Intelligent Transport Services (ITS)

MIT

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Urban Transportation Planning

MIT Course 1.252j/11.540j

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Scope

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- # Summary

- # TeleComs:
  - ## Enabling Technologies
- # ITS:
  - ## Concept and Goals
  - ## Automobile Oriented
  - ## Transit Oriented
- # Policy Arena:
  - ## From deployment of new technologies towards organizational changes

Summary: ITS in a nutshell

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- ## Objectives:
  - Originally to address road congestion
  - Later, transit, safety, logistics, demand management , security ...
  - Intermodal perspective

- ## Technology:
  - TeleComs as the starting point
  - Technical compatibility and integration
  - Market driven
  - Promises and realities
  - Often, solutions in search of problems

Summary: ITS in a nutshell

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- **Policy Arena:**
  - Need to share and exchange information
  - Institutional cooperation
  - From a tactical tool towards a strategic approach
  - Recent boost on behalf of road safety

Summary: ITS in a nutshell

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Main applications in the US:

- ATIS:
  - Advanced Traveler Information Systems
- AVCS
  - Advanced Vehicle Control Systems
- CVO:
  - Commercial Vehicle Operations
- APTS:
  - Advanced Public Transportation Systems
- ARTS:
  - Advanced Rural Transportation Systems

Ref: "Perspectives on Intelligent Transportation Systems" by Joseph M. Sussman, Springer 2005

TeleComs: **Tele**communications + **Com**puting sectors

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- Fastest growing sector in Europe
- 5% GDP: 4 million employed
- 300,000 new jobs ('95 - '97)
- More to come:
  - Audio visual (3G video services)
  - New mobile services, as....

- More cellular phones than computers!

Telecom jobs are booming
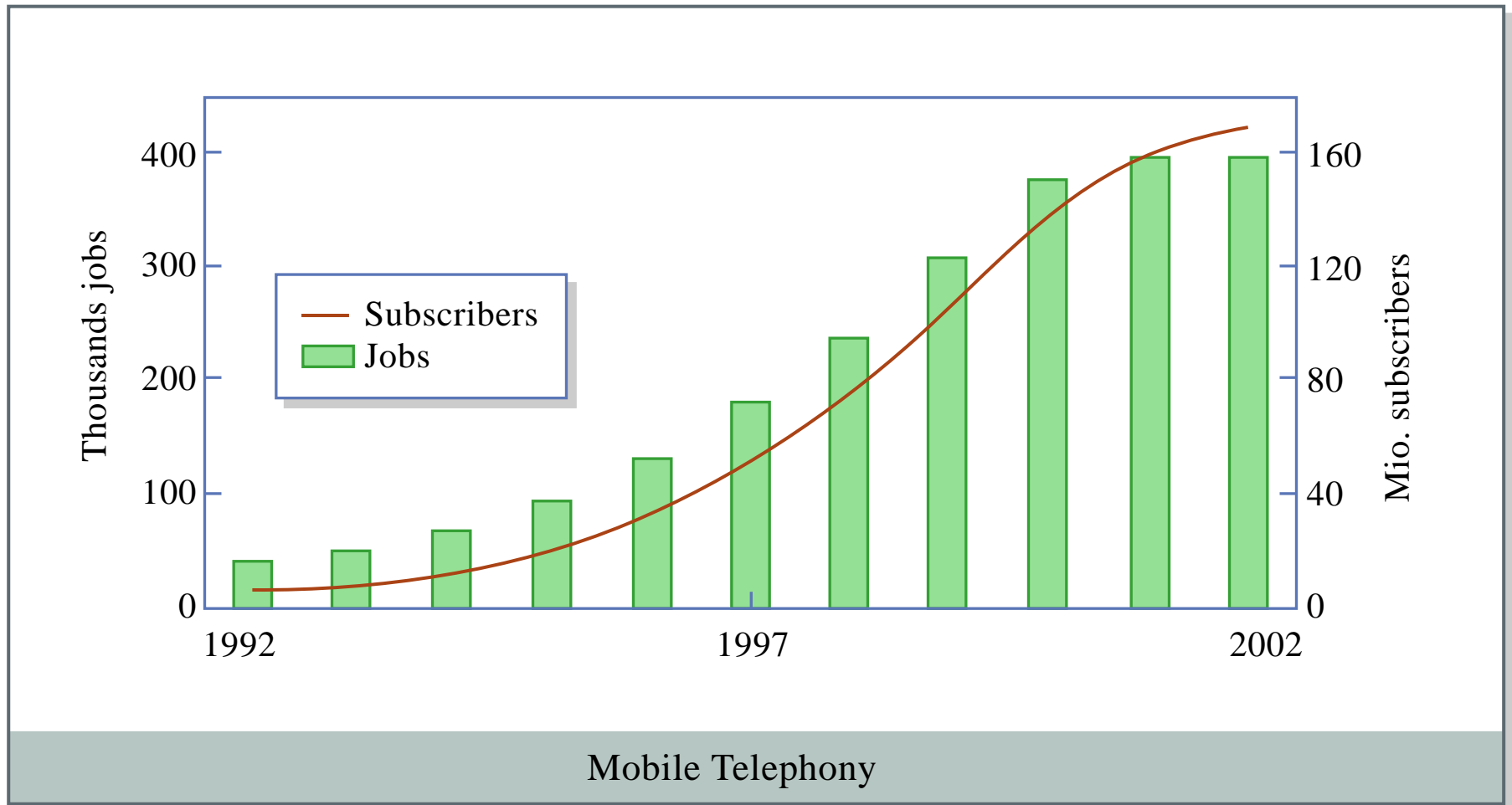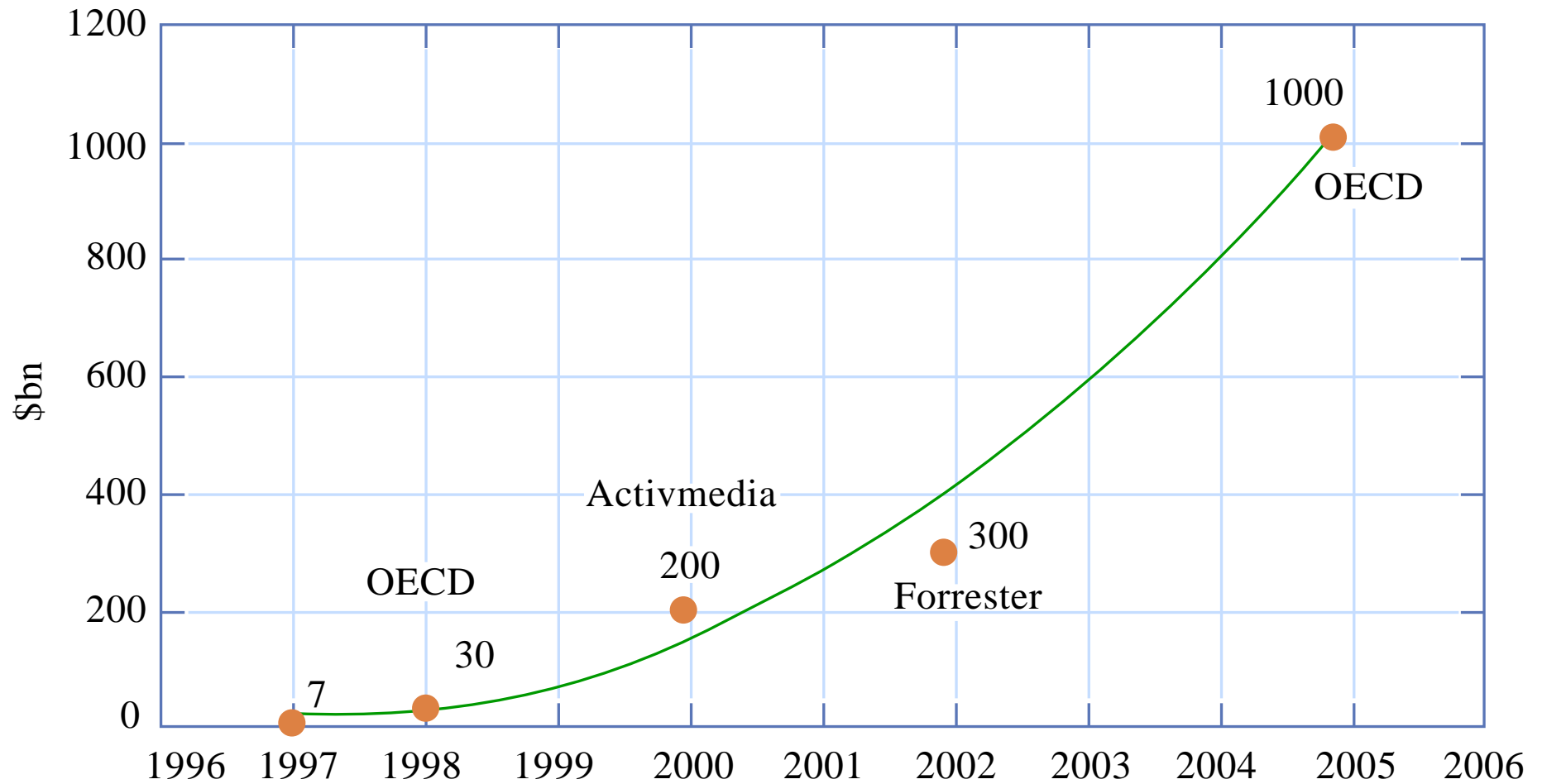
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Mobile Telephony

Figure by MIT OCW.

Projected E-commerce growth

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Technology evolution

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Figure by MIT OCW.

F.Salvucci and M.Murga

Technology evolution

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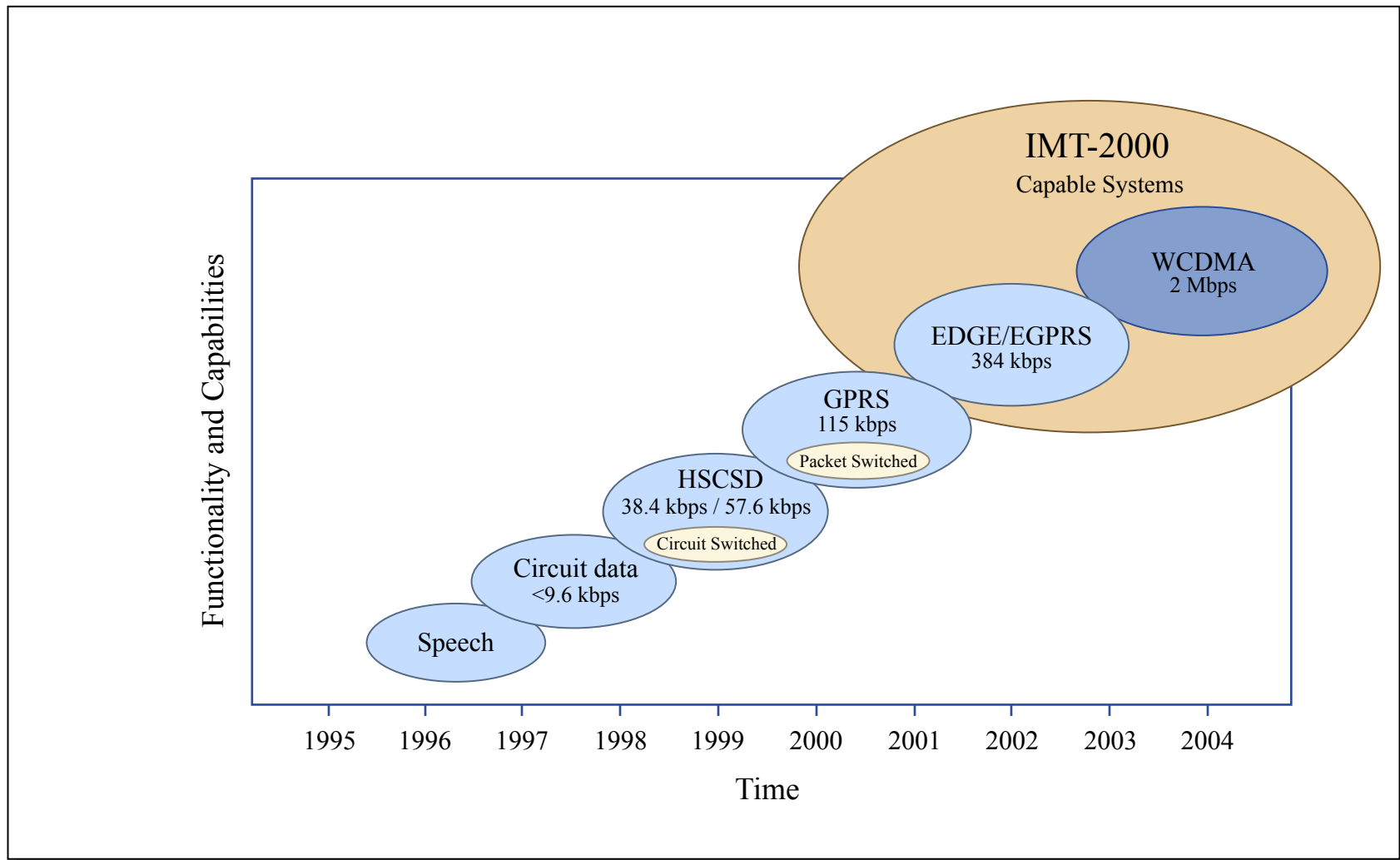
- SMS
- SIM Toolkit
- WAP
- GPRS
- Bluetooth
- Terminals
- Smartcards
- E-commerce
- Security
- Positioning

MIT The challenges of telecom providers...

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- Mobility -
  taking services from the
  desktop to the pocket for
  the ultimate in
  convenience

- Towards ubiquitous
  computing

- Security, payment,
  browsing and devices are
  key technology

Secure electronic financial transactions:

- **Business-to-business, retail and administrative transactions**

- **Billing, payment, accounting**

- **Anonymous small payments .. (Credit card usage at Newbury St for parkmeters)**

- **Reliable, tamper-proof smart cards and personal tokens – (using phones to pay for transit in Japan)**

Europe Today

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- ## Leads in:
  - Mobile communications
  - Digital television
  - Digital local access
 - Electronic payments and smart cards

- ## Lags in:
  - Corporate IT investment
  - Use of the Internet
  - Electronic commerce
  - PC industrial and technology development

What sort of Information Society?

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- ## EU Desideratum:
  - ### Employment rich
  - ### Socially inclusive
  - ### Economically stable
  - ### Culturally diverse
  - ### Environmentally sustainable

From TeleComs to: New ways to work

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- Flexibility in time and place
- Better use of skills
- Reduced investment for new job creation
- Reduced overhead costs
- Financial viability for more new kinds of work
- Greater responsiveness
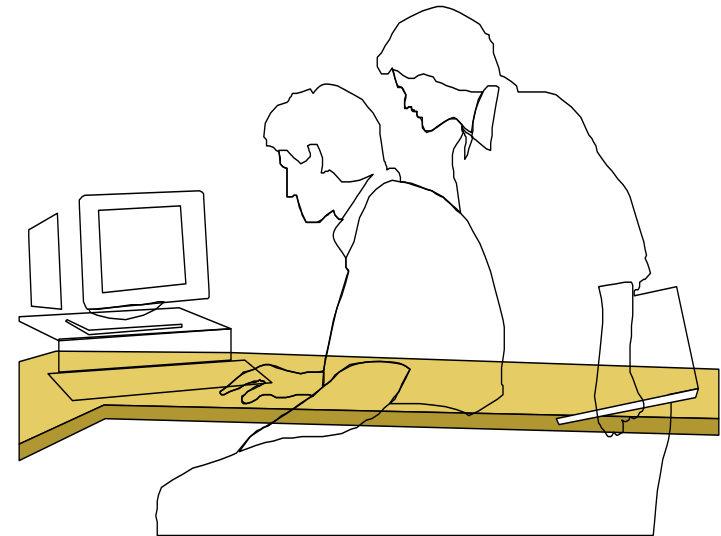
A Rapidly Flattening World

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"The result … is the creation of a global network, Web-enabled playing field that allows for multiple forms of collaboration – sharing knowledge and work – in real time, without regard to geography, distance, or in the future, even language"

Thomas Friedman, "The World is Flat", NY 2005

From TeleComs to: Teamwork and tele-work:

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- Teamwork across borders and timezones
- Real-time and asynchronous
- Linking different types of workplaces
- Intra-company and inter-company
- New tools and standards

ITS: Intelligent Transport Services

(As Part of the Information Society)

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ITS: Control, management and information tools aimed to improve the efficiency, safety and quality of service of the transportation system

eEurope: Main Targets

- Key challenge is to meet the growing demand for mobility within the finite transport networks

- Congestion in road transport
    - Speed up the development and deployment of Intelligent Transport Systems

- Safety of road, rail, air and maritime transport
    - Active safety systems in vehicles
    - Enhanced 112 with location information (equiv to US 911)

eEurope Targets: ITS Deployment

- Timely and reliable information and guidance services (in real time, pre-trip/on trip)

- Effective congestion and demand management strategies (to reduce delays and to improve the environment, safety and intermodality)

- Efficient incident and emergency management (detection, verification, response)

eEurope Targets: Road Safety

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- ## Safety of road:
  - New emphasis on account of 42,000 yearly deaths
  - All new cars sold in Europe equipped with more efficient active safety enhancing systems

- ## All citizens on the move throughout Europe should have access to:
  - call localization and
  - emergency services through the 112 number, recognizing the language challenge

Intelligent Transport Services (ITS)

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Urban Traffic:

- Traffic Signals

- Monitoring throughput:
  - Recommended speeds
  - Ramp metering

- Incident Management

- Signal priority for:
  - Emergency vehicles
  - Public transport

Intelligent Transport Services (ITS)

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Real-time Information:

- Automobile traffic
- Public transport
- Parking
- Airport arrivals/departures
- Points of interest (POI)
- News, banking, stocks...

Intelligent Transport Services (ITS)

Payment sytems:

- Tolls
- Transit fares
- Parking
- Electronic purse
- Mobile-business

Intelligent Transport Services (ITS)

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Urban Goods distribution:

- Fleet Management
- Real-time location
- Load consolidation
- Hazmat management

Intelligent Transport Services (ITS)
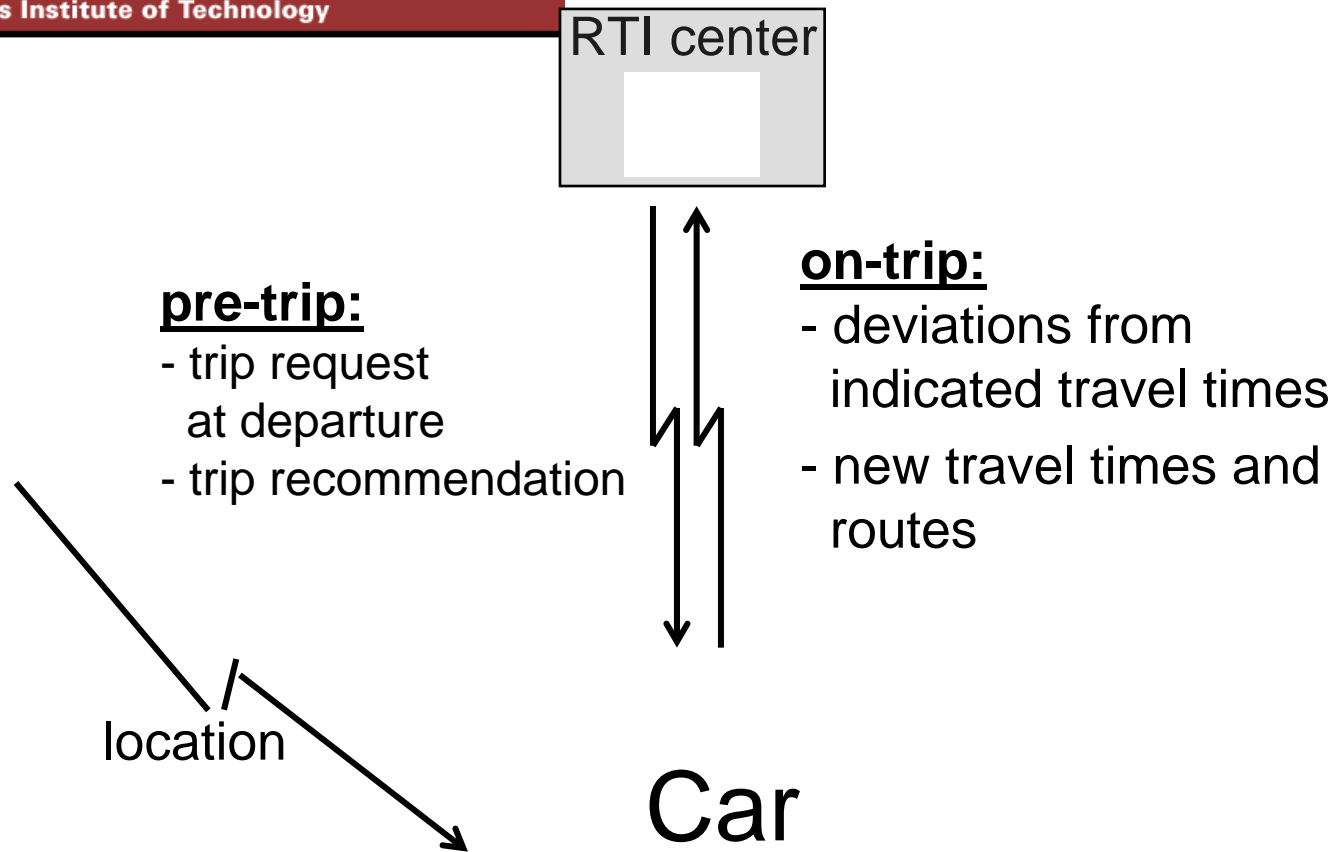
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Sectors involved:

- Transport
- Automobile industry
- Telecoms
- Banking
- Consumer electronics
- Tourism
- Mass Media
- …………………………

ITS and the Automobile

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- **Traffic Information Systems**
- **Route Guidance and Navigation**
- **Location-based Services**
- **Parking Information**
- **Safety**

ITS and the Car:
Traffic Information Systems

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RTI center

pre-trip:
- trip request
  at departure
- trip recommendation

on-trip:
- deviations from
  indicated travel times

- new travel times and
  routes

location

Car

ITS and the Car:
Traffic Information Systems

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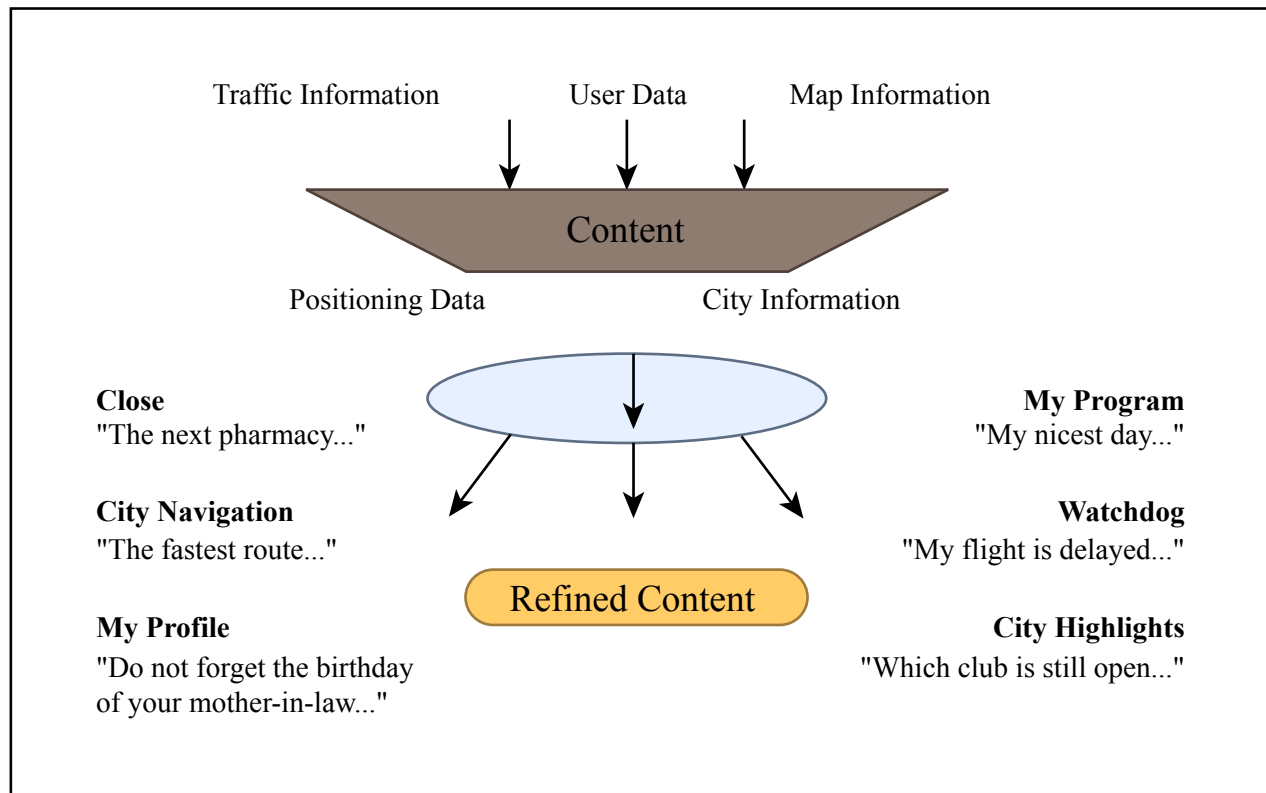
Figure by MIT OCW.

From Data to Information

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Figure by MIT OCW.

ITS and the Car:
Traffic Information Systems
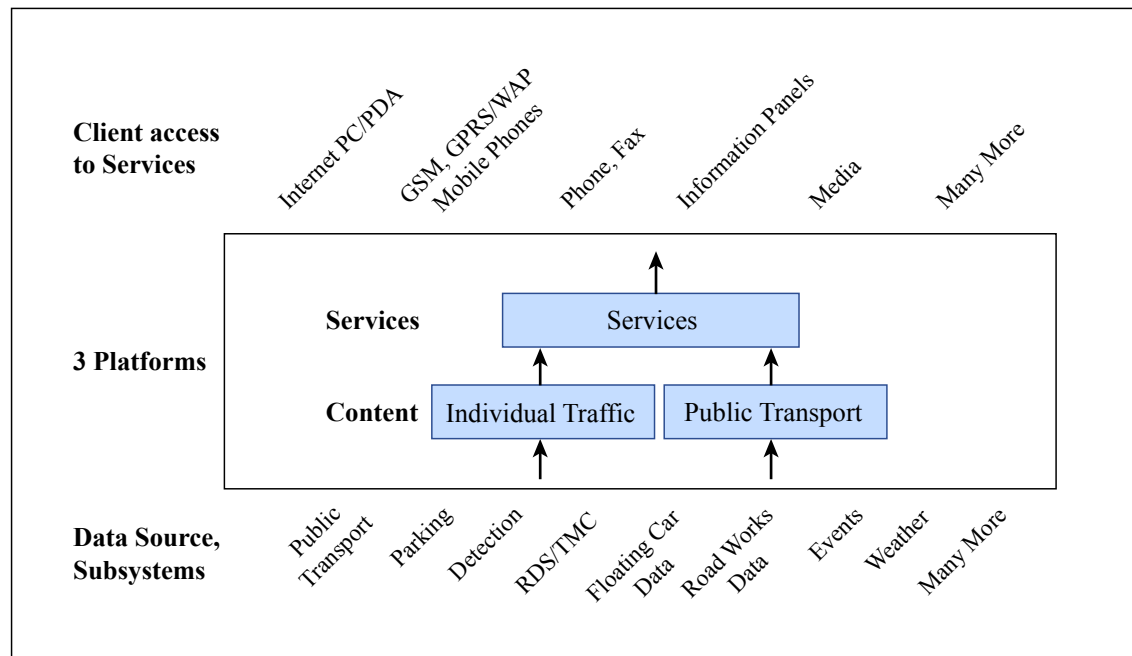
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- # Variable Message Signs

- # SMS messages and WAP

- # Digital Audio Broadcasting (DAB)

- # Traffic Message Channel (TMC)

Parking Information

- **Information on availability**
- **Reservation and ID**
- **Guidance to:**
  - **Available facility**
  - **Actual spot**

From Traffic Control Centers (TCC) to Traffic Management Centers (TMC)

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Just a name change?

Seattle...

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- # Real time information on the Web

  - Updated every minute

Seattle…

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- From color coded maps to actual photographs of the traffic stream

Seattle…

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- You can check in real time an incident

- Even choosing to see upstream impact

Paris….

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Color coded maps, time estimates … and times by transit

ITS and the Car:
Route Guidance and Navigation

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- ## Human Machine Interface (HMI)
  - Related to safety

- ## Speech Recognition
  - Hands free speaking and listening

- ## Location-Based Services
  - Accident location
  - Advanced Driver Assistance Systems (ADAS) – Collision Avoidance
  - GPS and Galileo

ITS and the Car: Last Mile Services

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- Based on Pre-Trip download

- Route indication

- Services

  - 3D visualization of last mile

  - Remote POI selection

Ref: TeleAtlas

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ITS and the Car: Last Mile Services

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Auto ➡ Web ➡

Tele Atlas Geocoded Mobile Mapping data

Tele Atlas Building Components Library

Tele Atlas DB
-Standard DB
-2D city maps

Object Recognition Tools

Building texture Information In TA DB
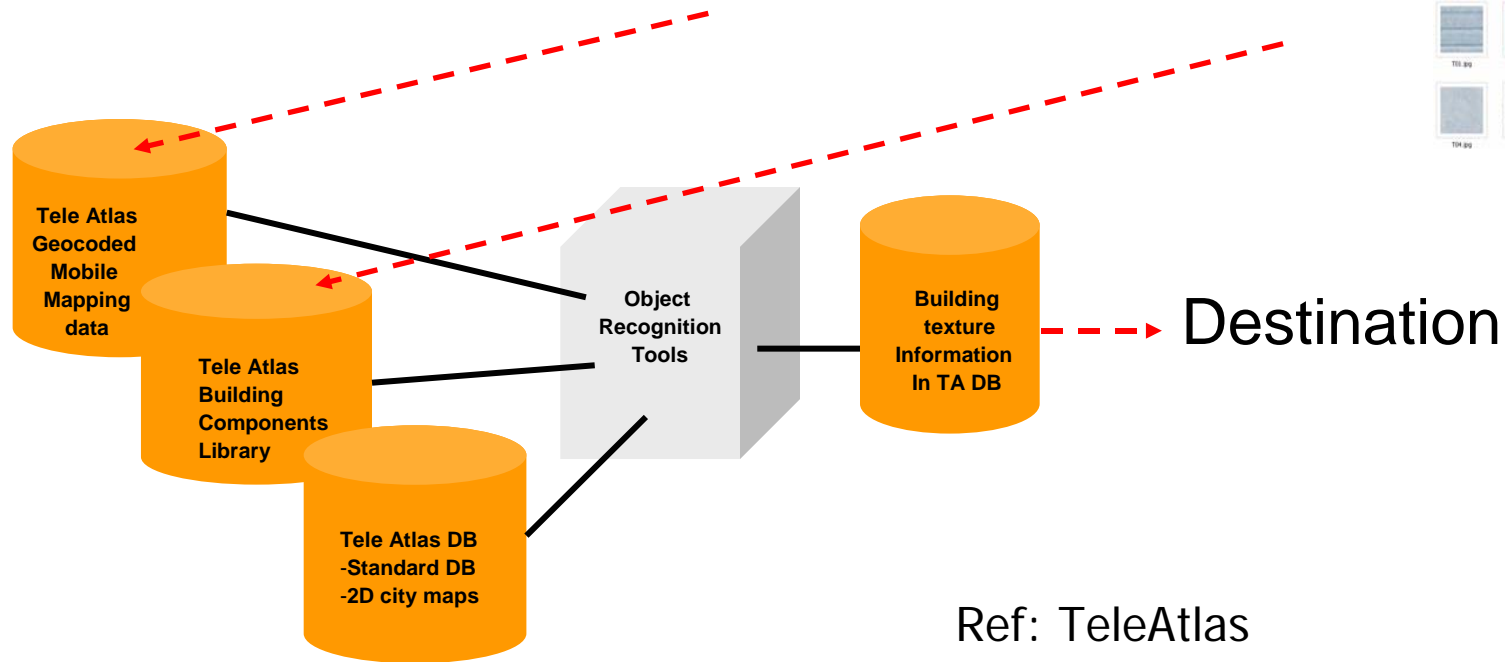
Destination

Ref: TeleAtlas

ITS and the Car:

Road Safety *(Last but not the least…)*

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- **Emergency Calls**
- **Passive (airbags) and Active (collision avoidance) Safety**
- **Advanced Driver Assistance Systems (ADAS):**
  - Driver monitoring
  - Vision enhancement
  - Collision warning and avoidance
  - Speed alert
  - Elderly and people with disabilities

ITS and the Car:

Road Safety *(Last but not the least...)*

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- **Speed control in urban environments**

- **People driving through red lights**

Speed on urban environments
Drivers through red lights

ITS and Public Transport

- ## Real-time information for:
  - ### Operators:
    - Fleet management
    - Travel time reliability
  - ### Users:
    - Waiting anxiety
    - Real-time information anytime anywhere
    - Route Planners
    - Universal smart cards

ITS and Public Transport

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- ## Operations
  - ### Automatic Vehicle Location (AVL)
  - ### Automatic Passenger Counters (APC)
  - ### Automatic Fare Payment (AFP)
  - ### Bus Priority Systems
  - ### Advanced Ticketing
  - ### Fleet Management

ITS – The organizational constraint

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Easy to deploy within each turf, but

hard to integrate across operators and modes
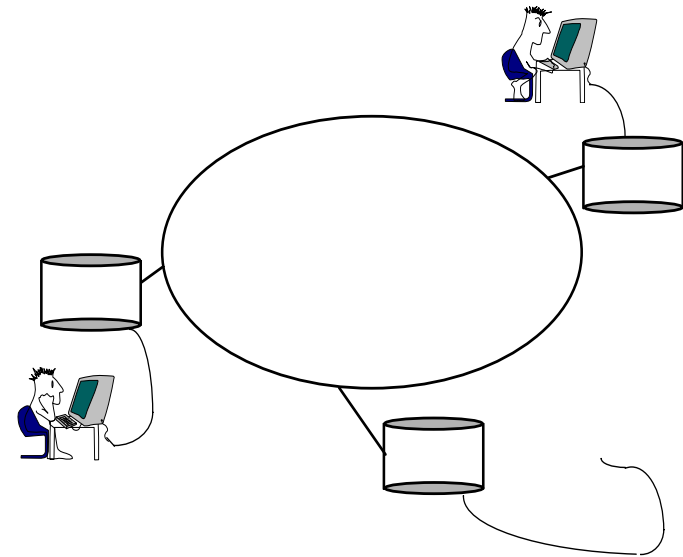
ITS Integration: A bumpy road

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- ## ITS:

Information +

Communication +

Integration

ITS Deployment

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- ## ITS Deployment requires:

  - ### Important organizational changes

  - ### A new path from control to sharing information

  - ### A transition from hierarchical systems to networks

ITS Integration: A bumpy road

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- *Let's share information*:
  - The public needs a single source of multi-modal information
  - The operators can benefit by sharing real time info
- *Let's decide with others in mind:*
  - Impacts or synergies on third parties?
  - Modularity of equipment and architecture?

ITS Integration: A bumpy road

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ITS is not a technical issue but a new frame for:

> Voluntary cooperation

> Seeing the big picture

> Bringing others into the decision process

> Adopting necessary new policies

ITS Deployment

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In short, ITS other than short-term mitigation tools, may serve :

- ✓ To become catalysts for change
- ✓ To establish new two-way relationships
- ✓ To create new spaces for collaboration
- ✓ To provide a global vision of the transport system

... But, ITS involves a long complex and difficult path (*the road less traveled*)

ITS as a Tool - Main Objectives?

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- To increase road capacity at low cost?

- Or, just an opportunity to promote a more efficient and diversified transport system?

- Should it be used to enhance mobility --
        Or to improve accessibility? Or perhaps, just to substitute some trips on certain days?

Final thought

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- We have to:
  - master the technology
  - envisage new applications from the existing technology, and
  - retain a proper global perspective

- What do you think…
  - Is ITS good or bad?
  - What is its main contribution?
  - Is technology in general good or bad?

(See the Sept 2002 issue of the Atlantic Monthly on Home Security)