

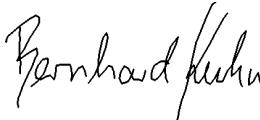
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TOP Business AG
making knowledge work

Welcome to „UMTS Today“

Bonn, April 16, 2002

Presented by:



Vice President Training Wireless & Public Networks

TOP Business AG, Nuremberg / Germany

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About TOP...

TOP Business AG
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Business Interactive
TOP Business Interactive GmbH

WBTs: GPRS, UMTS, TCP/IP, GSM, ATM, VoIP

2 STEP

Training Enterprise Nw. & Information Technology	Training Wireless & Public Networks	Consultancy Mobile & Fixed Networks	Training & Consultancy Org. & Mngmt. Development	Training Proj. Mngmt. Indiv. Skills	Training & Consultancy TQM ISO / TL9000
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- Since 1994, independent training institute, privately owned
- Training centers: Nuremberg, Hamburg, Neuss, Utrecht (NL)
- Total Staff in 2001: 90
- Total Sales in 2001: EUR 9.5m
- DIN EN ISO 9001 certification since 1993
- EFQM member since 1993
- www.TOPBusinessAG.com, www.business-interactive.com

EFQM

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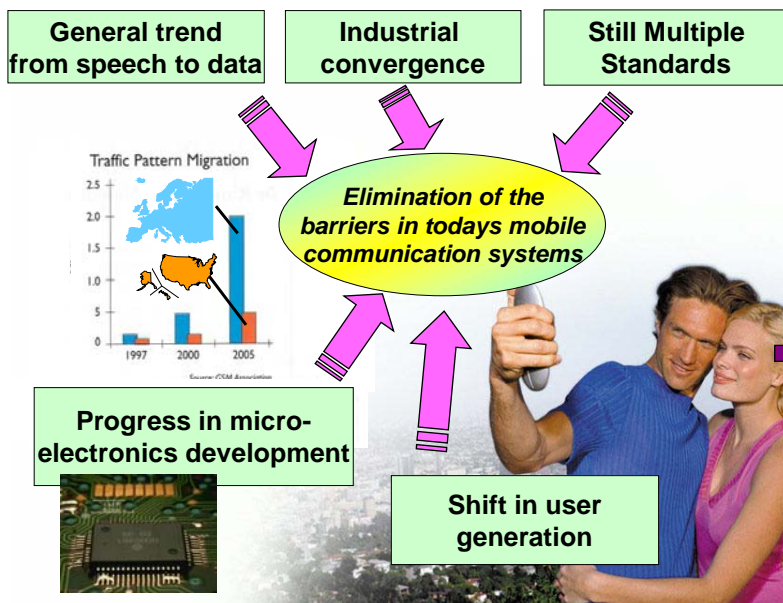
2

Presentation Content



1. UMTS Drivers
2. UMTS Key features
3. Architecture
4. FOMA Experiences
5. Actual Situation in Germany
6. Network Sharing

Infocom Market Drivers



- Drivers
- Key Features
- Architecture
- Services
- FOMA
- Germany
- Netw. Sharing

Is it Really True? (1)

Mobile services pay the way

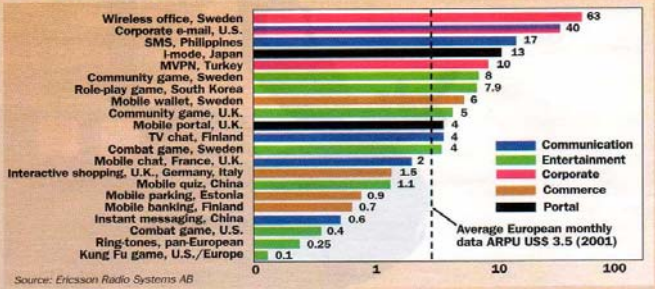
BY JOANNE TAAFFE
 • CANNES

What mobile data services are making money? Network equipment vendor Ericsson polled applications developers and operators worldwide in December 2001 to discover which mobile data applica-

tions were proving the most profitable. Ahead of the pack were two corporate applications: one for a wireless office in Sweden and another for corporate e-mail in the United States, which brought in average revenues per user well above those of short messaging services and DoCoMo's i-mode portal. Ericsson in-

cluded in its survey only those applications that had proven traffic volume; and were profitable, market independent and had growth potential, according to Ian James, product manager for wireless Internet solutions at Ericsson. The results of the survey will be presented at this week's 3GSM Congress in Cannes. ■

Monthly average revenue per user for mobile services (in US\$) (log scale)



6 <http://www.totaltele.com/cwl>

16 FEBRUARY 2002
 COMMUNICATIONSWEEK INTERNATIONAL

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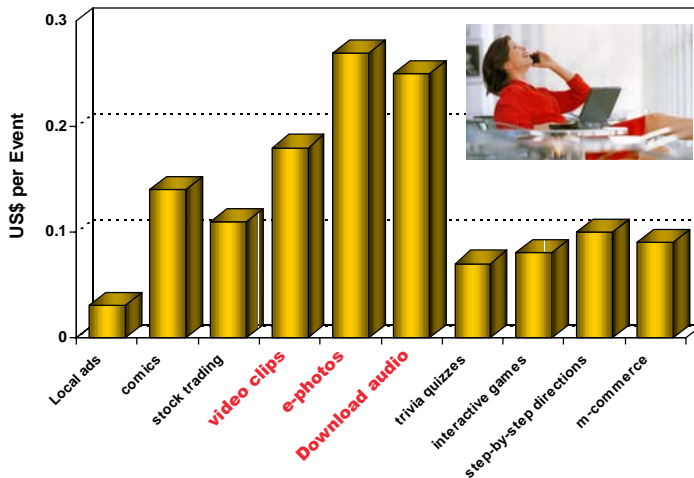
- Drivers
- Key Features
- Architecture
- Services
- FOMA
- Germany
- Netw. Sharing

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Is it Really True? (2)

Youth demonstrated strong interest and willingness to pay for multimedia applications.



Source: Strategy Analytics (Oct 01)

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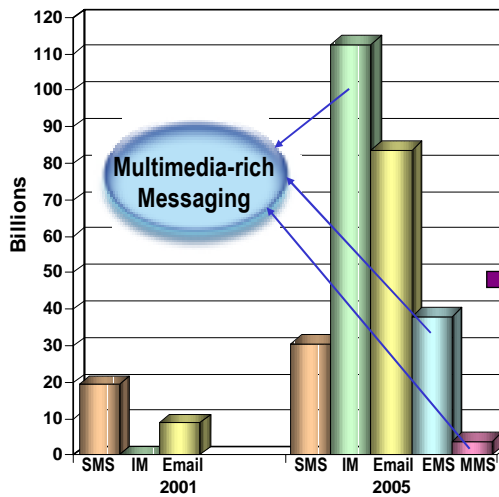
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The Wireless Messaging Opportunity



Worldwide Wireless Messaging Subscriber Forecast

Worldwide Wireless Messages Sent Per Month



Source: Cahners In-Stat Wireless Messaging Fusion, Aug 01

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Real-Time Communications Bring New Services

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Content Types



Static Media

- ◆ Downloadable Music/Video
- ◆ Pictures, books, documents, news...

Download Once – Play Many Times

Streaming Media

- ◆ Audio & video clips, real-time news/quotes
- ◆ Music-on-demand, Video-on-demand
- ◆ Internet radio, Broadcast TV

Continuous Download & Play... No Storage



Interactive Content

- ◆ Games, Gambling
- ◆ Tele- and Video-conferencing

Two-way Communications



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Standardization Committees For 3G

✦ European Telecommunications Standards Institute (ETSI, Europe)



✦ American National Standardization Institute (ANSI, USA)

✦ Committee T1 (USA)

✦ Association of Radio Industries and Businesses (ARIB, Japan)

✦ The Telecommunication Technology Committee (TTC, Japan)

✦ China Wireless Telecommunication Standard (CWTS)

✦ The Telecommunications Technology Association (TTA, Korea)

✦ 3rd Generation Partnership Project (3GPP)



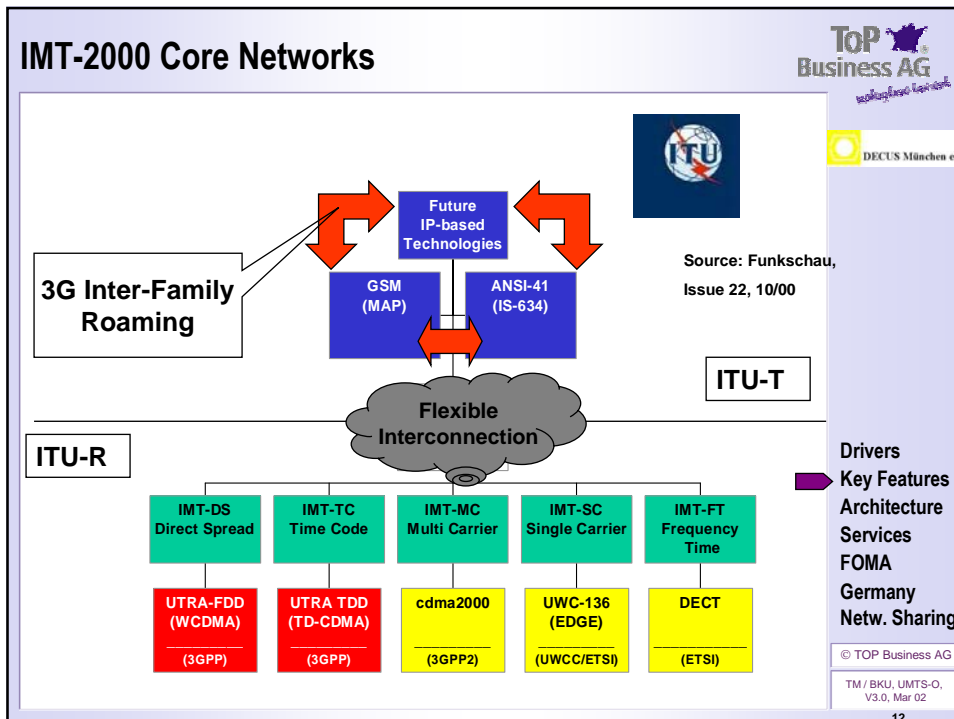
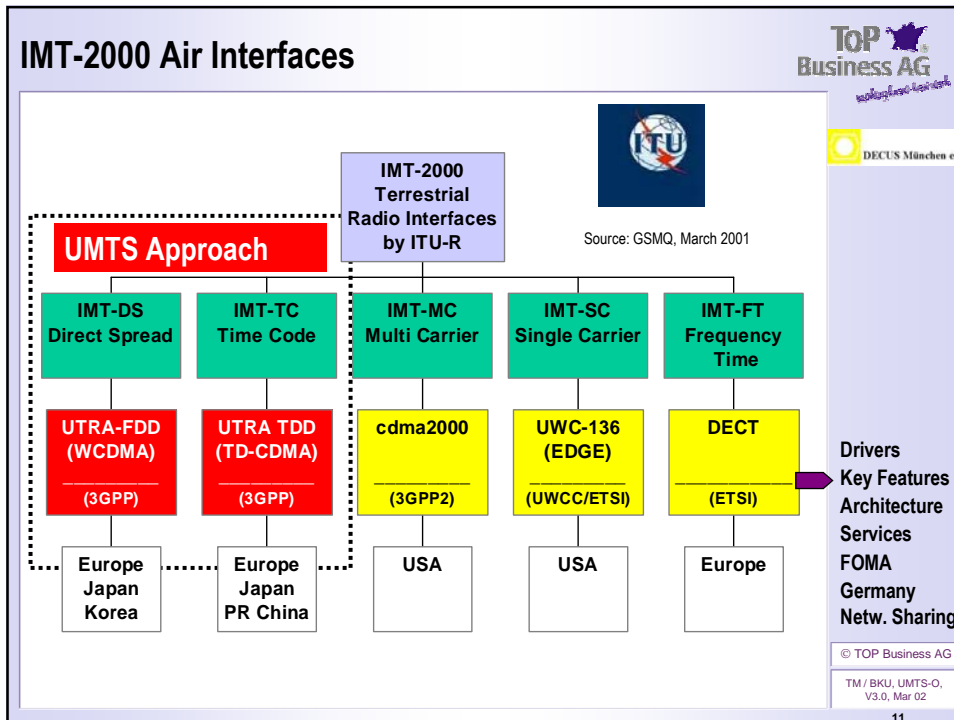
✦ 3rd Generation Partnership Project 2 (3GPP2)

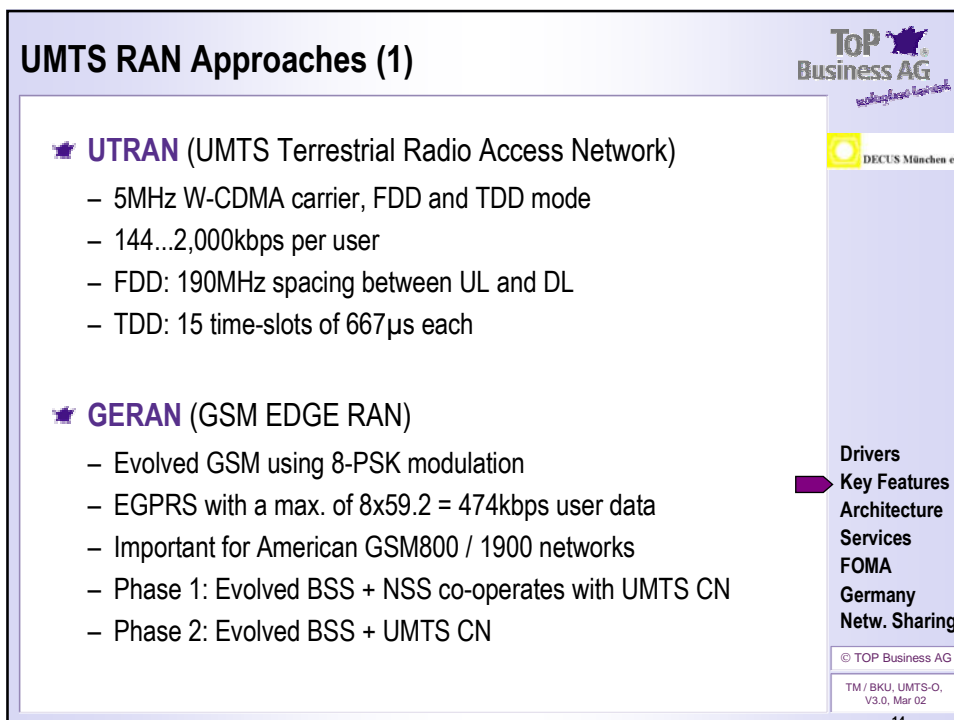
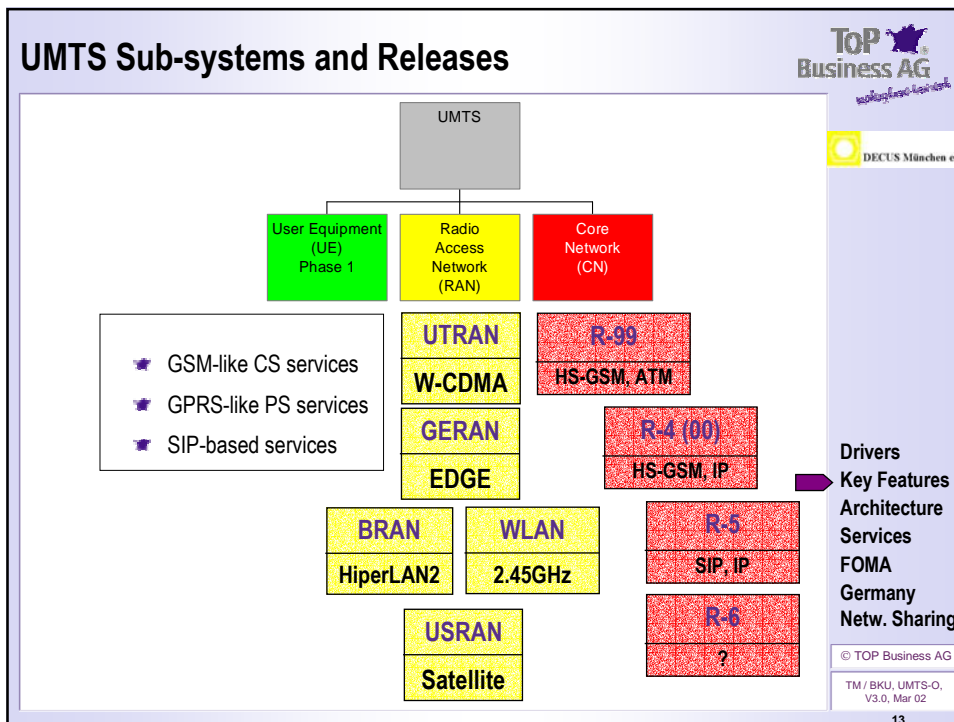


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UMTS RAN Approaches (2)

- ✦ **BRAN** (Broadband RAN)
 - Short-range radio access (50...300m)
 - HiperLAN2 (High-Performance Radio LAN)
 - <25Mbps per user
 - 5.2 / 17.2GHz range, partly unlicensed!
 - BPSK...64QAM with 5MHz channels
- ✦ **WLAN** (Wireless LAN)
 - 2.45GHz range (ISM), 10...100m, unlicensed!
 - IEEE802.11 with <11Mbps per user
 - Bluetooth with <1Mbps per user
- ✦ **USRAN** (UMTS Satellite RAN)
 - Not yet defined
 - Role of existing SatCom t.b.d., e.g.,

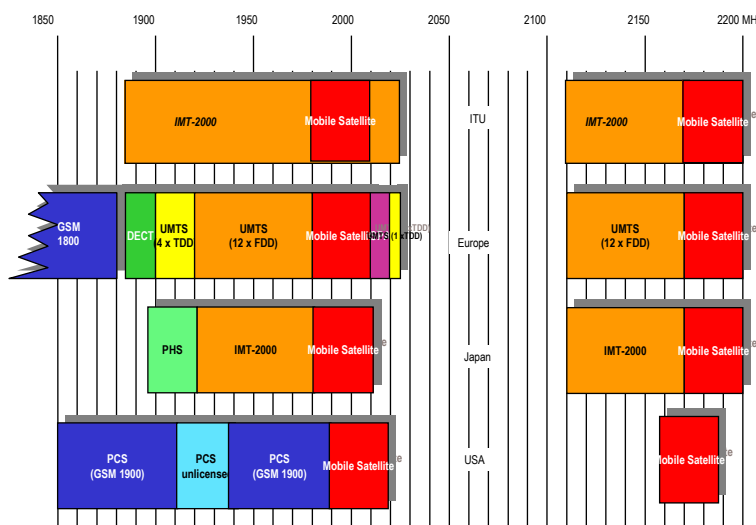


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Spectrum for UTRA



Source: ITU, Feb 2000

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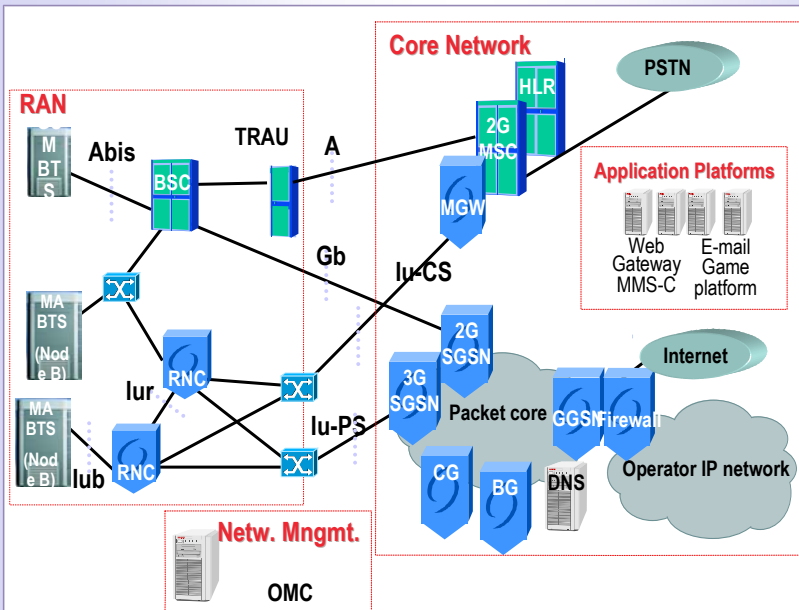
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UMTS CN Phases

- ★ **R-3 (R-99)**
 - Uses GSM NSS with IWF
 - Uses GPRS with IWF
 - ATM transport
- ★ **R-4 (former Rel. 2000)**
 - Bearer-independent CS domain
 - Transport over IP
 - Using Media Gateway
- ★ **R-5**
 - Mobile Internet
 - IP Multimedia
 - Session Initiation Protocol (SIP)
- ★ **R-6**
 - Completion of R-5 features, ???

UMTS R-99 (R-3) Architecture



UTRAN Components

Node B (W-CDMA BTS)

- TX / RX in one or more cells
- supports FDD and TDD operation
- Layer 1 radio operations incl. diversity and power control
- all cells within one Node B share the same SFN (System Frame No.)



RNC (BSC in GSM)

- Radio Resource Management
- Connection Management (call establishment, maintenance, release)
- Mobility Management (inter-RNC handover)



CN Components (1)

HLR

- Tasks as in GSM
- Subscriber's Record contain
 - Subscriber IDs (IMSI, MSISDN, PDP Address)
 - Location info (VLR No., MSC No., SGSN No.)
 - Parameters for subscribed basic and suppl. Services
 - Service restrictions (e.g., roaming)
 - PDP (Packet Data Protocols)
 - CSI (CAMEL Service Indicators)
 - Location-based Service indicators



CN Components (2)

- ✦ MGW (Media Gateway)
 - ATM / TDM conversion
 - lu / A signalling conversion between narrowband and broadband S7
 - Transcoding
- ✦ VLR
 - Temporary data base within MSC
 - Copy of subscriber's record from HLR
- ✦ SGSN
 - Packet routing
- ✦ GGSN
 - interface to IP networks, PSPDN, coporate networks

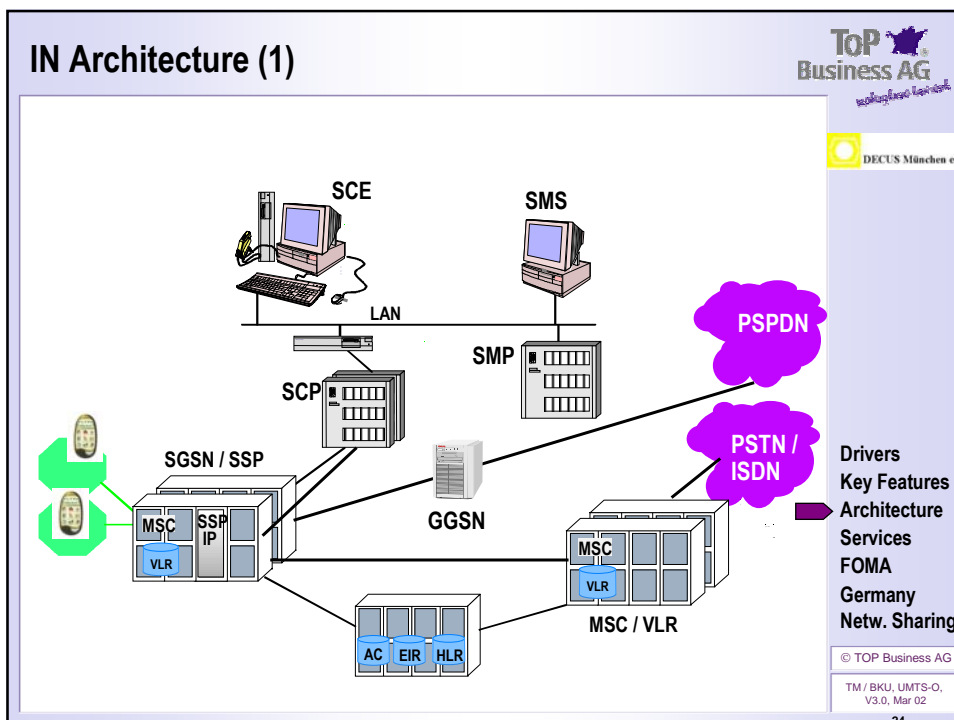
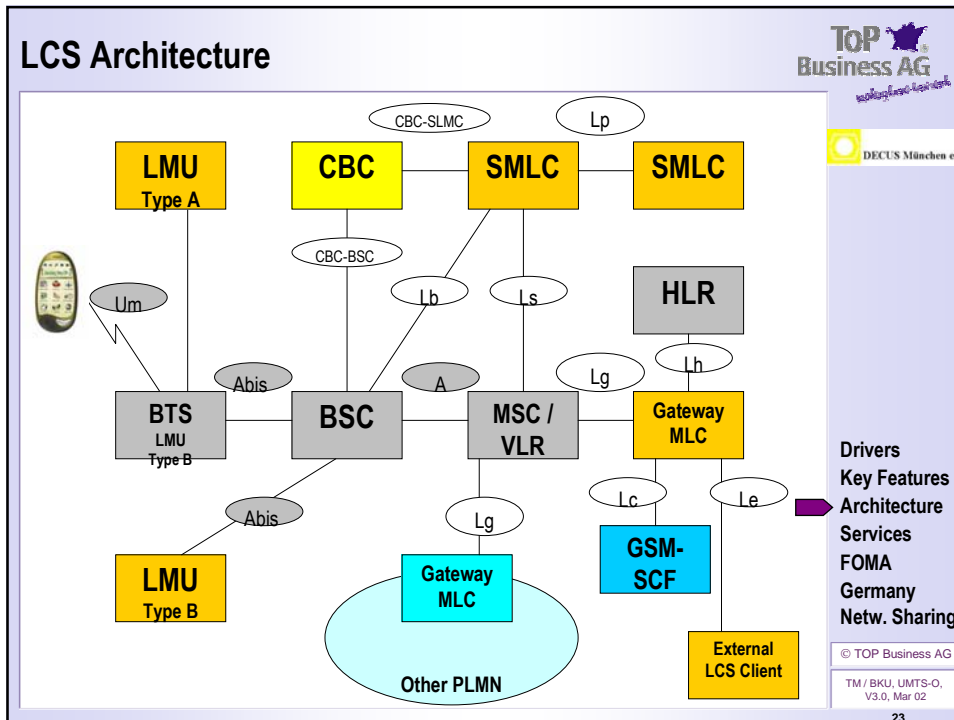


CN Components (3)

- ✦ SMS-C
 - ✦ CBC
 - ✦ VMS
- } as in GSM
- ✦ MMS (Multimedia Messaging Server)
 - Store & forward multimedia message switch
 - Unified acces to different mail boxes
 - Issue media type incl. format conversion according to user's profile
 - ✦ LCS components
 - GMLC
 - SMLC
 - LMU

} as in GSM



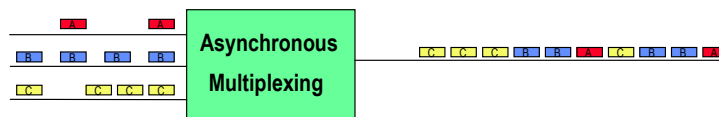
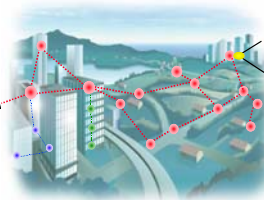


IN Architecture (2)

- ✦ SCP (Service Control Point)
 - Execution environment for service logic programs
 - Real-time data base
- ✦ IP (Intelligent Peripheral)
 - Interaction with the user by voice recognition or DTMF tones
- ✦ SCE (Service Creation Environment)
 - Creation and customization of user-specific IN services using CAMEL
- ✦ SMP (Service Management Point)
 - Service management by SMS (Service Management System, operator) or Web interface (individual)

Transmission in UMTS Networks

- ✦ Based on ATM (R-99)
 - Switched Virtual Channels or
 - Permanent Virtual Channels for
- ✦ For applications (User Plane)
 - SVC with AAL2 for CS services
 - PVC with AAL 5 for PS services
- ✦ Control Plane
 - PVC with SAAL / UNI for Node B - RNC
 - PVC with SAAL / NNI for RNC - RNC
 - B-ISUP for inter-ATM switch control



UMTS Handsets



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UMTS SIM (USIM)

- ✦ Own processor and memory
- ✦ Two types of data:
 - Specified data
 - Subscriber dependent
- ✦ Featuring:
 - Two name fields per entry
 - Multiple phone numbers per entry
 - Support of e-mail address
 - User definable groupings
 - Call details
 - USIM security
 - USAT (UMTS SIM Application Toolkit)



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USAT (1)

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- ✦ Set of commands and procedures to write USIM applications
- ✦ Supported by early UMTS mobiles?
- ✦ Proactive SIM card
 - Menu configuration
 - Languages
 - Call set-up
 - Event hooks
 - Upload parameters to mobile equipment, e.g., local info
 - Run AT commands, send DTMF
 - USAT local link with  **Bluetooth**
BRAND AND CONNECTIONS TRADE MARK
 - Launch browser

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USAT (2)

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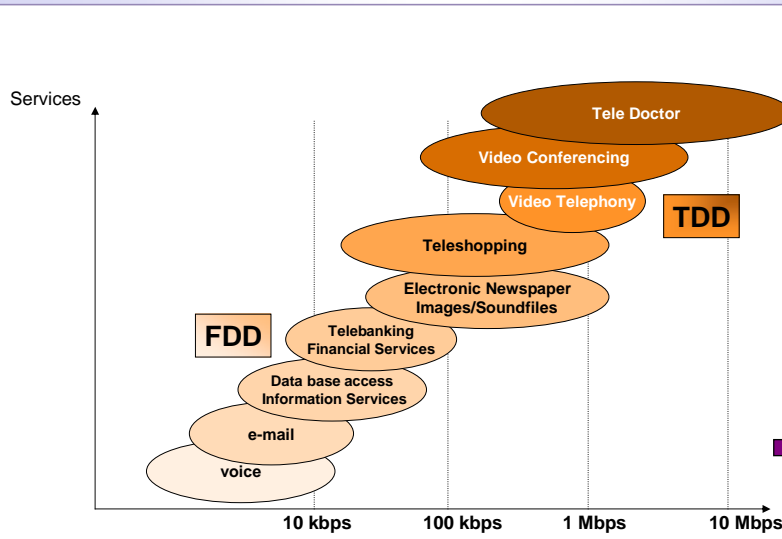
- ✦ SIM data download
 - via SMS or SAB
- ✦ Service screening
 - Call enabling / disabling
- ✦ Service discovery support
 - Maps services available on the SIM to mobile equipment and vice versa
 - Service search with filters

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UMTS Services And Required Data Rates



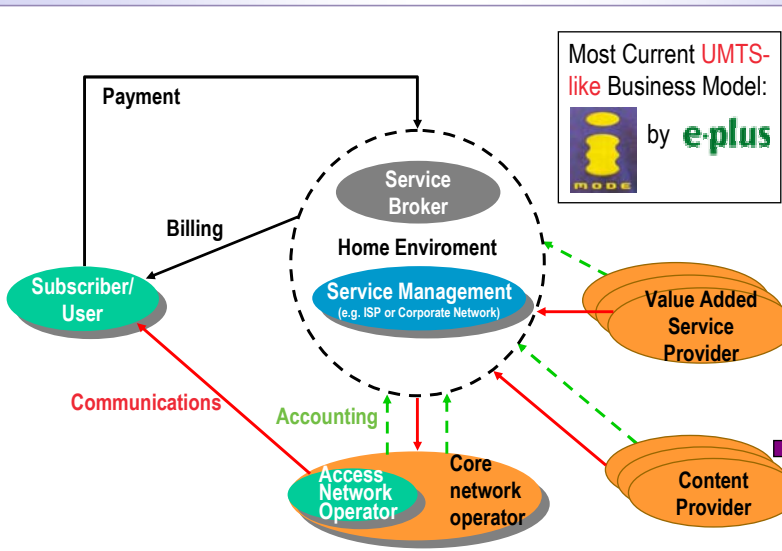
Source: TOP Business AG, White Paper Mobile Applications, Feb 2002

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UMTS Service Management



Most Current UMTS-like Business Model:
by e-plus

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R-99 UMTS Services - Evolved GSM Teleservices (1)

Speech with EFR and AMR coding

- flexible QoS
- vocoder can be adopted each 40ms during call

Codec Type	Bit Rate (kbps)
GSM EFR	12.2
-	10.2
G.728 CELP	7.95
TDMA EFR (IS-641)	7.40
PDC EFR	6.70
-	5.90
-	5.15
HR	4.75
-	1.80

HiFi audio

- AMR-WB codec (speech, music)
- 7kHz audio
- 32kbps planned

TFO (Transcoder Free Operation)

- for mobile to mobile calls

Multi Call

- 1 speech + <6 data calls

R-99 UMTS Services - Evolved GSM Teleservices (2)

SMS as in GSM (160 characters)

EMS (Enhanced Messaging Service)

- Standard SMS with enhanced format in User Data Header
- Formatted text with colors and paragraphing
- Still pictures (b&w, grey scale, color)
- Animations (sequence of 4 pictures)
- Melodies (<128 octets in IrDA iMelody format)
- vCard, vCalendar objects



R-99 UMTS Services - Evolved GSM Teleservices (3)

- **MMS (Multimedia Messaging Service)**
 - Store and forward MMs between mobile / non-mobiles
 - integrated server architecture to support
 - MIME (Multimedia Internet Mail Extension)
 - AMR voice mail
 - JPEG
 - MP3
 - MPEG4
 - Video



- **SAB (Service Area Broadcast)**
 - GSM Cell Broadcast in UMTS
 - CBC interfaces RNC

R-99 UMTS Services - Evolved GSM Bearer Services (1)

- **HSCSD (High-speed Circuit-switched Data)**
 - Asynchronous standard modem speeds:

User Bit Rate (kbps)	4.8 kbps Channels	9.6kbps Channels	14.4kbps Channels
19.2	4	2	-
28.8	-	3	2
38.4	-	4	-
43.2	-	-	3
57.6	-	-	4

- UDI (Unrestricted Digital Info) at 64kbps
- CS-based multimedia (H.324 on HSCSD)

R-99 UMTS Services - Evolved GSM Bearer Services (2)

- ✦ GPRS (General Packet Radio Service)
 - <2Mbps
 - VoIP-based multimedia (H.323 on GPRS)
- ✦ New service enablers
 - CAMEL (Customized Application of Mobile-enhanced Logic)
 - MExE (Mobile Execution Environment)
 - WAP (Wireless Application Protocol)
 - i-Mode
 - OSA (Open System Architecture)
 - VHE (Virtual Home Environment, fully supported in R-4)
 - LCS (fully supported in R-4)

Minimum QoS Capabilities for UMTS

Operating environment	Real time / constant delay		Non Real time / variable delay	
	Peak bit rate	BER / Max. transfer delay	Peak bit rate	BER / Max. transfer delay
Rural outdoor (Terminal speed up to 500 km/h)	At least 144 kbit/s (preferable 384 kbit/s)	10 ⁻³ - 10 ⁻⁷ / 20 - 300 ms	At least 144 kbit/s (preferable 384 kbit/s)	10 ⁻⁵ - 10 ⁻⁸ / 150 ms or more
Urban / Suburban outdoor (Terminal speed up to 120 km/h)	At least 384 kbit/s (preferable 512 kbit/s)	10 ⁻³ - 10 ⁻⁷ / 20 - 300 ms	At least 384 kbit/s (preferable 512 kbit/s)	10 ⁻⁵ - 10 ⁻⁸ / 150 ms or more
Indoor / Low range outdoor (Terminal speed up to 10 km/h)	2 Mbit/s	10 ⁻³ - 10 ⁻⁷ / 20 - 300 ms	2 Mbit/s	10 ⁻⁵ - 10 ⁻⁸ / 150 ms or more

The First UMTS Experiences



- ✦  -Freedom of Mobile Multimedia Access
- ✦ By Japan's NTT DoCoMo since Oct 1, 2001
- ✦ Cross-selection of consumers has been using FOMA handsets since May 2001 under real-world conditions
- ✦ Service area: Tokyo area, inside National Route 16 (within 30 km of Tokyo's center)
- ✦ Handsets with USIM:



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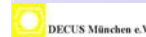
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FOMA Services (1)



- ✦ Voice communications with landline-equivalent sound quality
- ✦ Videophone at 64kbps (real-time video)
- ✦ <384Kbps downlink, <64Kbps uplink high-speed PS data
- ✦ CS connections for high-speed communications at 64kbps-uplink and downlink
- ✦ Short messaging
 - Sending / receiving short text messages between FOMA handsets
- ✦ Multiaccess
 - Simultaneous voice and packet communications








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FOMA Services (2)



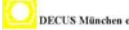
- ✦ High-speed packet communications with maximum 384Kbps downlink connection
- ✦ Sending / receiving up to 10,000 letters (5,000 full-space Japanese characters) i-mode mail with attached still pictures (GIF, JPEG), music (MIDI), etc.
- ✦ Select e-mails (text, attached file) to receive by checking its title

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FOMA Services (3)

- ✦ Class 1 leased-line service
 - Direct link between corporate LAN and FOMA network using a dedicated line for high-security networking
- ✦ Class 2 leased-line service (XWave)
 - Direct link between corporate LAN and FOMA network using an existing connection (ISDN or frame relay) for high-security networking

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UMTS in Germany (1)

- 6 licenses awarded in August 2000
 at ~EUR 51,000,000,000 (!) to

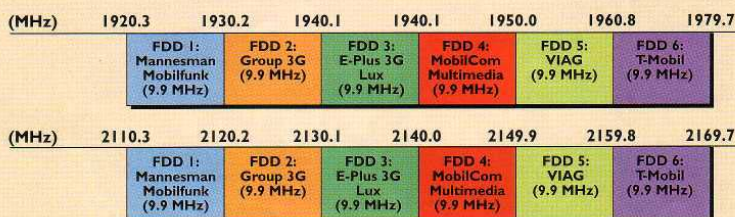


- First networks to be operational in late 2002?
 - Problems in infrastructure implementation
 - MS available?
 - New Node B sites, co-siting with GSM BTSs
 - New discussion on health impact?
 - Possible delays: 2003...2005

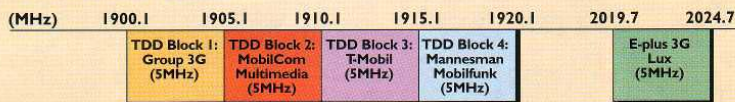
UMTS Frequency Allotment in Germany

Allotment of the UMT/IMT-2000 frequency blocks

FDD frequency blocks








TDD frequency blocks



Source: RegTP, Aug 2000

UMTS in Germany (2)

- ✦ New prefix „015x“, also to be used for GSM





















-  **0151**
-  **0152**
- **e-plus** **0155** (+ 0157 for GSM)
-  **0159**
-  **0156**
-  **0150**

- ✦ Subscriber number = 8 digits (100m numbers per operator)

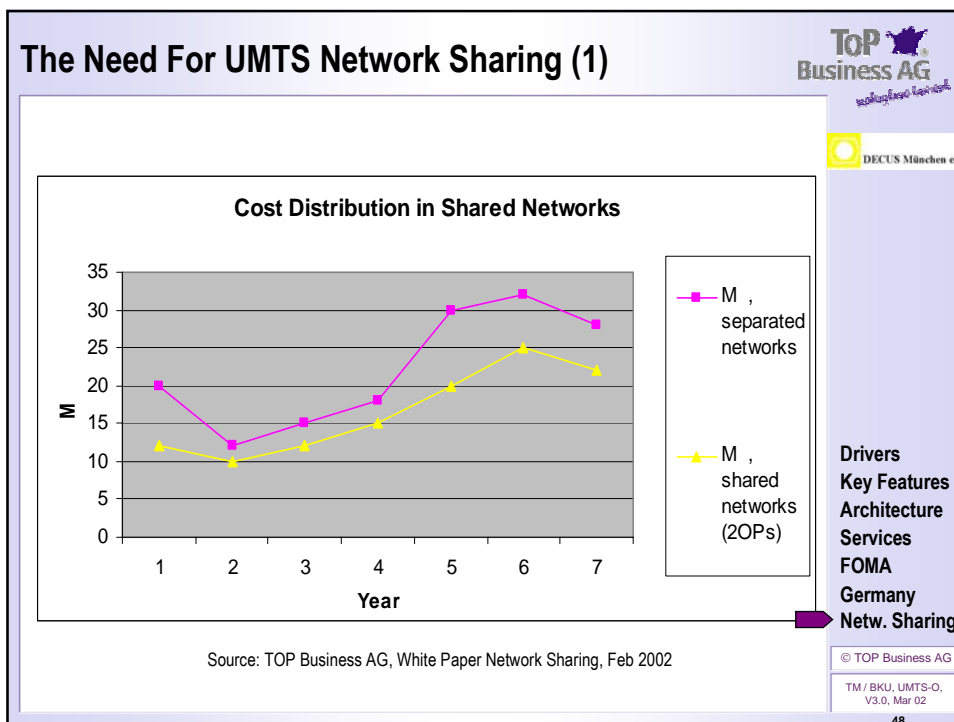
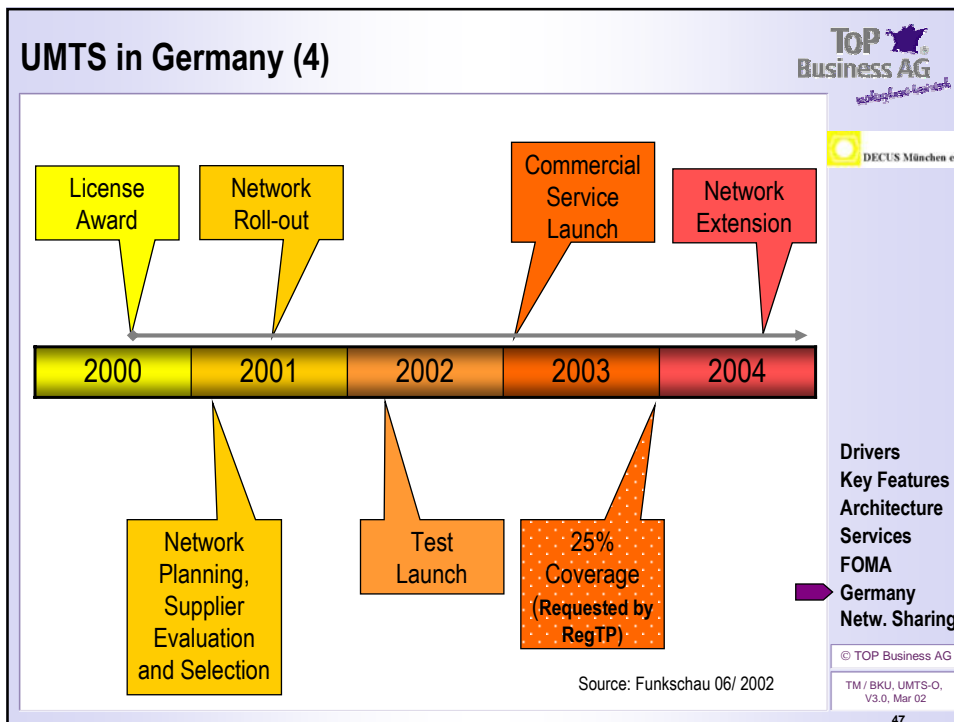
“015x / 99.999.999”

- ✦ Mobile Number Portability
 - Requested by RegTP by 11/2002
 - For 2G and 3G mobile networks

UMTS in Germany (3)

Carrier	Comm. Lauch (planned)	Estimated Costs bEUR	Infra Supplier	Needed Node B Sites	GSM / UMTS Co-siting	Already contracted UMTS Sites
	2003	4 - 6 -30% with netw. sharing	  	no info	Yes, with 	no info
	Q4 2002	3 - 5	 	+000s needed	No	no info
e-plus	2003	~2.5 (2000-2005)	 ?	8,000 until 2005	Yes, with 	all GSM sites
	H2 2003	no info	 ?	5,000 for launch	Yes, 4,000 Sites with 	2,000
	H2 2003	1.45 until 2003	 	8,500 until 2003	Not yet decided	no info
	Q1 2003	6.2 -40% with netw. sharing	 	no info	Yes 	no info

Source: Telecom Handel March 01, updated March 02



The Need For UMTS Network Sharing (2)

PLMN

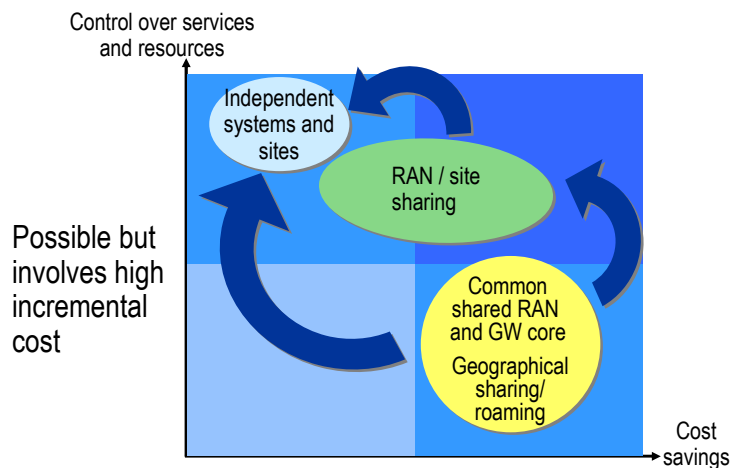
- Serving network operated by one single administration, in one country providing communication capabilities
- PLMN identity (MCC+MNC) and PLMN name stored on USIM
- USIM may overwrite network's PLMN name

Service Provider

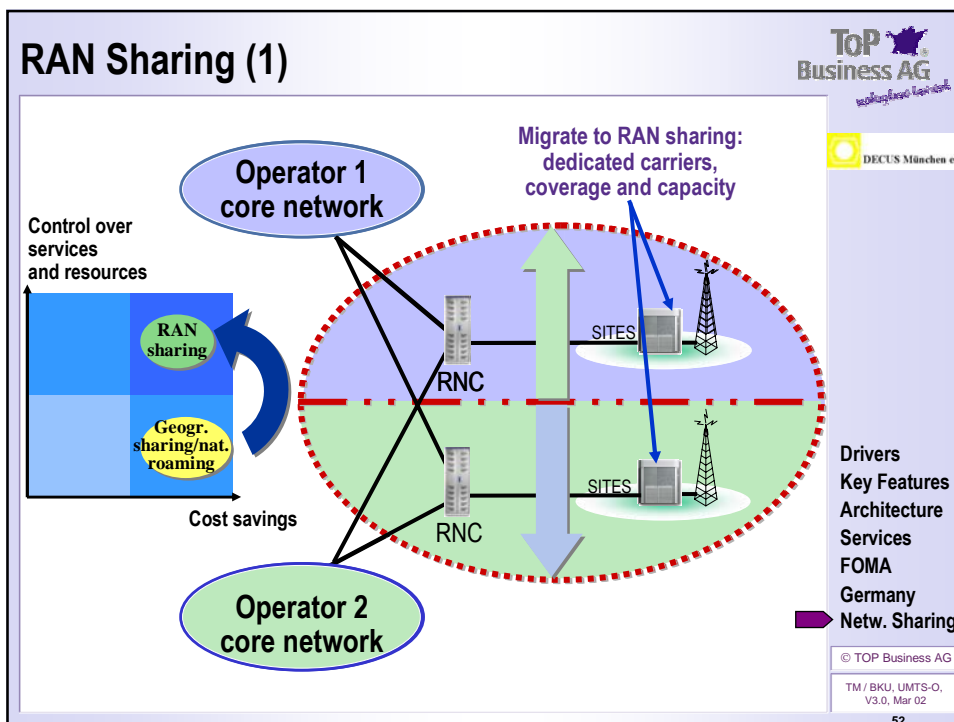
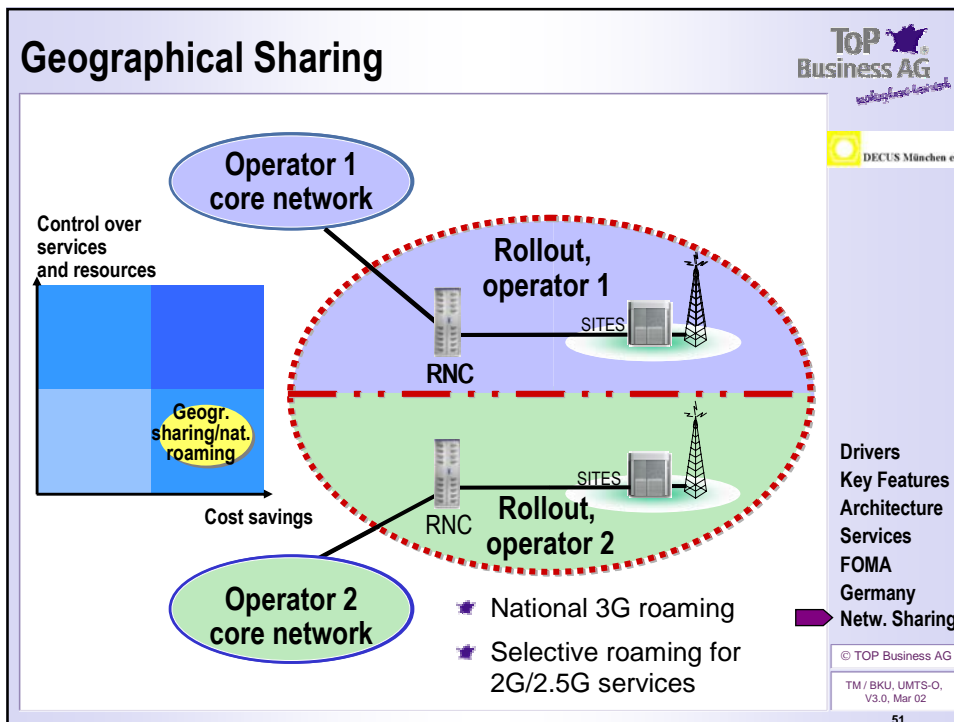
- Home environment for service provisioning and customer care
- Stored on USIM

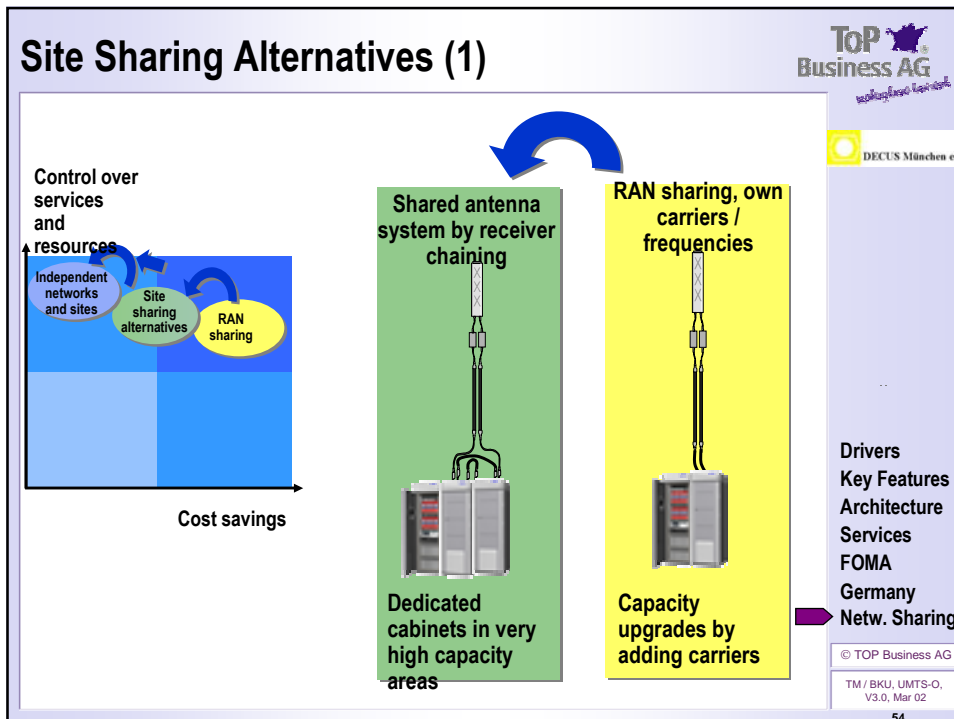
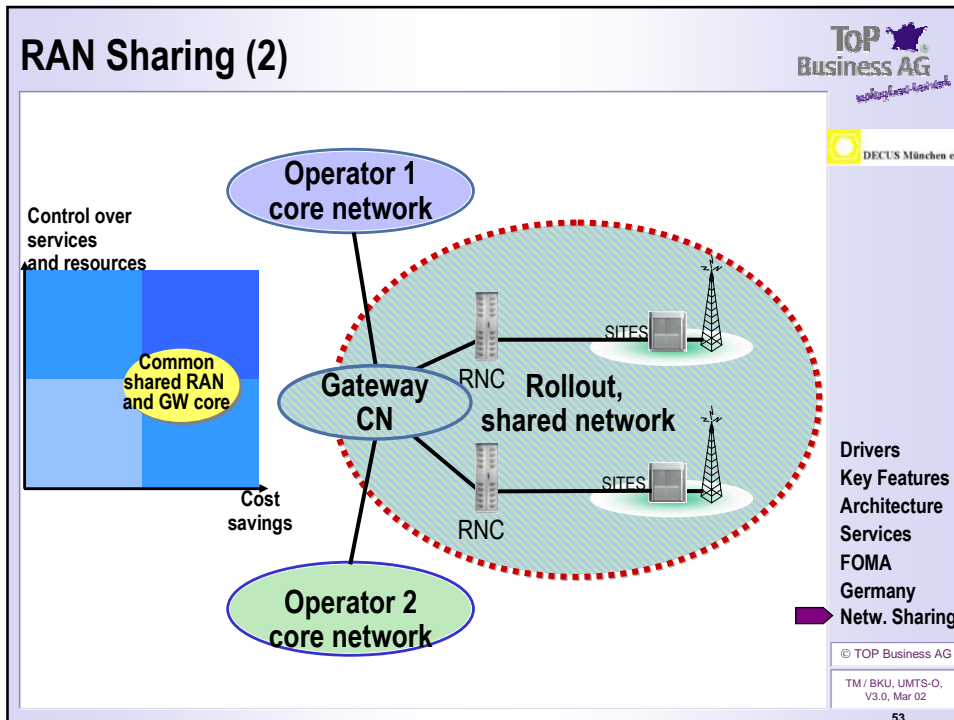
MCC (3 Bytes)	MNC (2-3 Bytes)	NetSubset (2 Bytes)	SP (2 Bytes)	Corporate (2 Bytes)
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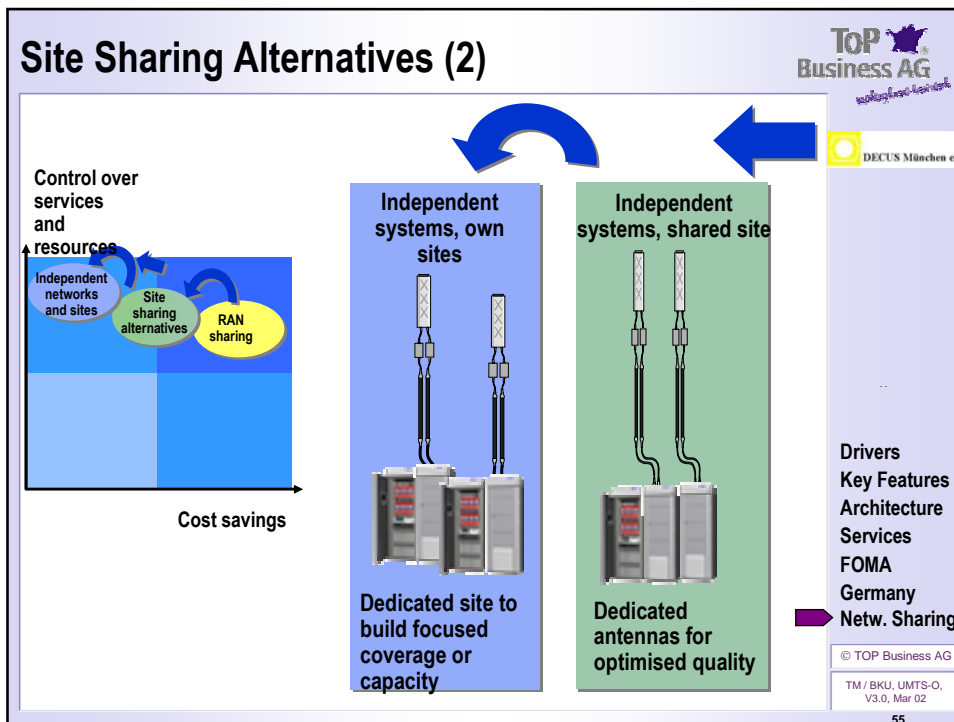
Roaming-based Sharing Or Separate Systems



➔ Evolution through RAN sharing provides high flexibility for cost and control optimisation at every phase







Finally...

✦ More info...

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Thanks a lot for Your attention...



...and further enjoy the conference!!