Multimedia im Netz
Online Multimedia

Wintersemester 2015/2016

Part IV

Conversational Multimedia Services

12 Multimedia Conferencing

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

Multimedia Conferencing: Definition

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

An Old Dream: Video Telephony

"Telephonoscope"
–
imaginary invention
by Edison

George du Maurier
Punch
Dec 9th, 1878

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)

Videophone Prototype 1955

Kay Labs,
San Diego
+ Pacific T&T
(Bell System)

History of Videoconferencing

- Bell Labs, 1920s: First videoconference between Washington and New York
- Bell Labs, 1964: Picturephone.
  - Other pioneers of the 1970s: NEC, British Telecom
- 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

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:
  - Basic point-to-point:
    e.g. Ekiga, Apple FaceTime, Microsoft Skype
  - Sophisticated solutions with server/cloud support:
    e.g. Microsoft Lync Server (Skype for Business),
    8x8.com

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 €

www.omalleygc.com


HP Halo System
(www.telepresenceoptions.com)

Video Conference Room Design

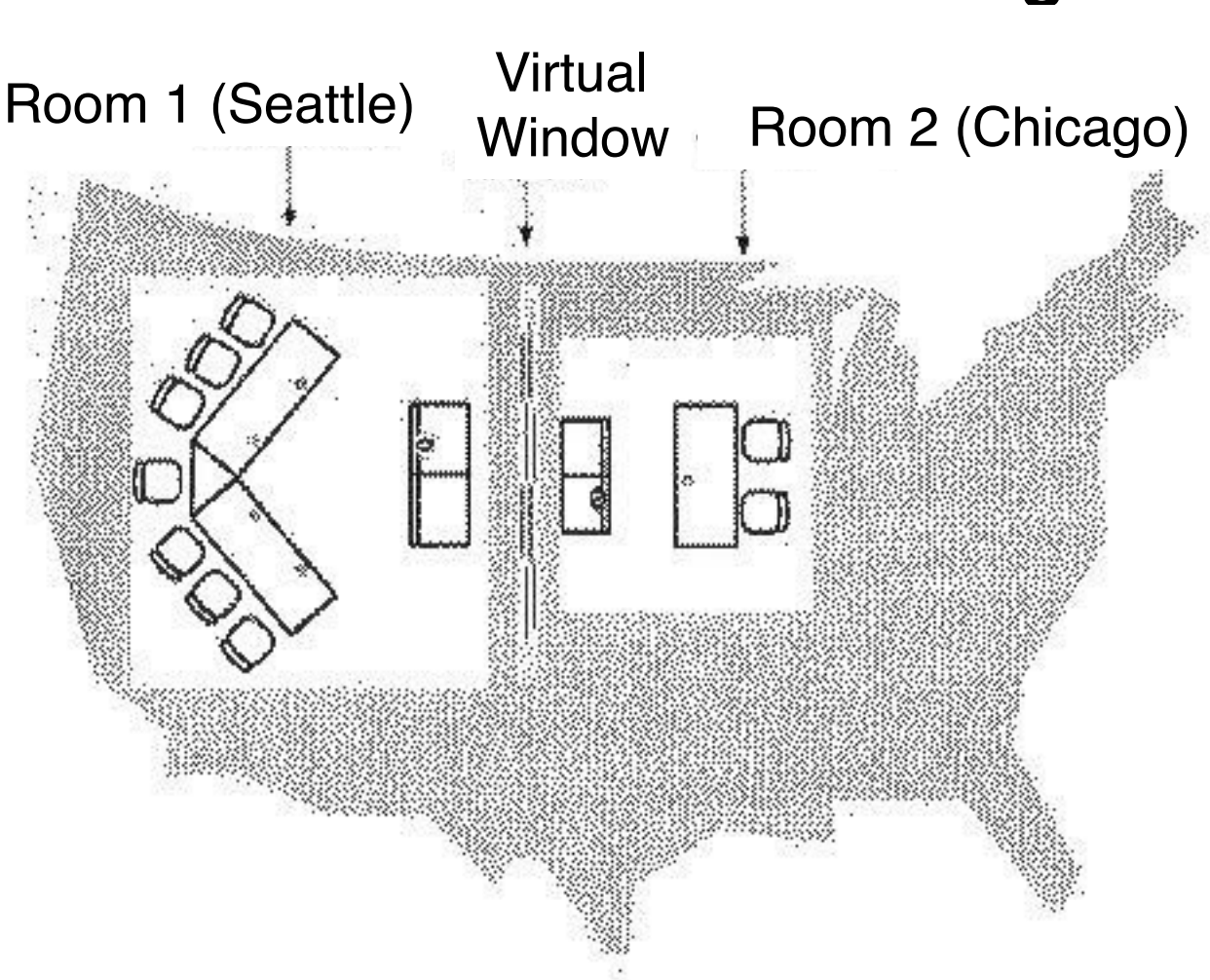


Figure 4-9 Two distant VTC rooms separated only by a virtual window.

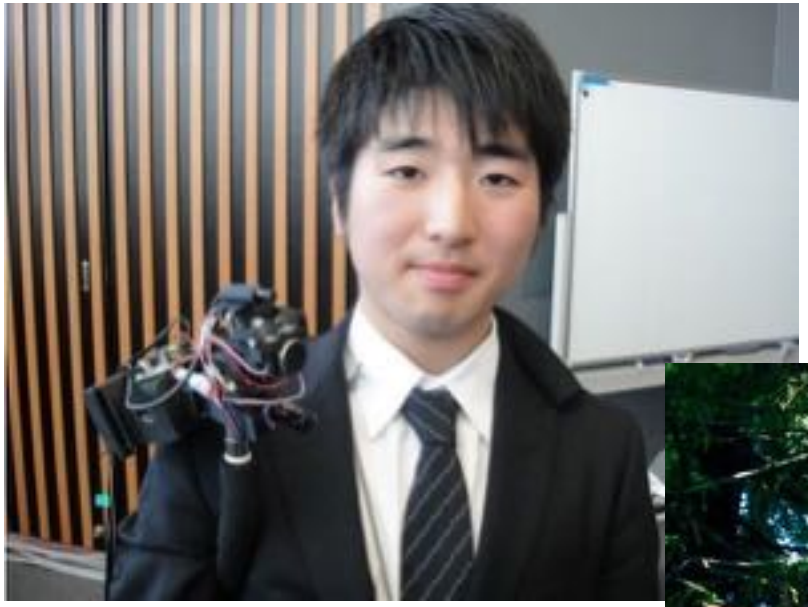
Source:
Rhodes p. 79

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

Shoulder-Mounted Telepresence Avatars



"TEROOS"
Keio University, Japan
Interaction 2011
Source: diginfo.tv

"Polly"
FXPAL Labs, USA, 2014
Sven Kratz, Patrick Proppe
Source: fxpal.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

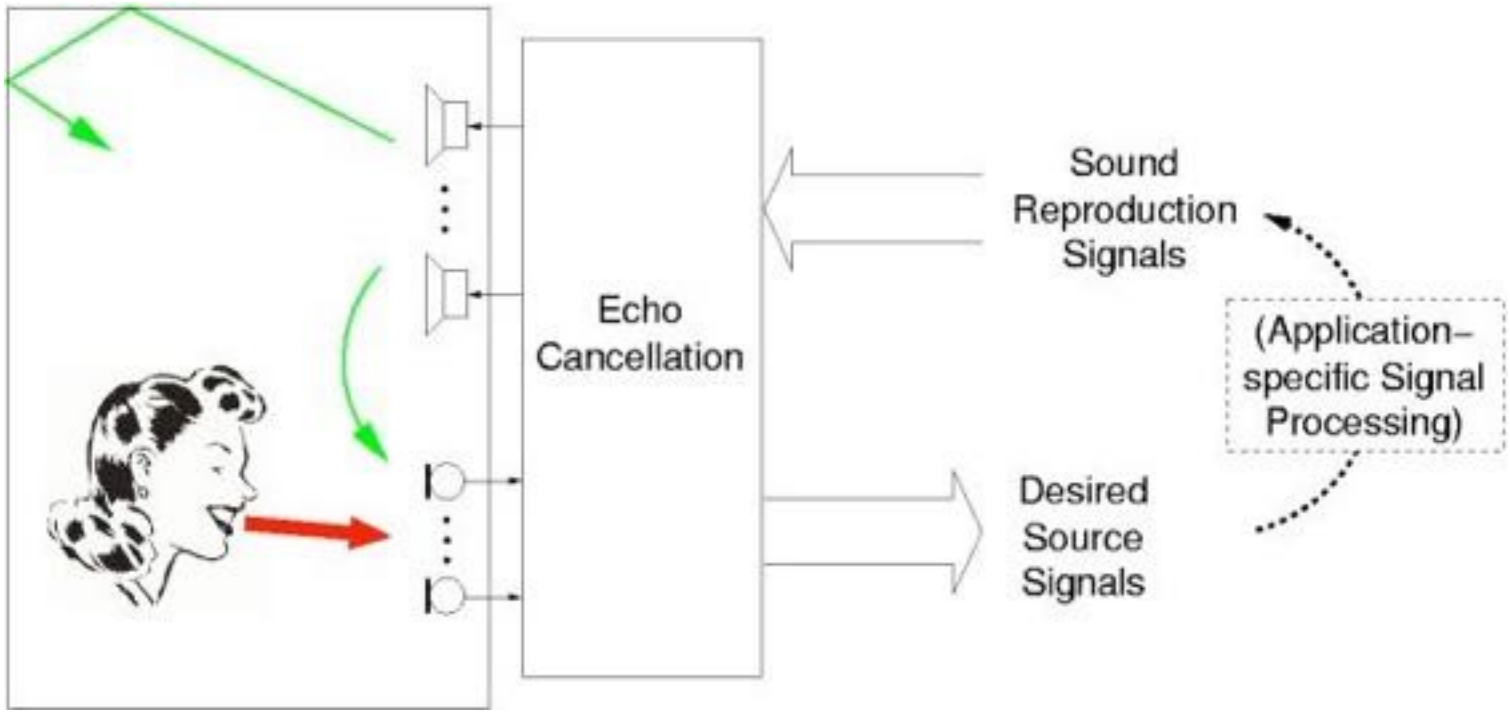
Document Camera

- Typical accessory of videoconference rooms

Source: Epson

Source: Qomohitevision/Wikimedia

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

12 Multimedia Conferencing

12.1 Multimedia Conferencing:
Service Definition and Equipment

12.2 Application Examples

12.3 Typology of Multi-Point Conferences

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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 PARC 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

- Year 2000 rollover: Avoid control problems of nuclear power stations
  - Emergency Center of the U.S. Department of Energy (Washington)
  - Situation and Crisis Center of MinAtom (Moscow)

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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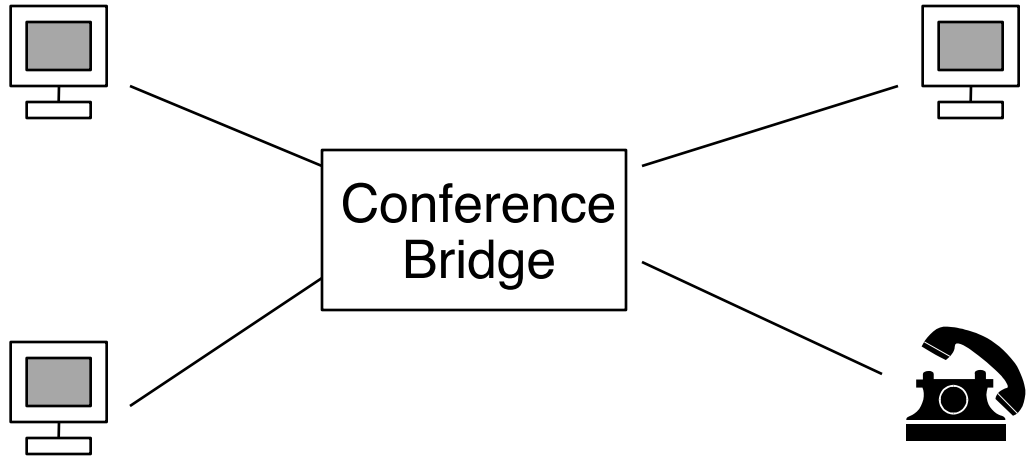
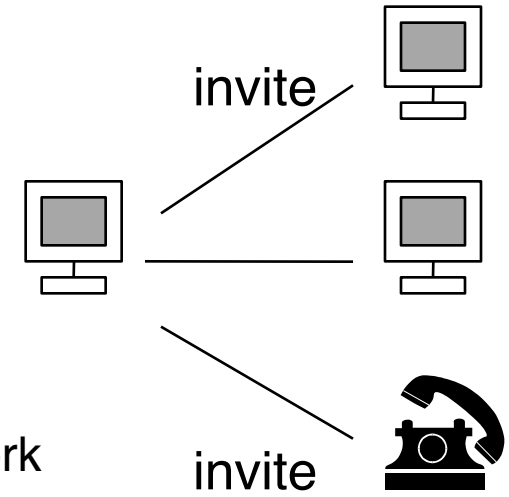
Meet-Me Conference



- Conference is pre-arranged
  - Time and address of bridge are known to participants
- Participants enter the conference
  - Active call (authorization), or called by bridge
- Central conference bridge owned by a network or service provider
- Examples: Telephone conference, Cisco WebEx meetings, Microsoft Skype for Business

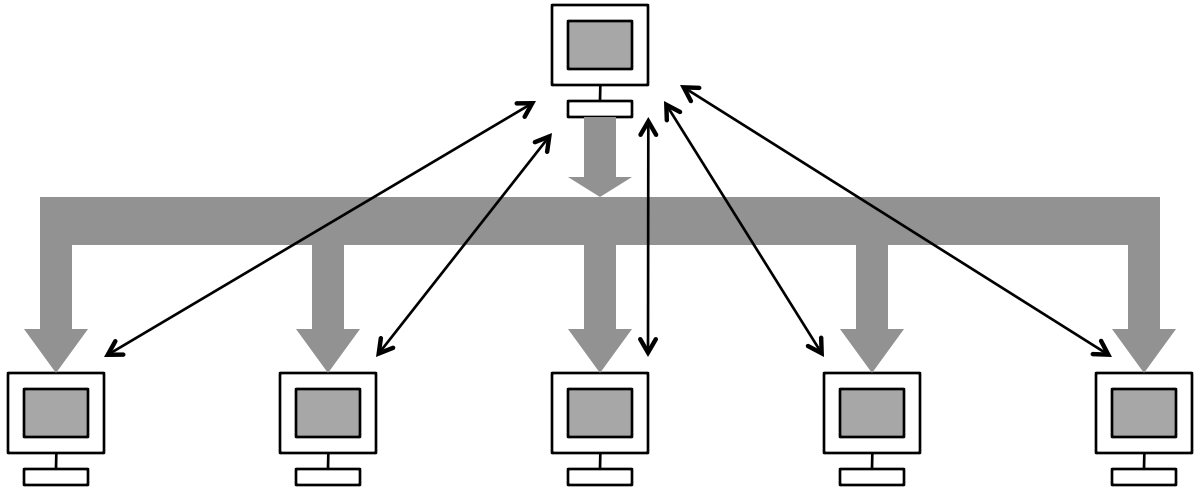
Ad-Hoc Conference

- Conference starts as a point-to-point conversation
- Participants *invite* other people by calling their terminals
- Conference is usually not pre-arranged
- Example: Three-way call in telephone exchanges
  - A talks to B
  - A puts B *on hold*
  - A calls C
  - A joins B and C into a three-way call
- Originating user must be able to provide bridge functionality
  - Bridge outside the public network, e.g. in a private network
  - Capacity limited (e.g. in number of participants)
- Example: Skype group calls
  - Up to 25 participants

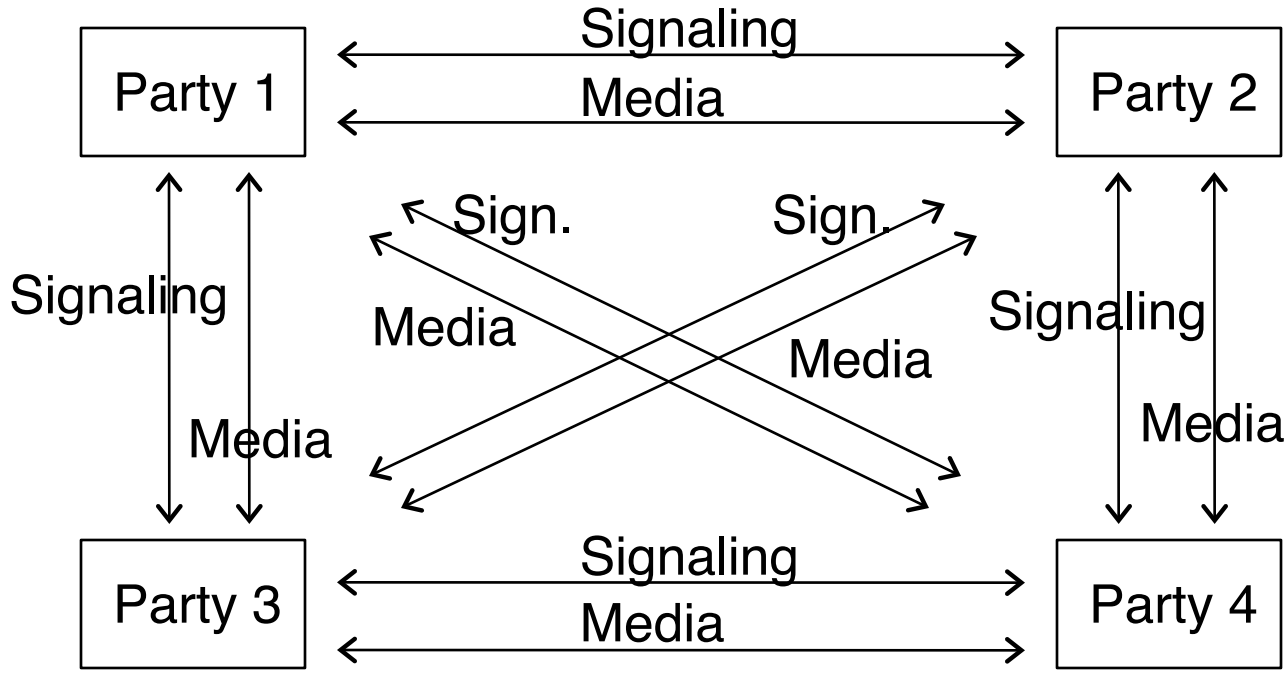


Interactive-Broadcast Conference

- 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

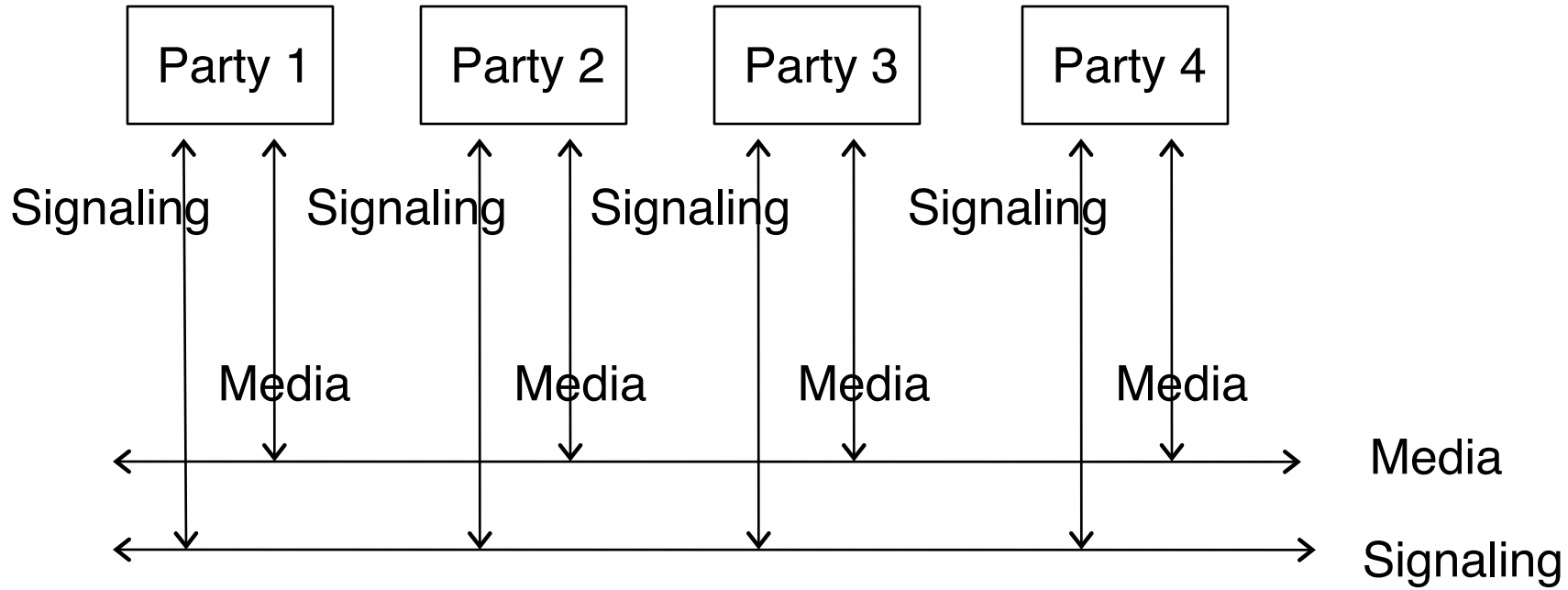


Full Mesh Network Configuration (P2P)



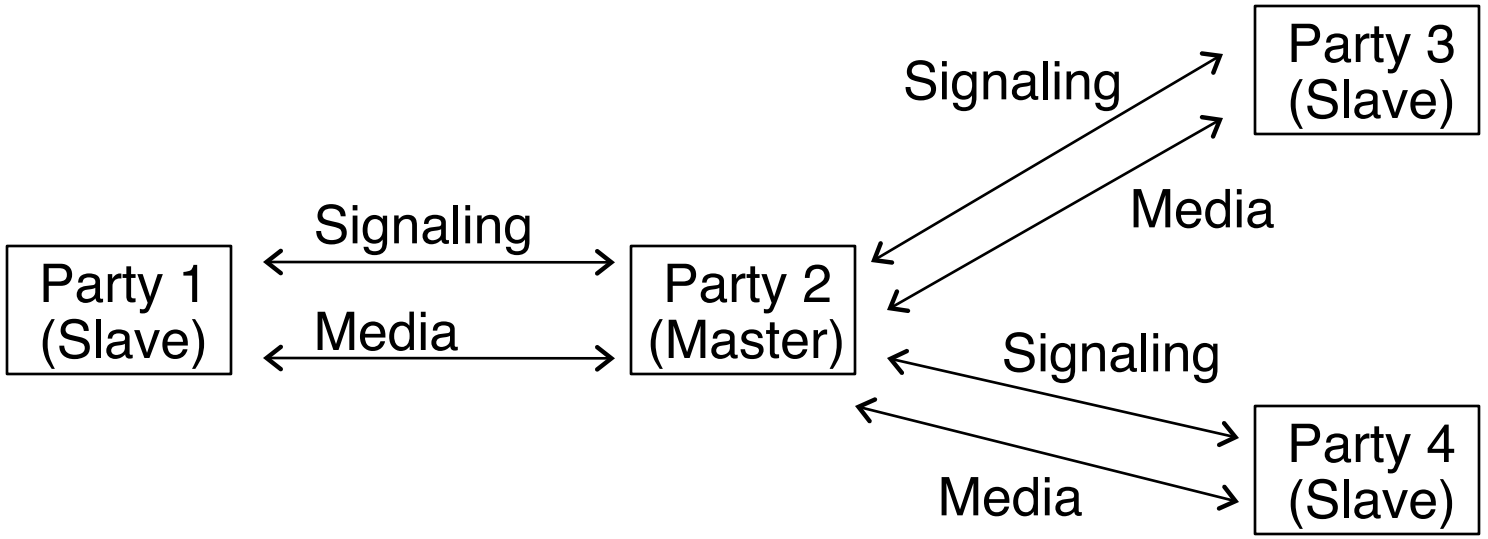
- Difficult to implement, no single point of failure, high bandwidth usage
- Suitable for ad-hoc conferences with low participant numbers
- Bad scalability

Multicast Network Configuration



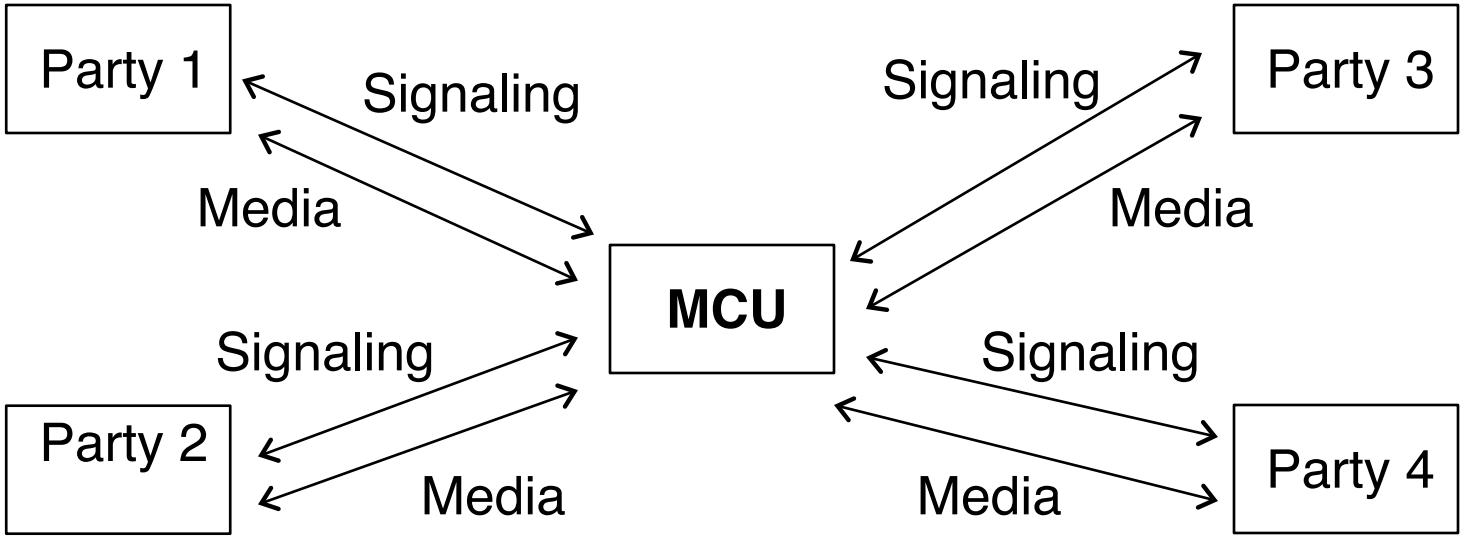
- Uses multicast addresses
- Difficult to implement, no single point of failure, bandwidth-efficient
- Suitable for interactive broadcasts with high number of participants

Star Network Configuration, Master-Slave Style



- 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

Star Network Configuration with MCU



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