Wireless Infrastructure Deployment and Economics (Course IK2514)

Course Overview, November 2014
Jan Markendahl, Cos/ICT/KTH

Agenda today

- Why this course? Your expectations?
- Course overview, course objectives
- KTH Social and the schedule
- About part 1 of the course and homework 1
- About part 2 and 3 of the course
- Lecture: Actors & roles at the telecom market
  - A small exercise

Wireless Infrastructure Deployment and Economics (Course IK2514)
Jan Markendahl COS/ICT
Associate Professor
Wireless Infrastructure Deployment and Economics

The course consists of three parts
- Telecom Markets and Regulation
- Mobile Operator Business
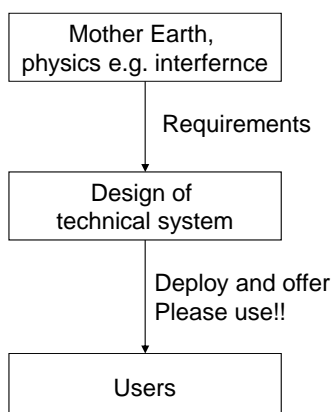- Wireless Broadband Network Deployment and Economics

The course is about "How to":
- Organize telecom markets
- Run a operator business and make money
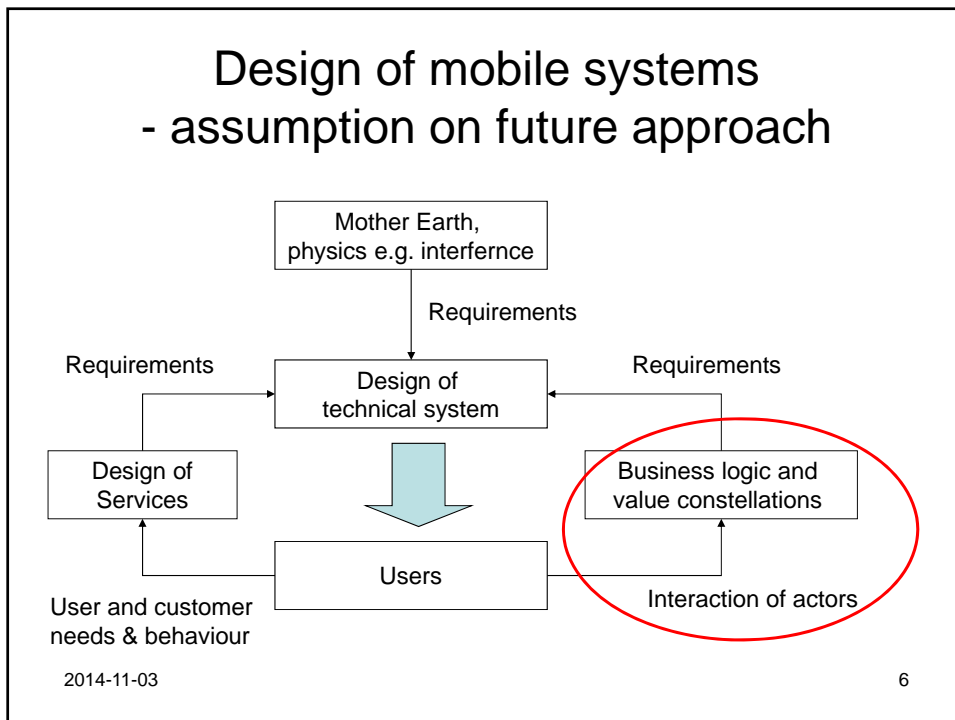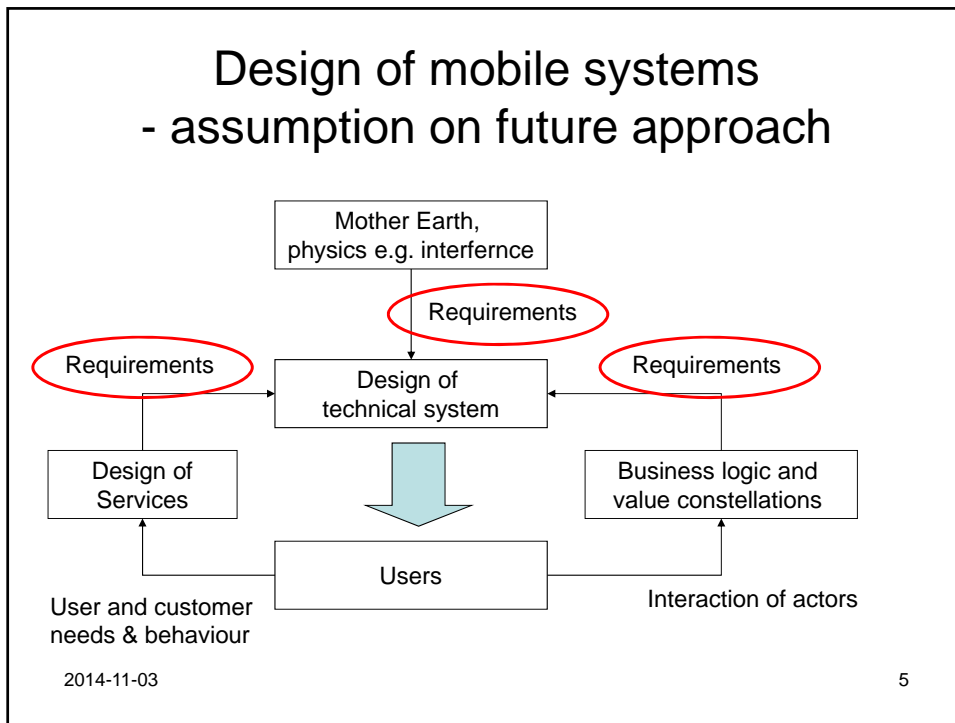- Dimension, design & analyze mobile broadband networks

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Design of mobile systems
- traditional approach

Mother Earth, physics e.g. interfernce

Requirements

Design of technical system

Deploy and offer Please use!!

Users

2014-11-03

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Design of mobile systems
- assumption on future approach

Mother Earth,
physics e.g. interfernce

Requirements

Requirements

Requirements

Design of
technical system

Design of
Services

Business logic and
value constellations

Users

User and customer
needs & behaviour

Interaction of actors

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Design of mobile systems
- assumption on future approach

Mother Earth,
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Requirements

Requirements

Requirements

Design of
technical system

Design of
Services

Business logic and
value constellations

Users

User and customer
needs & behaviour

Interaction of actors

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Techno-economic research and teaching

- Teaching on telecom and mobile systems
  - Many courses on how to design systems and technology
    - Knowledge useful for companies like Ericsson, Nokia, Apple
  - Not many courses on how to run and operate the mobile networks, i.e. the "telecom machine"
    - Knowledge useful for broadband and mobile operators
  - A need to put technology and solutions into a market and business perspective

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Know how to design a "machine"
- or Know how to use it !

Railways   Fire brigade   Farming

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Overall objectives and learning approach

The overall objective
- To enable students to design, model and analyze technical systems in an overall business context

Learning approach
- A strong focus is put on "learning by doing" with home works, reviews, seminars and a operator game
- Guest lecturers to give different perspectives
  – Regulator
  – Financial market
  – Manufacturers
  – Mobile operators
  – Internet companies
  – User and pricing

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Course objectives

After the course the students should be able to:

- Analyze telecom markets in terms of actors, market segments, services, regulation + identify differencies

- Describe the key characteristics of a Mobile Network Operator and identify strengths and weaknesses

- Dimension and design of a wireless network given demand, spectrum and radio access technologies

- Model and analyze the cost structure of a mobile operator network and compare different solutions

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Homework and operator game

- Three homework assignments
  1. To analyze the telecom market in a country
  2. To compare business strategies of two mobile operators in a country
  3. To dimension and make an overall networks design and make cost and capacity trade-offs
- To do reviewing
- Mobile operator game
  - A business game where operators compete year 0 - 6(8)
  - A full day exercise where 3-4 students is the mgmt team

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Course overview

- Course content
- Course objectives
- Learning approach
- Agenda, lectures and lecturers
- Home work assignments
- The mobile operator game
- Examination and credits

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Course Content

The course consists of three parts
- Telecom Markets and Regulation
- Mobile Operator Business
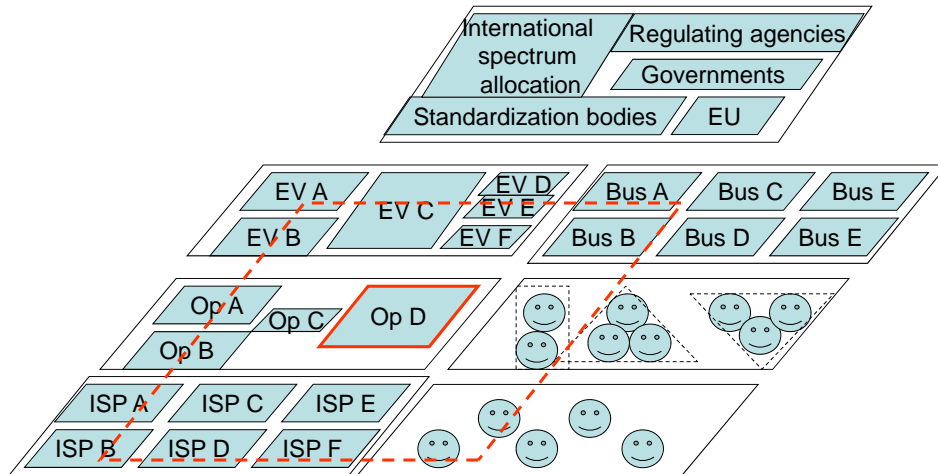- Wireless Broadband Network Deployment and Economics

Part1: Telecom Markets and regulation
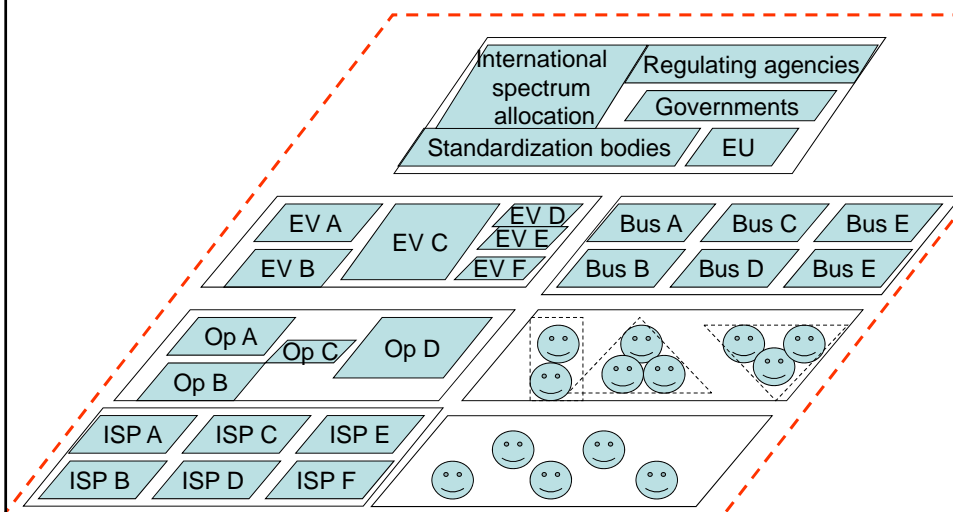
Part 2: Mobile operator business
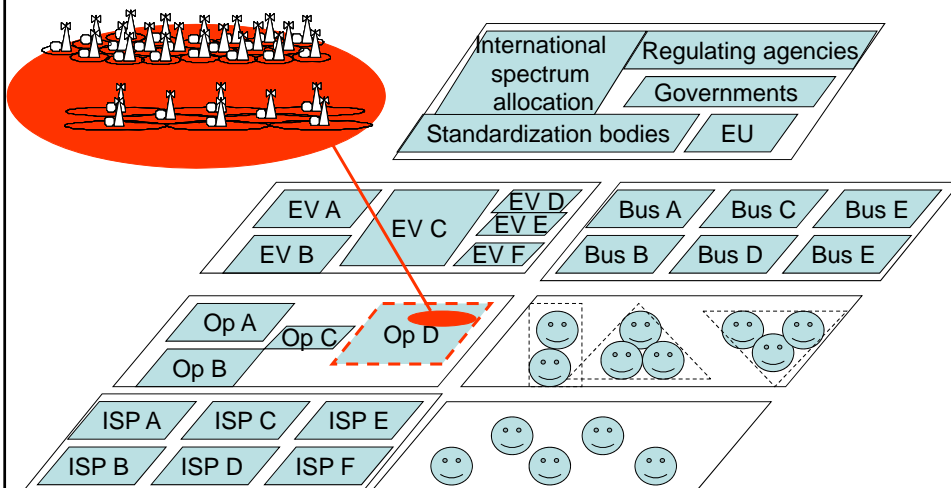

Part 3: Network dimensioning, deployment and cost structure analysis

Learning Approach

- A strong focus is put on "learning by doing" with home works, seminars and a operator game

- Motivation
  - The course covers a multitude of architectures, concepts, methods and tools within both wireless technology as well as areas of economics and business.
  - Each concept, solution etc may not be so complex or difficult to understand, but the combination of all aspects leads to a very high degree of complexity.

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Part 1: Telecom Markets and regulation

- Market structure, type of actors and business relations at telecom markets
- Telecom regulation, regulated markets and services, Spectrum allocation and licensing;
- Operator competition and cooperation, Mobile operator strategic planning
- **Home work 1:** Country study -description and analysis of the telecom market in country X

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Part 2: Mobile operator business

- Overview of operator business; marketing, customer management, charging & billing
- Cost structure, financing, investments and risk, revenue streams, pricing and subscriptions
- Operator challenges for mobile broadband, the revenue gap, capacity & coverage, data rate
- **Home work 2:** Analysis of operator strategy
- **Mobile Operator Business game** session (1 day) and preparation and summary report

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Part 3: Network dimensioning, deployment and cost structure analysis

- Economics of wireless infrastructure, cost-capacity trade-offs, scalability, spectrum allocation
- Network dimensioning, deployment and configuration strategies, impact of user demand
- Cost structure modeling & analysis of network, to calculate CAPEX, OPEX, Net present value
- **Home work 3:** Dimensioning and high level design of a wireless network incl. cost structure analysis

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About home work assignments

- **Homework 1 task:**
  - Describe the telecom market i country X
    in terms of key actors and their characteristics
  - Identify problems and challenges for key actors

- **Homework 2 task:**
  - Compare business strategies of two mobile operators in
    "your" country
  - Find data on the business performance and operator
    strategy in order to be able to make a comparison

- **Homework 3 task:**
  - Dimensioning of a radio access network and analysis of the
    cost structure for different deployment options and types of
    used Radio Access Technologies (RATs).
  - The analysis will be done for a specific scenario with a set of
    user and traffic data and different RAT´s)

To pass home work assignments 1 and 2

- To do a draft report and send for review
  - Max 4 pages in total
- Review the reports of student in the group
- Present review comments in group session
- Make a oral presentation of results
  - Max 5 minutes and 2 slides
- Attend the presentation seminar
- Revise report according to the review
  comments and submit a final version

Examination and grading

- In total the home works and the problems can give 30 points (3*5points + 5*3 points).
  - Each home work will be graded with 0 to 5 points and these points are included in the points at the exam.
  - At the exam there will be five problems to solve; each problem can give maximum 3 points.
- To pass the course
  - All home work assignments are satisfactory (3-5 points)
  - In total 12 points are required (grade E)
- Credits
  - 7,5hp = 5 weeks of full time work distributed over 9 weeks

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Course outline and timing

- Part 1: start 3/11
  Telecom Markets and Telecom regulation

- Part 2: start 18/11 (game session 10/12)
  Mobile operator business

- Part 3: start 24/11
  Network dimensioning, deployment and configuration and cost structure analysis

- Written exam: 13/1, 2015   KTH Social

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Lectures & seminars – part 1, week 1

- November 3; 13-15 (Jan Markendahl, KTH)
  - Course overview, Intro to telecom actors and roles
- November 4; 10-12 (Jan Markendahl, KTH)
  - More on actors and roles, ecosystems,
  - Telecom markets from the end-user perspective
- November 5; 10-12 (Bengt Mölleryd, PTS)
  - Development of telecom markets
  - Regulation and liberalization
- November 6; 10-12 (Bengt Mölleryd, PTS)
  - Telecom and spectrum regulation
  - Role of regulator and examples of regulated markets

- November 07; 18.00
  -> Submit draft HW1 report

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Lectures & seminars – part 1, week 2+3

- November 10; 13-15 (Student groups, no teacher)
  - Review seminar, discussions in student groups
- November 11; 15-17 (Jan Markendahl, KTH)
  - Country studies, examples of regulation, competition, etc
  - Q&A session for Home work 1
- November 12; 10-12 (Jan Markendahl, KTH)
  - More on mobile services
  - Cases on mobile media, mobile payments, IoT services
- November 13; 10-12 (Jan Markendahl, Ashraf Widaa, KTH)
  - More on operators and spectrum
  - Non European country cases
- November 17, 13-15 (Students)

  November 18; 7.59
   -> Submit final HW1 report

  - Oral presentations of Homework 1

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The homework assignments tasks

- Homework 1 task:
  - Describe the telecom market in country X in terms of characteristics of key actors
  - Identify problems and challenges for the identified key actors
- Homework 2 task:
  - Compare business strategies of two mobile operators in "your" country
  - Find data on business performance and operator strategy in order to do a comparison
- Homework 3 task:
  - Dimensioning of a radio access network and analysis of the cost structure for different deployment options and types of used Radio Access Technologies (RATs).

For HW1 and HW2:
Report no more than 4 pages in total
2 slides for a 5 min presentation

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Home work 1 deadlines 2014

Activity	Home work 1
Home work is assigned to each student	13-11-04 ; 12.00
Draft report sent to teacher & reviewers filename: "country"_HW1_1.doc	13-11-07; 18.00
Review comments sent to teacher and authors filename: "country"_HW1review_by"name"	13-11-10; 10:59
Review session and discussions in review groups (room 208 available, no teacher present)	13-11-10; 13:00-15:00
Send slides for oral presentation to teacher filename: "country"_HW1.ppt	13-11-17; 07:59
Oral presentation of HW1 Each review group will present together	13-11-17 ; 13:00-15:00 (16:00) Max 5 min per country
Send final report version to teacher filename: "country"_HW1_2.doc	13-11-21; 11:59
Feedback and HW grading send to student	13-11-28; 12.00 latest

For you to do today

- Sign list of presence, contact data
- If not done - Select course in Daisy
- If not done - Send e-mail to me, janmar@kth.se
  - Your expectations on the course
  - Your home country, other countries you have lived in language you control besides english
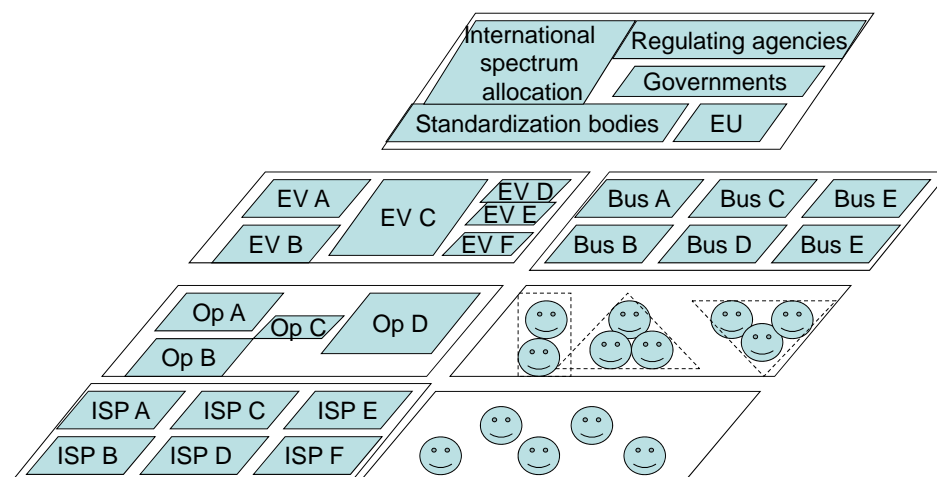 - Experiences that may be useful for the course

About actors at the telecom market

- Users
  - Consumers, busieness users, enterprices
- Equipment vendors
  - Networks, subsystems, handsets, laptops
- Operators
  - Fixed and Mobile, Broadband, MVNO´s
- Providers of different kinds of services
- Regulators, standardization bodies

Example of actors on the telecom market

About actors at the telecom market

- There are many types of actors at the market and many actors within each type of actors
- We will run a small exercise on actors that you can identify
- Two scenarios
  1. A user of a smartphone
  2. A user with a WLAN enabled laptop

Exercise on actors that you can identify
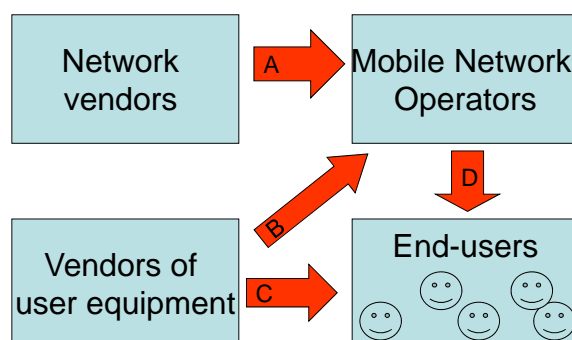
Task 1: A user of a smartphone

Task 2: A user with a WLAN enabled laptop
using hot spot where you need to pay

- Find as many actors as possible
- Write name of each actor at a "post it" note
  - Real names: Ericsson, Telia, Nokia, Dell,
  - Think "here and now" in Stockholm area
- Work in groups for another 10 minutes
- Then put notes on the board

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About actors and business

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