



# Infrastructure Independent Conferencing

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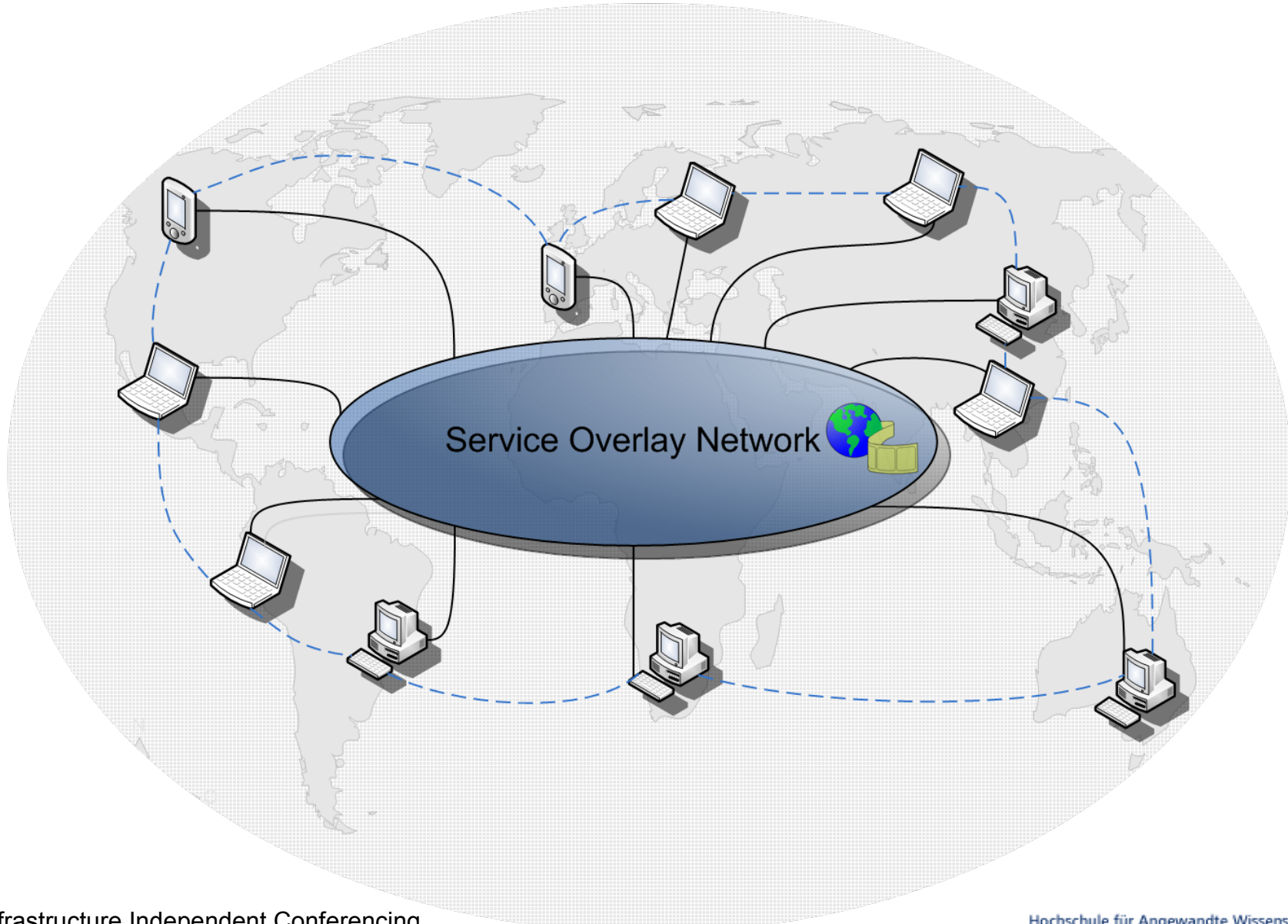
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# Outline

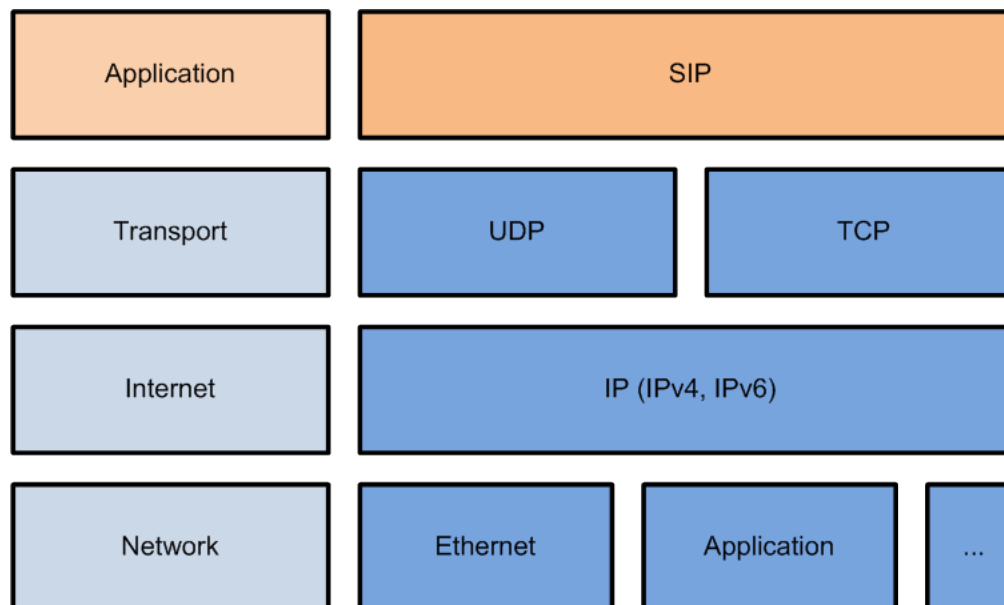
- Vision
- Overview SIP & Conferencing
- Distributing the Conference
- P2P Overlay Virtualization
- Mixing and Meshes
- Summary

# Infrastructure Independent Conferencing

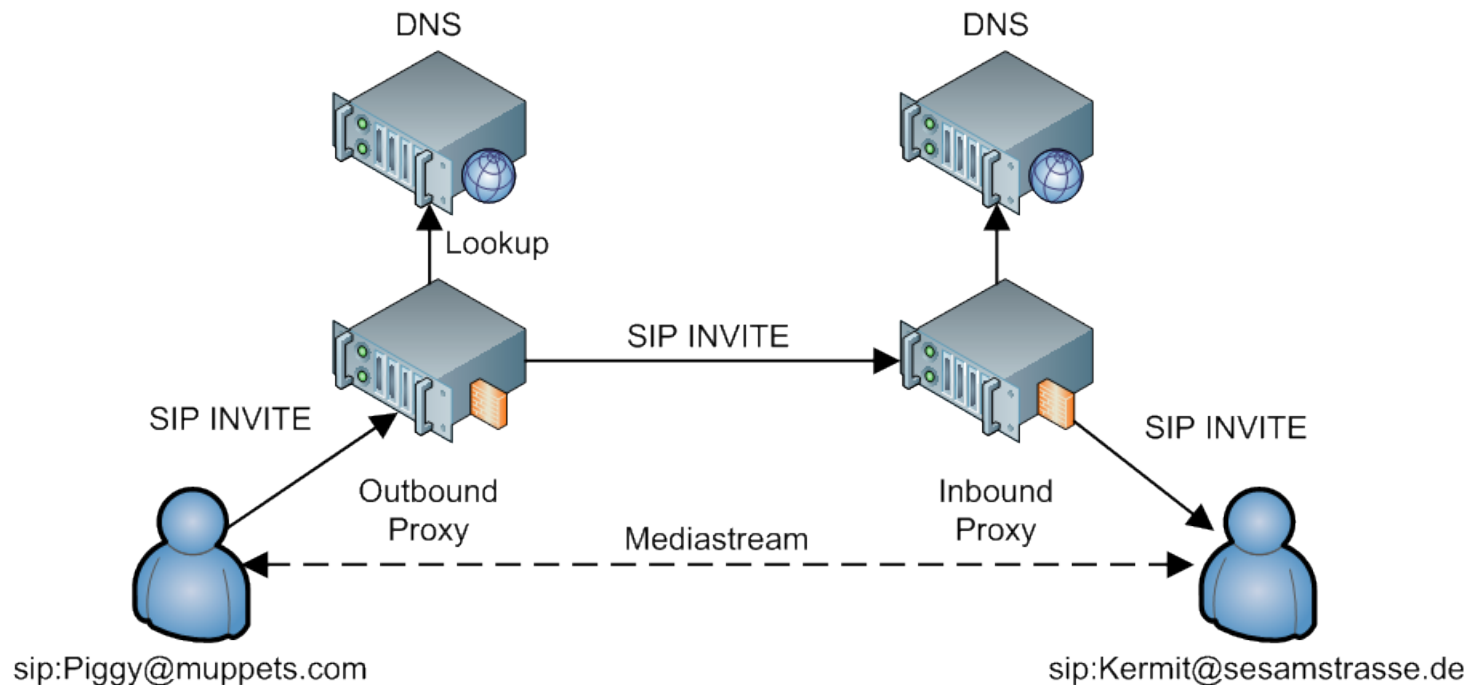


# Session Initiation Protocol Overview

- Application-Layer protocol for signaling (RFC 3261)
- Creating, modifying and terminate sessions
- Usage: Internet Telephony, Multimedia Conferences
- Carries session description information



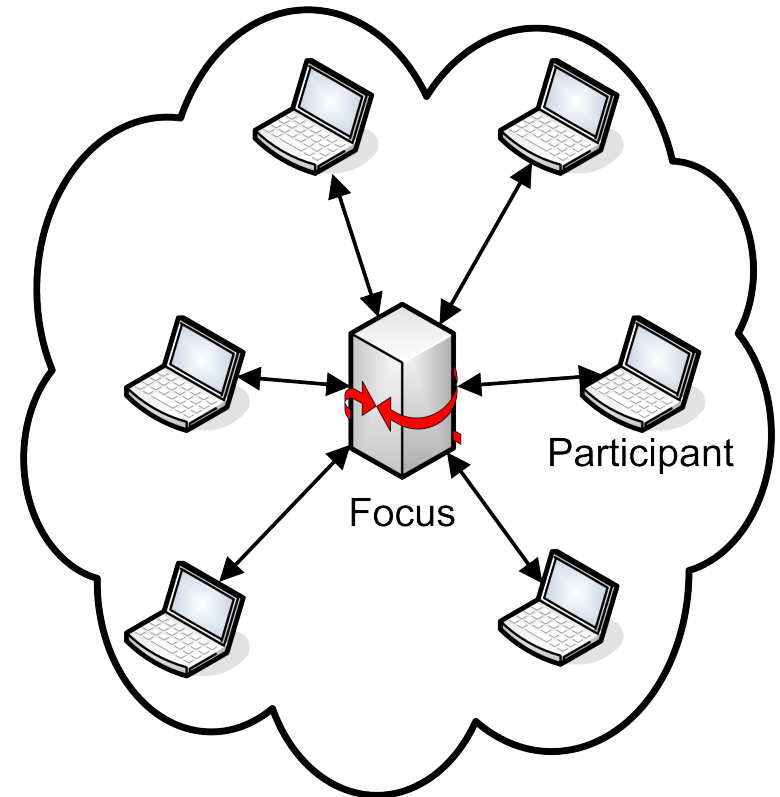
# Session Initiation Protocol Architecture



- *SIP Trapezoid*: Client (*User Agent*) connected to proxies
- Each user agent identified by *SIP URI*
- SIP Session establishment via INVITE request
- After parameter-negotiation → Multimedia session

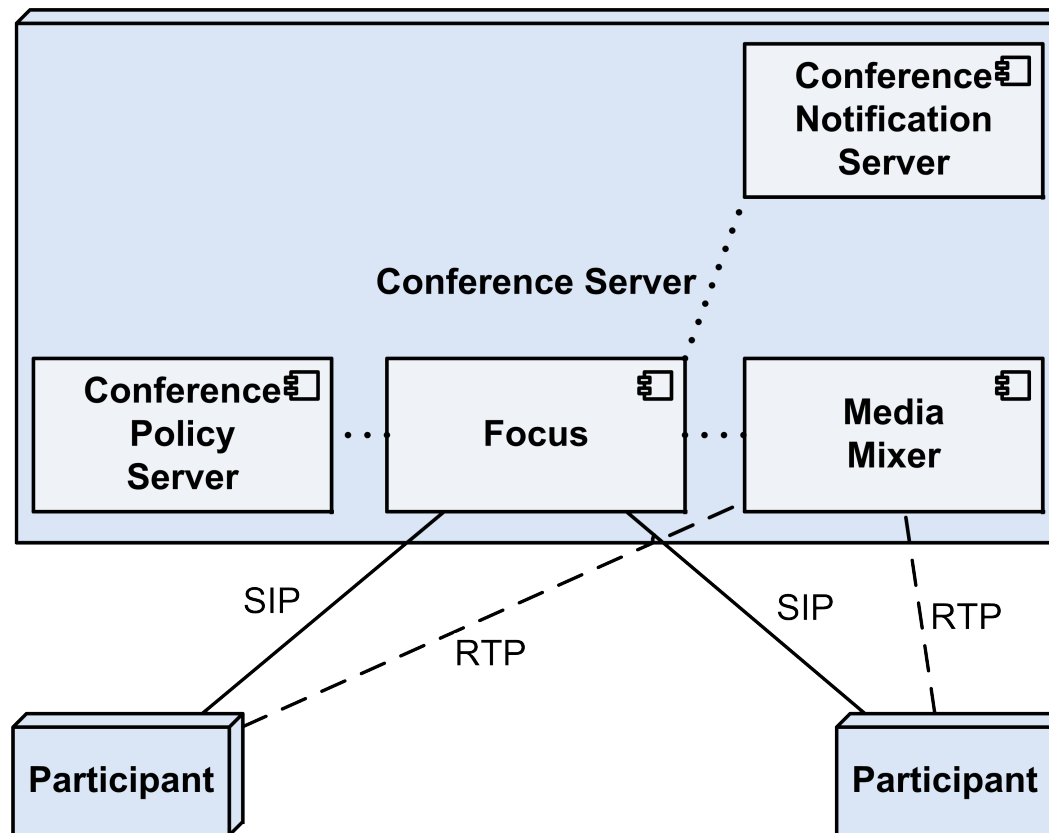
# Conferencing with SIP

- Commonly used multi-party model:
  - *tightly coupled conference*
- Central point of control called *focus*:
  - Conference-specific URI
    - ➔ e.g., sip:my-conf@domain.de
  - Negotiates media parameters
  - Provides dialogs
  - Media stream connectivity
  - Conference policy
  - Notification services



# Centralized Conferencing

- Central point of control and media mixing
- Dedicated application server



# Problem Statement

- Problem: Conference URI
  - ♦ *Identifies multi-party session*
  - ♦ Locates globally conference focus
    - Single point of failure
- Goal: Transparent focus distribution:
  - ♦ *Identifier/locator split* for the conference URI
  - ♦ Multiple peers act as focus
  - ♦ Identifier remains, routing distributed

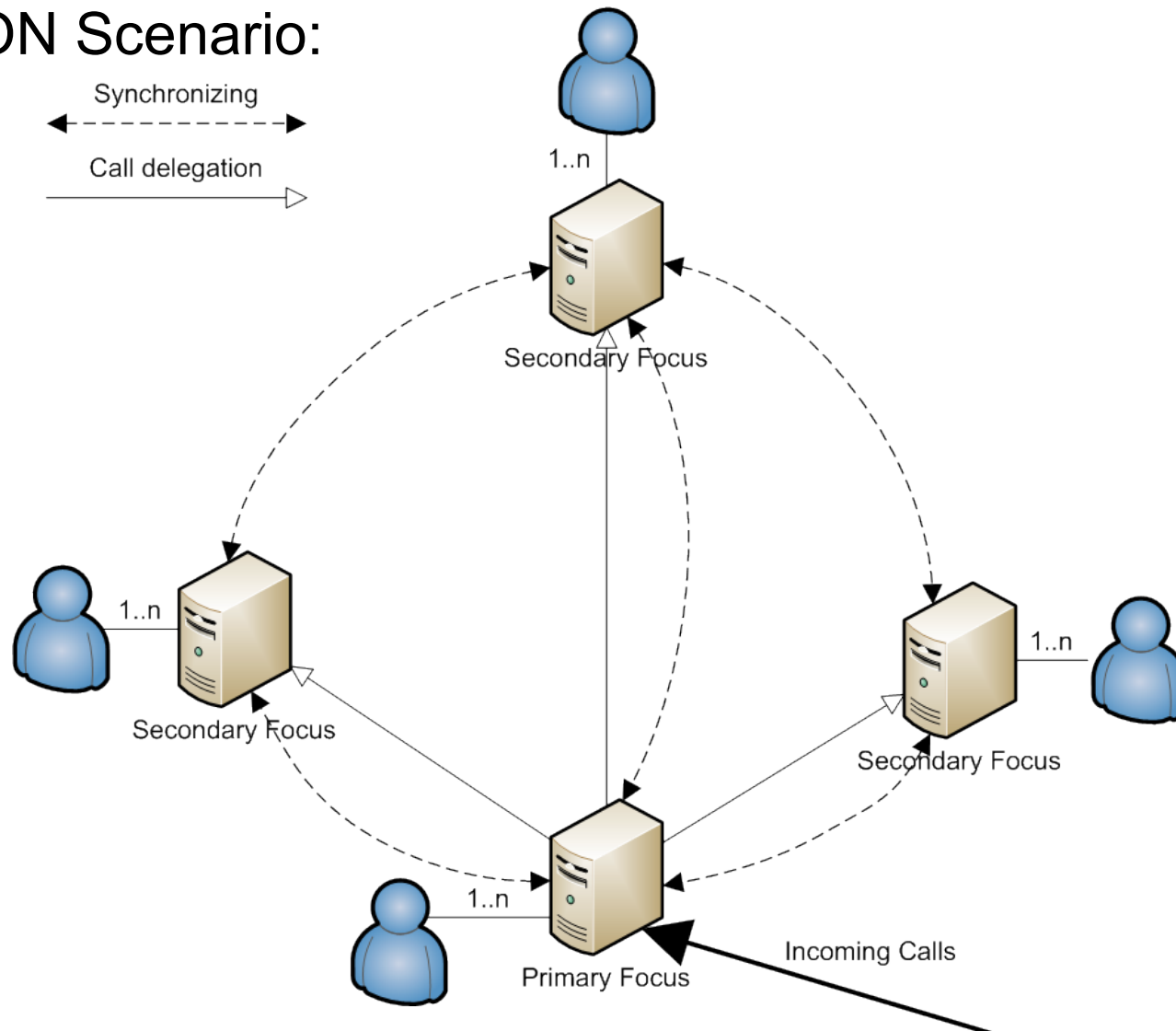


# Scalable Distributed Conferencing (SDCON)

- Adaptively distributing conference control
  - ♦ *Primary Focus* → Conference initiator
  - ♦ *Secondary Focus* → Controller on demand
- Call delegation to remote focus
  - ♦ Balancing load among focus peers
- Extending conference event package
  - ♦ Consistent view to overall conference
- Focus Discovery
  - ♦ Detect secondary focus peers among participants

# SDCON Topology

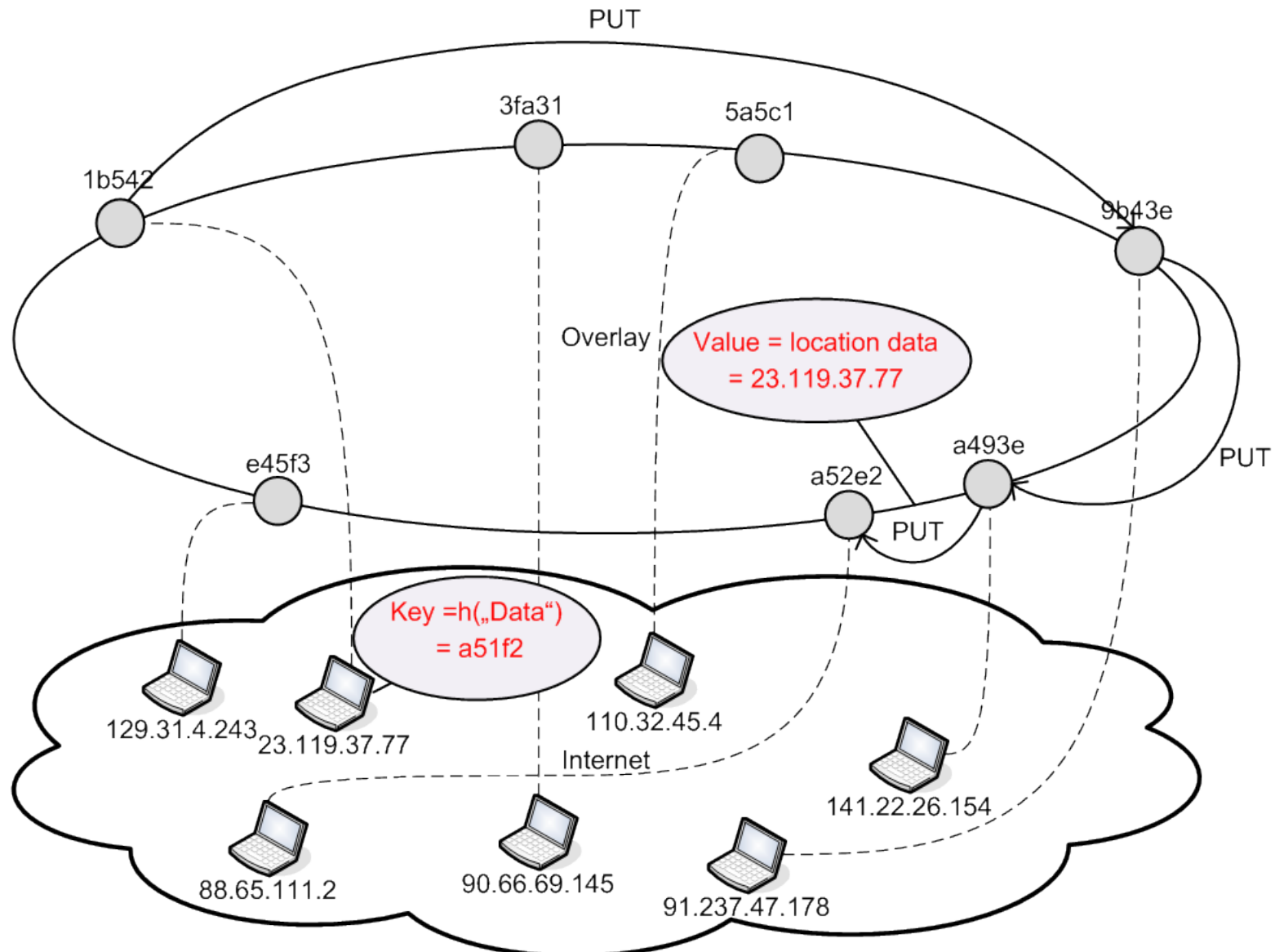
- SDCON Scenario:



# Structured P2P Overview

- Content and Nodes mapped into same flat address space
- Nodes responsible for subset of addresses (DHT)
- Overlay ID generated by hash-functions
  - ♦ E.g. ,  $\text{hash}(\text{"Data"}) \rightarrow \text{a51f2} = \text{key}$  for data
  - ♦ *Value* stored at node responsible for this key
- Basic overlay operations:
  - ♦ Join  $\rightarrow$  Join the overlay
  - ♦ Put  $\rightarrow$  Add a resource
  - ♦ Get  $\rightarrow$  Retrieve value
  - ♦ Leave  $\rightarrow$  Exit the overlay

# P2P Overlay Overview



# Conference ID Virtualization

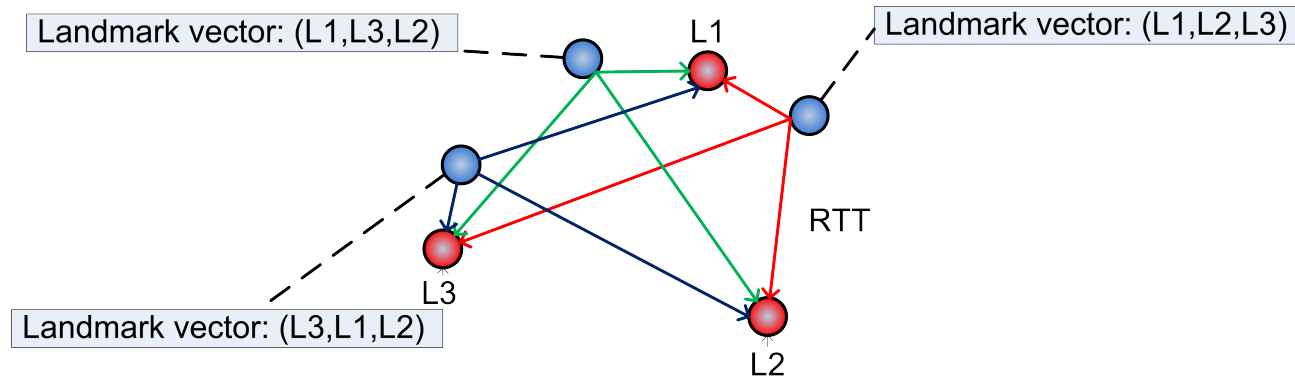
- Using Service Overlay Network
  - Lookup function for resolving SIP URIs
    - *No dependency* on proxy/registrar server
  - Storing Conference URI in Overlay:
    - *Located by overlay* instead of single focus
    - *Multiple entry points* to the conference
  - Potential Secondary Focus announce their capabilities
    - *Accelerated focus discovery*
  - Exploiting overlay proximity awareness
    - *Optimized conference topology*

# Virtualization of the Conference

- Virtualizing the conference
  - ♦ Conference URI stored in overlay
  - ♦ Indicating multiple *entry points* to the conference
  - ♦ Participant chooses entry point by proximity and capacity
- Improves resilience and durability for a conference
  - ♦ Compensation at focus departure
  - ♦ Conference continues while focus peers are available

# Exploiting Proximity Awareness

- Location-based Identifier, e.g., from *Landmarking*

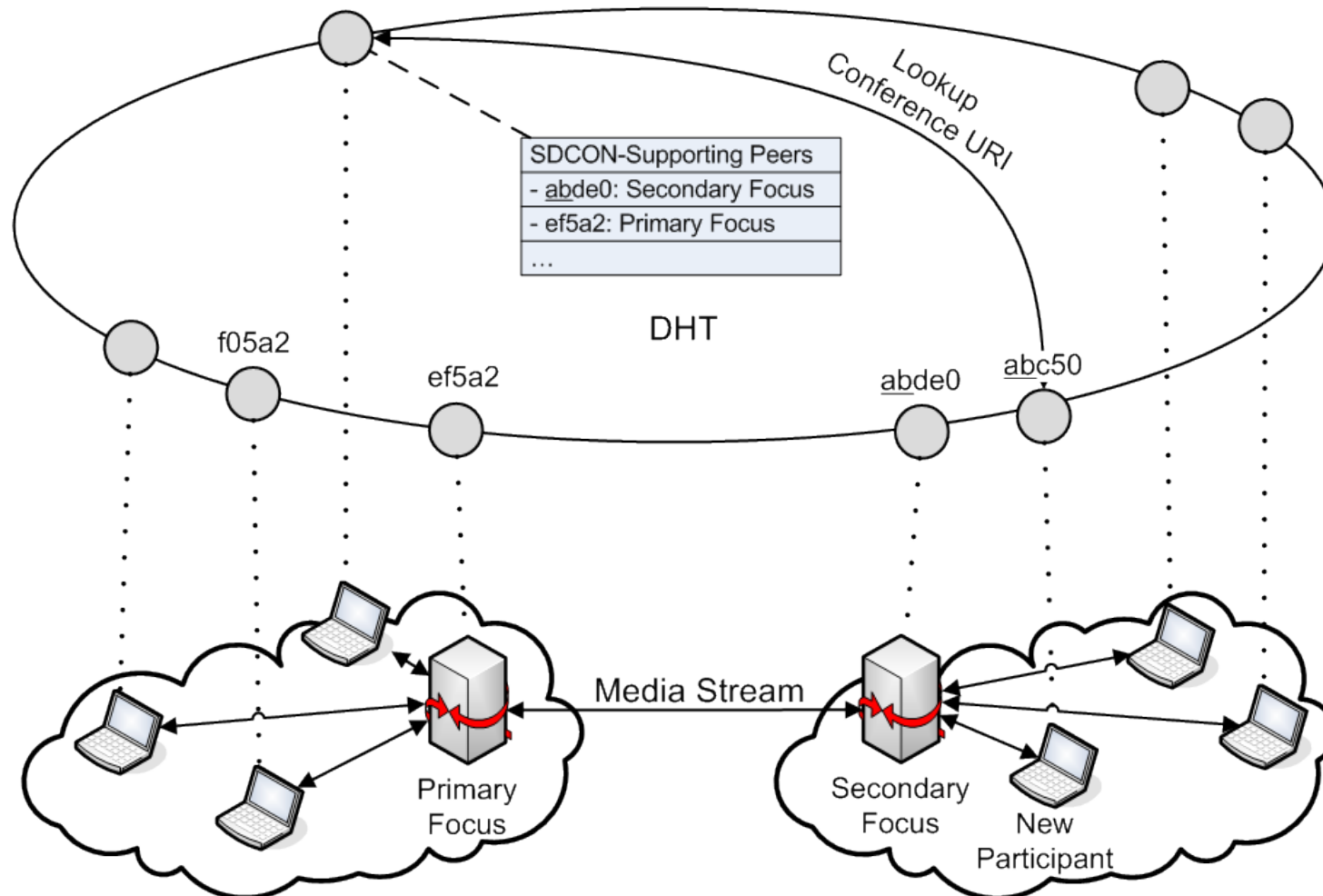


- Conference peers mutually estimate proximity from IDs
- Self-optimizing conference topology
  - Participants in dialog close to focus
  - Activate new focus peers near recently joined members



# Proximity-aware Focus Selection

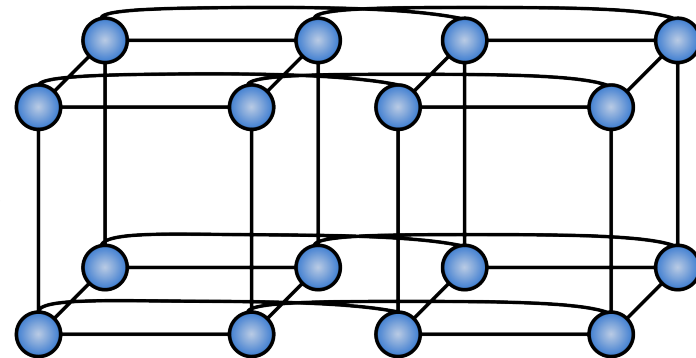
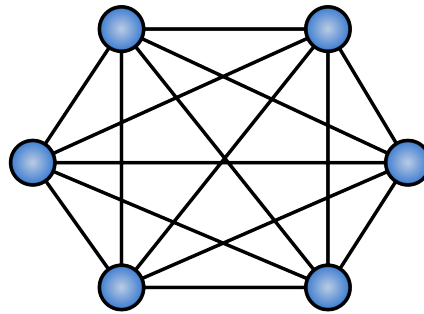
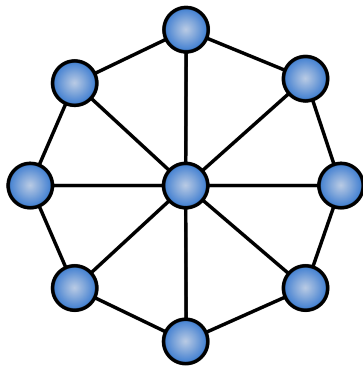
- Virtual Conference Example:





# Media Mixing & Routes

- Media stream routes follow signaling routes
  - ♦ Optimizing bandwidth usage
  - ♦ Distributing computing effort
- Building inter-focus meshes
  - ♦ Short diameter, degree and symmetric



# Summary

- Transparent focus Identifier/Locator split
- Independent of proxies/registrars
- Virtual conference among multiple focus peers
- Optimized conferencing topology by proximity awareness
- Distributed media mixing and efficient routes

# Infrastructure Independent Conferencing

Thanks for your attention!

Questions?