

Multimedia im Netz

Wintersemester 2013/2014

Part IV

Conversational Multimedia Services

Outline (New)

* = Nicht für Nebenfach !

- | | | |
|-----|---|---|
| 1. | Introduction and Motivation | |
| 2. | Interactive Web Applications | Part I:
Web Technologies
for Interactive MM |
| 3. | Web Paradigms and Interactivity * | |
| 4. | Web Programming with Java * | |
| 5. | Communities, the Web, and Multimedia | |
| 6. | Digital Rights: Definition and Management | |
| 7. | Cryptographic Techniques | Part II:
Content-Oriented
Base Technologies |
| 8. | Multimedia Content Description | |
| 9. | Electronic Books and Magazines | |
| 10. | Multimedia Content Management and Distribution | Part III:
Multimedia
Distribution |
| 11. | Web Radio, Web TV and IPTV | |
| 12. | Multimedia Conferencing | Part IV:
Conversational
Multimedia Services |
| 13. | Signaling Protocols for
Multimedia Communication * | |
| 14. | Visions and Outlook | |

12 Multimedia Conferencing

12.1 Multimedia Conferencing: Service Definition and Equipment

12.2 Application Examples

12.3 Typology of Multi-Point Conferences

Literature:

James R. Wilcox: Videoconferencing, the whole picture, 3rd ed,
CMP Media 2000

John Rhodes: Videoconferencing for the Real World,
Focal Press 2001

Scott Firestone et al.: Voice and Video Conferencing Fundamentals,
Cisco Press 2007

Videoconferencing: Definition

- Multimedia conferencing:
 - The *synchronous* exchange of digitized multimedia information (e.g. video, audio, images) between conference participants at two or more separate sites
 - Transferred images:
 - » Pictures of the participants
 - » Video clips, still pictures and other accompanying material in digitized form
 - » Screen or window content
 - Transferred sound:
 - » Discussions between meeting participants
 - » Sound from accompanying material (sound or video clips)
- Group-system videoconferencing: Joins two groups of people meeting in physically separate rooms
- Personal videoconferencing: Joins individual users (desktops, phones)
- Two sites (*point-to-point*) or more (*multi-point*)

An Old Dream: Video Conferencing in Movies



Metropolis, 1927



Star Trek, 1970s



2001: A Space Odyssey, 1968

Fritz Lang: Metropolis (1927)



Stanley Kubrick: 2001 – A Space Odyssey (1968)



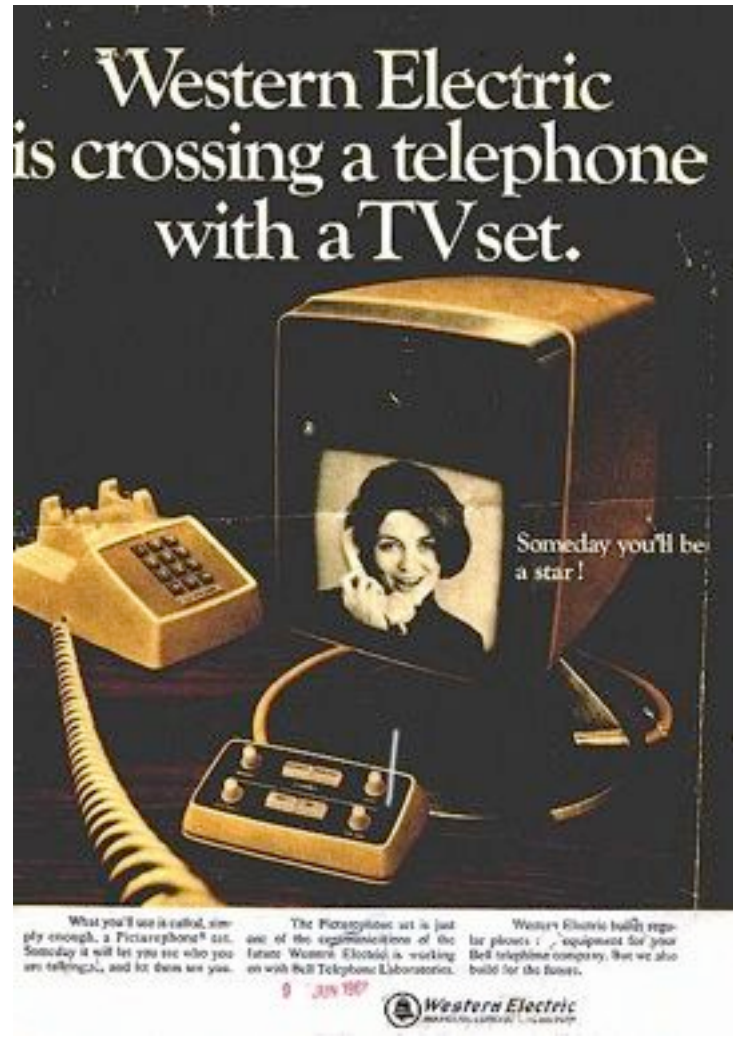
History of Videoconferencing

- Bell Labs, 1920s: First videoconference between Washington and New York
- Bell Labs, 1940s: Videoconference research resumed
- Bell Labs, 1964: Picturephone.
 - Other pioneers, 1970s: NEC, British Telecom (1979)
- 1983: Compression of video signal to phone line bandwidth: Widcom project (DARPA)
- 1984: PictureTel, first software-based videoconferencing system (224 Kbps)
- 1994: Intel ProShare system (two ISDN B-channels)
- 1996: Standards H.323 and H.324, including H.263 compression
- 1996 until today: Trend to use IP data network technology instead of ISDN

vintageadbrowser.com



Picturephone Mod 1



System Type I: Picturephones

- Telephone sets enhanced by video display and small camera
- Available on the market already for significant time
 - E.g. for ISDN



Pictures: Aethra

System Type II: Desktop Systems

- Desktop videoconferencing systems
 - PC with small camera mounted above the monitor
 - “Picture phone” on PC basis
 - Optimal for *application sharing*
- Disadvantages:
 - Usable only by a person a time
 - Limited picture and sound quality
- Cost 2001: 500 – 2000 € plus PC
- Cost now: Very low (often built in)
- Pure software solutions:
 - Simple standard systems like Ekiga, Apple FaceTime, Microsoft Skype
 - Sophisticated specialized software with dedicated servers/online service (e.g. Microsoft Office LifeMeeting)



Pictures: VCON, Apple, LifeSize

System Type III: Set-Top Systems

- Small box containing camera, microphone, speakers, codec, network interface, ...
 - To be put on top of TV set or monitor
- Simple, easy to use, targeted also to computer-illiterate users
- Disadvantage:
 - “Vendor lock-in”:
Upgrades are often difficult
- Cost: 3000 – 9000 €



Picture: LifeSize (Team 220)

System Type IV: Rollabout Systems

- Movable, medium-sized unit, often a rolling cabinet, containing
 - High-quality audio, video and telecommunication systems
 - One or two large monitors
 - Remotely controllable camera
- Optimal for small groups (three to six people)
- Cost: 10.000 – 20.000 €



Pictures:
LifeSize,
Tandberg

System Type V: Room Systems

- Room custom-equipped for conferencing requirements
- Possibly many cameras and monitors
- Furniture integrated with conferencing equipment (cameras, monitors)
- High-quality sound system
- Cost: 30.000 – 1.000.000 €



Video Conference Room Design

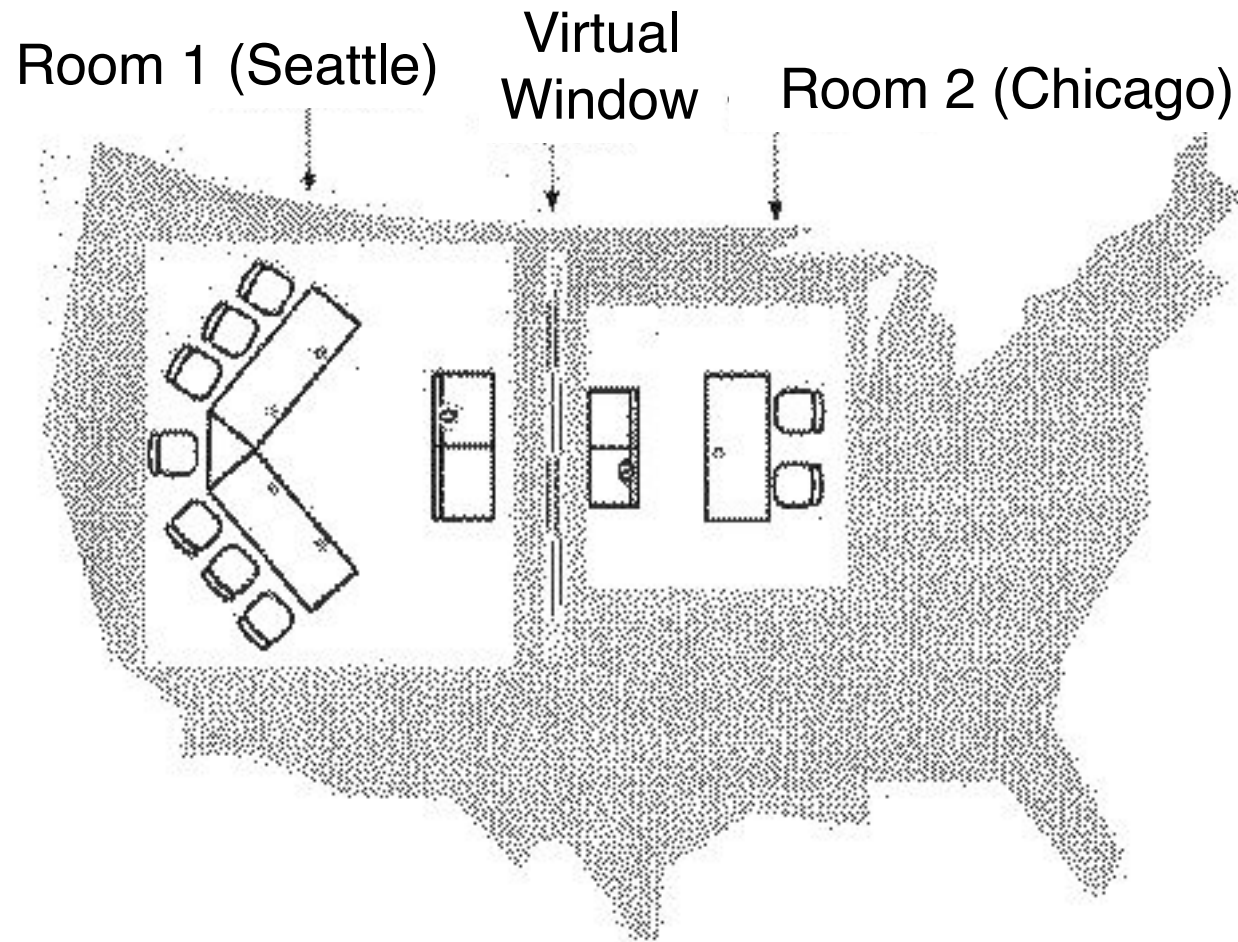


Figure 4-9 Two distant VTC rooms separated only by a virtual window.

Source:
Rhodes p. 79

System Type VI: Telepresence Systems

- Telepresence device
 - containing screen, camera, phone, speaker
 - Column-like form, screen/camera on eye height
- Remotely controlled robot wheels for free movement and spontaneous interaction
- Example: “beam” telepresence robot, cost 2014 ca. USD 16.000



www.suitabletech.com

Advertisement Video for Telepresence Robot



www.suitabletech.com

System Type VII: Handheld Systems

- Videoconferencing clients running on mobile devices
 - Smartphones
 - Tablets
 - E.g. Apps for iOS or Android
- Examples:
Apple FaceTime,
LifeSize UVC ClearSea client
- Cost: Very low cost
+ subscription (in some cases)



Pictures: Apple/LifeSize

Camera Control

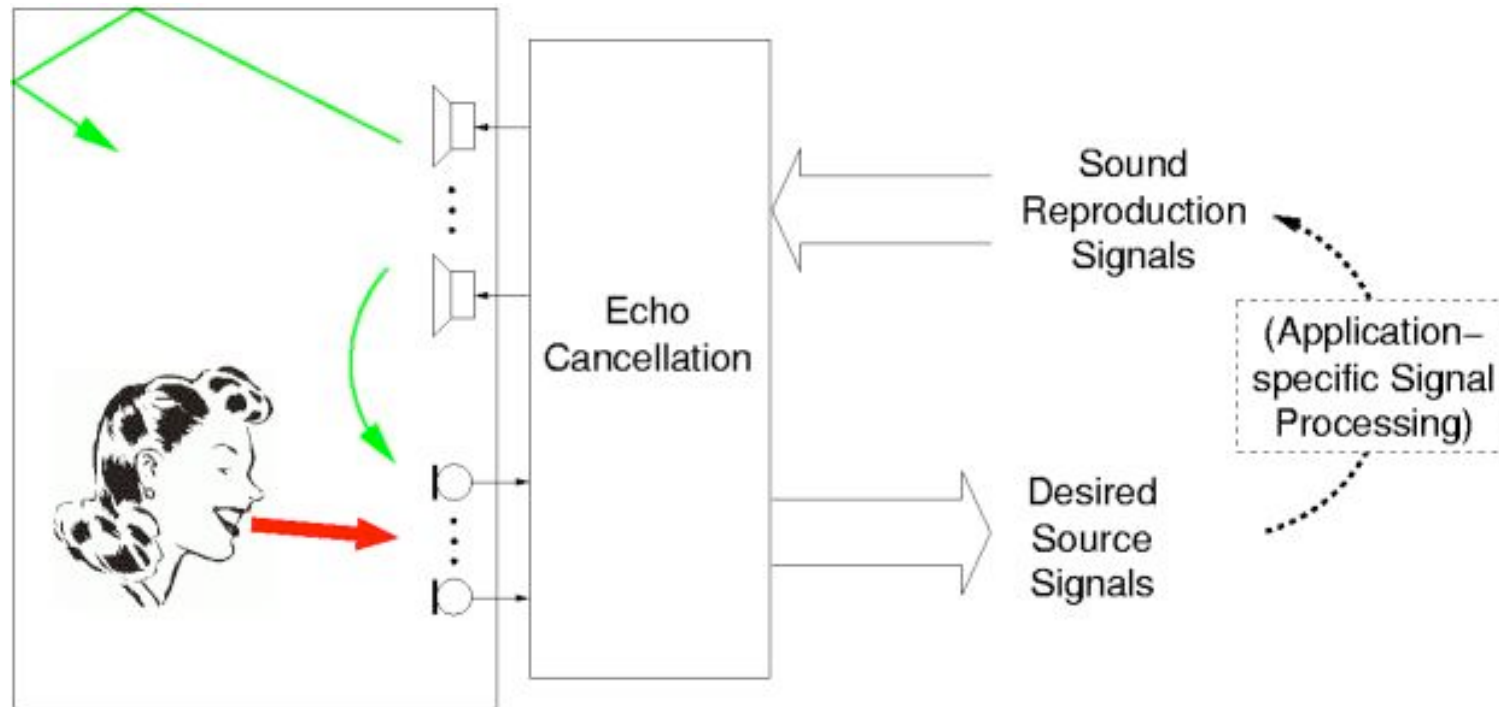
- Far-end camera control:
 - Participant or operator in room A allowed to control camera in room B
 - Useful when untrained people in room B
 - Mainly for point-to-point conferences
 - Standards exist (e.g. H.281/H.224 and H.323 V 5 Appendix Q, 2003)
- Camera presets:
 - Angles to view individual participants and other perspectives are pre-programmed before conference starts
 - Camera can be moved with a single key press, e.g. to show a specific participant
- Follow-me function:
 - Camera movement automatically synchronized with room or speaker microphones
 - Camera snaps into position for current speaker

Copy-Stand Camera

- Typical accessory of videoconference rooms



Echo and Feedback



Picture:
Uni Erlangen

- Hands-free conference:
 - Feedback of own and foreign sound signals through loudspeaker into microphone
 - Various sources for delays
- Solutions: Cancellation in software, special microphones, headsets

Videoconferencing as Cloud Service

- Cloud resources:
 - Hardware (conference bridges)
 - Codecs (transcoding)
 - Directory services
- Simple clients
- No proprietary server needed
- Service paid per use



2 Universal access available to everyone.
NOW you can host (or join) impromptu or scheduled video conferences with anyone who has access to a browser and a web camera, a tablet or a smartphone.

Polycom CloudAXIS

Pictures: 8x8.com, Polycom

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12.3 Typology of Multi-Point Conferences

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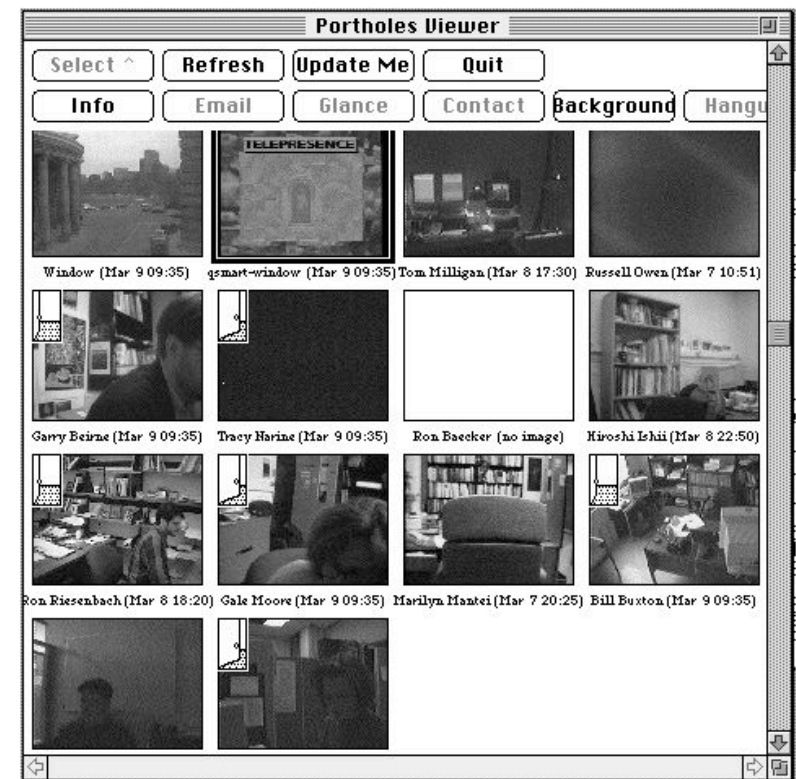
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Application: Xerox PARC Media Spaces

- Xerox PARC, mid 1980-s
 - Link between Palo Alto/California and Portland/Oregon
 - “Always-on” audio/video links between offices and meeting rooms
 - Later (1990s): “Porthole” project linking PARX and EuroPARC
- Positive effects:
 - *Awareness* of remote situation (e.g. presence of people at remote site)
 - Enabling informal encounters across sites
- Problems:
 - Boundaries of personal and private space
 - Integration into daily work life
 - Time shifts

Pictures: Steve Harrison (people.cs.vt.edu/~srh/), billbuxton.com



Application: Preventing Nuclear Destruction

- Videoconference technology helped to protect the world during the year 2000 date rollover
 - To avoid control problems of nuclear power stations
 - Videoconference link between
 - » Emergency Center of the U.S. Department of Energy (Washington)
 - » Situation and Crisis Center of MinAtom (Moscow)
 - Expert exchange: Experts of the remote side present locally
- T1 line (24 phone lines bandwidth), off-the-shelf video codecs, LCD projectors etc.
- Newly developed (UNIX-based) video transmission software

Application: Distance Learning

- Lectures transmitted to remote students
 - Training of staff in businesses
 - Home-learning
- Integration of remote guest speakers in meetings



www.sllboces.org

Application: Telemedicine

(According to Wilcox, p. 37)

- Remote consultation of medical specialists
 - Military health care for patients on remote bases
 - Health care services for prison inmates
 - Rapid emergency response
 - Specialist support during critical operations
- Visiting nurses video-consulting with patients
 - Allows reduction of physical visits
- Additional data:
 - Pictures:
X-ray, tomography, ...
 - Lab results
 - Current vital data



Pictures: Radvision

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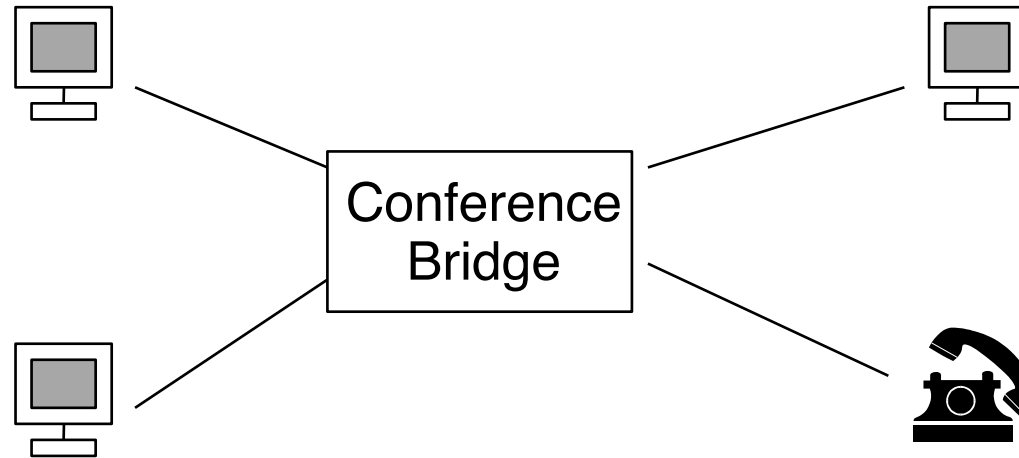
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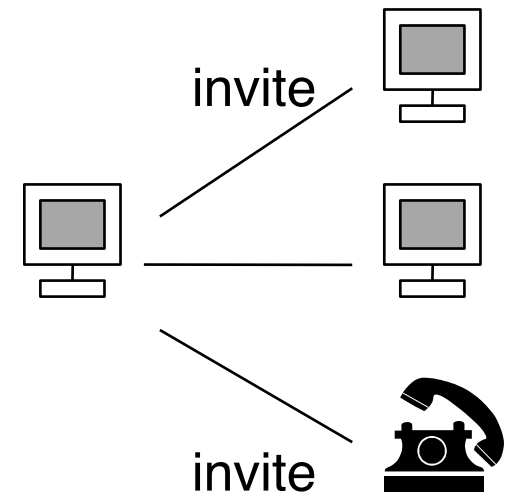
Meet-Me Conference



- Conference is pre-arranged
 - Time and address of bridge are known to participants
- Participants call the bridge to enter the conference
 - Bridge may also call out to participants
- Central conference bridge is a resource owned by a network or service provider
 - Mixes and distributes audio and video signals
- Examples: Telephone conference services, Skype conference call

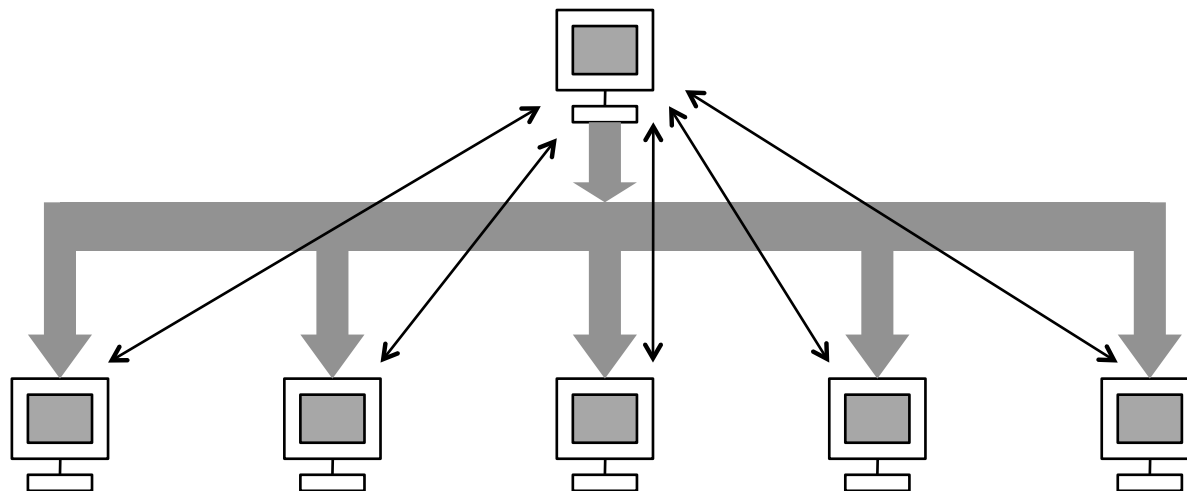
Ad-Hoc Conference

- Conference starts as a point-to-point conversation
- Grows to a multi-point conference when participants *invite* other people by calling their terminals
- Conference is usually not pre-arranged
- Example: Three-way call in ISDN/private telephone exchanges
 - A talks to B
 - A puts B *on hold*
 - A calls C
 - A joins B and C into a three-way call
- User originating the conference call must be able to provide the necessary bridge functionality
 - Bridge outside the public network, e.g. in a private network
 - Capacity limited (e.g. in number of participants)

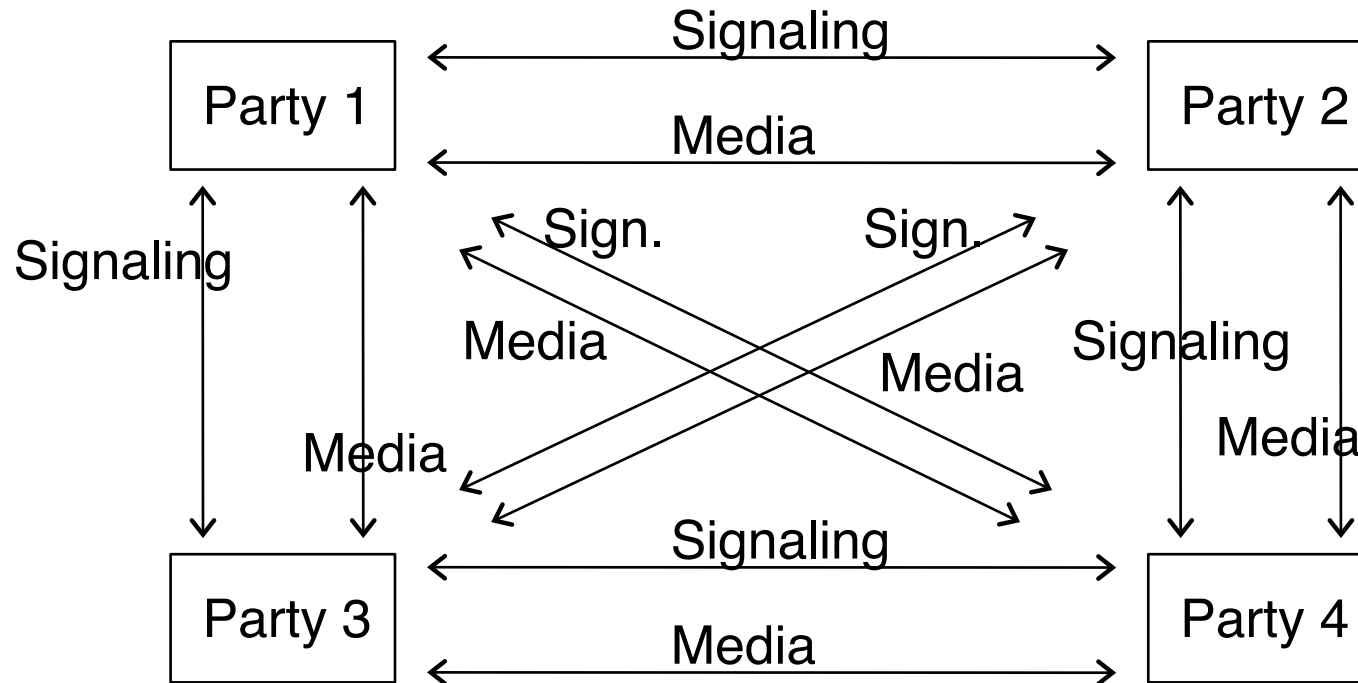


Interactive-Broadcast Conference

- Asymmetric conference
 - Master distributes media and signaling to many terminals
 - Terminals have a much simpler back channel to the master (e.g. just signaling or a plain text stream)
- Scales to thousands of terminals
- Typical applications: tele-teaching, business TV

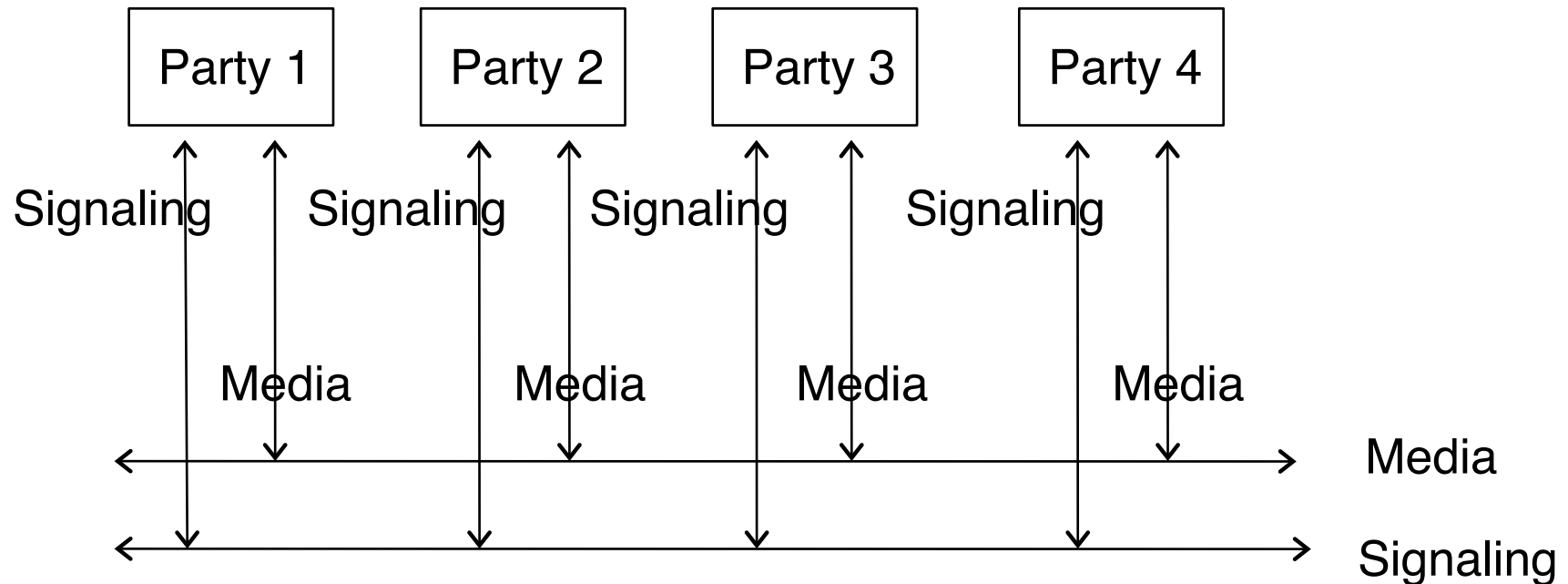


Multi-Unicast Network Configuration (P2P)



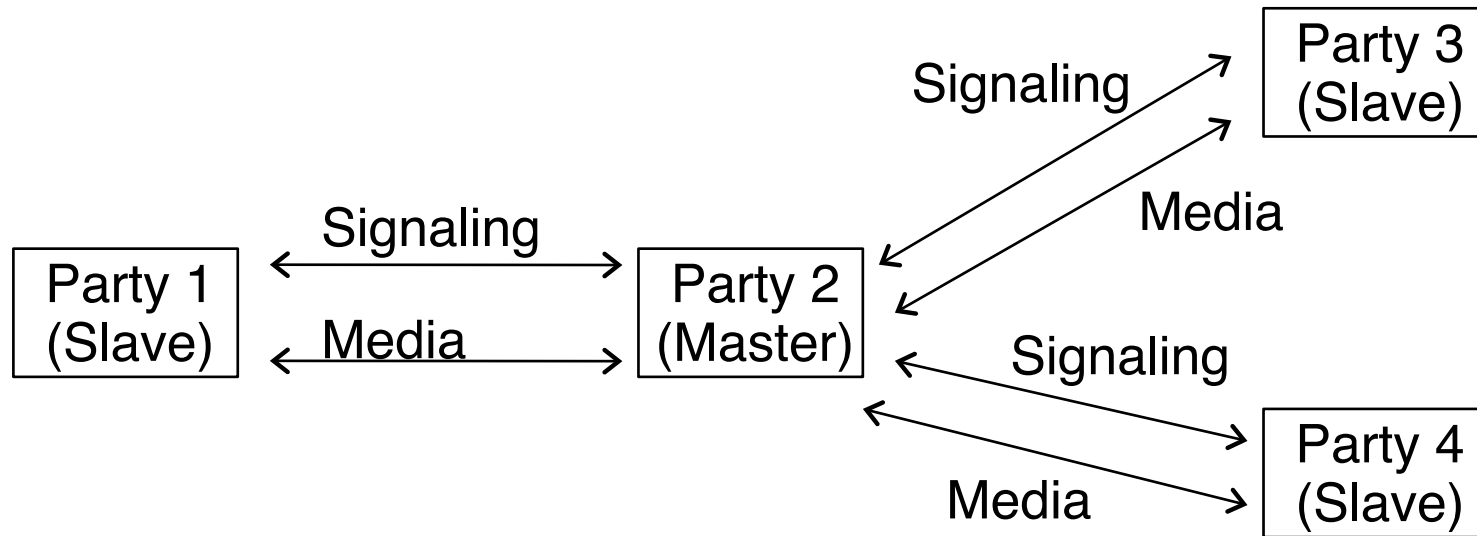
- Difficult to implement, no single point of failure, high bandwidth usage
- Suitable for ad-hoc conferences with low participant numbers
- Bad scalability

Multicast Network Configuration



- Uses multicast addresses
- Difficult to implement, no single point of failure, bandwidth-efficient
- Suitable for interactive broadcasts with high number of participants

Master-Slave Network Configuration



- Easy to implement, single point of failure, medium bandwidth-efficiency
- Suitable for meet-me and ad-hoc conferences of medium size
- *Note:* Hybrid forms may use different configurations for signaling and media!
 - H.323: Master-Slave signaling, master-slave or multicast media distribution