Business Models of the Future Internet

Future Internet Summer School 2009

Mario Kind

Agenda.
The plan for the next two hours.

- Introduction
- Session 1: Excursus business models
- Session 2: Interconnection
- Session 3: Business aspects of the Future Internet
- Session 4: Case study “Network virtualisation”

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Introduction.
Who I am.

- Doing research at Deutsche Telekom Laboratories
- Master degree in information science from University of Applied Science, Leipzig
- 8 years of work experience within Deutsche Telekom AG

- My background
  - Fixed access networks
  - Techno-economic calculations
  - Interest into evolution of service platforms

Introduction.
What is your experience?

- Who is a student / professional ?
- How long are you working within the telecommunication / Internet business ?
- Who has a technical / economical background ?

- Since when are you using the Internet ?

Introduction.
Motivation / targets of this course.

- Raise awareness for techno-economics

- Show constraints of today…
- … and show one solution with the economical incentives behind exemplarily

- Show complexity and components of business models
- Explain facets of interconnection
- Show strategic areas impacting the future service and business environment
- Explain solution in some case studies

Introduction.
The Agenda for this course.

- Session 1 will provide an overview on business models and methods to derive them.
- Session 2 will present an overview on interconnection and aspects from the current situation.
- Session 3 will present aspects which might impact the future based on the work of the IST 4WARD project.
- Session 4 will present a case study on the “hot topic” of network virtualisation.
- There will be a coffee break at some point…

Introduction.
Questions ? Yes, please!

- This course should be a little bit interactive
- Please raise your hand or voice or both to ask me when you think you have to ask something immediately
- Time for questions is reserved after each session

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Business models.
Agenda.

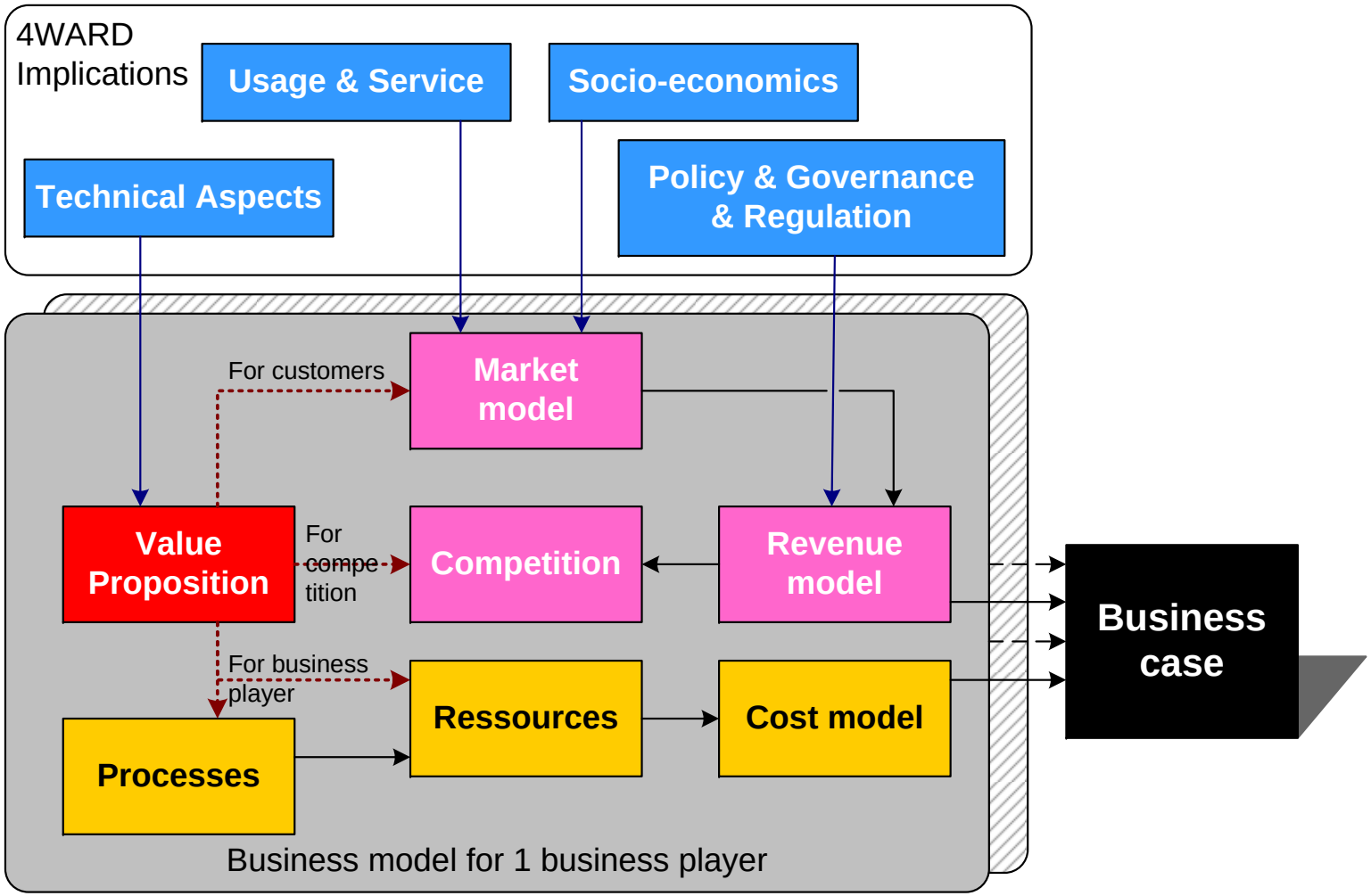
- Clarification of the term business model
- Components of the business models
- Some problems in calculations
- Some methods

Business models.
Interpretation of the term.

- No common, but a number of similar definitions
- Some examples:
  - "… spells-out how a company makes money by specifying where it is positioned in the value chain"
  - "… is architecture for the product, service, information flows, including a description of various business actors and their roles, a description of potential benefits for the various actors, and a description of the sources of revenue"
  - "a successful business model creates a heuristic logic that connects technical potential with the realization of economic value."
- Overall, some components in common

Source: CELTIC ECOSYS Deliverable 03: "Business models in telecommunications"

Business models.
Components (1/8).



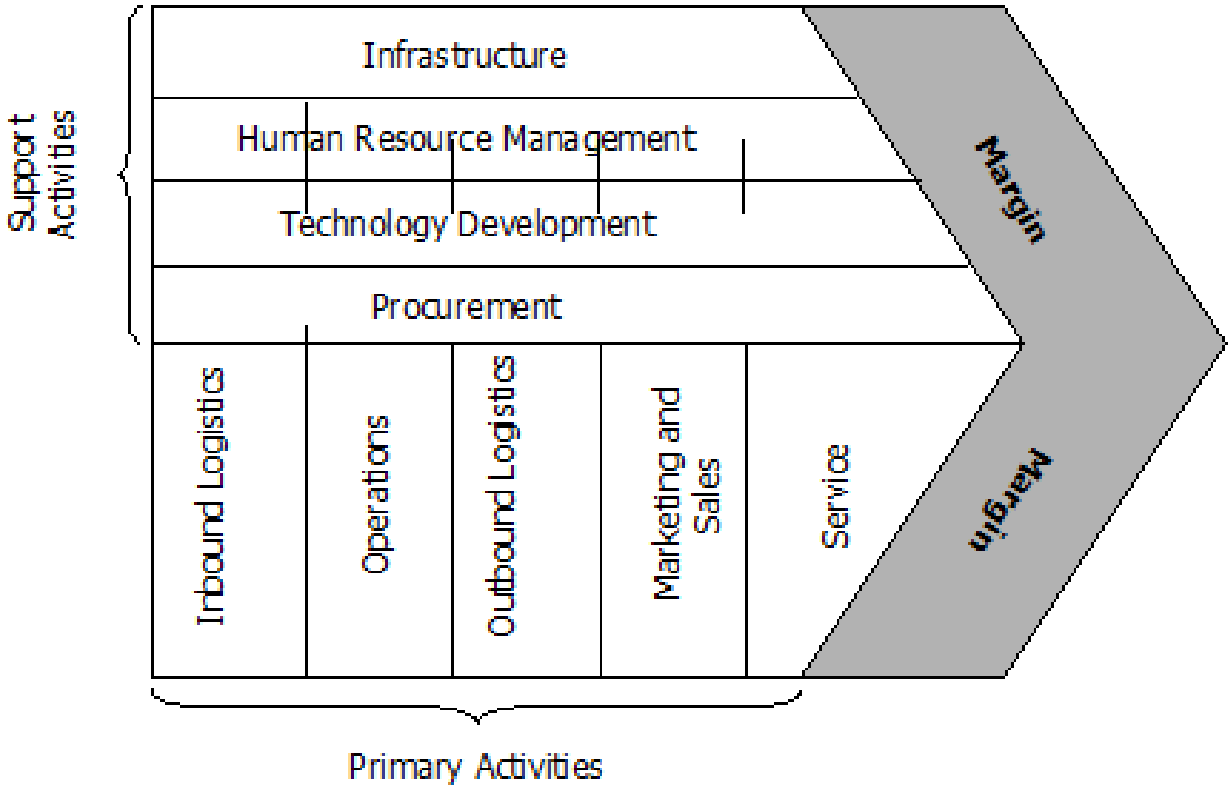
Business models.
Components (2/8).

- Value proposition defines position in industry
  - Basic
  - Expected
  - Desired
  - Unanticipated
- Value proposition impacts other parts of the business model
  - Customers
  - Competition
  - Cost model

Source: K. Albrecht "Customer Value"

Business models.
Components (3/8).

- Value chain from Porter

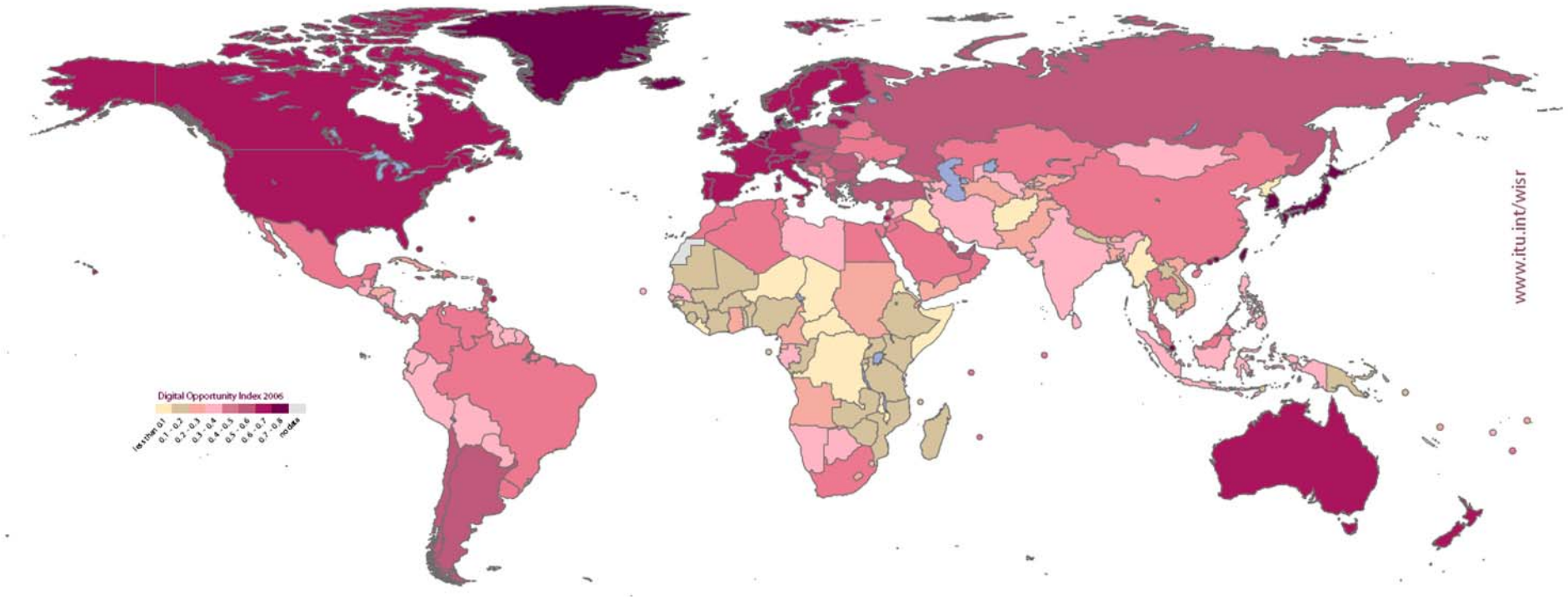


Source: Michael E. Porter "Competitive Advantage: Creating and Sustaining superior Performance"

Business models.
Components (4/8).

- Market model defines number of potential customer
  - Services offered
  - Usage scenarios
  - Social aspects
  - Ecological aspects
- Some examples on the next slides

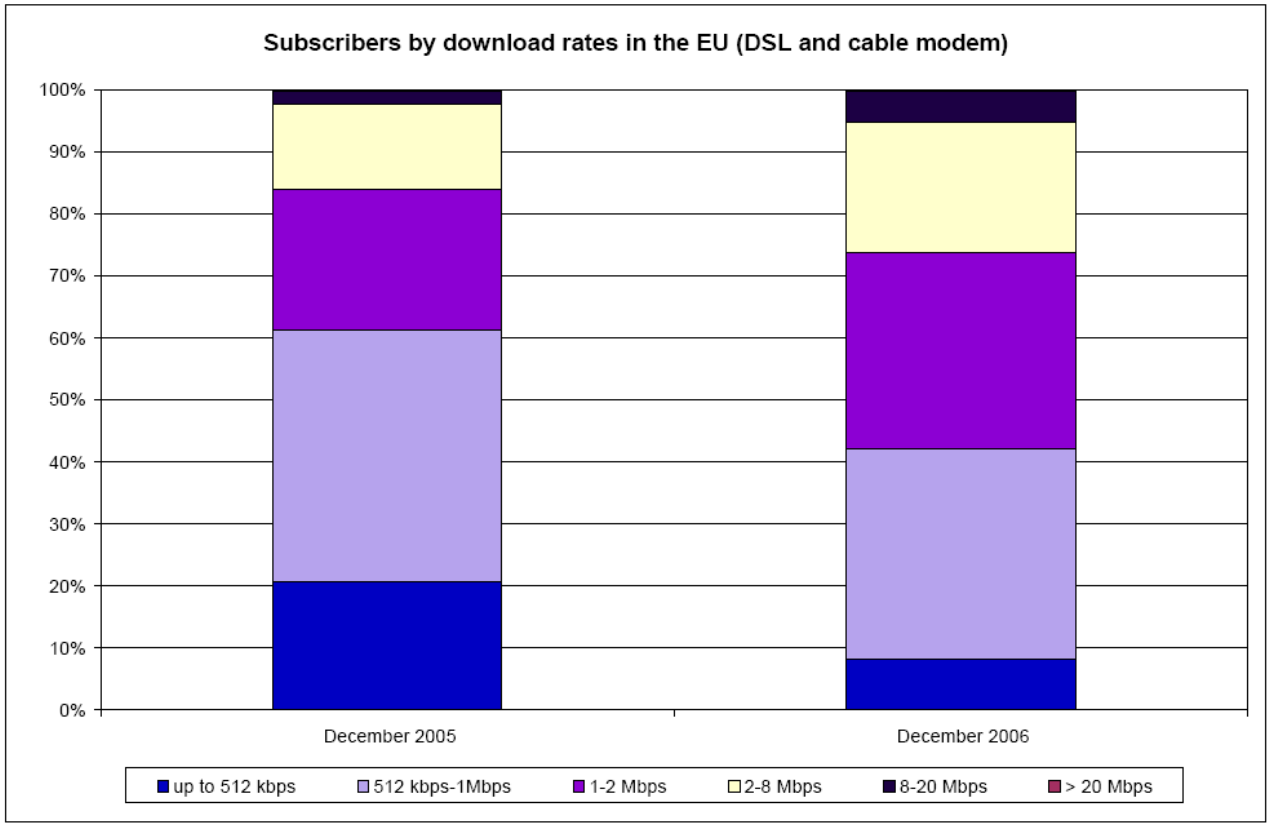
Business models.
Components (5/8).



Digital Opportunity Index of ITU

Business models.
Components (6/8).

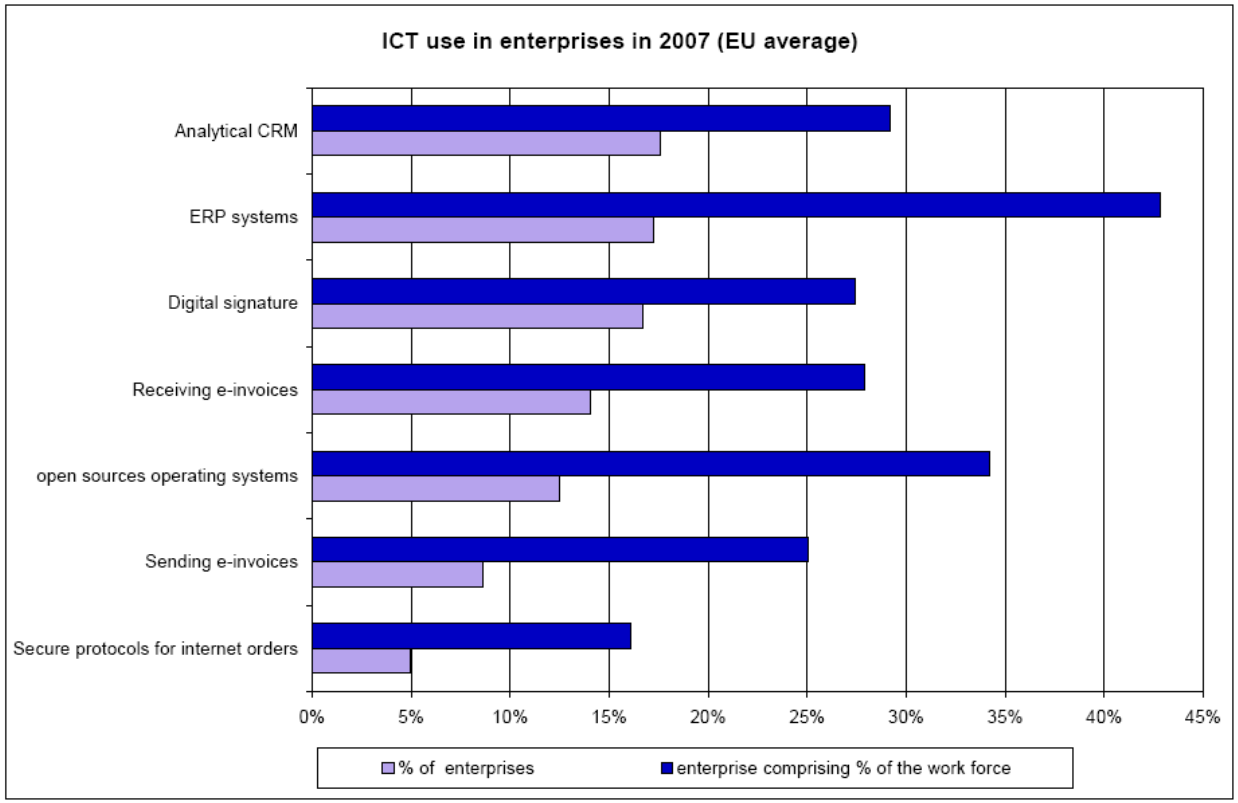
- Downstream data rate in EU



Source: EC services based on data from Idate[25]

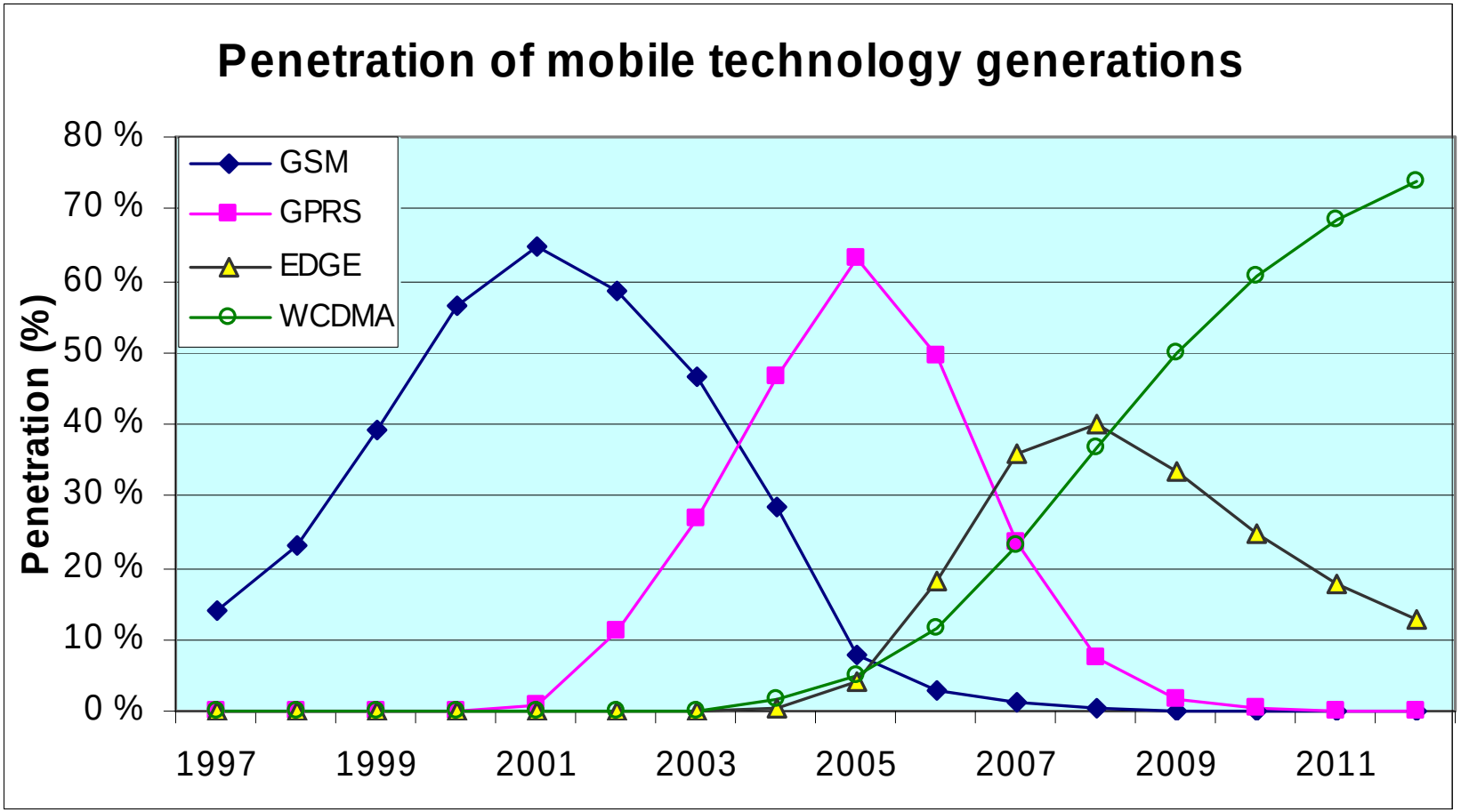
Business models.
Components (7/8).

- Information and communication technologies in enterprises



Source: Eurostat, Survey on ICT use in EU enterprises [64]

Business models.
Components (8/8).



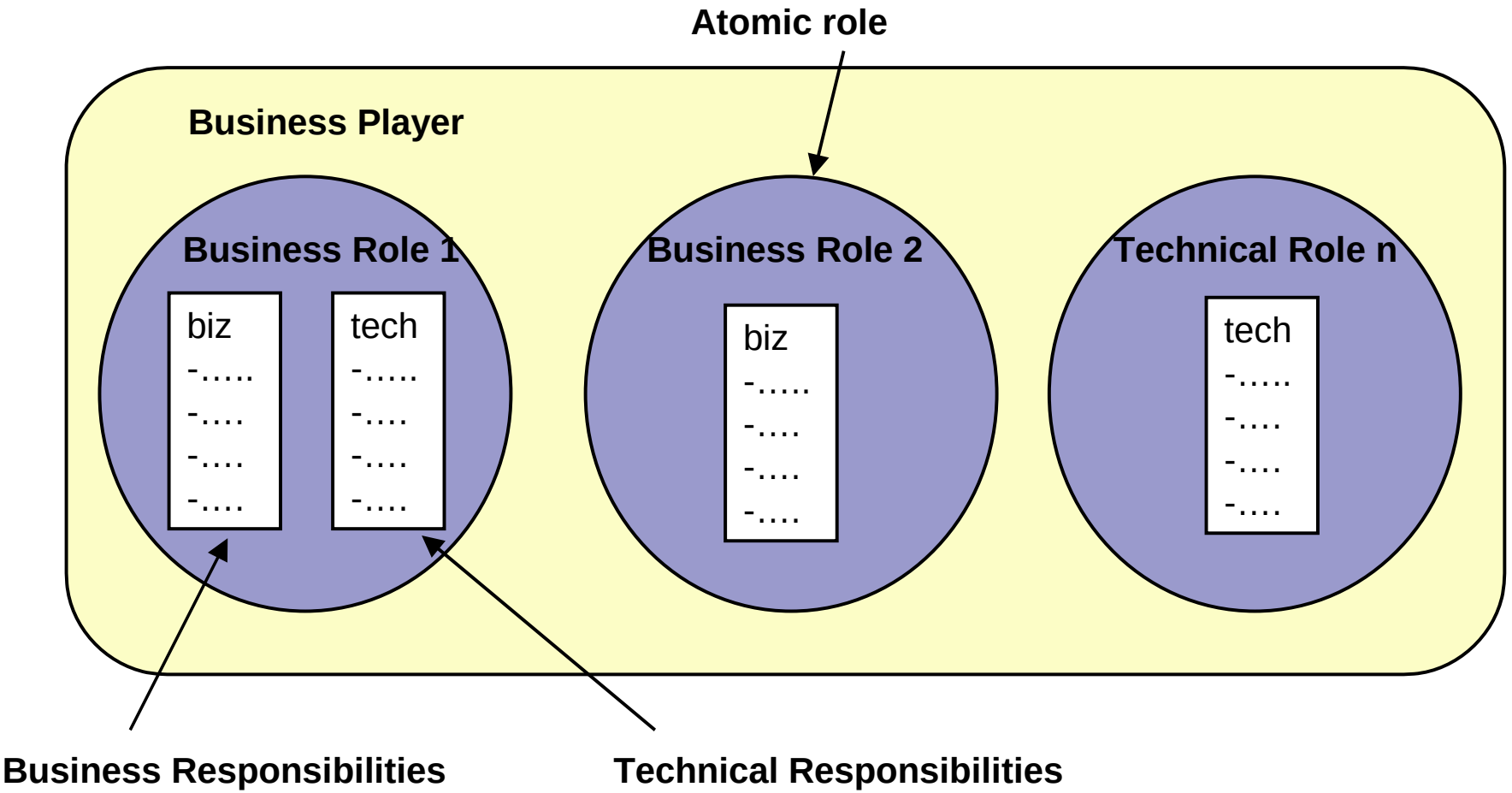
Source: CELTIC ECOSYS Deliverable 14

Business models.
Business Role modelling (1/3).

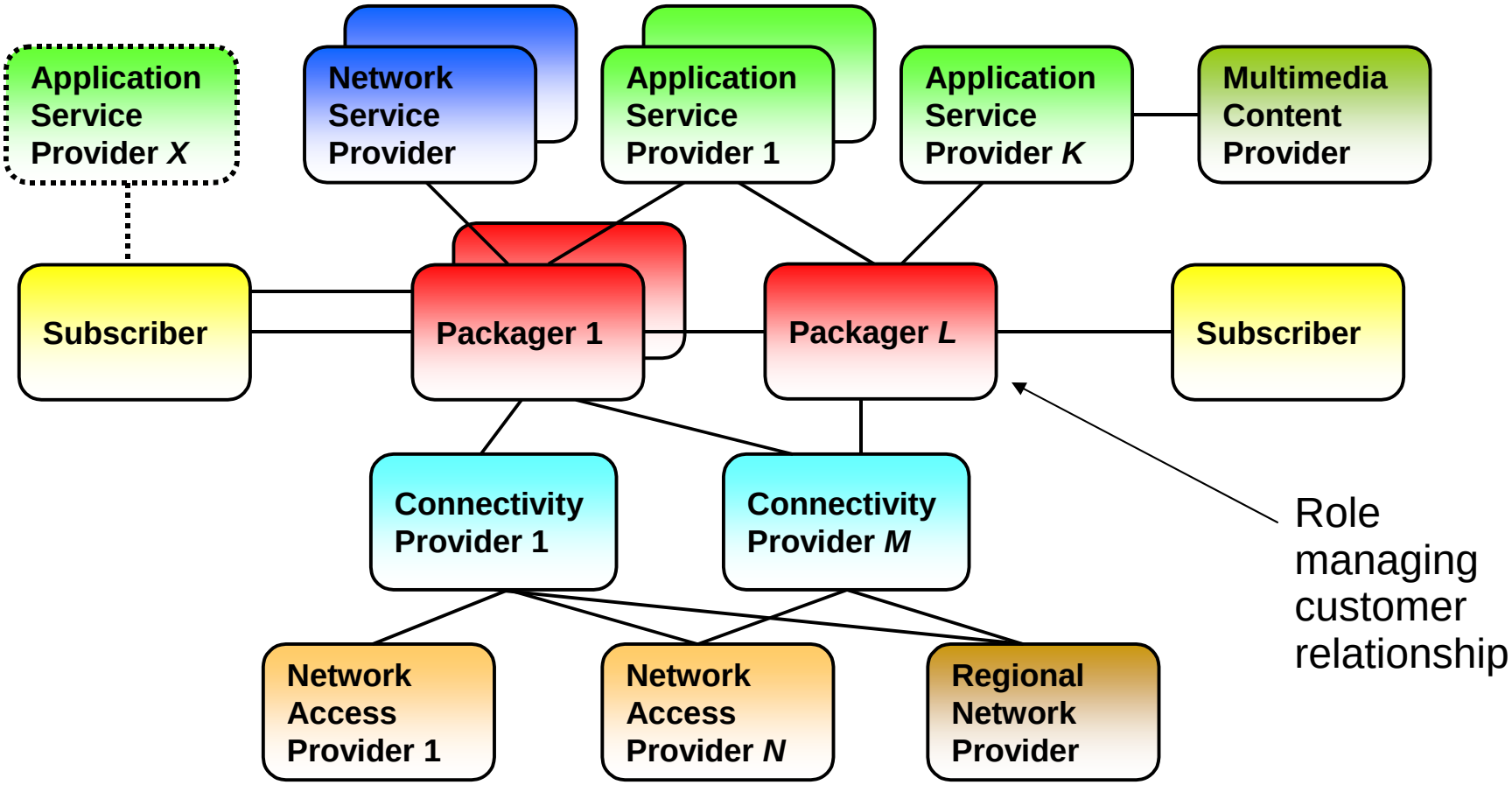
- Role is a logical group of functions, similar to departments in enterprises
- Increasing complexity to describe real world actors („player“)
  - Players are doing more than one business
  - Difficulty to analyse needed interfaces
    - Business
    - Technical
- Split the actors in functional entities („role“)
- Assign responsibilities (cf. Porter’s value chain)
- Be aware of different strategies for roles and players

Source: IST MUSE: White Paper “MUSE Business Model in BB Access”

Business models.
Business Role modelling (2/3).



Business models.
Business Role modelling (3/3).

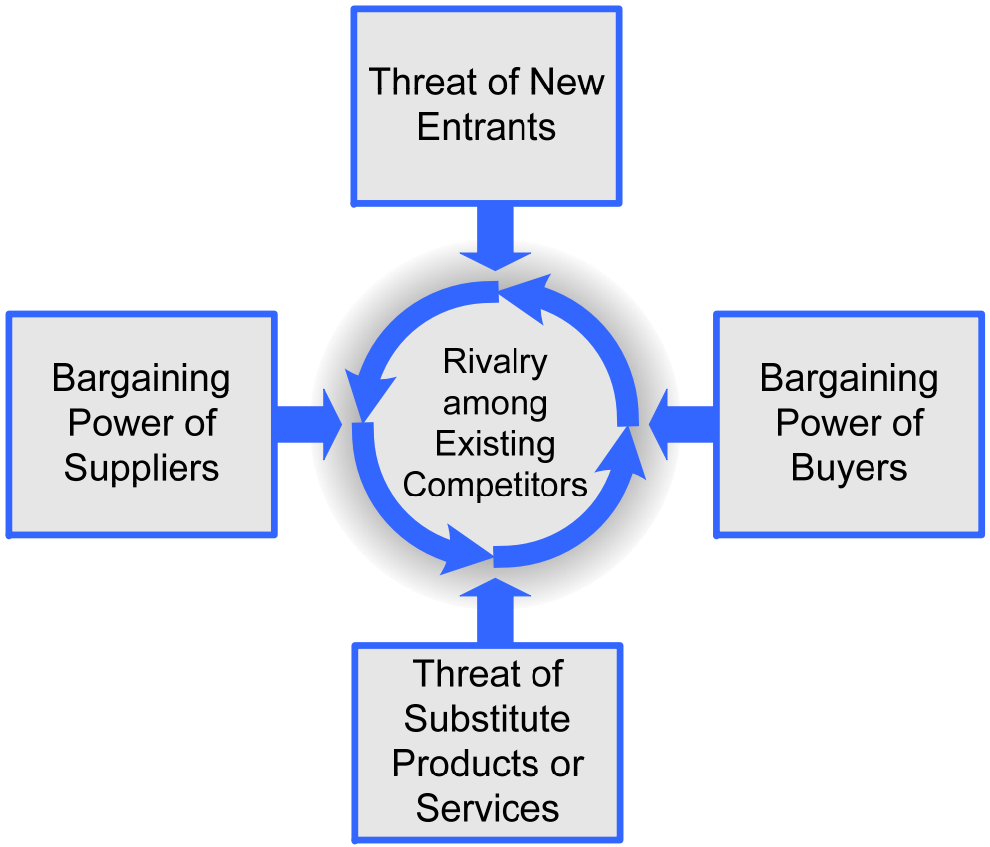


Business models.
Porter's Five Forces (1/2).

- Developed by Michael E. Porter (the same as value chain…)
- Widely used tool for strategy analysis
- Provides qualitative (!) insights into one industry (!) – micro economic
- Defines five forces – see next slide
- No recommended set of criteria exists, but a basic set is outlined

Source: Michael E. Porter: "The five competitive forces that shape strategy" Harvard Business Review January 2008

Business models.
Porter's Five Forces (2/2).



Source: Michael E. Porter: "The five competitive forces that shape strategy" Harvard Business Review January 2008

Business models.
PEST (1/2).

- PEST = Political, Economic, Social and Technological
- Help in analysing environmental (external) influences on business
- Subjective for strategic impact, the „big picture“
  - Opportunities
  - Threats
- Useful for starting a business in country or region
- Typically done prior SWOT analysis
- Starting point, followed by analysis of impact of the factors

Business models.
PEST (2/2).

POLITICAL	ECONOMIC	SOCIAL	TECHNOLOGICAL
The political arena has a huge influence upon the regulation of businesses and the spending power of consumers and business customers. •Elections, stability of political environment: war, terrorism, political trends, governmental leadership •Employment laws, consumer protection, taxes •Environmental regulations, marketing ethics attitude, government view on culture •Industry-specific regulations, competitive regulations, inter-country relationships/attitudes, trading agreements	State of the economy, looking at: •Economic growth trends, taxation, long-term prospects for the economy Gross Domestic Product (GDP) per capita, production levels, disposable income •Interest rates, level of inflation, government spending levels •Job growth/unemployment, exchange rates, tariffs, consumer confidence index	The social and cultural influences on business vary among social groups. Factors include: •Demographics (age, gender, race, family size, etc.), population shifts, education, life length •Lifestyle changes, trends, fads, fashion, attitudes towards “new”, strong/weak opinion on green issues •Immigration/emigration, living standards, health, housing trends, occupations •Earning capacity, roles of men and women in society, how wealthy are older generations •Attitudes to work and leisure activities, commuting time	Technology is a major driver for innovation. •Inventions, new discoveries, research, innovation •Energy uses/ sources/ fuels, transportation, obsolescence, waste removal/ recycling •Health (pharmaceutical, equipment, etc.), bio-tech, manufacturing advances, genetics, agri-tech •Communications, information technology, internet, new distribution of product and services •Cheaper products and services, better quality

Business models.
SWOT (1/2).

- SWOT = Strengths, Weaknesses, Opportunities, and Threats
- Tool for understanding and business decision making
- Help in analysing company (internal) and environmental (external) influences
- Subjective for business discussions
- General example on next slide

Business models.
SWOT (2/2).

Strengths	Weaknesses
Resources and capabilities that can be used as basis for competitive advantage •Capabilities? •Unique selling/ production companies? •Experience, knowledge, skills? •Competitive advantages? •Reach, distribution? •Location and geography?	Points which diminish competitive advantage •Gaps in capabilities? •Lack of competitive strength? •Reach-distribution? •Investments? •Differentiation needed?
Opportunities	**Threats**
Possibilities in the external environment for growth and profit that should be used to enhance strengths and eliminate weaknesses (using PEST) •Market developments? •Technology developments and innovation? •Global influences? Geographical, social, environmental effects? •Economy? Wealth distribution? •Legislation, regulation and politics?	Changes in external environment which pose a threat for functioning, diminish strengths and create weaknesses (using PEST) •Political, legislative, economics, sociological aspects? •Global influences? Geographical, social, environmental effects? •Economy? Wealth distribution? •Legislation, regulation and politics? •Sustainable financial backing?

Business models.
Business case.

- Combination of all components for a specific purpose
- Calculates €
- Simple definition: Capital expenditures + operational expenditures + revenues
- Capital Expenditures: cost of long-term improvements
- Operational Expenditures: on-going cost for running a product
- Reality is more complicated, includes:
  - Time frame
  - Depreciations, Taxes
  - …

Business models.
Capital Expenditures.

- Calculated for a given time period
  - Volumes of equipment
  - Infrastructure
  - Expected cost trends
- First installed investments for network coverage are customer independent or fixed, e.g. coverage of an area or backhaul capacity, cost per customer differs
- Growing customer base leads to linearly cost or variable, e.g. CPE equipment
- Semi variable investments for threshold based equipments, e.g. DSLAM with number of ports
- Price evolution by learning curves or percentage decrease

Example: Modelling of DSL equipment price trends

1. Initial prices for reference year

Cost elements	Reference year	CAPEX Unit Cost
DSLAM - LEX	2004	8 000
Linecard - ADSL(2)	2004	1 700
Linecard - ADSL2+	2005	2 000
Linecard - VDSL2	2006	2 200
CPE Modem - ADSL	2004	65

2. Annual price evolution

Cost elements	2005	2006	2007	2008	2009	2010
DSLAM - LEX	-5 %	-5 %	-2 %	-2 %	0 %	0 %
Linecard - ADSL(2)	-2 %	-2 %	-2 %	0 %	0 %	0 %
Linecard - ADSL2+		-10 %	-5 %	-2 %	0 %	0 %
Linecard - VDSL2			-10 %	-5 %	-5 %	-2 %
CPE Modem - ADSL	-5 %	-5 %	-5 %	-5 %	-2 %	-2 %

3. Number of required elements per year

Cost elements	2004	2005	2006	2007	2008	2009	2010
DSLAM - LEX	8 000	7 600	7 448	7 299	7 299	7 299	7 299
Linecard - ADSL(2)	1 700	1 666	1 633	1 633	1 633	1 633	1 633
Linecard - ADSL2+	0	2 000	1 900	1 862	1 862	1 862	1 862
Linecard - VDSL2	0	0	2 200	2 090	1 986	1 946	1 946
CPE Modem - ADSL	65	62	59	56	55	54	54

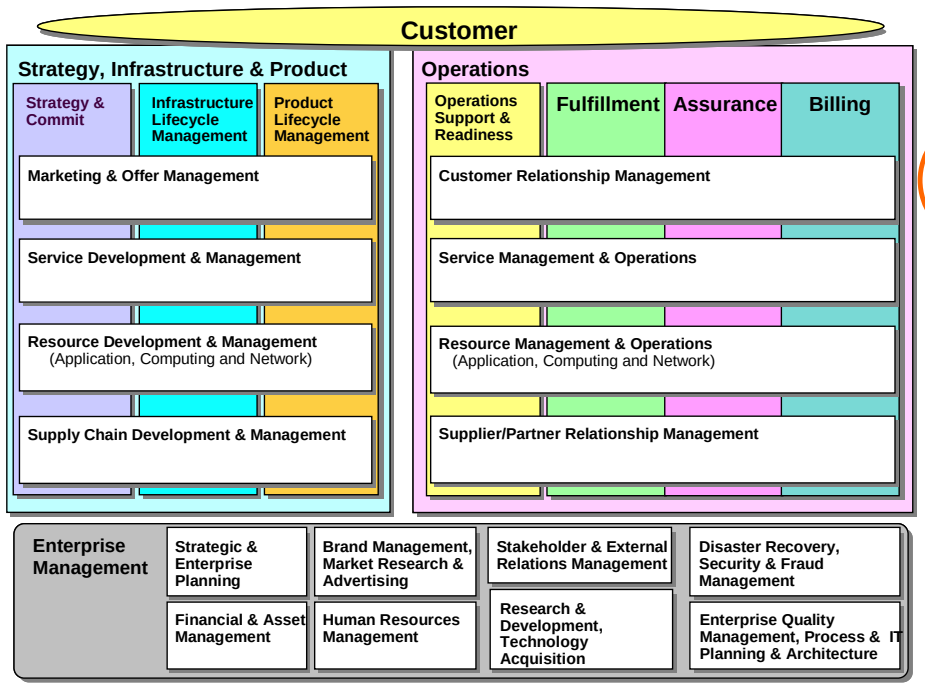
Business models.
Operational Expenditures (1/2).

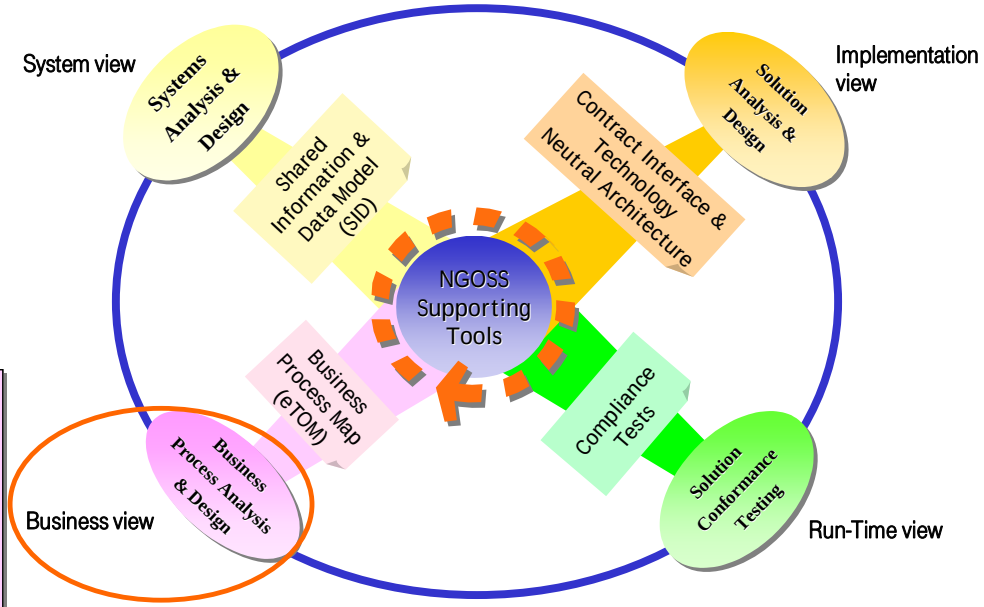
- Difficult to estimate, especially for new products
- Importance increases due to competition
- Service provider costs are dominated by Operational Expenditures
- Example on the right details 15 elements (Source: CETLIC ECOSYS project)

Operational Expenditure elements	
1	Maintenance of equipment and components
2	Equipment and software licenses, maintenance outsourcing
3	Sales and marketing, Customer acquisition
4	Customer provisioning
5	Customer care
6	Charging and billing
7	Service management
8	Network management
9	Product/platform development
10	Rental of physical network resources
11	Roaming
12	Interconnection
13	Yearly cost of radio spectrum licenses
14	Regulation
15	Content

Business models.
Operational Expenditures (2/2).

TeleManagement Forum NG-OSS framework with enhanced telecom operations map (eTOM) defines best practise and standards





Business models.
Some personal experiences.

- Analyse carefully your value proposition.
- The difficulty is not to have a methodology, it‘s the application…
- …you should know (at least a little bit) the industry. It helps to understand the history of the industry, know relevant projects and initiatives.

- No fear, it takes a lot of questions and time to understand the basics.

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The plan for the next two hours.

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Interconnection.
Agenda.

- Definition of terms
- Some examples
- Future topics for interconnection

Interconnection.
Definitions (1/4).

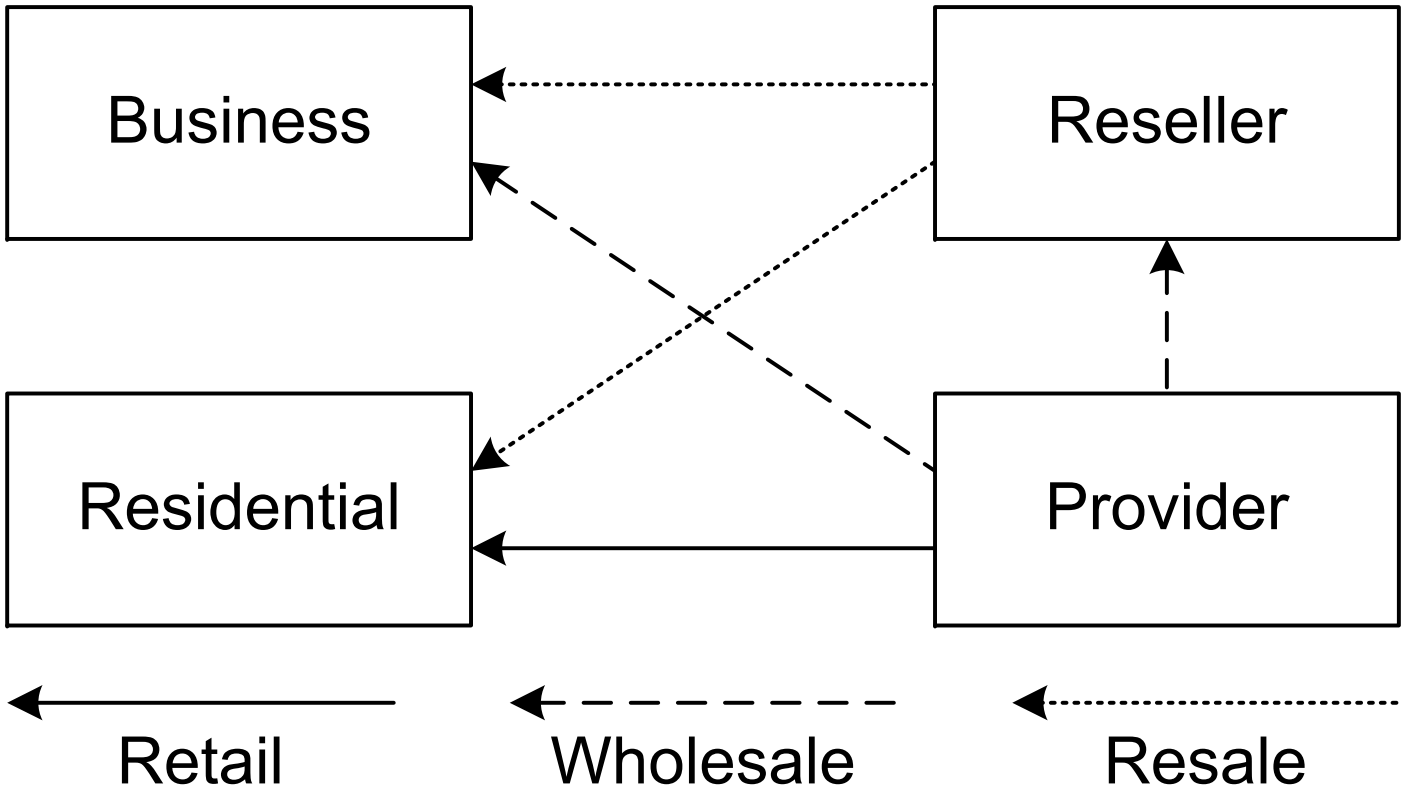
- Interconnection
  - Different definitions exist
  - DIRECTIVE 2002/19/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 7 March 2002 on access to, and interconnection of, electronic communications networks and associated facilities (Access Directive):

    "interconnection means the physical and logical linking of public communications networks used by the same or a different undertaking in order to allow the users of one undertaking to communicate with users of the same or another undertaking, or to access services provided by another undertaking. Services may be provided by the parties involved or other parties who have access to the network. Interconnection is a specific type of access implemented between public network operators"
- Another important discussion is interoperability

Interconnection.
Definitions (2/4).

- From provider point of view, different other terms are relevant
- Typically, no clear definition exists
- Retail describes that a provider sells products and services to his own customers
- Wholesale describes that a provider sells products and services to another provider / carrier. In certain cases, the relationship with business customers is referred as wholesale.
- Resale describes that a provider sells products and services from another provider / carrier to his customers.

Interconnection.
Definitions (3/4).



Interconnection.
Definitions (4/4).

- Roaming
  - Service layer interconnection
  - Operator provides temporarily access to customers of another operator
  - Commonly known together with mobile networks
  - Exists today mainly than being outside home country or with WiFi networks
  - In early mobile days, it was used to extend coverage for small operators within a country
- Cooperation
  - Business agreement to share certain tasks / resources / etc.
  - To be applied carefully, antitrust and competition law

Interconnection.
Examples (1/6).

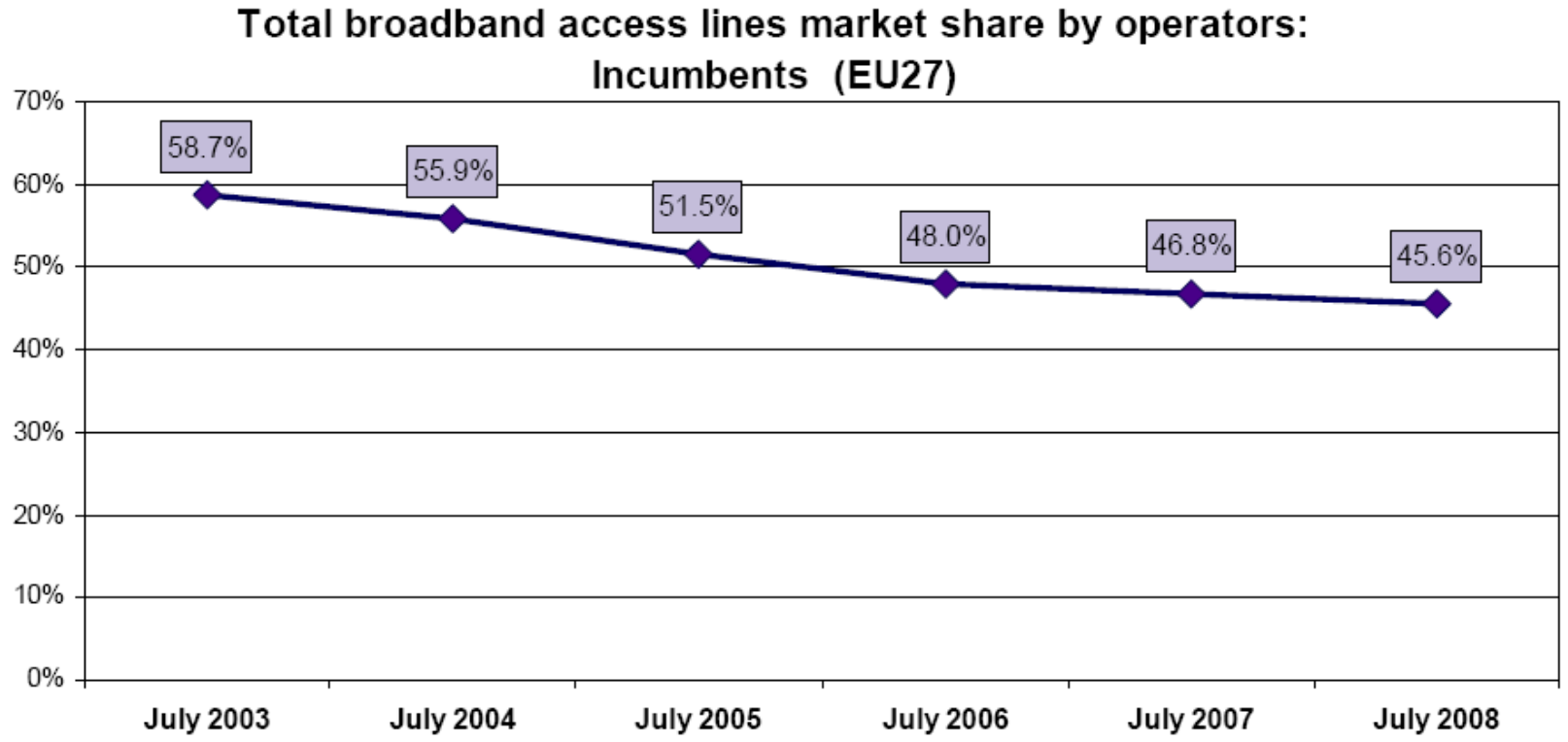
- No general model in place
- Typically, combination of previous terms
- Mobile
  - Cooperation agreement for interconnection of different networks, e.g. telephone numbers
  - Physical interconnection provided via data connection
    - Router in central office
    - Wholesale connection
  - Roaming requires additional agreement and logical as well as physical interconnection

Interconnection.
Examples (2/6).

- Wholesale and resale in fixed broadband networks
- EU differentiate between four different types
  - Fully unbundled lines
  - Shared access lines (incumbent provides telephony)
  - Bitstream access (incumbent provides transport for broadband)
  - Simple resale (resaler sells same product – no feature added)

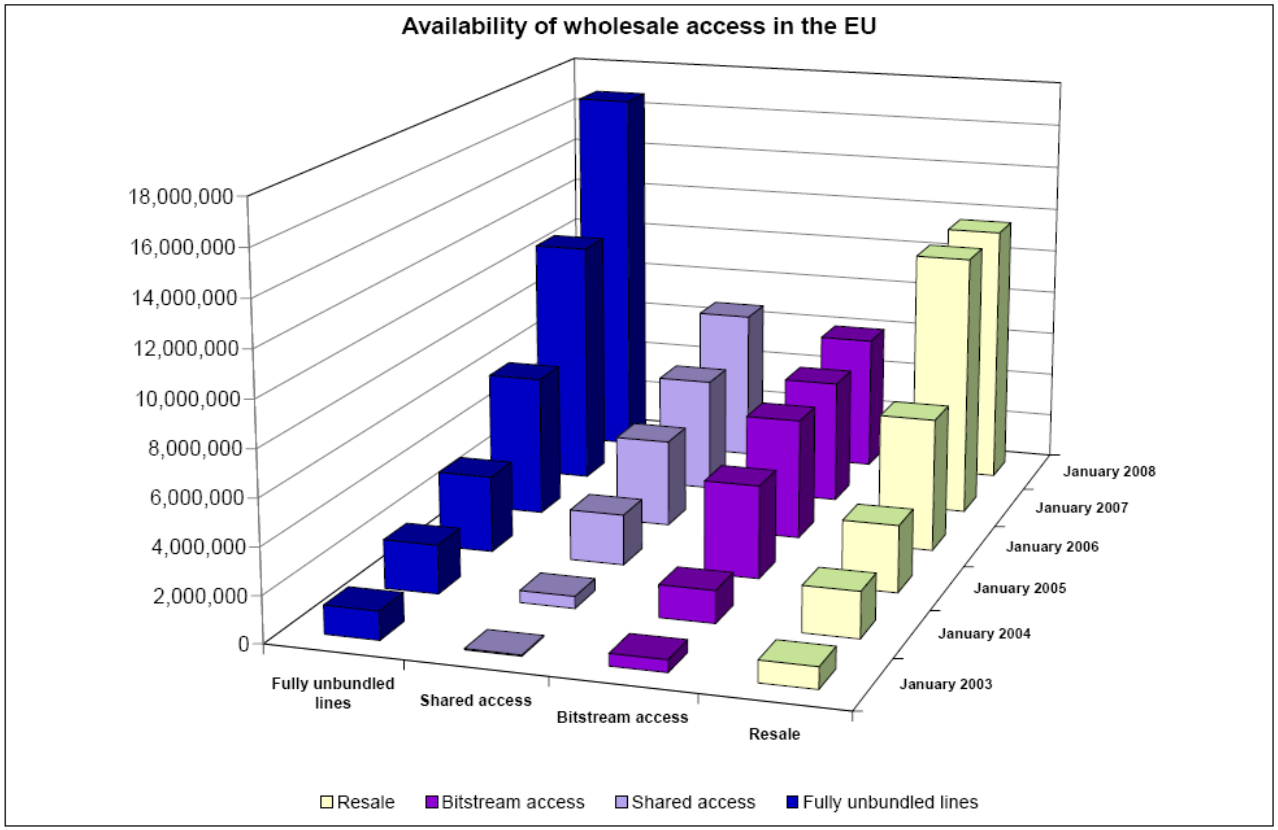
Interconnection.
Examples (4/6).

- Incumbent market share of broadband access lines



Interconnection.
Examples (3/6).

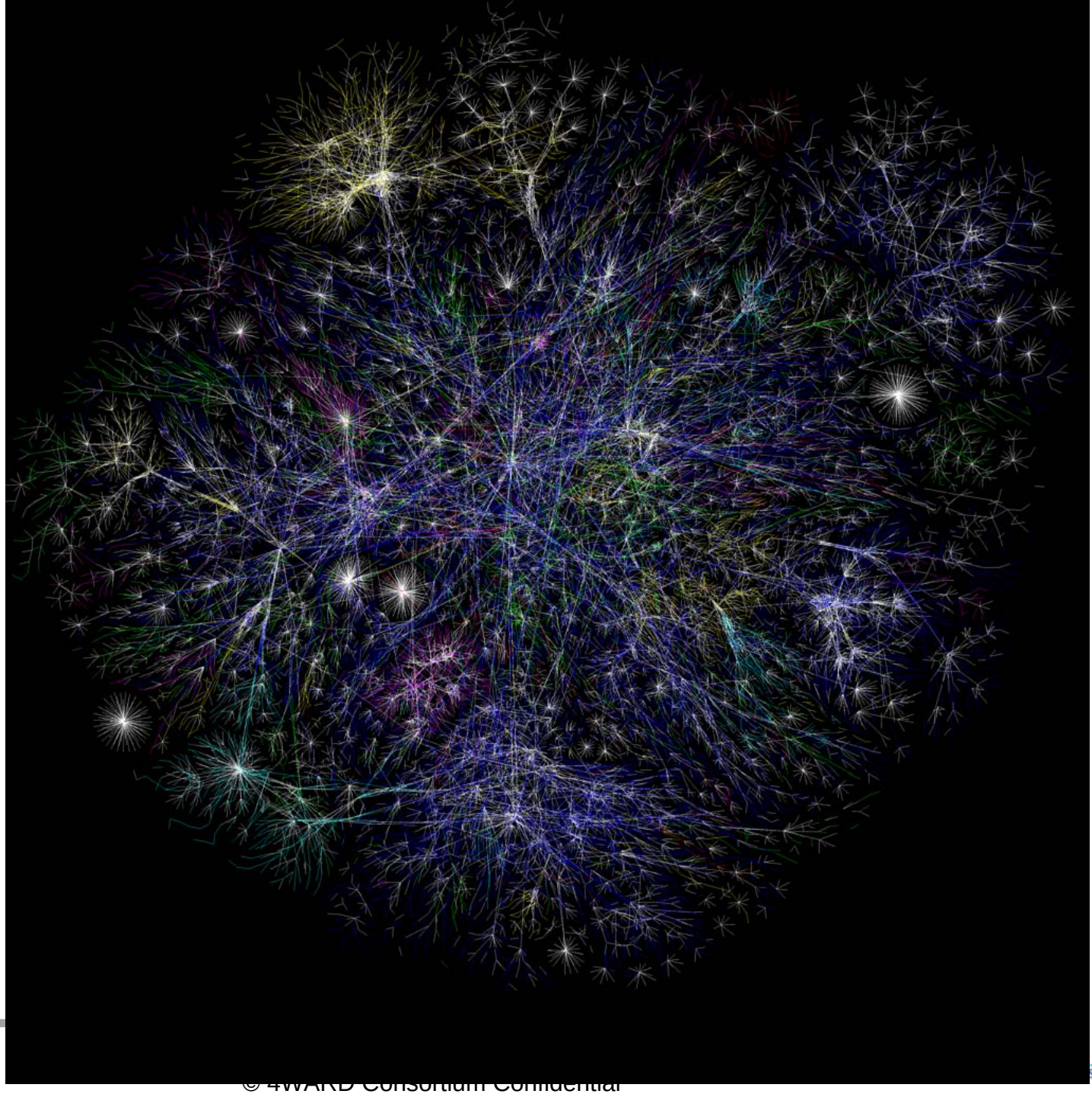
- Fixed broadband access products



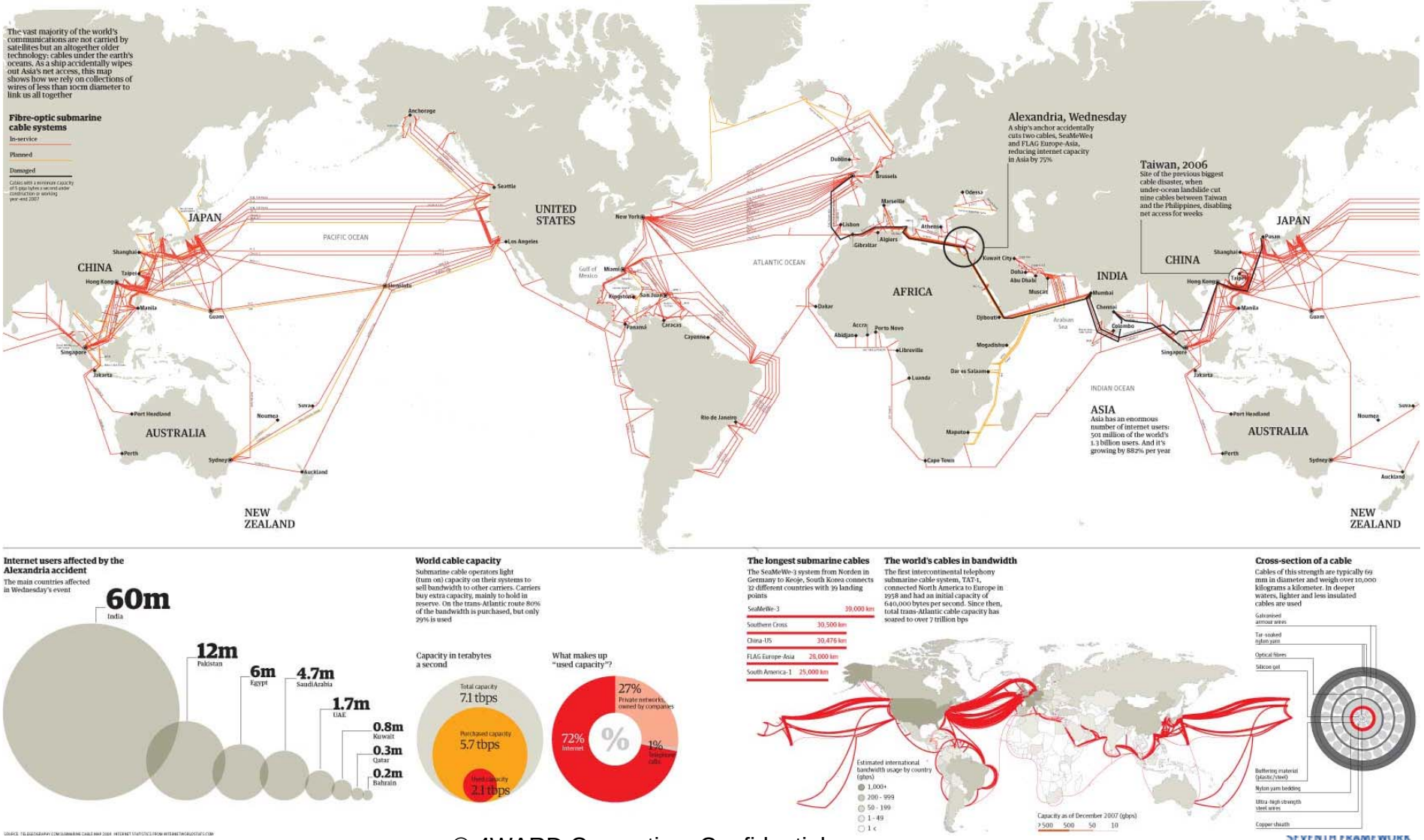
Source: EC services based on data from COCOM

Interconnection.
Examples (5/6).

- Next slide provides an overview of the connections of different IPs
- Date: 2005
- Source: http://www.opte.org/



Interconnection.
Examples (6/6).



Interconnection.
Future topics.

- Importance of interconnection will increase in the next years
- Interconnection of core networks is given, players established and little changes can be expected
- Content delivery networks are increasing, might change interconnection ecosystem
- Next generation access networks
  - Huge investments needed, often not possible for a single player
  - Shared infrastructure deployments increase
  - Interconnection and interoperability issues under discussion
  - Examples are FTTB/H for fixed and LTE for mobile area

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Business aspects of the Future Internet.
Agenda.

- Future Internet
- Scenarios
- Themes
- Business cases
- Value cloud problem

- This results are based on the work of WP1 in the IST 4WARD project.

Business aspects of the Future Internet.

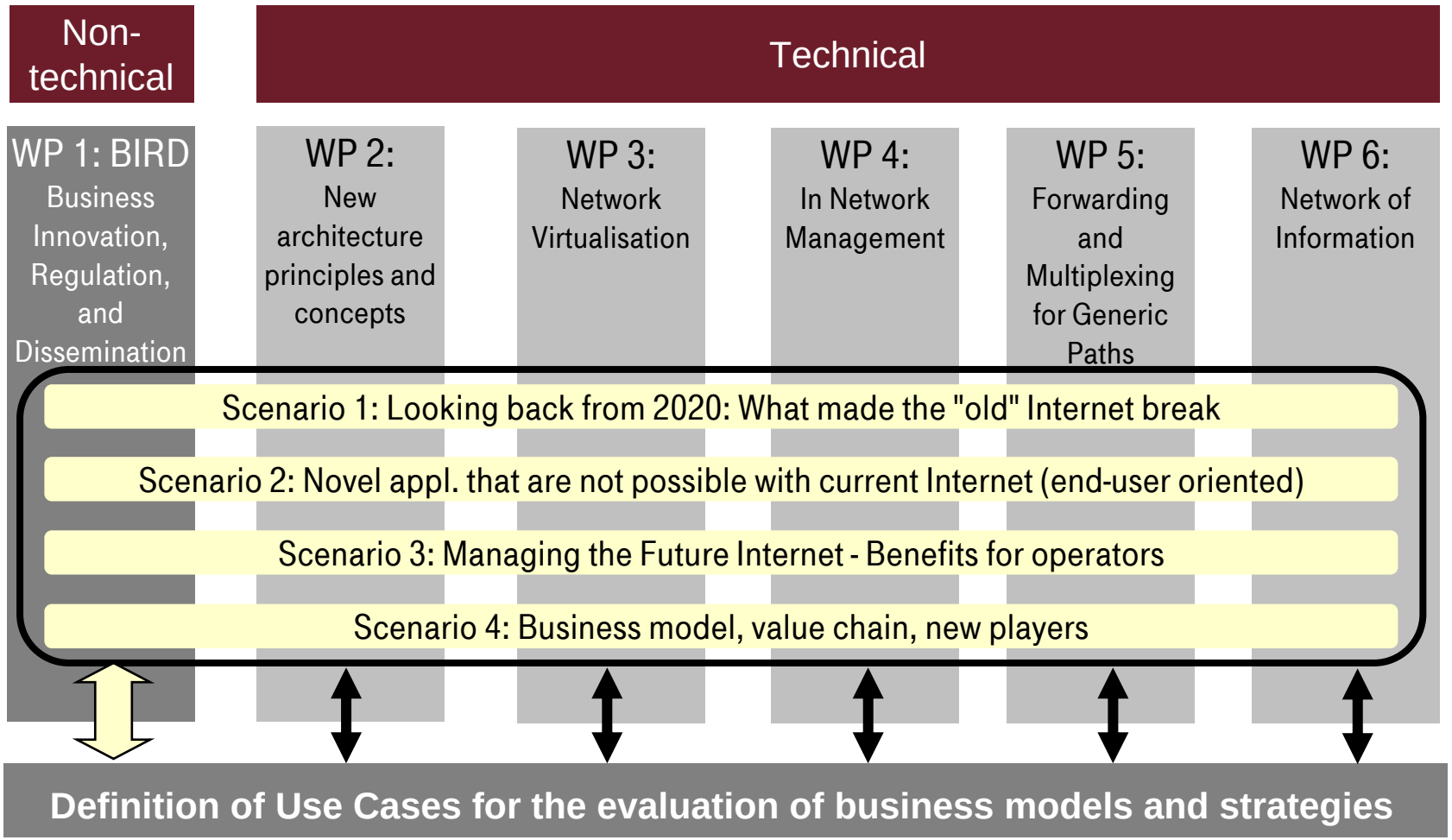
Future Internet.

- Future Internet is a summarizing term for worldwide research activities dedicated to the further development of the original Internet. (Source: Wikipedia)
- Ultimate goal is standardisation
- Focus of 4WARD project is 2020
- In contrast to the development of the current Internet, social, environmental and business aspects are part of the development.

Business aspects of the Future Internet.
Scenarios (1/2).

- Creation of common understanding
- Project wide scenarios define the scope
  - Future Internet
  - 2020
  - Technical as well as social, governance…
- Four scenarios

Business aspects of the Future Internet.
Scenarios (2/2).



Business aspects of the Future Internet.

Scenario 1: Looking back from 2020: What made the old Internet break?

- Outlines decisive technical and non-technical developments stopping evolution of the existing Internet concepts
- Includes the analysis of infrastructure problems, innovation restrictions, and the limitations in economic incentives.
- Set of potential problems:
  - usability problems, ignorance of security issues, and human communication problems
  - network accessibility problems for dependable communication
  - misuse of identity information
  - implementation and product deficiencies
  - growing costs for fixing obvious problems to maintain a minimum network reliability making network operation economically infeasible

Business aspects of the Future Internet.

Scenario 2: Novel applications which are not possible with the current Internet.

- Identifies and evaluates challenges imposed from new applications, which are not possible or very difficult to implement using the existing Internet concepts
- Some examples:
  - User-oriented network vs. Device-oriented network
  - Network and terminal transparency
  - context awareness
  - micro-service provider
  - personal networks / integrating the real world and the Internet
  - augmented reality
  - resources on demand
  - 3D video

Business aspects of the Future Internet.
Scenario 3: Managing the Future Internet.

- Concentrates on network management issues
- Challenges by several, partly competing partly collaborating, network operators and a multitude of service providers
- Major topics:
  - blurring boundaries between operators and other players in a future Internet
  - growing complexity of infrastructure and services
  - associated need for ways of network/service management
  - capabilities provided to operators

Business aspects of the Future Internet.

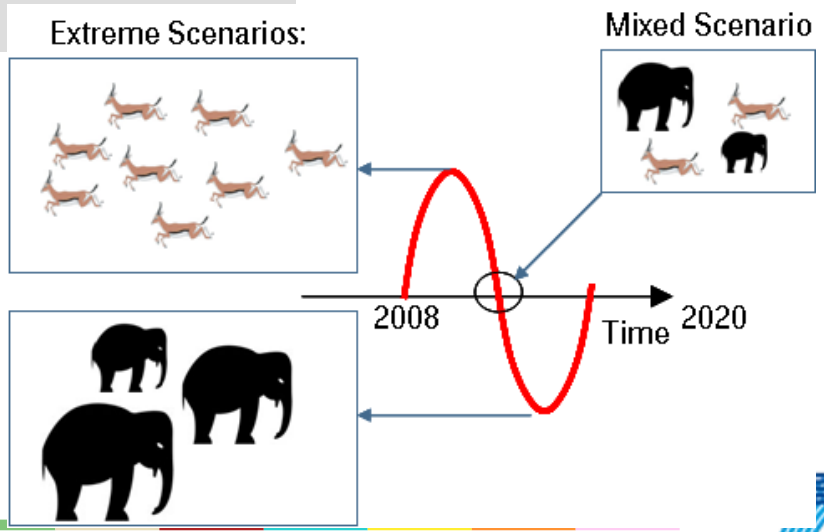
Scenario 4: Business models, value chains and new players (1/2).

- Focus on the non-technical aspects of the Future Internet
- Evaluation of social, economic and political trends on the telecom business
- Identification of most decisive elements that will govern the future business environment.
- Issues in the context of an Internet break:
  - change of the market balance
  - opportunities for new business players
  - regulation requirements to enable fair and reliable market conditions
  - cooperation strategy for established actors

Business aspects of the Future Internet.

Scenario 4: Business models, value chains and new players (2/2).

Elephant Scenario	Gazelle Scenario
Some big players (vertical)	Many players (horizontal)
Walled garden	Unbundling, network neutrality
Borders, limits	Openness
Regulated	Chaotic?, free?
Global regulation	Local, regional
Technically homogeneous	heterogeneous

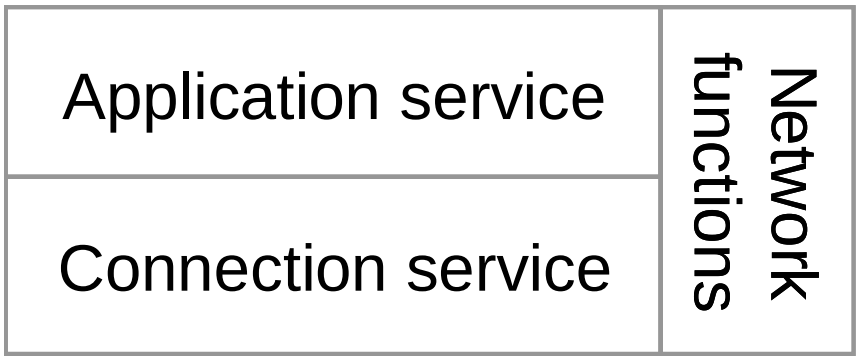


Business aspects of the Future Internet.
Themes.

- Work group with special focus on a research / development topic
- Ensure project wide understanding of their topic
- Technical as well as non-technical
- Three important non-technical
  - Usage & Service (U&S)
  - Socio-Economics (SE)
  - Policy & Governance & Regulation (P&G&R)

Business aspects of the Future Internet.
Usage & Service (U&S) (1/2).

- Links the technology with the customer and his needs and requirements
- Analysis benefit of different technologies
- Analysis impact on existing service models and needed changes
- Analysis of user behaviour



Simplified Service Model of Today

Business aspects of the Future Internet.
Usage & Service (U&S) (2/2).

- What is the evolution of existing services until 2020 and what are major driving forces?
- What applications could emerge in the timeframe until 2020 and what might be there impact?
- How will the usage change in the timeframe until 2020 due to e.g. increased number of users and devices?
- How are the network and its infrastructure components impacted by the evolution?
- How could current and future business models be supported or enabled?
- What might be the impact of a changing policy & governance environment, and what might be the consequences from future regulation paradigm?

Business aspects of the Future Internet.
Socio-Economics (SE) (1/2).

- Technology is an enabler, but people have to adopt it
- Some key factors
  - Affordability
  - Population structure
  - Improving education, qualification and occupation
  - Existence of communication networks
  - Climate change and energy use
  - seamless mobility
  - Internet of things
  - privacy, security, access control, identity stealing
  - …

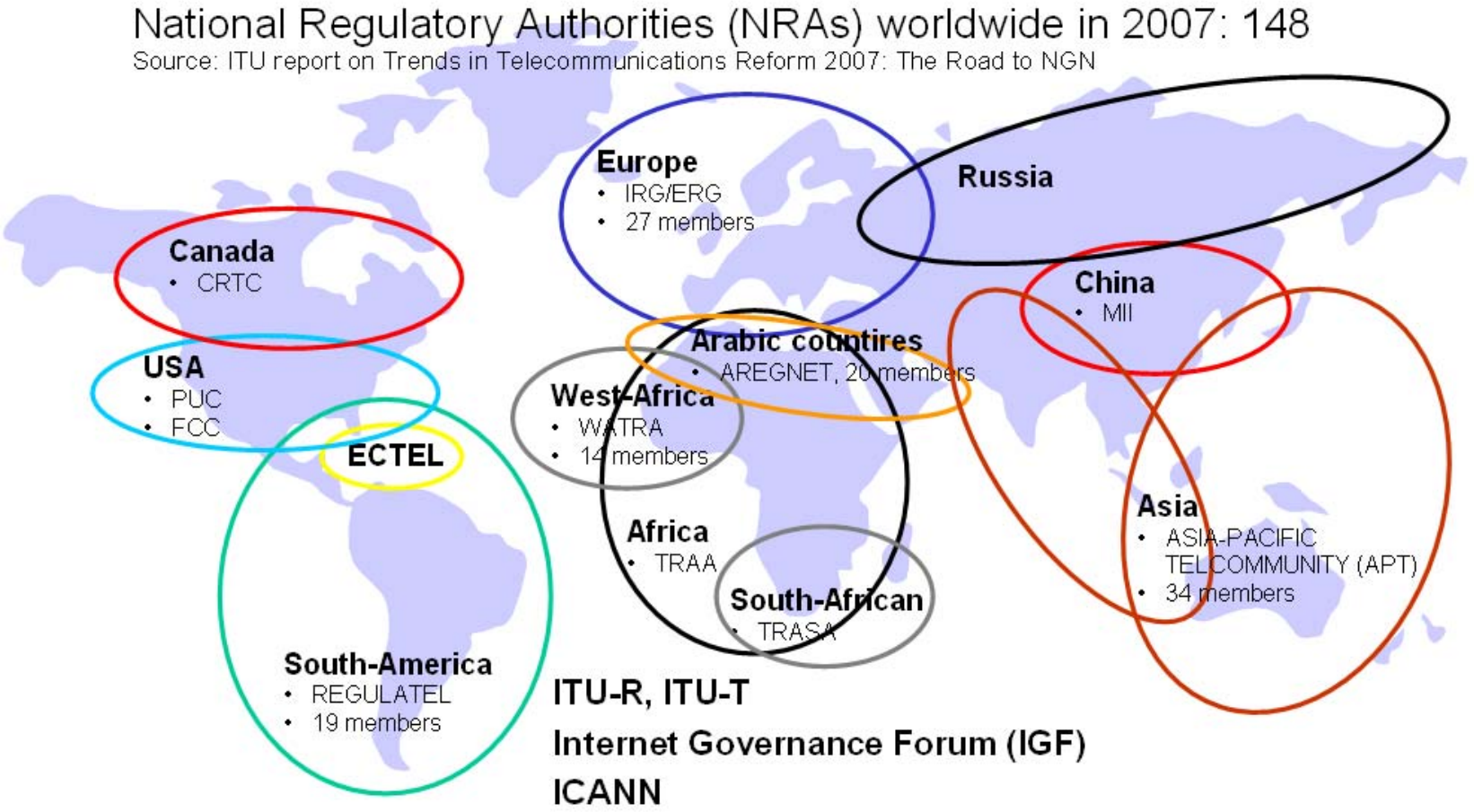
Business aspects of the Future Internet.
Socio-Economics (SE) (2/2).

- Research Line 1: What is the impact of social and economic scenarios on the different business ideas?
  - How do the different lifestyles in developed countries and the various social parameters affect the Future Internet business ideas and their viability? How the various social parameters can change the viability of each business idea?
  - What are in developing countries the major social and economic trends supporting or slowing down the Future Internet spreading?
- Research Line 2: What is the impact of technological solutions on the viability of the business ideas?
  - Which technological solutions, if any, will allow a better quality of life and significant changes in society, economy, environment, and politics?
  - How the technology innovation will impact on everyday life of individuals and businesses?
- Research Line 3: What are the economic issues that deal with the viability of different technological solutions?
  - What impact technology will have in driving and supporting new business models and business roles?
  - What impacts will have new technology on the economics of the new networks?

Business aspects of the Future Internet.
Policy & Governance & Regulation (1/4).

- Ensure customer welfare, control market, market share and competition
- Some issues:
  - Large number of actors, how to balance?
  - Different views: focus on the infrastructure or on the service component
  - Different areas of convergence regulated differently
  - Privacy and security
  - Controlling responsibility for the legality of information sharing, and the protection responsibility of the protects legal usage of network resources
  - Net Neutrality, Internet Governance, other …

Business aspects of the Future Internet.
Policy & Governance & Regulation (2/4).



Business aspects of the Future Internet.
Policy & Governance & Regulation (3/4).

- Regulatory scenarios: Ex ante and ex post
  - Ex ante tries to establish specific rules and requirements to prevent anti-competitive or otherwise undesirable market activity by operators before it occurs
  - Ex post relies primarily on competition law, market failure or anti-competitive behaviour management after it has occurred

Business aspects of the Future Internet.
Policy & Governance & Regulation (4/4).

- What is the impact of the hypothetical regulatory scenarios on the viability of the different business models? Sub-questions are:
  - How do the different regulatory scenarios impact on the structures of the value networks?
  - How does regulation vary in different regions? Is there a leveled playing field for the European ICT industry in global competition? Within the European single market? Is this reflected in the regulatory framework?
  - How do the potential regional differences in regulation impact on the viability of the different business models globally; how could a negative impact be minimized?
  - How could the regulatory framework boost exploitation of the new technologies, promote investment and provide competition while securing end consumer interests?
  - How can the Future Internet provide a positive impact on EU policy objectives?
- What are the key regulatory requirements for technologies, and what is their impact on the viability of the different technological solutions?
- Which technological areas of the Future Internet should be regulated?
- What are the areas for governance bodies to be involved in?

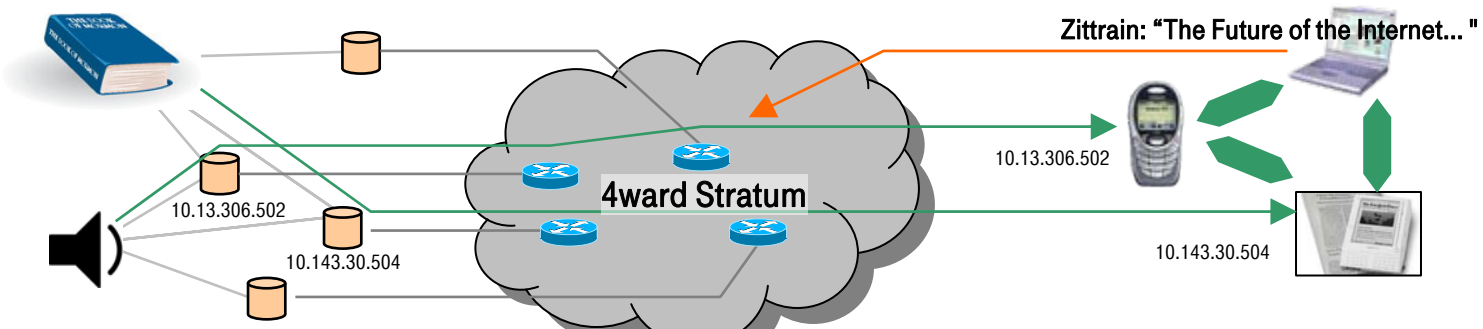
Business aspects of the Future Internet.
Business use cases.

- Business use case: abstract business cases without processes, resources and revenues
- Concrete combination of technical and non-technical aspects
  - Specific technology
  - Potential services and usage
  - Social aspects
  - Potential regulation scenarios
- Guidance
  - Scalability aspects of technologies
  - Aspects of usage
  - Definition of interfaces
- One example in the following

Business aspects of the Future Internet.
New ways of information delivery (1/4).

- Business idea:
  - Support ongoing digitalization of media (books, video tapes etc..) from network side
  - Support appropriate access to digital media, simple usage of diverse end terminals including easy switching between them
- Technical Solutions: Network of information, Generic path concept

Business aspects of the Future Internet.
New ways of information delivery (2/4).



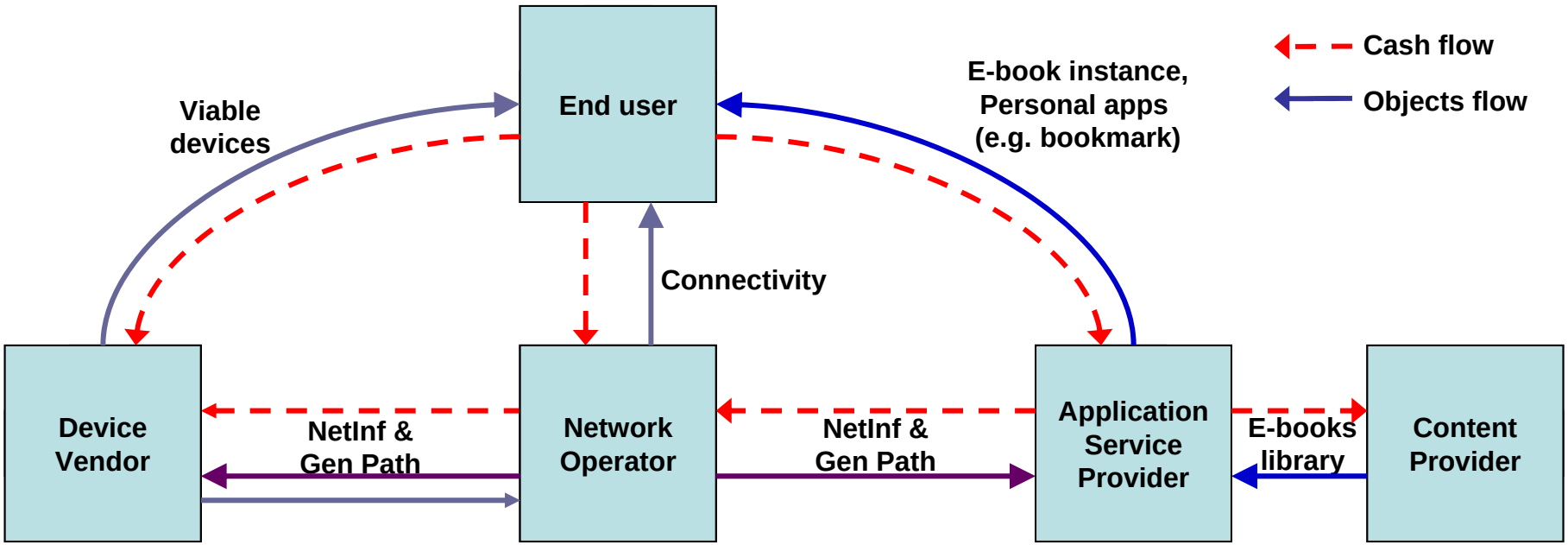
Network of Information (NetInf)

- The network of information finds the location of the required file in the appropriate format

Generic Path concept

- The generic path takes the address from NetInf and ensures most efficient transport through the network
- The generic path controls switching between end terminals

Business aspects of the Future Internet.
New ways of information delivery (3/4).



Business aspects of the Future Internet.
New ways of information delivery (4/4).

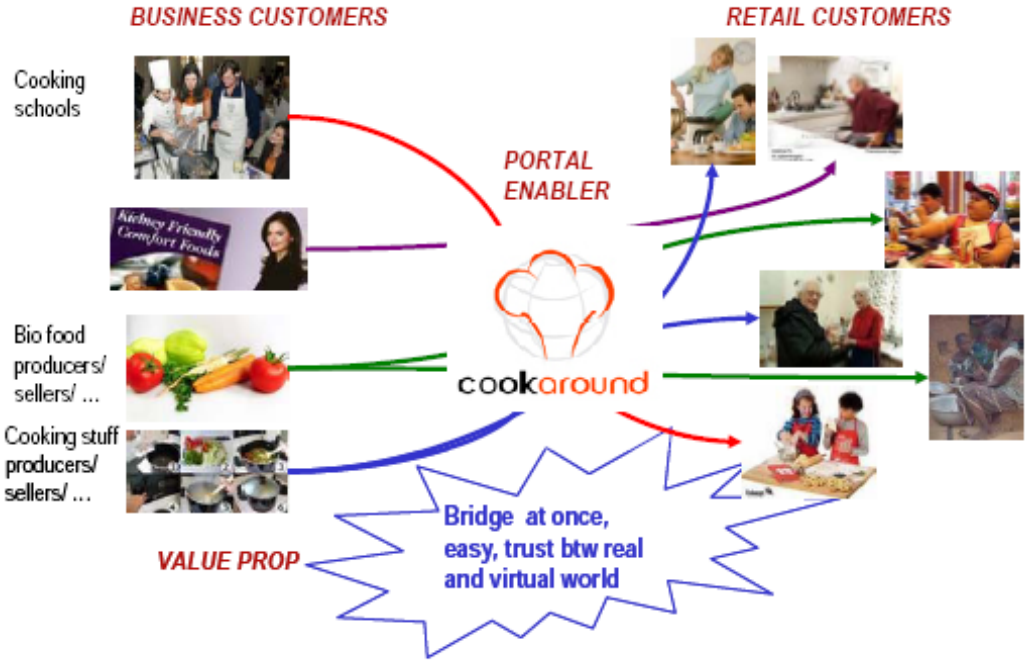
- Benefits for the end user:
  - Comfortable and speed optimized information delivery
  - Optimized presentation format dependent on end device and personal configuration options
  - Simple Switching between different end terminals
- New service opportunities for providers:
  - Support ongoing digitalisation of media (books, video tapes etc..) and provide essential functions for a comfortable access[1].
  - Provide more efficient and billable ways of information delivery as in current file sharing networks[2].

[1] Assumption that the market is willing to pay for a comfortable, fast and secure information access, which will be nearly automatically configured by specialised end devices.

[2] Policy, Governance & Regulation: Need for operator interoperability by open and standardized interfaces also on the VN level.

Business aspects of the Future Internet.
Recent business use cases (1/2).

- Community-oriented applications
  - Support of group-behaviour
  - Trend towards specialised and / or ad hoc composition



Business aspects of the Future Internet.
Recent business use cases (2/2).

- Internet of Things or One Thousand Network Devices
- Increasing number of devices per person, e.g.
  - Electronic paper / pencil
  - Sensor for healthcare or monitoring
  - Transport management
  - Energy management
- Increasing importance of network connectivity
- Analysis of impacts into core business processes ongoing

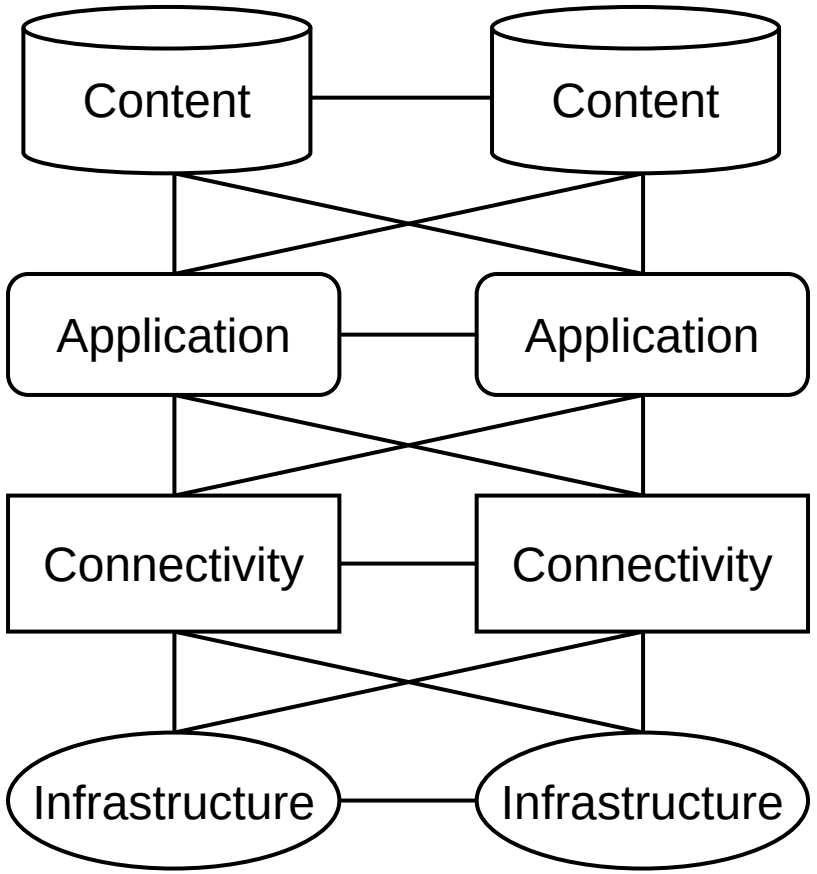
- Results to be published in D-1.2 (expected in 2010)

Business aspects of the Future Internet.
Virtualisation.

- See next session… ;-)

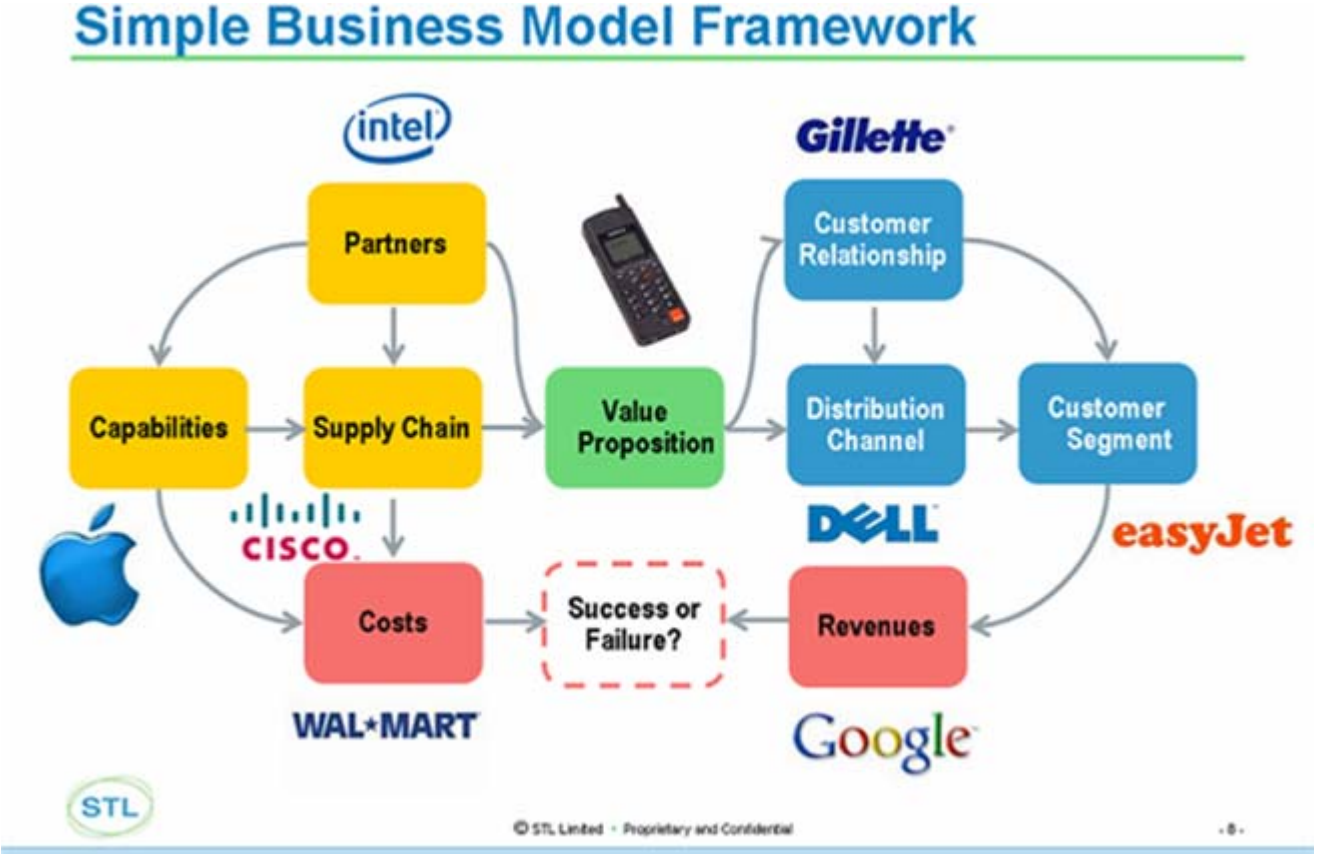
Business aspects of the Future Internet.
The value cloud problem (1/2).

- Revenue will spread from single to multi source.
- Increasing complexity in relationship management
- Increasing need for interfaces, where possible and economical feasible: standardized
- Strengthens of certain business aspects might be concentrated by few players (best in class) – you can not do everything



Business aspects of the Future Internet.
The value cloud problem (2/2).

- Some examples for best in class in a business model framework



Agenda.
The plan for the next two hours.

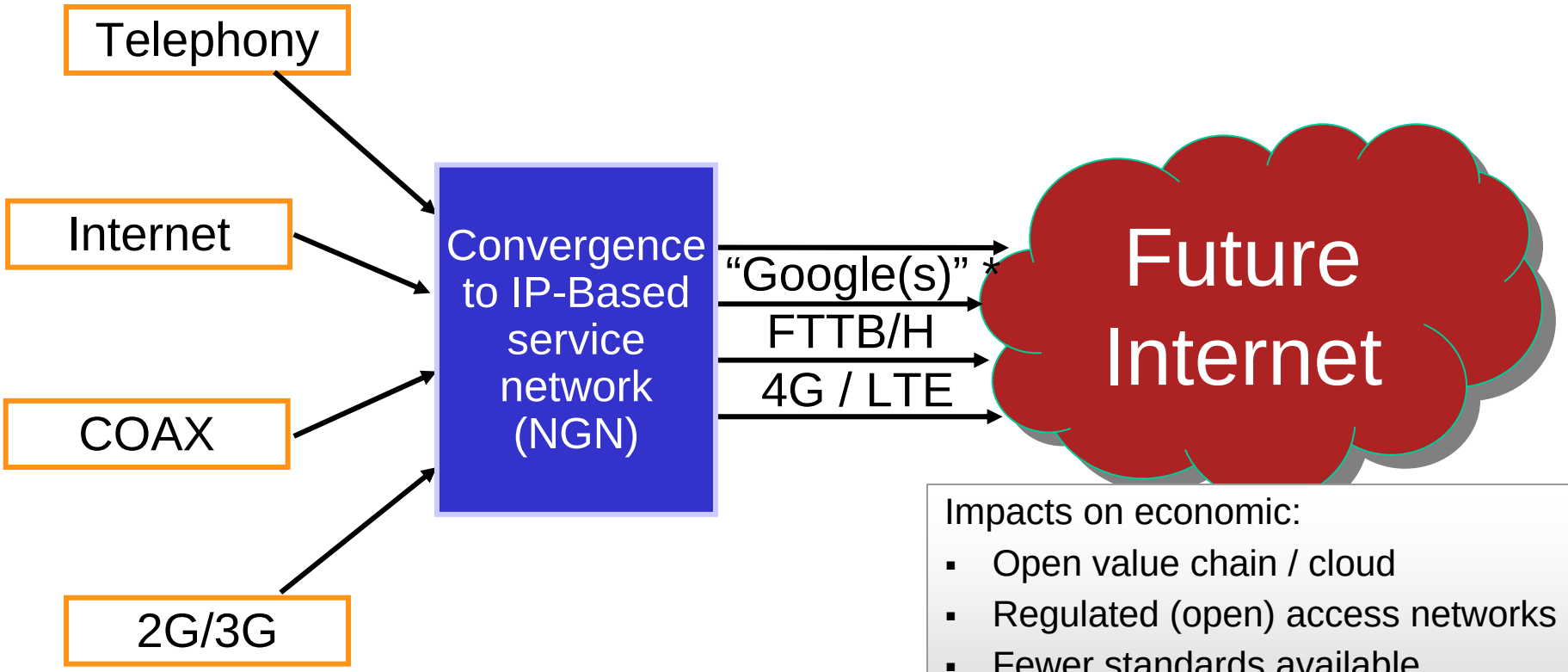
- Introduction
- Session 1: Excursus business models
- Session 2: Interconnection
- Session 3: Business aspects of the Future Internet
- Session 4: Case study “Network virtualisation”

Case study “Network virtualisation”.
Agenda.

- Problem statement
- Recap: Technical solution
- Value proposition
- Competition analysis
- P&G&R issues
- Conclusions

- The case study is published in D-1.1 and D-3.1.1 of the IST 4WARD project.

Case study “Network virtualisation”.
Problem statement (1/3).

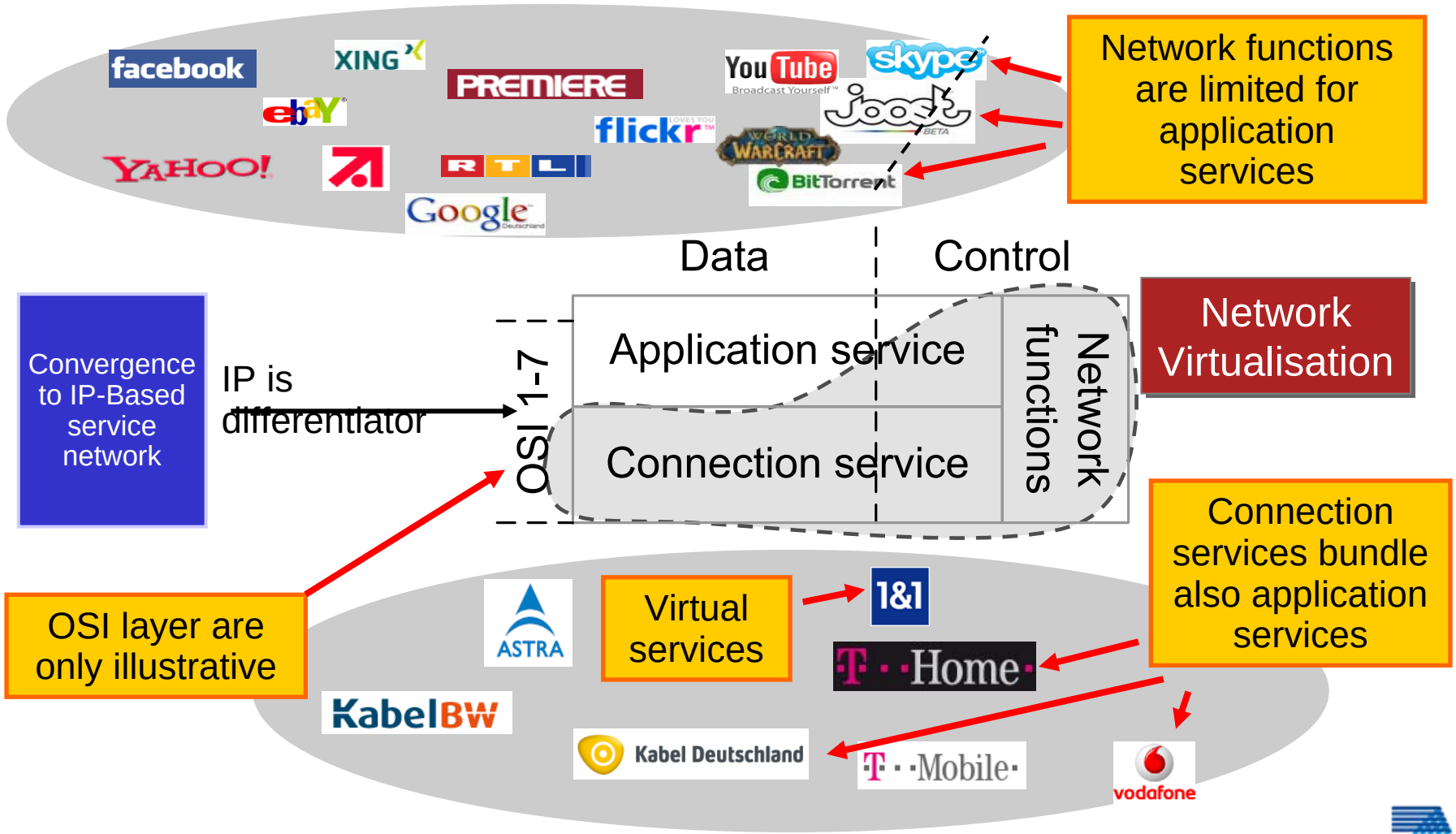


Impacts on economic:

- Open value chain / cloud
- Regulated (open) access networks
- Fewer standards available
- Shorter service lifecycles

* Synonym for Internet companies

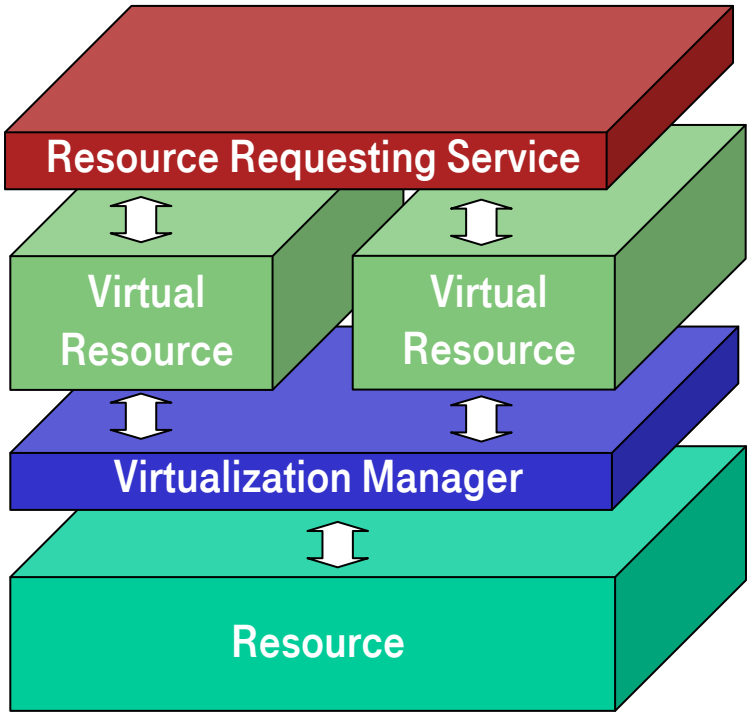
Case study “Network virtualisation”.
Problem statement (2/3).



Case study “Network virtualisation”.
Problem statement (3/3).

- Operator relevant topics
  - Service orientation
  - Improvement of network management
  - Testing of equipment / protocols / …
  - Protocol extensions and transitions
  - Improve energy efficiency
  - Day-night utilisation
  - Convergence of different technologies – At which level?

Case study “Network virtualisation”.
Value proposition (1/9).



- Optimized physical resource
- Higher availability / less shortages
- Commoditization of resources
- Reduced complexity in management

➔ Optimize TCO of resource

- Additional operation and maintenance
- Specialized resources requires higher efforts

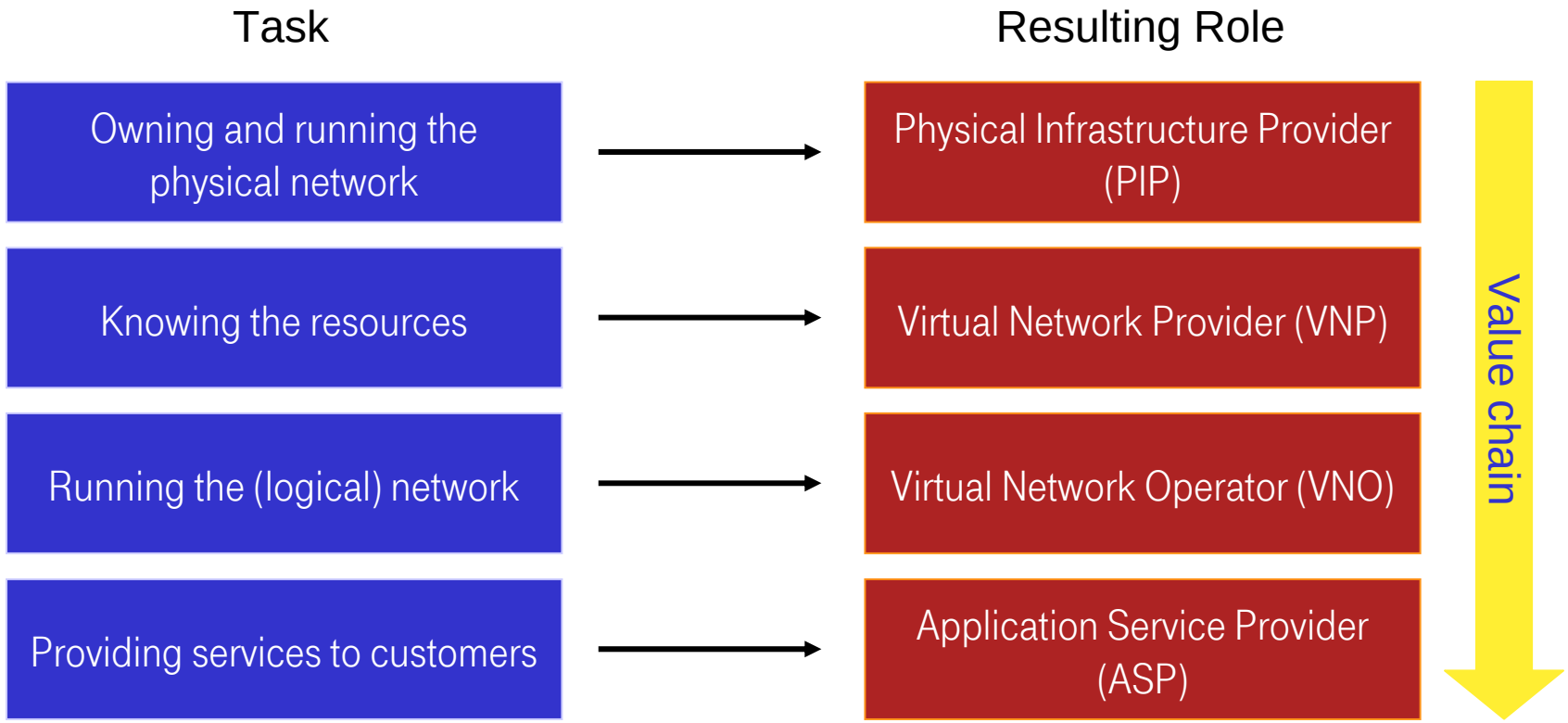
➔ Efforts for integration of virtualization

Case study “Network virtualisation”.
Value proposition (2/9).

- Network virtualisation already exists in certain kinds
- VPNs, typically IP or MPLS
- Wholesale / interconnection
- FTTB/H deployments
- Mobile network side sharing
- Undersea cables

Case study “Network virtualisation”. Value proposition (3/9).

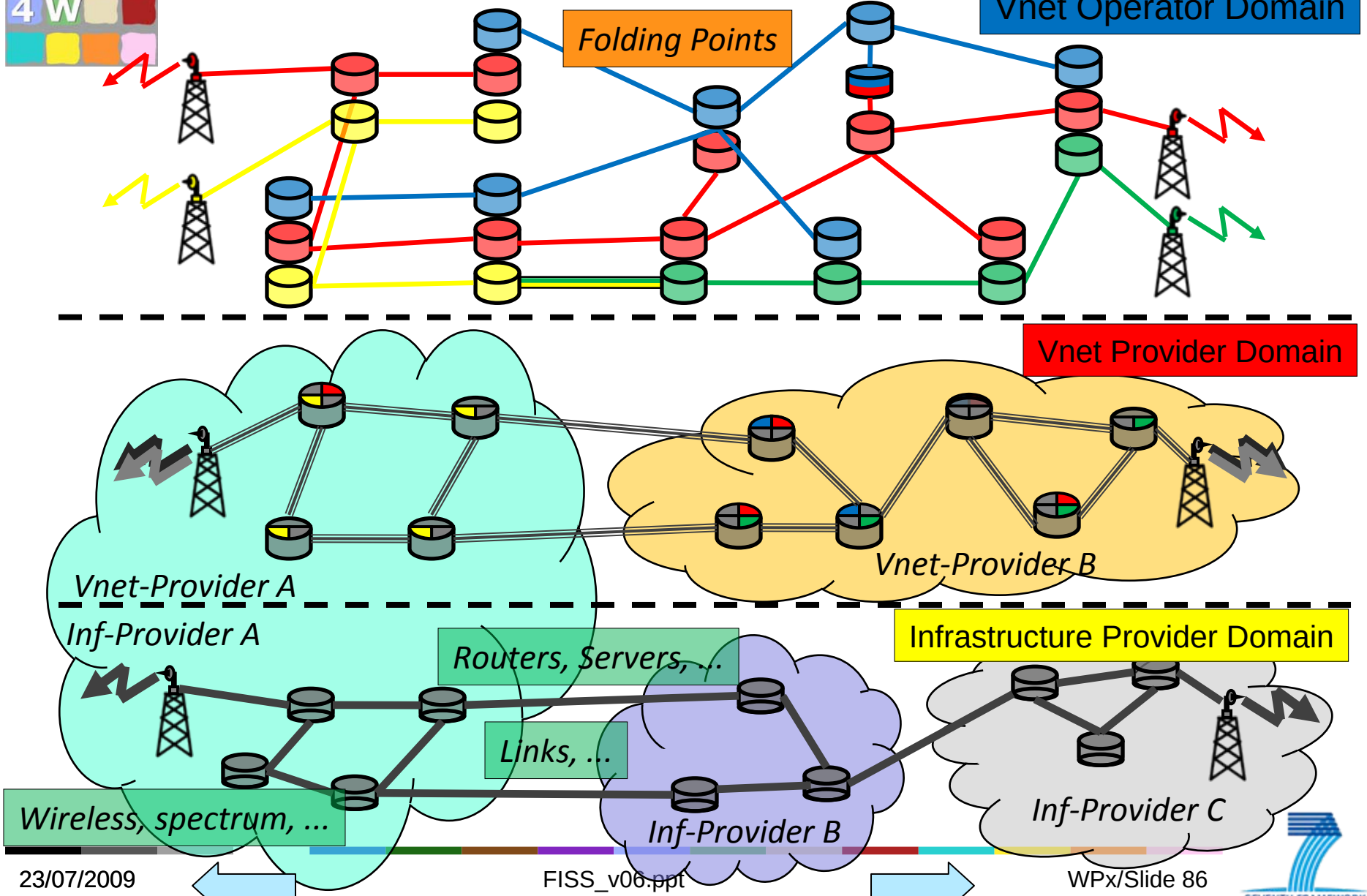
- Simplified tasks lead to four roles



Case study “Network virtualisation”.
Value proposition (4/9).

- Next slide is animated

Enable new business roles and players



Case study “Network virtualisation”.
Value proposition (5/9).

- Impacted markets:
  - Supplier for telecommunication hardware and related software, e.g. operating systems
  - Software developer (area of networking, e.g. management solutions)
  - Network provider market with connectivity services to customers and others operators
  - Service provider running specific or highly optimized service delivery methods / platforms need adaptations
  - Business customers requiring LAN-like services across multiple physical decentralized networks
  - Residential customer market with evolving social requirements
  - Training market providing skills to manage the virtualized networks
  - Research in virtualization and its needs

Case study “Network virtualisation”.
Value proposition (7/9).

- Special interests of the Physical Infrastructure Provider:
  - Higher investment collateral
  - Technical flexibility by decoupling service from network
  - Power savings
  - Optimization in bandwidth usage of links
- Value for the Virtual Network Provider:
  - Service Level Agreement improvements
  - Offering ‘virtual network’ connectivity in a multi domain and heterogeneous network infrastructure
  - Gaining from potential competition between PIP and buying of spare resources from PIP

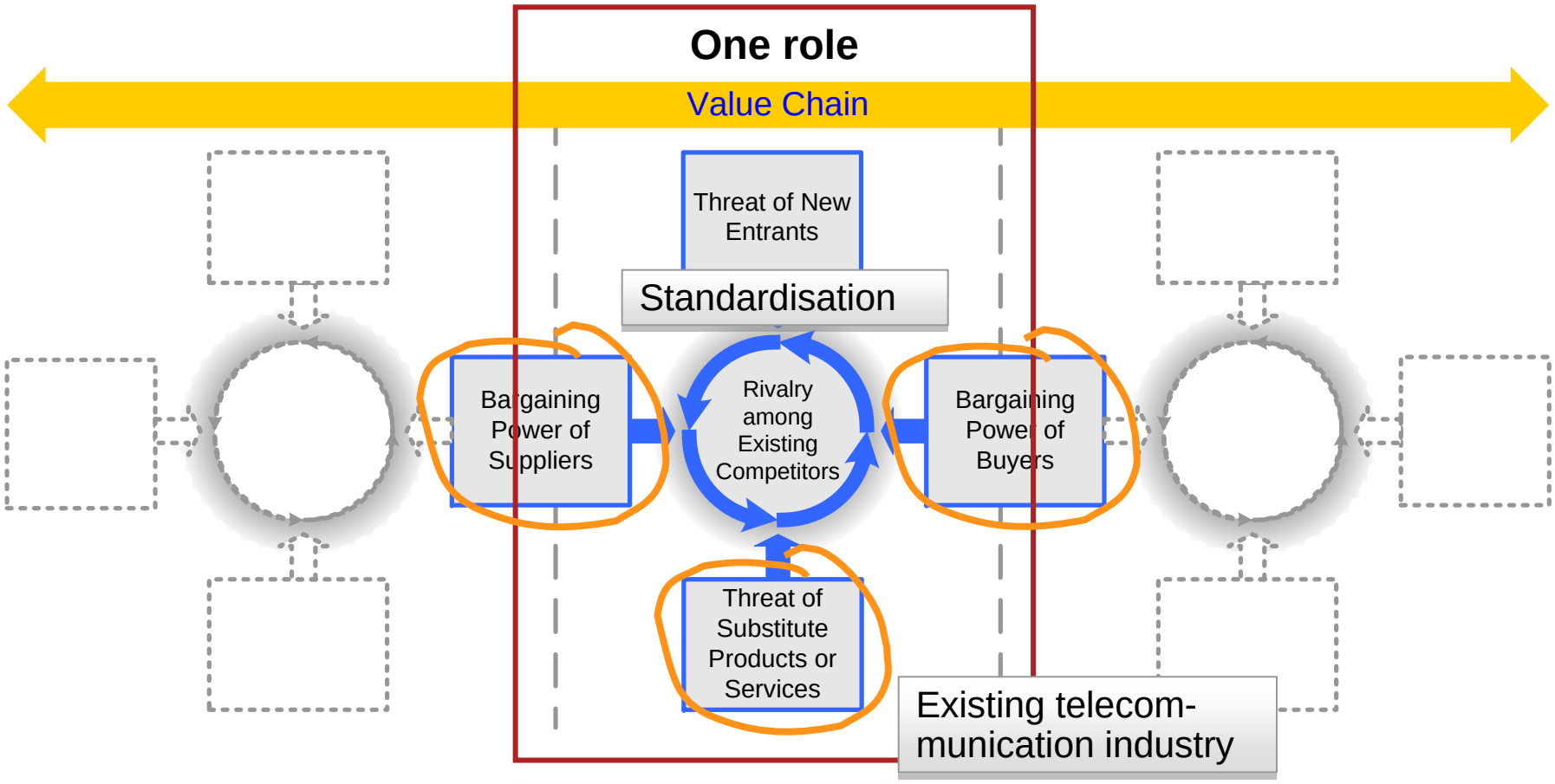
Case study “Network virtualisation”.
Value proposition (8/9).

- Value for the Virtual Network Operator:
  - Optimized resource offerings for tailored services
  - Management of networks for service providers
  - Ensuring dedicated quality, security etc. level
- Service provider might be taken by four roles:
  - Network service provider
  - Application / Internet service provider
  - Business and corporate customer
  - Residential customers

Case study “Network virtualisation”.
Value proposition (9/9).

- Network service provider
  - Network coverage extension
  - Specialized service offerings for virtual private networks or content distribution might be enabled
  - Reduced investments into software
  - Limited operational optimizations
- Application / Internet service provider
  - New services directly supported by the network
  - No additional investments into hardware
  - Additional costs for software and training for virtualization skills
  - Operational optimization in the management and delivery in the network
  - Reduced time to market for the introduction of new / additional services
- Business and corporate customer
  - Interested in an optimized and cheaper network
  - Increased control and optimization with insourcing
  - Additional knowledge and management cost
- Residential customers
  - Potential seen in community services / networks for the family, clubs, etc.
  - No revenues

Case study “Network virtualisation”.
Competition analysis (1/3).



Case study “Network virtualisation”.
Competition analysis (2/3).

- Physical Infrastructure Provider
  - Similar competition like today
  - Stabilized revenues
  - Limited profits
  - Strong supplier dependency
- Virtual Network Provider
  - Business depends on the player
- Virtual Network Operator
  - Innovation will differentiate
  - Increasing number of players
  - Customer bargaining power

Case study “Network virtualisation”.
Competition analysis (3/3).

- Service Providers
  - Similar to today (beginning)
  - Number of customers is limited
  - Entrance of new players

Case study “Network virtualisation”.
P&G&R.

- Fairness of resource access (compare to net neutrality debate)
- Monitoring of throughput, quality levels, etc.
- International rules for:
  - Interworking of protocols
  - Organization of network topology
  - Governance in address spaces, naming service organization
  - Responsibilities for abuse prosecution
  - Networks crossing regional legal (and regulatory) boundaries
  - Lawful interception
  - Organization of security and privacy
  - Organization of taxes
  - Organization of legal aspects, e.g. digital rights for media
  - Responsibilities for abuse prosecution

Ongoing work

Case study “Network virtualisation”.
Next steps to be done.

- Definition of products
- In depth analysis of impacted
  - Processes
  - Resources
- Calculation of business case