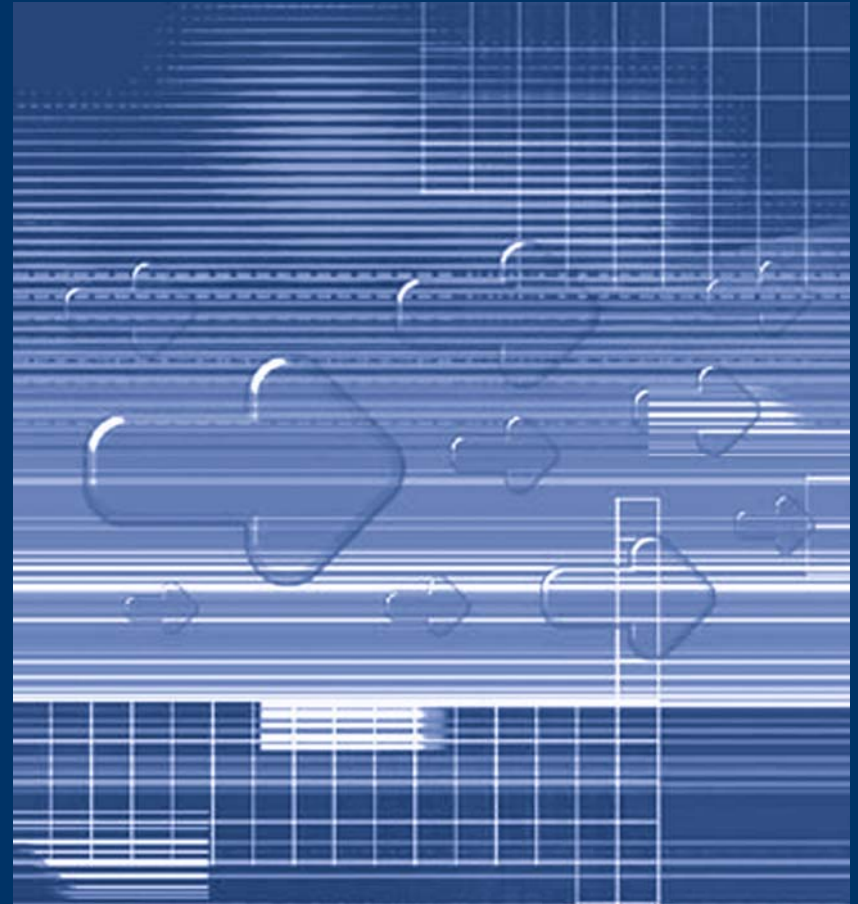


Hauptseminar  
Überfachliche Grundlagen:

„Trends der Mobilkommunikation im internationalen Umfeld und ihre wirtschaftlichen Auswirkungen“

Prof. Dr. Manfred Broy

Hans-Peter Blomeyer-Bartenstein  
Norbert Diernhofer



**Technische und wirtschaftliche  
Grundgedanken**

Peter Blomeyer-Bartenstein  
Garching, Oktober 2004





1. **Current Situation**
2. **A Vision beyond 3G**
3. **Influencing Spheres of 3G & 4G and their Interdependencies**
4. **Key Challenges of 4G**
5. **Resumée**



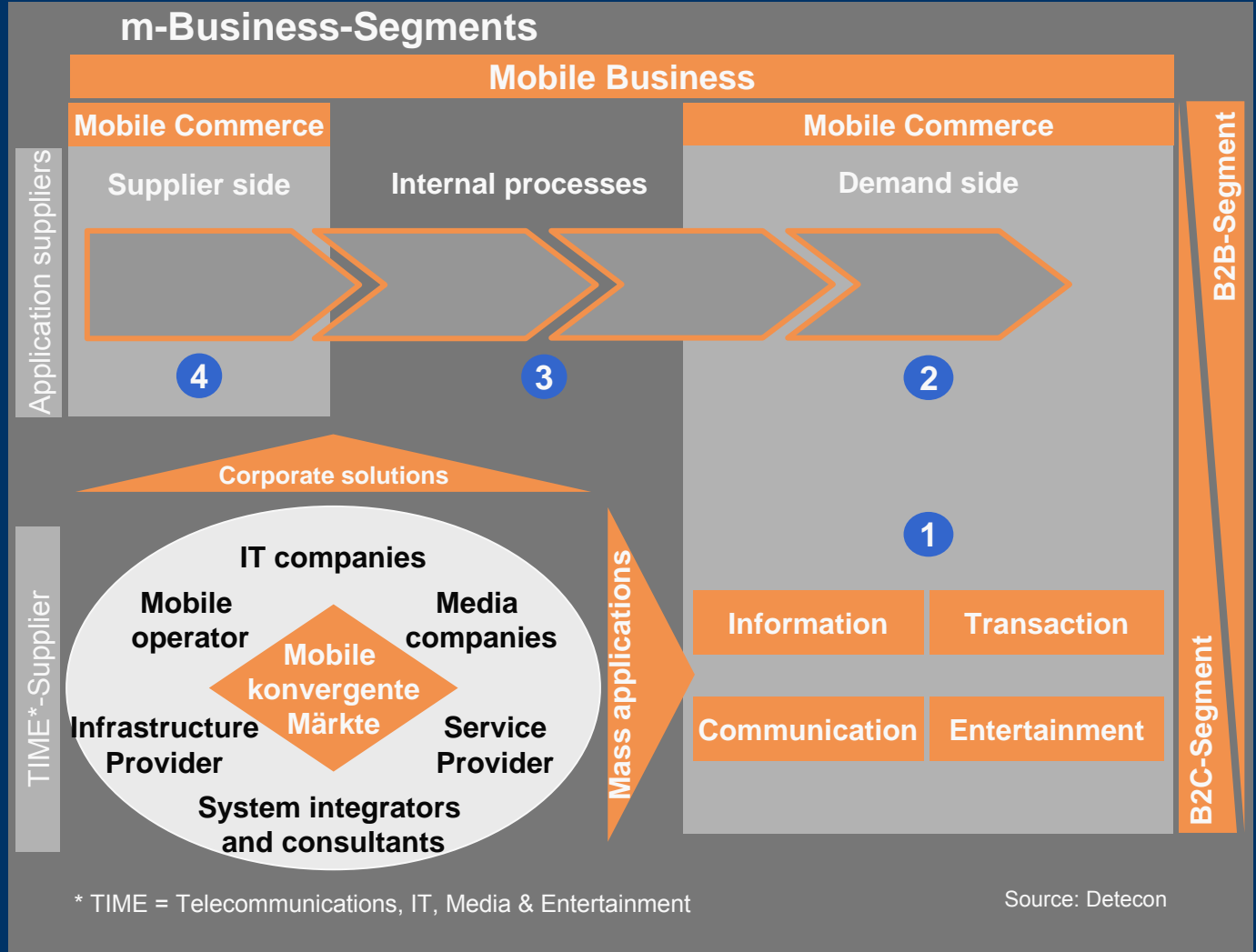
# 1. Current Situation

## 1.1 m-Business: a categorization

m-Business supports the exchange of goods, services, informations and know-how within the company and their customers.

m-Business uses mobile telecommunication technologies....

- 1 ... to offer time- and location specific B2C-Services
- 2 ... to optimize the customer relations
- 3 ... to optimize processes and grow productivity
- 4 ... to improve the procurement and the storekeeping of goods



\* TIME = Telecommunications, IT, Media & Entertainment

Source: Detecon

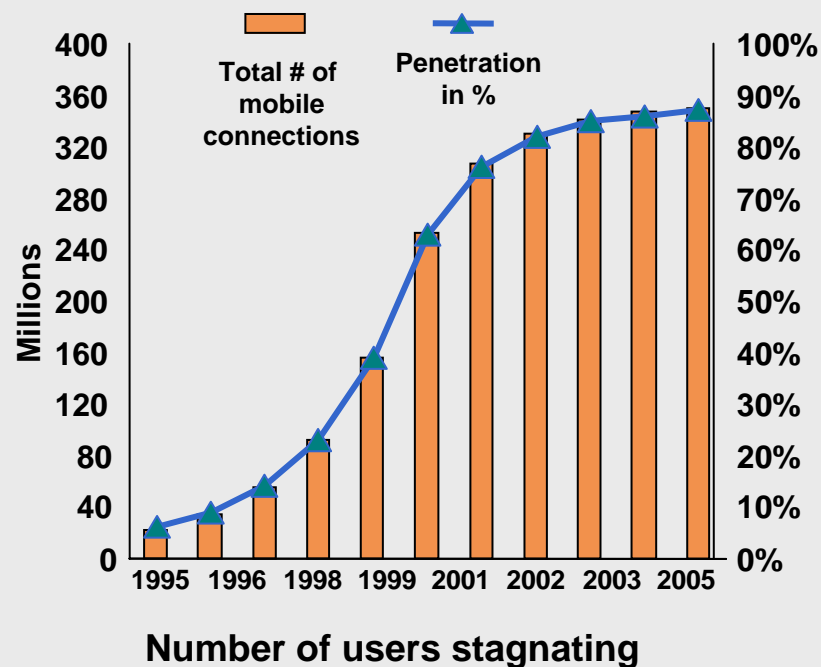


# 1. Current Situation

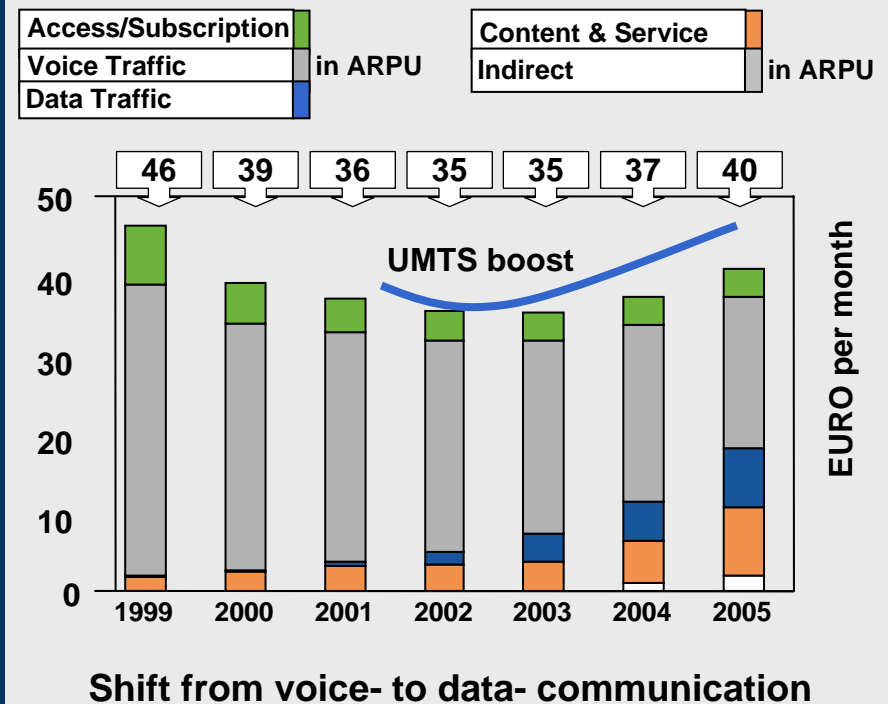
## 1.2 m-Business markets

The potentials of revenues in data communication will grow significantly.  
Voice-centric services will relatively slow down.

### Mobile connections in Europe 1995 - 2005



### Mobile revenues per user in Europe 1999 - 2005



Source: Durlacher Research Ltd./EQVITEC Partners Oy, Yankee Group, GP Morgan, Diebold - Analyse

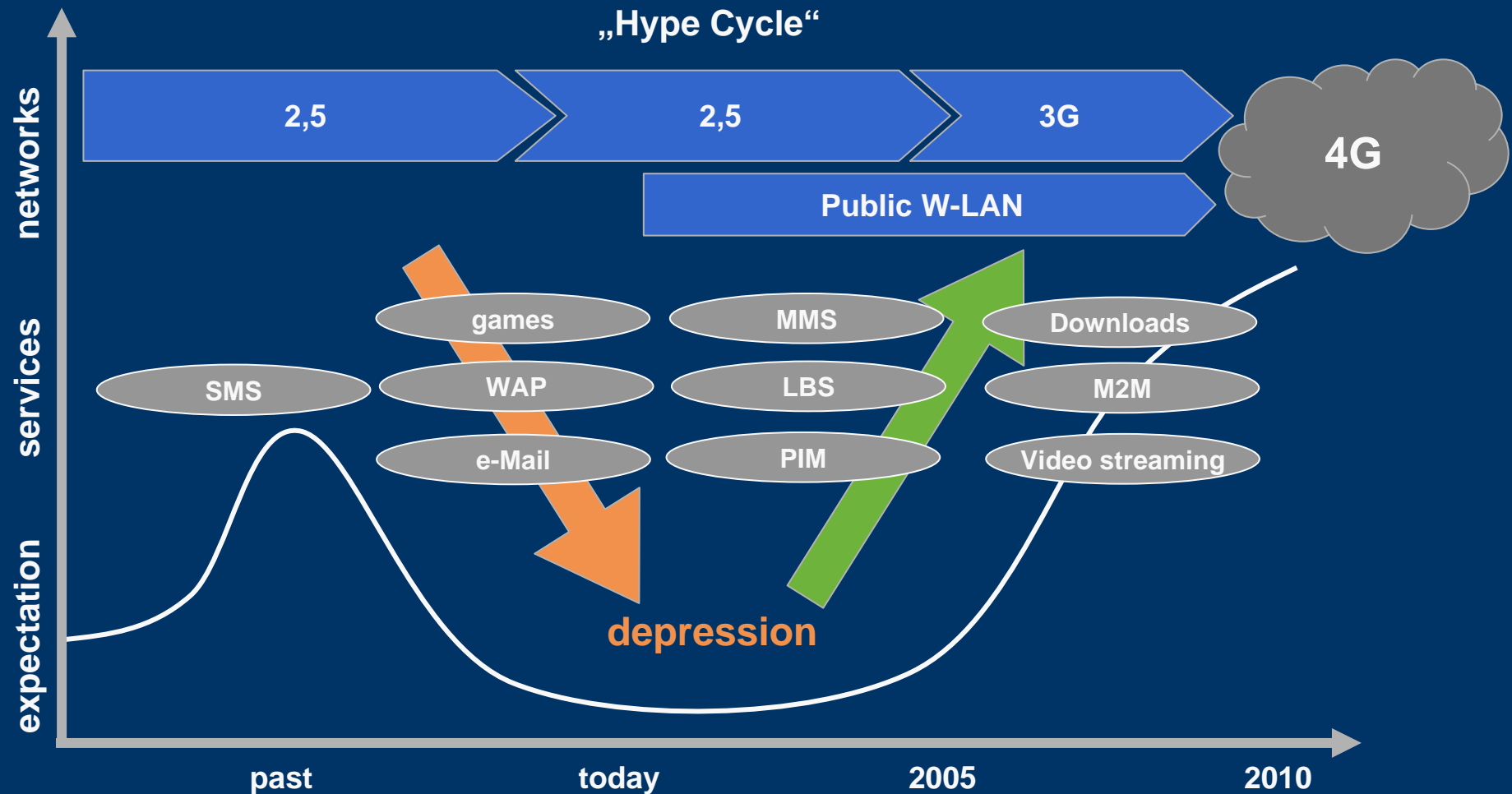


# 1. Current Situation

## 1.3 m-Business Hype Cycle

m-Business in troubles !

Will 3G, PW-LAN's and attractive services lead to another boom ?

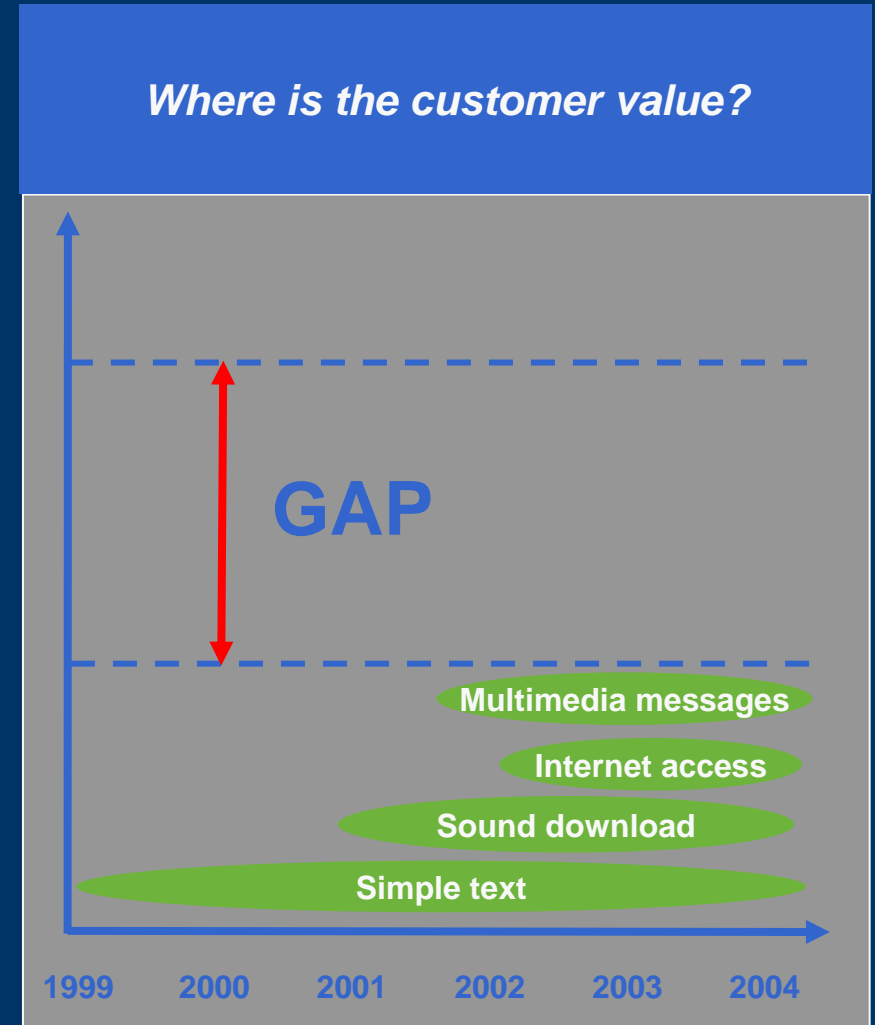
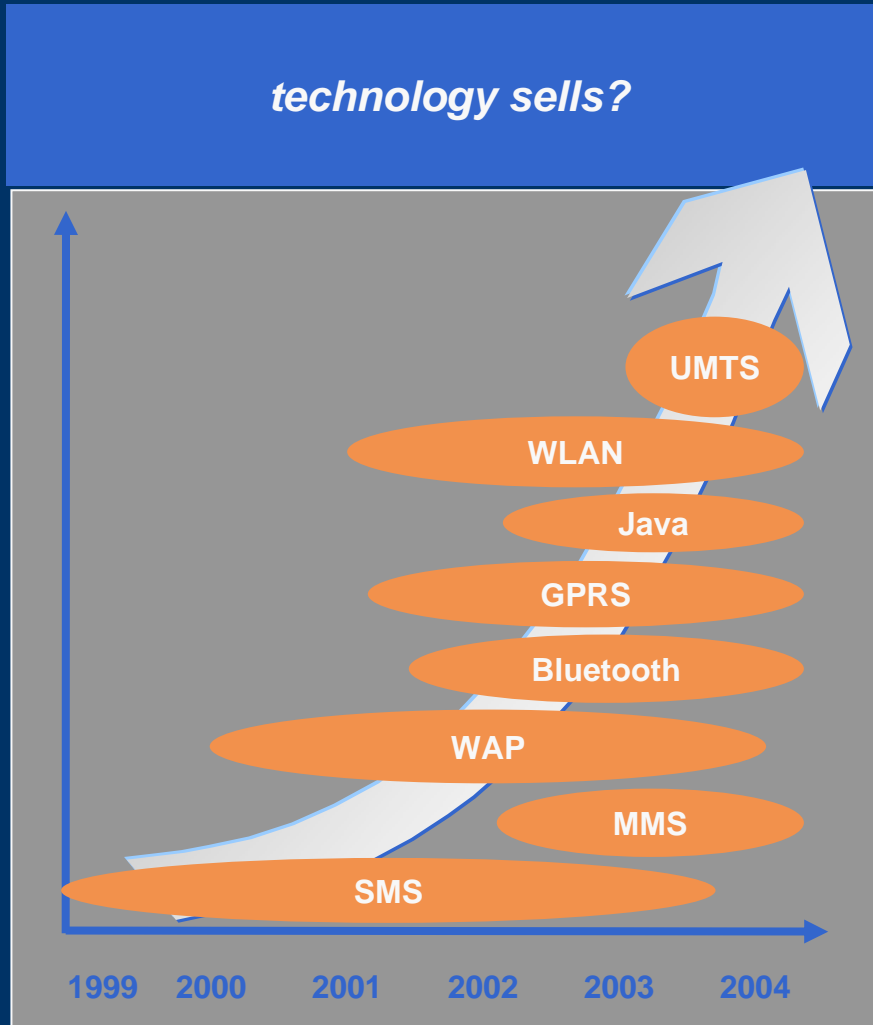




# 1. Current Situation

## 1.4 Focus

Re-focus on value added and services instead of technologies.



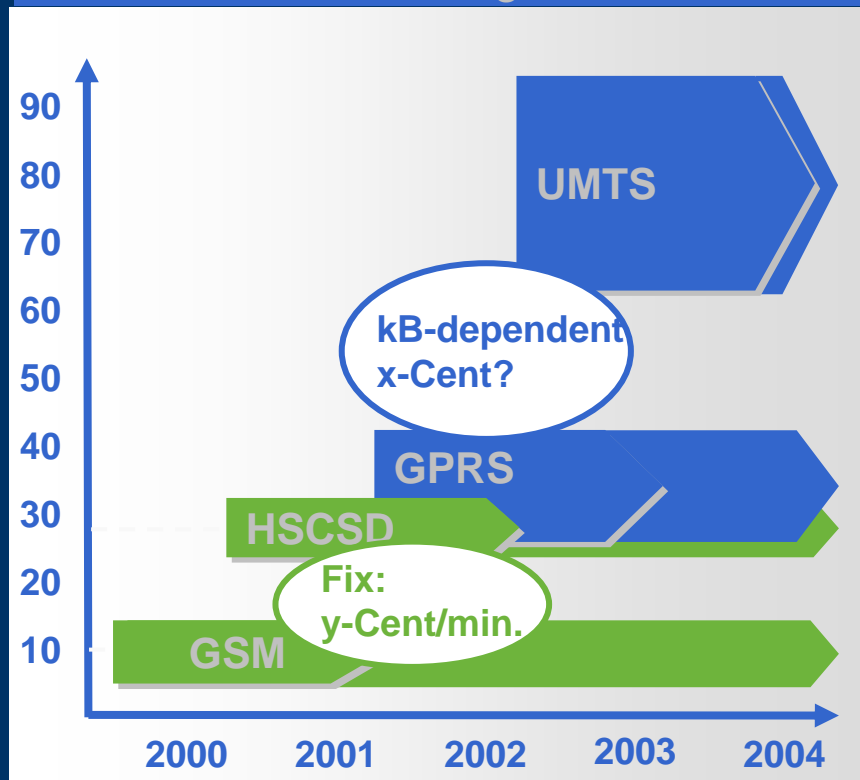


# 1. Current Situation

1.5 Abo Pricing is mission critical

Lessons Learned: One Price fixes it all – could the flat rate help?

Raising complexity  
of price and tariffs  
Data exchange in kB



„Willingness to Pay“  
Three golden rules for mobile pricing

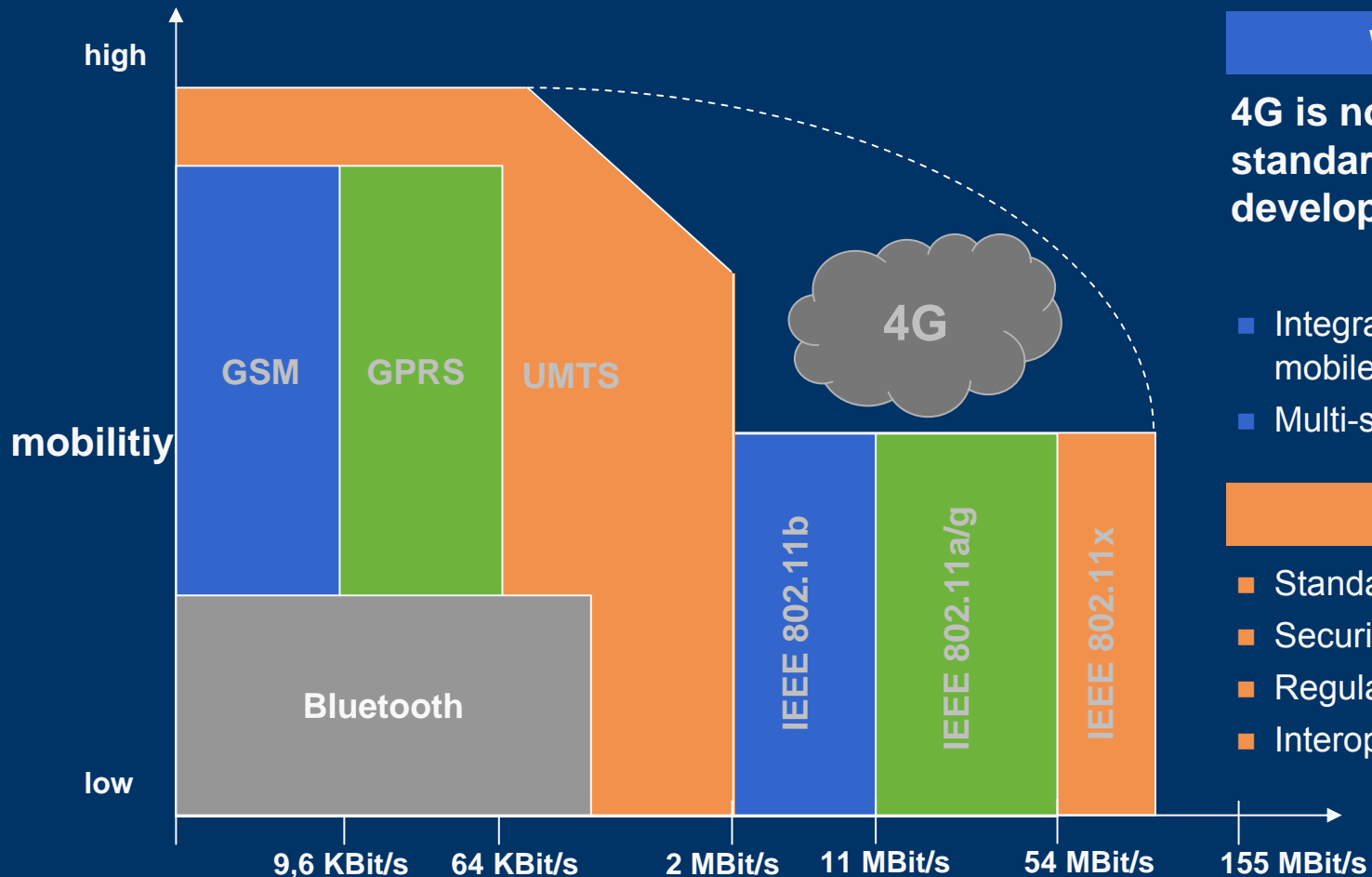
1. Prospect of costs
2. Differentiation of services by quality
3. Segment focused pricing



# 1. Current Situation

## 1.6 From 3G to 4G

On the long term 4G will be a combination of the existing services.



### What is 4G?

**4G is not a defined standard, but an ongoing development basing on 3G**

- Integration of W-LAN's in mobile networks
- Multi-standardized devices

### Challenges

- Standards
- Security
- Regulation
- Interoperability



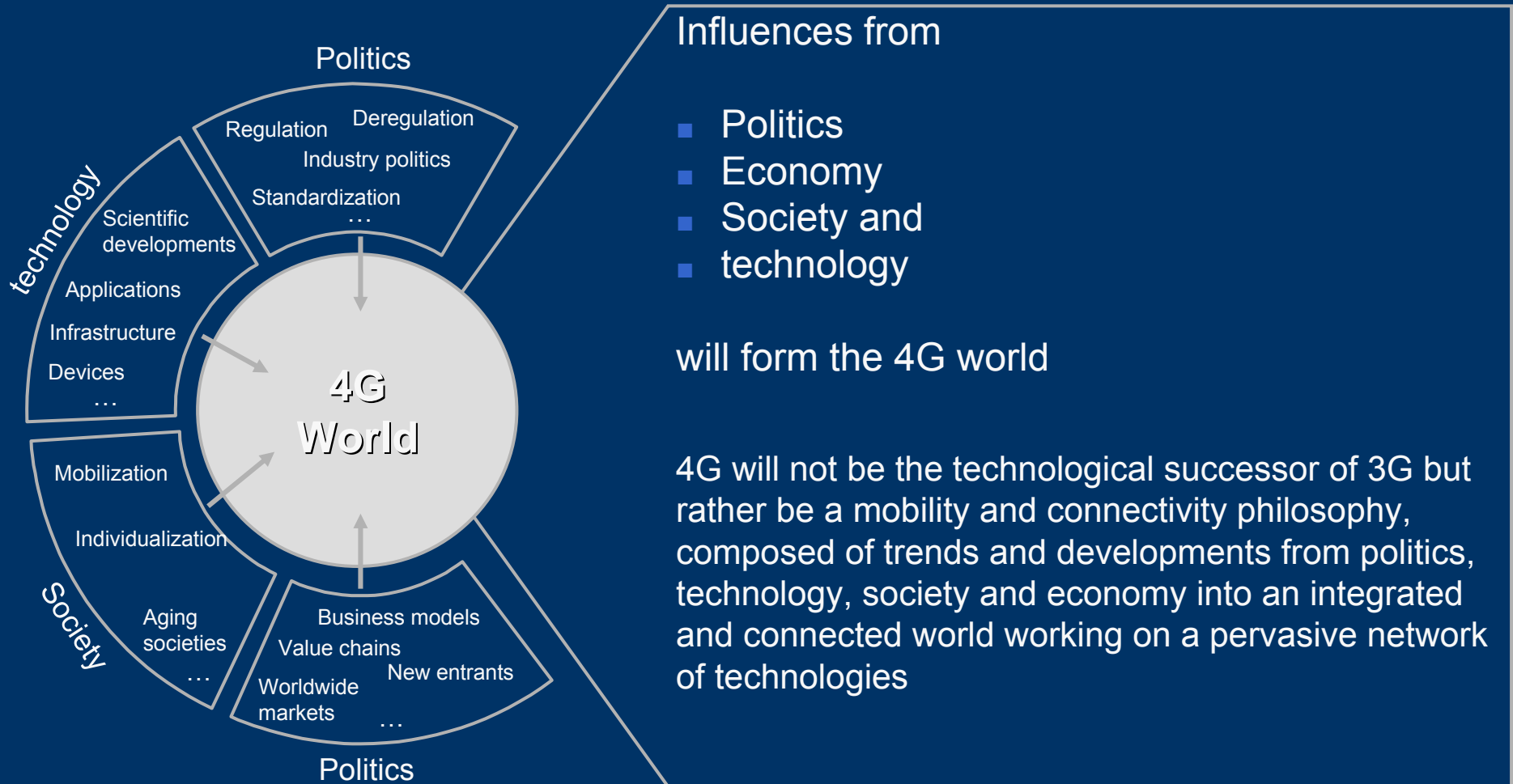
1. Current Situation
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## 2 A Vision Beyond 3G

### 2.1 Building Blocks driving 4G Development

Politics, technology, Society and Economy will drive the future of 4G significantly – connectivity and mobility philosophy for the knowledge society



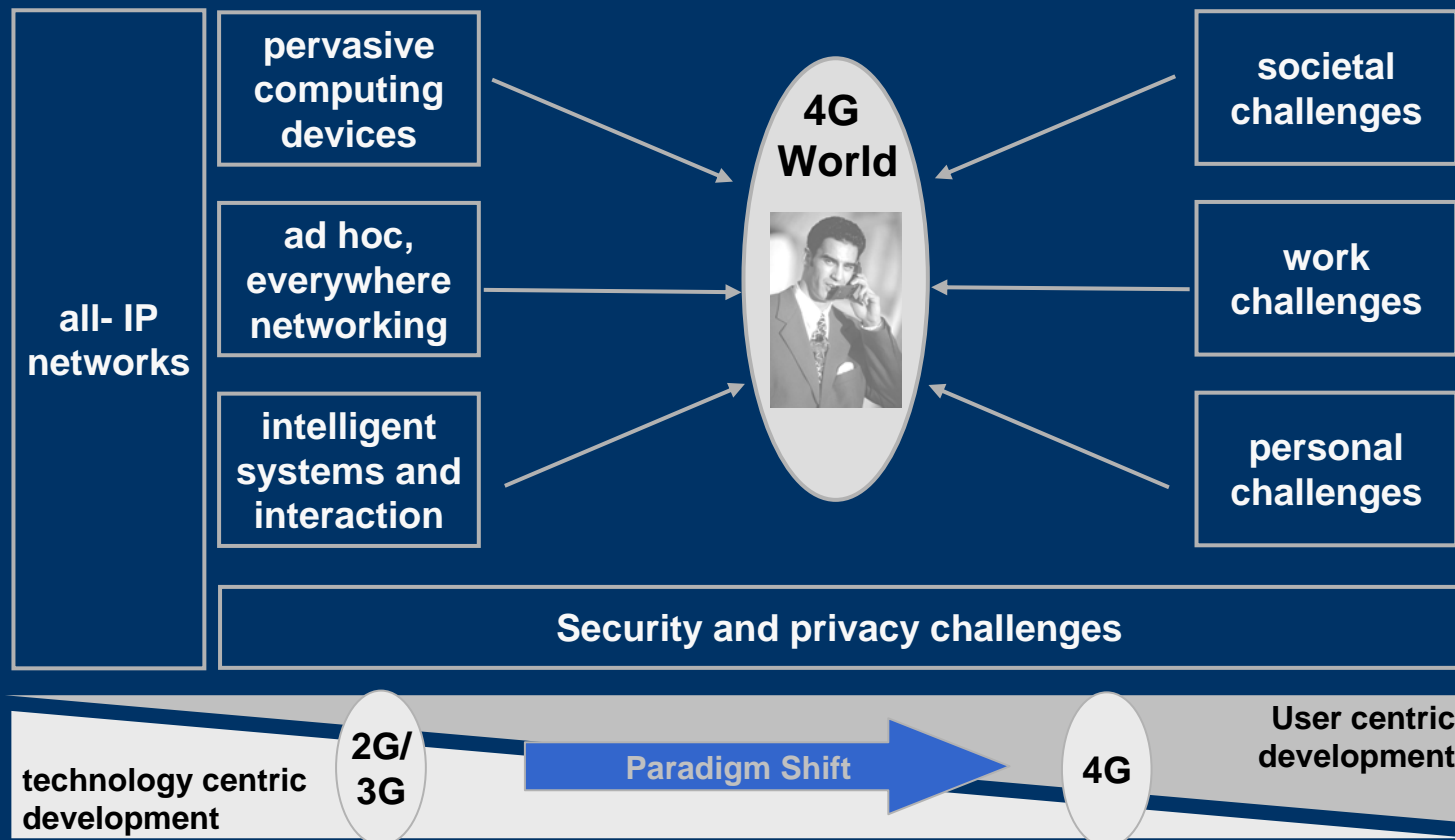


## 2 A Vision Beyond 3G

### 2.2 Current Understanding of the 4G Vision

In contrast to the past technology driven advancements a paradigm shift towards placing the user needs in the center of attention is necessary.

#### 4G paradigm shift





1. Current Situation
2. A Vision beyond 3G
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# 3. Influencing Spheres of 4G and their Interdependencies


## 3.1 Current Regional Developments towards 4G

US and Japan are driving their respective views of 4G while Europe is still trying to follow an integration of standards approach

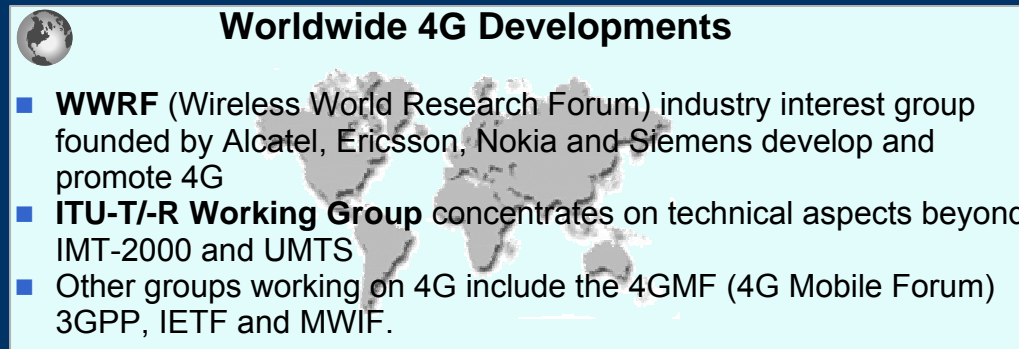
 **EU 4G Developments**

- Most of **Europe** believes in a **4G world based on IMT-2000** plus supplementing technologies on a all IP core network.
- To promote this **various organizations** and leading companies are driving research on 4G: ETSI, CEPT, IST Cluster on „Systems beyond 3G“, Mobile VCE...
- In the past **EU** has successfully worked on **Mobile Broadband System (MBS)**, a high speed cellular system and proven that it can manage different institutions to get a working system developed




 **Worldwide 4G Developments**

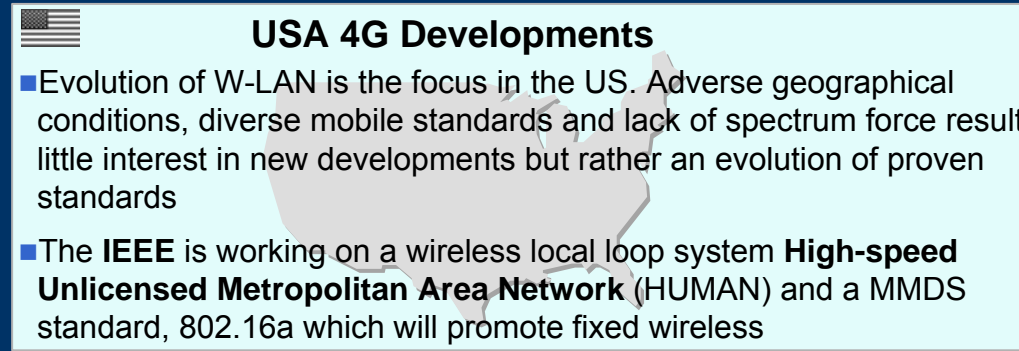
- WWRF** (Wireless World Research Forum) industry interest group founded by Alcatel, Ericsson, Nokia and Siemens develop and promote 4G
- ITU-T/R Working Group** concentrates on technical aspects beyond IMT-2000 and UMTS
- Other groups working on 4G include the 4GMF (4G Mobile Forum) 3GPP, IETF and MWIF.




**4G**

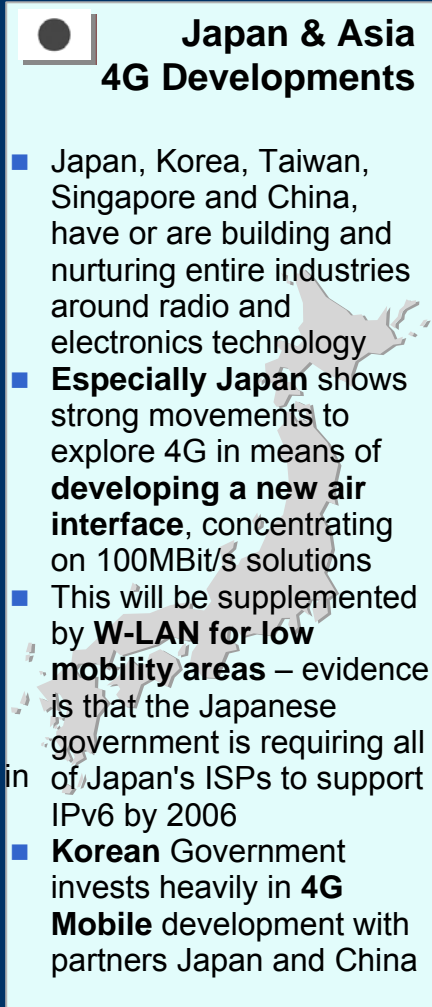
 **USA 4G Developments**

- Evolution of W-LAN is the focus in the US. Adverse geographical conditions, diverse mobile standards and lack of spectrum force result in little interest in new developments but rather an evolution of proven standards
- The **IEEE** is working on a wireless local loop system **High-speed Unlicensed Metropolitan Area Network (HUMAN)** and a MMDS standard, 802.16a which will promote fixed wireless



 **Japan & Asia 4G Developments**

- Japan, Korea, Taiwan, Singapore and China, have or are building and nurturing entire industries around radio and electronics technology
- Especially Japan** shows strong movements to explore 4G in means of **developing a new air interface**, concentrating on 100MBit/s solutions
- This will be supplemented by **W-LAN for low mobility areas** – evidence is that the Japanese government is requiring all of Japan's ISPs to support IPv6 by 2006
- Korean** Government invests heavily in **4G Mobile** development with partners Japan and China





### 3. Influencing Spheres of 4G and their Interdependencies

#### 3.2.1 Key Issues - Technological Sphere

Evolution instead of revolution characterizes the development towards 4G – most technologies needed are already existing



*Focus of future development shifts from developing new technologies and standards towards an integration and interoperability imperative. The basic technologies needed are mostly in place or are already being developed. The arising technological issue is about ensuring a consistent process framework for service and application delivery.*



*Core technology will be an integration network based on IP V6. The harmonization of technologies and standards is a long process making an integrating layer above the different technologies the more attractive and feasible option.*



*User expectations and service requirements form the user oriented development of technology (devices, applications and user interfaces) in terms of usability, quality, flexibility and intelligence.*

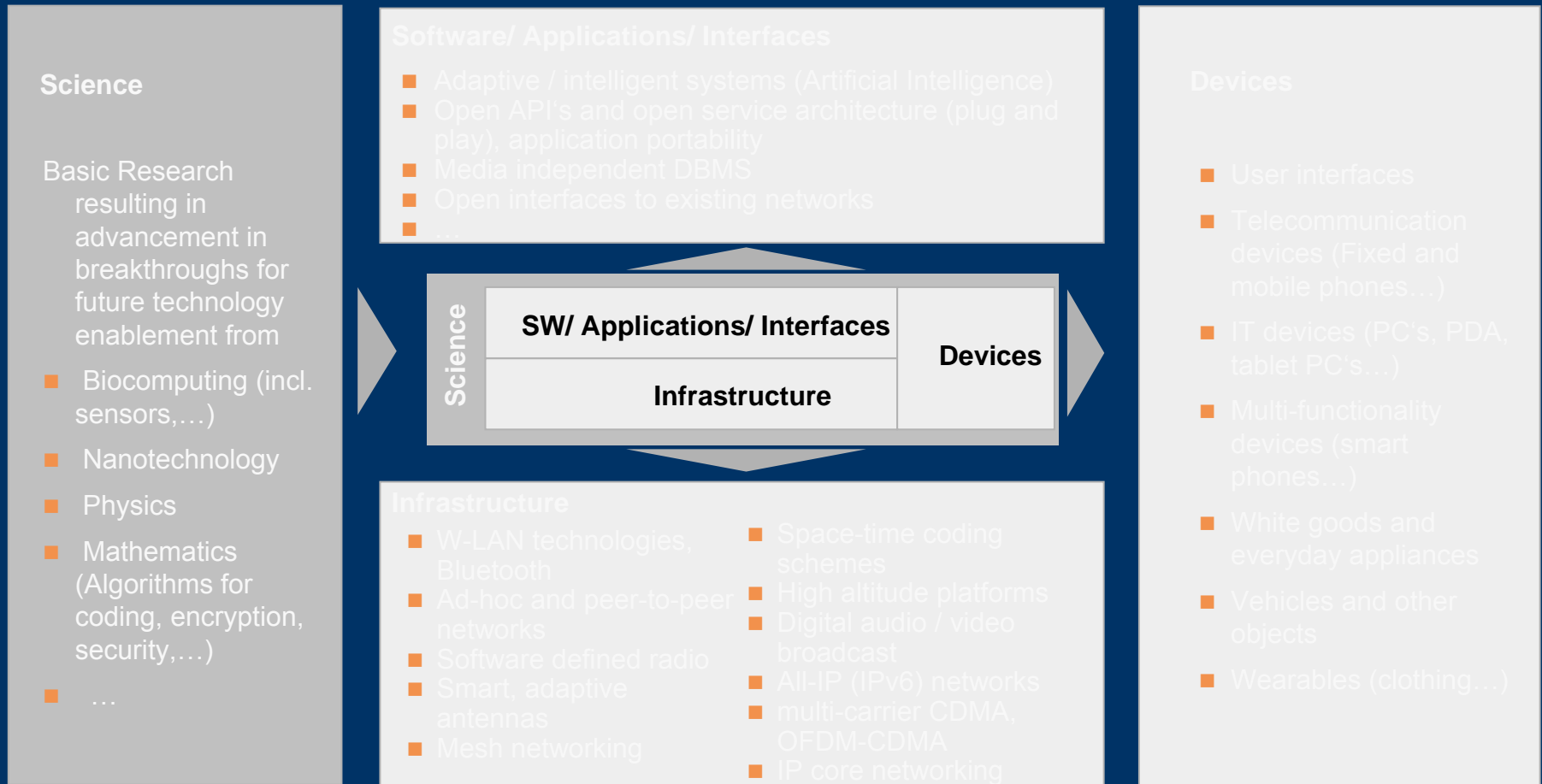


# 3 Influencing Spheres of 4G and their Interdependencies

## 3.2.2 technology Systematization

A maze of competing standards, proprietary technologies and related technical problems is delaying future development.

technology - systematization, trends and developments





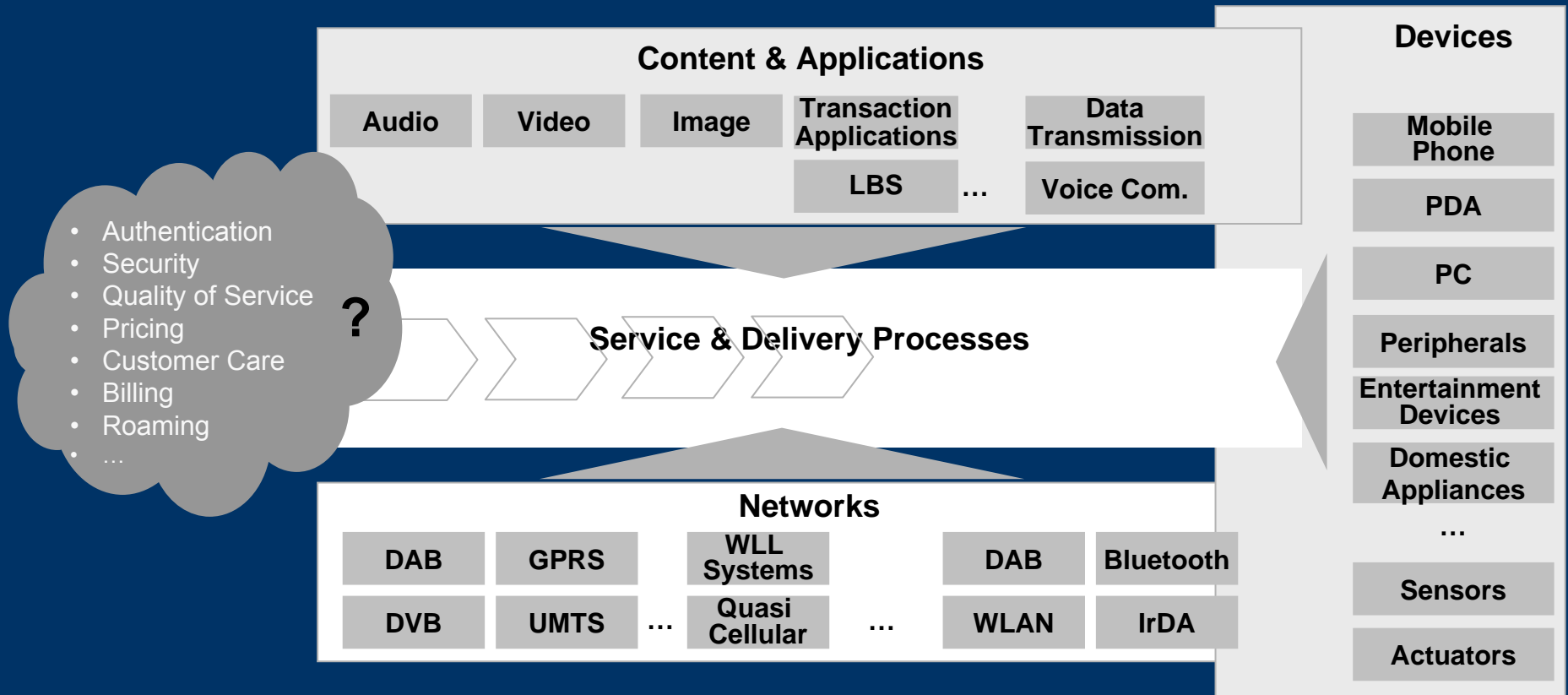
# 3. Influencing Spheres of 4G and their Interdependencies

## 3.2.3 4G Emerging Technologies

A broad number of existing or currently designed technologies are being projected into the 4G world – with consequences for the delivery processes.

Broadcasting, Infotainment, Messaging, ...

Corporate Apps. – CRM, SCM,...





# 3. Influencing Spheres of 4G and their Interdependencies

## 3.2.4 Key Technological Issues and Challenges

So far the industry agrees that an IP core network will be the key. It will neither be possible nor necessary to invest in designing a new wide-area air interface

### Key Technological Issues and Challenges

#### Science

- Support and funding by public sources or via the industry (esp. in the current economic environment) of scientific R&D will be crucial – closing the time to market gap is critical
- Driving an interdisciplinary approach from all areas of science
- Driving usability of technology by researching further into Artificial intelligence, intuitive man machine interfaces and delivering technology...

#### Software/ Applications/ Interfaces

- Integration of different technologies, mainly delivering middleware functionality and interfaces vs. performance trade off become key issues
- Applications need to adapt to user roles and needs and provide usability, flexibility and security
- Establishing a migration path for applications

#### Devices

- The two major trends integrated multi-functionality devices vs. dedicated devices will continue.
- The integration of everyday life articles such as appliances will drive overall connectivity but also result in a more complex environment
- Faster innovation cycles of new devices might become a barrier



#### Infrastructure

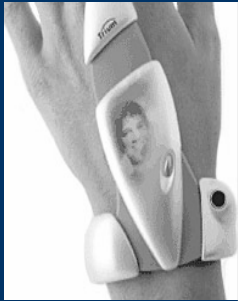
- Most technologies for 4G are in place, main issue being integration and interconnection
- IP core networks will form the backbone of 4G, no need for new standards but making the existing work together
- Integration of technology from and into other areas such as TV, Vehicles, Radio, Home appliances, Clothing...
- Funding by operators being under financial pressure.



# 3 Influencing Spheres of 4G and their Interdependencies

## 3.2.5 Major 4G technology Trends

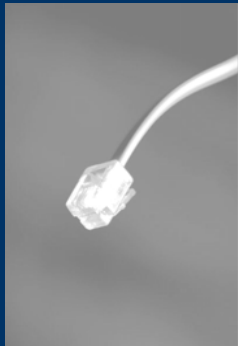
Unlike 3G which is focusing on the air interface, 4G will focus on the core network and use existing standards and a variety of „connected devices“.



### A multitude of terminals and devices with mobile communication abilities

Influence of 4G will extend beyond devices such as mobile telephones, PDA's, laptops and PC's:

- New Devices and device categories will emerge (“wearables”, data gloves, earrings, goggles)
- Existing devices such as white goods will be enhanced and connected
- Everyday objects will become connected (goods, parcels, toys, vehicles, sensors and actuators)



### Overlay of many independent, but interoperable networks

Internet Protocol (IPv6) will play a dominant role in building an interoperable network, serving all access technologies providing the required flexibility:

- Different access technology (frequency, bandwidth, reliability...)
- Different range (fixed, local hot spots, worldwide accessibility...)
- Different infrastructure (Ad-hoc networks with no infrastructure, cell-based systems, satellite networks..)
- Different needs for mobility support (quasi stationary, vehicles at high speed...)



### Wide range of requirements on data rate, quality of service, security, availability, price.

User centric concepts lead to the following future service requirements:

- Payment information, location information, video, multi-player games
- technology must be widely accepted and easy to use
- Reconciling different service requirements of business and private customers
- Ease of operation: 'silent servants'



### 3 Influencing Spheres of 4G and their Interdependencies

#### 3.3.1 Key Issues - Societal Sphere

Since 4G is user centric, the importance of behavioral analysis and corresponding market approaches grows significantly



***Trends embedded in the social framework. They are perceived and lived behaviors that are accepted by a number of individuals. Acceptance of 4G will be driven by conveying the benefits and changing behavior***



***Driving 4G means also the coherent analysis of the surrounding influencing environments, since individuals in different groups share different sets of beliefs, communicational behavior and values towards 4G***



***Social trends can be explained individually but in order to come to a picture of the future, the interdependencies of trends must be combined into future scenarios***

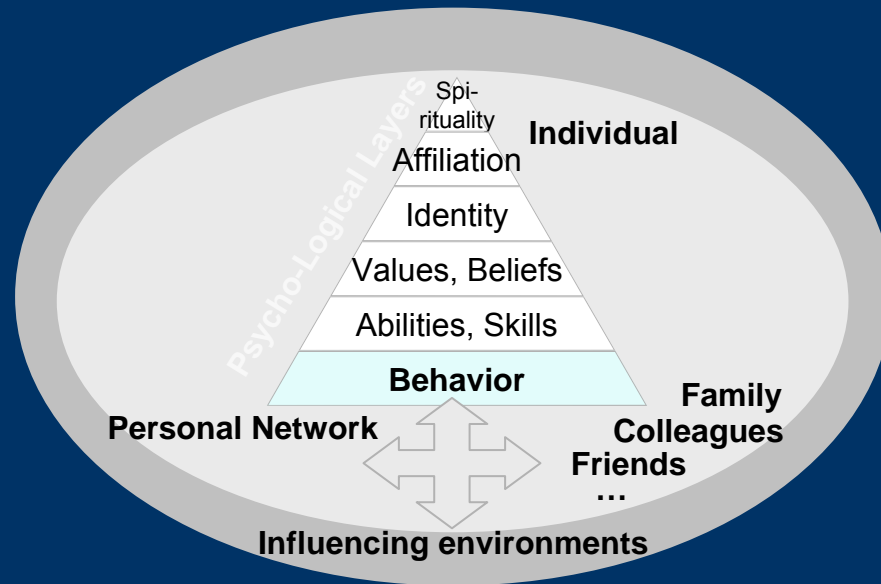


### 3. Influencing Spheres of 4G and their Interdependencies

#### 3.3.2 Systematization of Society Trends

Trends are perceived and lived behaviors accepted by a number of individuals. technology can not cause trends but it is an important enabler and catalyst.

##### Behavioral Layer Model



##### Key Messages and Issues

- Change means changing behaviour. Trends are perceived and lived behaviors that are accepted by a number of individuals.
- Trying to change behaviour and means delivering something that has an intrinsic value for the individual
- Different environments influence the psycho-logical layers and vice versa but only through the “behaviour” layer

##### Challenges for 4G Development

**Trendscouting** and evaluation of driving factors of these trends in order to **understand peoples behavior** and general **attitude towards 4G usage in different environments**

**Analysis** of the possible **beneficial effects of 4G** by determining individual values, beliefs and identities that set the individual perceived benefits.

Focus on **changing people’s behavior** by conveying that 4G add additional value to the individual



# 3. Influencing Spheres of 4G and their Interdependencies

## 3.3.3 General Society Trends towards 4G

There is a increasing number of trends that will have an impact for the 4G world. They have to be set into context with the other influencing factors

### Examples of trends and developments

<b>tribalism vs. universalism</b>	Individual societies/ social groups or segments vs. universal solutions
<b>mobilization/ changing ork</b>	People are increasingly mobile – for private/ leisure and work reasons
<b>technology mastery</b>	It becomes increasingly harder to manage and use all kinds of technology
<b>individualization</b>	Affiliations and identities form micro groups and segments
<b>rising affluence</b>	Rising diversity and choice of information, sources, products and services
<b>complex society</b>	Microsegments cause no clear affiliation to the society as a whole
<b>aging societies</b>	Longer life expectance extend social groups with no/ little “tec” experience
<b>cocooning</b>	Retreat into a personal sphere with less physical contact with others

### Challenges/ consequences for 4G

Regional differences must be taken into account. Different groups have different beliefs and values
Support the demand for secure, reliable and fast access to information and communication resources independent on location.
Ease of use, intelligent applications and user interfaces
Customer segmentation, mass customization on service and application level
Choice management, intelligent systems
Finding common denominator of key values to different clusters and how to connect them
New interfaces for communication habits of older or disabled persons
Provide the means for close-to-physical interaction with other (real or virtual) beings

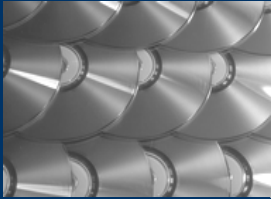




### 3. Influencing Spheres of 4G and their Interdependencies

#### 3.3.4 Detecon Society Theses

Individual Trends will have to be combined into scenarios sometimes resulting in a rather radical view of the future



Thesis 1: Living in an information/ knowledge society, filtering relevant information becomes increasingly difficult. Social status will be determined not only by the access to data and information, but also by the ability to transform them into relevant information and knowledge



Thesis 2: Communication technology will significantly accelerate change the way people interact physically. The networked society will start to lower physical interaction and amplify trends like cocooning and virtual work



Thesis 3: People specializing on core functions and working for different companies at the same time might become reality



Thesis 4: (Wireless) telecommunications, TV, internet, radio will operate on a single platform. The shift towards the integrated home world will be accelerated by readily available content through different means (movies, music, games...)



### 3 Influencing Spheres of 4G and their Interdependencies

#### 3.4.1 Key Issues - Economical Sphere

A migration path for mobile operators and their suppliers currently under economic pressure will be the key success factor for establishing 4G



***Changing user requirements will result in new business models and value chain roles – especially operators are under pressure by forward and backwards integration of manufacturers and new service provider models***



***Key players in the future will be those that are able to manage ease of use for the customer and to reduce complexity while dominating the value chain***



***The 4G business imperative will be that it has to add economic value unlike the present 3G model***



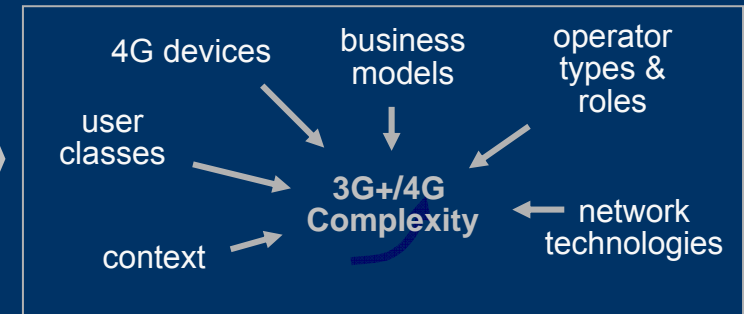
# 3. Influencing Spheres of 4G and their Interdependencies

## 3.4.2 Detecon Theses

The emerging key players will be those that are able to manage ease of use for the customer and reduce complexity - probably SW suppliers

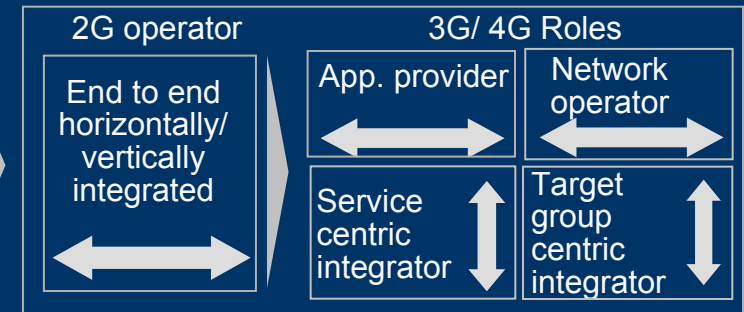
### Managing complexity

- Managing and reducing complexity for the user while maintaining service quality will be the key task in 4G
- Product offerings will dramatically change
- Partnerships, joint developments and alliances will play an important role to make markets



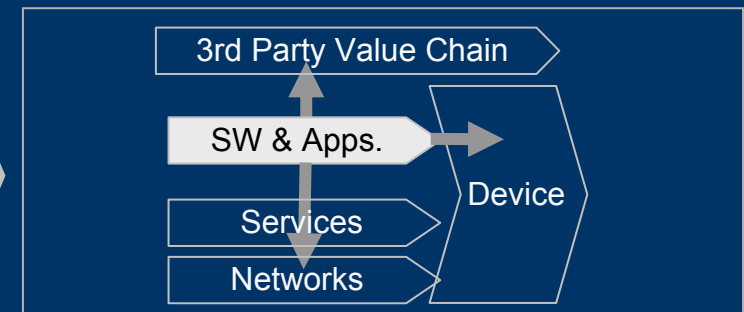
### Different roles and different business models

- Increasing number of players from different industries and value chains and specialization in scope of work
- New entrants from gaming, media markets...
- Importance of creating a seamless migration path for mobile operators



### Domination of value chain comes from software players

- Software dominance caused by increasing middleware focus
- Compatibility and interoperability of networks and applications will be mainly a software topic
- Design of intelligent applications and integration of multi-functionality



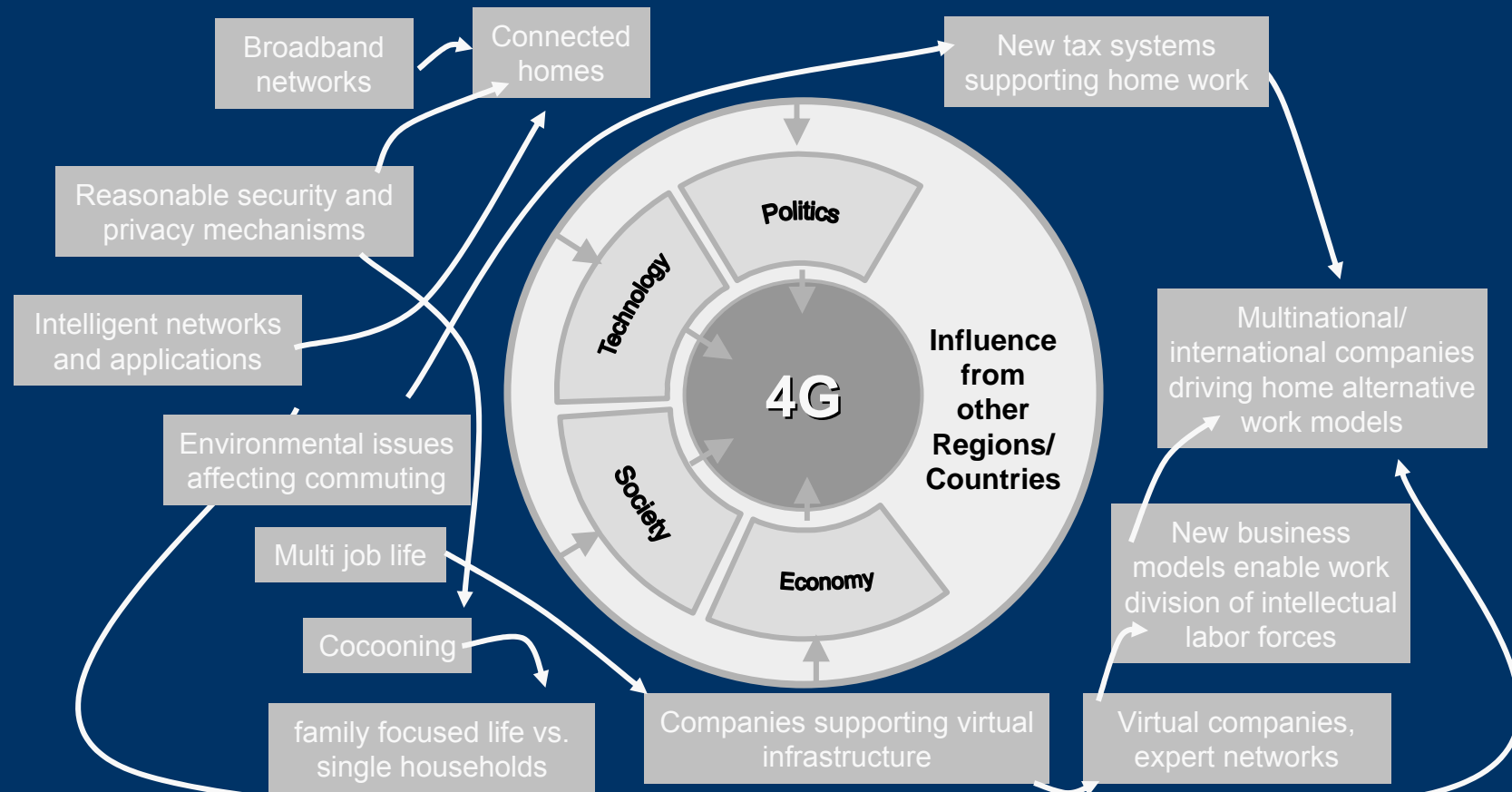


# 3 Influencing Spheres of 4G and their Interdependencies

## 3.5 Example of trend interdependencies

Trends and Developments in the four spheres and other influences are interconnected and influence each other.

4G interdependencies and influencing trends: Example office work in the future





### 3. Influencing Spheres of 4G and their Interdependencies

#### 3.6 Example scenario – Office Work

A possible outcome of the trends of Office Work in the future is the fully connected home office with a number of positive and negative effects ...

#### Office Work Scenario

Intellectual work division leading to specialization and multiple jobs

Flexible Division of Working Time

technology advancements resulting in real time work opportunities, from office work to handling machines



Cutting travel time by working at home

Virtual networks form the backbone of companies

#### Examples of Possible Effects and Outcomes



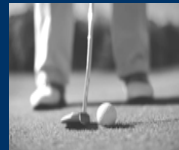
Working in a home office significantly reduces traffic congestions and pollution but negative effects for travel & transport industry



Intelligent machines and applications take over some of the work tasks and doing them in a more efficient manner



Positive economic effects by new business models and more efficient ways to work. Creation of new service industries & job types



Increasing leisure time improving overall quality of life vs. overall negative impact on productivity



Physical isolation and stronger dependency on virtual contacts and interaction but increasing usage of technology



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## 4. Key Challenges of 4G

### 4.1 4G overall challenges

4G is not a technological development but merely a philosophy and therefore it must be analyzed and stimulated in an interdisciplinary approach

*Understanding the importance, drivers and interdependencies of the 4G trends and developments in the influencing spheres as an interconnected system that drives the emergence of 4G*

*The user centric approach must be the dominant theme for 4G. Furthermore understanding that the development will not be a focused technological development but rather a social evolution with technology being an important enabler and facilitator*

*Regulation and standardization act as an catalyst for 4G – however concentration on developing and finalizing current standards and technologies will be more important that trying to aim for a global alignment*

*The IT industry will show a significant change as a whole. Players trying to cope with changing user requirements will develop new value chain roles and business models. Especially mobile operators and their suppliers as the drivers of 3G will be facing increasing pressure from other players*



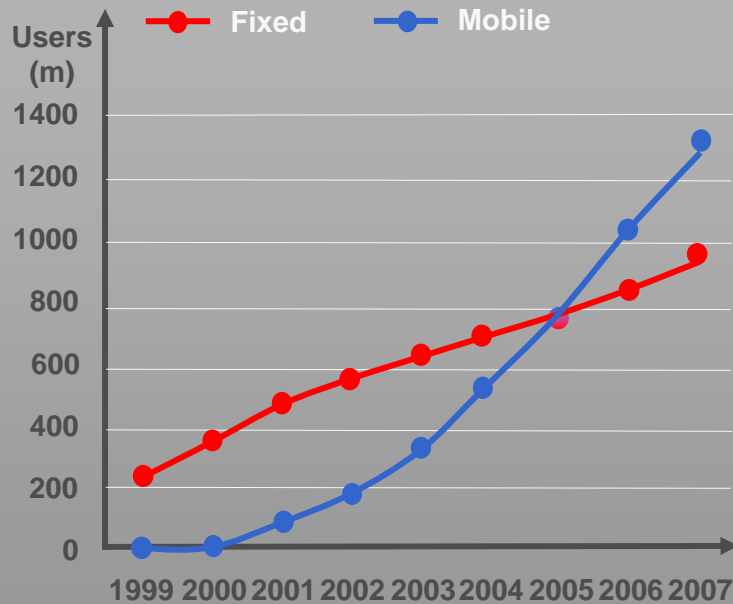
1. Current Situation
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# 5. Resumée

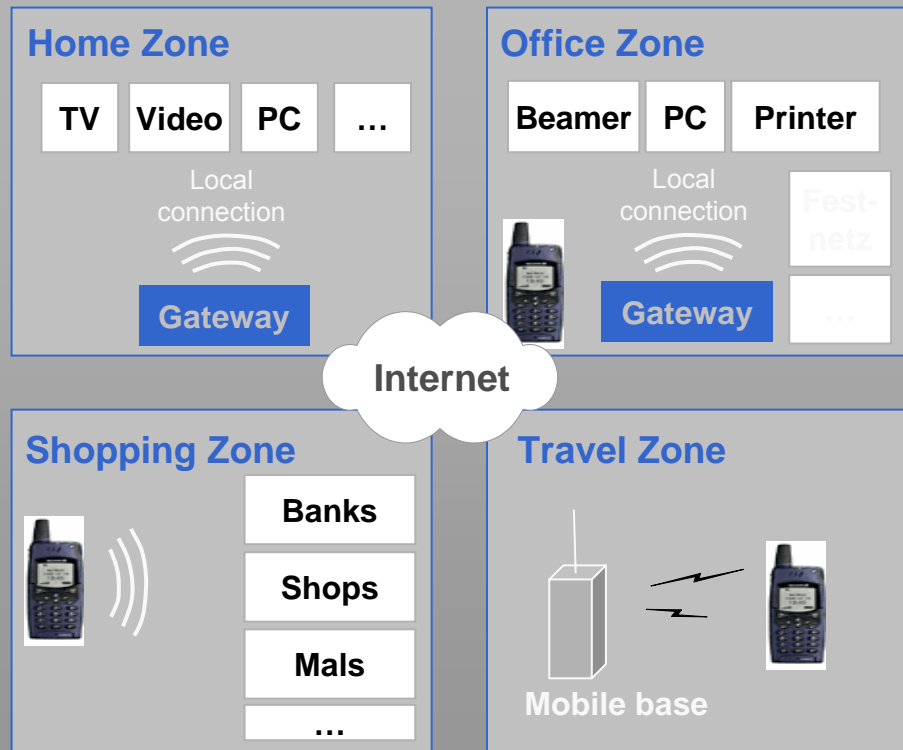
AAA - Anytime, Anywhere, Anything: The internet will be permanently with us.

In 2005 more customers will have access via mobile than fixed network  
fixed vs. mobile user



Source: ARC Group

Internet everywhere:  
Mobile device zones



Source: ARC Group



# 5. Resumée

The convergence of mobile and internet is dedicated to the behavior of the customers.

