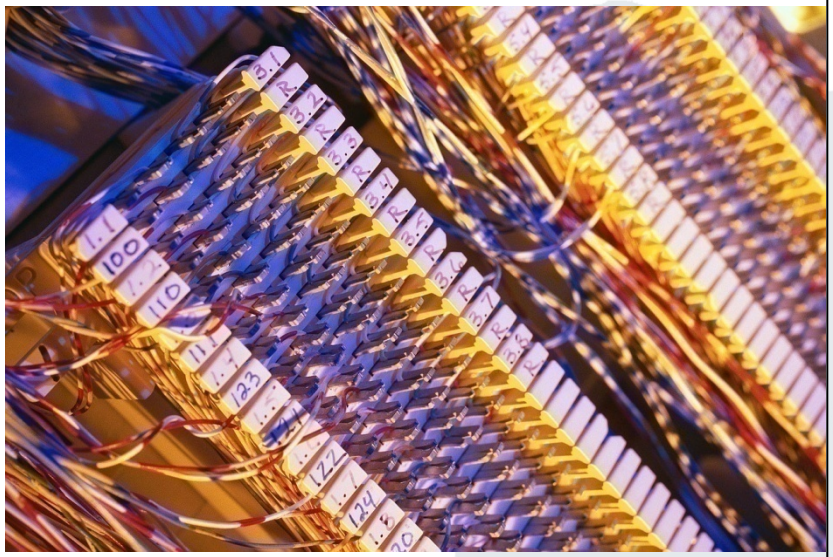
mobile business

Lecture 14

Q & A Session



Mobile Business I (WS 2017/18)

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Question 1

- How does "cell based communication" (CBS) relate to the two date transmission paradigms? Can it be associated with one of them or is it a completely different approach?
- Could you please explain the advantages of Circuit Switched Mobile Data Services?
- Could you please explain the disadvantages of Circuit Switched Mobile Data Services?

Mobile Data Services
Data Transmission Paradigms

There are two major paradigms for data transmission in communication networks:

▪***Circuit-Switched:*** In circuit-switched networks, the communication line is used exclusively for the communicating parties.

- Connections are **exclusive** ➲ even if no data is transferred, the network resources are used.
- In reality, the typical usage for voice connections is 30% of the network's capacity - for data transmission it is less than 10%.
- The ***duration of a connection*** is used for billing purposes
- Example: *Circuit Switched Data (CSD)* and *High-Speed Circuit Switched Data (HSCSD)* for Mobile Data Services

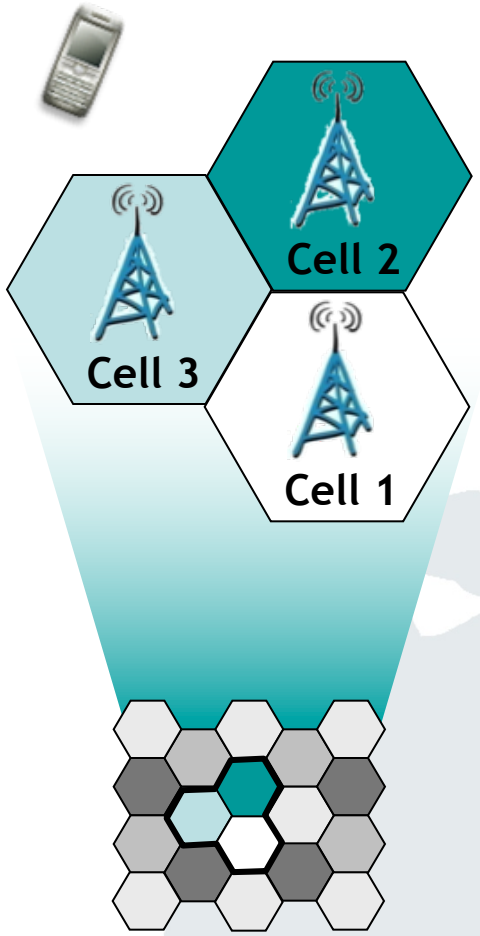
▪***Packet-Oriented:*** In packet-oriented networks, the communication is divided into several packets, which get addressed and transferred using a **shared** transmission medium.

- The connection is kept all the time (always on). However, the network is only used when data is transmitted.
- The capacity of the communication network is allocated dynamically.
- For billing purposes, the ***amount of transferred data*** is used.
- Example: GPRS for Mobile Data Services

Cell Based Communication (CBC)

What is a Cellular Network?

- Cellular networks are radio networks consisting of several transmitters.
- Each transmitter or base station, covers a certain area ➲ ***a cell***.
- Cell radii can vary from tens of meters to several kilometres.
- The shape of a cell is influenced by the environment (buildings, etc) and usually neither hexagonal nor a perfect circle, even though this is the usual way of drawing them.



[M-Lehrstuhl]

Cell Based Communication (CBC)

Advantages of CBC (1)

- Cellular networks offer a number of advantages compared to centralised radio systems:
  - ***Higher capacity:*** Cells offer the possibility to "*reuse*" the transmission frequencies assigned to mobile devices (e.g. by multiplexing). In order to do so, the networks need a thorough planning of the position of base stations and their frequencies.
    - ➲ More users can use the infrastructure
  - ***Reduced transmission power:*** Reduced power usage for the mobile device, due to the fact that only a limited amount of transmission power is needed in a small cell, compared to a far away base station.
    - ➲ Reduced power consumption for mobile devices

Cell Based Communication (CBC)

Advantages of CBC (2)

- Cellular networks offer a number of advantages compared to centralised radio systems:
  - ***Robustness:*** Cellular systems are decentralised with regard to their base stations. In the case that one antenna fails, only a small area gets affected.
    - ➲ Failure of one base station does not affect the complete infrastructure
  - ***Better coverage:*** Cells can be adapted to geographic conditions (mountains, buildings, etc.).
    - ➲ Better availability of the infrastructure

Cell Based Communication (CBC)

Disadvantages of CBC

- However, there are also some drawbacks of cell based communication infrastructures:
  - ***Required infrastructure:*** A complex and costly infrastructure is required, in order to link all base stations. This includes switches, antennas, location registers, etc.
  - ***Handover needed:*** When changing from one cell to another, a handover mechanism is needed that allows a change of cells in real-time. These mechanisms are complex.
  - ***Frequency planning:*** The distribution of the frequencies being used for the base stations needs to be planned carefully, in order to minimise interferences, etc.

Cell Based Communication (CBC)

Multiplexing

- Fundamental mechanism in communication system
- Describes how several users can share a medium (e.g. mobile network) with minimum or no interference.
- ***Goal:*** Most efficient usage of a medium
- ***Abstract example:*** Traffic (users) using a highway with several lanes (medium) without accidents (interference)

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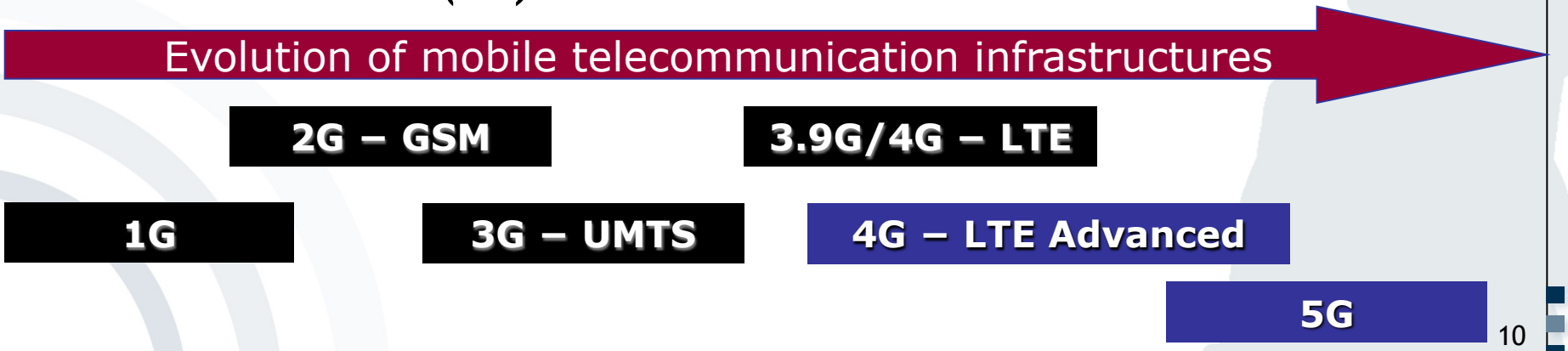
Question 2

Which information from the history of infrastructure developments (generations of telecommunication) should be kept in mind?

Mobile Telecommunication Infrastructures

- ***1st Generation (1G) - Analogue networks***
- ***2nd Generation (2G) - GSM networks***
  Global System for Mobile Communications
- ***3rd Generation (3G/3.5G) - UMTS/HSPA/HSPA+***
  Universal Mobile Telecommunications System
  High Speed Packet Access / Evolved HSPA = HSPA+
- ***3.9G or 4G - LTE***
  Long Term Evolution
- ***4th Generation (4G) - LTE Advanced***
- ***5th Generation (5G) - Mobile broadband***



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Question 3

What is the logical link between slide 55 and 56? Does it show the historical development going from country level agreements in roaming to operator level agreements?

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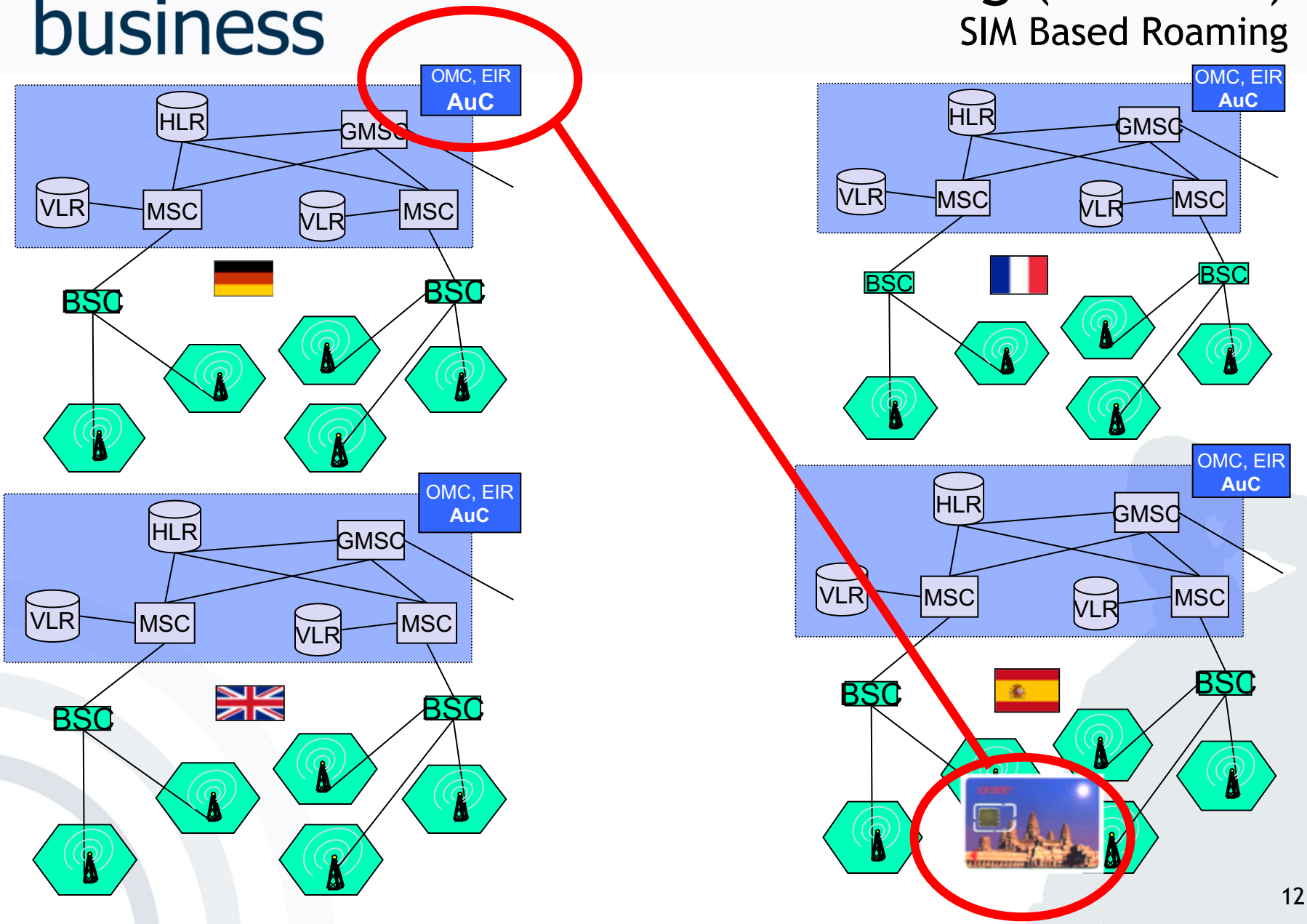
Roaming (slide 55)

SIM Based Roaming



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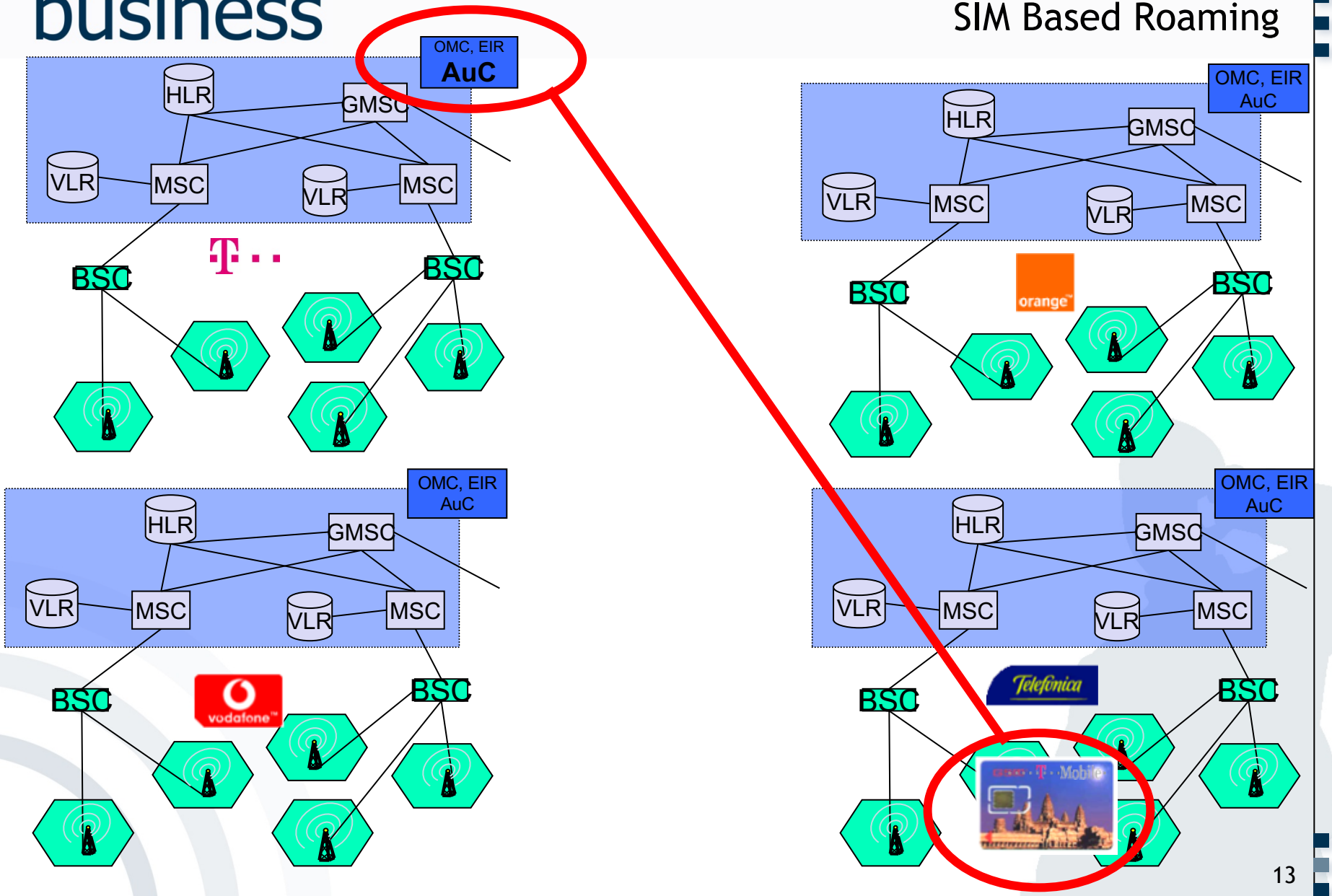
Roaming (slide 56)

SIM Based Roaming



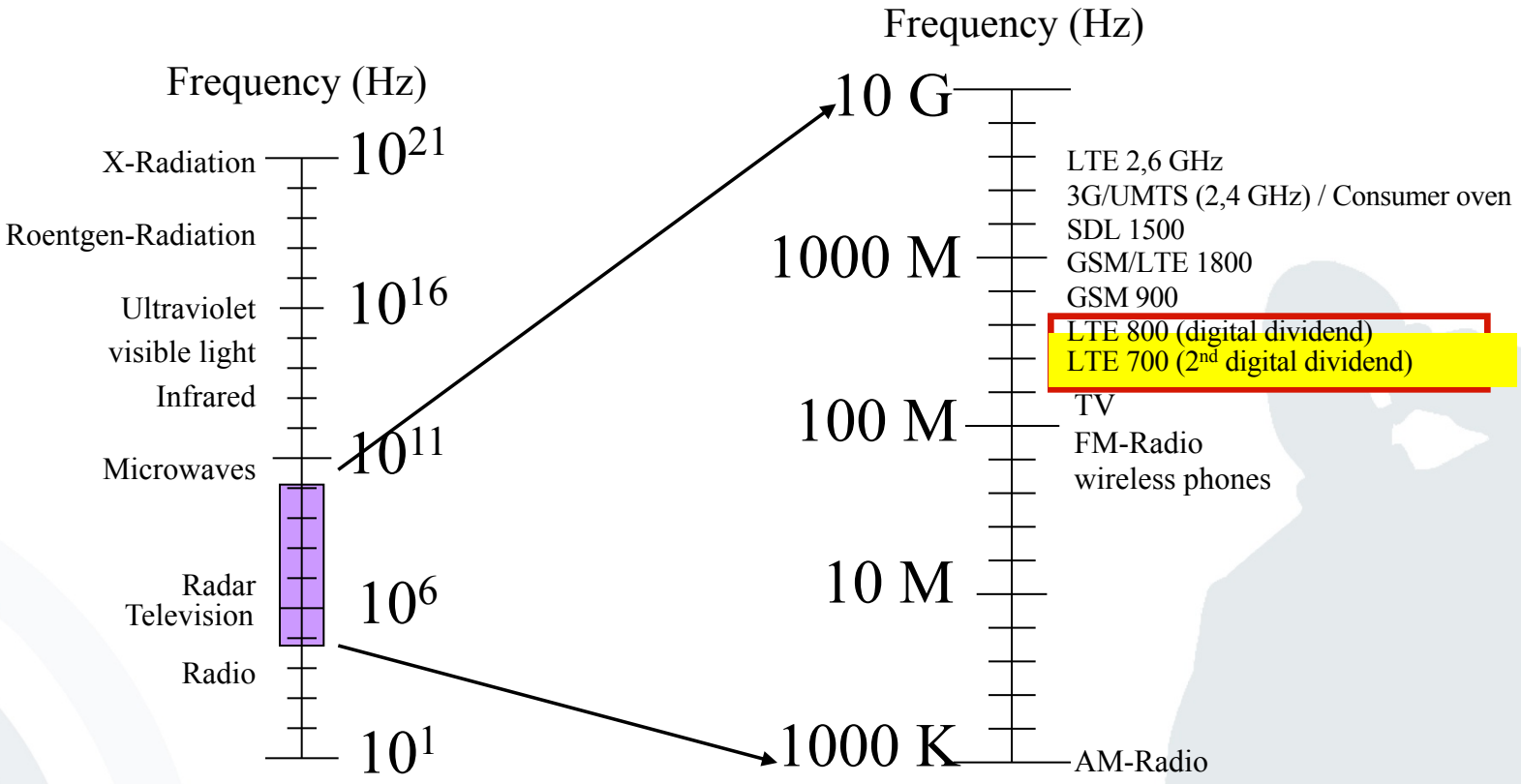
Question 4

How can we explain „digital dividend“? Ist the explanation „frequency range of instruments of entertainment and communication electronics“ enough?

Cell Based Communication (CBC)

Spectrum Ranges

Frequency range of instruments of entertainment and communication electronics



Question 5

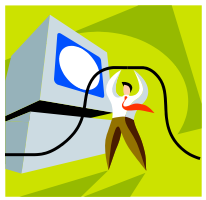
Are redirection ("tunneling") on layer 3 (slide 26) and "binding update" (slide 28) two different answers to the mobile IP problem?

Mobile IP
Mobility problem

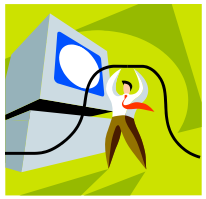
Partner B changes network

Old IP address (Partner B)

New IP address (Partner B)



Router



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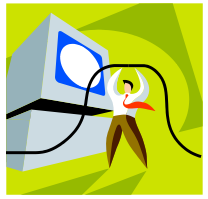

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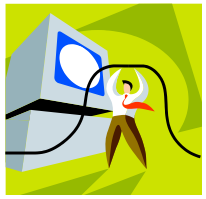
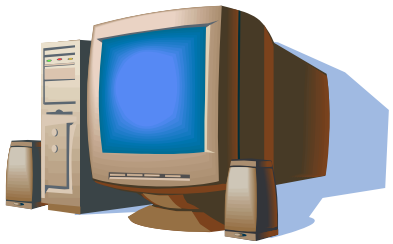


Router

Partner A

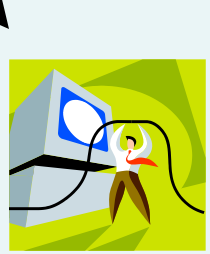
Mobile IP (Slide 26)
Mobility solution - Layer 3



Redirection (“Tunneling“) via home address to mobile device

Home address (Partner B)

New IP address (Partner B)



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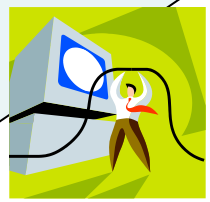

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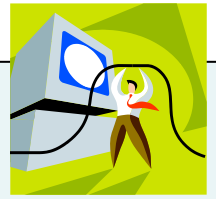
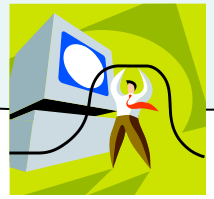


Router



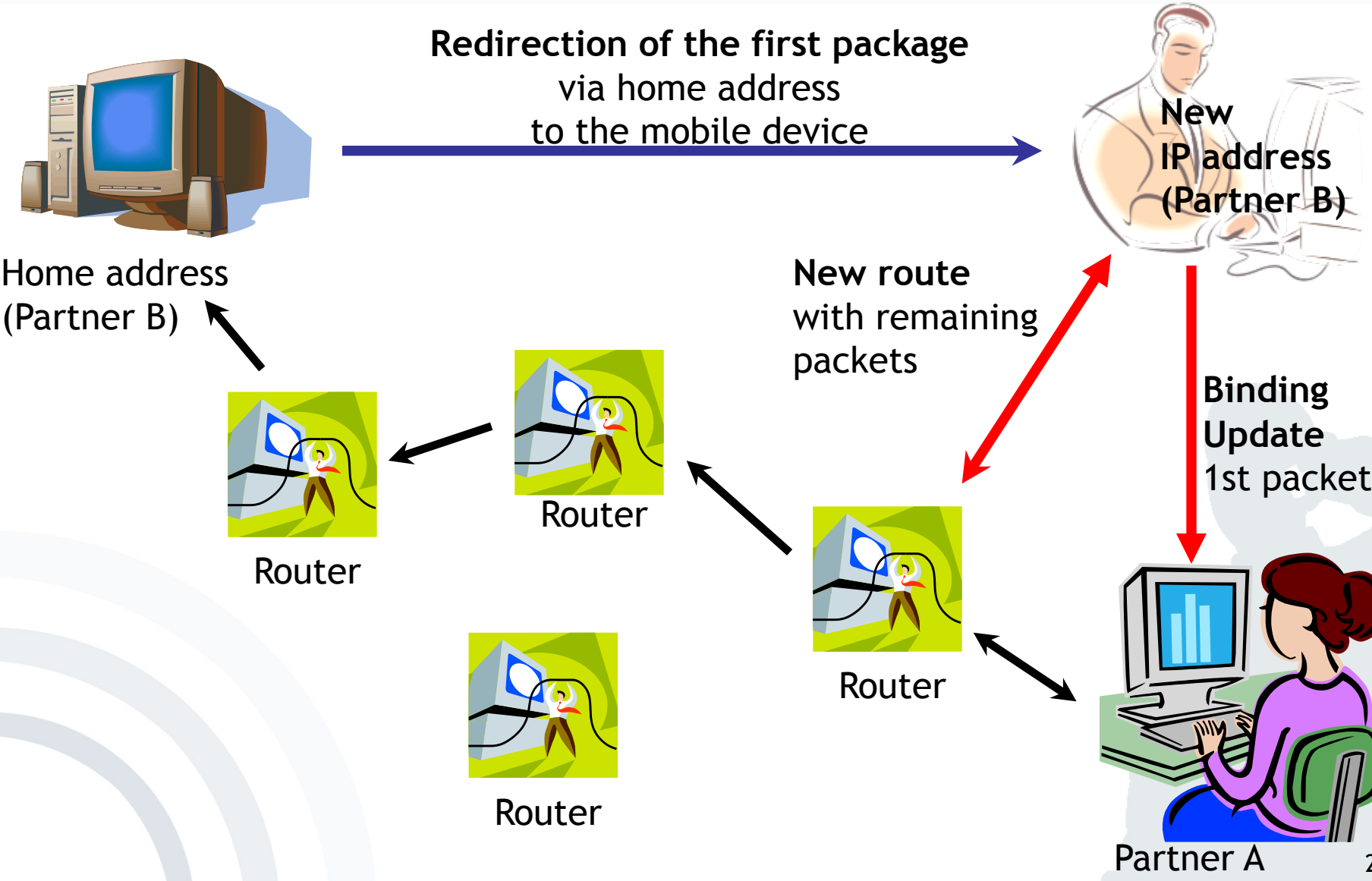
Router

Partner A

Mobile IP
Mobility solution - Layer 3

- **But** redirection implies
  - A longer route than before
  - Higher runtime
  - Avoidable usage of resources

Mobile IP (Slide 28)
Mobility solution - Binding Update



Question 6

What is RAN all about? How is it related to the "Mobile IP" chapter before on the lecture agenda?

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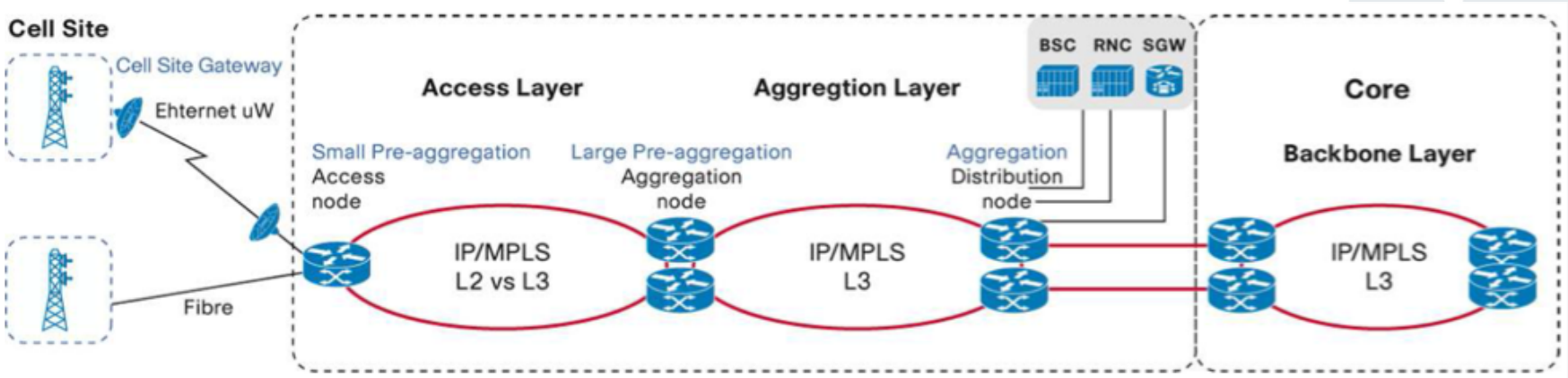
Radio Access Networks (RAN)

- Part of a mobile telecommunication system
- Provides connection between device (phone, computer, or machine) and core network
- Implements certain radio access technologies, e.g. GSM or 3G
- Examples of radio access network types are:
  - **GRAN:** GSM radio access network
  - **GERAN:** essentially the same as GRAN but specifying the inclusion of EDGE packet radio services
  - **UTRAN:** UMTS radio access network
  - **E-UTRAN:** Long Term Evolution (LTE) high speed, low latency radio access network
  - **C-RAN**: Centralized or Cloud-based radio access network
- Some handsets have capability to be simultaneously connected to multiple RANs (dual-mode handsets).

IP-based Radio Access Networks (IP RAN)

- All different backhaul technologies may be collapsed onto a single IP/MPLS network (MPLS = Multiprotocol Label Switching) → End-to-end IP approach
- Support for legacy services and reduced cost per bit
- 2G, 3G, and 4G radio technologies transparently supported
- Cost savings possible due to alternative transport media (such as Ethernet and DSL)



Question 7

Lecture 6 Slide 35 doesn´t tell me anything. What does 1st-tier, 2nd-tier-structure mean? Why/how is there an increasing contact between 2nd-tier and customer?

Market Structure

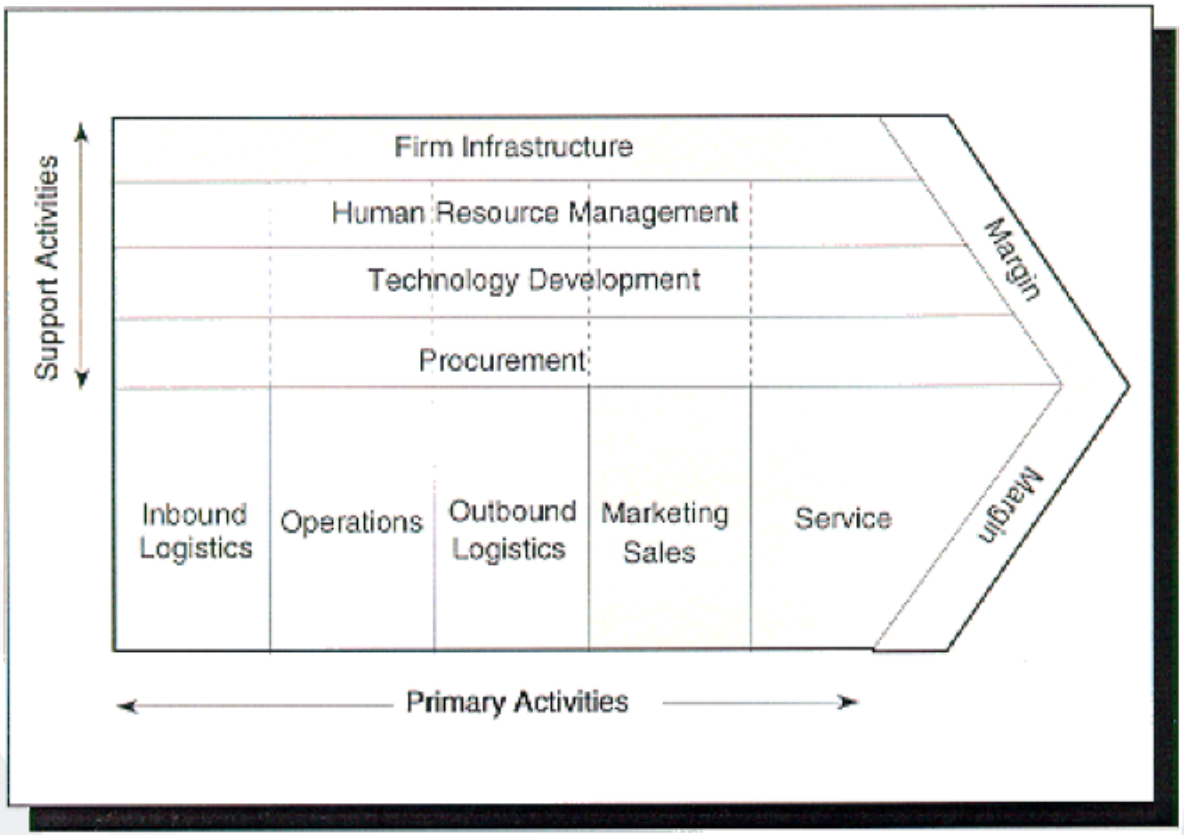
- Interesting disintegration of 1st-tier-, 2nd-tier-structure
- Increasing contact between 2nd-tier and customer.

Question 8

- What is the rationale behind the modified value chain (slide 39)?
- Could you explain the split of traditional value chain creation and the modified value chain?

Value Creation

- Classical value chain (Porter 1985)



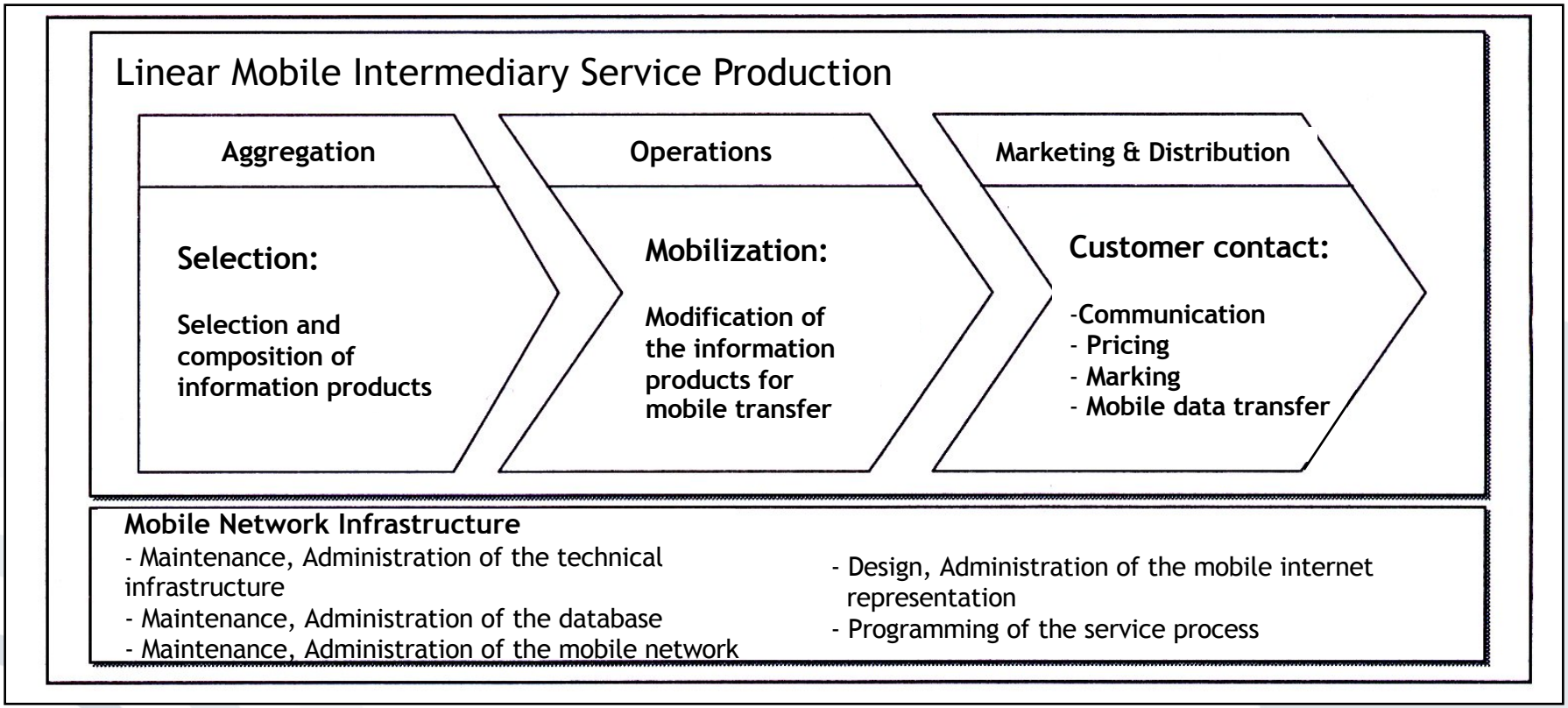
Value Creation

- Suitable for illustrating value-adding activities
- Input-output-orientation of the different value chain elements
- Applicable to services? (criticism)
- Mobile segment: Only for linear mobile services (procurement, preparation, sales)

➲ Modification of the value chain

Value Creation

- Modified value chain



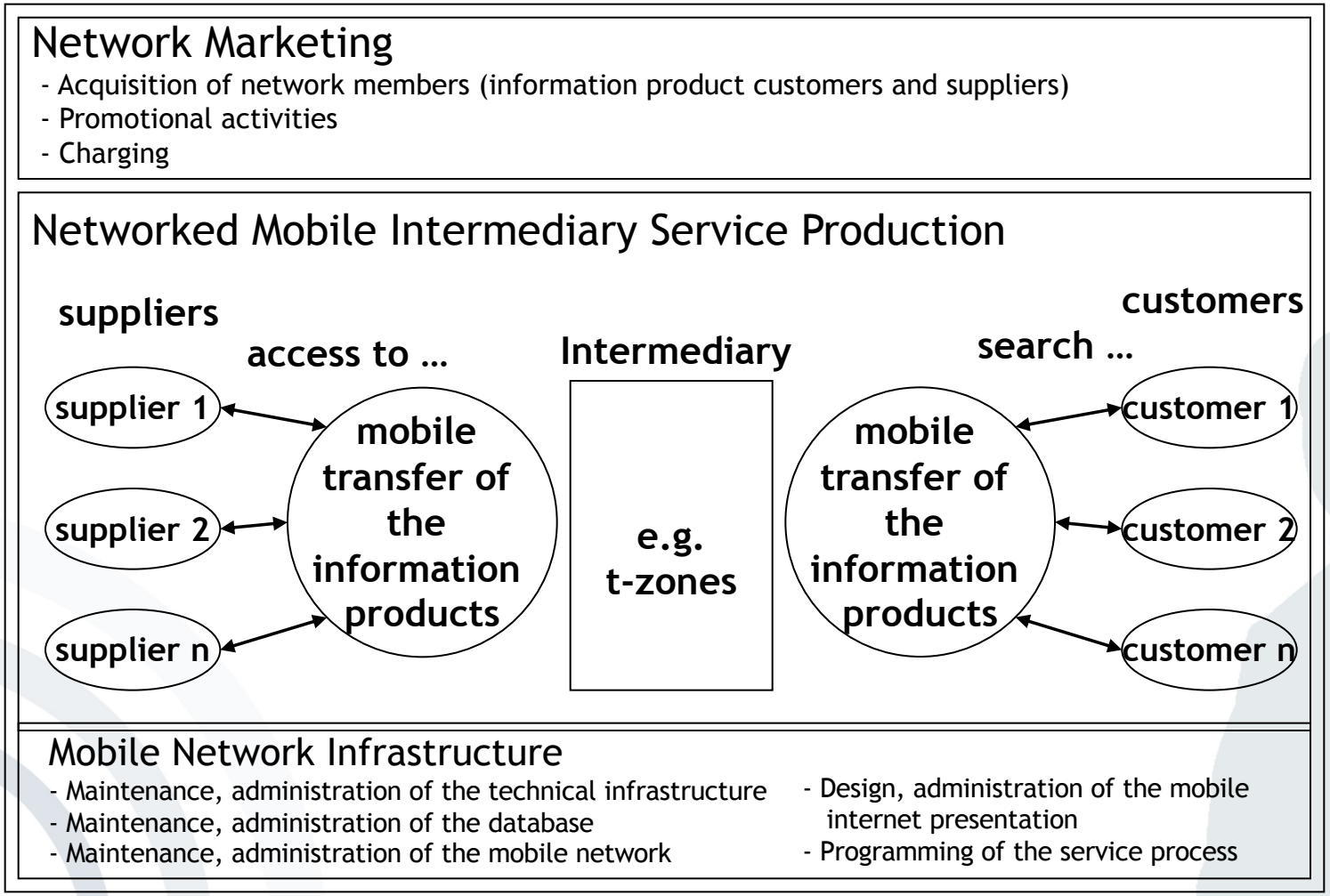
Question 9

What are the two slides 42 (value network) and 44 (value added shop) about?

Value Creation (slide 42)

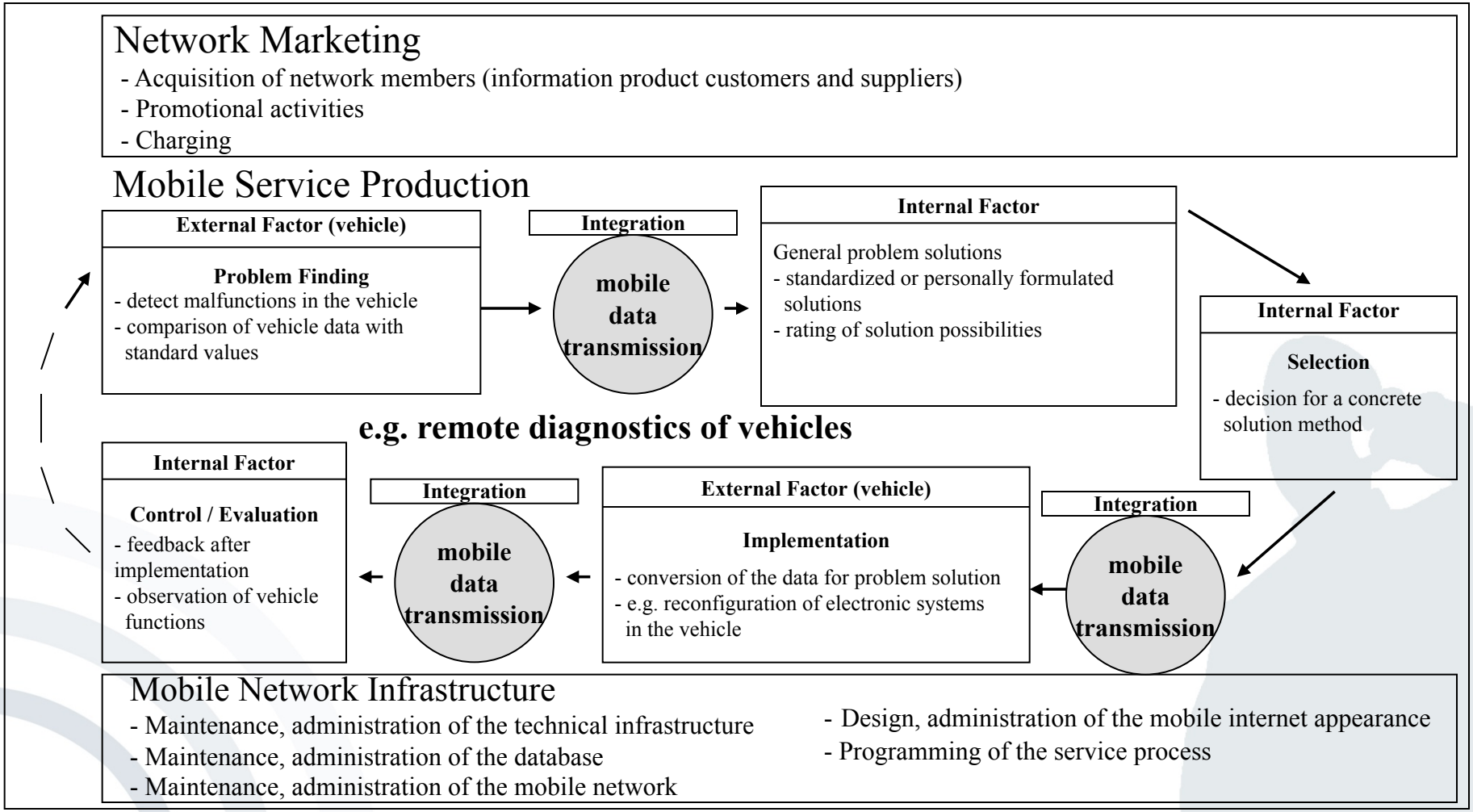
- Value network

[ReicMeieFrem2002]



Value Creation (slide 44)

- Value added shop [ReicMeieFrem2002]

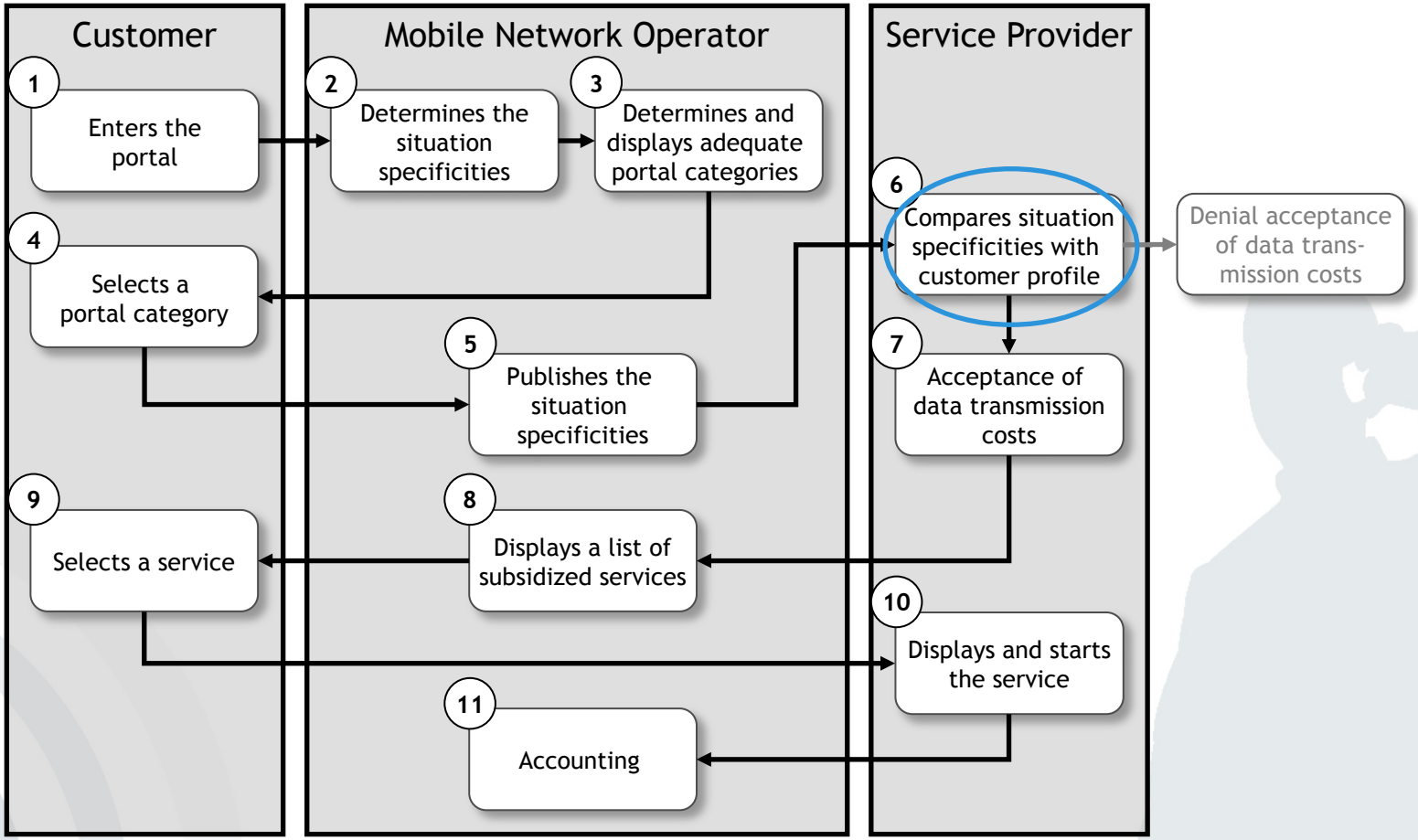


Question 10

Can you please explain the process for context sensitive services? (lecture 7 slide 49)

Business Models for Mobile Network Operators

- Process for context sensitive services



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Question 11

What key messages from the market share slides are most important (slides 5-10, 15/16)?

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Worldwide Mobile Phone Sales to End Users by Vendor Q1-2017 vs. Q1-2005

Company	1Q17 units	1Q17Market Share (%)	1Q05 units	1Q05 Market
Samsung	78,671.4	***20.7***	24,479.8	***13.5***
Apple	51,992.5	***13.7***	-	
Huawei	34,181.2	***9.0***	-	-
Oppo	30,922.3	***8.1***	-	
Vivo	25,842.2	***6.8***		
Nokia	➲ others		76,088.4	***30.4***
LG Electronics (former LG)			11,464.2	***6.3***
Lenovo*/Motorola			30,143.3	***16.7***
Huawei			➲ others	
TCL Communication				
ZTE				
BenQ Mobile			10,209.5	***5.7***
Sony Mobile Com.			9,905.8	***5.5***
Others	158,368.7	***41.7***	39,829.5	***21.9***
TOTAL	**379,977.3**	**100.0**	**180,992.2**	**100.0**

Worldwide Mobile Phone Sales to End Users by Vendor Q1-2017 vs. Q1-2016

In 1.000 Units

Company	1Q17 Units	1Q17 Market Share (%)	1Q16 Units	1Q16 Market Share (%)
Samsung	78,671.4	***20.7***	81,186.9	***23.2***
Apple	51,992.5	***13.7***	51,629.5	***14.8***
Huawei	34,181.2	***9.0***	28,861.0	***8.3***
Oppo	30,922.3	***8.1***	16,112.6	***4.6***
Others	184,210.9	***48.5***	171,461.4	***49.1***
Total	**379,978.3**	**100.0**	**349,251.4**	**100.0**

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Worldwide Mobile Phone Sales to End Users by Vendor 2012 vs. 2011 – A Decline?

In 1.000 Units

Company	2012 Units	2012 Market Share (%)	2011 Units	2011 Market Share (%)
Samsung	384,631.2	***22.0***	315,052.2	***17.7***
Nokia	333,938.0	***19.1***	422,478.3	***23.8***
Apple	130,133.2	***7.5***	89,263.2	***5.0***
ZTE	67,344.4	***3.9***	56,881.8	***3.2***
LG Electronics	58,015.9	***3.3***	86,370.9	***4.9***
Huawei Technologies	47,288.3	***2.7***	40,663.4	***2.3***
TCL Communication	37,176.6	***2.1***	34,037.5	***1.9***
Research In Motion	34,210.3	***2.0***	51,541.9	***2.9***
Motorola	33,916.3	***1.9***	40,269.1	***2.3***
HTC	32,121.8	***1.8***	43,266.9	***2.4***
Others	587399.6	***33.6***	595886.9	***33.6***
TOTAL	**1,746,175.6**	**100.0**	**1,775,712.0**	**100.0**

Cf. TOTAL Units sold in 2013: 1,820,200.0

Worldwide Smartphone Sales to End Users by Vendor Q1-2017 vs. Q4-2016

In 1.000 Units

Company	1Q17 Units	1Q17 Market Share (%)	4Q16 Units	4Q16 Market Share (%)
Samsung	78,671.4	20.7%	76,782.6	17.8%
Apple	51,992.5	13,7%	77,038.9	17.9%
Huawei	34,181.2	9.0%	40,803.7	9.5%
Oppo	30,922.3	8.1%	26,704.7	6.2%
Others	184,209.9	48.5%	185,921.1	48.7%
Total	379,977.3	100%	431,539.3	100%

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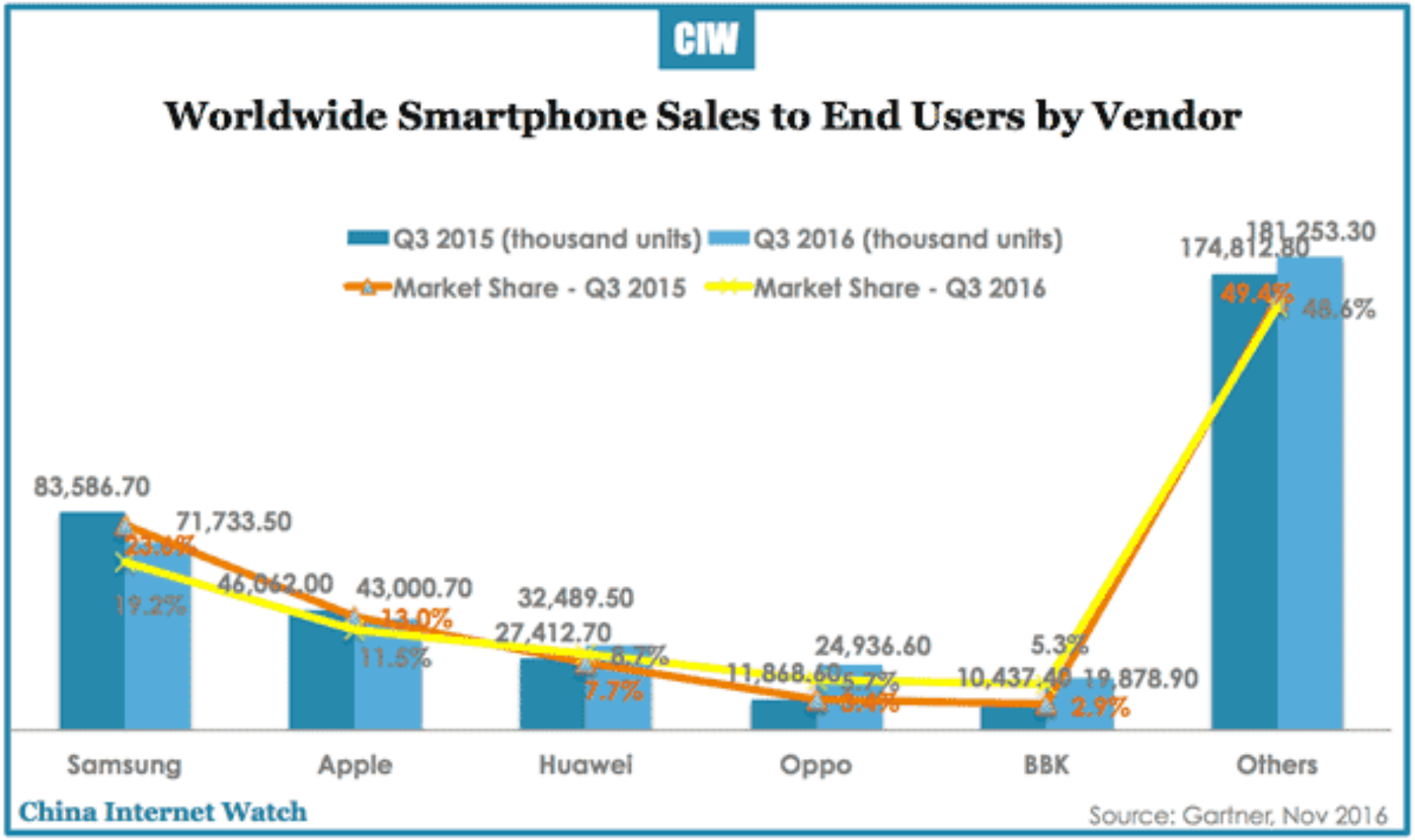
Worldwide Smartphone Sales to End Users by Vendor Q3-2016 vs. Q3-2015



Worldwide Smartphone Sales to End Users by Vendor Q1-2017 vs. Q1-2016

In 1.000 Units

Company	1Q17 Units	1Q17 Market Share (%)	1Q16 Units	1Q16 Market Share (%)
Samsung	78,671.4	20.7	81,186.9	23.3
Apple	51,992.5	13.7	51,629.5	14.8
Huawei	34,181.2	9.0	28,861.0	8.3
Oppo	30,922.3	8.1	15,891.5	4.6
Vivo	25,842.2	6.8	14,001.0	4.0
Others	158,367.7	41.7	156,654.2	45.0
Total	**379,977.3**	**100.0**	**348,224.2**	**100.0**

Worldwide Device Shipments by Segment – 2015 View

- Worldwide device shipments and projections by segment show a shift in consumer preferences:

Device Type	2014	2015	2016	2017
Traditional PCs (Desk-Based and Notebook)	277	251	243	233
Ultramobiles (Premium)	37	49	68	89
PC Market	**314**	**300**	**311**	**322**
Ultramobiles (Tablets and Clamshells)	226	214	228	244
Computing Devices Market	**540**	**514**	**539**	**566**
Mobile Phones	1,879	1,94	2,007	2,062
Total Devices Market	**2,419**	**2,454**	**2,546**	**2,628**

Note: The *Ultramobile (Premium)* category includes devices such as Microsoft's Windows 8 Intel x86 products and Apple's MacBook Air.
The *Ultramobile (Tablets and Clamshells)* category includes devices such as, iPad, iPad mini, Samsung Galaxy Tab S 10.5, Nexus 7 and Acer Iconia Tab 8.

- The reason may be an increasing focus on energy efficiency and weight.

Worldwide Device Shipments by Segment - 2016 View

In 1.000 Units

Device Type	2015	2016	2017	2018
Traditional PCs (Desk-Based and Notebook)	244	216	205	199
Ultramobile (Premium)	44	49	61	75
PC Market	**288**	**265**	**266**	**274**
Ultramobiles (Basic and Utility)	196	177	173	173
Computing Devices Market	**484**	**442**	**439**	**447**
Mobile Phones	1,917	1,887	1,910	1,933
TOTAL	**2,401**	**2,329**	**2,349**	**2,380**

- Note: The *Ultramobile (Premium)* category includes devices such as Microsoft's Windows 10 Intel x86 products and Apple's MacBook Air.
  The *Ultramobile (Basic and Utility Tablets)* category includes devices such as, iPad, iPad mini, Samsung Galaxy Tab S2, Amazon Fire HD, Lenovo Yoga Tab 3, Acer Iconia One.

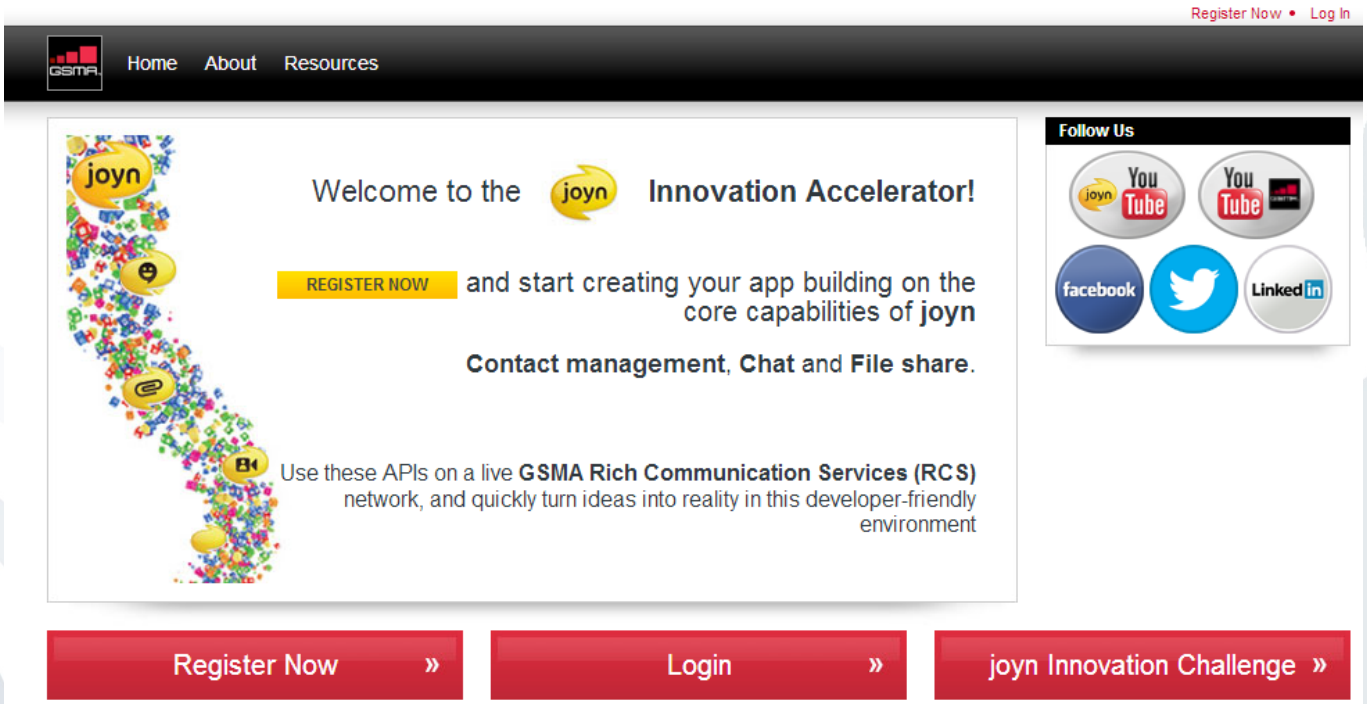
Question 12

Can you please explain RCS-e/joyn? (lecture 4 slide 44) Is it important?

IP-based Mobile Services
RCS-e/joyn

Rich Communication Services – enhanced (RCS-e)

- Formerly Rich Communication Suite
- Cross-carrier ecosystem developed in a **global initiative by the GSMA**
- GSMA supports mobile network operators in their effort to market the service using **brand name** joyn (Message+) to application developers and end users.



joyn Innovation Accelerator website, http://rcs.oneapi-gw.gsma.com, accessed on 2013-10-11.

IP-based Mobile Services
RCS-e/joyn Features*

- "Enhanced Phonebook": Automatic update of contacts (network converged address book), social presence information (status, available services)

- "Enhanced Messaging": 1-to-1 and group chat, file transfer, sending location data

- "Enriched Calls": Voice connections can be enhanced by IP-based communication (e.g. video calls). In LTE networks: Voice over IP/LTE, Video over IP/LTE.

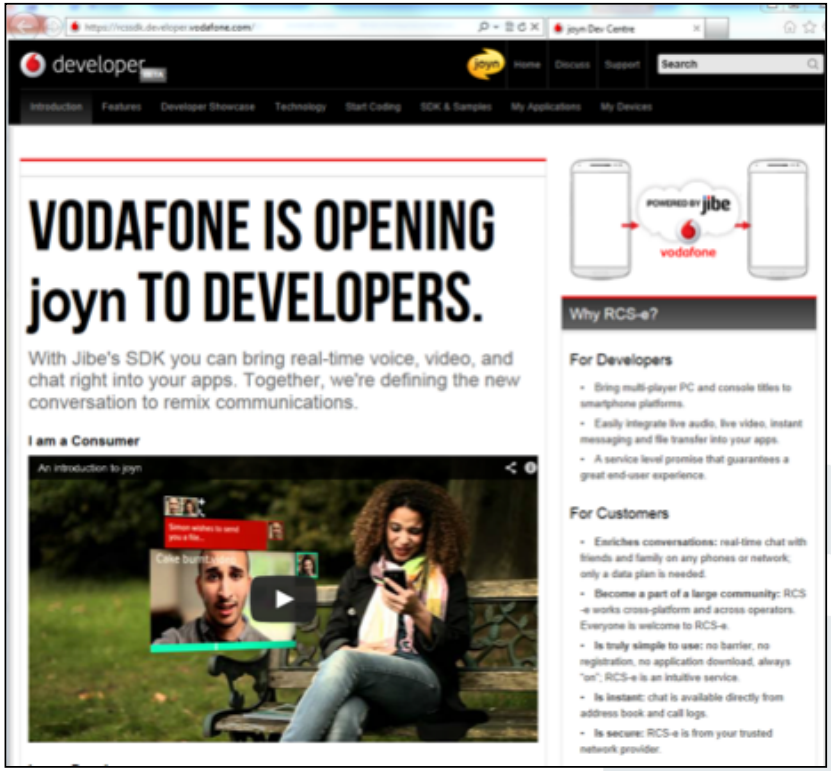
* RCS-e specification Release 5

IP-based Mobile Services
RCS-e/joyn MNO Perspective

- **Wide range of IP-based services** are implemented into the network infrastructure.
- Built upon the capabilities of the **IP Multimedia Subsystem (IMS)** – like Voice over Long Term Evolution (VoLTE)
- Provides *"Mobile Network Operators (MNOs) with a means of transitioning voice and messaging services into an all-IP and LTE world"*. [Wiki 2013]
- **Global interoperability** (interworking between networks) and development and distribution of user-friendly und secure **RCS-e client software** for smartphones users using various **mobile OS** platforms among biggest challenges

IP-based Mobile Services
RCS-e/joyn User Acceptance

- User acceptance depends especially on
  - availability of user-friendly apps and stable smartphone client software for the users' mobile OS,
  - interoperability throughout most networks,
  - pricing and pricing transparency.



https://rcssdk.developer.vodafone.com, accessed on 2013-06-05.

- Therefore MNOs encourage developers to implement joyn features into 3rd-party software

IP-based Mobile Services
RCS Universal Profile specification

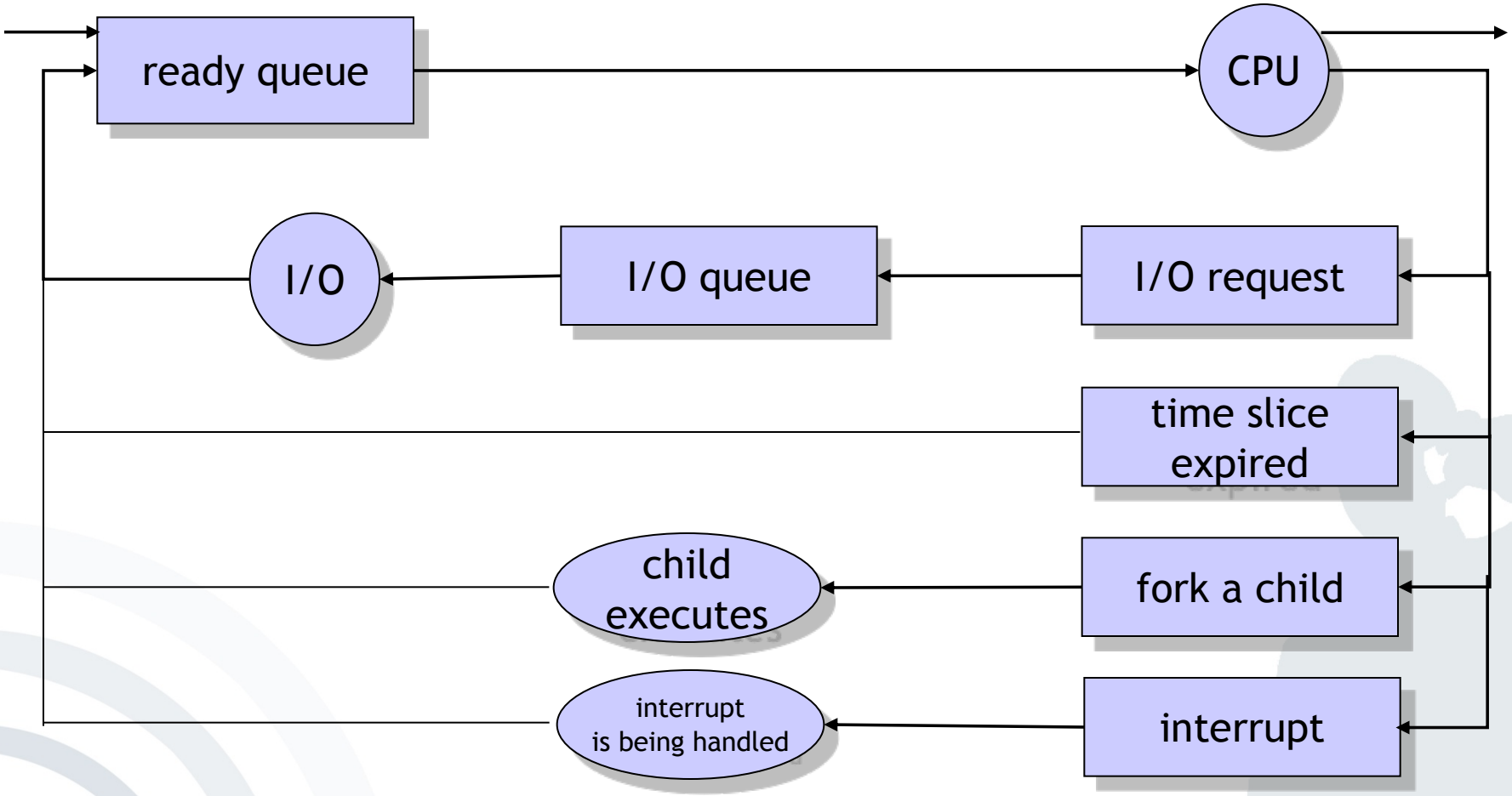
- A GSMA specification for advanced communications
- Supported by 56 operators and OEMs as well as 2 OS providers: Google and Microsoft
  - Group chat, social presence information, IP voice calls, file transfer are additions to the specification.

https://www.gsma.com/futurenetworks/wp-content/uploads/2016/11/Universal-Profile-FAQs-updated-17-Nov-2016.pdf

Question 13

Can you please explain scheduling in queues? (lecture 10 slide 16)

Scheduling in Queues



Exam related questions

- Is the WAP topic in the annex section relevant to the exam?
- Is there any topic or lecture you exclude for the exam?

Question 14

Could you explain the disadvantages of Bluetooth? (Exercise 4)

Personal Area Network (PAN)

Bluetooth

- Frequency range of 2.4 GHz
- Simple and cheap possibility to set up ad-hoc networks of limited range (up to 10 meters)
- No official standard, but de-facto-standard
- v4.2 (2014) improved speed, privacy, and connectivity (support for the Internet of Things)
- Broadly supported by related industries:
  - Computer hardware
  - Software
  - Consumer electronics
  - …

Personal Area Network (PAN)

Popular Bluetooth Applications

Sound transmission
(to earphones, headphones
or Hi-Fi equipment)

Wireless communications between devices
(Bluetooth-Headset)

Personal Area Network (PAN)

Bluetooth Applications

- Connection of periphery-devices (headsets, keyboards, mice, etc.)
- Setting up of ad-hoc networks for spontaneous data exchange
- Applications similar to those based on infrared technology
- Weaknesses of infrared technology were overcome
  - Increased bandwidth (up to 865.2KBit/s)
  - No optical connection between devices necessary
  - Expanded range (up to 10m)
  - Allows setting up of ad-hoc networks instead of point-to-point connections

mobile business

Thank you!

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