



Mobile Phone Technology Development

Year End Strategy Update December 3, 2002

Dr. Yrjö Neuvo
Executive Vice President, CTO, NMP

NOKIA

© NOKIA - 2002 Year End Strategy Update

What Has Changed in Ten Years in Mobile Phones?

	Nokia 1011 Release: 1992	Nokia 6100 Release: 2002
Weight	475 g ~ 16.7 oz.	78 g ~ 2.7 oz.
Volume	339 cc	60 cc
Standby time	15 h	320 h
Talk time	80 min	360 min
Electronic components	>1000	<350
Functionality	GSM900	GSM/GPRS 900/1800/1900, HSCSD, infra red, MMS, WAP, Java, polyphonic ring tones, handsfree speaker, color LCD...

NOKIA

© NOKIA - 2002 Year End Strategy Update

Next 10 Years - At Least as Exciting

Rich User Experience

- Data Speeds
- Displays
- Cameras
- Applications
- Performance / Power
- Miniaturization

Leadership in Technologies and Architectures

- Cellular Standards & IPR
- System Know-how
 - Direct Conversion
 - Processing Power
- Orchestrate the System Architecture
 - Hardware
 - Software
- Miniaturization




NOKIA

© NOKIA - 2002 Year End Strategy Update

Richer User Experience

NOKIA

© NOKIA - 2002 Year End Strategy Update

Richer Experience - Content Explosion

Content Types		2002 size	2005 size	2008 size	2012 size
MMS	person to person	50 kB	150 kB	450 kB	2000kB
Browsing Web Content	content to person	135kB	200 kB	296 kB	500kB
Java Application	download	30 kB	150kB	750 kB	6000kB
Video	download	50 kB	200kB	800kB	5000kB

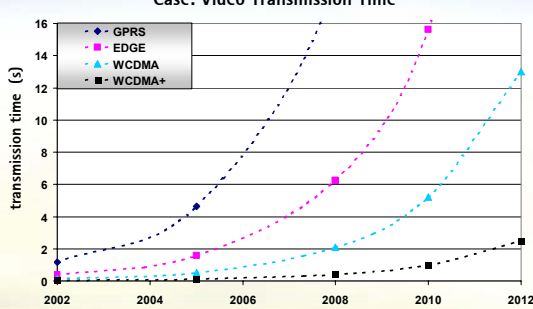
A challenge to data speeds, response times and processing power.

NOKIA

© NOKIA - 2002 Year End Strategy Update

... Leads to the Need of Higher Data Speeds

Case: Video Transmission Time



Year	GPRS	EDGE	WCDMA	WCDMA+
2002	~1.5	~0.5	~0.2	~0.1
2004	~3.0	~1.0	~0.5	~0.2
2006	~6.0	~2.0	~1.0	~0.3
2008	~12.0	~4.0	~2.0	~0.5
2010	~16.0	~8.0	~4.0	~1.0
2012	-	-	~8.0	~2.0

NOKIA

© NOKIA - 2002 Year End Strategy Update

Video Transmission & End-user Experience - Today

- Video messages with MMS over 2.5G networks
 - End user created
 - MMS services

Picture size: up to QCIF (176 x144)
 Framerates: 8-15 frame/s
 Bitrates: 28-64 kbit/s
 Audio: NB-AMR 12.2 kbit/s, mono narrowband
 Networks: 30 kbit/s
 Services: MMS, streaming (no QoS)

Nokia products

- RealOne Player in Nokia 9210i, Nokia 3650
- Video recorder in Nokia 3650
- Video recorder in Nokia 6650

NOKIA

© NOKIA - 2002 Year End Strategy Update

Video

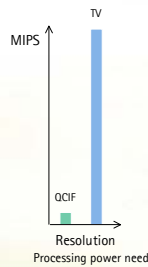
NOKIA

© NOKIA - 2002 Year End Strategy Update

Video Transmission & End-user Experience - Future

- Full TV quality video
 - 3G
 - Digital Video Broadcasting

Picture size: TV resolution (720 x 576, 720 x 480)
 Framerates: up to 30 frame/s
 Bitrates: up to 1 Mbit/s
 Audio: stereo, surround sound
 Networks: up to 1 Mbit/s
 Services: broadcasting



NOKIA

© NOKIA - 2002 Year End Strategy Update

Video

NOKIA

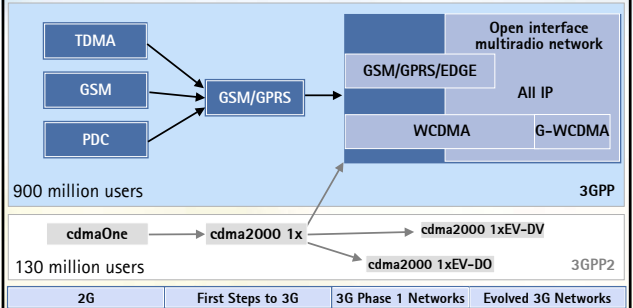
© NOKIA - 2002 Year End Strategy Update

Leadership in Technology and Architectures

NOKIA

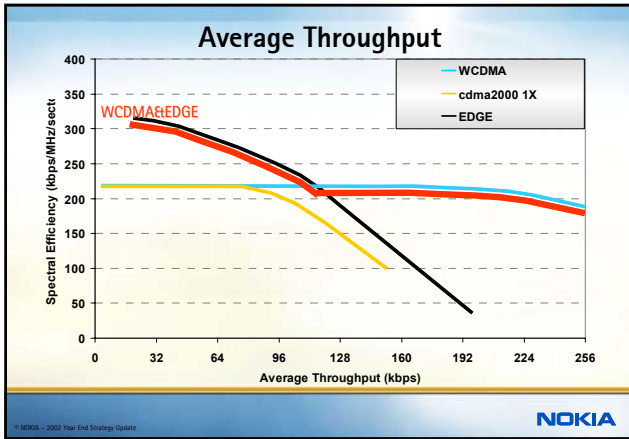
© NOKIA - 2002 Year End Strategy Update

Inevitable Need for Data Speeds - Global Evolution to 3G Networks



NOKIA

© NOKIA - 2002 Year End Strategy Update

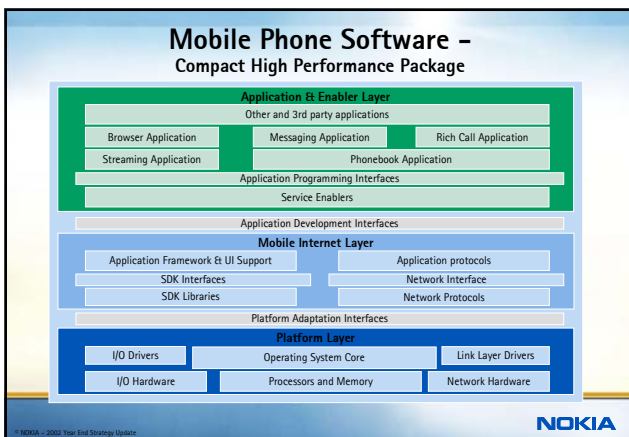
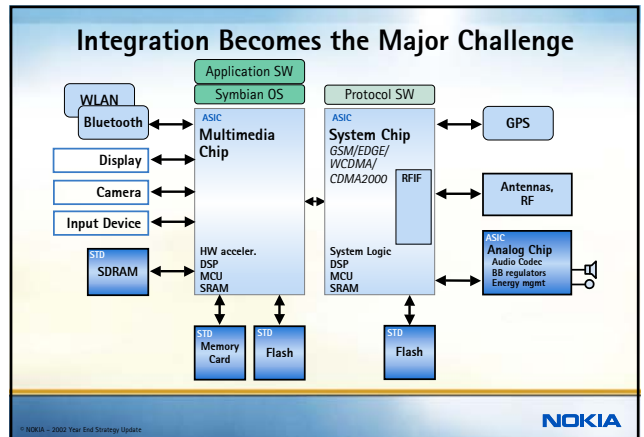
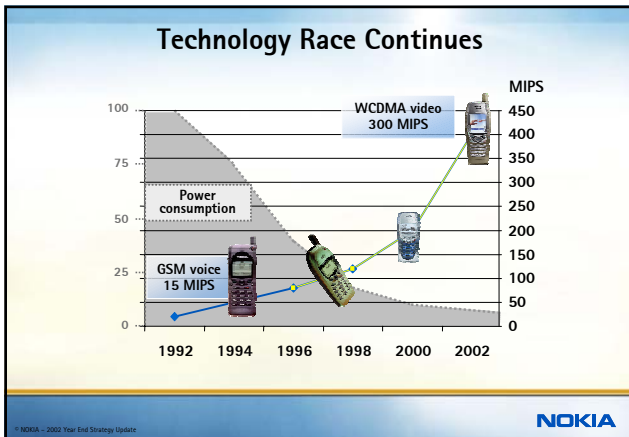


Nokia Has a Strong Patent Portfolio in Radio Technologies

- Nokia is the biggest patent holder in WCDMA according to an independent evaluation*
 - Nokia owns approximately 45% of Essential patents in this standard
- In CDMA2000 Nokia owns approximately 16% of declared Essential patents according to ARIB
 - The second biggest patent holder in this standard

* PA Consulting Group carried out a technical evaluation of Essential IP patents - this was not an evaluation of patent validity or infringement as would be carried out by patent counsel.

© NOKIA - 2002 Year End Strategy Update



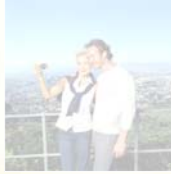
The Nokia 6650 - The New Platform

- The world's first dual mode GSM/WCDMA terminal
- Both radio technologies integrated in the same chip
- High level of integration for low cost and mass markets
- A new quantum leap in mobile processing power without compromising mobility (operation times, size, features)
- The Nokia 6650 is the de facto implementation that sets the benchmark for the industry

© NOKIA - 2002 Year End Strategy Update

Conclusions

- Consumer demand for richer applications and services
- Higher data speeds and more capable devices needed
- Technology race in mobile devices continues
- Value-added and innovations through technology



NOKIA

© NOKIA - 2002 Year-End Strategy Update

NOKIA

NOKIA

© NOKIA - 2002 Year-End Strategy Update