UMTS Deployment Issues and Economics

Overvieweing key options and economic aspects of UMTS deployment

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UMTS Deployment
The operator's decisions

- **"Entry level" network**
- **Timing of functional enhancements**
- **Timing of capacity increases**
- **Tariff policy and its evolution**

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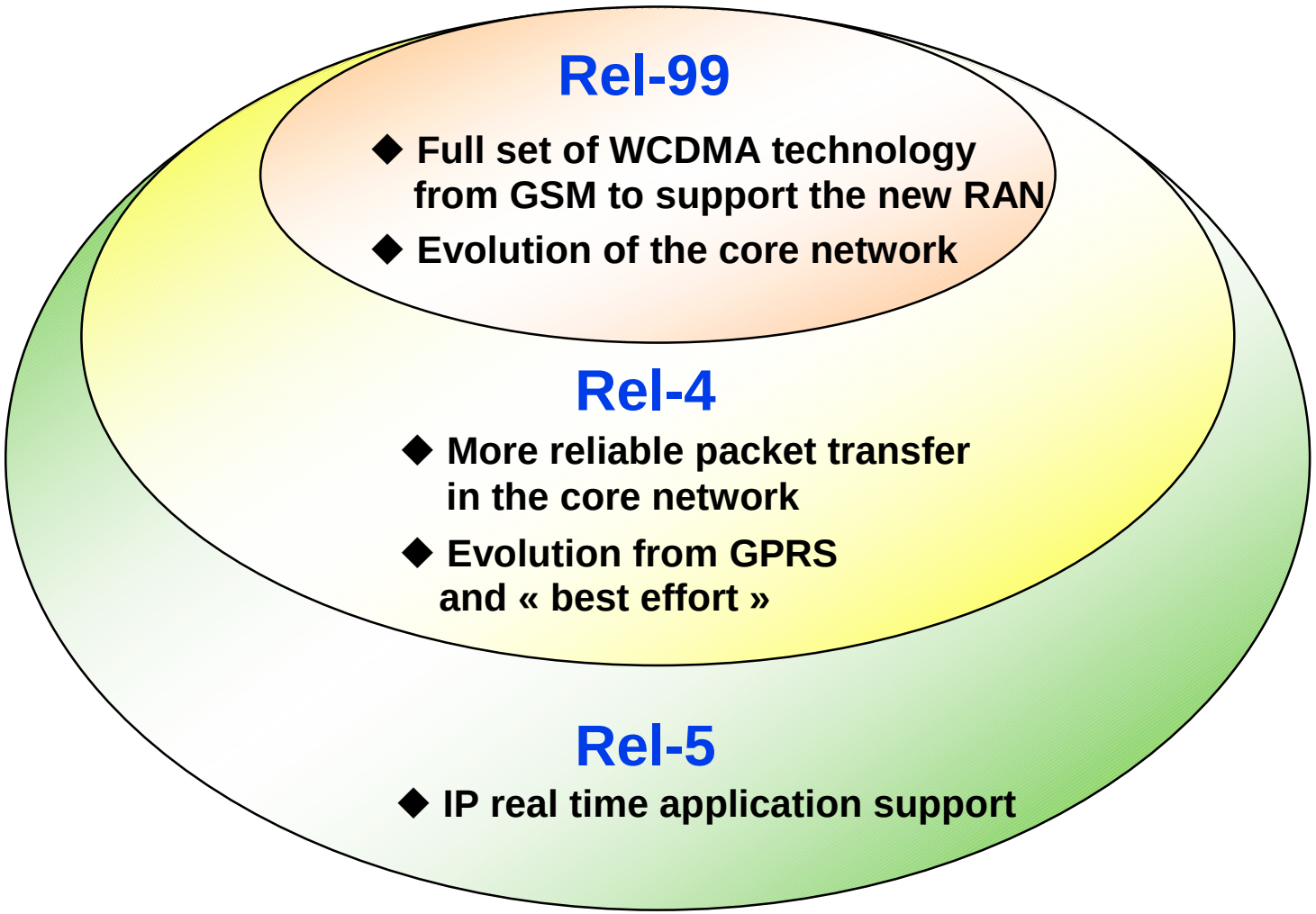
Features of UMTS releases (1)



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Features of UMTS releases (2)

Services & System Aspects		
Release 1999	**Release 4**	**Release 5**
• Services as available with GSM • Multimedia messaging	• Authentication algorithm • Transcoder-Free Operation (TrFO) • Tandem Free aspects for 3G and between 2G and 3G systems • Virtual Home Environment (VHE) and Open Services Architecture (OSA) evolution • Location Services (LCS) in Circuit Switched and Packet Switched domains	• Development/Selection of a Multi-Rate Wideband Speech Codec (50Hz-7kHz) for Wideband Speech Telephony in multiple radio environments • IP-based multimedia services • Push Services • Enhancements to: – Security – VHE – OSA – Global Text Telephony – Location Services – 3G radio access

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Features of UMTS releases (3)

3G Radio Access

Release 1999	Release 4	Release 5
• Completely new Radio Access Network (UTRAN) built “from scratch” • Different base technology compared to GSM: Wideband CDMA instead of TDMA	• New TDD mode (1,28 Mcps) for narrowband applications	• Intra-domain connection of RAN Nodes to Multiple Core Network Nodes
• FDD and TDD (both 3.84 Mcps) • Adopted by ITU as part of the IMT 2000 family	• Radio interface improvements, e.g.: – UTRA repeater • Radio Access Network improvements, e.g.: – Robust Header Compression (first use of IETF RFC 3095)	• High Speed Downlink Packet Access • Evolution of UTRAN transport: support of IP and radio bearers for efficient IP-based multimedia services • Separation of resource reservation and radio link activation benefits to high bit-rate users

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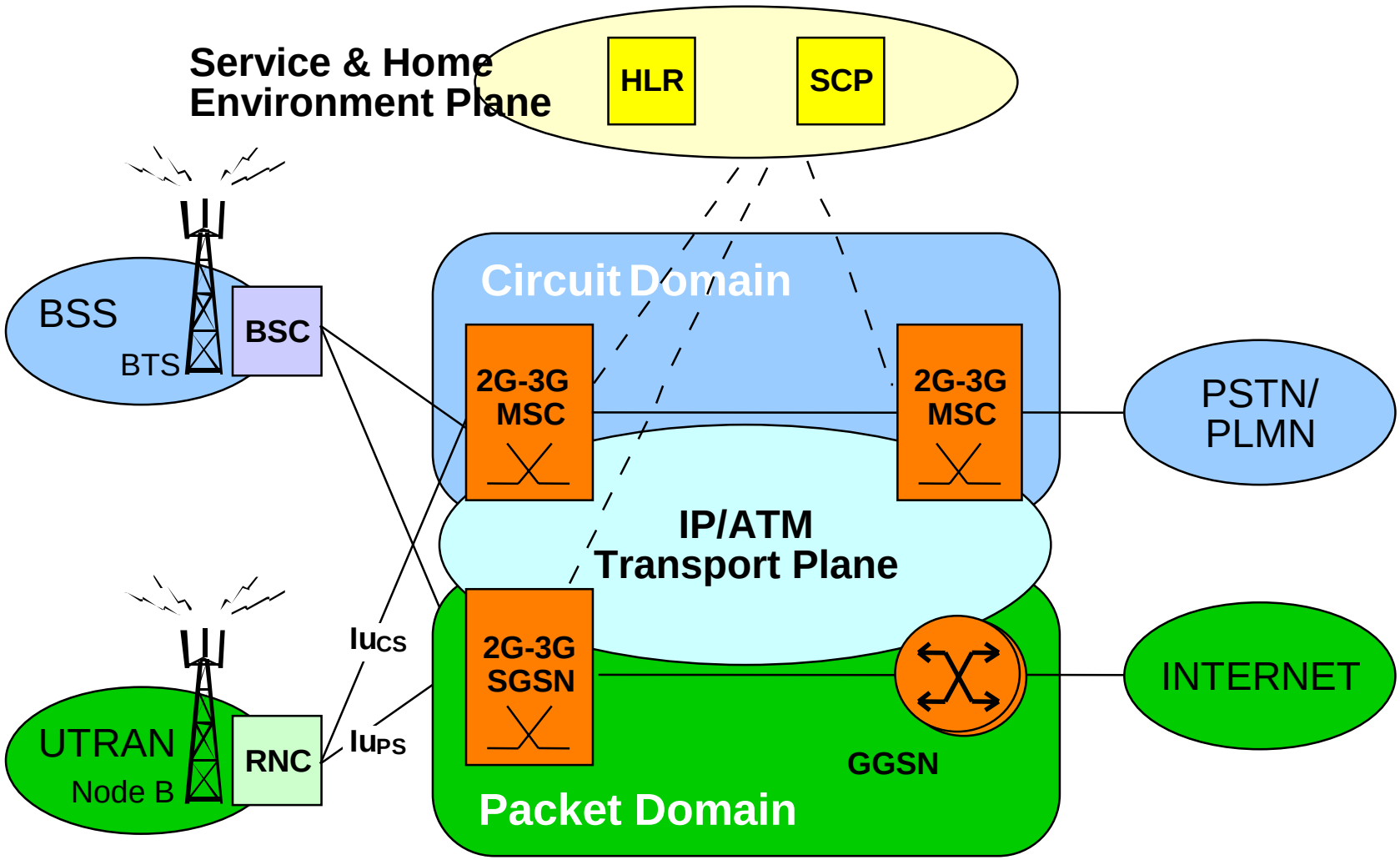
Features of UMTS releases (4)

Core Network

Release 1999	Release 4	Release 5
• CAMEL Phase 2 and 3 • Basic UMTS Security issues	• Evolution of Transport in the CN • Non-Transparent Real Time Facsimile • Circuit Switched (CS) Emergency Call Enhancements	• Provisioning of IP-Based Multimedia Services (SIP Call Control protocol)
• EDGE	• Enable Bearer Independent CS Architecture	• Packet Switched (PS) Emergency Call Enhancements • CAMEL Phase 4
• ACSI (Advanced Speech Call Items) Call Forwarding Enhancements	• Transcoder-Free Operation • ASCI Enhancements • Operator Determined Barring (ODB) for Packet Oriented Services	• Intra Domain Connection of RAN Nodes to Multiple CN Nodes • Reliable end-to-end QoS for Packet Switched domain
• GPRS		
• GPRS Tunnelling Protocol Enhancements • Handover		
• GSM-UMTS internetworking		
• Mobile Station Classmark • Multicall • Circuit Switched Bearers in UMTS		
• OSA		
• Unstructured Supplementary Service Data		

UMTS Deployment
UMTS Release 99



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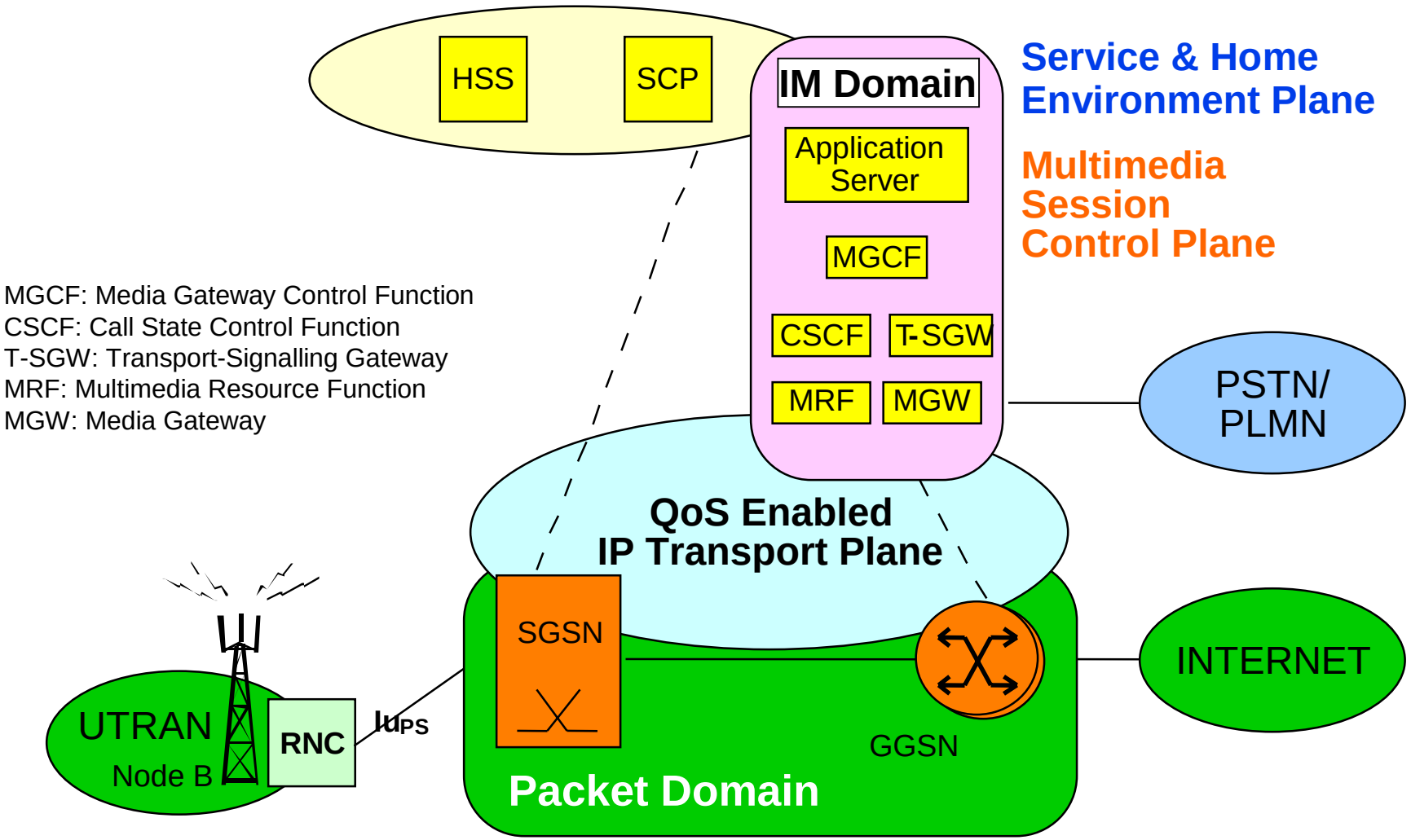
UMTS Release 5



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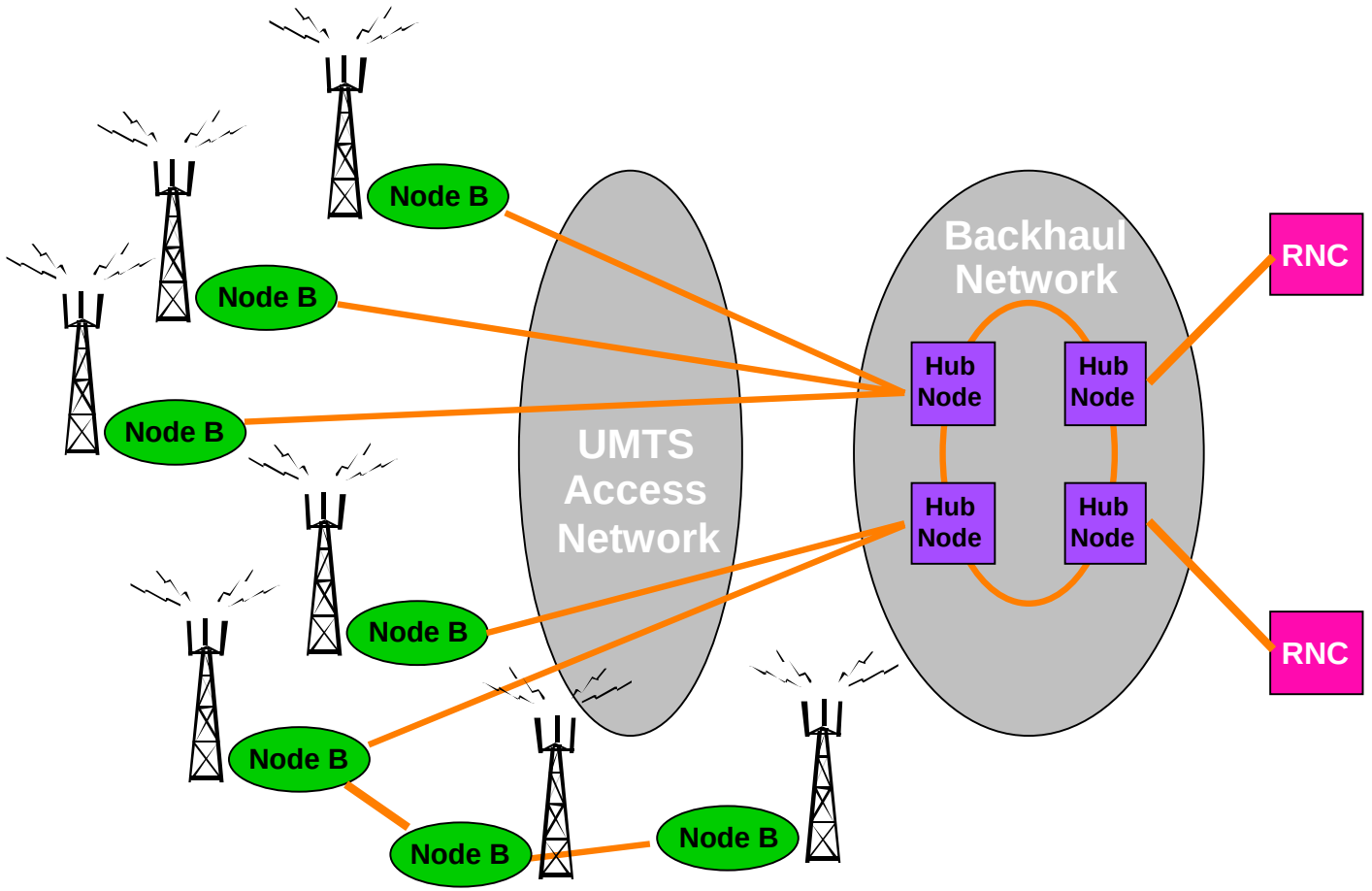
UTRAN transport solutions



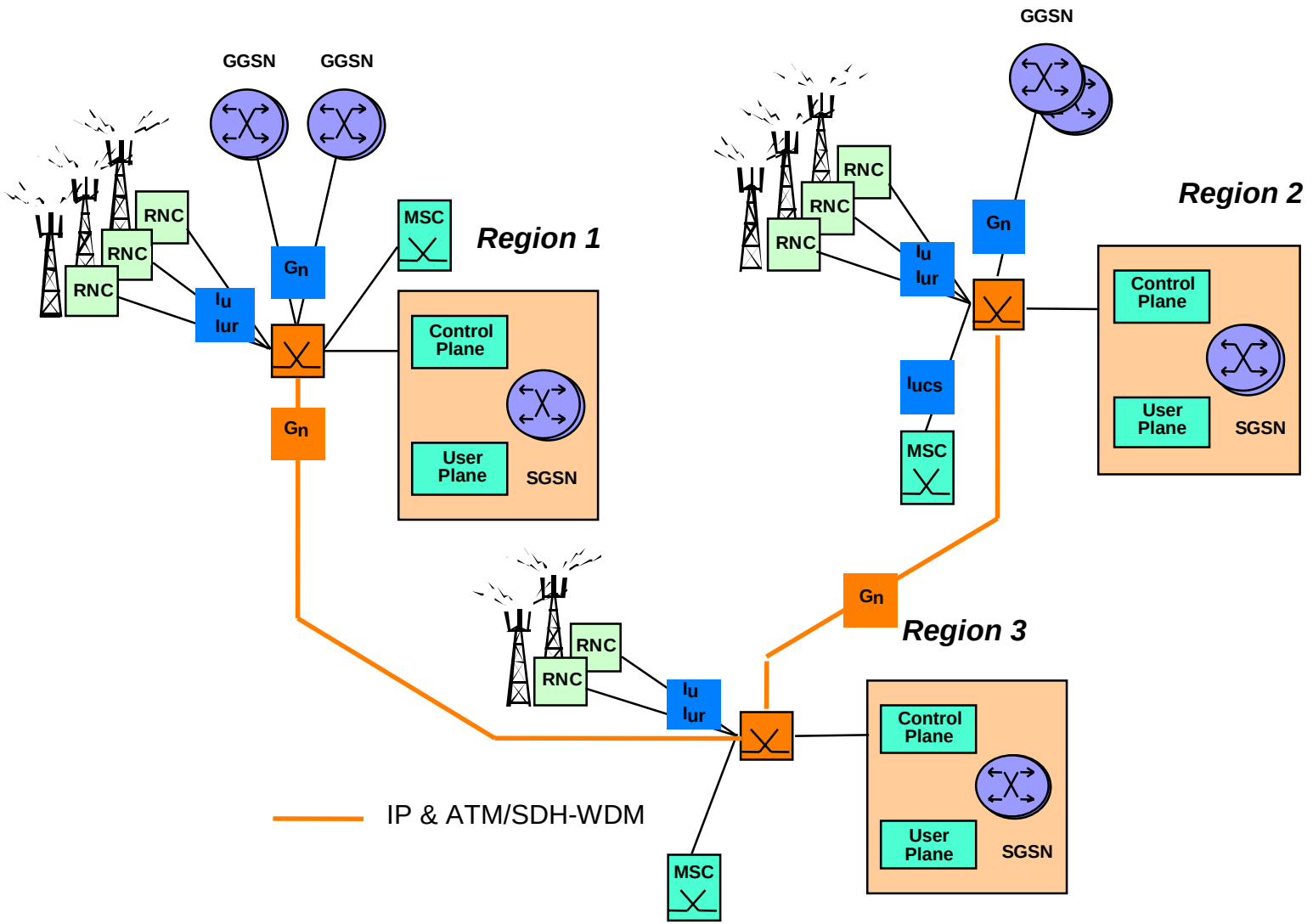
Physical media and the transport technique

- Low capacity microwave (PDH)
- High capacity microwave or optical links (SDH STM-1/STM-4)
- ATM, LMDS, XDSL, leased lines

Topologies

- Tandem
- Ring
- Star

Architecture for core network transport



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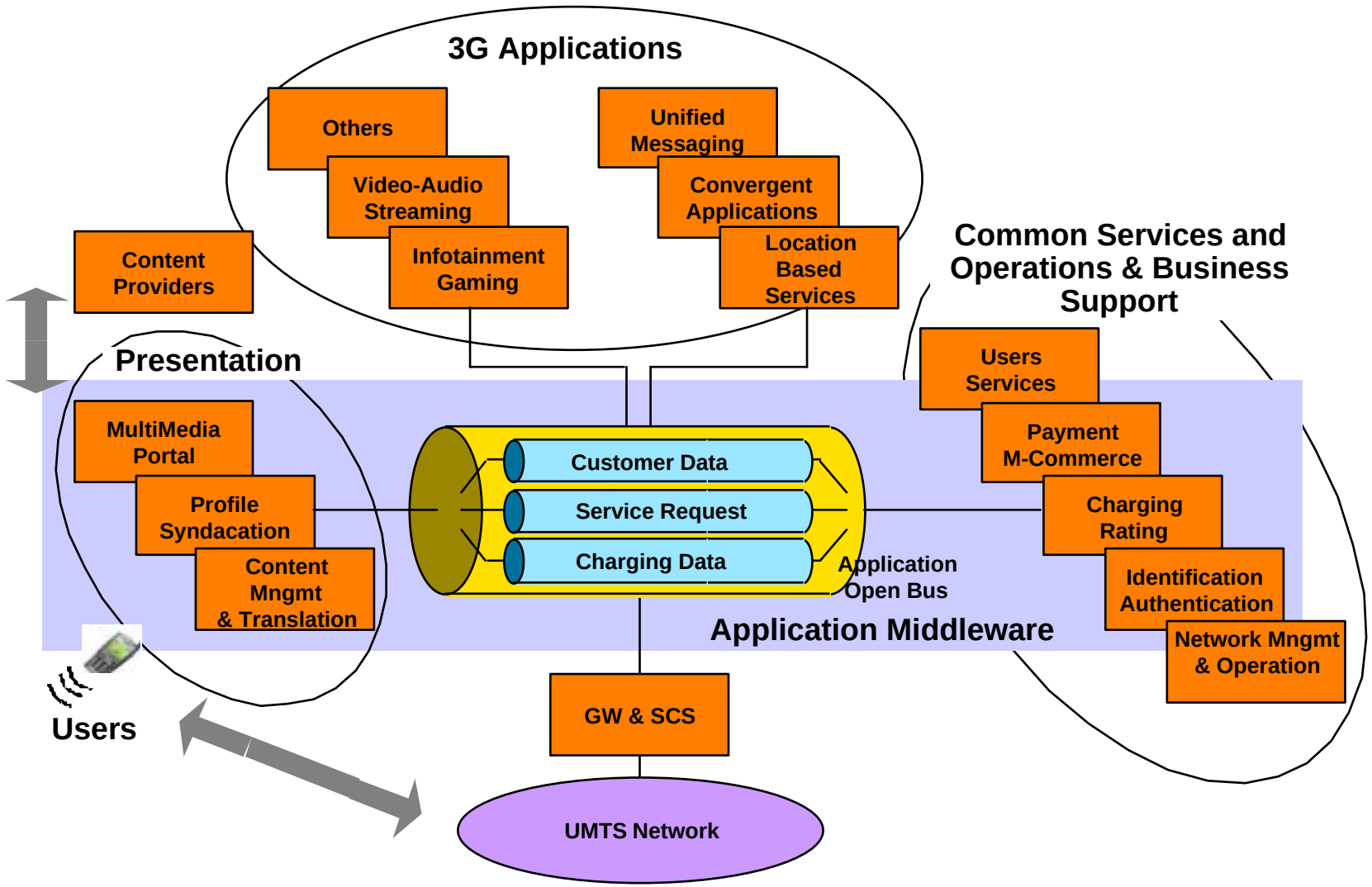
Core Network: Key options

- **Different types of UMTS terminals**
- **Multimedia services**
- **UMTS standards with respect to IP Multimedia aspects**
- **Replacement of first-release 3G terminals**
- **Speed of UMTS market growth**

Service Platform: Functional architecture



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Service platform: Key options

Service Category	Market Segment
Mobile Intranet/Extranet Access	Business
Mobile Internet Access	Business, consumer
Location Based Services	Business, consumer
Rich Voice	Business, consumer
Customized Infotainment	Consumer
Multimedia Messaging Service	Consumer

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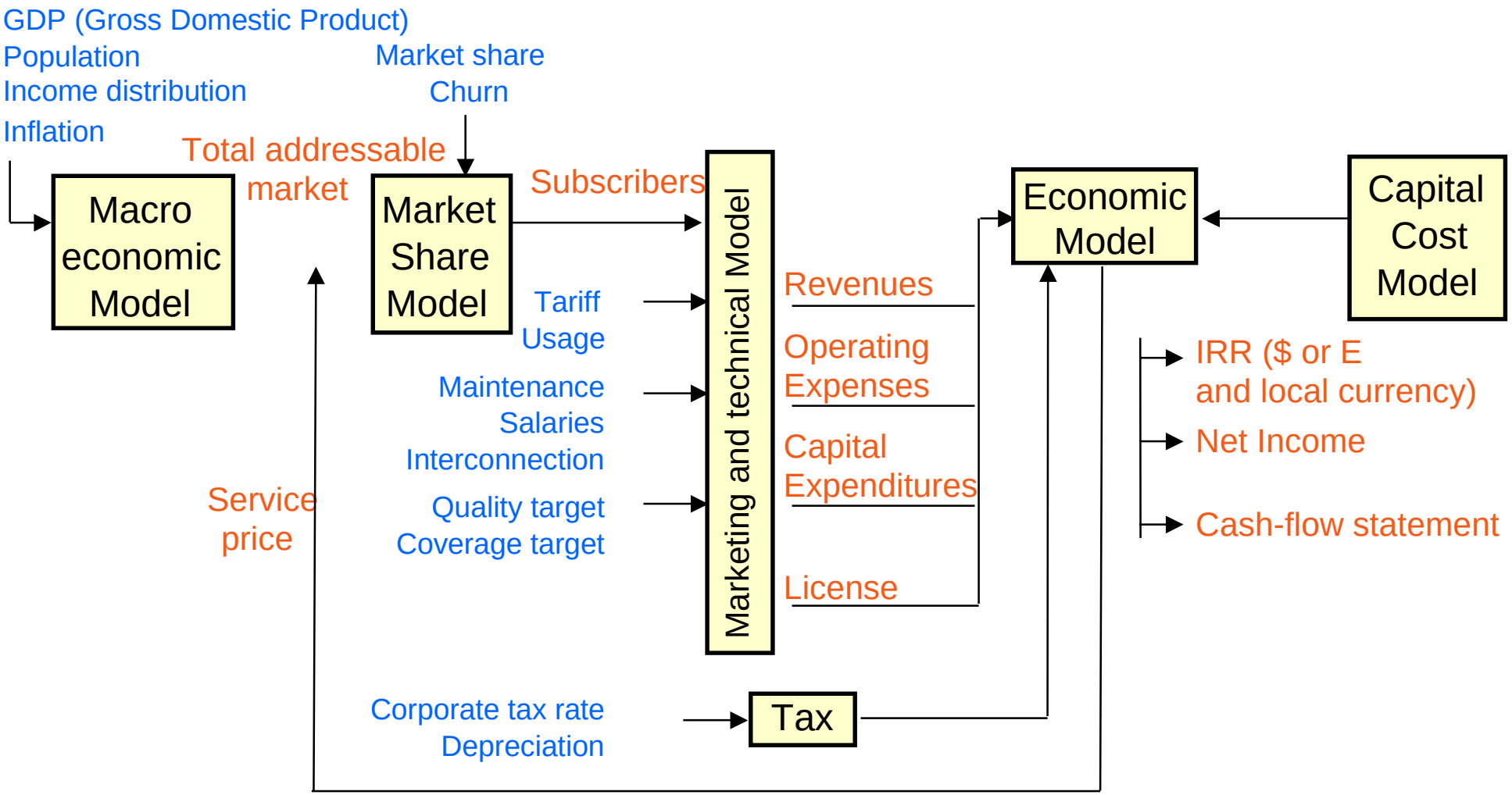
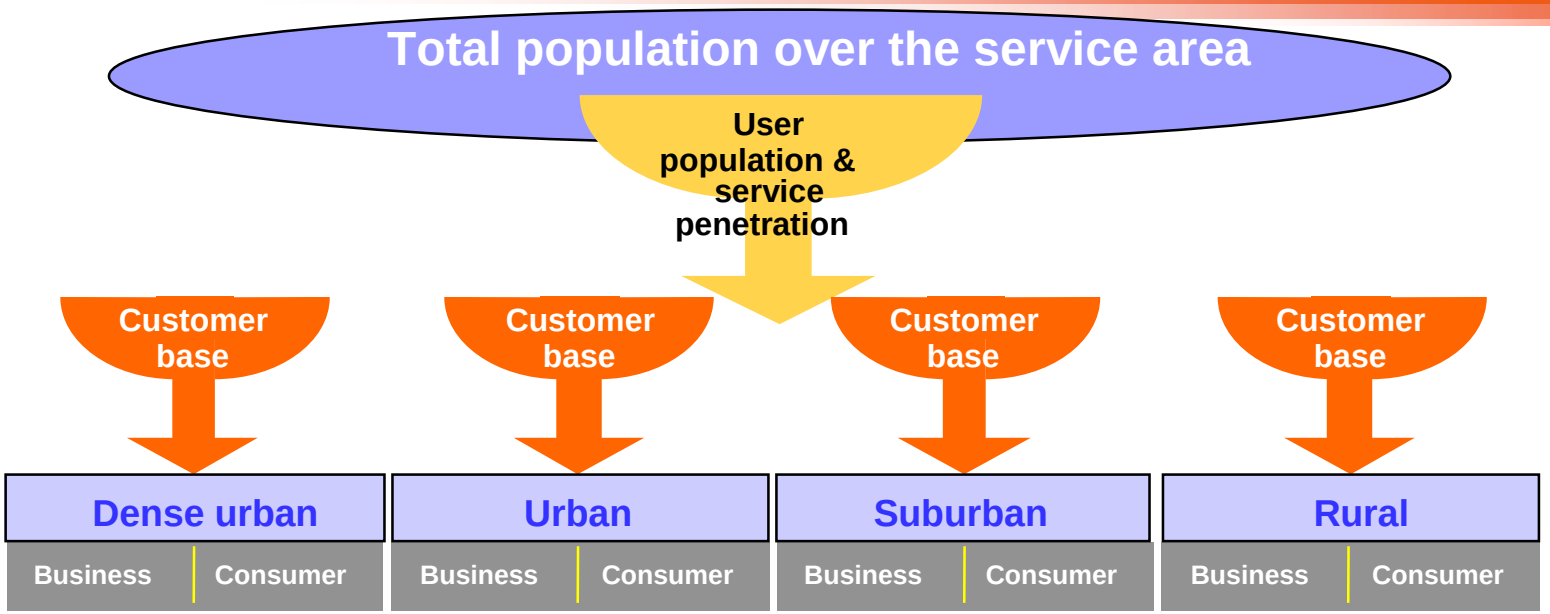
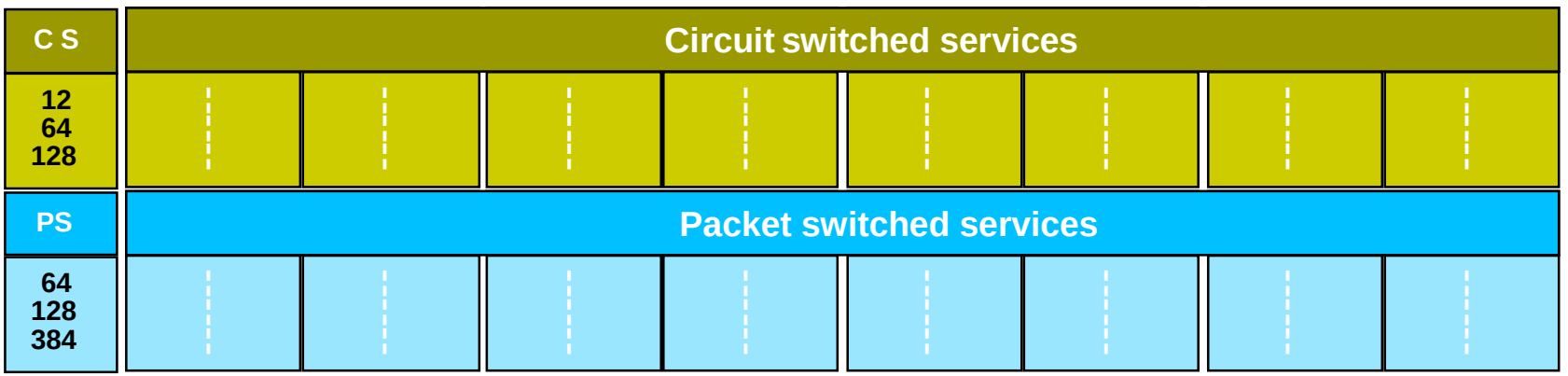
Business Analysis modeling

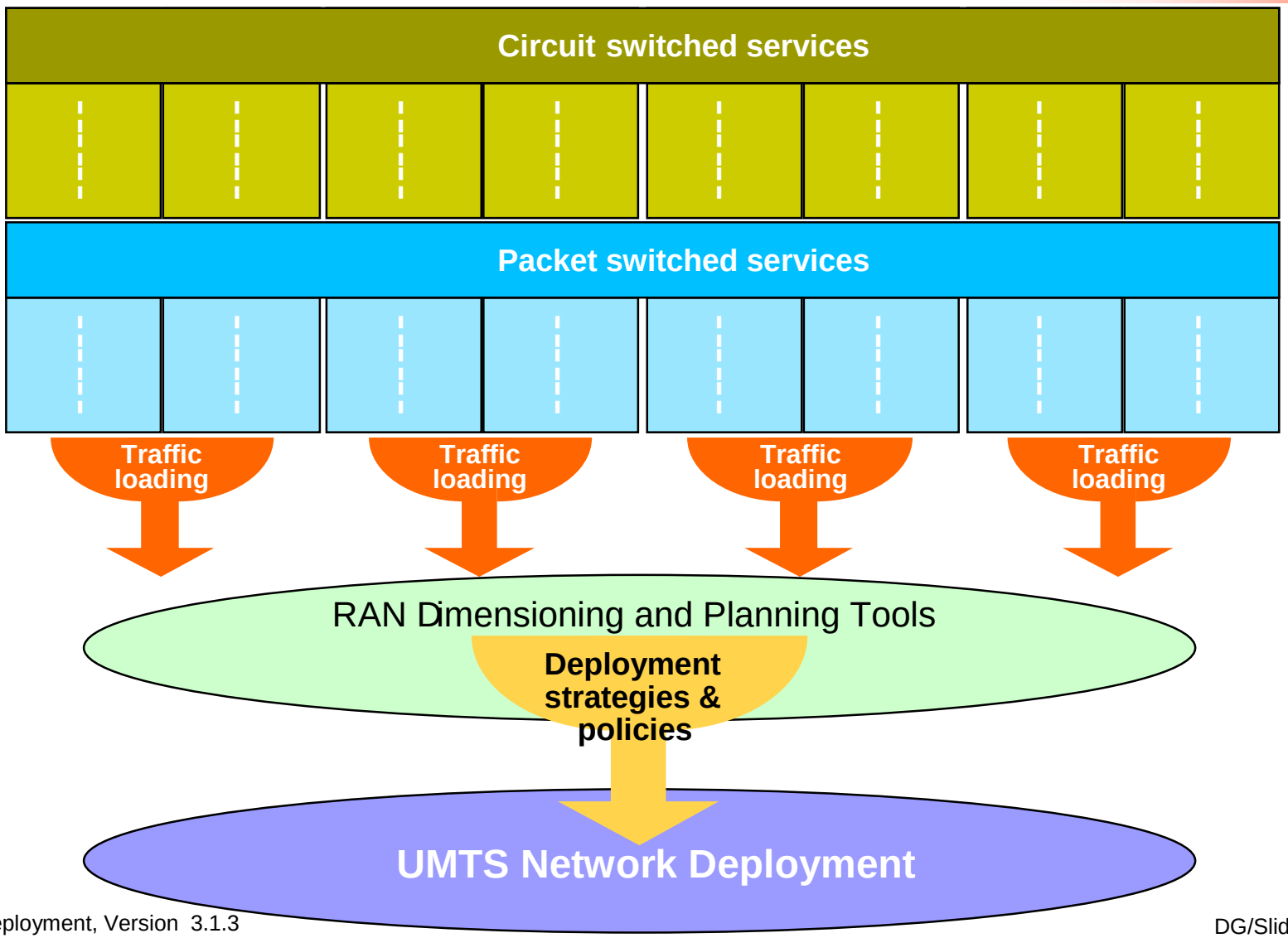


RAN planning and UMTS deployment (1)

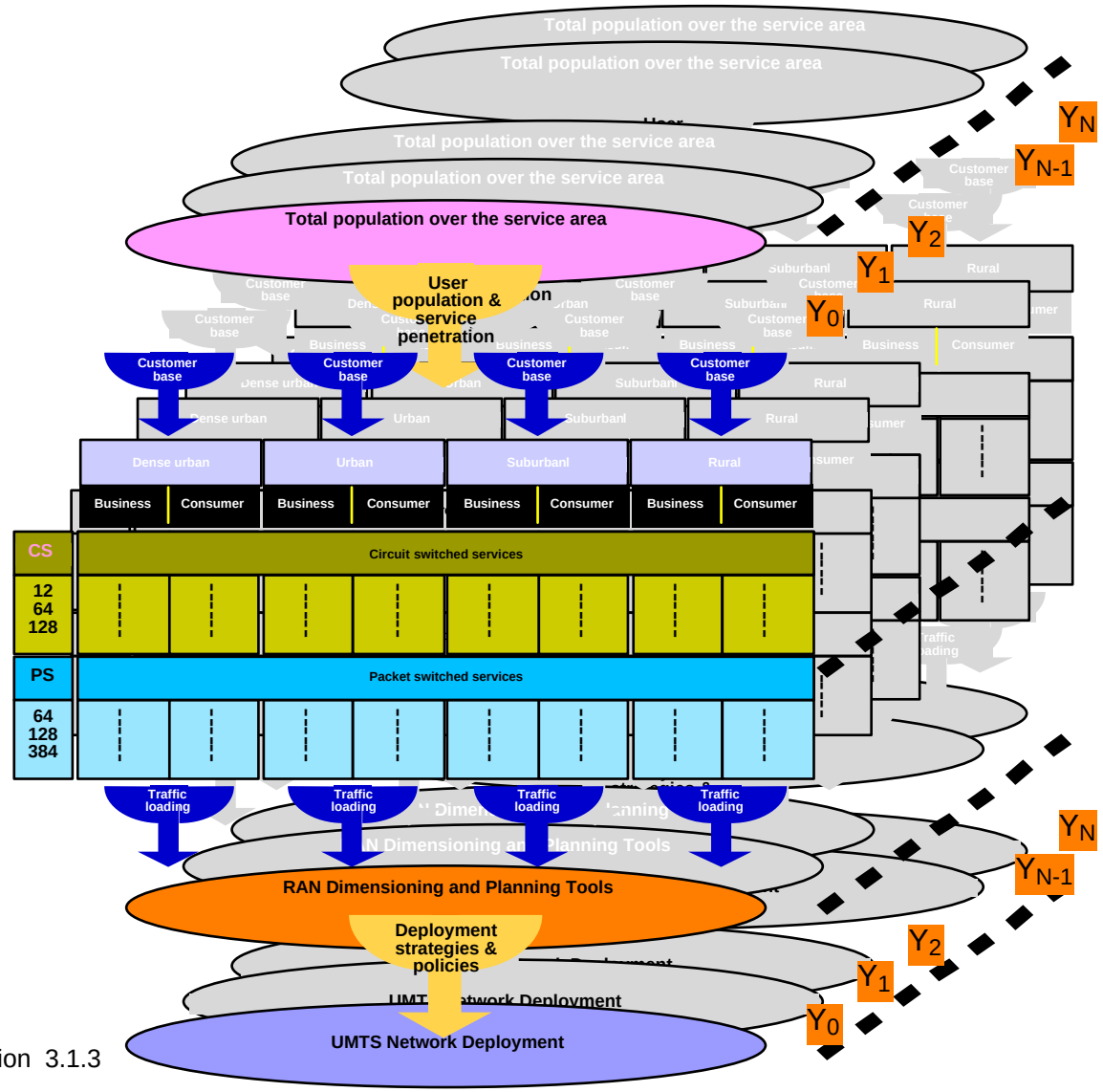




RAN planning and UMTS deployment (2)



RAN planning and UMTS deployment (3)



Net Present Value: Definition

Net Present Value (NPV):

- Cumulative discounted cash-flow generated to date, or less formally
- The profitability of a business, as appreciated a Year 0, over a span of N years - N ranging from 1 to the economic life of the system

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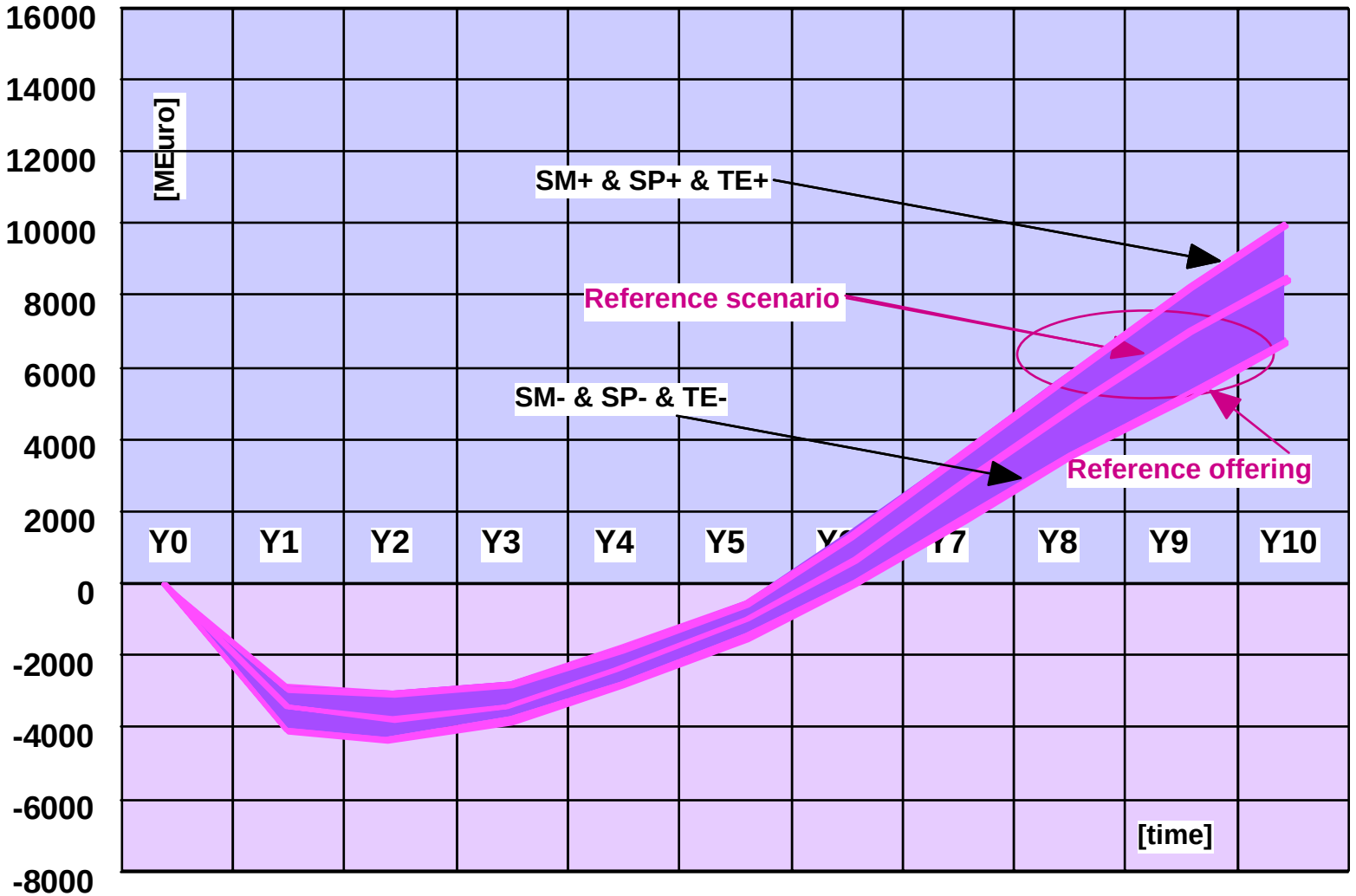
Share of investments over network components

	Year 0	Year 3	Year 4 to Year 10
	Rel-99	from Rel-99 to Rel-5	Capacity increases
RAN			
- Node Bs	55%	55%	60%
- RNCs	30%	35%	30%
- UTRAN transport infrastructure	15%	10%	10%
Core Network			
- MSCs & MSC servers	50%	0%	0%
- SGSNs & GGSNs	35%	60%	65%
- MGWs	0%	10%	10%
- CSCFs, MGCFs, T-SGWs, MRFs	0%	20%	15%
- Core network transport infrastructure	15%	10%	10%
	Year 0	**Year 3**	**Year 4 to Year 10**
Service Market Segment	65%	60%	50%
- Business	35%	40%	50%
- Consumer			
Tariffs	3% yearly reduction in over the whole economic life cycle		

Net Present Value: Reference scenario



SM: Service Mix SP: Service Penetration TE: Tariff Erosion

UMTS business plan: Sensitivity analysis

Deviation from assumed service mix	SM+ ⇒ Y3: +10%, Y10: +25% SM- ⇒ Y3: -10%, Y10: -25%		
Deviation from assumed service penetration	SP+ ⇒ Y3: +10%, Y10: +25% SM- ⇒ Y3: -10%, Y10: -25%		
Yearly deviation from tariff erosion	TE+ ⇒ +10% TE- ⇒ -10%		
Alternative scenario	**Year 0**	**Year 3**	**Year 4 to Year 10**
Service Market Segment - Business - Consumer	65% 35%	60% 40%	50% 50%

SM: Service Mix SP: Service Penetration TE: Tariff Erosion

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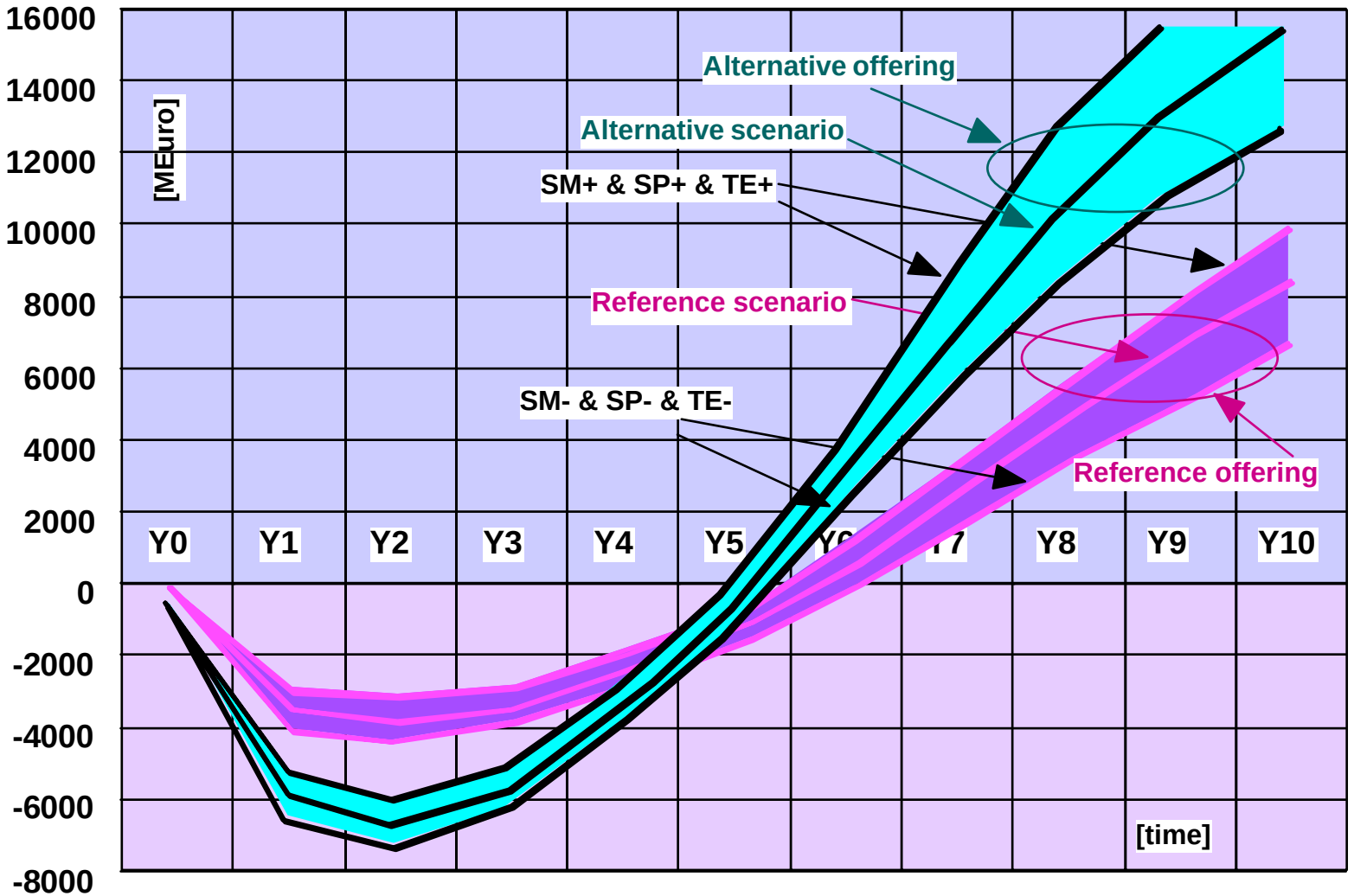
NPV: Alternative business plan



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Conclusions

- Strategic, market and economic decisions play a fundamental role in planning investments for phased functional and capacity enhancements along the economic life of the network
- A balance has to be striven between actions decided in the early stages of the network deployment and actions which may be deferred
- Whatever deployment policy is chosen, a significant margin of flexibility for adjusting the deployment plan has to be factored from the outset