

ICT Building Research & Education at Aalborg University

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Aalborg University
<http://it.civil.auc.dk>

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CONTENT

- The IT in Civil Engineering Group
- Research
- Education
- Motivations and success criteria
- References



IT IN CIVIL ENGINEERING

AAU



IT in Civil Engineering AAU

Per Christiansson (Professor)

Kjeld Svidt (Asst. Prof.)

Yoke Chin Lai (PhD)

Mads Carlsen (PhD)

Media Lab



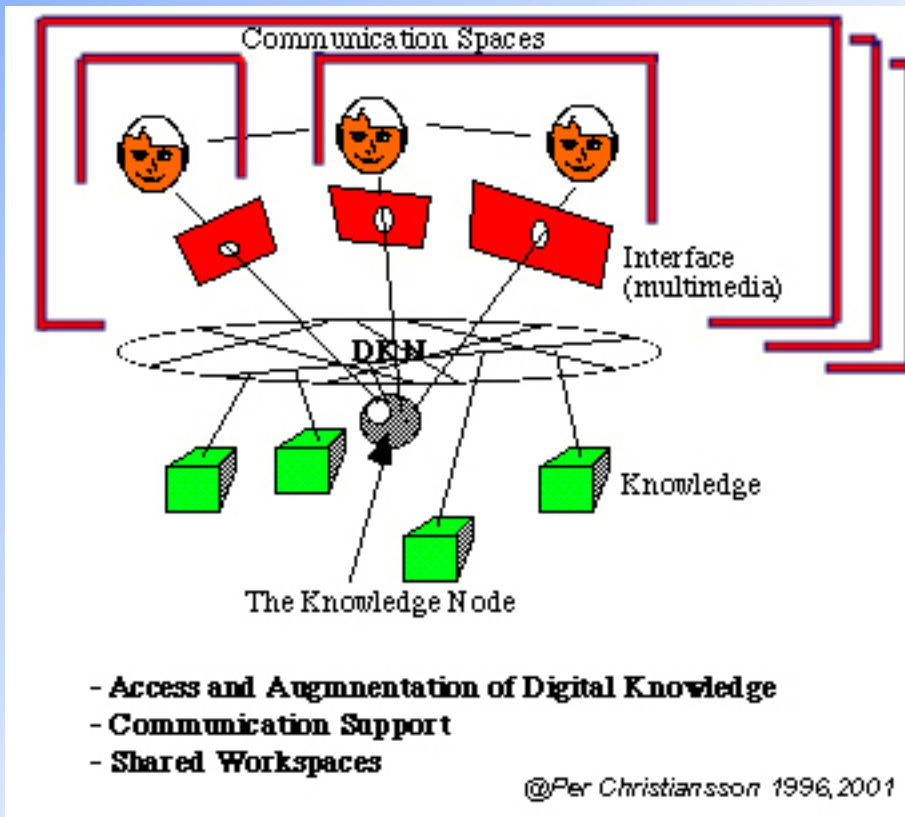
Inaugurated in 1974, Aalborg University now has about *13,000 students*. Teaching and research are conducted at the highest level in the fields of engineering, natural sciences, social sciences and humanities. The university's annual budget is in excess of *750 million Danish kroner*.



RESEARCH



The Knowledge Node Concept



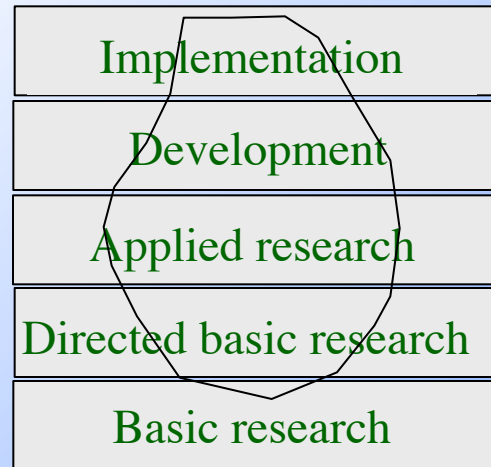
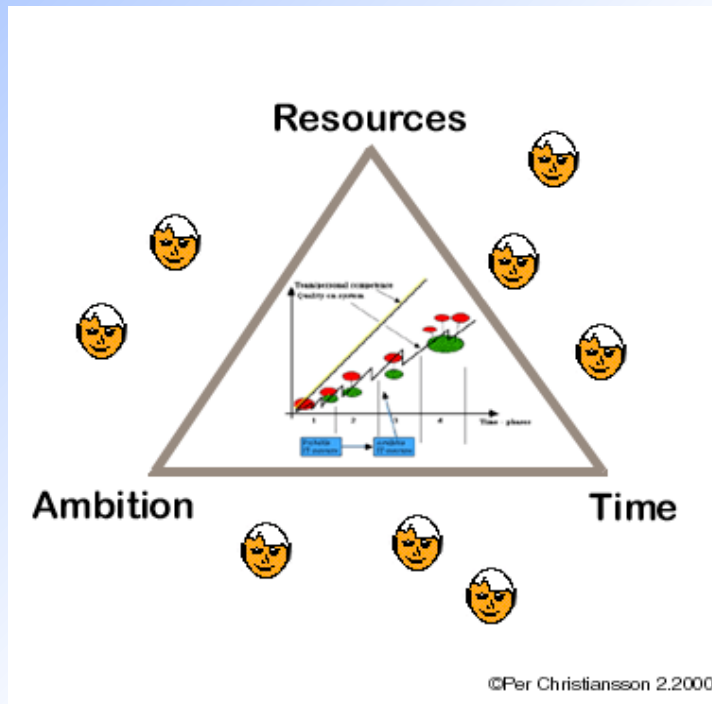
- **Participants**; number of, type (persons, agents)
- **Collaboration subject/context & Form of interaction**; design, reviews, purchase, learning, brainstorm, negotiation, discussion,
- **Communication content** to support interaction; e.g. speech, sound, images, music, video, whisper, body language, 3D objects, control information;.....
- **Meeting spaces** and room definitions; physical, virtual, static, dynamic, mobile and combinations.
- **Collaboration artefacts**; communication channels, user applications, and information containers



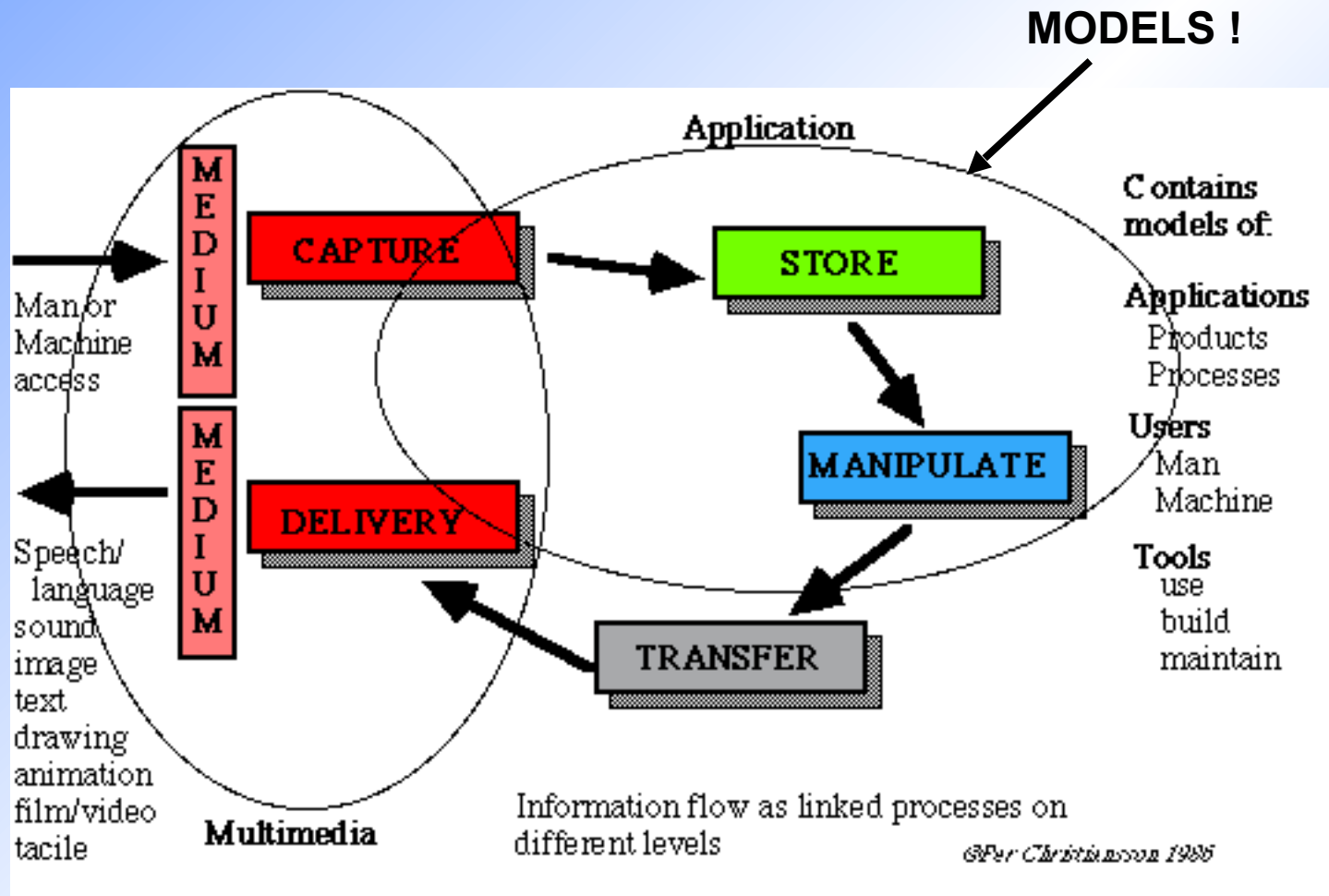
THE RESEARCH SCENE

Actors - Resources - Results

Constraints: Limited resources, wanted results, who should be involved, who drives, balance Res/Dvlp/Std/Netw



IT (ICT) Definition



R&D at IT in Civil Engineering Aalborg University



<http://it.civil.auc.dk/it/projects/>

Research areas at IT in Civil Engineering

VIRTUAL BULDINGS AND IT-SUPPORTED COLLABORATION

KNOWLEDGE MANAGEMENT AND KNOWLEDGE TRANSFER

INTELLIGENT BUILDINGS AND DIGITAL CITIES

Master thesis examples

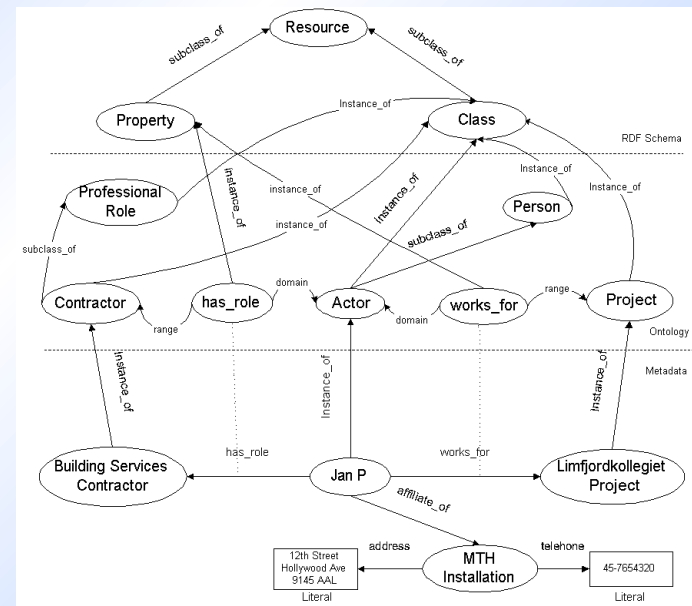
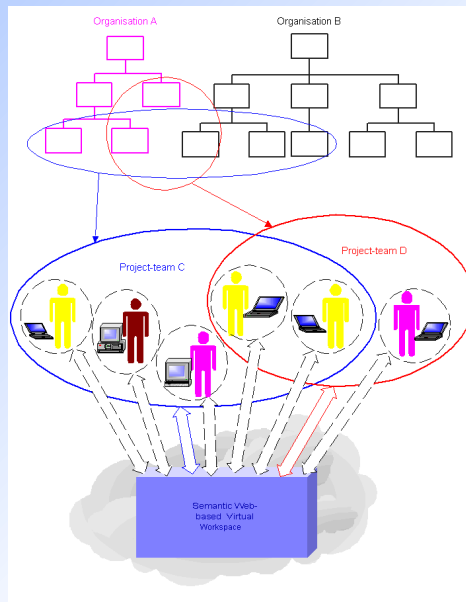
- Anvendelse af metadata I byggeprocessen
- Optimering af leverancekæden i byggeriet
- Knowledge Management in the building process
- Fremtidens digitale byer og bygninger



R&D at IT in Civil Engineering 2/3

VIRTUAL BUILDINGS AND IT-SUPPORTED COLLABORATION

- **IT in Collaborative Building Design.** PhD project Yoke-Chin Lai within Danish Center for Integrated Design. CID



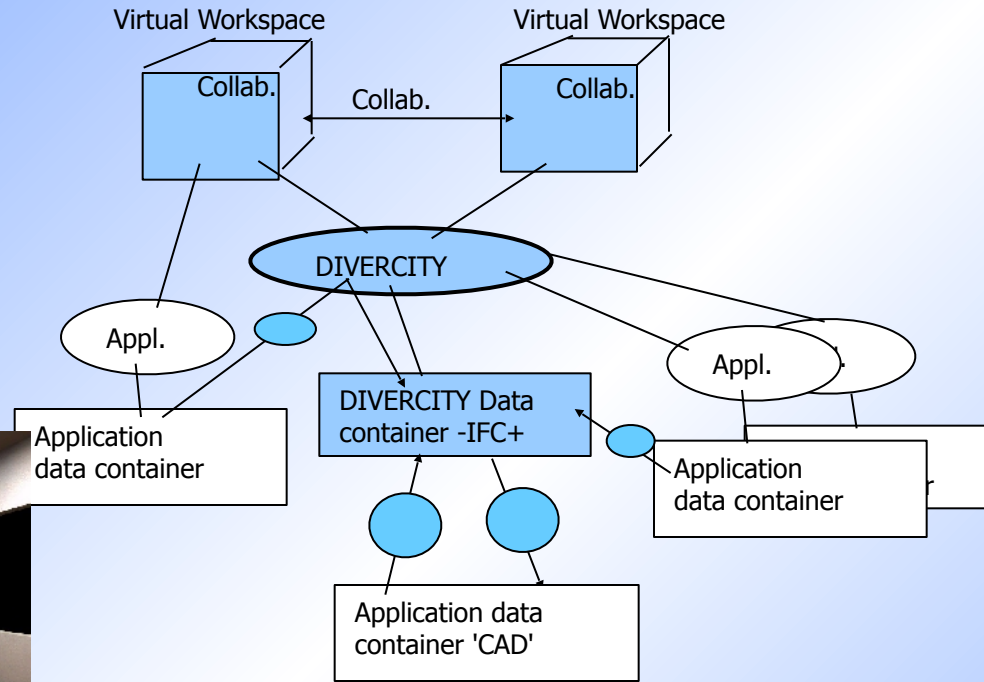
- **IFC-modelserver- en platform for integreret informationshåndtering i byggesektoren**
- **Distributed Virtual Workspace for enhancing Communication within the Construction Industry - DIVERCITY (EU project)**



DIVERCITY project infrastructure



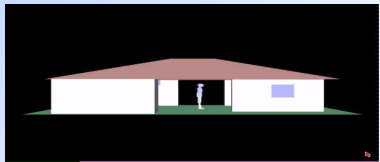
DIVERCITY function, form, content, behaviour



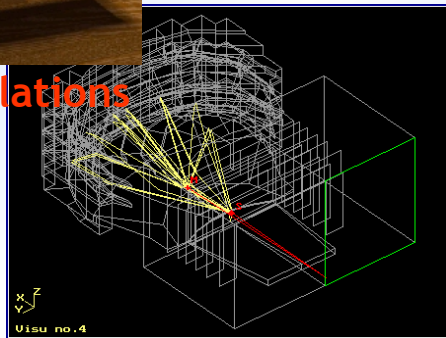
Client briefing



Lighting Simulations



Thermal Analysis



Acoustics

Building Model (IFC,...)



4D building site



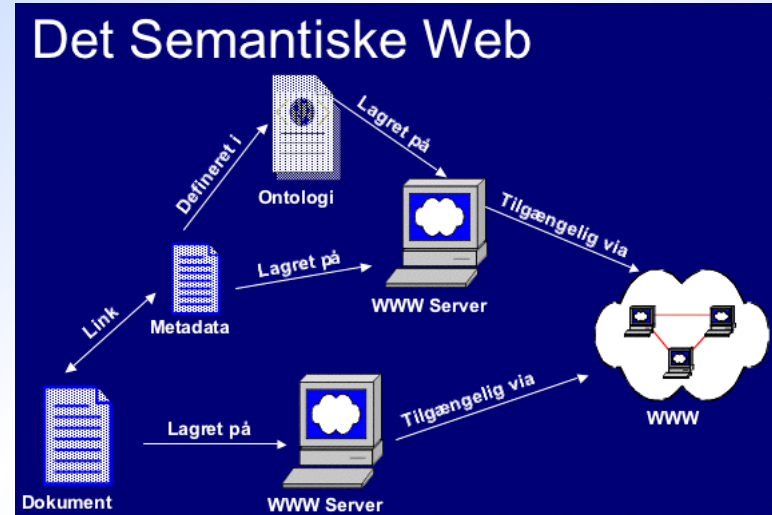
DIVERCITY project data

- Shared cost RTD project - Key Action II.2.2
EU IST-1999-13365.
(New Methods of Work / Workplace Design / Team Work)
- Started in **March 2000** - (Febr 2003)
Expected duration: **30 months**
- Total cost: **3 M Euro** (app.) -
Commission funding: 2 M Euro
- Consortium (10 partners - **5 countries**):
- **Objective** : Design & Develop a Distributed Virtual Workspace adapted for the Construction Industry



KNOWLEDGE MANAGEMENT AND KNOWLEDGE TRANSFER

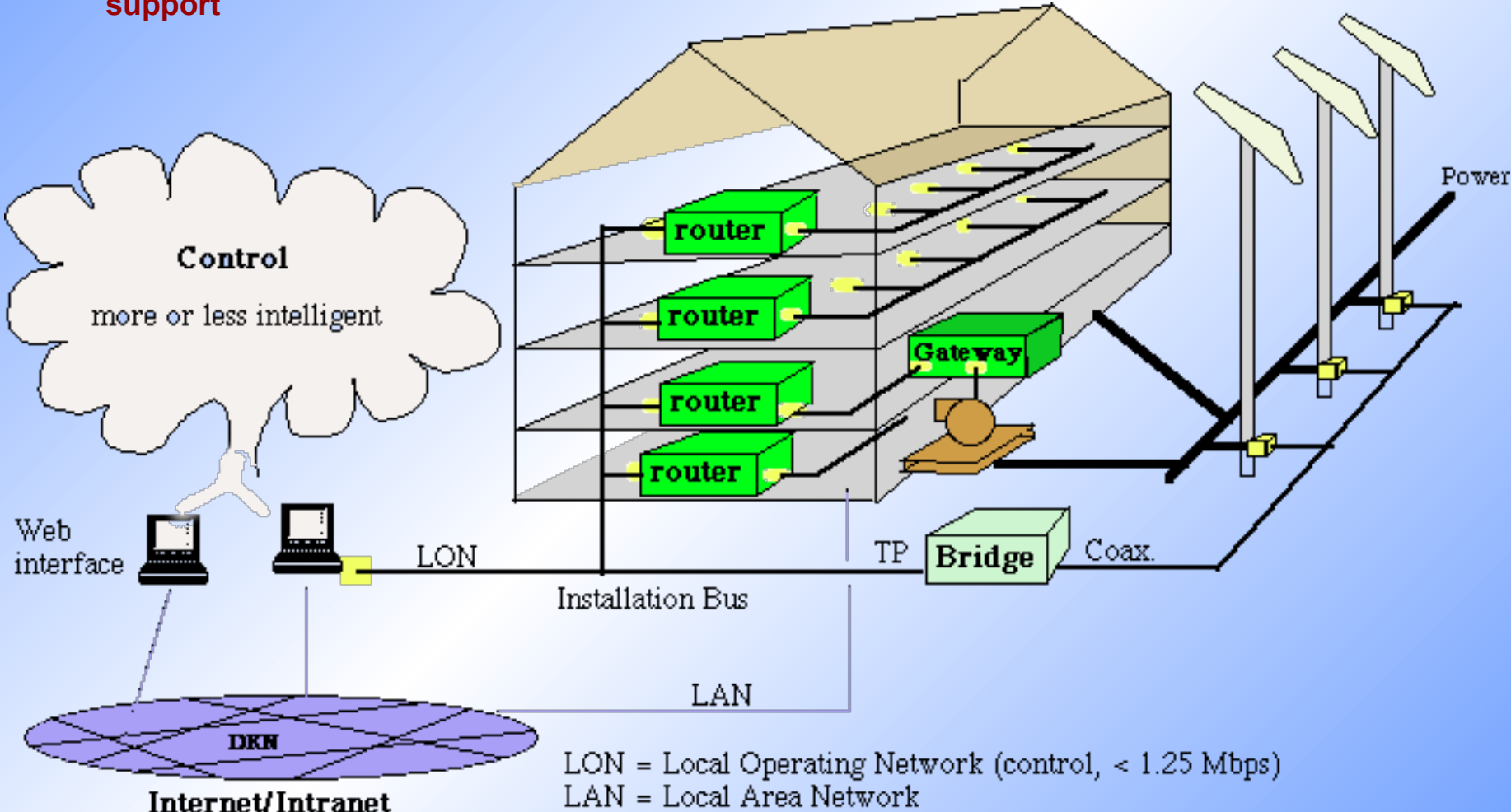
- **Future Building Industry Knowledge Management Systems.**
(PhD project Mads Carlsen)



- **IT på byggepladsen** (Ministeriet for Videnskab).
AAU, Vitus Bering, BYG Byggeriets IT, 4 bygge- og anlægsvirksomheder

The Intelligent and Responsive Building

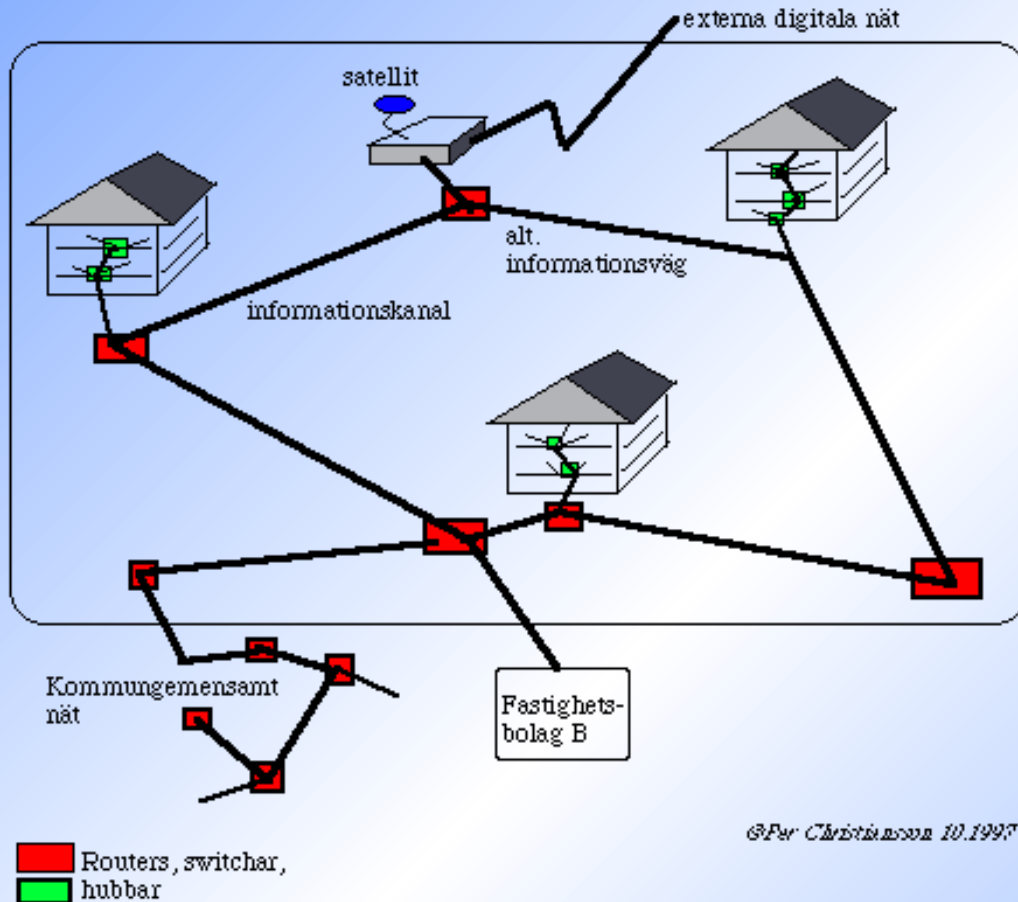
**USE
O&M
ADMIN
support**



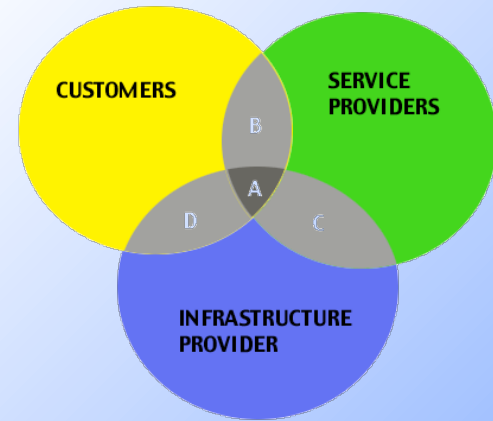
Per Christianacca 1.12.1999



Digital City Services



@Per Christiansson 10.1997



©Per Christiansson 30.8.2000

Deifine and develop new services



NATIONAL COLLABORATION

Det Digitale Byggeri (Erhvervs- og Boligstyrelsen)

- Byggherrekrav

Konsortium "Byggherrekrav - Digitalt Udbud",

Konsortium "Byggherre krav - 3D modeller"

(Projektwebs for alle parter i et byggeri,
Digital aflevering)

- Det Digitale Fundament

- Bedst i byggeriet

ERFA-gruppen objektorienteret bygningsmodel

University collaboration

Collaboration with industry in projects

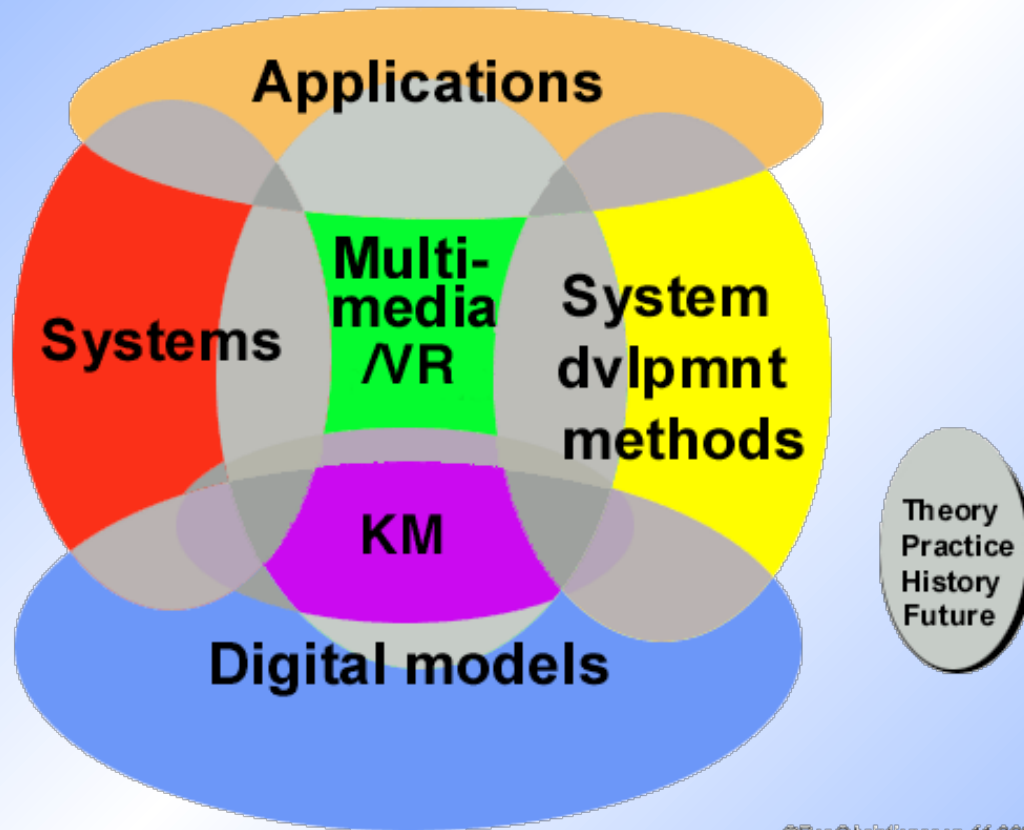
International collaboration



EDUCATION



Learning Domains



Overall education domains across which ICT courses are defined.



Distributed learning

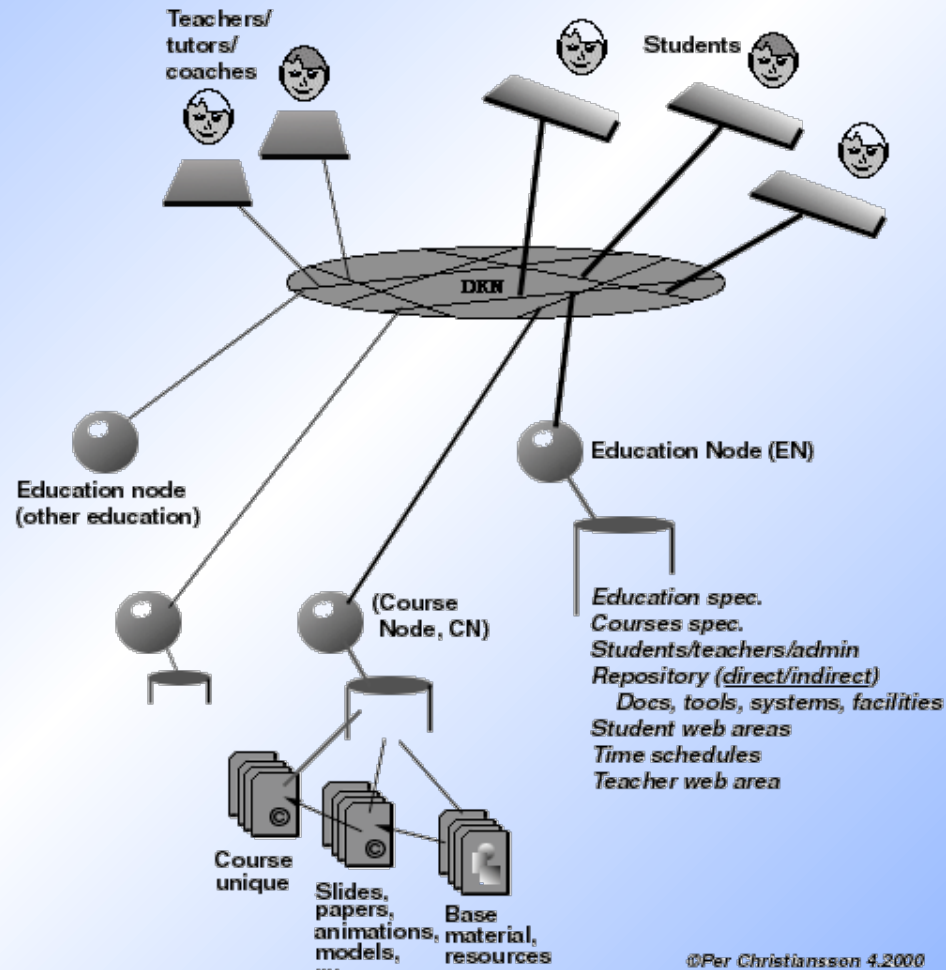


Remote lecture and application sharing between Aalborg and Lund Universities 1999 in teacher/secretary course (parallel ISDN based video communication and Internet based application)

Structuring Learning Systems

CHALLENGES

- Virtual learning spaces
- Distributed project groups
- New interaction tools
- Changed pedagogy
- Changed tutor roles
- Adapted learning material
- Distributed learning material
- New management tools



Education. IT in Civil Engineering courses

1/3

- **Civil Engineering**
 - IT in the Building Process (semester 6)
- **Building Management**
 - Virtual Buildings (sem7)
 - Multimedia & Knowledge Management (sem8)
 - Integrated Building Process (sem9)
- **Architecture & Design**
 - Intelligent Models (sem6)
 - Computer Aided Design



Education. IT in Civil Engineering courses

2/3

- **Master of IT distributed open education**
(3*1/2 years)
 - Human Computer Interaction, HCI (year 1)
 - CSCW Computer Collaborative Work (year 1)
 - Multimedia Interface Design and (year2)
 - Knowledge Management within Companies and Projects (year2)
 - Intelligent Buildings and the Digital City (year3)
 - Virtual Buildings (year2-3)
 - Building Simulations (year 3)



Education. IT in Civil Engineering courses

3/3

- **Life Long Education** (Livslang uddannelse)
(short courses)
 - IT i Byggeriet (1999, 2001)
- **Internal** courses for teachers and secretaries

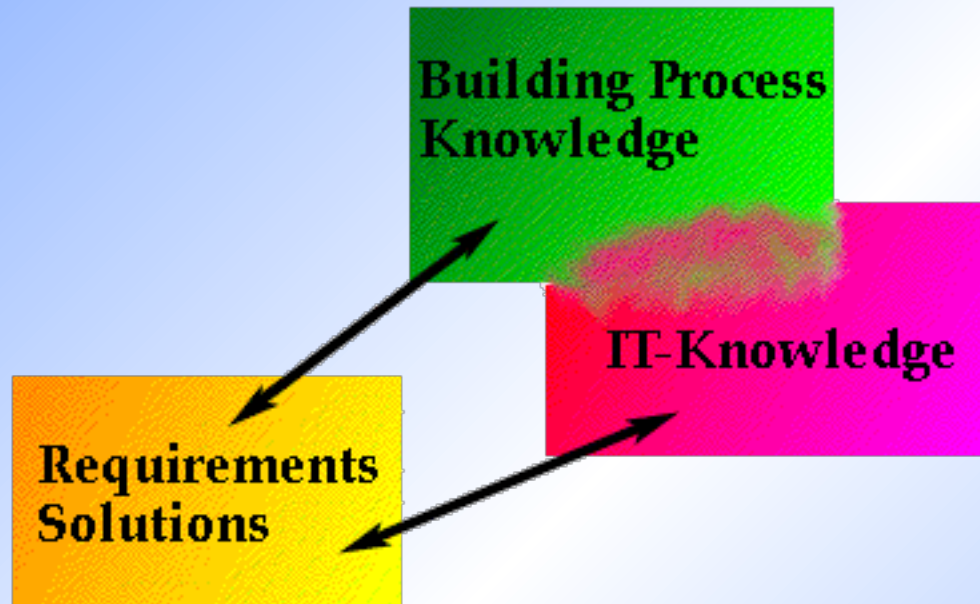


MOTIVATION

**UNDERSTANDING
COMPLEXITY**

**PARTICIPATION IN
CHANGE PROCESS**





Builders must have ICT competence to be able to formulate requirements on and participate in the design and implementation of tomorrows building process IT-tools.

The IT community cannot (should not) by themselves build tomorrows AEC tools.



Success Criteria

1/3

- ICT **must not** be regarded as one of these tools that we only have to learn to use but as an integral part of the company and project knowledge management system.
- Increased knowledge transfer and **ICT competence. Knowledge communication** crucial (companies, schools, public services).
- Acquire **deep understanding** of ICT influence on organisation, work methods, user environments, information handling, and ICT strategies.
- Increase of **awareness** on fundamentals and methods for a beneficial change of building processes and organisation (knowledge exchange and management, demonstrations, implications, participatory design).
- Increased **international** project participation.
- Basic research, applied research and development activities are **all** required.

We are all involved in a continuous change process and **design of the future** together (with constant re-assessments). Great possibilities and time to do some creative, bold, and holistic inceptions at both universities and industries



Success Criteria

2/3

- The formulation and refinement of digital *models* of the building process must be driven by the end users. (Products, processes, components, tools, users/teams)
- Participatory design (industry - university) of new *tools* and *services* that in many cases are not yet defined.
- *User participation* in User Environments and systems development The *building community* must and will actively participate in the *design, try out, and implementation* of *new IT tools* (collaboration, communication and information handling) to support high quality building products in a life cycle perspective. *Client*, building product *users, and suppliers* with greater influences in the design process.

We are all involved in a continuous change process and **design of the future** together (with constant re-assessments). Great possibilities and time to do some creative, bold, and holistic inceptions at both universities and industries



Success Criteria

3/3

- Development of *scenarios* (from idea - demolition of building) encompassing credible ICT tools.
- Utilisation of changed *communication networks* on all levels.
- Utilisation of increased possibilities to build (low cost) *Virtual Worlds/rooms* and *Virtual Buildings* (with partly redundant knowledge representations, meta data, temporal and 'intelligent' properties).
- Agreements on *vocabularies* and *concepts* within and between stakeholders starting with meta project level and more detailed team and component deliverers specifications.

We are all involved in a continuous change process and **design of the future** together (with constant re-assessments). Great possibilities and time to do some creative, bold, and holistic inceptions at both universities and industries



REFERENCES



References



IT in the Building Process



AALBORG universitet

see also <http://it.civil.auc.dk>

News

Research

Education

Publications

Presentations

Staff

Media Lab

<http://w78.civil.auc.dk>

<http://dkbit.civil.auc.dk>

Search facilities

(local, AAU)

CIB W78

DKBIT

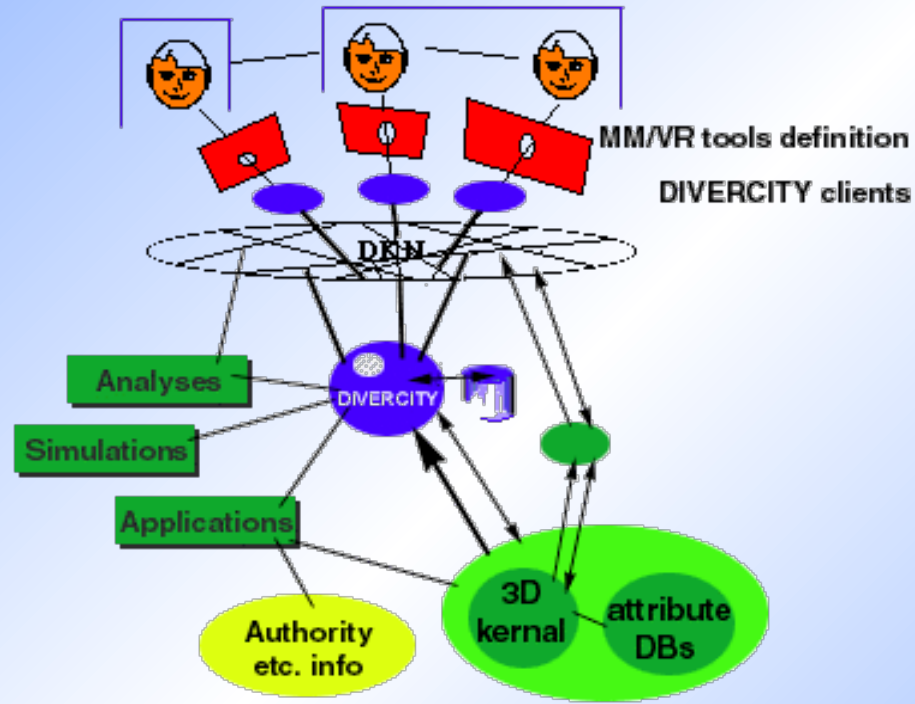
Denmark Building IT



END



DIVERCITY function, form, content, behaviour



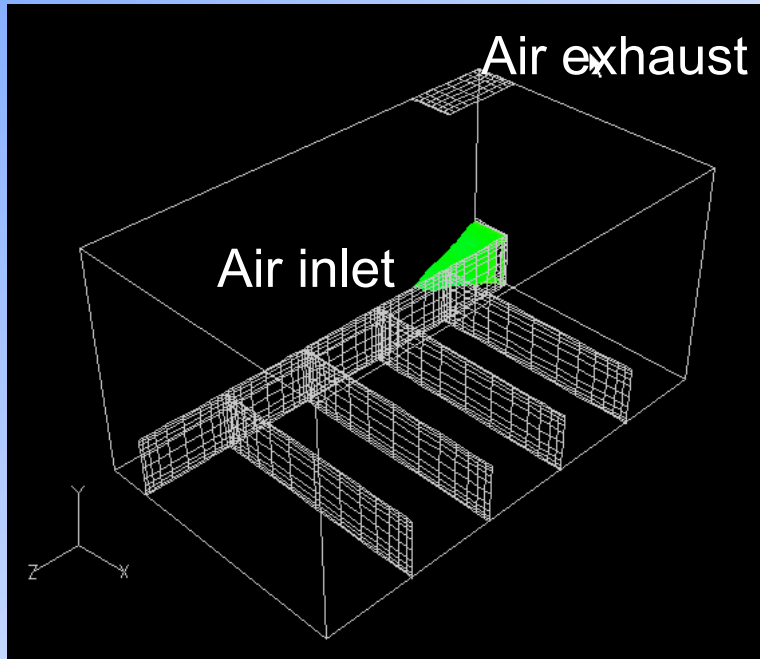
- DIVERCITY supports
- communication between persons
 - multiple building product/process information access
 - building process activities

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The objective of the project is to produce a prototype virtual workspace that will enable the three key phases (client briefing, design review, construction) to be visualized and manipulated, and to *produce a set of VR tools that aid the construction design and planning process.*



Airflow visualization in VR Cave 3D



Displacement ventilation in a livestock building

Temperature field, Vector field, Streamlines, Particle movement

(Royal Veterinary and Agricultural University and Aalborg University)

