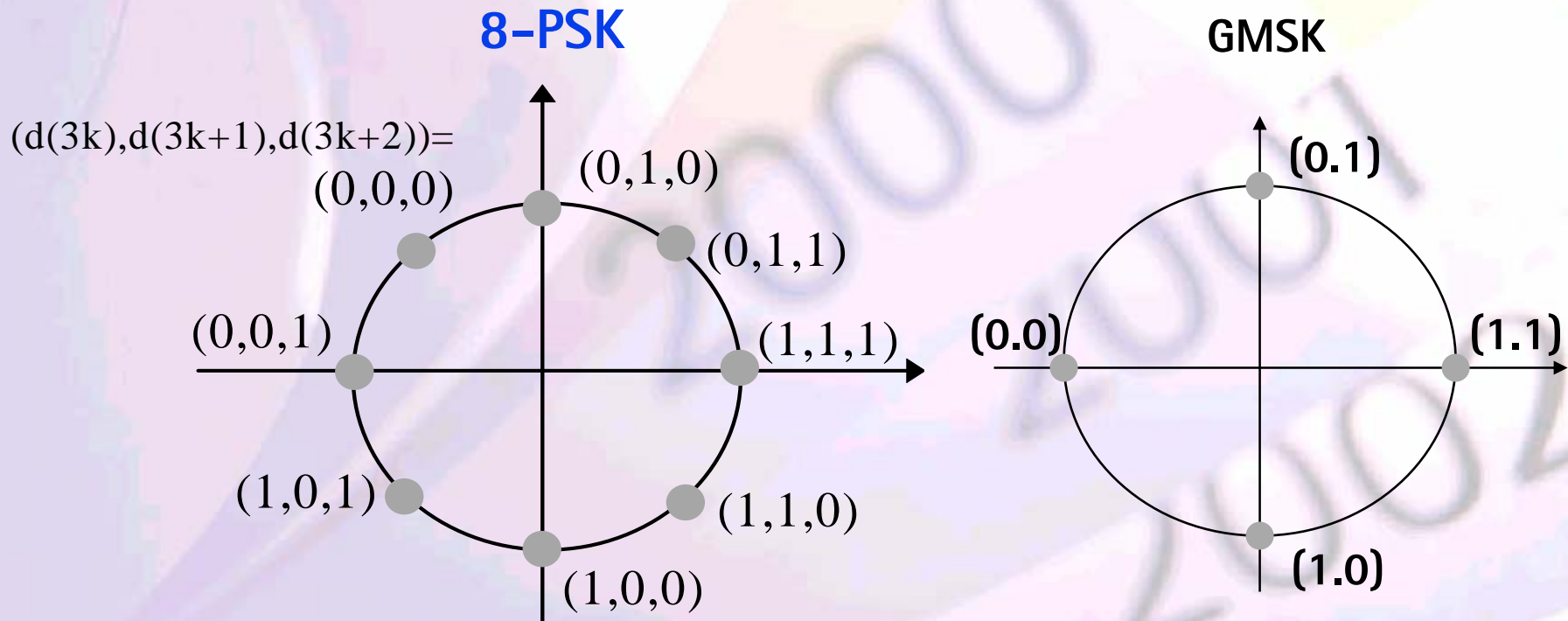
- **EDGE = Enhanced Data Rates for Global Evolution**
 - Standardised by 3GPP, ETSI, ANSI, ITU
- **EDGE is part of GSM2+ specifications**
 - Implementation under existing GSM license
- **EDGE brings 3G to GSM standard**
 - 40 kbps per TSL with Enhanced GPRS (C/I=17dB)
 - Maximum 473 kbps user rates - later on above 2Mbps (rel 6)
 - EGPRS and voice call simultaneously (Dual Transfer Mode)
 - Four voice calls per TCH with E-AMR (rel 5.)
 - Harmonised QoS and IP services (rel. 5) with WCDMA
- **EDGE implemented to current GSM network**
 - Current GSM resources
 - Processes and competencies
 - Current sites and frequency plans



Nokia EDGE Features

- **To existing GSM/ TDMA/ AMPS/ CDMA frequencies**
 - 800, 900, 1800 and 1900 MHz frequencies
- **Enhanced GPRS**
 - 8-PSK Modulation
 - Modulation & Coding Schemes MCS-1...9
 - Link Adaptation (LA)
 - Incremental Redundancy (IR)
 - RLC window size increase
- **Enhanced AMR**
 - 8-PSK Modulation
 - Quarter Rate speech codecs
- **Nokia Dynamic Abis**
- **Nokia Smart Radio Concept (SRC)**
 - Intelligent Downlink Diversity

8-PSK Modulation



	EDGE	GSM
Modulation	8-PSK, 3 bit/symbol	GMSK, 1 bit/symbol
Symbol rate	270.833 ksps	270.833 ksps
Payload/burst	346 bits	114 bits
Gross rate/time slot	69.2 kbps	22.8 kbps

EGPRS Modulation & Coding Schemes

- Nine MCS's with both GMSK and 8-PSK modulation
 - Higher data rates per time slot with 8-PSK modulation
 - GMSK used for lower data rates
- Max. 59,2 kbps per TSL – EGPRS max. with 8 TSL is 473 kbps

	coding scheme	modulation	RLC blks / radio blk	FEC code rate	user bits / 20 ms	bit rate (bps)
GPRS	CS-1	GMSK	1	0.45	160	8,0
	CS-2		1	0.65	240	12,0
	CS-3		1	0.75	288	14,4
	CS-4		1	n/a	400	20,0
EGPRS	MCS-1		1	0.53	176	8,8
	MCS-2		1	0.66	224	11,2
	MCS-3		1	0.85	296	14,8
	MCS-4		1	1.00	352	17,6
	MCS-5	8-PSK	1	0.38	448	22,4
	MCS-6		1	0.49	592	29,6
	MCS-7		2	0.76	448+448	44,8
	MCS-8		2	0.92	544+544	54,4
	MCS-9		2	1.00	592+592	59,2

Coverage and average user data rate Downlink

- EGPRS improves data coverage or capacity/data bit rates
 - Specially at indoors

Radio ntw dimensioning
GSM/EDGE

Service dimensioning
Terminal & radio ntw performance
Mass market MS: 4 TSL DL = 45...160 kbps

GPRS 12 kbps/TSL
EGPRS 40 kbps/ TSL

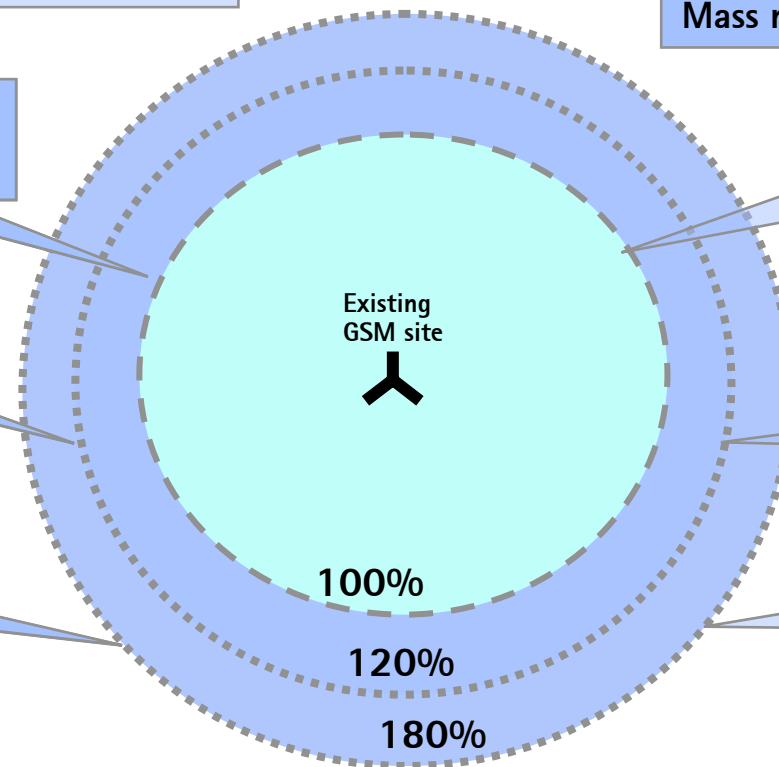
GPRS 45 kbps with 4 TSL
EGPRS 160 kbps with 4 TSL

EGPRS 12 kbps/TSL

EGPRS 45 kbps with 4 TSL

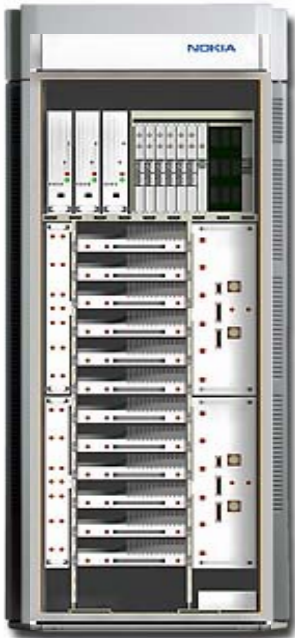
EGPRS with SRC 12 kbps/TSL

EGPRS with SRC 45 kbps with 4 TSL



EDGE with simple update to Nokia GSM network

Nokia UltraSite
EDGE BTS



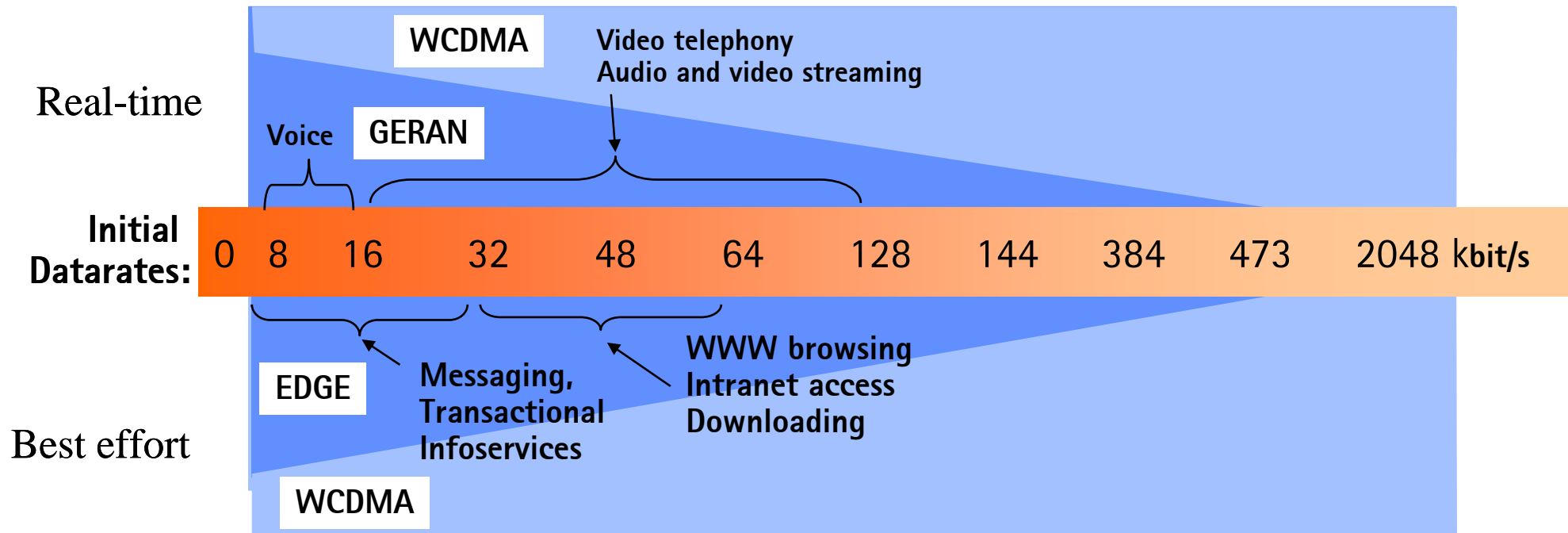
Triple mode
GSM/EDGE/WCDMA

- **BTS**
 - GSM/EDGE dualmode TRX/BB to be added to all UltraSite EDGE BTS and MetroSite EDGE BTS
 - More efficient transmission usage with Dynamic Abis channel allocation
 - Radio optimisation with Smart Radio Concept for EDGE
- **BSC**
 - Software update with next Nokia release
- **GPRS and NSS core**
 - Software update with next Nokia release
- **NMS** and planning tool updates

Different bit rates for different services

EDGE lifts current GSM network to 3G era

- EDGE is optimised for voice and up to 128 kbps data service coverage
 - WCDMA optimised for high bit rate applications
 - Evolution to Common RRM, RAN and core






Radio Access Technologies for Data Traffic

Near term expected datarates

- **With EGPRS seamless interworking and handovers with WCDMA**
 - Average throughput is depends on network planning, capacity allocation, terminal capacity, and technology.

Maximum user datarates

	Theoretical	Near term expectation (DL/UL)
 GPRS	171 kbit/s	74/39 kBit/s (CS-1...4) 45/24 kBit/s (CS-1...2)
 EGPRS	473 kbit/s	237/118 kBit/s (59 kbit/s/tsl)
 WCDMA	2M bit/s	128..384 kBit/s MS 384/384 kBit/s RAN1 512/384 kBit/s RAN2

Above GPRS and EDGE figures calculated with 4 TSL downlink and 2 TSL uplink.

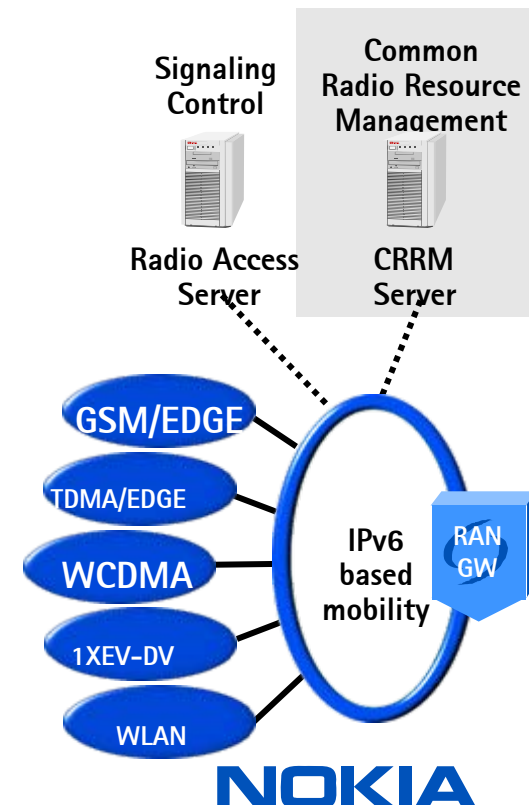
Capacity Ensures Quality

- The traffic will grow with new 3G services and increased penetration
- EDGE provides capacity for the existing GSM bands by
 - offering **capacity relief** for congested GSM band
 - **boosting data speed** for faster response times
- Overlapping WCDMA and EDGE layers ensure high service quality
 - **Load sharing** during traffic peaks with service priorities and using intersystem handovers
 - **Service continuation** - drop in QoS with EGPRS much lower than with GPRS enabling services be continued when changing bearer (EDGE<->WCDMA)

EDGE and WCDMA will merge into single multiradio system

- More capacity with less cost by combining multiple radio access technologies (trunking gain)
- Improved peak traffic handling with load balancing and congestion control
- Optimised resource utilisation by unified radio bearer QoS Management and dynamic bearer selection

Nokia IP-RAN



Why EDGE

- **60% of mobile subscribers in 2006 will be GSM/EDGE subs**
 - Enhanced service coverage to GSM foot print
- **3G service delivery in GSM frequencies with EDGE**
 - 3G capacity with existing GSM frequency band
 - Low cost wide area 3G radio coverage
 - Low cost voice capacity
 - Low cost 3G terminals
 - All IP evolution for one common core and RAN with WCDMA
- **EDGE roll-out can be started now**
 - UltraSite and MetroSite EDGE BTS roll-out now
 - GSM/EDGE TRX/BB roll-out 4Q2001
 - Everything ready for service launch by 3Q2002

GSM/EDGE is the best way to continue GSM network expansion