CSCW Tele–service Creation with ISABEL

http://isabel.dit.upm.es (info & executables)

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What is **ISABEL**

ISABEL

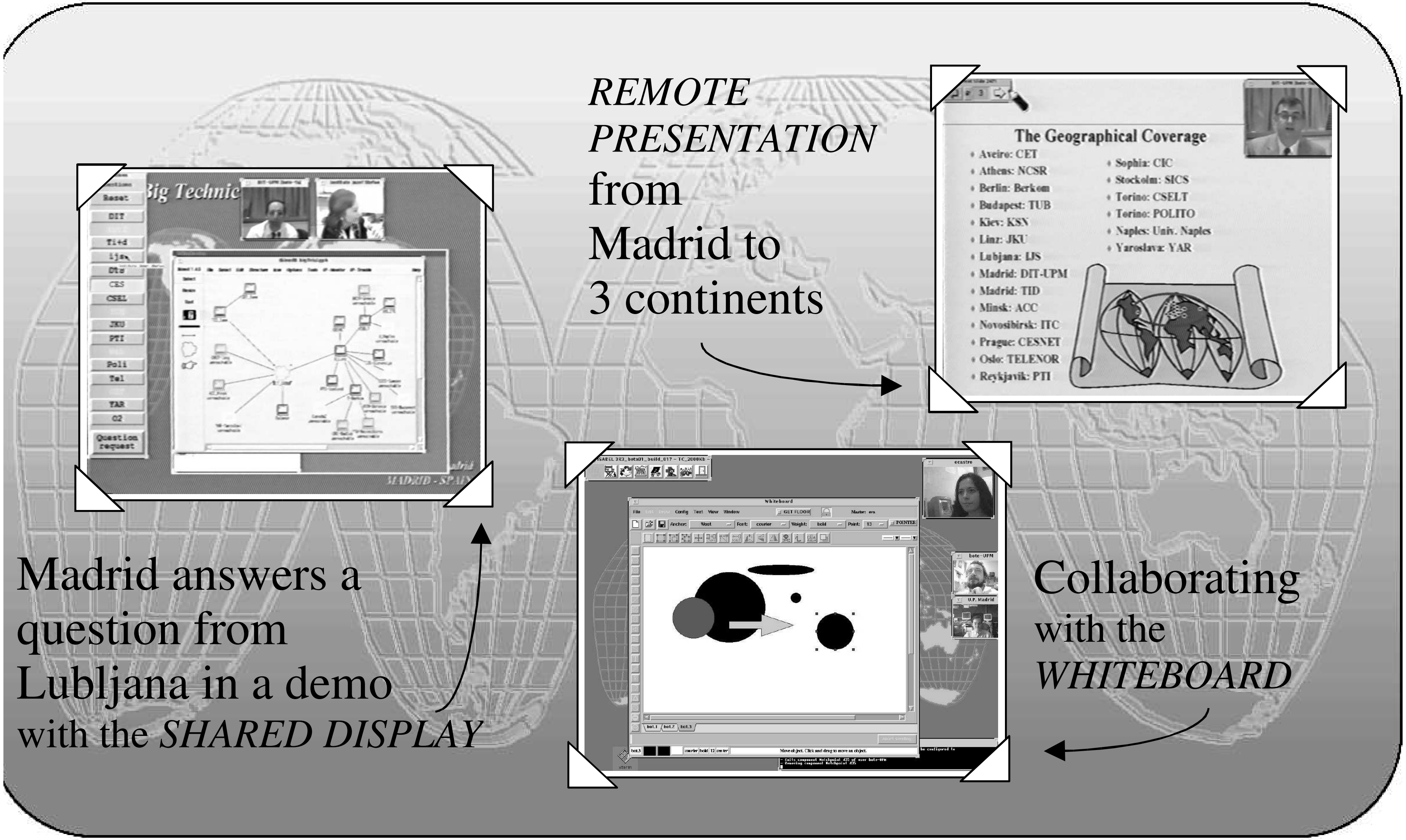
- Advanced multiconferencing system
  - supports: **audio + video + data** comunication
  - to connect a **large number of users**
    - multiconferences with over 20 sites effectivelly supported
- ISABEL can create any collaboration scenario
  - Programable service generation environment
  - Predefined collaboration scenarios are included
    - distributed meeting support
    - teleclassrooom
    - teletraining support
    - distributed congress or conference support
    - Others can be designed with minimal effort

What is ISABEL

- Service creation environment
  - Developed in RACE/ACTS projects
  - Based on CSCW and distributed multimedia
  - Configurable: language to define new services
    - Tele−training, Tele−meeting, Tele−work, Tele−congress, ...
- To interconnect groups, audiences
  - Cheaper service (cost are shared)
- Over hetereogeneous networks
    - Internet, MBONE, ISDN, ATM, Satllite, Frame Relay, ...
    - With QoS adaptation

ISABEL advances multiconferencing one step ahead by allowing customization to satisfy user needs

ISABEL provides powerfull management of a variety of CSCW components



ISABEL Distributed Events

- Synchronous collaboration where physical presence is substituted by telepresence
  - Domain specific: lecture, meeting, conference, collaboration, ...
  - Try to obtain the same results as in a local collaboration
- Homogeneous events:
  - audience interconnection
  - all participants must share the same view of the event
    - Needed to achieve sense of participating in a unique event

Platforms supported

SUN (Sunos) + Parallax

1993

ISABEL 3R3
(IST´98)

SUN (Solaris) + Parallax

1996

SGI IRIX – O2

1997

PC Linux

1997

1999

3R4 – PC Linux

3R4 enhances:
Video SDK,
Video bw usage,
performance (PC),
(Multiprocessor),
Setup, stability, ...

Solaris(PCI)?
SGI O2?
Win95–98–NT?

Elements of ISABEL

Elements of ISABEL

- Tele–presence
  - Remote sense of presence: audio – video
  - N to N audio – video conference (multicast)
- Shared Work–Space
  - Set of share media which support the collaboration
  - Dependent on type of collaboration
  - Viegraph presenter, pointer/pencil, display sharing, blackboard,...
- Interaction Control (Event management, Floor control)
  - To enable an ordered interaction

Telepresence

- Audio: Quality is critical for good interaction
  - No compression: PCM, standard (~256Kb/s), CD
  - Codecs: G721, G722, G723 and GSM
- Video: MJPEG
  - Several framerates and qualities (10 K/s – 4 Mb/s)
  - Other codecs under way (MPEG, H.261)
- Audio and video is configurable:
  - Audio: type and source
  - Video: position, size, frame rate and quality

Shared Workspace: Components

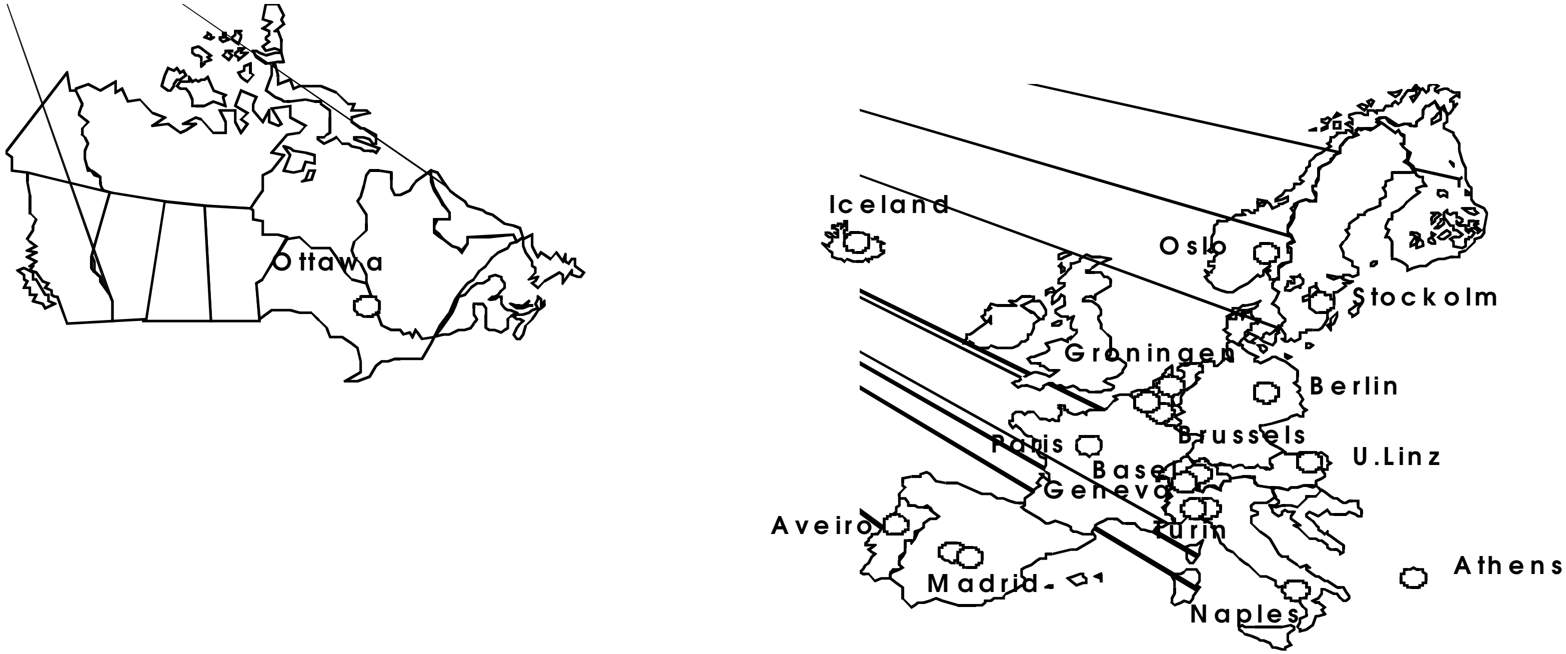
- Viewgraph presenter: remote presentations.
- Pointer/pencil: to point and highlight on the screen.
- Display sharing: to perform remote demos
  - integrable con VNC –> windows, compartición de documentos basada en servidores web
- Shared Notepad: for joint text edition.
- Shared blackboard: graphix
- Fax: to show an arbitrary image/window
- Scanner: to present papers

ISABEL based Events

ISABEL Tele–conferences

- RACE Summer Schools on ABC (1993, 1994, 1995, 1996)
  - ABC´93: 2 sites (Spain–Portugal)
  - ABC´94: 5 sites (Spain, Portugal, Switzerland)
  - ABC´95: 11 sites
    - Spain, Portugal, Switz., Italy, Austria, Neth., Belg., Germany
  - ABC´96: over 20 sites
- Project meetings, workshops, demos, ...
  - Telemeeting/work service for Ericsson
    - Includes: Spain, Germany Sweden

ABC´96: Tele–conference

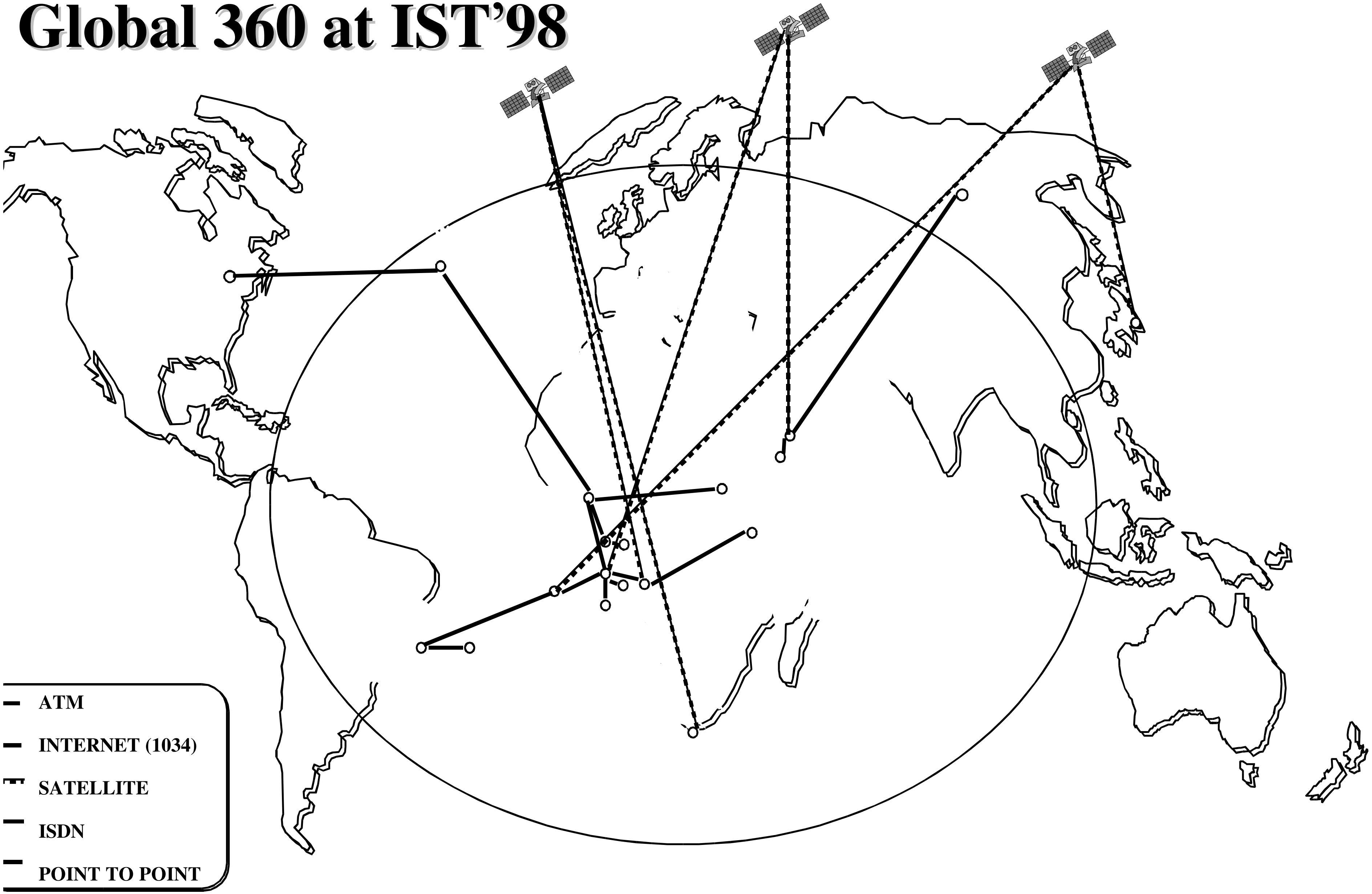


– 4 day event with > 20 sites (5 main + 12 interactive + 5 WPs)
– Control Center: UPM – Madrid.
– Terrestrial and satellite ATM 6Mbit/s connections.
– Main Sites: Aveiro, Berlin, Brussels, Madrid, Naples.
– Other Sites: Athens, Barcelona, Bern, Geneve, Den Haag, Linz,
Oslo, Ottawa, Paris, Rejkiavik, Rome, Stockolm, Turin, ...

Global 360

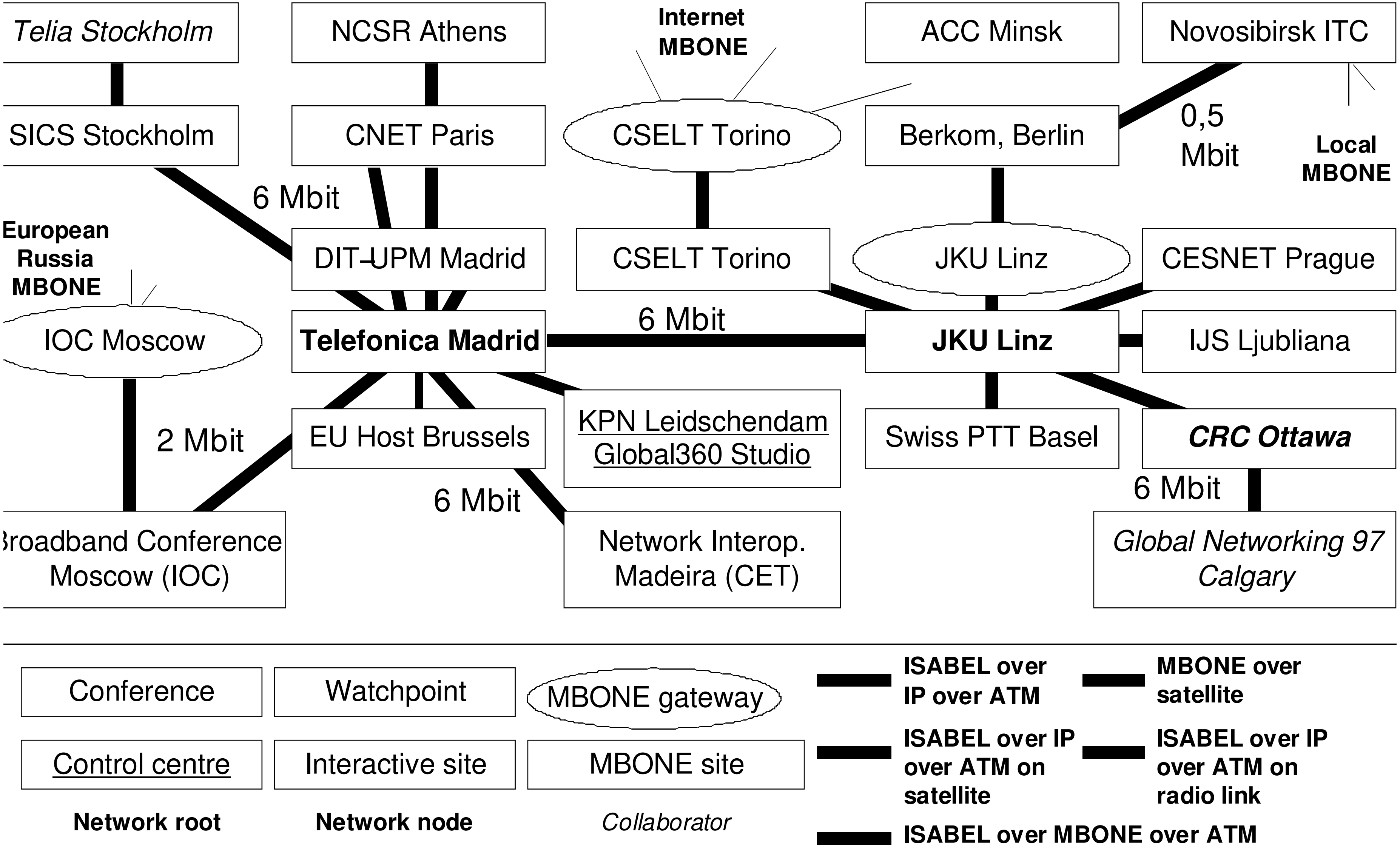
- Global event in June 1997
  - 20 sites: Canada <–> Europe <–> Novosibirsk
- Program: Debates, presentations, demos, ...
- Windows into 4 conferences:
  - Network Interoperability, Madeira
  - Global Networking ’97, Calgary
  - Broadband for Education & Research, Moscow
  - 21st Century – the Communications Age, Brussels
- Professional TV production techniques used
- Management Center in KPN – The Netherlands

Global 360 at IST'98



Connecting the world with ISABEL

Global 360: network



Forthcoming Tele–conferences

- IDC´98: 3rd Int. Distributed Conference: Technology Serving the Information Society, 25–28 Sept 98
  - Lisbon, Aveiro, Madrid, Ottawa, Moscow, Novosibirsk, Berlin, Rejkyavik, Athens, Prague, Lubjana, Budapest, ...
- Telecom I+D: Spanish Telecom Conf. 28–29 Oct 98
  - 2 session transmitted
  - Madrid, Barcelona, Valencia, Sevilla, Bilbao, Zaragoza,....
- IST´98: Information Society Tech. 30 Nov – 2 Dec 98
  - EU Research Conference & Exhibition (Vienna)
    - Viena, Novosibirsk, Moscow, Madrid, Barcelona, Prague, Ottawa, Tokio, Budapest, Berlin, Rejkyavik, Prague, ...
  - Two ISABEL access points in Vienna:
    - Digital Theater
    - Telecoms sessions of IST´98

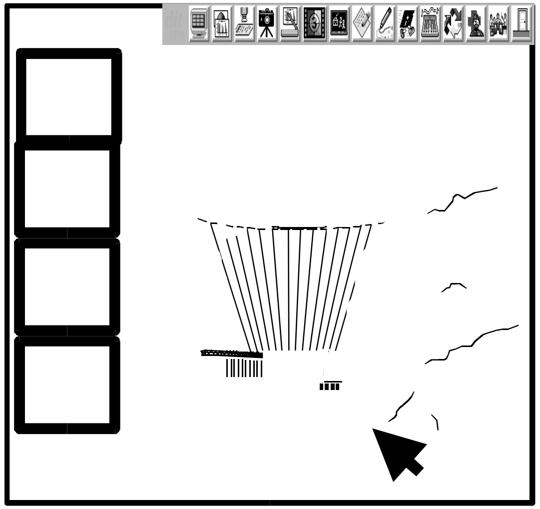
The Service Concept

Services and Interaction modes

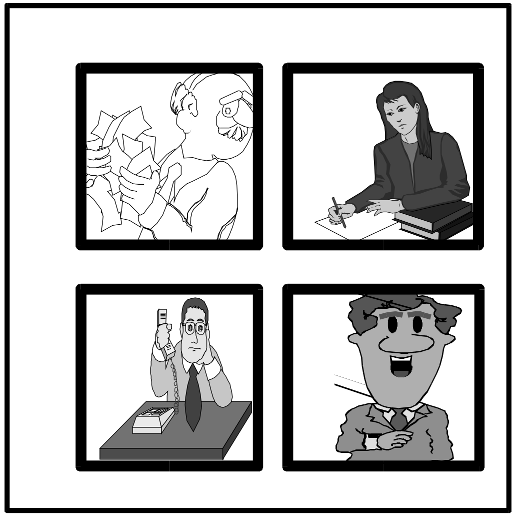
- Service = Set of interaction modes + management
  - Control panel: provides access to management function
- Interaction mode:
  - Particular set–up of audio, video, shared workspace, ... supporting a particular type of collaboration
  - Each participant is assigned a particular role.
    - Examples: Presentation, questions, debate, demonstration, ...
- A distributed event is a sequence of interactions
  - Selected during the event operation by means of the control panel.

Interaction mode examples

work mode

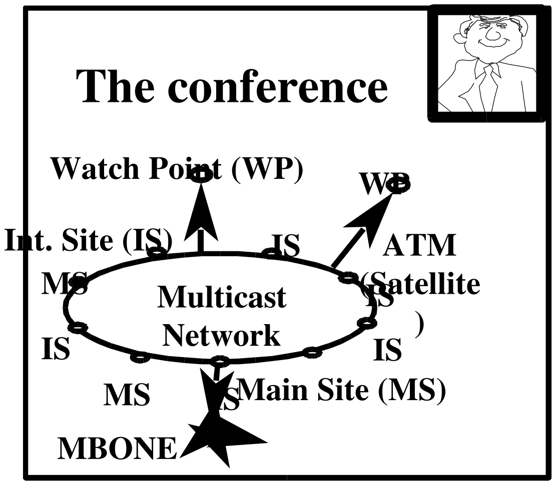


Debate mode

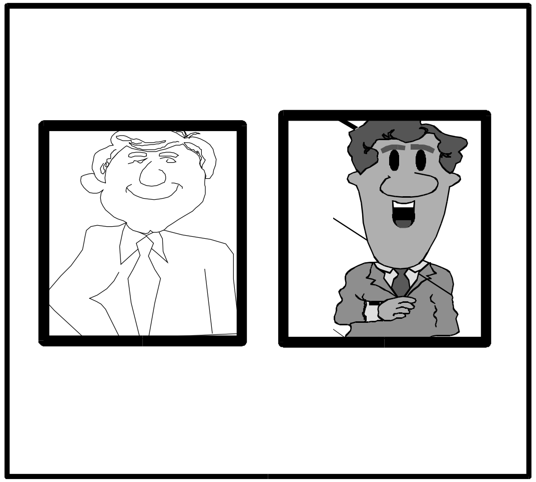


Speech mode

Lecture mode



Question mode



The Tele–conference Service

Tele–conference service

- Creates the virtual tele–auditorium
- Allows speakers and attendees to participate and interact from any of the sites
- Semi–professional management
  - Complex service but rich in functionality

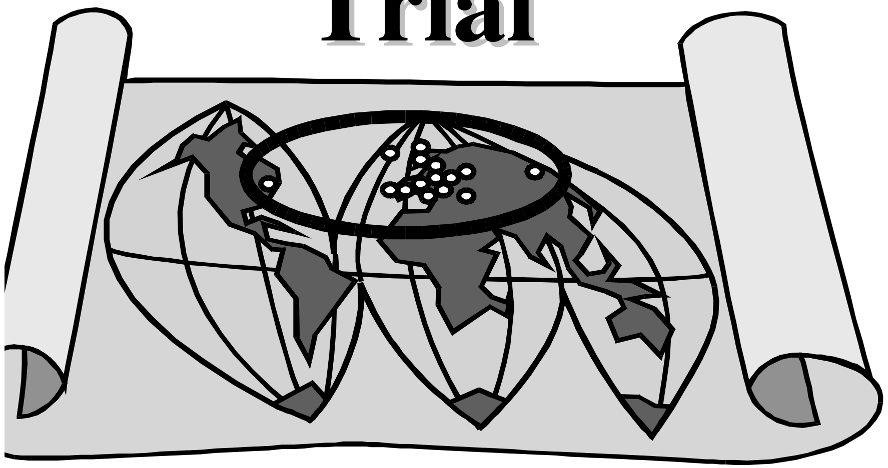
Tele–conference Management

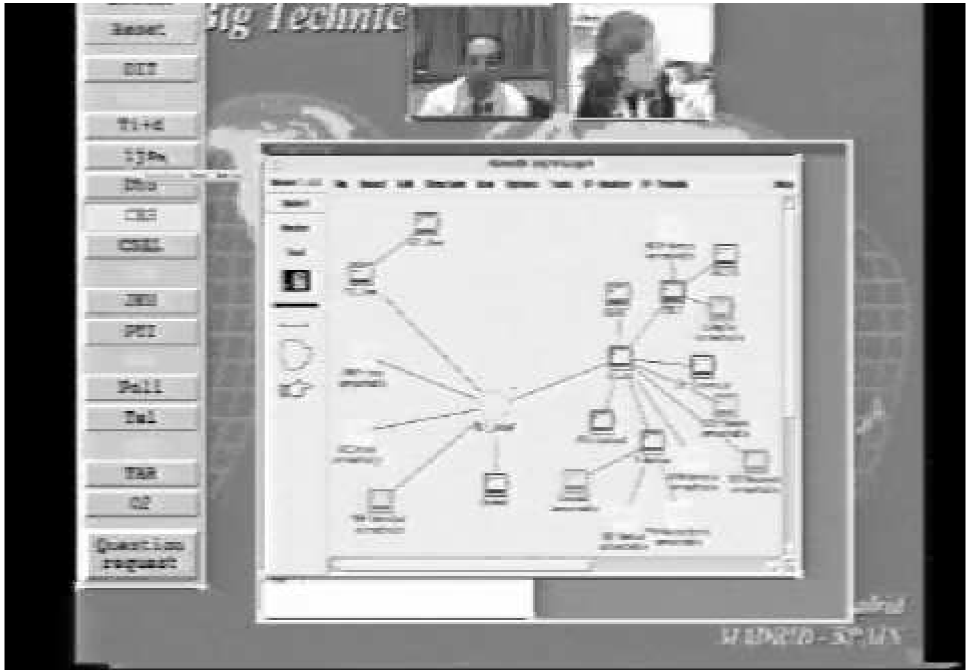
- Inspired in Show or TV production procedures
  - To be operated by professional operators
- Separates media presentation media media control
  - Needs presentation WS and control WS in each site_
- Event control room with central control workstation
  - Only one control panel for the event
  - Local auditorium control minimized
  - Script driven

Tele–conference Interaction Modes

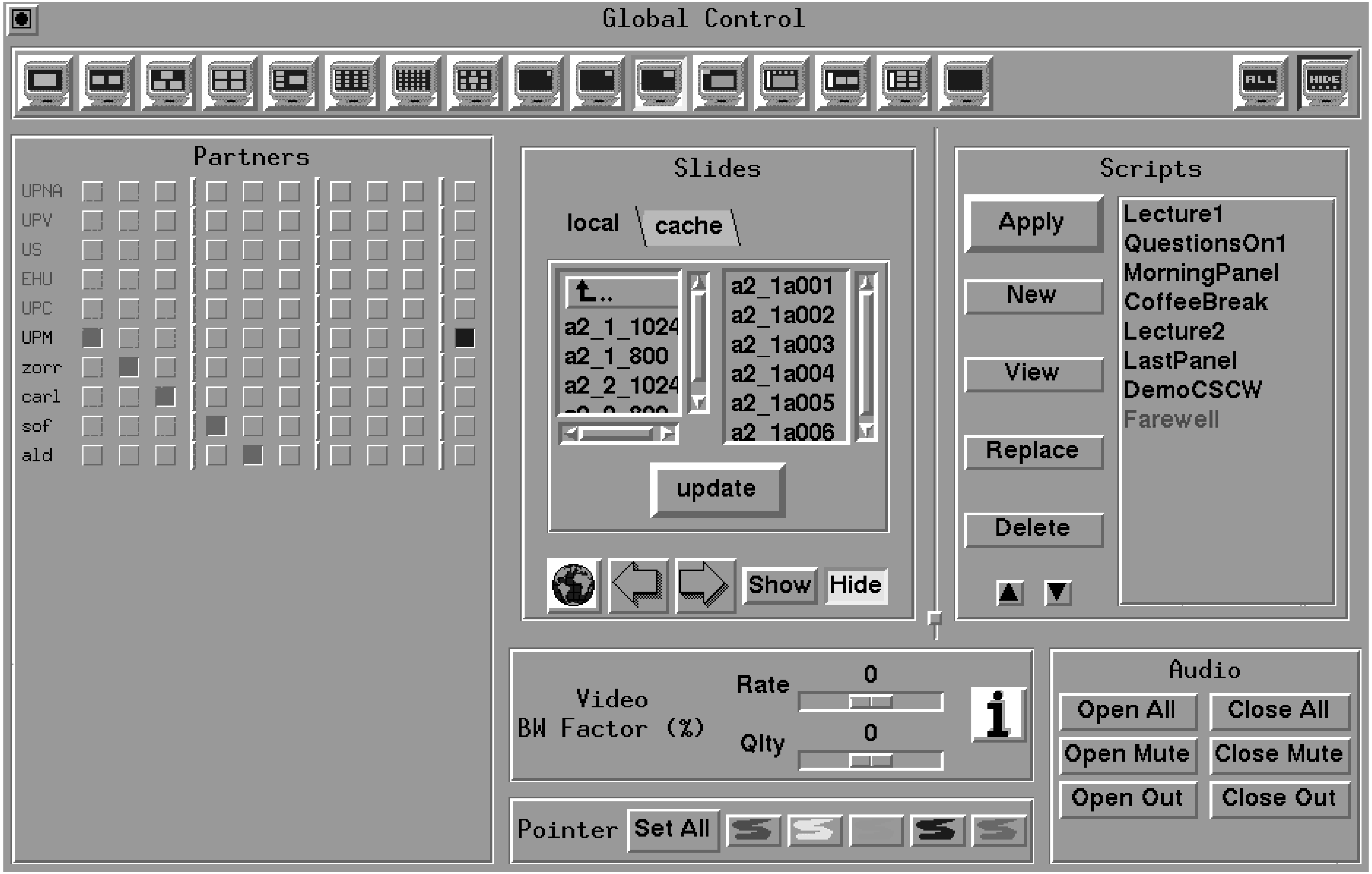
- Lecture mode
  - Viewgraphs + pointer/pencil + presenter video
- Question/Answer mode
  - Presenter video + question video
- Panel discussion mode (1, 2, 3 or 4 sites)
  - 1, 2, 3 or 4 site videos
- Demonstration mode
  - Display sharing + presenters video

The Big Technical Trial





Tele–conference Control Panel



Conference Management

- Set current interaction mode
  - assign particular roles and rights to each particant
  - Example: lecturing site, listening site, ...
- Add/Remove new participants
- Manage access control
- On line presentation and record of system activity
- Manage components and related parameters

The Tele–meeting Service

Tele–meeting service

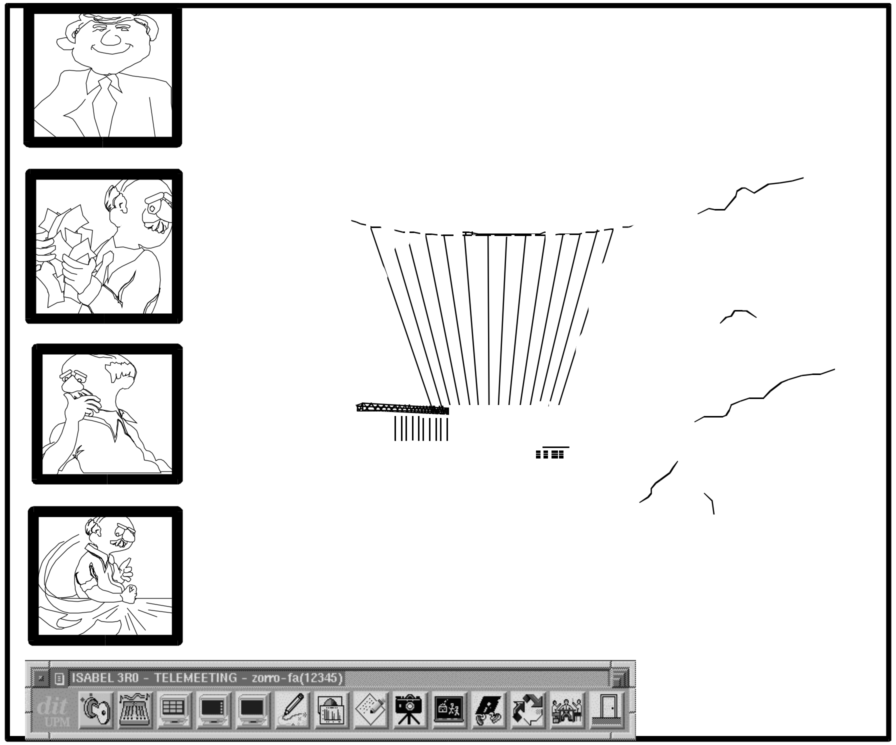
- Goal: to create a unique virtual meeting room
  - Connecting all meeting rooms
  - Simple to operate and easy manage
    - Needs only one WS per access point
- Management performed by attendees
  - Interaction modes changed by room moderators
    - Meeting chairmen has “last word”
- Paper input and output
  - on line scanning and printing

Tele–meeting Interaction Modes

- <u>Speech mode</u>
  - Speech video in large + other videos in small
- <u>Presentation mode</u>
  - Viewgraphs + pointer/pencil + presenters video
- <u>Discussion mode</u>
  - All videos presented in larges size possible
- <u>Work mode</u>
  - All site videos presented in small
  - Work area: digitized paper, blackboard, notepad, pointer/pencil, display sharing, fax, ..

Examples of Telemeeting Interaction Modes

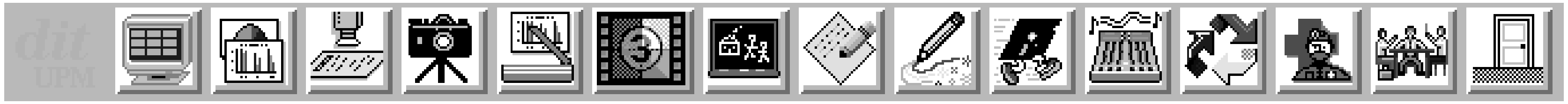
Work mode



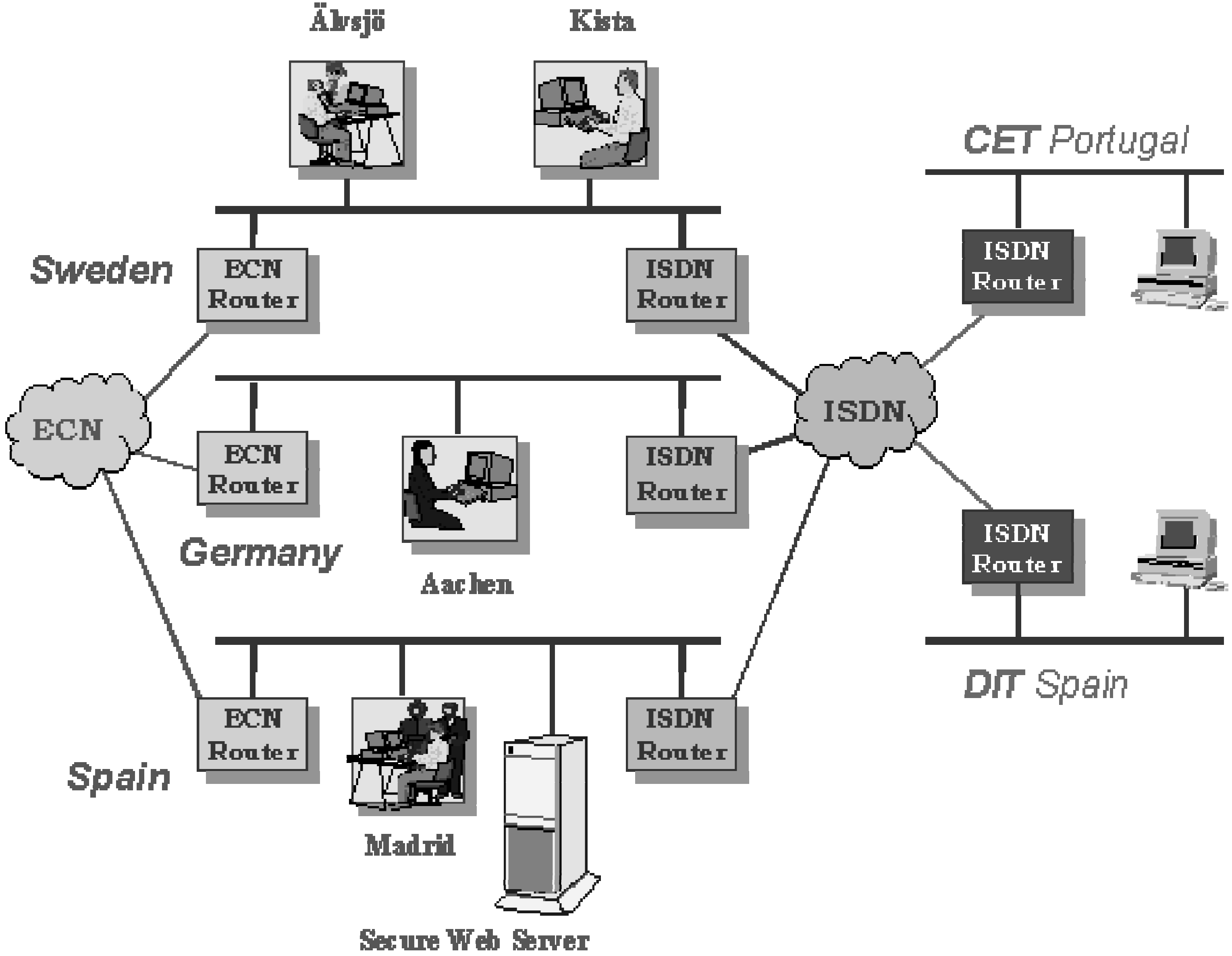
Discussion mode

Tele–meeting Control Panel

- Each site has a similar control panel
  - symmetric control scheme
  - a conference chairperson may be convenient
- Simple usage: one button one interaction mode
- Each site can enable an interaction mode
  - He plays the master role (if any)



Tecodis



Älvsjö
Kista
CET Portugal
Sweden
ECN Router
ISDN Router
ISDN Router
ECN
ECN Router
ISDN
ISDN Router
Germany
Aachen
ISDN Router
DIT Spain
ECN Router
ISDN Router
Spain
Madrid
Secure Web Server

The Tele–classroom Service

The school paradigm

- The school paradigm is still valid
  - A <u>place</u> where pupils concentrate in acquiring knowledge and/or training guided by their lecturers/tutors
- It will probably last as the most important element of the educational system
- Information and communication technologies can complement and enhance traditional methods
  - Distance learning is one of those complements

Distance Learning

- Learning or training activity where a significant percentage (>50%) is given from the distance
  - It incorporates usually information and communication technologies as a key element
- Examples
  - Courses distributed by TV (questions by phone)
  - Open Universities
    - Paper based, internet based, ..
  - Real time courses with telepresence
    - Videoconference, CSCW, ...

Distance learning types

- Non presential interaction
  - Exist since a long time: paper and tf based
  - Tendency: incorporate asynchronous groupware technology
    - E−mail, newsgroups, WWW, ...
    - complemented with paper and mail
- Telepresence based interaction
  - Exists since a long time: TV based
    - cable TV, satellite broadcast, business TV,...
  - Teleconferencing
  - Future: distributed multimedia applications

Why distance learning?

- Lack of time to attend regular courses
  - 4 Open Universities
- Need or willingness to follow top experts
- Unavailability of sufficient resources to set up regular studies
  - 4 Optimisation of educational resources
- Remote areas without regular education
- Need of accessing very specific equipment
- ......

An example of non–presential distance learning

- CEPADE: Postgraduate MBA at UPM
  - Typical case of non presential distance learning
    - Makes intensive use of information technology
- To be followed from any place in the world
  - Mainly Spanish speaking Students (3000)
- Communication traditionally via mail, tf,
  - Today complemented internet: e–mail, bbs, chat, ...
  - One news–group per course
    - One subconference per topic
- Presential examinations

Tele–classroom: Interac. Modes

- <u>Speech or document camera mode</u>
  - 4 Speech video in large + other videos in small
- <u>Presentation mode</u>
  - 4 Slides/pointer/pencil + all videos (lecturer larger)
- <u>Discussion mode</u>
  - 4 All videos presented in large size possible
- <u>Work mode</u>
  - 4 All site videos presented in small
  - 4 Work area: digitised paper, blackboard, notepad, pointer/pencil, display sharing, fax, ..

Tele–classroom Control Panel

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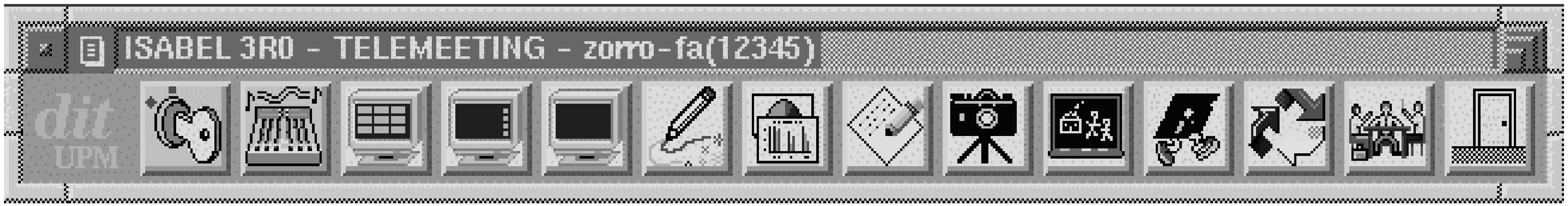


Virtual Classroom

- Communications Research Center – Canada
  - http://www.virtualclassroom.crc.ca/vcnew/sat_splash.html
- "VirtualClassroom – SUSIE Component”
  - Project Description: SUSIE Educational Component is a 2–year interactive collaborative learning project that links Basel, Berlin and Ottawa under the ACTS AC320 SUSIE CSCW application to engage students from schools working closely with the various ATM testbeds. A fourth site in Dublin, Ireland will participate in the sessions by integrating a PictureTel over ISDN based environment with the ISABEL node in Basel. The purpose of the CRC VirtualClassroom program is research & development with educational/ corporate partners in broadband learning applications. A description of the program and network is attached.
  - Lead Organization: Communications Research Centre and Swiss PTT EXPERT Testbed.

V–classroom Keywords

- **Intelligent Learning** refers to a constructive process of guided knowledge building supported by teamwork.
- **Video–mediated learning** refers to the use of a collaborative multimedia system, including video technology, to connect different locations and coordinate teamwork among learners.
- **Distributed Cognitions** refers to the concept that cognition does not solely reside inside a person’s head but is distributed amongst individuals, that knowledge is socially constructed through collaborative efforts to achieve shared objectives in cultural surroundings, and that information is processed amongst individuals and the tools and artifacts provided by culture.
- **Virtual peer–learning community** refers to geographically distributed peers, bound together via broadband networks, supporting each other in specific learning goals.

Clases de grado

- IBA = Internet de Banda Ancha
    - UPV,UPC,UPM,UC3M
    - IT : Redes de Banda Ancha
  - 2000/2001 proyecto SABA–2
  - 2001/2002
- Trabajos de alumnos
  - multisede
  - aplicación de colaboración basada en web
    - (grupos de trabajo, versiones de docs, chat, etc)
- Coste
  - es preciso soporte técnico!!
    - Audio, pruebas red, escenario, chat, etc

The Architecture of ISABEL

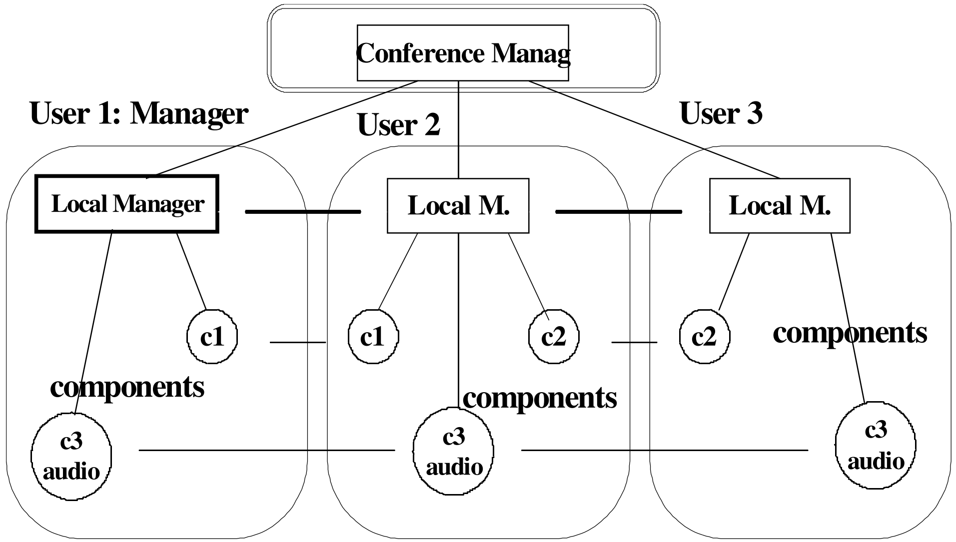
Architecture

Layered architecture with three levels

- Conference coordination sublayer (TCL–TK)
  - activity, roles, session control, views, ...
- Component sublayer (C++)
  - Video (MJPEG), Audio (CD), slides, pointer, ...
- Transport layer (TCP–UDP/IP over xxx)
- Runs on: SUN–Solaris, SGI–O2, PC–Linux.

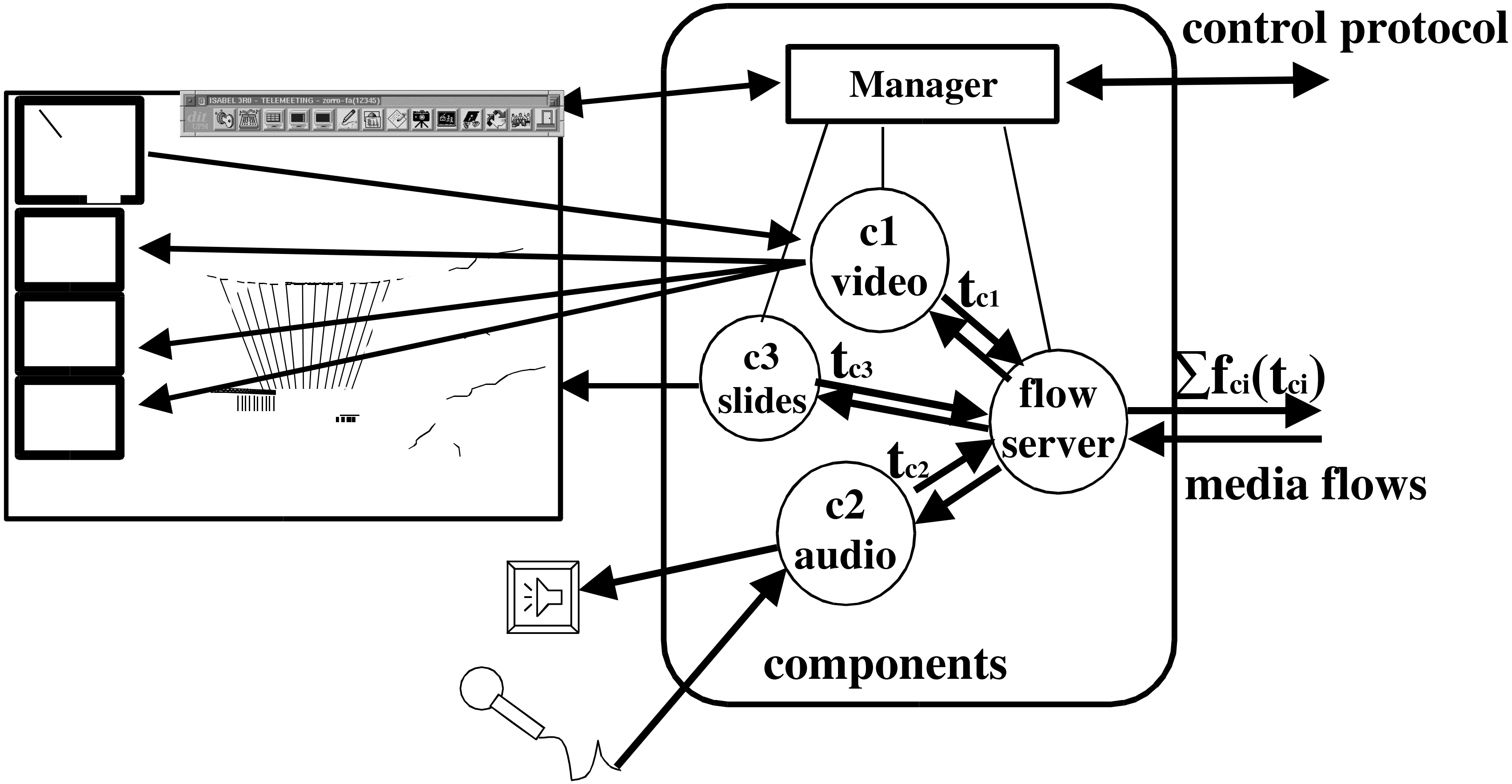
ISABEL Architecture

Control Interface (Management Center)	User Interface (Lecturer, Video, Audio,......)
Conference Control Layer	Multimedia Component Layer
Distributed Object Layer	Multimedia Encapsulation Layer
TCP	UDP (Unicast, Multicast)

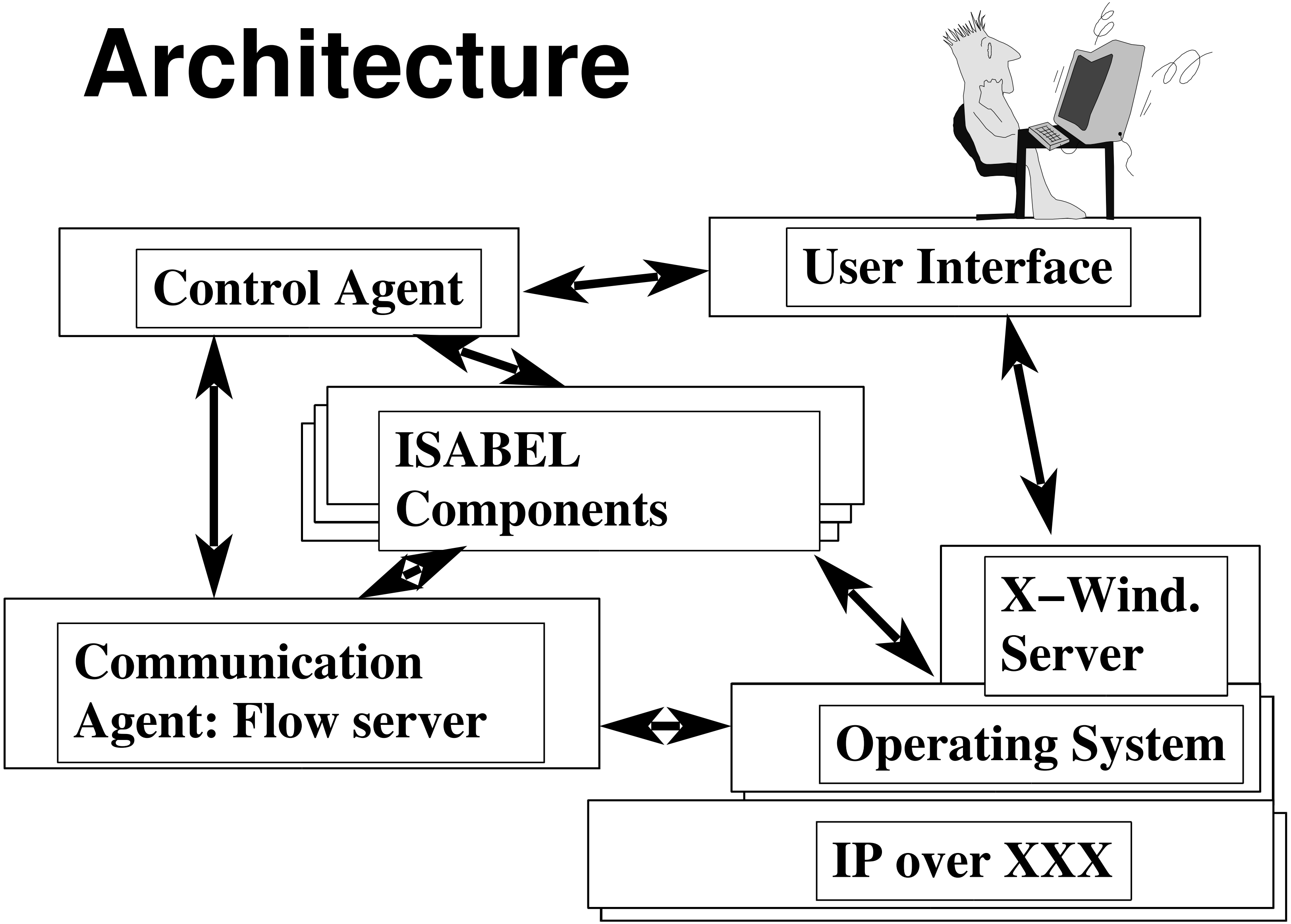


ISABEL Architecture

◆Manager + media components + flow server



Software Architecture



ISABEL Elements

- Interface:
  - Enables communication with user and operator
- Control Agent:
  - Manages the session
- Components:
  - one for each media stream
- IROUTER:
  - Provides unifies network access

Control Agent

- Accepts user commands through the Control Interface
- Syncronizes the state changes among all participants
- Manages the individual media components
- Manages the IROUTER
- Programable (Activity File)
  - Language for defining: Interaction Modes, Services

Components

- Each media stream is managed by a component
  - Video, audio, pencil, slides, fax, displ. sharing, ...
- Components communicate via multicast subnet (if available)
- Dynamic reconfiguration capabilities
  - reconfiguration is controlled by the control agent

The Network Service

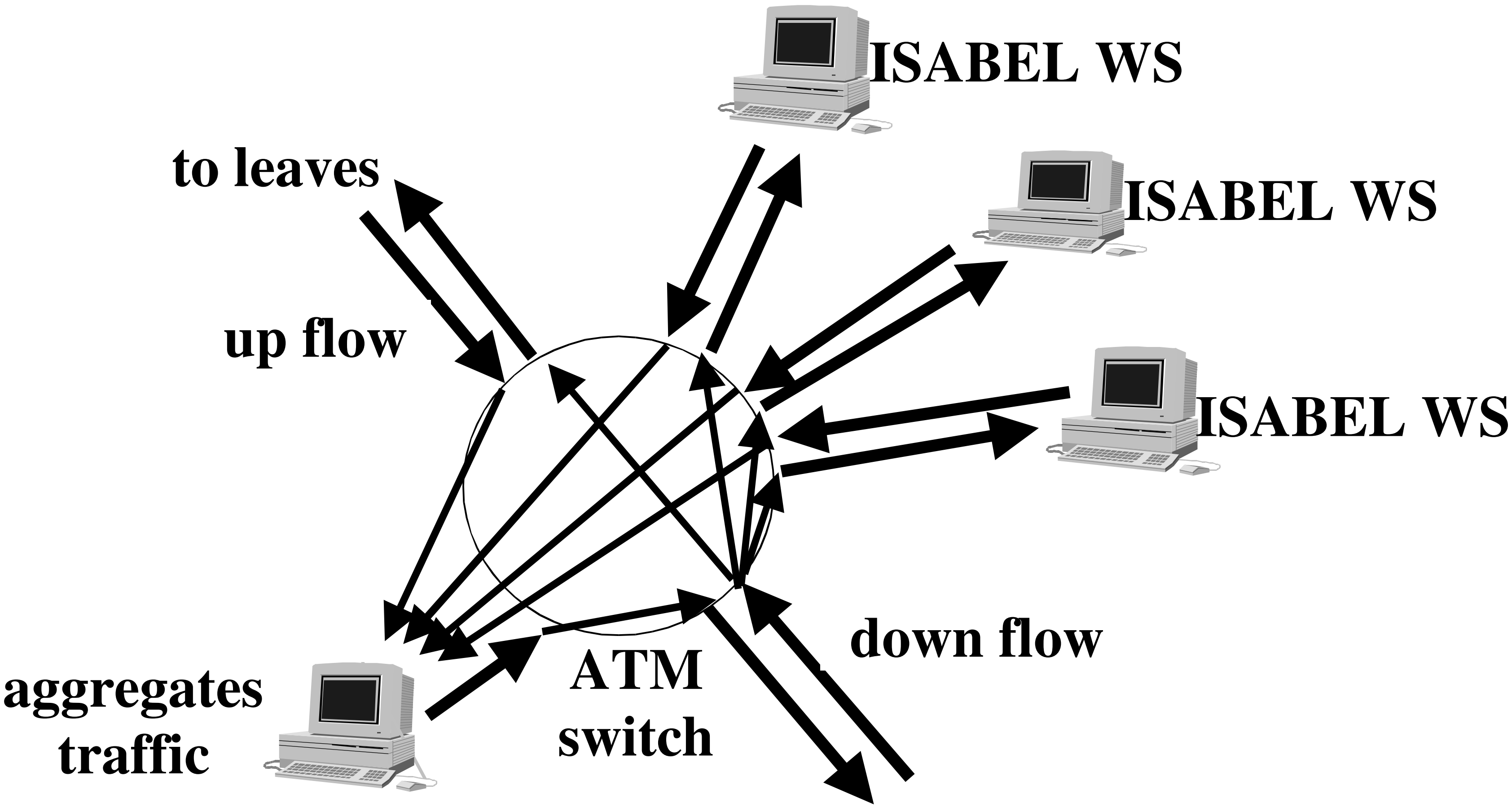
ISABEL Network Service

- TCP–UDP/IP
  - Multicast recomended for more than two participants
    - For example, UDP multicast.
  - Best results when QoS can be assured (ATM, ISDN,..)
  - LAN, MBONE, Internet, ... can be used
- Network Nodes have been developed
  - ATM multicast nodes
    - based on IROUTERS
  - Application multicast servers and QoS adapters
    - Based on Flow servers

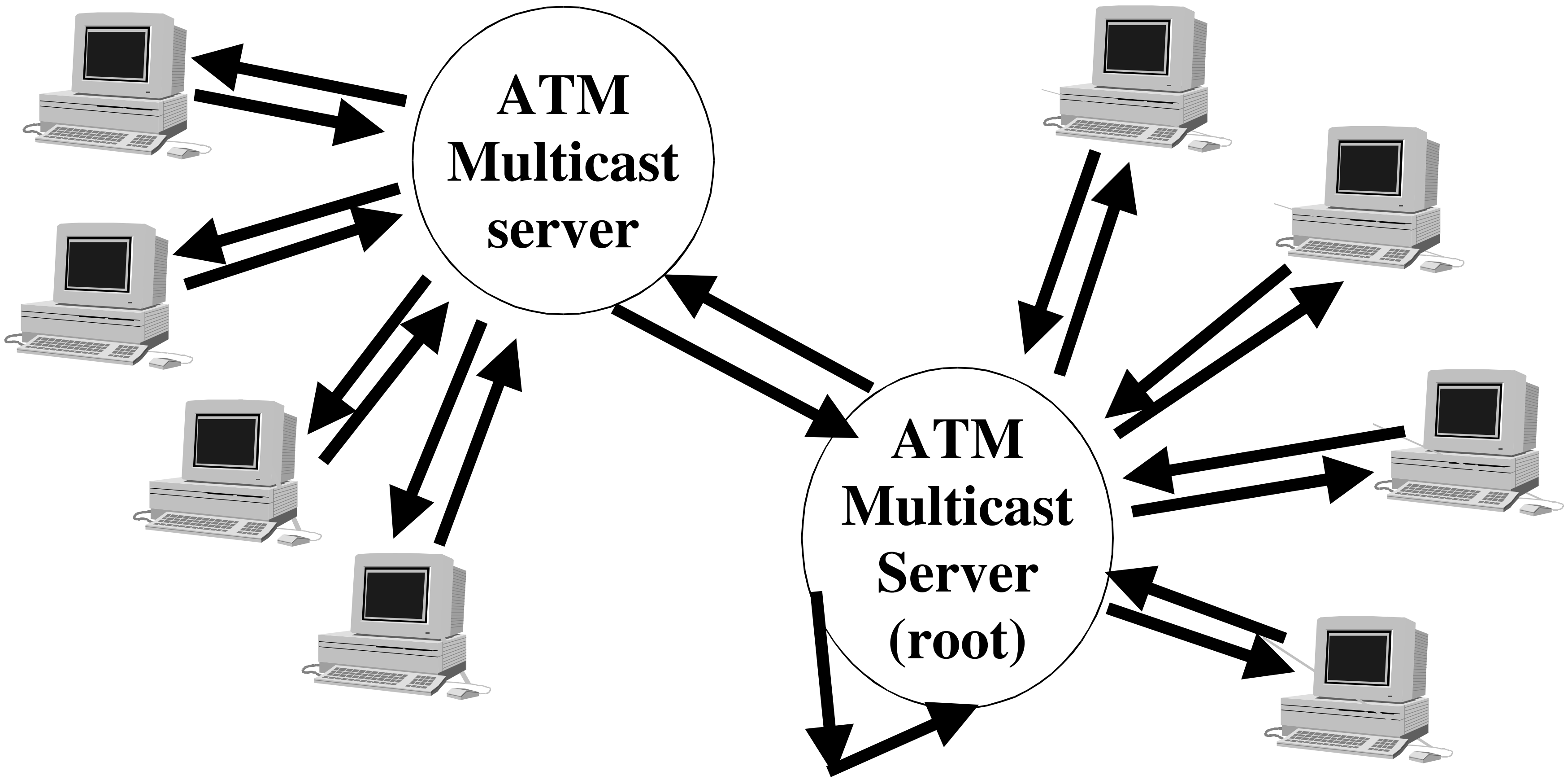
The IROUTER

- The IROUTER:
  - 4 ISABEL network agent which deals with all network related issues
- Roles played by the IROUTER:
  - 4 To interface the application with the network
  - 4 To multicast servers

ATM Multicast Server



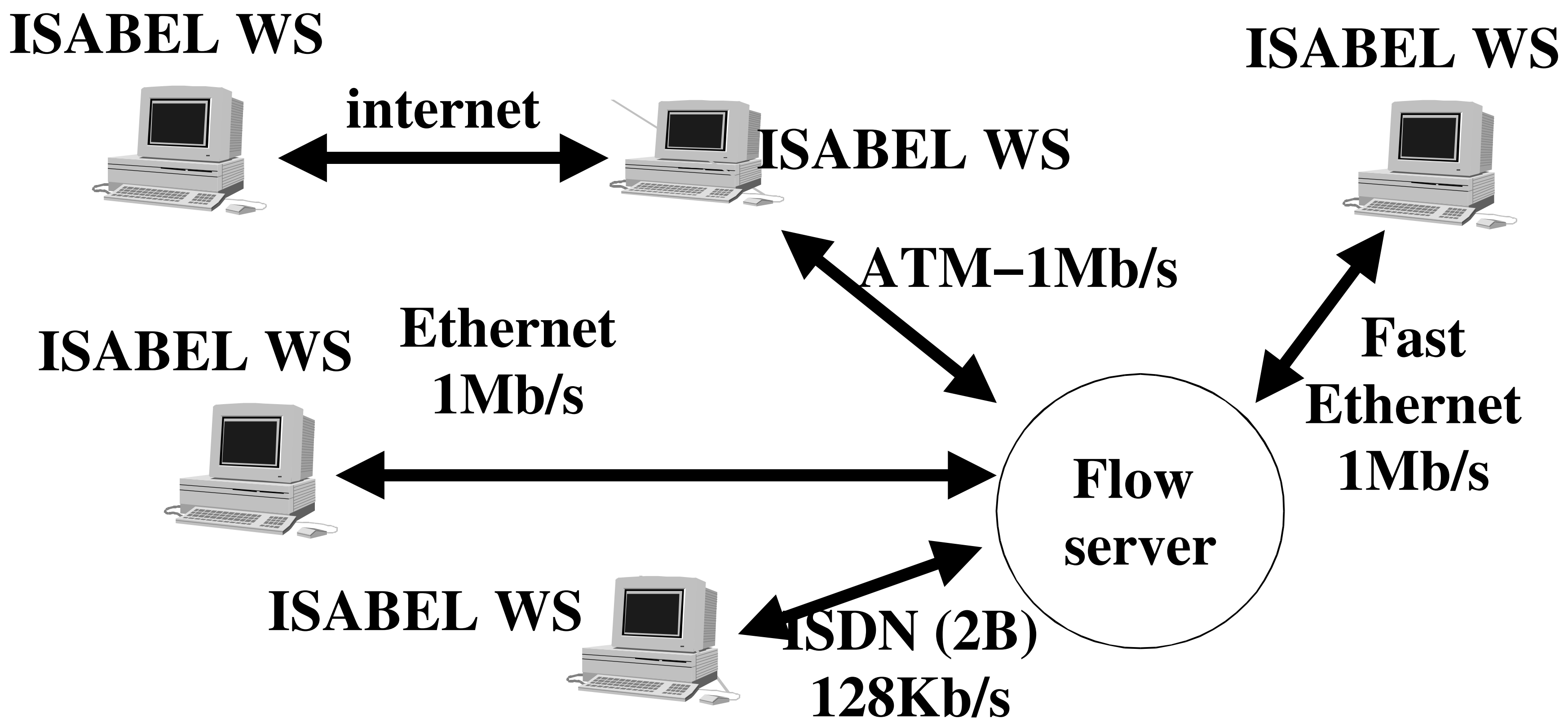
ATM Multicast Tree



The Flow Server

- The Flow Server is the ISABEL network agent
  - Adapts the ISABEL information flows
    - to different QoS
    - to different network requirements
- The Flow Server is the ISABEL multipoint unit
  - Creates application level multicast servers
    - over unicast and multicast services
  - Each terminal has an MCU inside
    - ISABEL does not need explicit MCUs in multipoint scenarios
  - High performance MCUs can be created also

Use of the Flow Server



Functions of the flow server

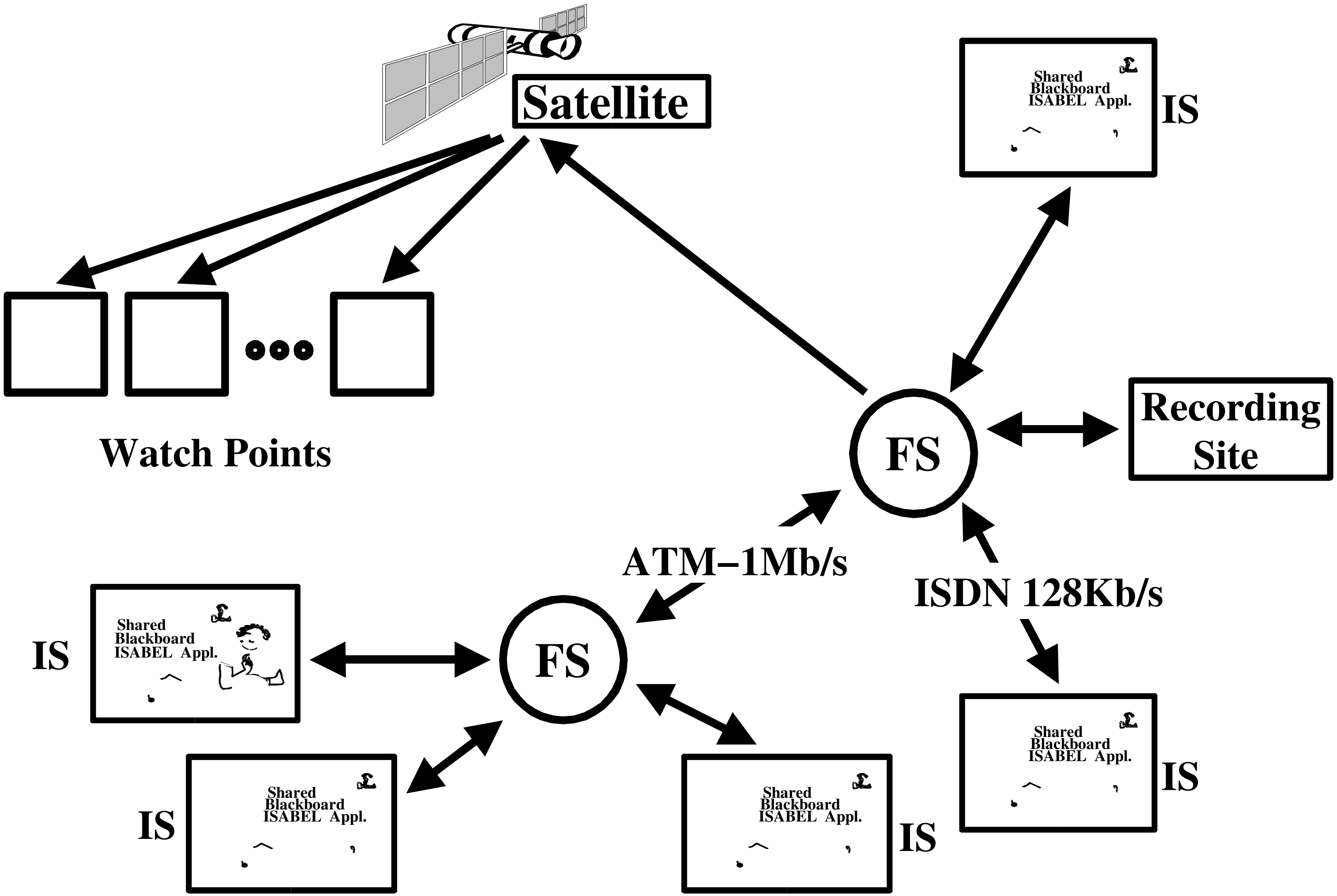
- Decouple application from network services
  - unicast, multicast, ...
- Aggregate media stream traffic into unique flow
- Shape outgoing traffic according to network needs
- Packet replication and routing
- Intelligent QoS (quality of service) adaptation
  - Reduce flow bandwidth by applying least cost transformations

Event Set–up

Event Roles of ISABEL

- IS: Interactive sites => to participate
  - Can assume any role and interaction
  - Main sites: more reliable IS, i.e. host speakers, ...
- WP: Watch points => to watch
  - Event presented as in an IS, but without interaction
    - A interaction by request under way
  - Listen only mode of ISABEL (to a multicast group)
  - Broacast networks (satellite, MBONE, LAN, ...)
- RS: Recording sites => to record the event
  - To pack lectures or congresses
- FS: Flow Servers => to connect end points
  - Perform multicast and QoS adaptation

Event set–up example



Future Work

- More efficient video compression algorithms
  - H261–3, MPEG
- SDK for integration of new codecs, interfaces,..
- Tune existing ISABEL service definition
  - New service definition language
- Interworking with existing groupware
  - MBONE, Videoconferencing, Microsoft´s Netmeeting, Netscape Communicator, ..
- Wider QoS or CoS adaptation
- Automatic event/network setup
  - Launched by event servers