Basics of Telecommunication
Fall-2000
S-38.118

Introductory lecture 13.9.2000

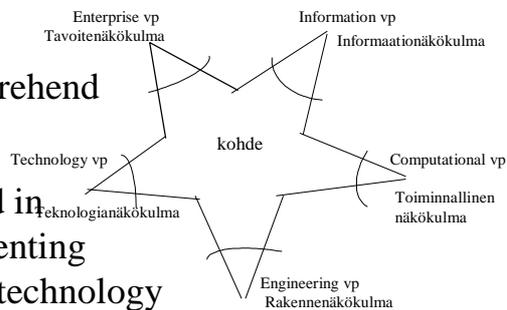Condensed version

Mika Ilvesmäki

Goals for the course

- To give basic knowledge and general education to communications technology in general and to S-38 courses in particular.
- Aims to teach the student to think on system level
  - See the black box from the outside, how it functions.
- The details of bits and bytes are not emphasized
  - Although important to learn if taught…

Prerequisites

- Courses:
  - S-38.105 Tietoliikennetekniikan perusteet
    - Or equivalent
- Skills:
  - Adequate mathematical background and skills
    - Probability calculus in particular
    - And a reasonably analytical way of thinking

Points of view to telecommunications

- Telecommunications is diversified and versatile issue
  - Easy to miscomprehend
- Several models
  - Usually restricted in their way of presenting communications technology

Enterprise vp
Tavoitenäkökulma

Information vp
Informaationäkökulma

kohde

Technology vp

Computational vp

Teknologianäkökulma

Toiminnallinen näkökulma

Engineering vp
Rakennenäkökulma

OSI-reference model

- Open Systems Interconnection
  - 7 –layer model that enables to design the protocols of different vendors so that interoperability is achieved.
- A method and tool for the software engineering
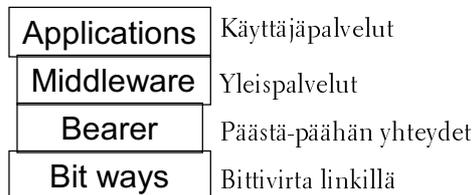- A way of portraying relations between entities in telecommunications

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OSI-model in practise

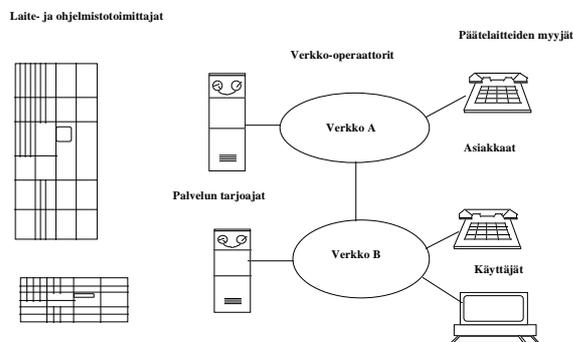| |
|---|
| Application/Sovelluskerros |
| Presentation / Esityskerros |
| Session / Yhteyskerros |
| Transport / Kuljetuskerros |
| Network / Verkkokerros |
| Data link / Linkkikerros |
| Physical / Fyysinen kerros |

- Does it help to understand telecommunications?

ODN-model

- Open Data Network
  - Simple
  - Very few bearer and middleware services
  - Several Bit Ways and Applications

Applications	Käyttäjäpalvelut
Middleware	Yleispalvelut
Bearer	Päästä-päähän yhteydet
Bit ways	Bittivirta linkillä

The subjects of communications

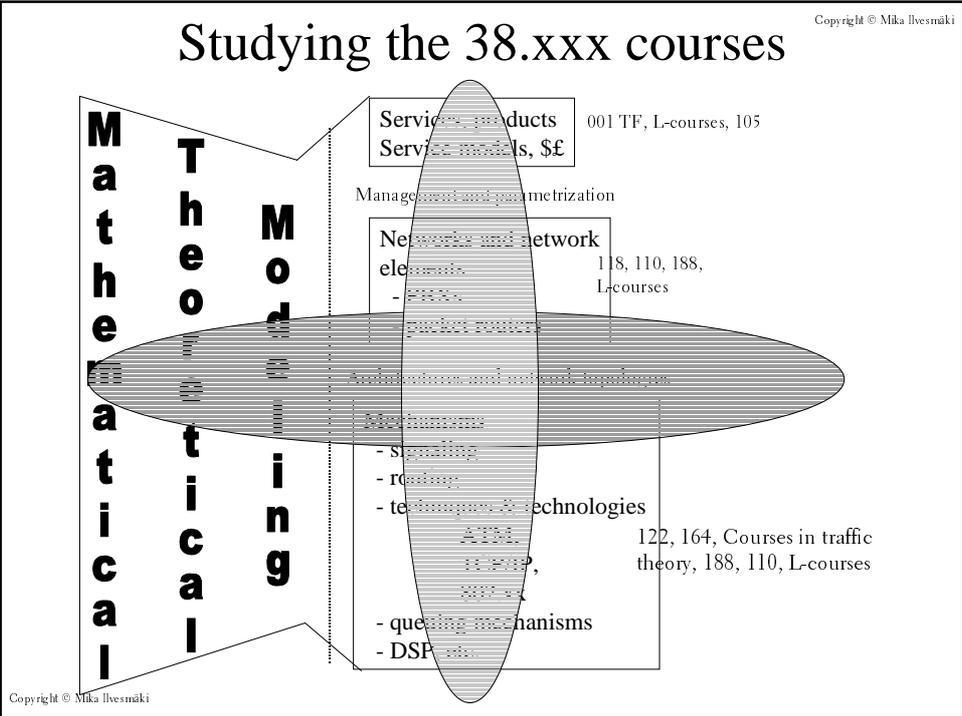- Vendors, Service providers, Operators, Customers, Users

4

Technical functionality

- All telecommunications is based on basic technologies (and techniques, like:
    - Transforming the acoustic signal to electric,
    - amplifying,
    - Sample the analogous signal to digital,
    - modulate,
    - Multiplex and demultiplex,
    - code
    - Switch, relay and forward
    - signalling.

The basic species of networks

- Two fundamentally different types of networks
    - Telephone networks
    - Data networks
- Different mechanisms of data forwarding and service models.
- Telecommunications hot topic: Convergence

Studying the 38.xxx courses

Mathematical **Theoretical** **Modeling**

Servi... ...ducts
Servi... ...ls, $£   001 TF, L-courses, 105

Manage... ...metrization

Net... ...network
ele...   118, 110, 188,
- PBX...   L-courses
- packet routers

...bscription and internal topology

Mechanisms
- signaling
- routing
- te... ...echnologies
        ATM   122, 164, Courses in traffic
        TCP/IP,   theory, 188, 110, L-courses
        SDL...
- queuing mechanisms
- DSP...

Telecommunications way of thought

- $: user, consumer; business model, service model
  - Or How to make a product out of my technical solution?
- X: equipment, switches, PBXs or IP-routers
  - What equipment do I have to produce the services?
- {<=>}: Mechanisms, protocols, methods, technological solutions,
  - Of what mechanisms does my equipment consist?

$
X
{⇔}

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Communications and mathematics

- $\sum$: Mathematics is a way to handle, model and grasp the technologies

$$\sum \frac{\$}{\boxed{X}}_{\{\Leftrightarrow\}}$$

Something still missing...!

$$\sum \frac{\$}{\boxed{X}}_{\{\Leftrightarrow\}}$$

Management and parametrization

Network topologies

The duty of the teacher is not to pass
on knowledge but to awake the
student to think on his own.