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SIP in the Transition to next Generation Networks: Covering the Gap between IPv4 and IPv6

Dorgham Sisalem & Jens Fiedler
Fraunhofer Institute Fokus
Berlin, Germany

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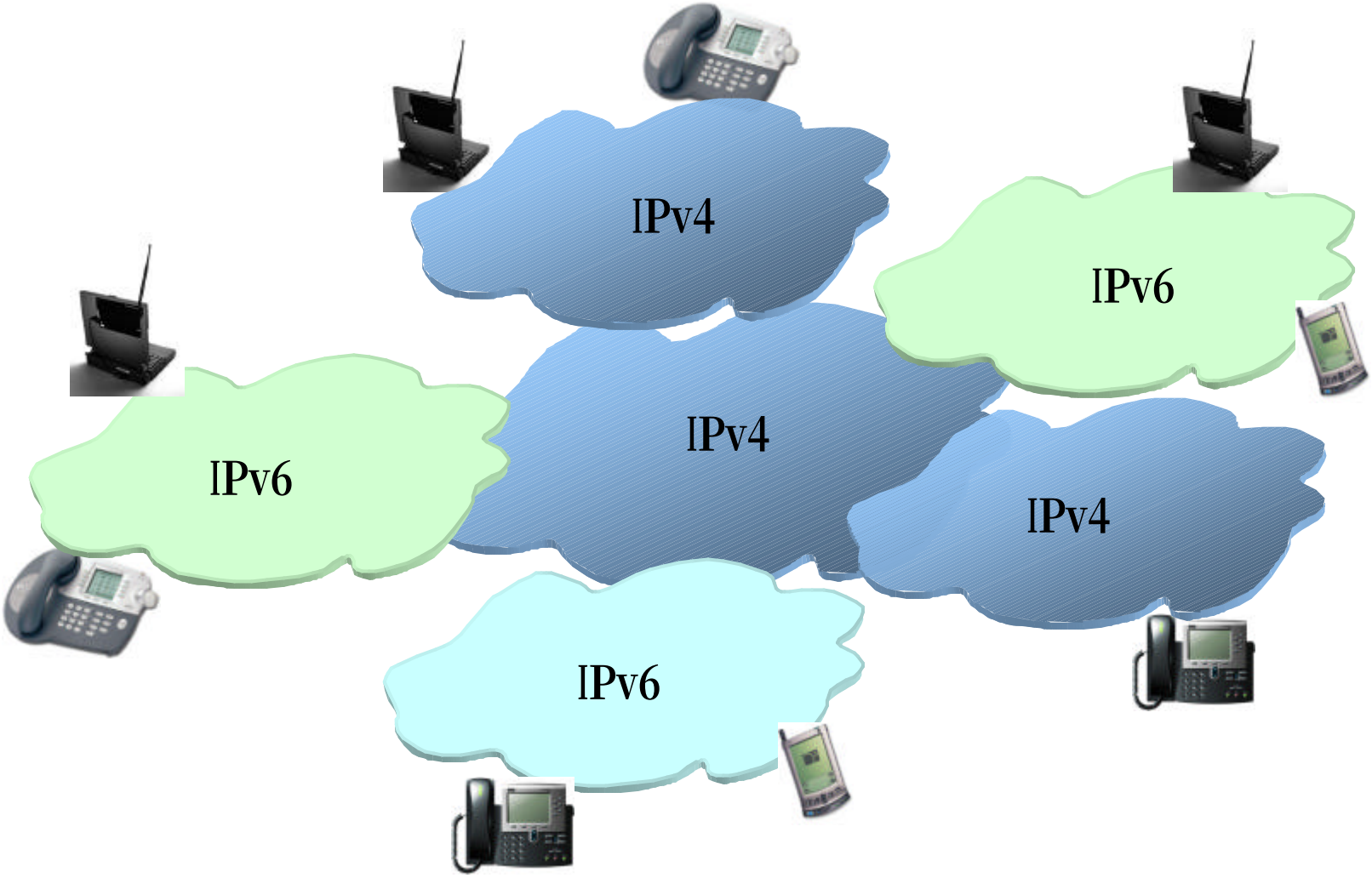
Fraunhofer Fokus

- The Fraunhofer-Gesellschaft is the national research body in Germany
- One of the leading organizations for institutes of applied research in Europe, undertaking contract research on behalf of industry.
- At present, the organization maintains 56 research establishments at locations throughout Germany of which 16 work on networking and communication issues (total staff: some 11,000).
- The research establishment FOKUS is located in Berlin and has more than 200 employees divided in 8 competence centers.
- Activities SIP, QoS, multimedia and mobile communication, accounting, AAA and measurement.

Why Move to IPv6?

- Next generation networks are said to be IPv6 capable. Why?
  - Support for nearly endless range of addresses
    - Remember even toasters and light bulbs in remote villages in China will be connected to the internet in the brave new world of NGN
  - Supposedly better support for QoS and routing
  - Simpler configuration and better methods for discovering servers
  - Remove the need for network address translators

Towards NGN Networks



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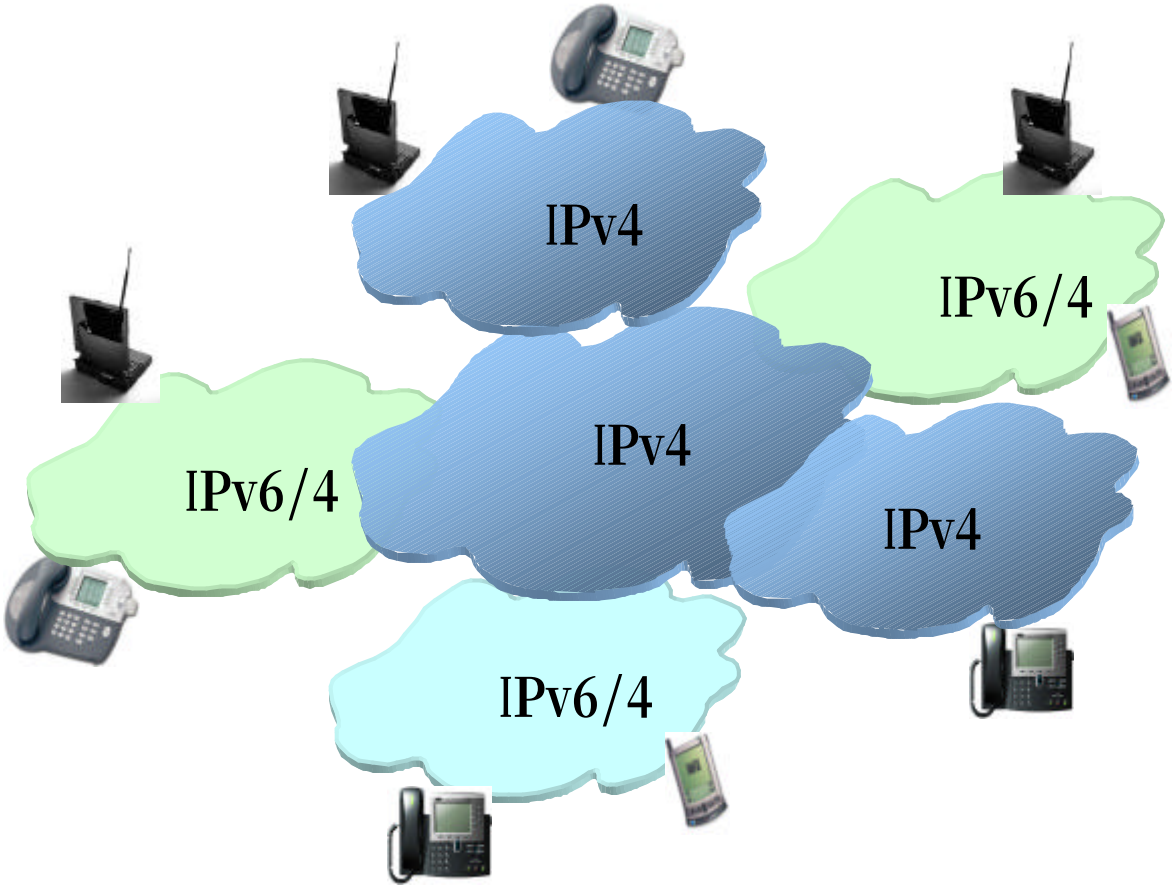
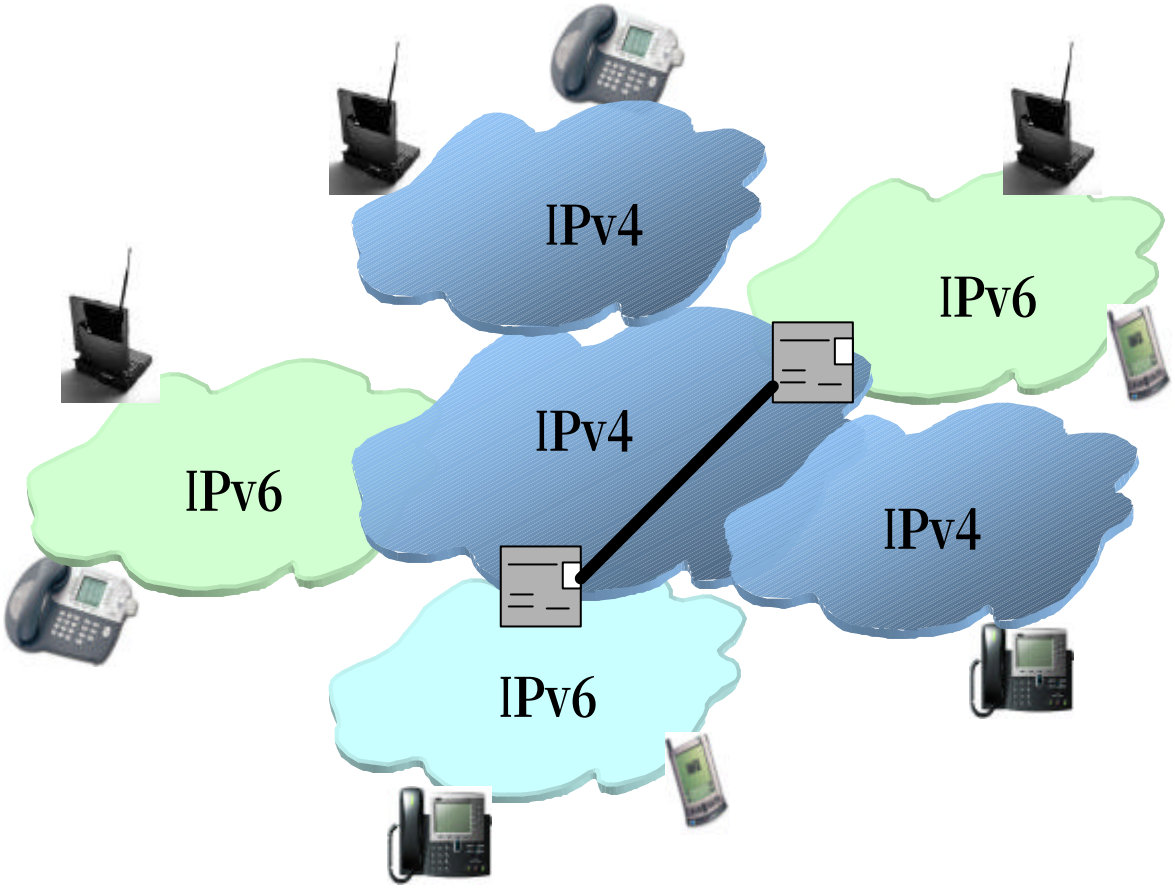
Towards NGN Networks: Dual Stack



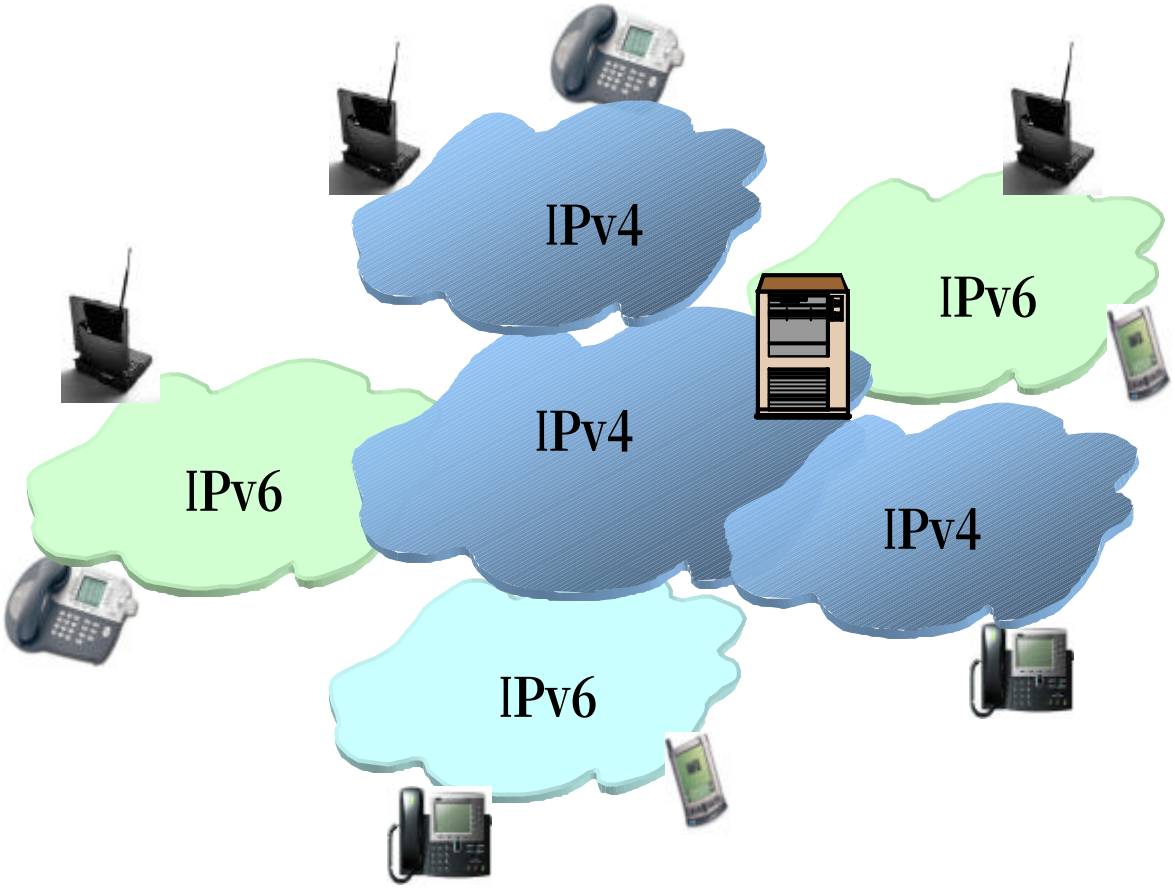
- IPv6 devices support also IPv4
  - Requires IPv4 and IPv6 addresses for the end systems
  - Networks need to support both IPv4 and IPv6 routing
  - Applications need to coupe with IPv4 and IPv6 messages

Towards NGN Networks: Tunneling



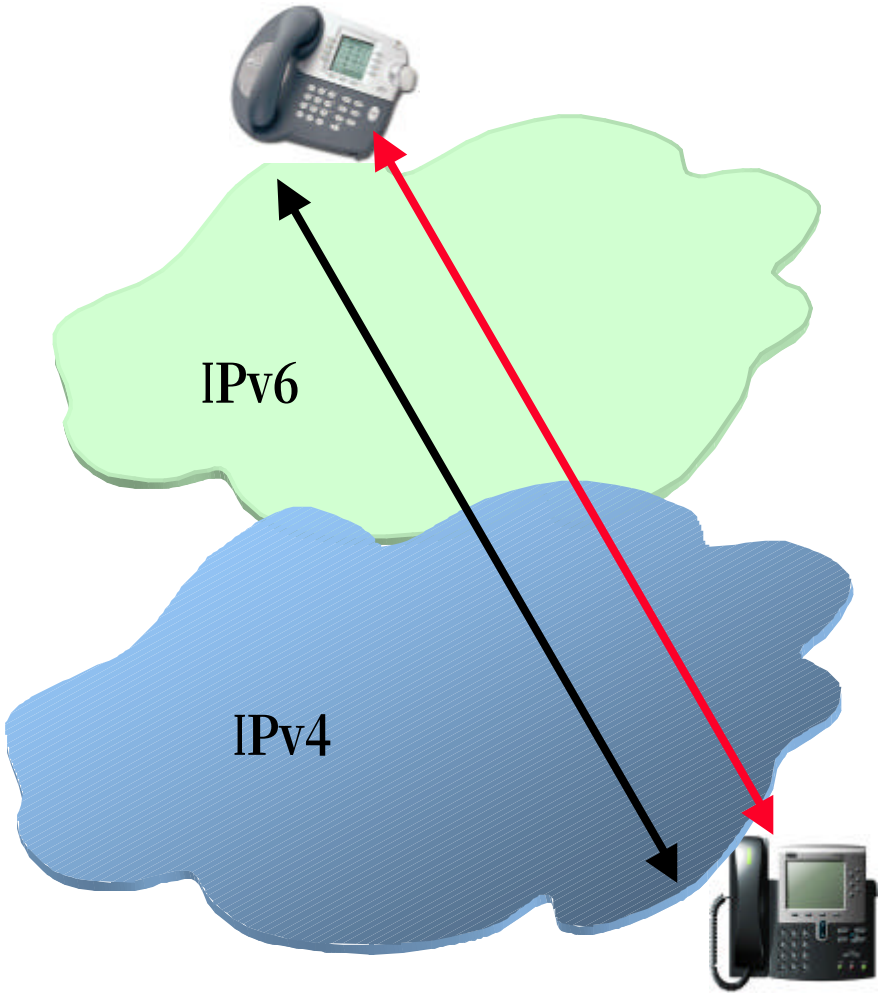
- Carry IPv6 messages as IPv4 packets
  - Administrators nightmare
  - Only for connecting islands of IPv6

Towards NGN Networks: Translation



- Dedicated gateways translate packets from IPv4 to IPv6 and vice versa
  - Same problems as NATs, however, limited to network borders
  - Simpler networks (need only to support one IP version)
  - Simpler end systems and applications

SIP and IPv6



- Need end applications capable of IPv6
- Need proxies and registrars capable of understanding IPv6
- Need support for appropriate transition mechanisms for exchanging media and SIP signaling

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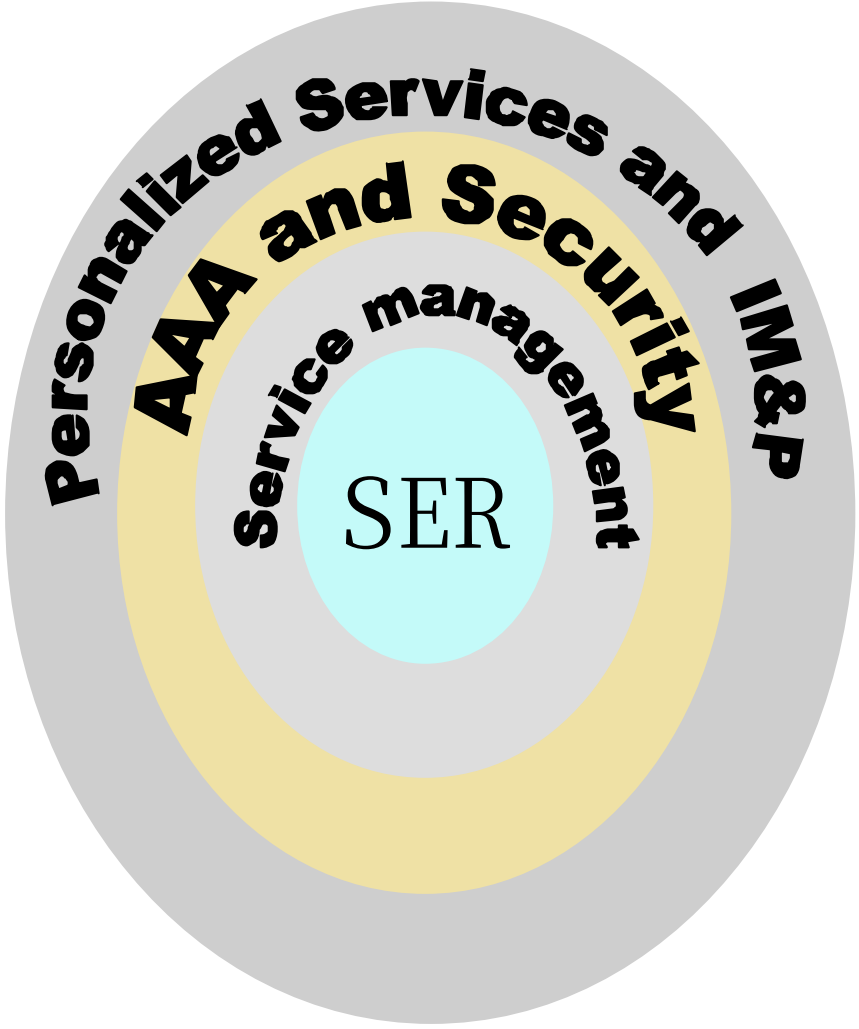
IPv6 Capable SIP Infrastructure



- Implementation based on the SIP Express Platform:
  - Open source
  - Provides enhanced SIP functionalities with proxy, redirect, registrar and location management
  - Efficient implementation
  - Distributed and modular architecture
  - SMS, JABBER, IM&P support

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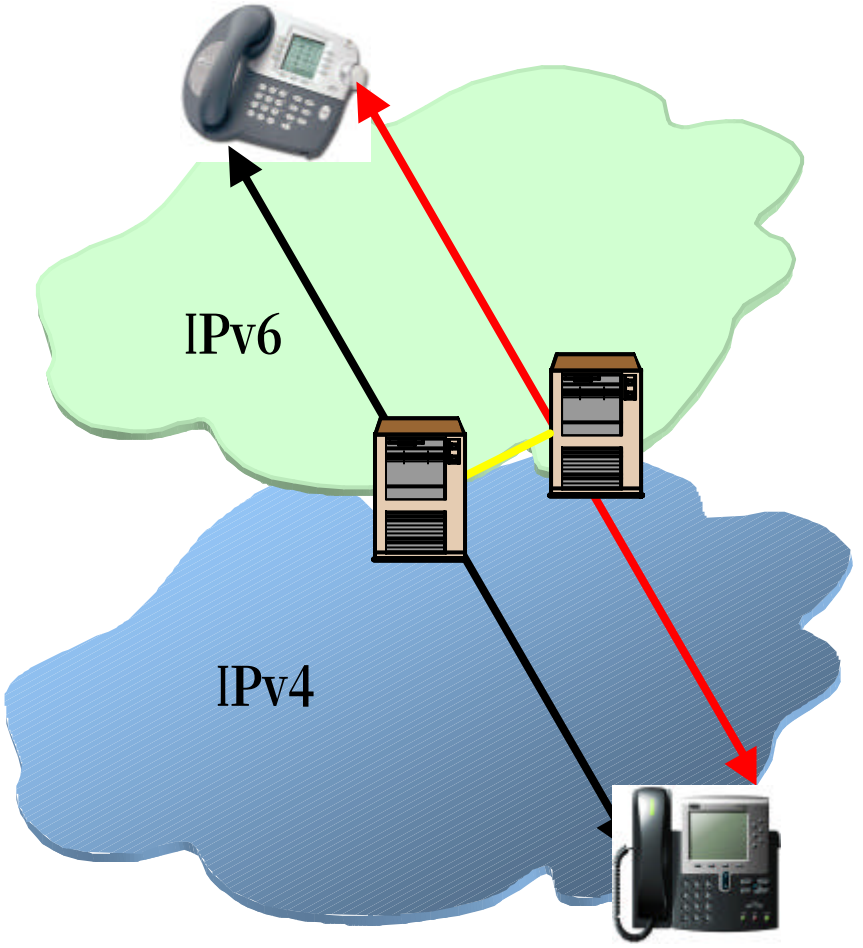
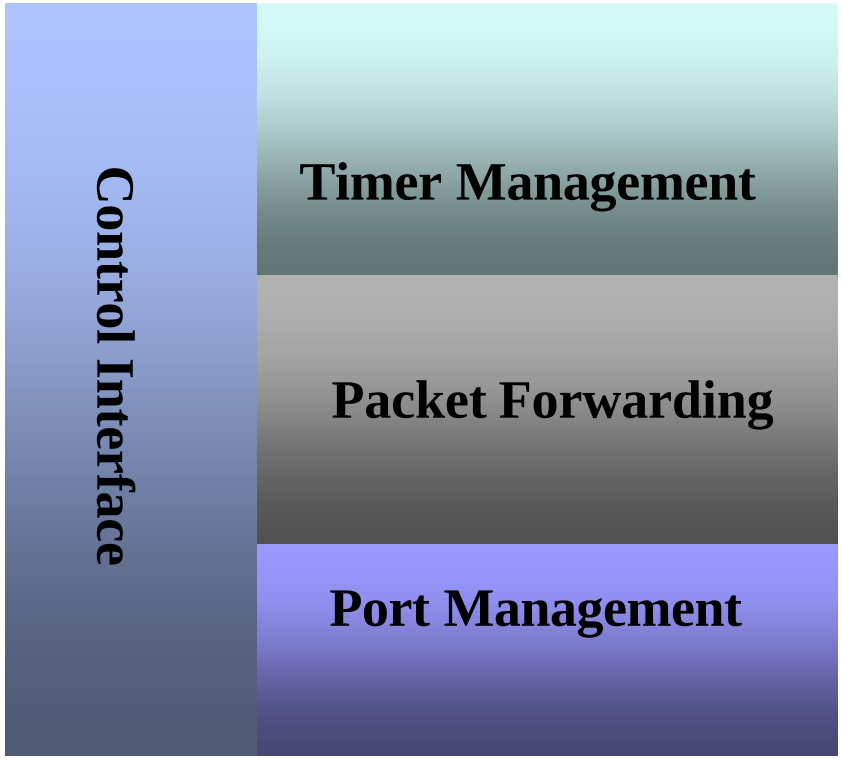
SIP in Heterogeneous Environments: Problem Statement

- Media translation
  - Translate RTP packets between v4 and v6
  - Translate RTCP packets between v4 and v6
  - Manage several connections (UDP sockets) in parallel
- Signaling translation
  - Translate the SIP IP addresses between v4 and v6
  - Adapt possible included addresses
    - Request-URI, Contact, Via, (Record-)route
  - Adapt addresses in the SDP body
- Signaling-Media coordination
  - Request RTP/RTCP forwarding
  - Collect the assigned ports for SDP modification



Media Translator

- Move UDP packets between IPv4 and IPv6 sockets
- Create/destroy the necessary ports for RTP and RTCP
- Interact with the SIP proxy
- Administrate connection-timers for soft state



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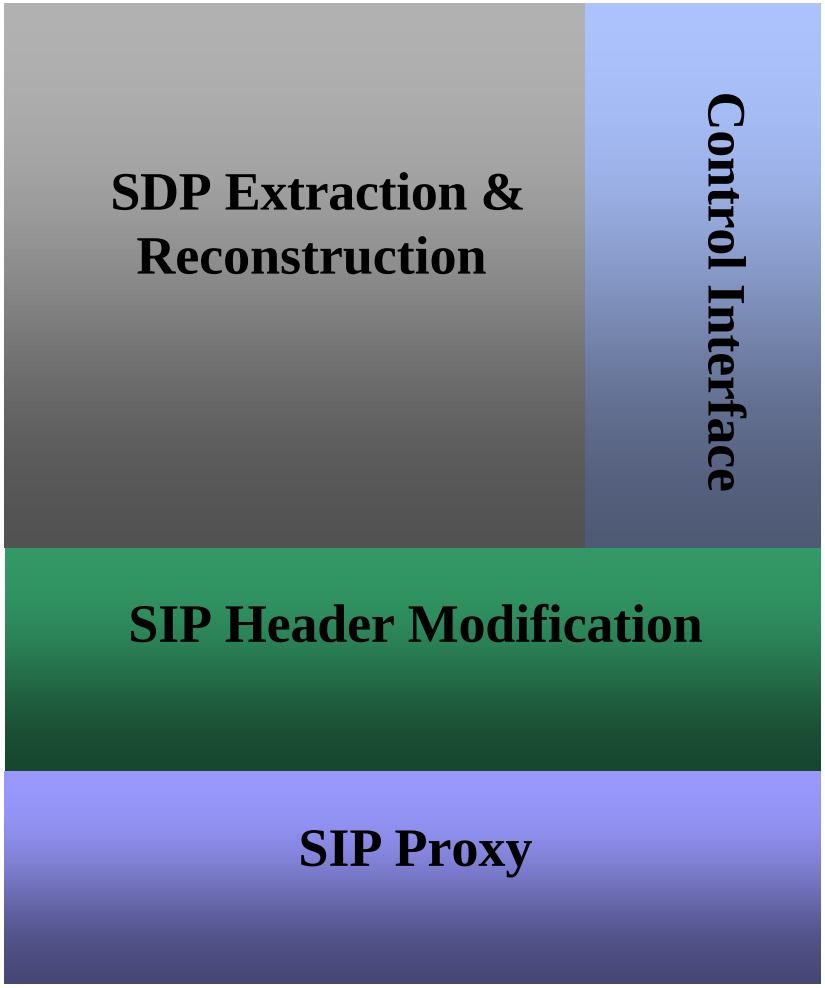
SIP Interprotocol Proxy

- Alter SIP headers
  - Adapt Request-URI, Via, Contact, (Record-)Route
- Alter SDP parts (o, m, c)
- Proxy SIP messages
- Interaction with the media translator :
  - realized with UDP messages
  - send map requests with terminal address & port
  - receive map result with proxy address & port in other protocol family



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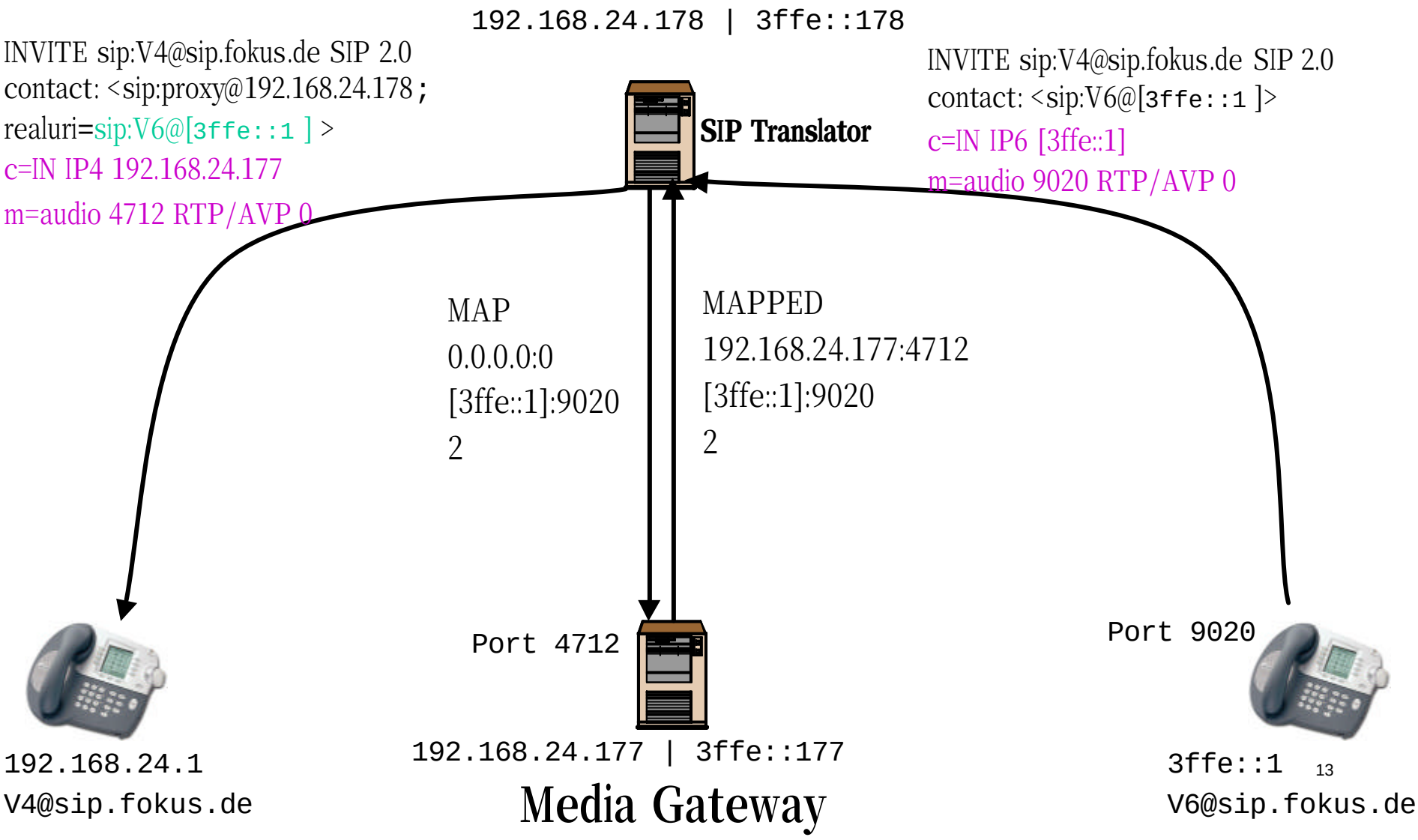
The Mapping Process (1)



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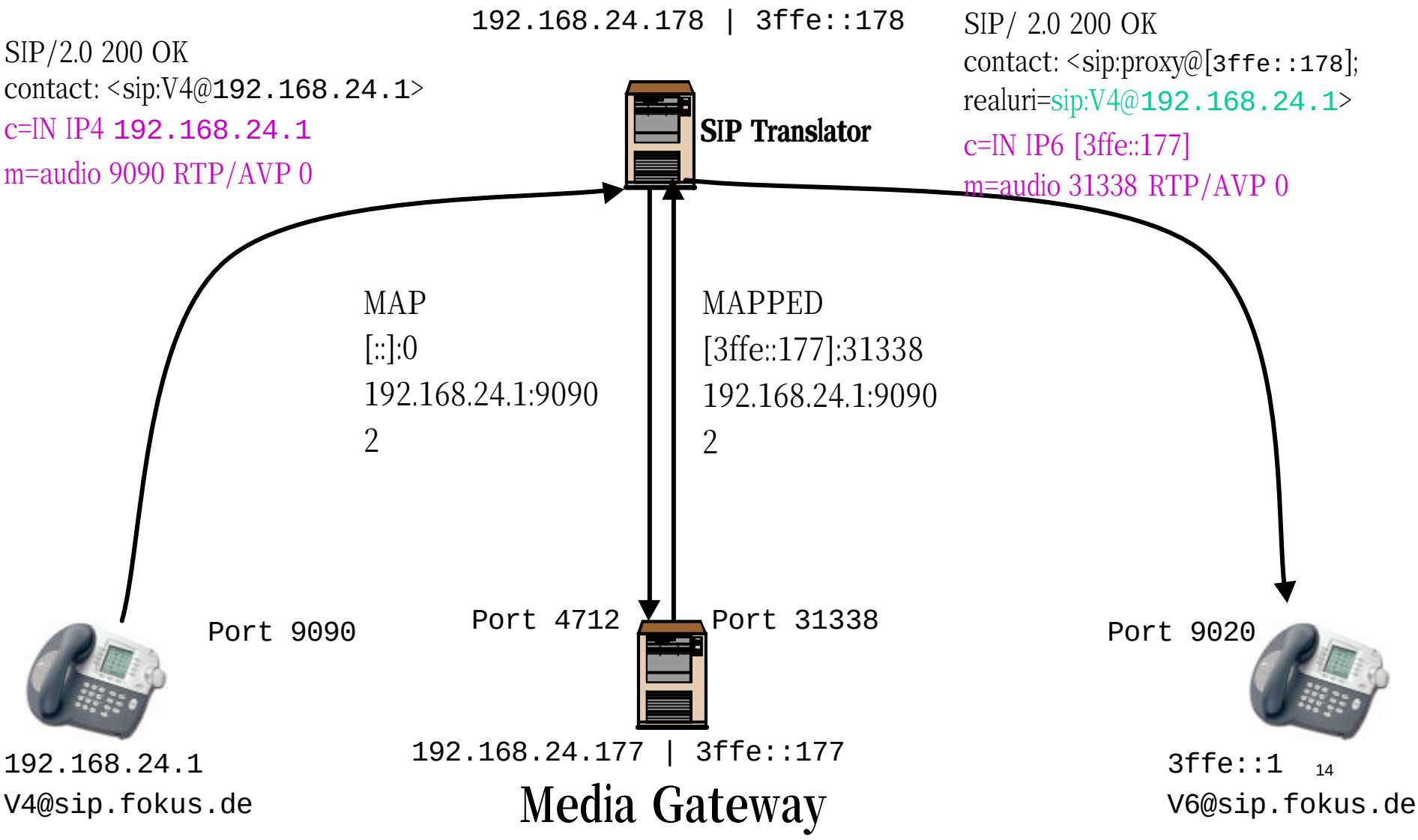
The Mapping Process (2)



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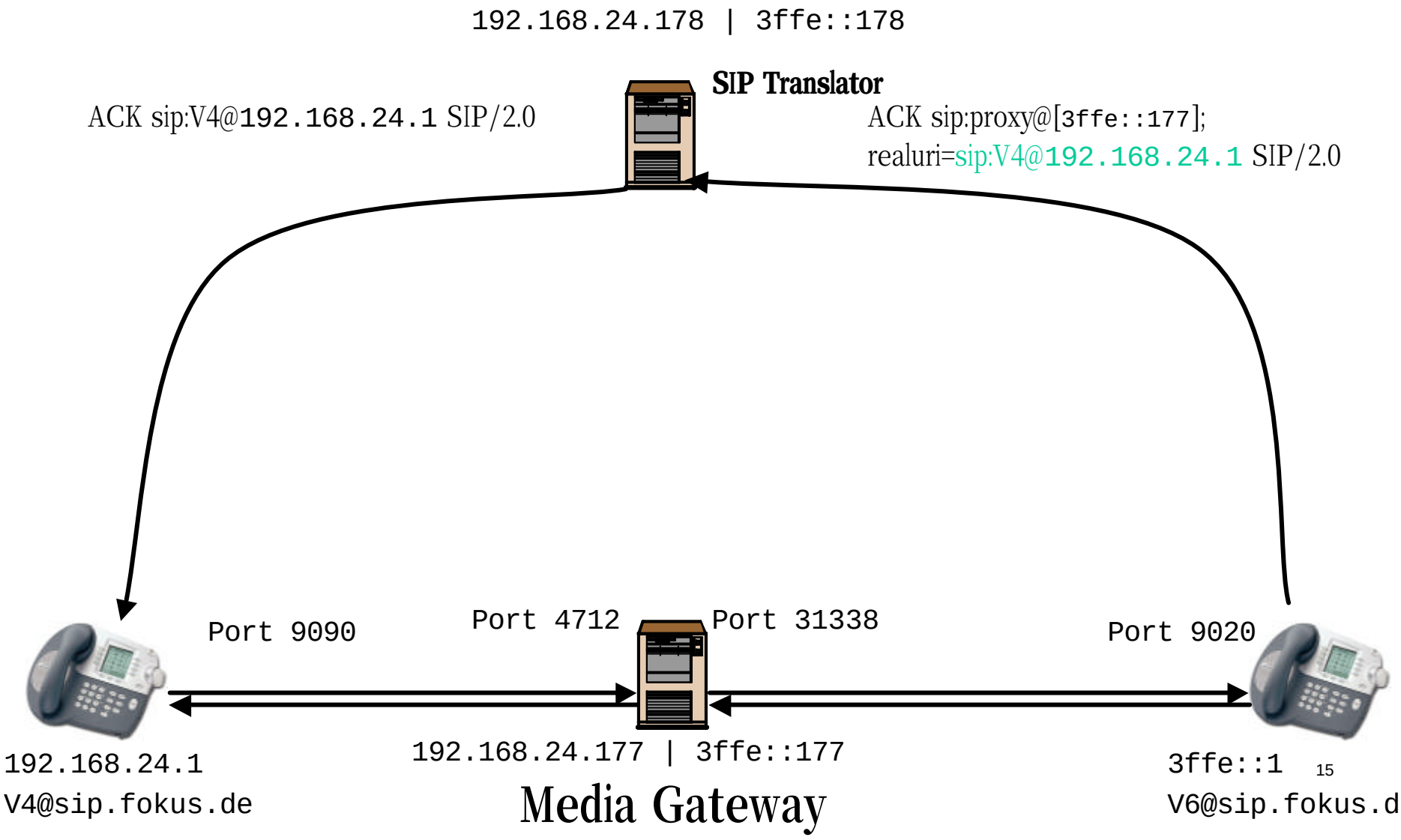
The Mapping Process (3)



Planned work

- Expand media translator to support multicast
- Add unmapping of RTP forwarding on call termination in addition to soft state
- Implement a more D.o.S attack safe method for mapping installation
- Do testing with other media (video)

Final Words

- First implementation ready and available from

  http://www.iptel.org

- Demo IPv6 capable UA available as well
- Work supported by Deutsche Telekom and further developed and to be deployed in European IPv6 network (6NET)

Thanks. Questions?