

Wireless Networks

Trends, Architecture and Services

Dr. Mehmet Unsoy

munsoy@yahoo.com

November 2002

Outline

- **Wireless Market Overview**
- **Mobile Operator Technology Roadmap**
- **Multimedia Services**

Top Wireless Trends

- **Global Wireless Market Growth Continues**
 - Growth in Subscribers and MOU
 - Voice is killer app for wireless, but also wireless will be king of voice
 - Wireless data growth on 2.5G
- **Wireless Operators – Technology & Disruption**
 - Mobile device proliferation, choices, new players
 - All-IP wireless networks
 - New wireless application players
 - Wireless is major growth area for OSS / BSS
 - WLANs for hot-spots and in-building coverage

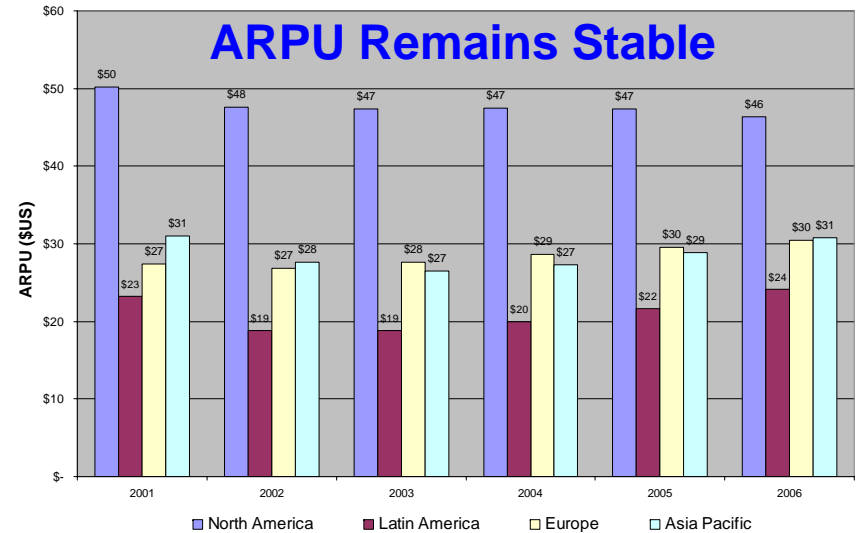
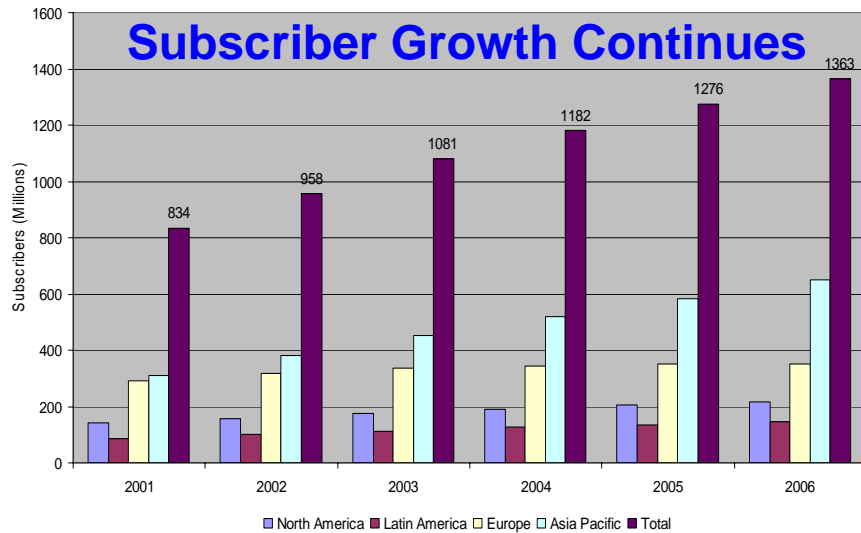
Top Wireless Trends

- **Wireless Operators – Business Model Disruptions**
 - Wireless operators will consolidate
 - Wireless operators → Cellco + Servco
- **Enterprise Expansion**
 - Growth in enterprise wireless = WLANs +WWAN
- **Semiconductor Innovation**
 - New wireless chips solve key wireless problems
- **Futures**
 - Future wireless growth → between “things”

Wireless Market Environment

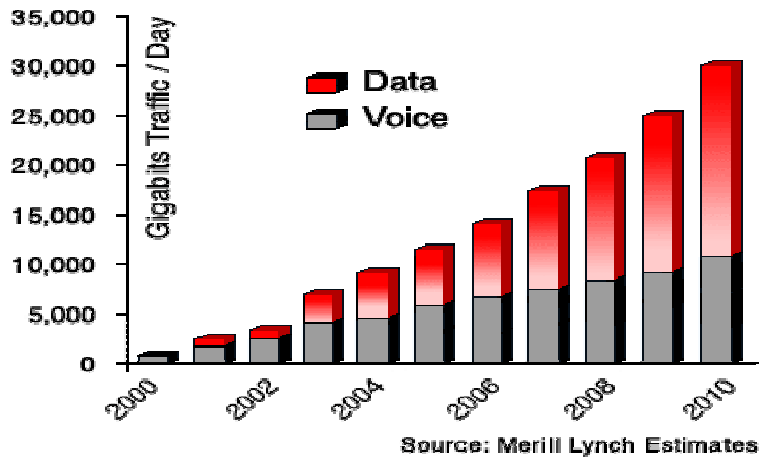
- **Wireless market continues to grow**
 - Subs in NA & Asia increasing while in Europe leveling off
 - Operator revenues increasing due to increase in minutes of use (MOU)
 - Average revenue per user (ARPU) is leveling off but EBITDA is increasing
 - Voice continues to be killer app, but data is experiencing the highest growth, primarily in Europe and Asia
 - CAPEX for wireless infrastructure is expected to resume growth in 2004; highest growth expected in WCDMA
- **Wireless Data is key for future**
 - MMS rollout to build on SMS success; 2.5G / GPRS life is extended; 3G rollout will be cautious in the beginning
 - Wireless services & applications will be critical for future growth of revenues
- **Immediate Top Priorities for Wireless Operators:**
 - Reduce cost, enable new revenue generating services, and improve TTM

Wireless Market Fundamentals Continue to Be Strong

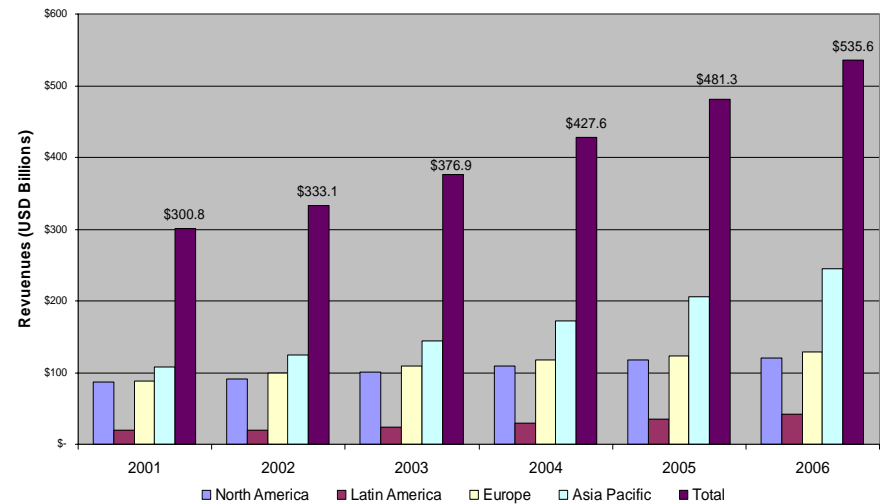


Traffic and MOU Per User Increases

Worldwide Voice vs Data Traffic on Mobile

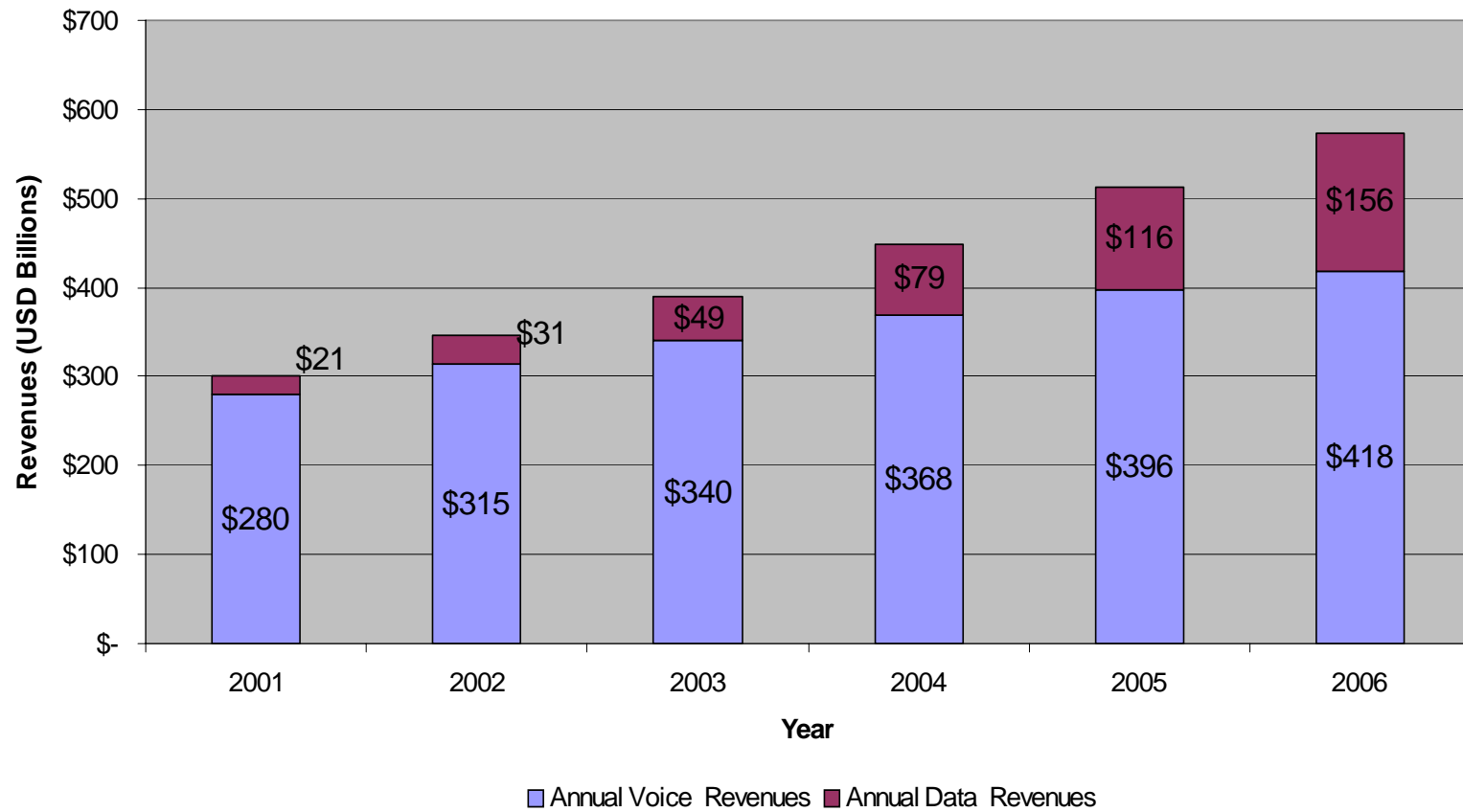


Global Operator Revenues Growing

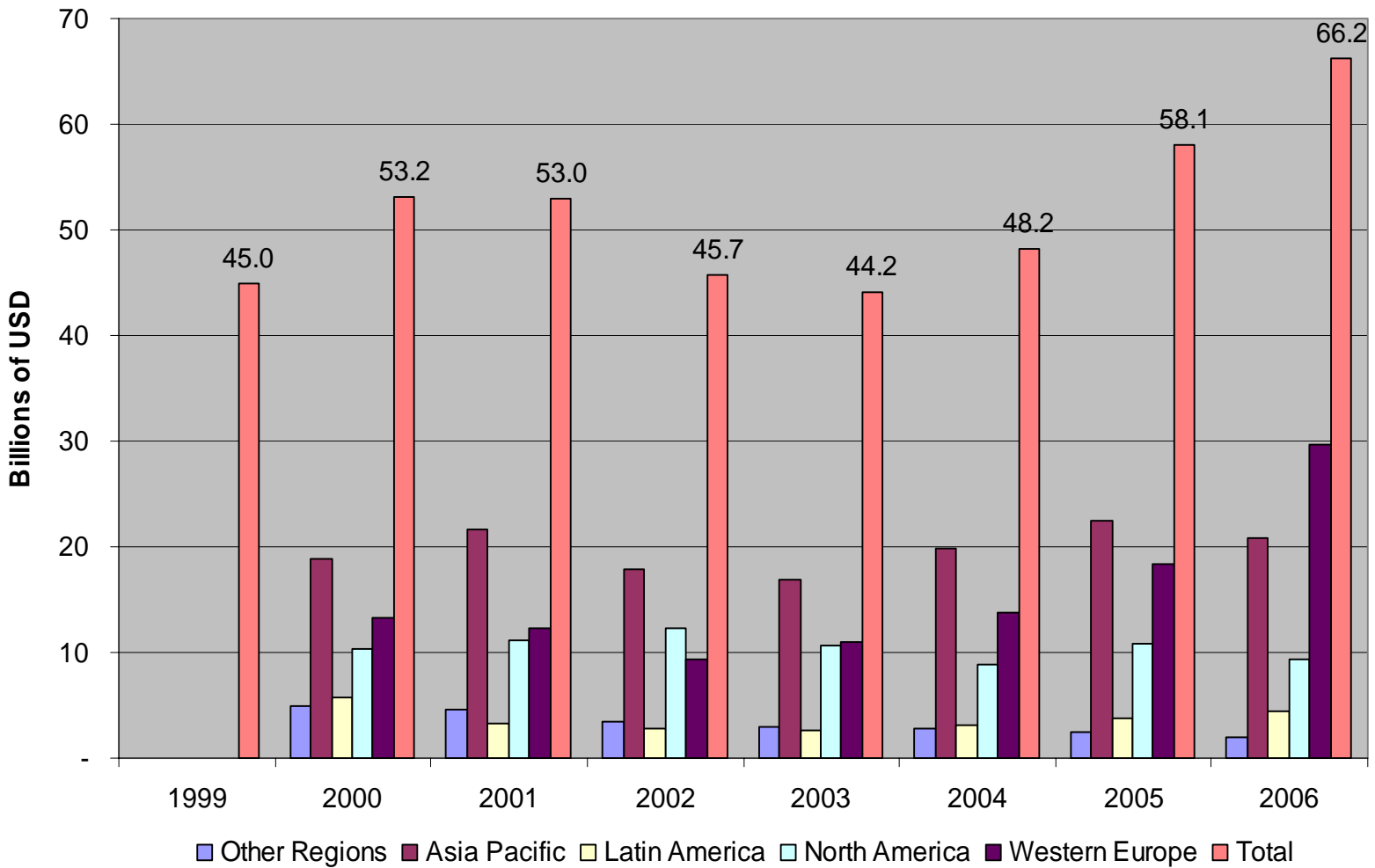


Voice Continues to be the “Killer App”

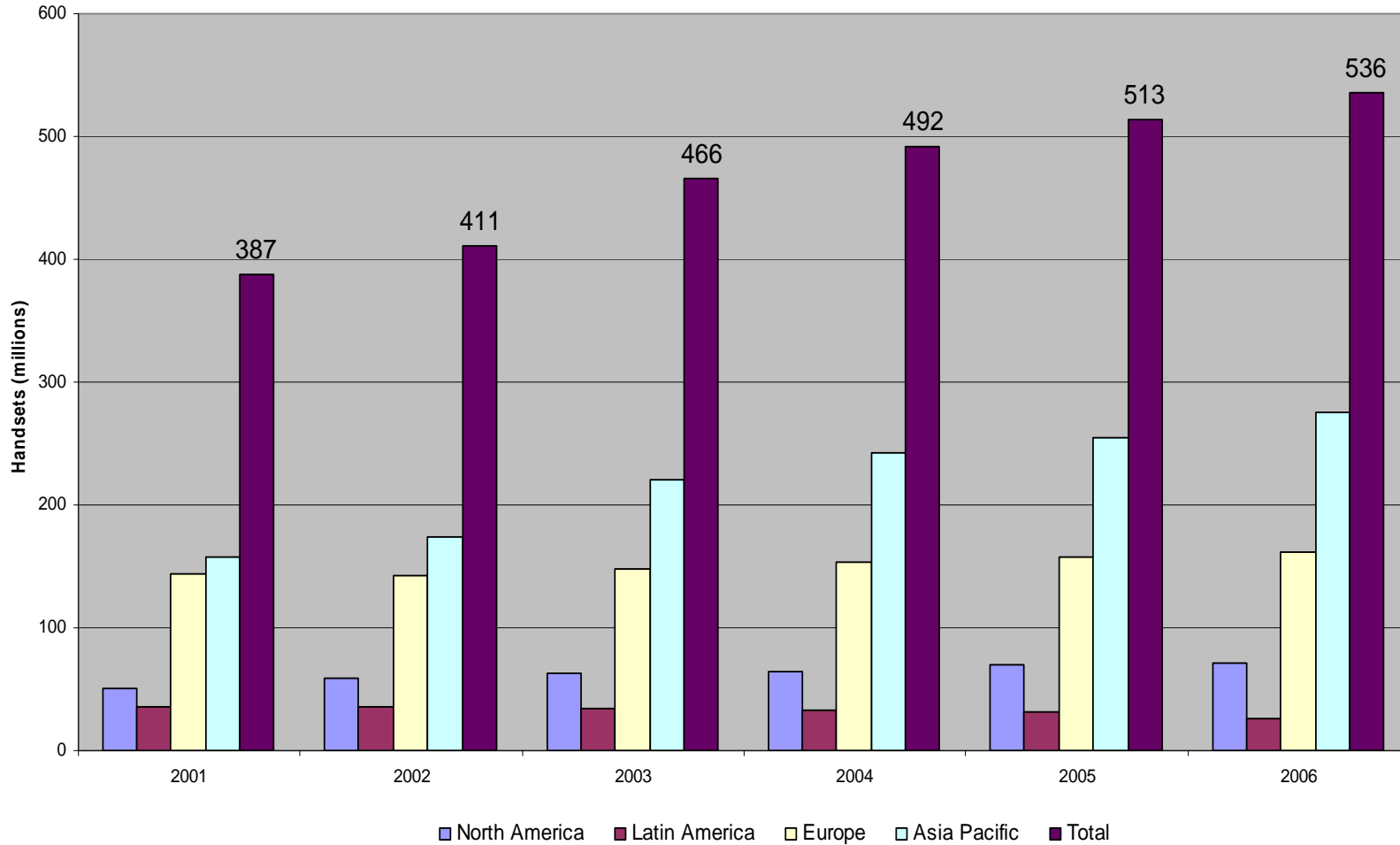
Global Voice and Data Revenues For Wireless Service Providers



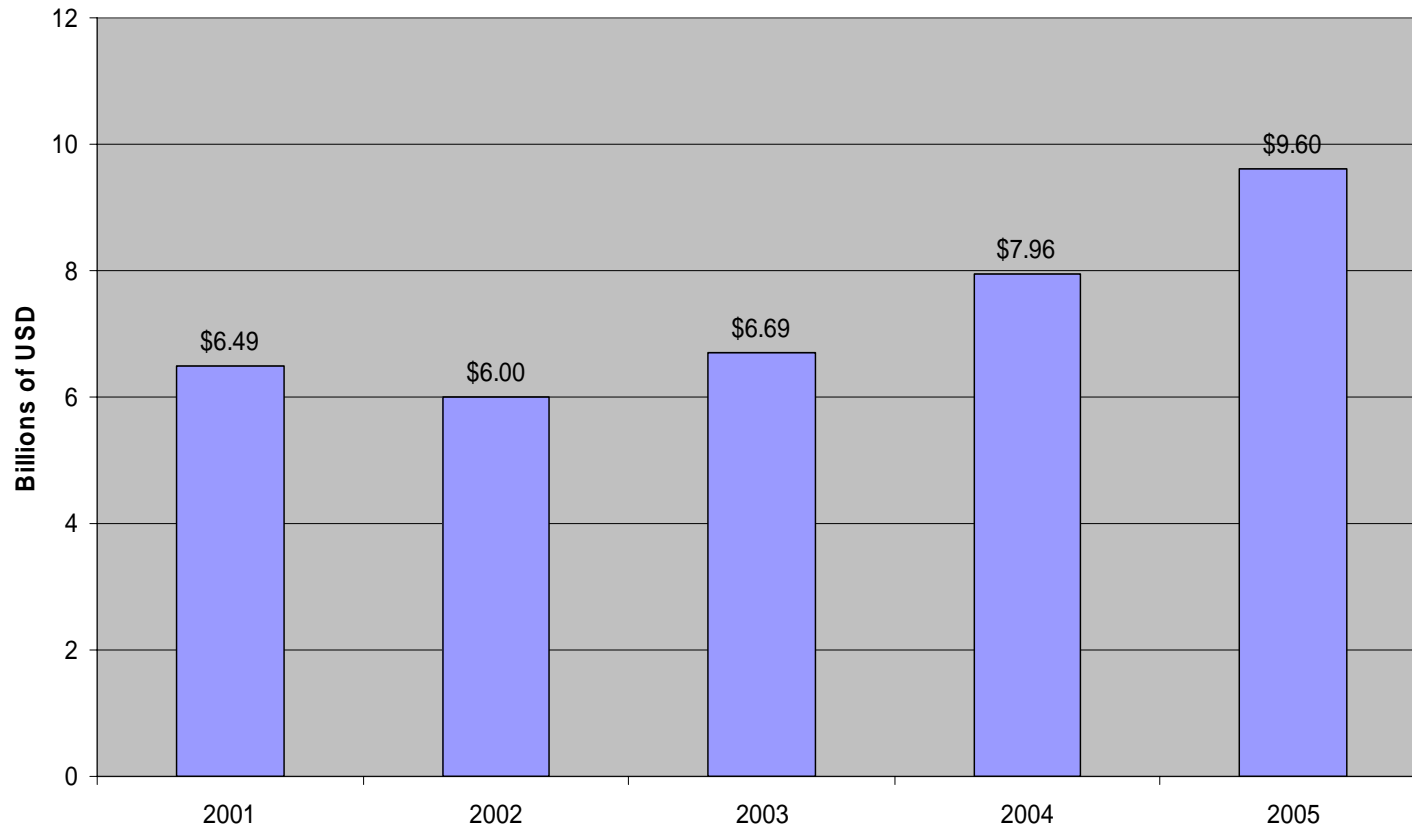
Infrastructure CapEx: Minimal Dip Then Growth Beyond 2003



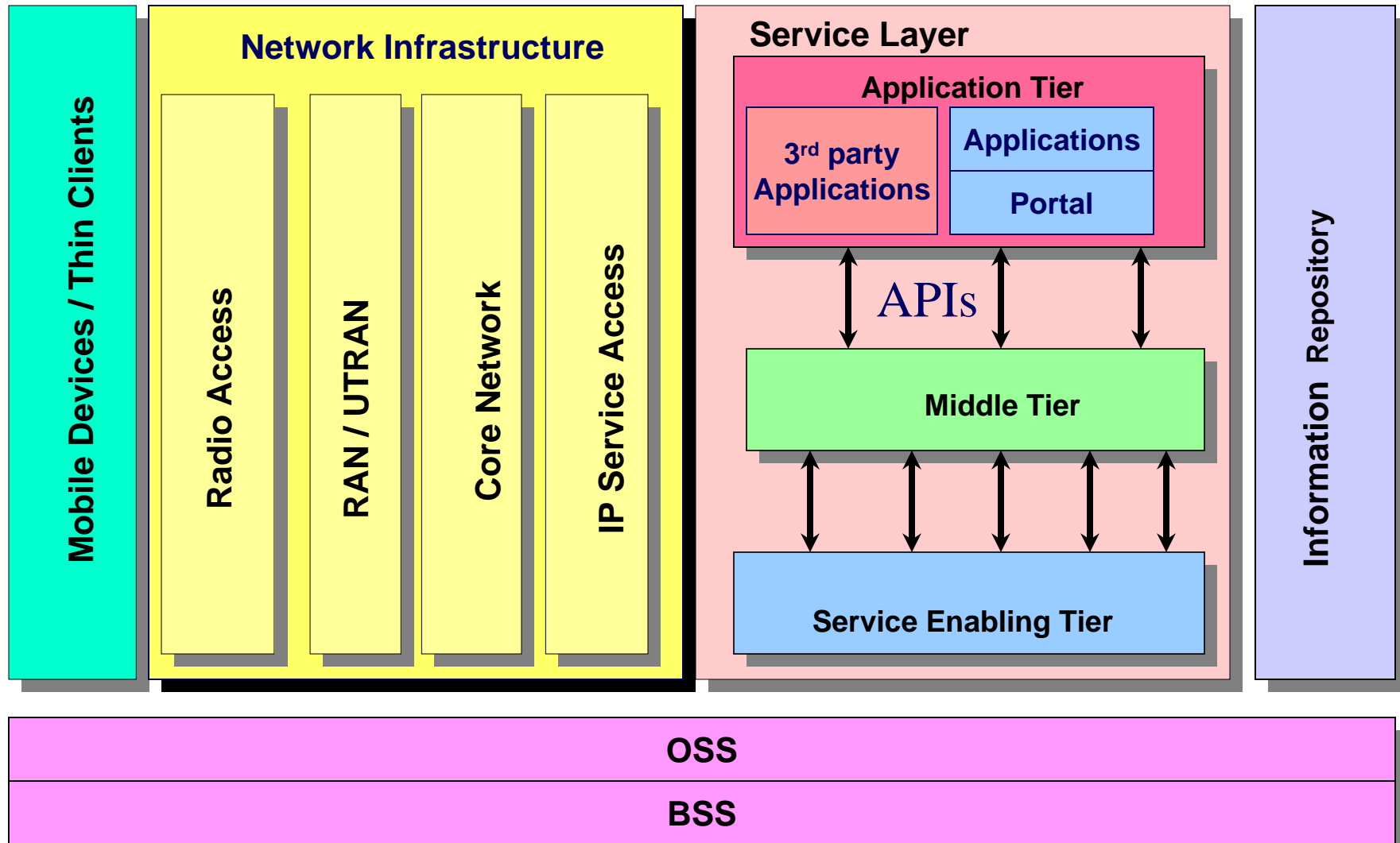
Handset Shipments: Steady Growth Expected

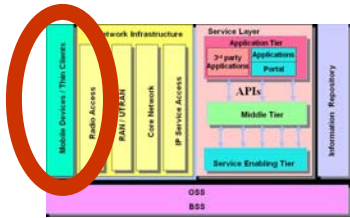


Wireless OSS: Strong Growth Expected After Initial Dip

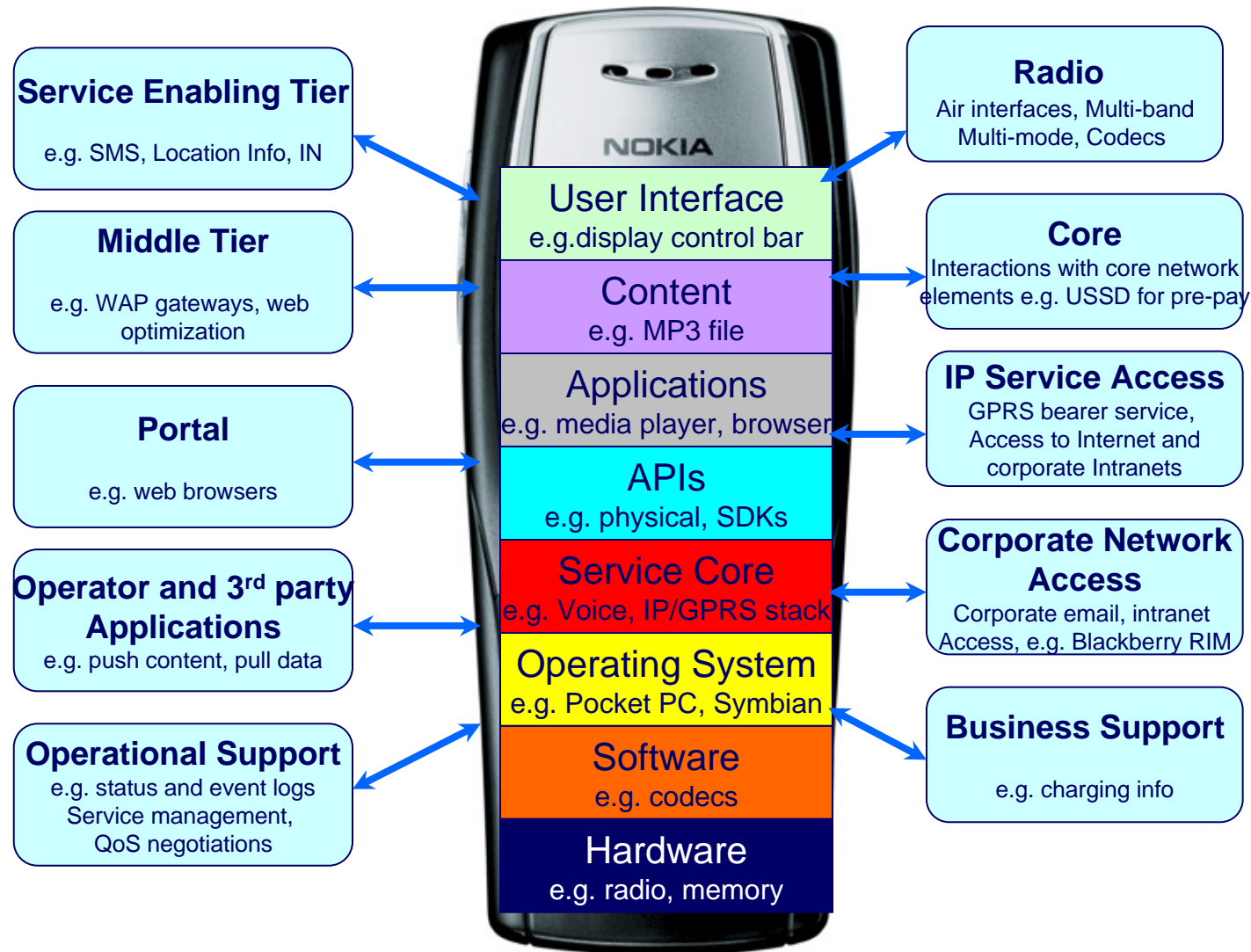


End-to-End Architecture





Mobile Device Architecture



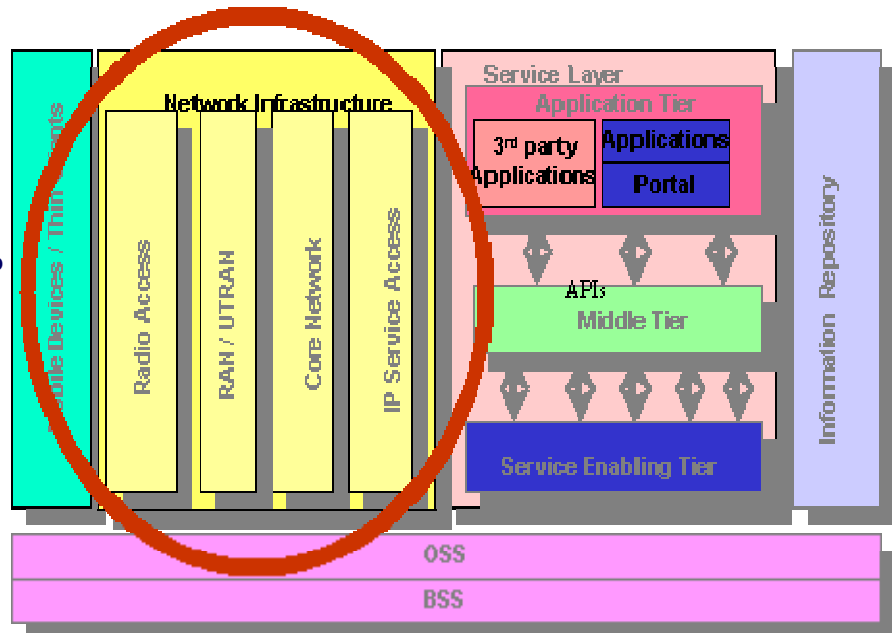
Wireless Network Infrastructure

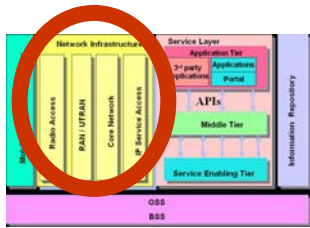
Infrastructure Economics

- Radio networks: high CAPEX cost; 10's of thousand cell sites
- Radio Access Networks: high OPEX cost; 30+% of total OPEX
- Core Networks: TDM based, high OPEX and CAPEX costs
- All: too slow to offer new services

Operators' Strategies

- Extend life of 2G/2.5G; launch more services with GPRS
- Infrastructure sharing with other wireless operators
- Cost reduce CS domain by evolving to all-IP networks, & capping MSCs
- Better timing of 3G investments / deployment, & tie it with device availability
- Position / deploy WLANs as complementary hot spot or in-building coverage

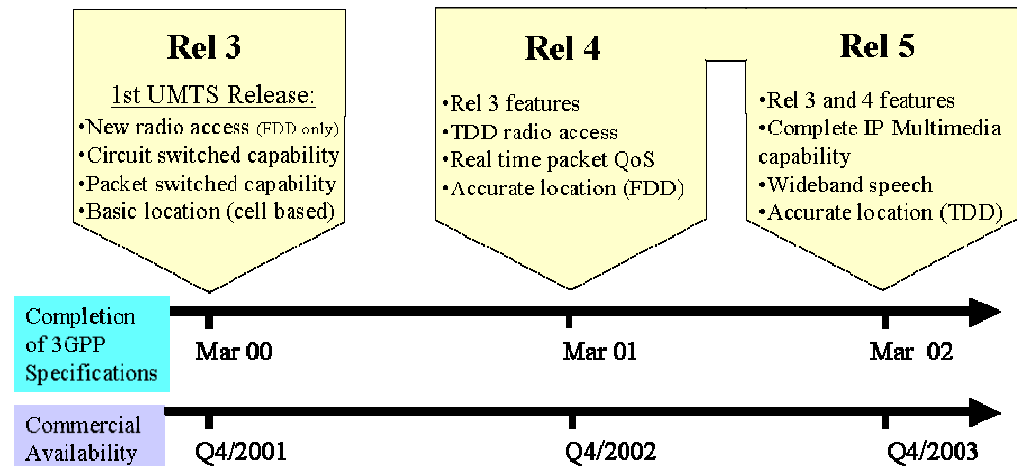




Wireless Network Evolutions

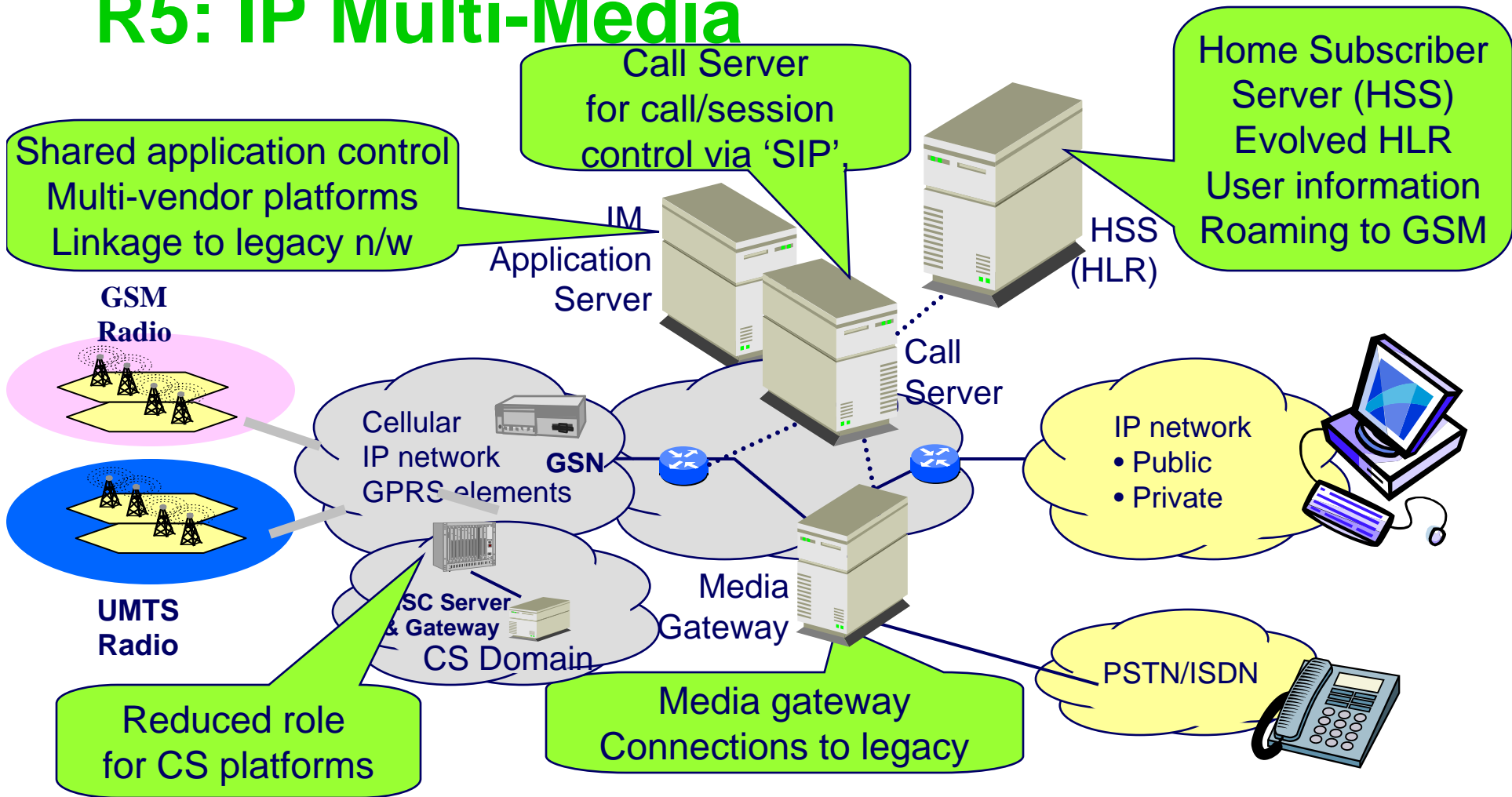
- **Wireless networks will evolve to all-IP networks, that utilize IP technologies for all real-time traffic, including voice**
- **Key motivations for move to all-IP networks are**
 - **Significant (30+%) cost savings in OPEX & CAPEX**
 - **New revenue generations (30+%)**

- **Standards driven evolutionary timetable**
- **Some operators will deploy before others, soft-switch technologies**



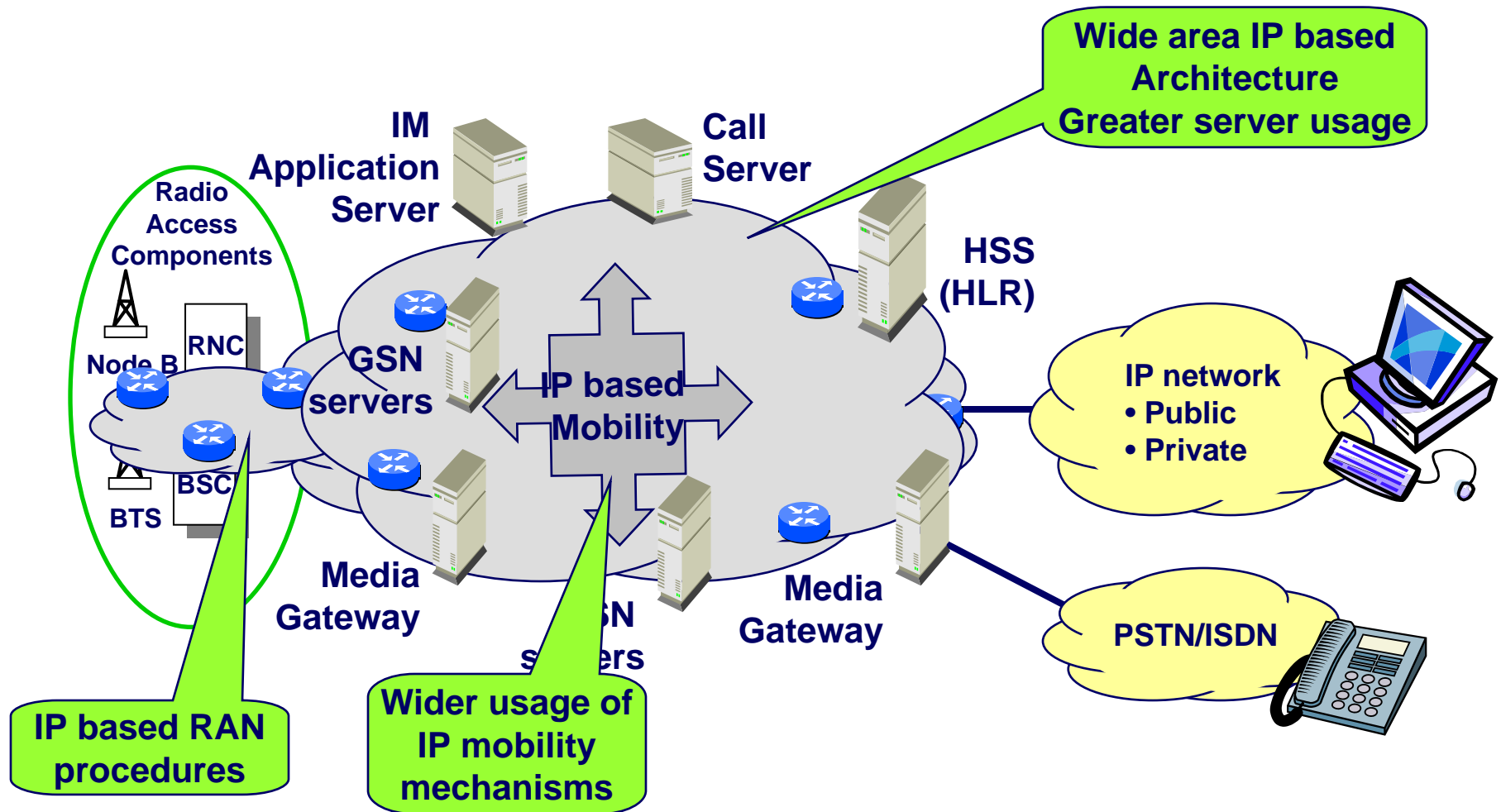
- **Wireless will lead the rest of telecom in deploying key IP technologies, such as SIP, IPv6, & others**

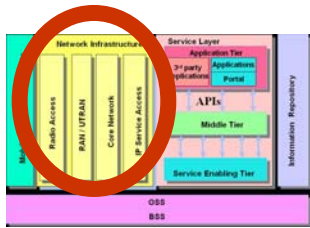
R5: IP Multi-Media



- Supports real time Multi-media IP applications
- Major change to infrastructure
- Significant cost savings & revenue increase

All-IP Mobile Network Architecture





Paradigm Shifts Triggered by All-IP Networks

- **Business Paradigm shifts**
 - Peer-to-peer SIP for signaling
- **Technical Paradigm Shifts**
 - Separation of signaling and bearer channels
 - Multimedia services – combination of voice and data on an end-to-end basis
 - Mobility enabled, MPLS enabled, IPv6 based routing environment for wireless core networks



- **Cellco vs. Servco**
- **Wireless ASPs**
- **MVNOs**



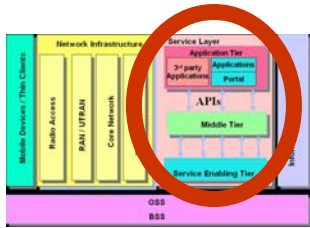
- **Cost savings**
- **New services**



- **New services**



- **New products**



All Wireless Operators are Building Service Layers

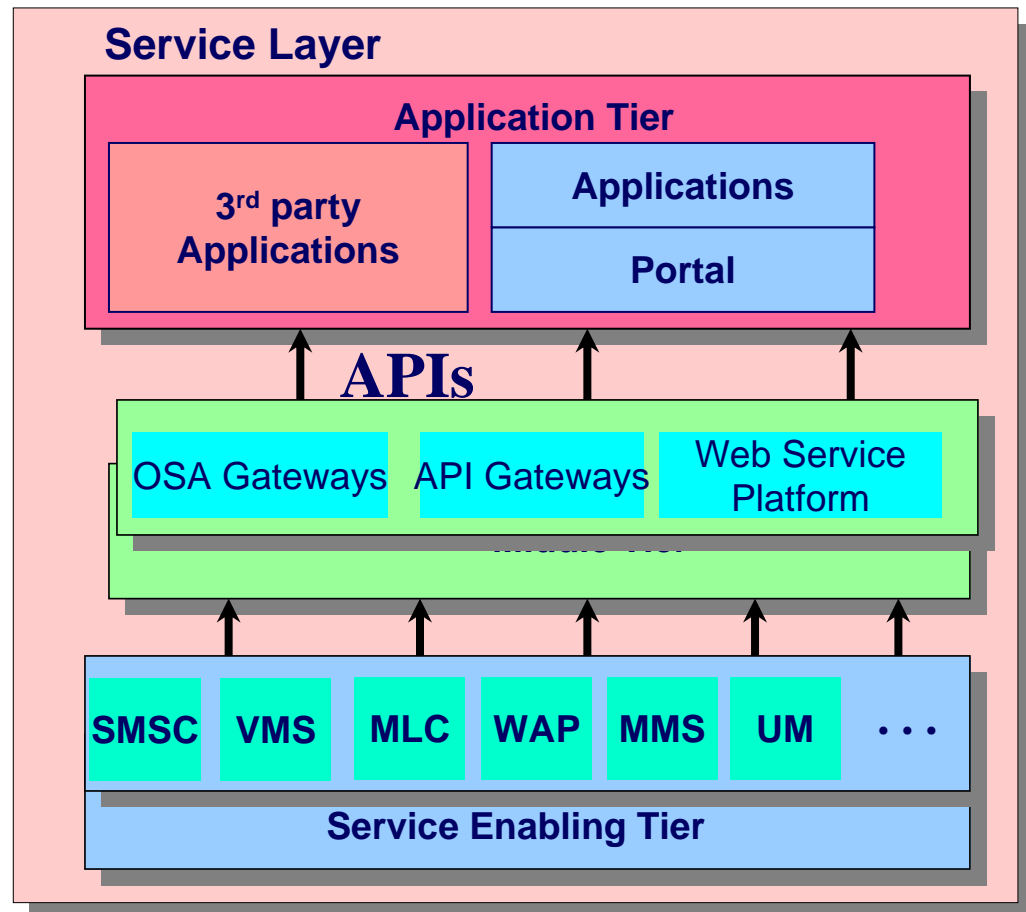
Objectives:

- To go up the value chain
- Enable high-margin revenues
- Build on early successes, e.g. SMS

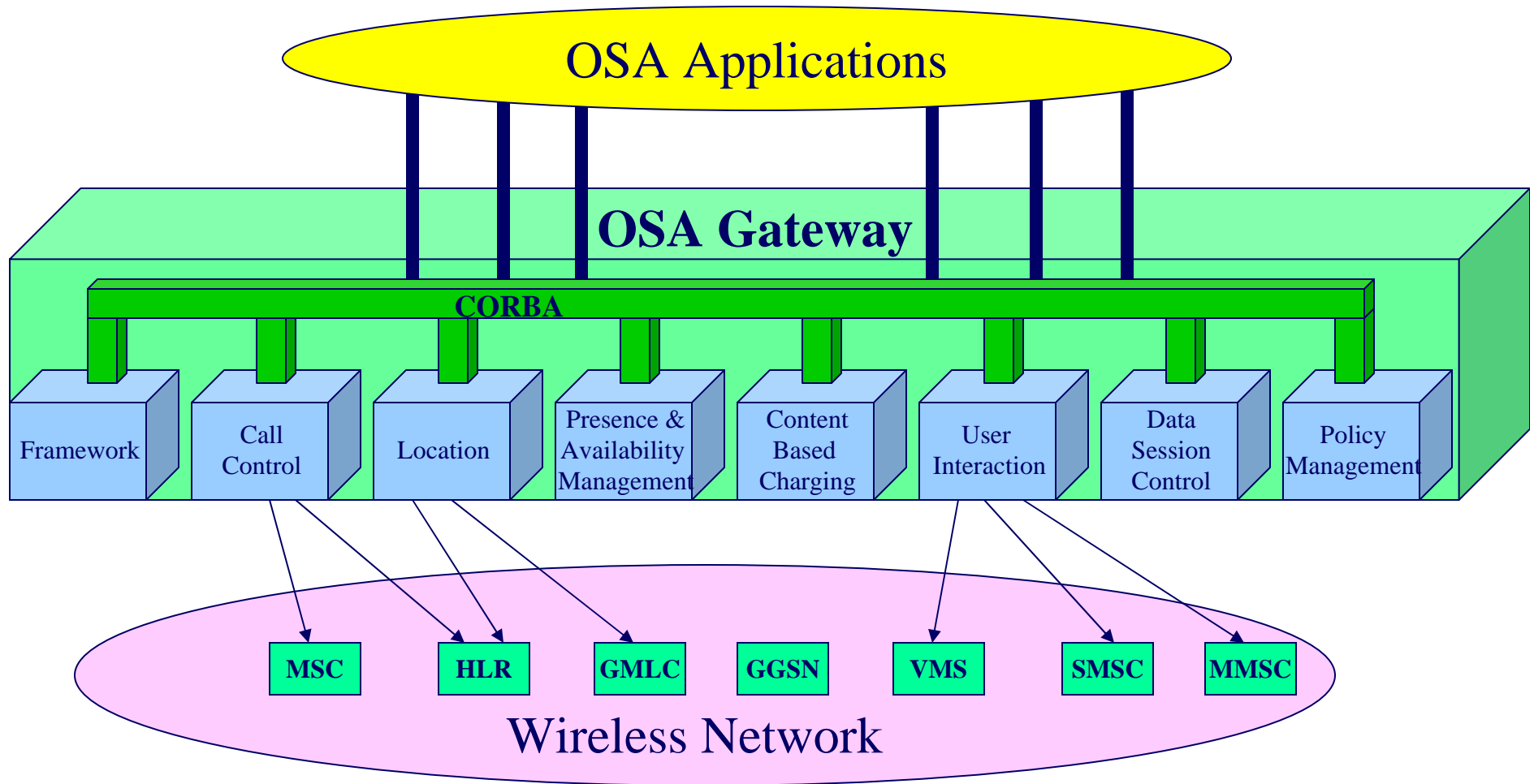
3rd Party apps very critical

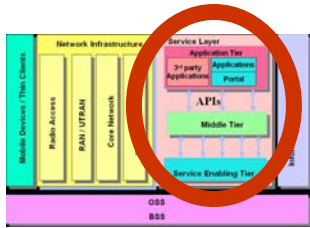
- 90+% future apps
- APIs very important

SIP will revolutionize the service layer

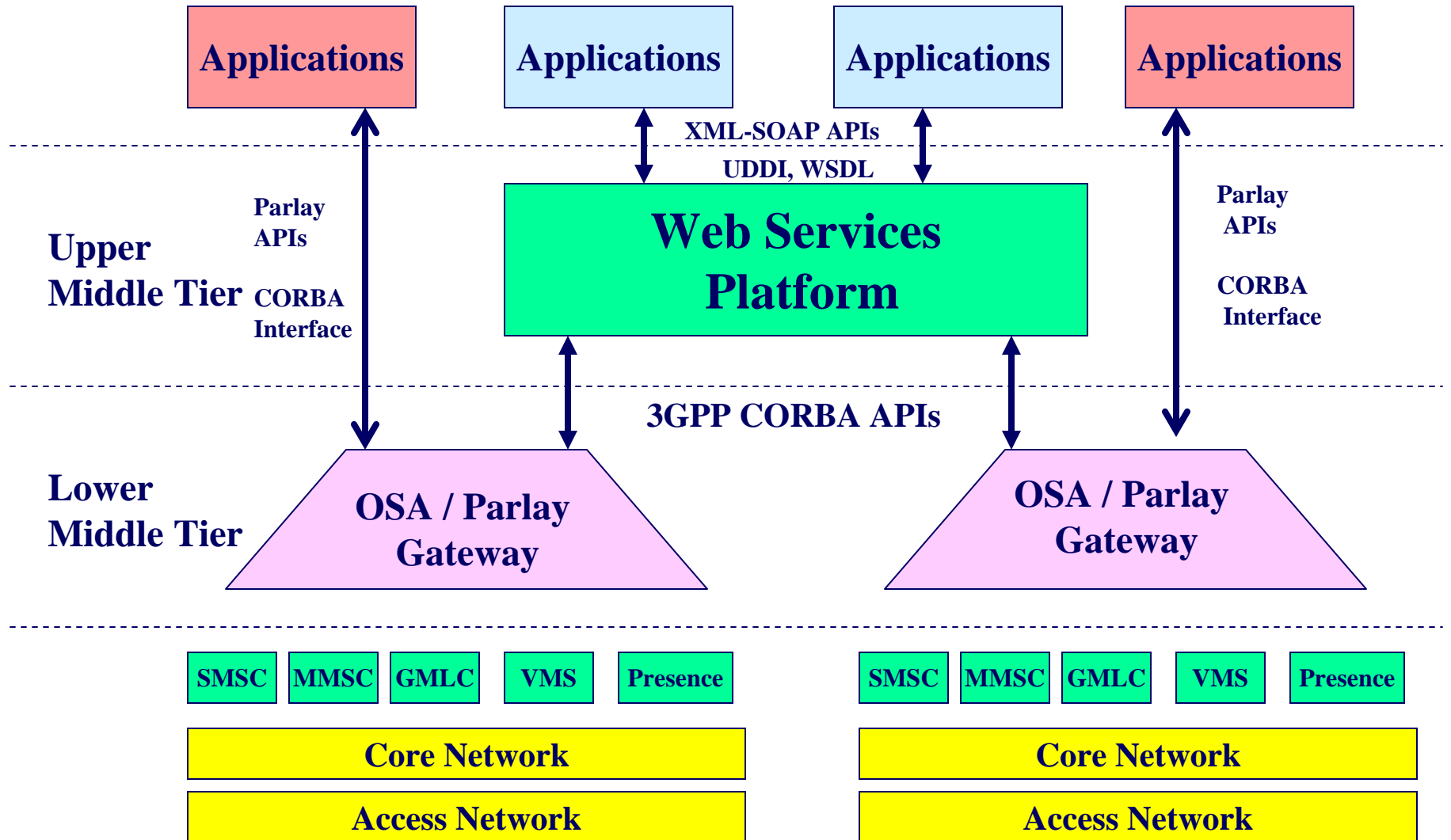


Overview of OSA





Middle Tier Service Layer Architecture



Presence and Availability – Improving reachability



Nancy

Fred

Availability – Indicating the willingness to Communicate

Available

Out of Lunch

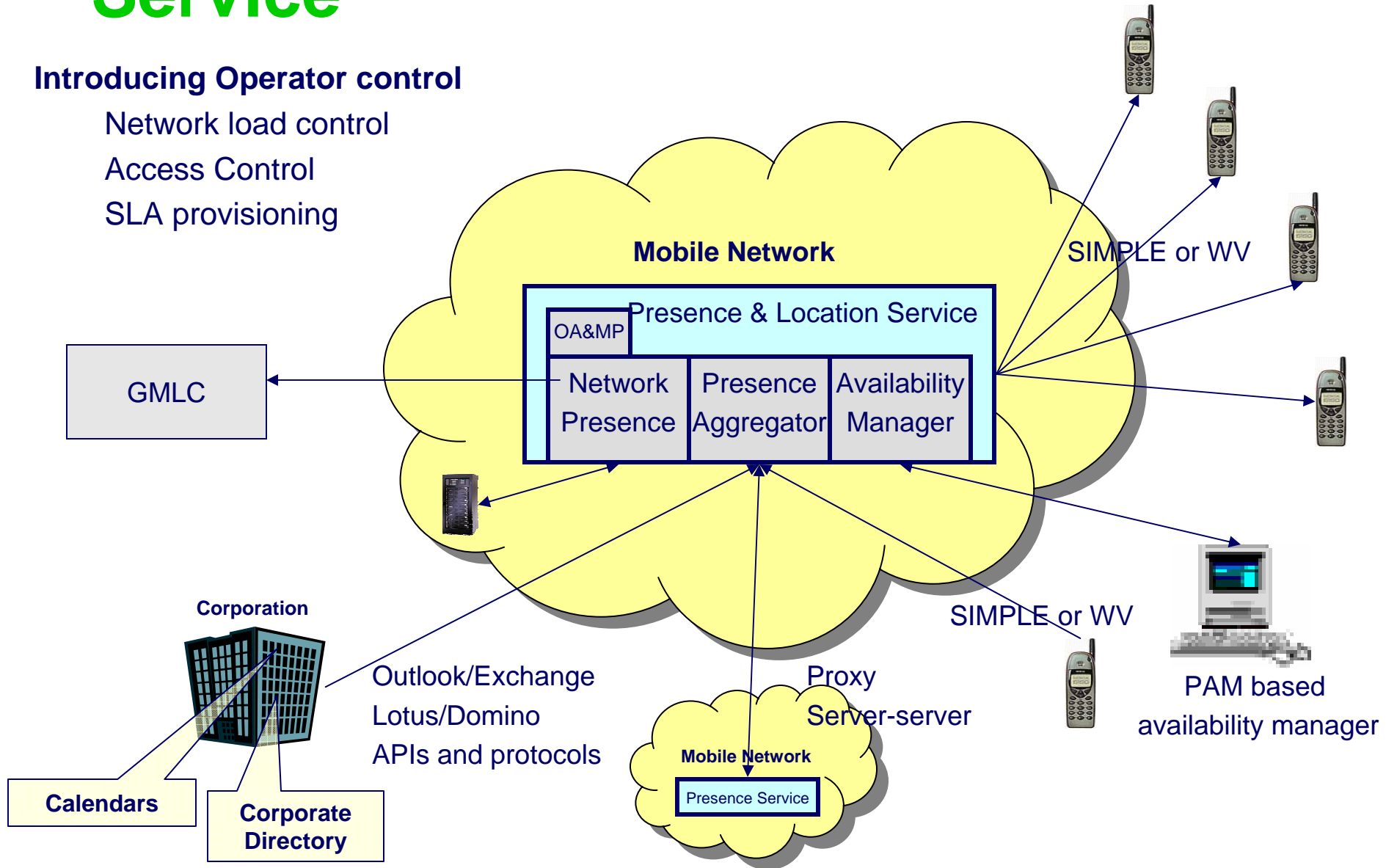
Presence – Indicating the ability and Means to Communicate



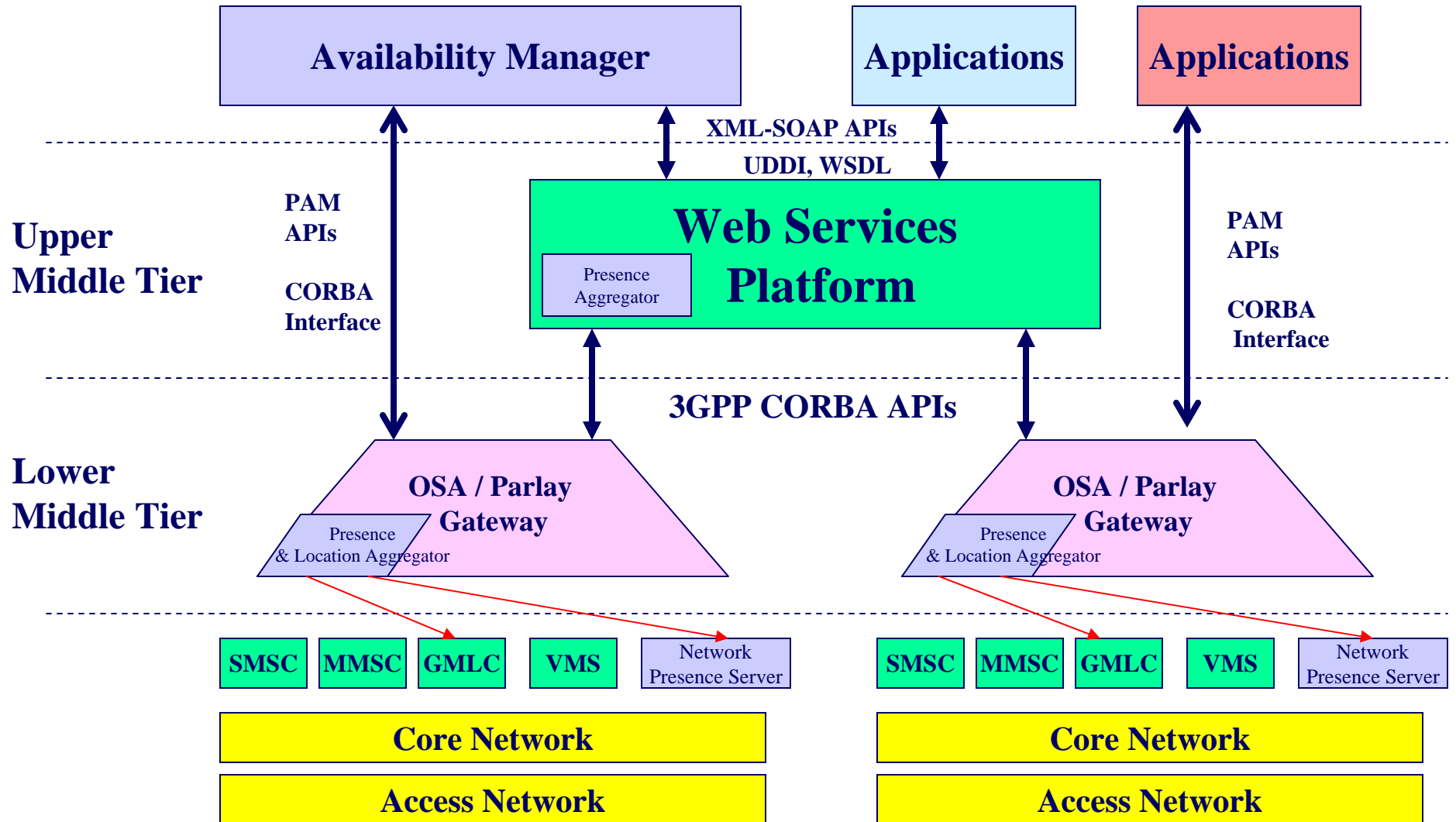
Anatomy of a Presence & Location Service

Introducing Operator control

- Network load control
- Access Control
- SLA provisioning



Aggregation of presence and location information from Wireless Network



Multimedia Messaging

SMS, EMS and MMS

SMS



- Plain text, maximum 160 characters, black only
- Uses the signalling channel
- Supported by all GSM phones in current use

EMS



- Plain text, simple graphics & sound, upper limit on message size
- Uses the signalling channel
- Very low handset penetration

MMS



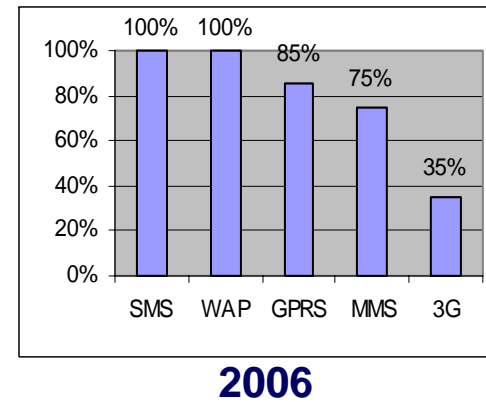
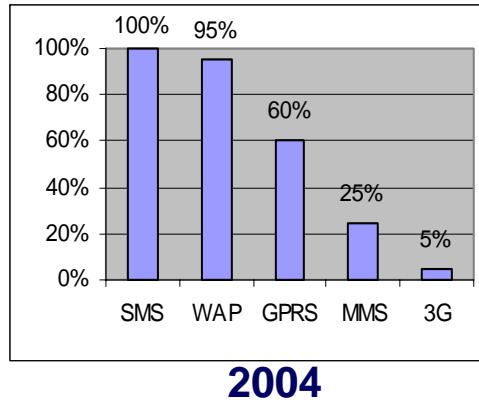
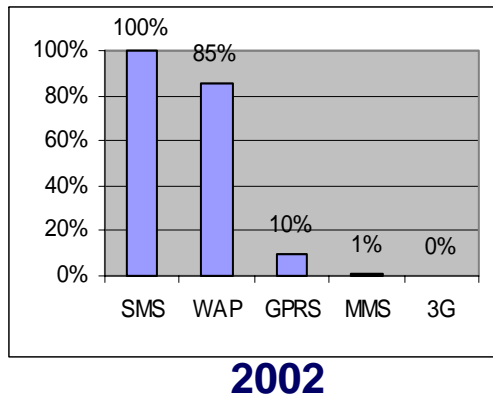
- Freeform text, colour, graphics, photos, audio and video
- Unlimited message size
- Uses IP standards
- Near zero handset penetration

MMS is the next major step for messaging

MMS Services

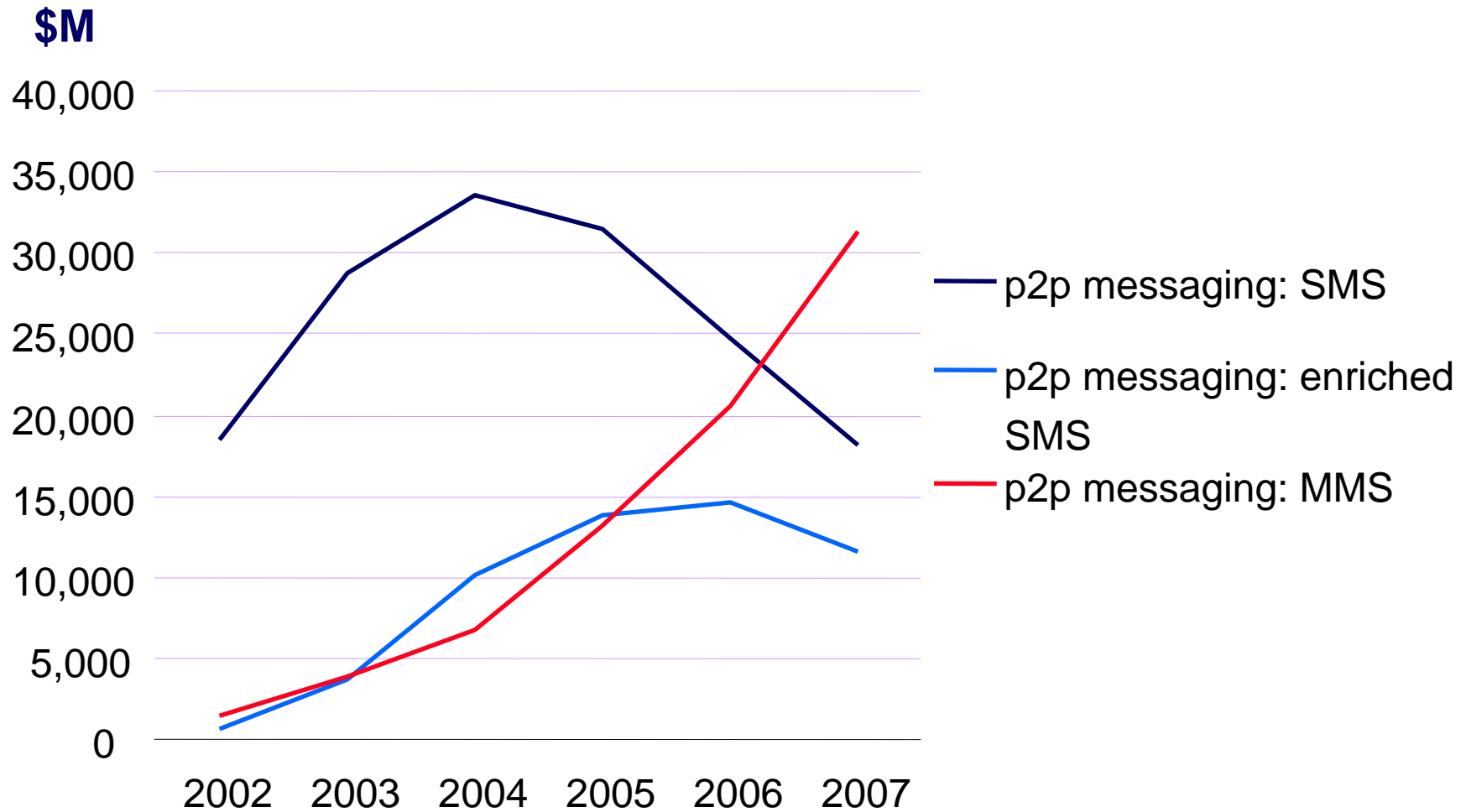
- **Person to Person**
 - Rich media messaging
 - Combination of text, sounds, images and video
 - To and from MMS enabled handsets
 - If recipient not MMS enabled, inform by SMS from where and how to retrieve
- **VAS to Person**
 - Rich media downloads, advertising, VAS services
- **Person to System**
 - Storing multimedia content, e.g. pictures on an on-line album
- **System to System**
 - Remote surveillance

MMS Handset Penetration



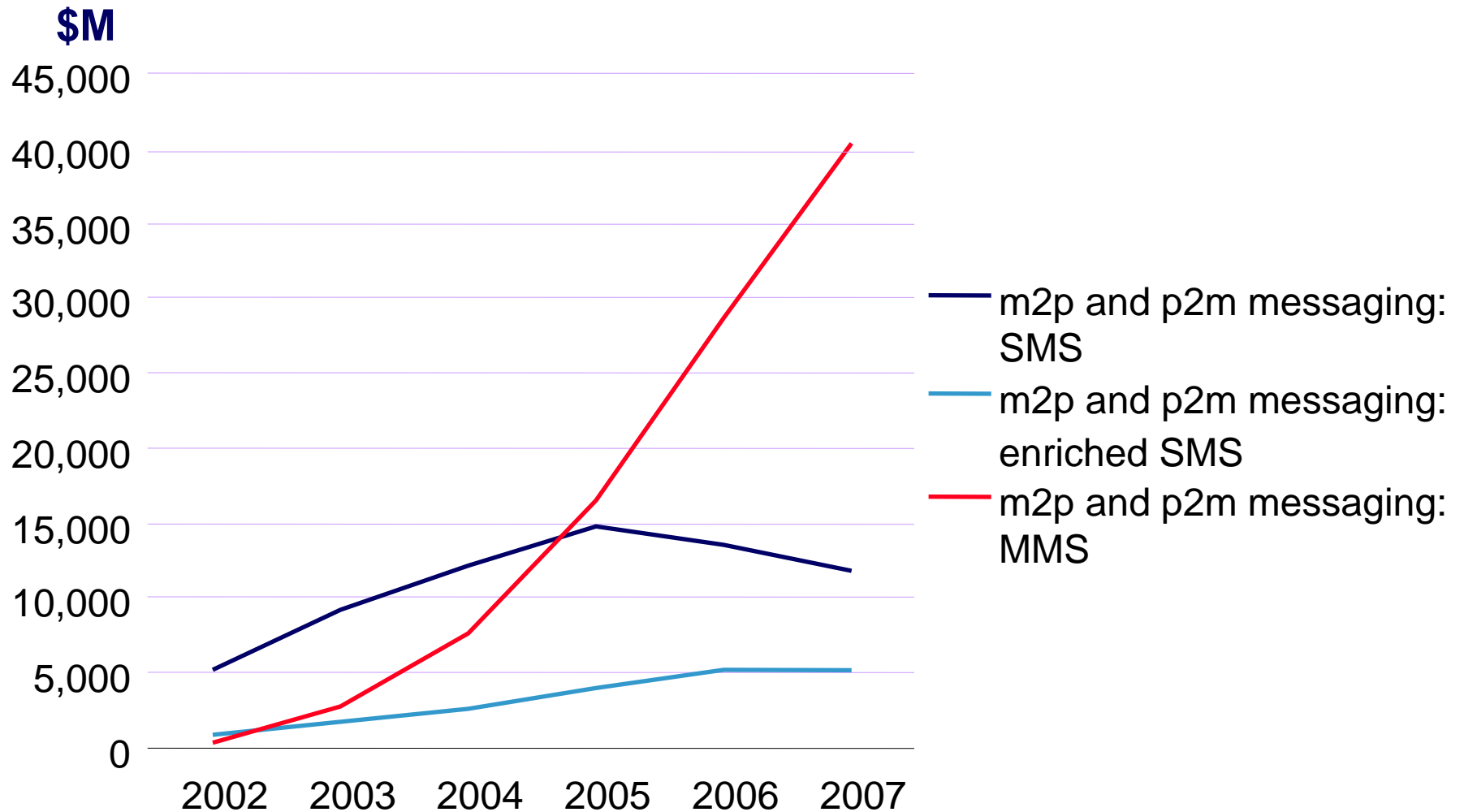
- **MMS handset penetration is expected to reach 25% by 2004 and 75% by 2006, according to Ericsson**
- **Ovum predicts 50% MMS handset penetration by 2005; and also 30% of all person-to-person messaging be MMS**
- **Orange group forecasts 40% of their users will be using MMS by 2005**

Global P2P Messaging Revenue



Source: Ovum

Global M2P/P2M Messaging Revenue



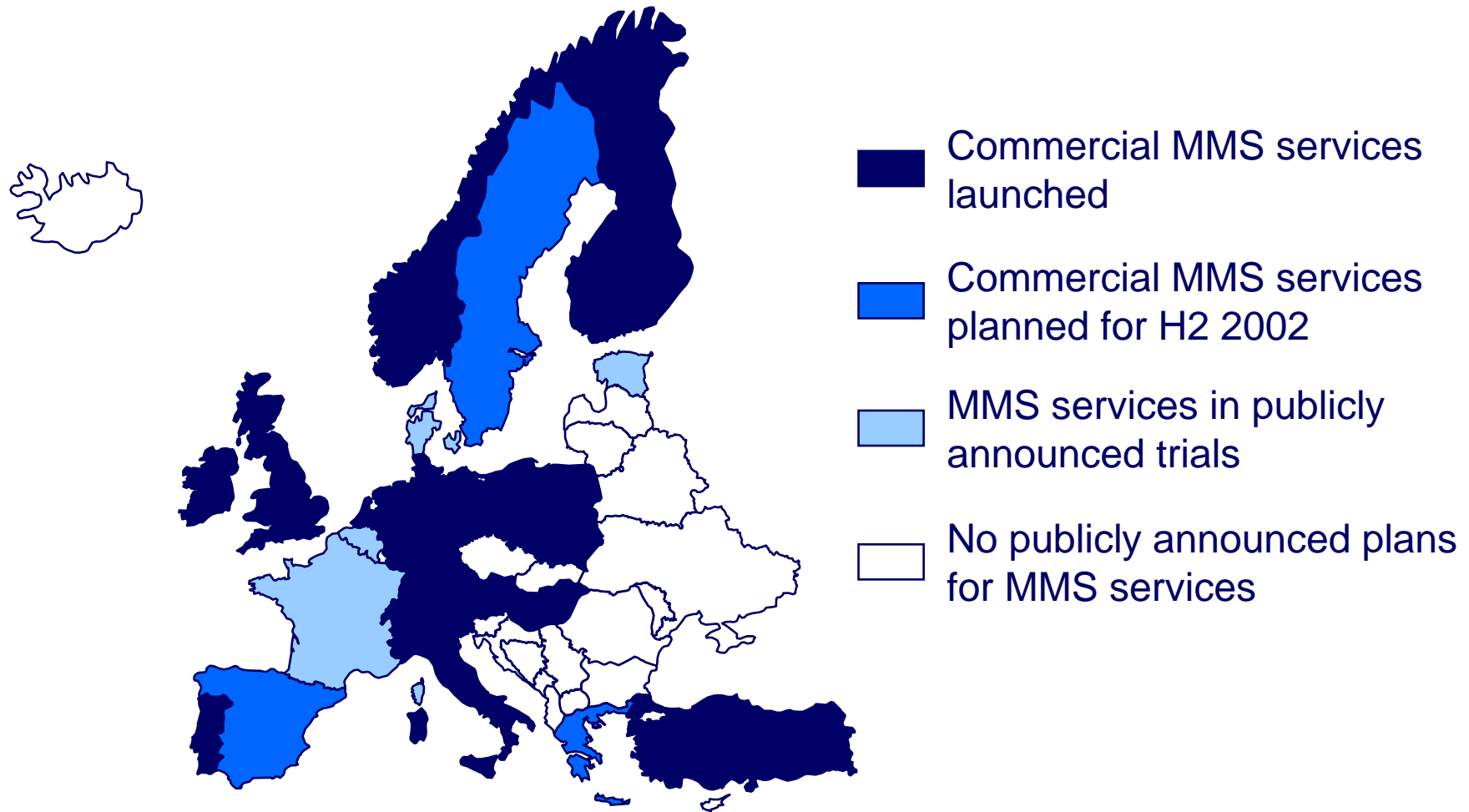
Source: Ovum

Status of the MMS market

- **MMS standard completed in Q2 2001**
 - MPEG video and MP3 audio 'coming soon'
- **MMS network platforms available since Q3 2001**
- **MMS phones available since Q2 2002**
 - eg, Sony Ericsson T68i & T300, Nokia 7650 & 6610, Sharp TQ GZ10 & GX-1, Motorola A820
- **Around 40 operators have launched or launching services**
 - eg, Telenor, Westel, CSL, D2, Telecel, TMN, Sonera, MMO2, T-Mobil

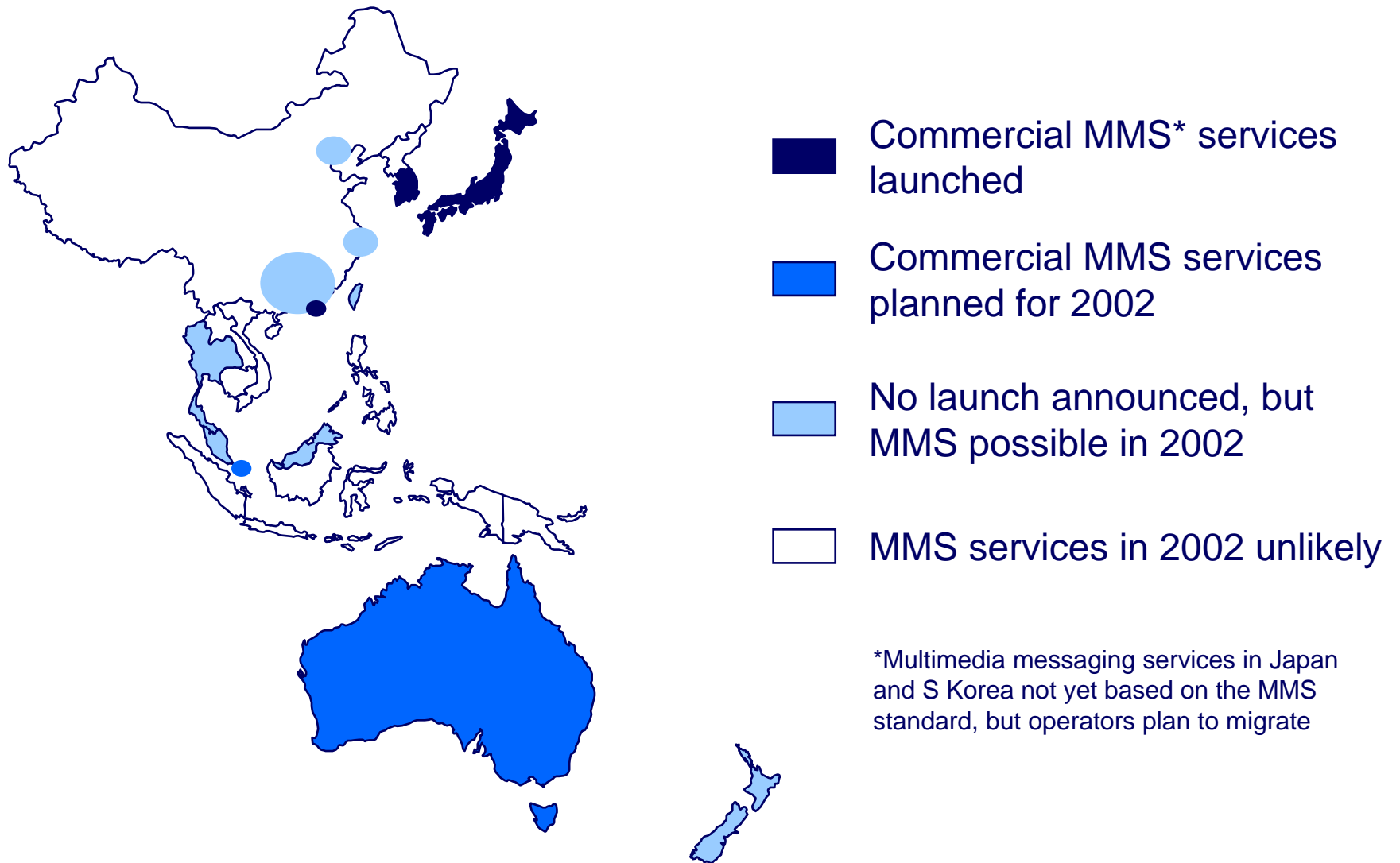
2002 is 'launch-pad year' for MMS

MMS in Europe



Europe leads with initial MMS deployments

MMS in the Asia Pacific



MMS Service Pricing

Some early examples

Single per-message price*

Telenor Norway \$1.20

Sonera Finland \$0.59

Telecel Portugal \$0.45

TMN Portugal \$0.45

MMO2 UK \$0.42

D2 Germany \$0.39

*up to 30Kbyte maximum, in most cases

Other approaches

T-Mobil (UK)

\$30 per month, subscription covers up to 350 messages

CSL (Hong Kong)

Volume charge to both sender & receiver, plus charge for paid-for content (eg, 70¢ for a photo, \$2 for a branded greetings card)

Westel (Hungary)

Small: 31¢

Medium: 65¢

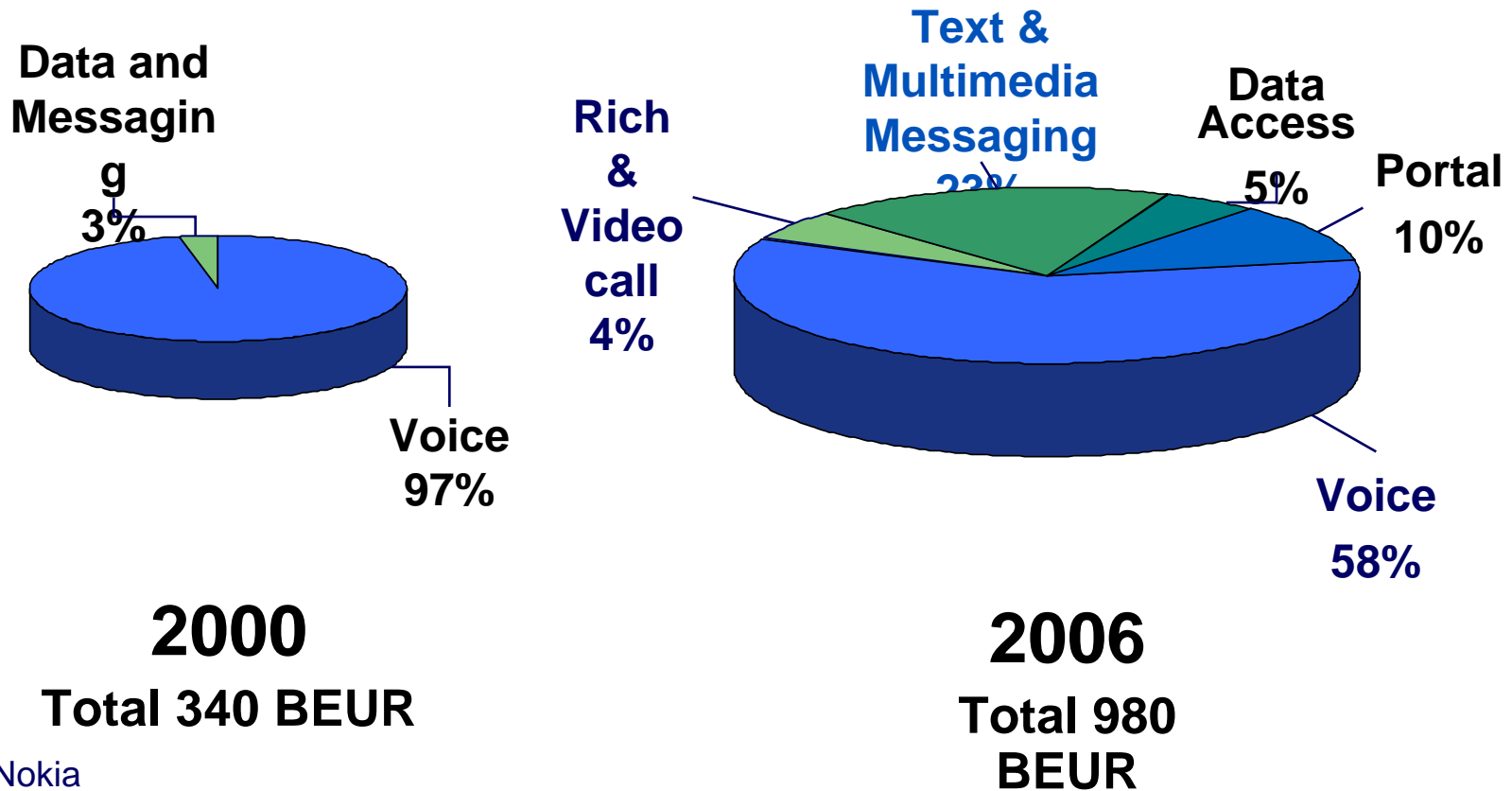
Large: \$1.30

2002 will be a period of experimentation

Messaging

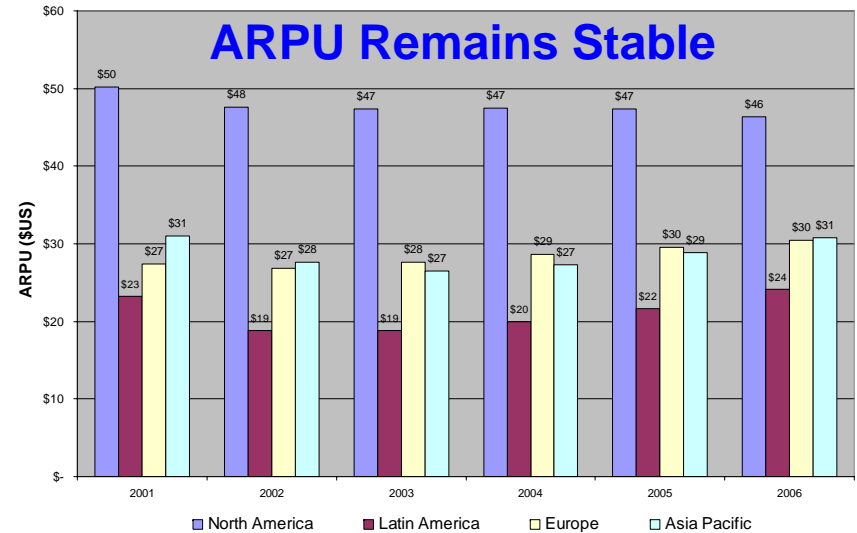
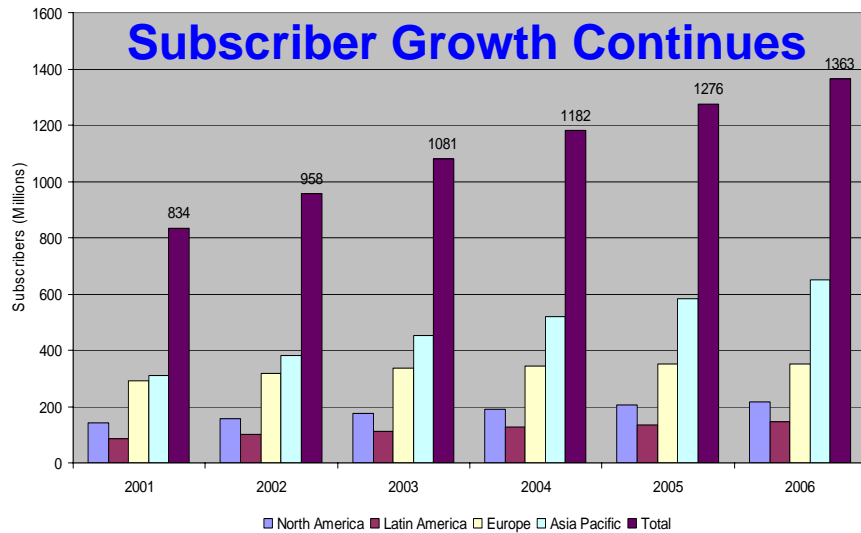
– the major revenue generator

Global Mobile Service Revenues (BEUR)



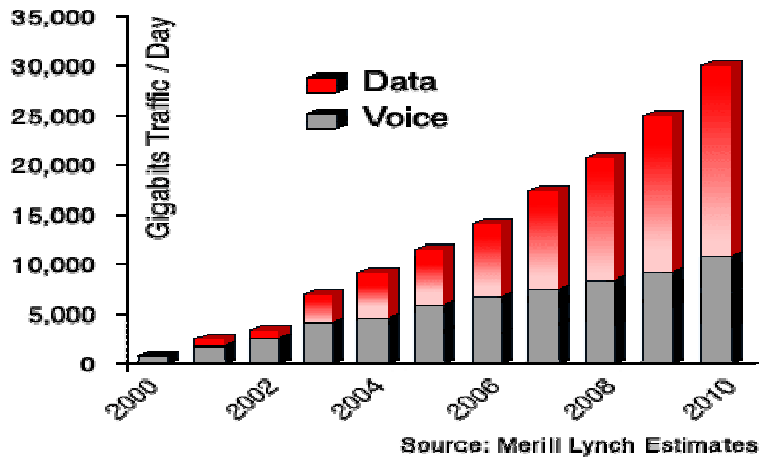
Source: Nokia

Wireless Market Fundamentals Continue to Be Strong



Traffic and MOU Per User Increases

Worldwide Voice vs Data Traffic on Mobile



Global Operator Revenues Growing

