

Wireless Infrastructure Deployment and Economics (Course IK2514)

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Wireless Infrastructure Deployment and Economics

The course consists of three parts

- Telecom Markets and Regulation
- Mobile Operator Business
- Wireless Broadband Network Deployment and Economics

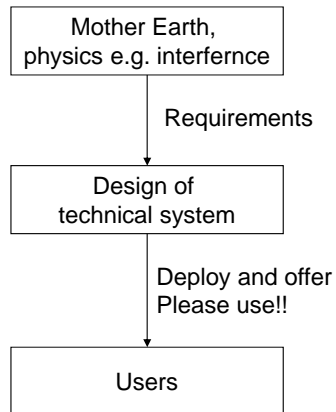
The course is about "How to":

- Organize telecom markets
- Run a operator business and make money
- Dimension, design & analyze mobile broadband networks

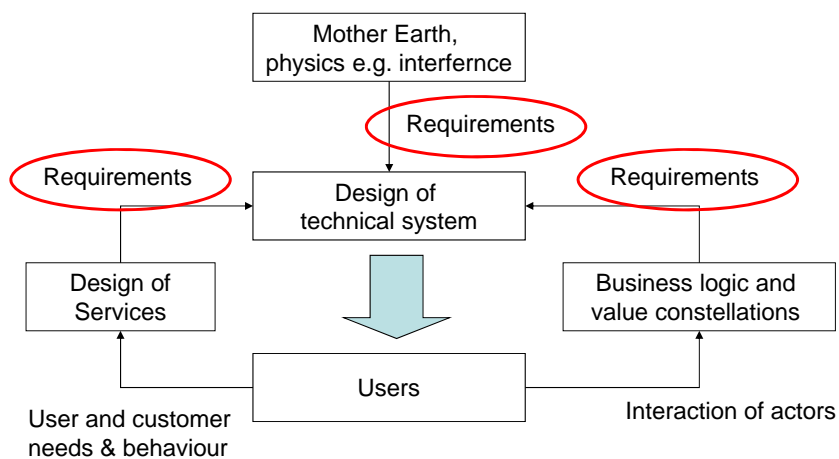
Agenda today

- 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

Design of mobile systems - traditional approach



Design of mobile systems - assumption on future approach



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

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

Course overview

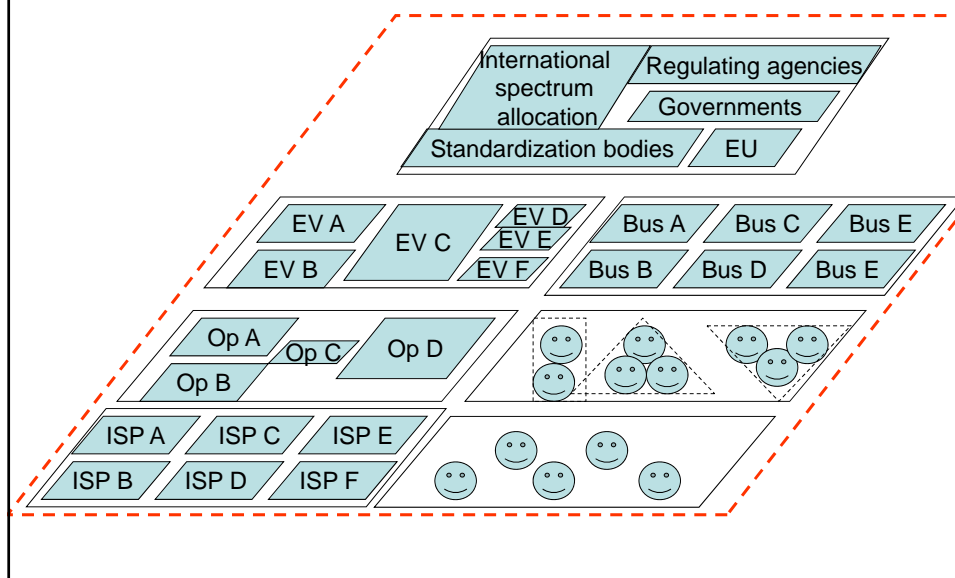
- Course content
- Course objectives
- Learning approach
- Agenda, lectures and lecturers
- Home work assignments
- The mobile operator game
- Examination and credits

Course Content

The course consists of three parts

- Telecom Markets and Regulation
- Mobile Operator Business
- Wireless Broadband Network
Deployment and Economics

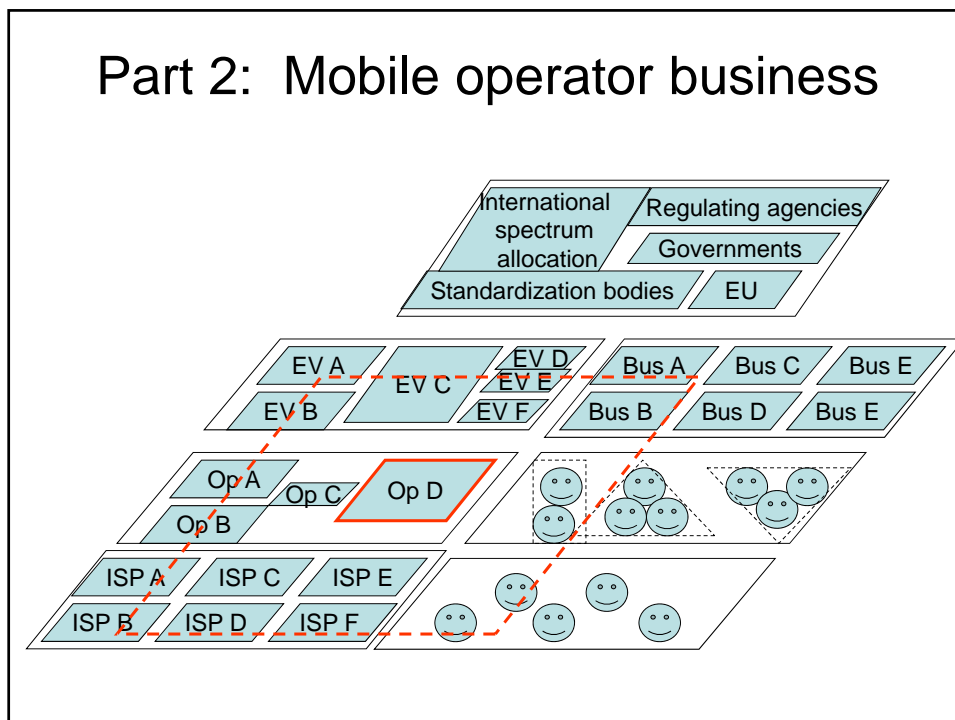
Part1: Telecom Markets and regulation



Part 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

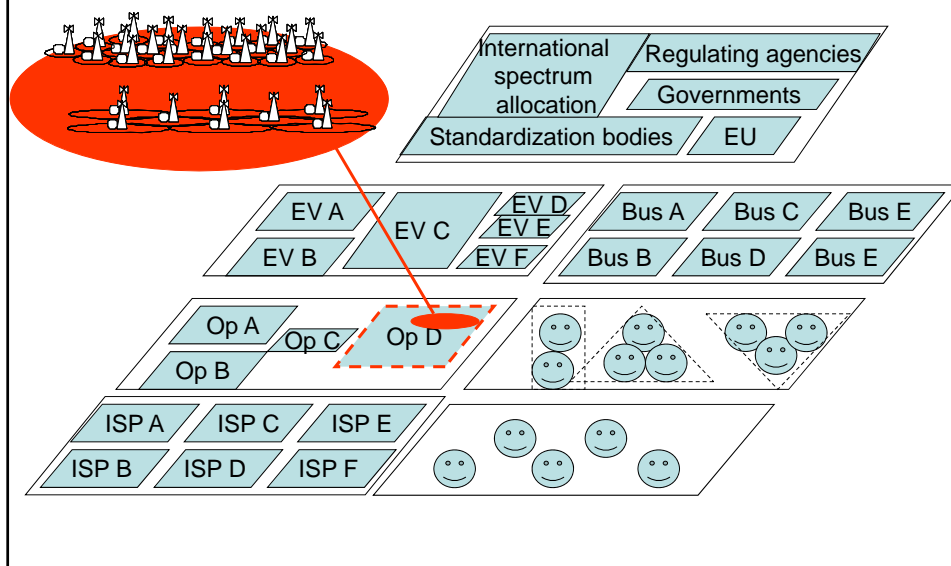
Part 2: Mobile operator business



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

Part 3: Network dimensioning, deployment and cost structure analysis



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

Course objectives

After the course the students should be able to:

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

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.

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

Course outline and timing

- Part 1: 5/11 – 18/11
Telecom Markets and Telecom regulation
- Part 2: 19/11 – 28/11 (+ game session 10 or 11/12)
Mobile operator business
- Part 3: 29/11 – 20/12
Network dimensioning, deployment and configuration and cost structure analysis
- Written exam: 14/1, 2014



KTH Social

Lectures & seminars – part 1, week 1

- November 5; 10-12 (Jan Markendahl, KTH)
 - Course overview
 - Intro to telecom actors and roles
- November 6; 10-12 (Bengt Mölleryd, PTS)
 - Development of telecom markets
 - Regulation and liberalization
- November 7; 10-12 (Jan Markendahl, KTH)
 - More on actors and roles, ecosystems,
 - Telecom markets from the end-user perspective
- November 8; 10-12 (Bengt Mölleryd, PTS)
 - Telecom and spectrum regulation
 - Role of regulator and examples of regulated markets

Lectures & seminars – part 1, week 2

- November 11; 7.59
 - > Submit draft HW1 report
- November 12; 10-12 (Student groups, no teacher)
 - Review seminar, discussions in student groups
- November 13; 10-12 (Jan Markendahl, KTH)
 - Country studies, examples of regulation, competition, etc
 - Q&A session for Home work 1
- November 14, 08-10 (Students)
 - Presentations of Homework 1
- November 18; 7.59
 - > Submit final HW1 report

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**

About review of the homework reports

- Below is a short check list with key aspects to consider when reviewing the HW reports
 - Are the key aspects of the analysis covered?
 - Is there a relevant methodology section?
 - Are the results and analysis clearly described?
 - Are the results and analysis supported by a convincing argumentation?
 - Is the report OK when it comes to layout, presentation style and language
 - Are there sections with "cut and paste" material from webpages, reports, etc?
 - Are relevant references used?
 - Is there any self-assessment and is it relevant?

Home work 1 deadlines

Activity	Home work 1
Home work is assigned to each student	13-11-06 ; 12:00
Draft report sent to teacher & reviewers filename: "country"_HW1_1.doc	13-11-11; 07:59
Review comments sent to teacher and authors filename: "country"_HW1review_by"name"	13-11-12; 09:59
Review session and discussions in groups	13-11-12; 10:00-12:00
Send slides for oral presentation to teacher filename: "country"_HW1.ppt	13-11-13; 15:00
Oral presentation	13-11-14 ; 08:00-12:00 5 min at seminar
Teacher feedback sent to student	13-11-15; 15:00
Send final report version to teacher filename: "country"_HW1_2.doc	13-11-18; 11:59
HW grading sent to student	13-11-22; 12:00 latest

For you to do today

- Sign list of presence, contact data
 - One list for students already selected the
 - One list for students not selected the course
- 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