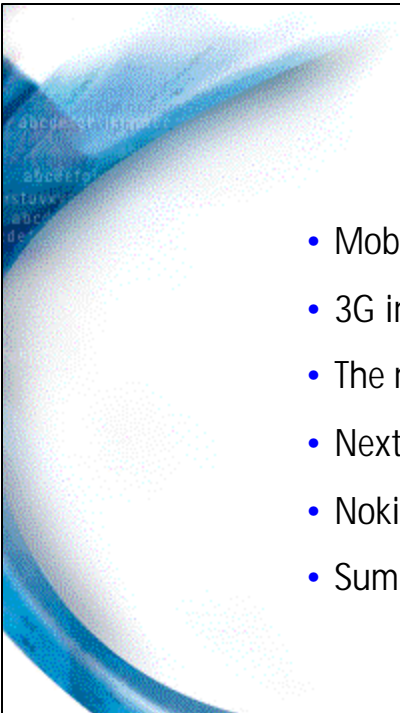




**GSM Evolution to 3G:
Best Value
Best Performance**

Dr. J.T. Bergqvist
Senior Vice President
Nokia Networks

NOKIA



The Menu

- Mobile Data imperative
- 3G imminence
- The multiradio race
- Next step - All IP
- Nokia enabled networks
- Summary

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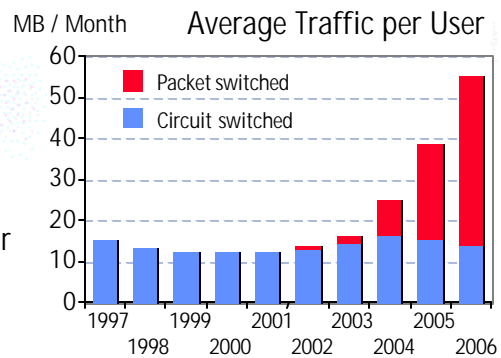
Mobile Data imperative

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Mobile Data services will drive the market

Key enablers for data take-off:

- Multimedia Messaging - sharing experiences
- Browsing - Mobile Internet in your pocket
- Rich Call - enhanced voice and video telephony



Source: Nokia, Advanced European operator

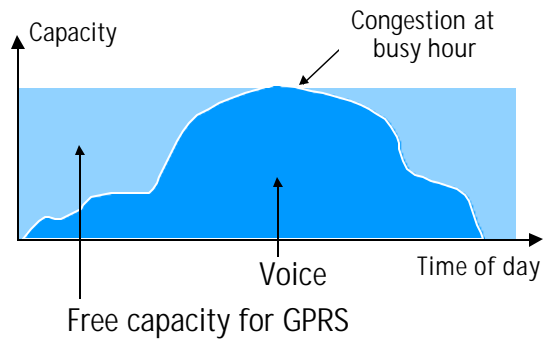
Both WCDMA and EDGE radio technologies with GPRS will be needed to meet the mobile network capacity requirements

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Initial Phase: The Quality **Launch** of GPRS Service

Challenge

- Small amount of GPRS traffic can be handled by existing idle radio network capacity, but:
- Busy hour voice traffic loads jeopardize the GPRS service performance



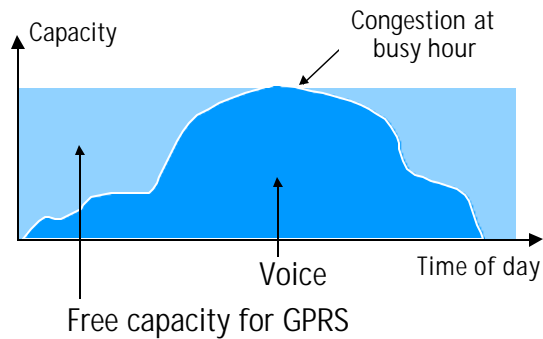
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Initial Phase: The Quality **Launch** of GPRS Service

Radio Capacity Increase Required

Nokia Estimates

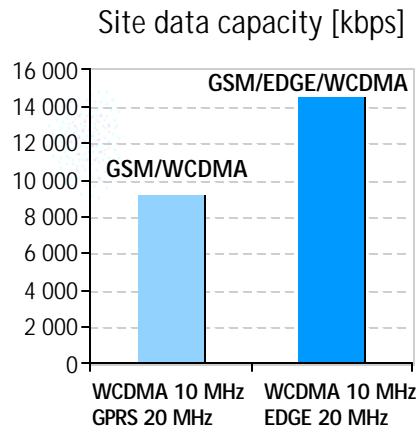
- To be added for initial GPRS use:
 - Urban Cells: 3 timeslots/sector
 - Semi-urban cells: 1 timeslot / sector
 - Rural cells: 1 timeslot / sector
- Overall implication is 3% capacity expansion to the installed transceiver base



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Advanced Phase: WCDMA and EDGE in parallel use

- EDGE: tripled data speeds and capacity for each channel compared to basic GSM
- EDGE typically provides 50% more combined site capacity



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3G imminence

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WCDMA 3G is on track for 2H/2002 commercial launches

Mobile Middleware and Services

- Mobile middleware platforms built for GPRS will convert to 3G
- Multimedia Messaging Service infrastructure ready in time for WCDMA 3G launches in 2H/2002

Mobile Terminals

- Nokia will bring dual mode GSM/WCDMA terminals in volumes in 2H/2002

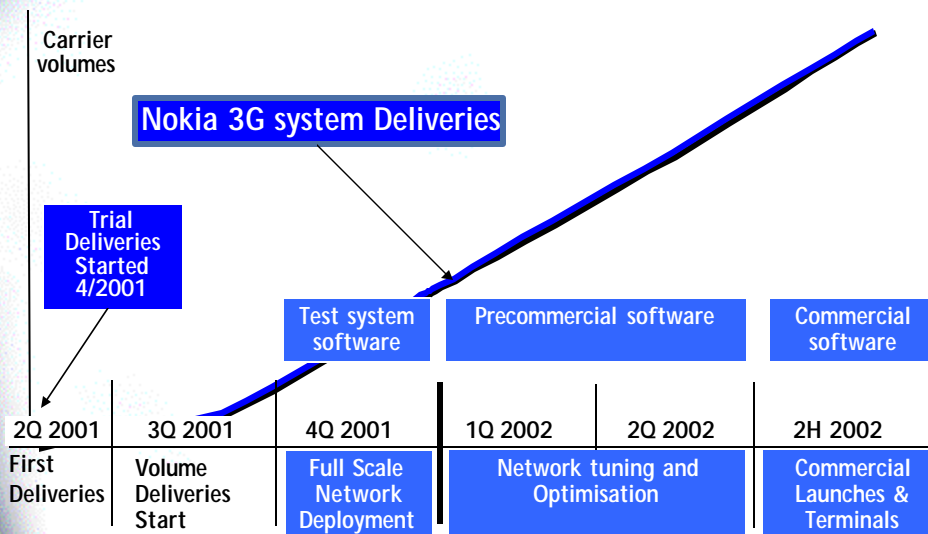
Mobile Networks

- WCDMA Network infrastructure volume rollout is under way
- Volume deliveries of both RAN and core equipment started in September 2001
- Network upgrade to commercial Rel99 June01 version in early 2002



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Nokia is in volume rollout phase of 3G



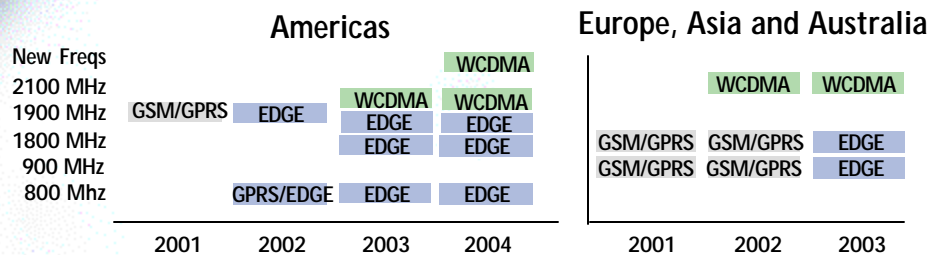
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Nokia Confirms the EDGE Time Schedule

- No changes to core network required, UltraSite and MetroSite base stations are upgradeable to EDGE
- EDGE hardware available from 4Q/2001 in America (800/1900) and from 2Q/2002 in Europe and Asia (900/1800)
- Full commercial software support in networks from 2H/2002
- Nokia Mobile Phones will bring EDGE terminals to the market in line with Nokia Networks' network rollout capabilities

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Timelines for 3G implementation



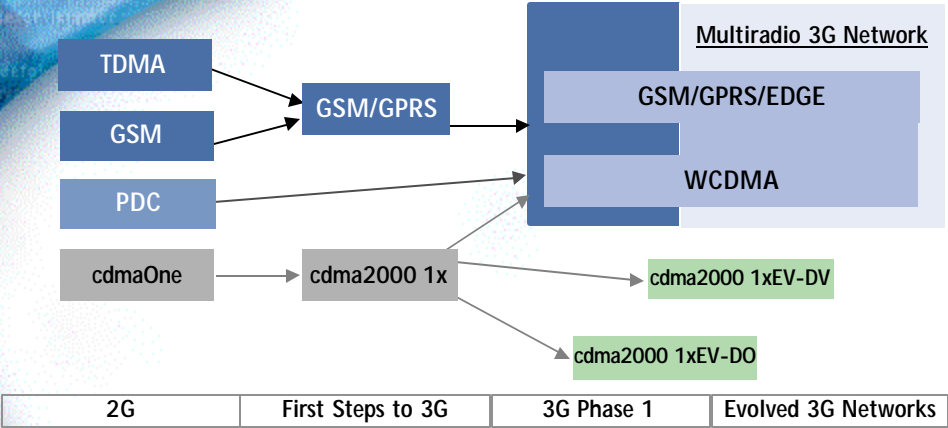
- EDGE is preceding WCDMA in North-America as ideally suited for local frequency allocations
- By adopting GSM/GPRS/EDGE early, TDMA and CDMA operators can also secure the benefits of powerful economies of scale

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The multiradio race



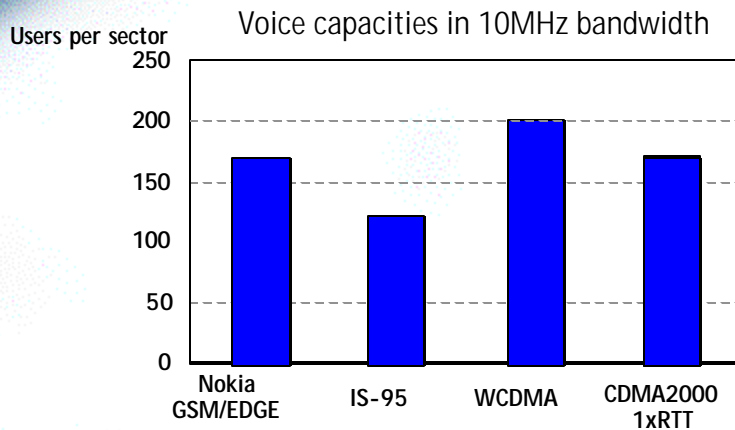
Global evolution to 3G multiradio networks



GSM/EDGE/WCDMA will create one seamless 3G Multiradio system with a common services core network



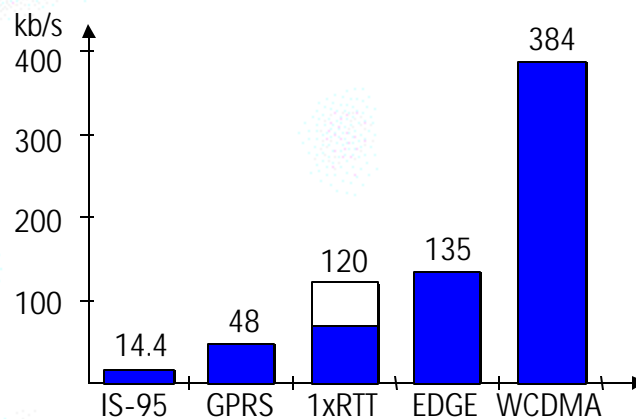
GSM/EDGE & WCDMA offer competitive voice capacity



'Nokia GSM/EDGE' includes AMR and Nokia specific capacity enhancement features

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Practical maximum wide-area data rates - Superior 3G performance with EDGE & WCDMA

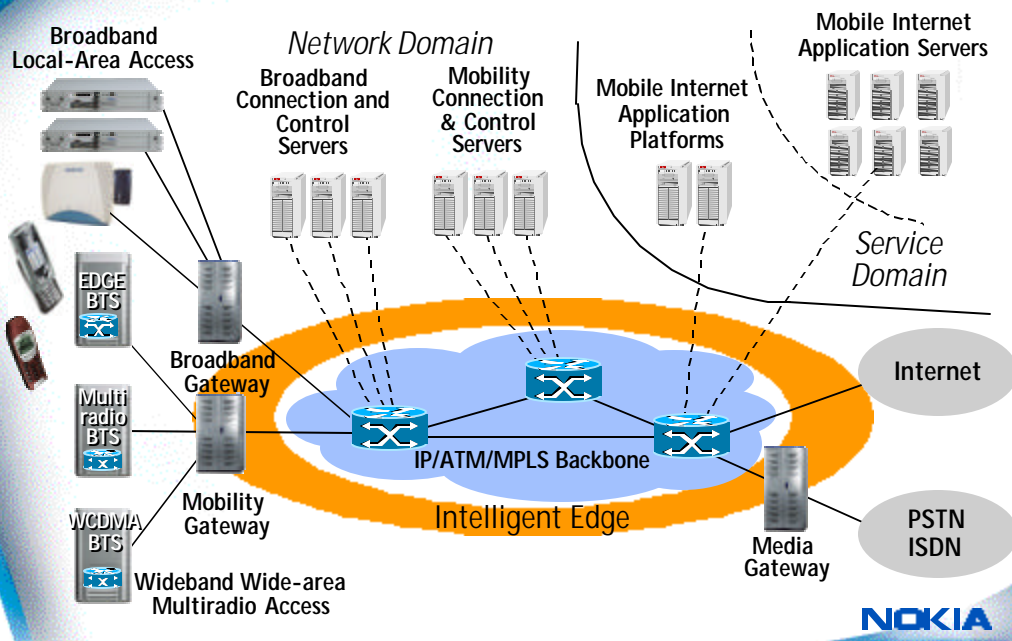


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Next step - All IP

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Implementing Global IP Mobility: The All IP Network

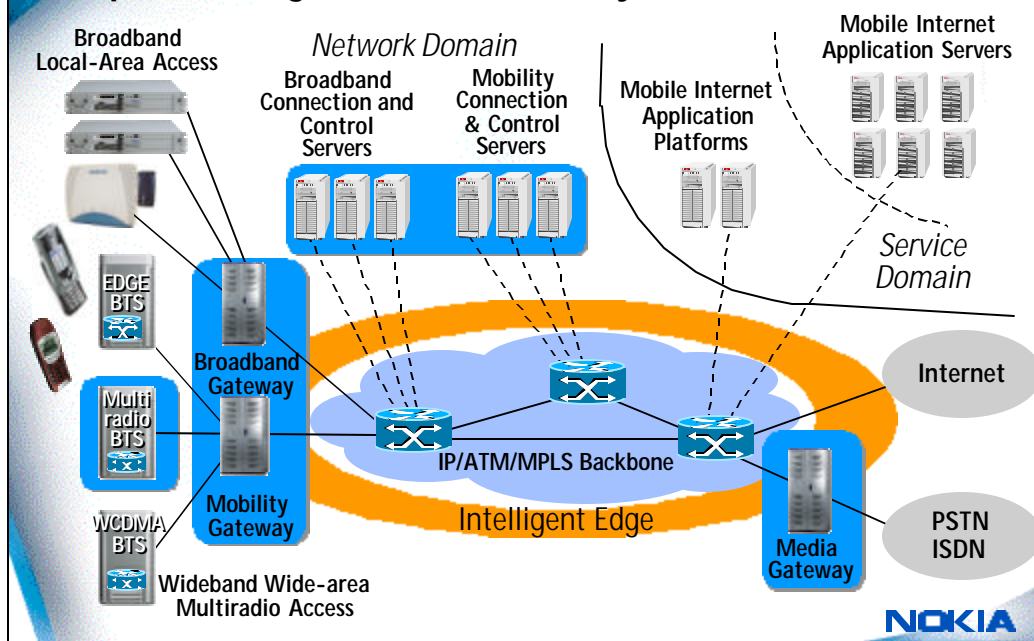


New network architecture – Nokia will shape the All IP future

- Multiple data sessions and further lowered core network costs
- Nokia targets to be a strong All IP system supplier
- Industry wide standardization of All IP interfaces through 3GPP
- Nokia invites the other industry players to share open specifications on base station and Intelligent Edge platform levels
- Nokia shall launch an initiative to offer carrier-class platform technologies also to other vendors

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Implementing Global IP Mobility: The All IP Network



The slide features a background with a blue and white abstract design on the left side, resembling a stylized globe or a network structure. The text "Nokia enabled networks" is centered in a bold, black font. The Nokia logo is positioned in the bottom right corner.

Nokia enabled networks

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The slide features a background with a blue and white abstract design on the left side, resembling a stylized globe or a network structure. The text "Nokia's Forte" is centered in a bold, black font. Below the title is a bulleted list of features. The Nokia logo is positioned in the bottom right corner.

Nokia's Forte

- Selected *ready to launch* Mobile Internet solutions for GPRS, 3G and All IP
- High Performance GPRS core
- First to market with dualmode WCDMA 3G system
- Range of EDGE capable base stations
- Industry leading IP RAN and Intelligent Edge platforms
- World's most advanced microwave radio family
- Leading innovations in wireless broadband area:
 - O-WLAN
 - Wireless Routing

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Summary

- Mobile Data services will drive the growth
- WCDMA 3G rolls out
 - Test networks delivered, commercial roll-out started
 - Significant volumes in 2002: approximately 100 000 carriers
 - Commercial launch capability 2H 2002
- WCDMA and EDGE will coexist to maximise data capacity
- GSM/EDGE/WCDMA are the largest global technology family
 - Economies of scale driving adoption
 - Highly competitive in voice and overriding in data
- All IP networks will follow
 - Nokia will emerge also as carrier-class networking platforms provider

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