Internet architecture and services

MSc main specialization in Computer Engineering, BME VIK

Internet architecture and services

Main specialization subjects

- Agile network service development (vitmma01), TMIT

- Internet ecosystem and its evolution (vitmma00), TMIT

- Cloud networking (vitmma02), TMIT

- Internet services and applications (vitmma04), TMIT

- Modeling seminar for engineers (vitmma03), TMIT

Main specialization laboratory

- Infokommunication services laboratory 1 (vihima04), HIT

- Infokommunication services laboratory 2 (vitmmb00), TMIT

Project lab / theses work

- Project laboratory 1-2

- MSc thesis work 1-2

http://www.vik.bme.hu/en/education/programs/

Internet services and applications (2017 fall)

- Basic information
    - <u>lectures</u>: Mondays 12:15- (IB144)
    - <u>practices</u>: Every 2nd Thursday 14:15-16:00 (IB145) – starting **7th Sept**

    - <u>Requirements</u>:
        - <u>During the semester</u>: Accomplishing the **Home Project Teamwork**
        - <u>Exam</u>: in exam period

    - Lecturer: Attila Vidács (vidacs@tmit.bme.hu)
    - Course homepage: **http://www.tmit.bme.hu/vitmma04-2017eng**

Internet services and applications

Introduction

Internet / network / communication services

- Examples of (communication) services

  - audio services (telephony, mobile telephony, online music, …);

  - image services (fax, videoconference, VoD, streaming video,…);

  - distributed data services (file sharing, meeting scheduling, online gaming, e-newspaper, shared storage,…);

  - Web-based services (travel booking, mobile Web access, e-business, e-commerce, e-learning, e-…);
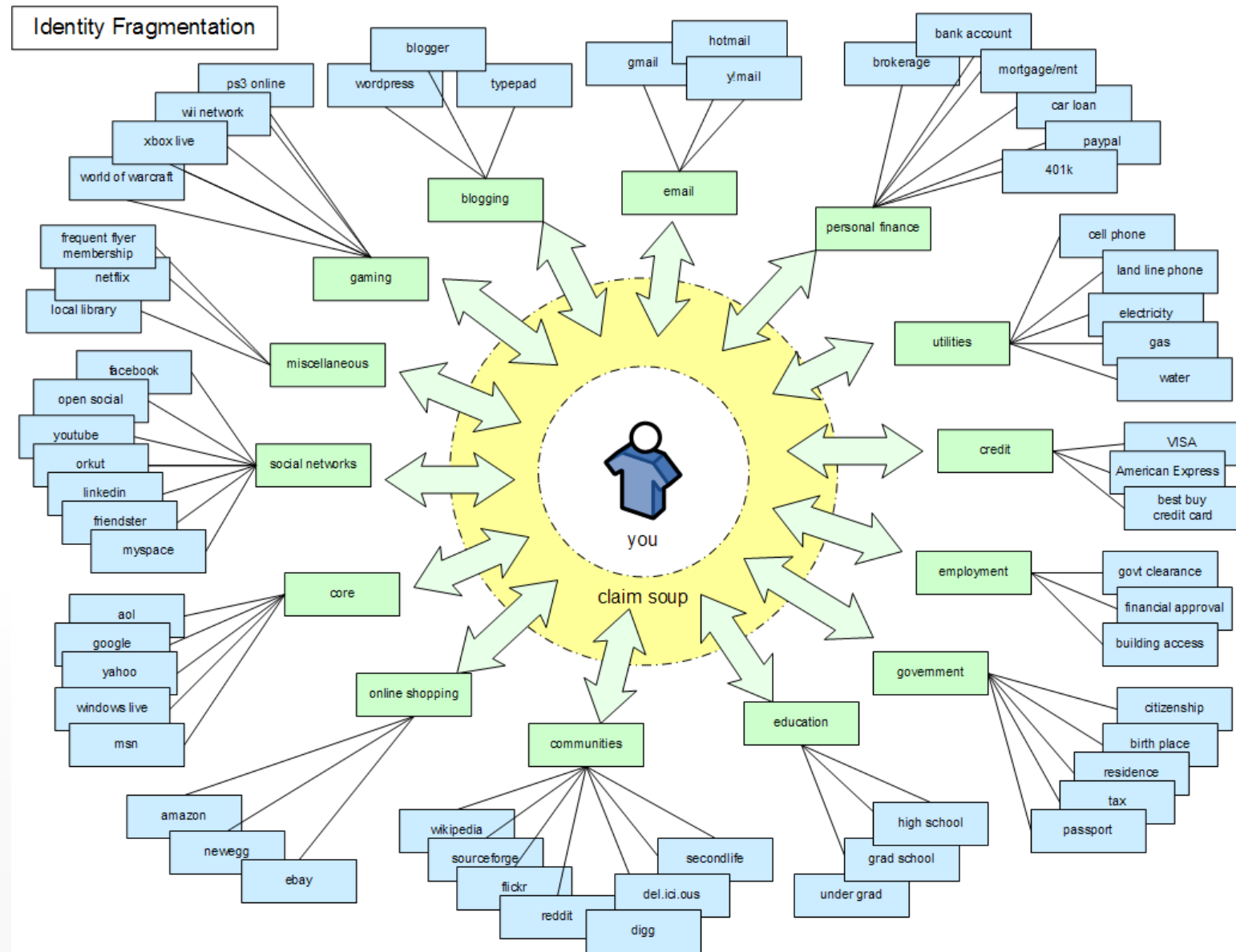
  - AND MANY-MANY OTHERS!....

(Internet) services

- Definition of service (Oxford) [mass noun]

  1. „The action of helping or doing work for someone."

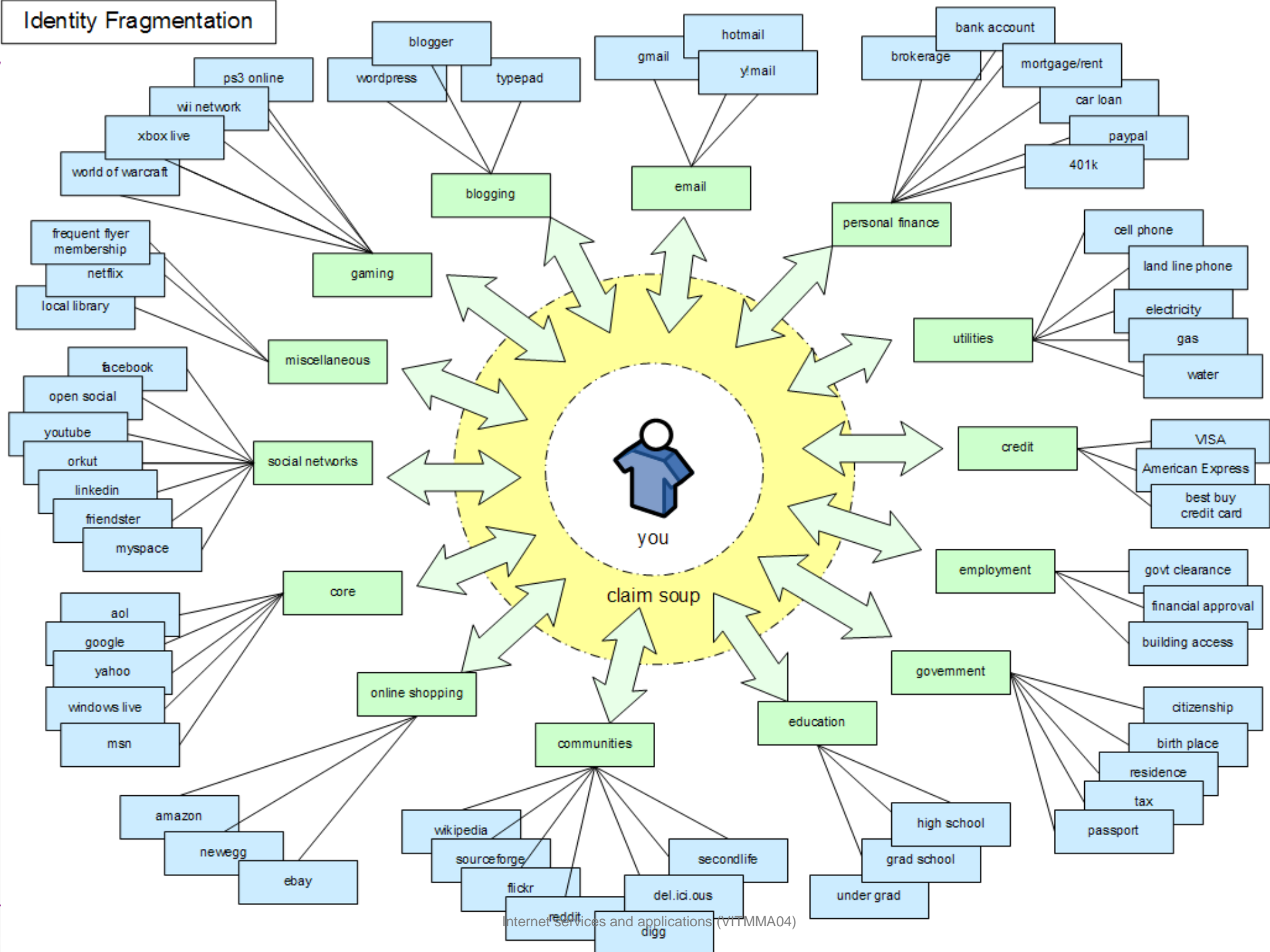 2. „A system supplying a public need such as transport, communications, or utilities such as electricity and water."

Services (cont'd)

- Services provide **abilities** for the **end user**

→ the end **user is in the center**, <u>not</u> the network!

Services (cont'd)

- From the end user's point of view: The service is an abstraction of the underlying network, including the protocols and resources.

- Example: POTS (Plain Old Telephone Service)

  - The subscriber just „dials" other subscribers and simply talks to them…

  - …but this assumes a rather complex networking infrastructure. This whole complexity remains hidden from the subscribers.

- *The most important feature of an efficient service is that it is not necessary for the user to know how the actual service is implemented.*

Services – from business point of view

- Business perspective: The service is something that is packaged and sold to the customer.

  → selling services provide the primary income for network operators!

- What we call a „service" in marketing is typically a combination of many different technical services.

- The services that the operators provide are vital for them to **distinguish themselves** from the competitors in an *increasingly competitive market*.

Service packs

History

very briefly...☺

History – Network support for services

- Rapid evolution of communication services in the last 150 years:

  data services (telegram) → speech services (telephony) → voice services (radio) → text services (telex) → image services (fax) → video services (TV) → mobile services (pager, mobile telephony) → internet services (email, file transfer, remote access, telephony) → based services (e-) → ?*

- Many services were supported *on dedicated networks* in early years....

- …BUT as a result of the convergence of computing and communication…

  - *new* services emerged on *existing* networks,

  - *existing* services can be provided on *shared* (*integrated*) networks.

Communication services

Internet services and applications (VITMMA04)
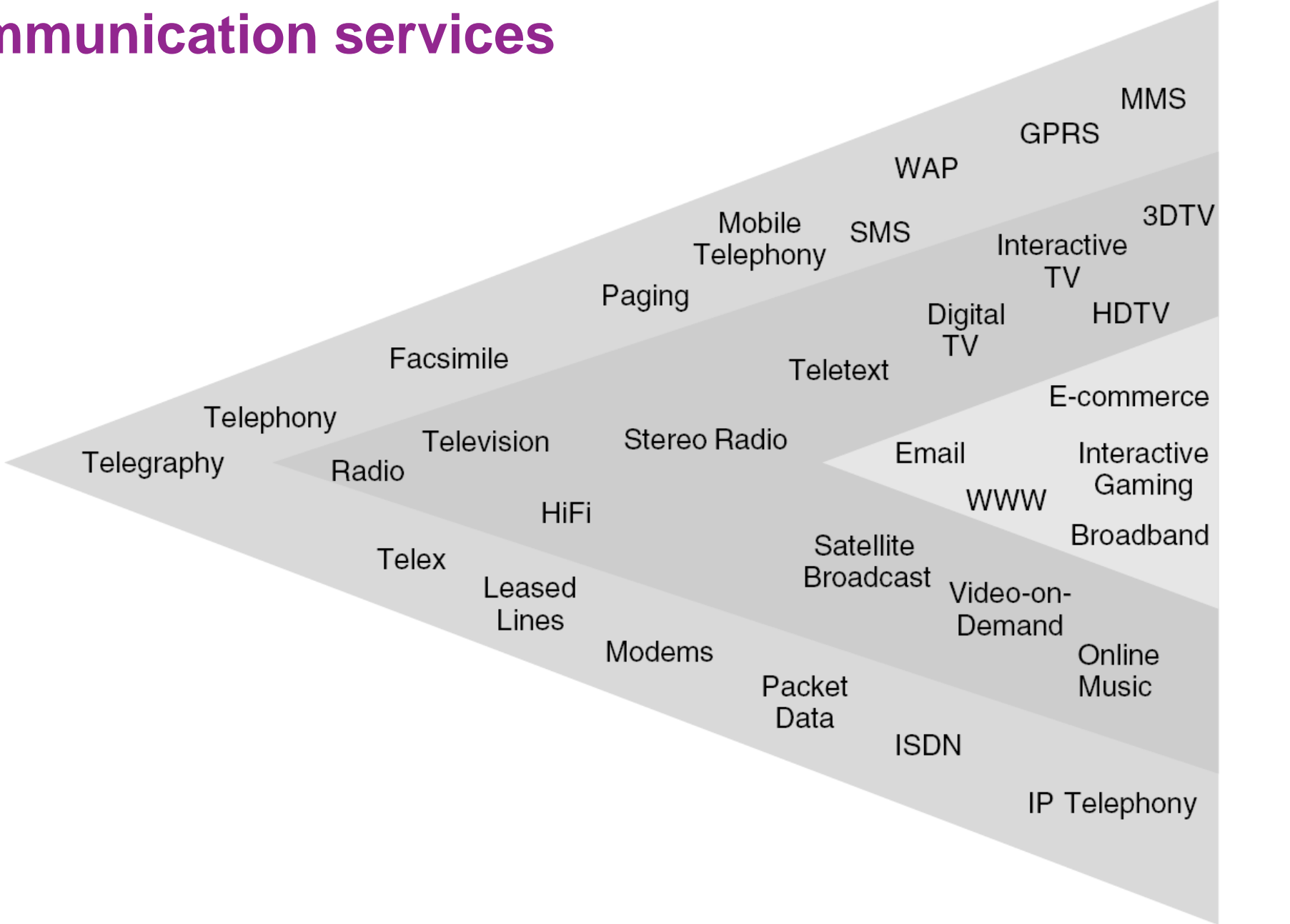
History (cont'd.)

- Telephony was the main ara of service development

    - SPC (Stored Program Controlled) telephone exchanges were able to provide much more than simple switching (i.e., end-to-end path establishminet).

    - The IN (Intelligent Network) concept (in 1990s) made possible to *separate switching and services*.

    - Signalling became an important question in service creation.

    - However, the voice-based circuit-switched discipline made the creation of new types of services very difficult for a long time.

History (cont'd.)

- The Internet is continuously developing since the 1970s

  - In contrast to telephone networks, the internet is *data centric* and pac*ket-switched*, but...

  - the digitalization of analogous signals made it possible to transfer voice (and other media) as well.

  - In spite of the best effor discipline of the internet, it proved to be able to transfer different media types as well!

- Mobile communication opened up new areas for telephony

  - Earlier analogous networks became digital.

  - The 3(+)G mobile networks provide a significant building block of internet technology.

History – converged networks
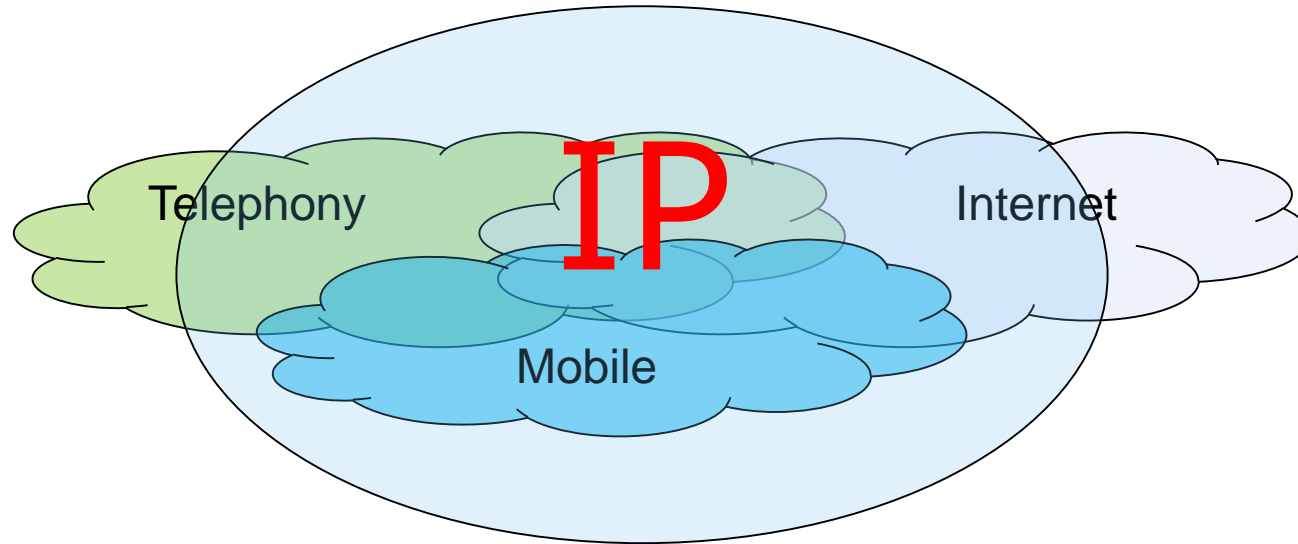
- OLD: dedicated network for each service („stove-pipe")

- NEW: converged networks

→ **The IP-based networks became the common infrastructure for communication services!**

Tradinional service provisioning vs. Internet philosophy

- **The traditional way of service provision**
  - services are implemented *within the core* network
  - strong control over quality and reliability

  - *Note: Assuring quality, reliability and control is not a bad option! (e.g., „five-nines...")*

Tradinional service provisioning vs. Internet philosophy

- **Internet philosophy**

  - the network core must be kept simple (scalable, massive volumes of transferred data)

  - services must be *provided at the edge*

  - the service can be provided *by a third party*

  - the *users can define* their own services, too.

  - <u>Note</u>: *The management and control becomes „problematic" when users can take part of it!*

Telecom networks vs. internet

Is it clear, where the „traditional" telecom word meets the „new" internet?

Internet-based services

Internet service architecture

- Many internet-based service use the client-server architecture.

  - Client: software/hardware entity that provides the means (often graphical) for end-users to <u>access the service.</u>

  - Server: software/hardware entity that provides a set of (pre-defined) <u>functions</u> to connected clients.

Internet service architecture

- Typical **client-server** use case:

    1. The client sends a *request* for the server;

    2. the server performs a set of *operations*;

    3. the server returns results to the requesting client in a *response*.

- In case of a large-scale service…

    - the service *runs on many servers*;

    - supports *different types of client applications*,

    - that *run on different end-user equipments* (e.g.,. PC, PDA, smartphone, …).

Internet service architecture

- <u>Note</u>: The *differentiation between client and server* holds only for the service, but not for the internet!

  - Both the client and the server are network nodes with given IP addresses on the internet.

  - IP addresses are used for transferring packets from source to destination (*routing*).

- <u>Corollary</u>: *The routing can be called the only service that the internet provides. All service providers use this service to provide their own value-added services.*

- In other words: the routing capability of the internet is separated from all the services that *use* the internet.

Internet-based services

- The internet for designed to support a wide range of services from the beginning.

  - *Provides „nothing*" but supports „everything"!*

    (= except connectivity!)*

- This goal was achieved by separating *service intelligence* from *data transfer*.

- The use of internet as a general purpose service platform became possible, when a special overlay, the World Wide Web, and its client application, the web browser appeared.