Hochschule für Angewandte Wissenschaften Hamburg
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H∀Mcast –
Future Internet made in Hamburg?

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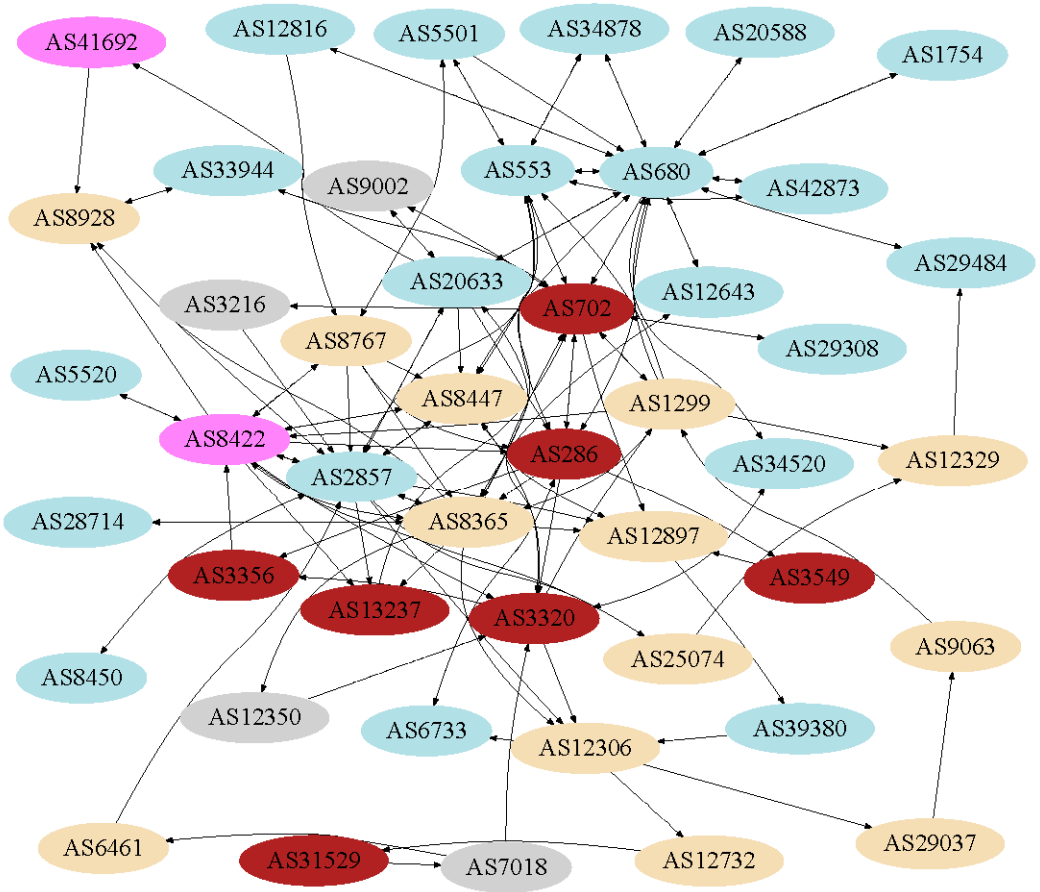
Forschungsschwerpunkt: IMS Interagierende Multimediale Systeme

Internet Technologies Group

Agenda

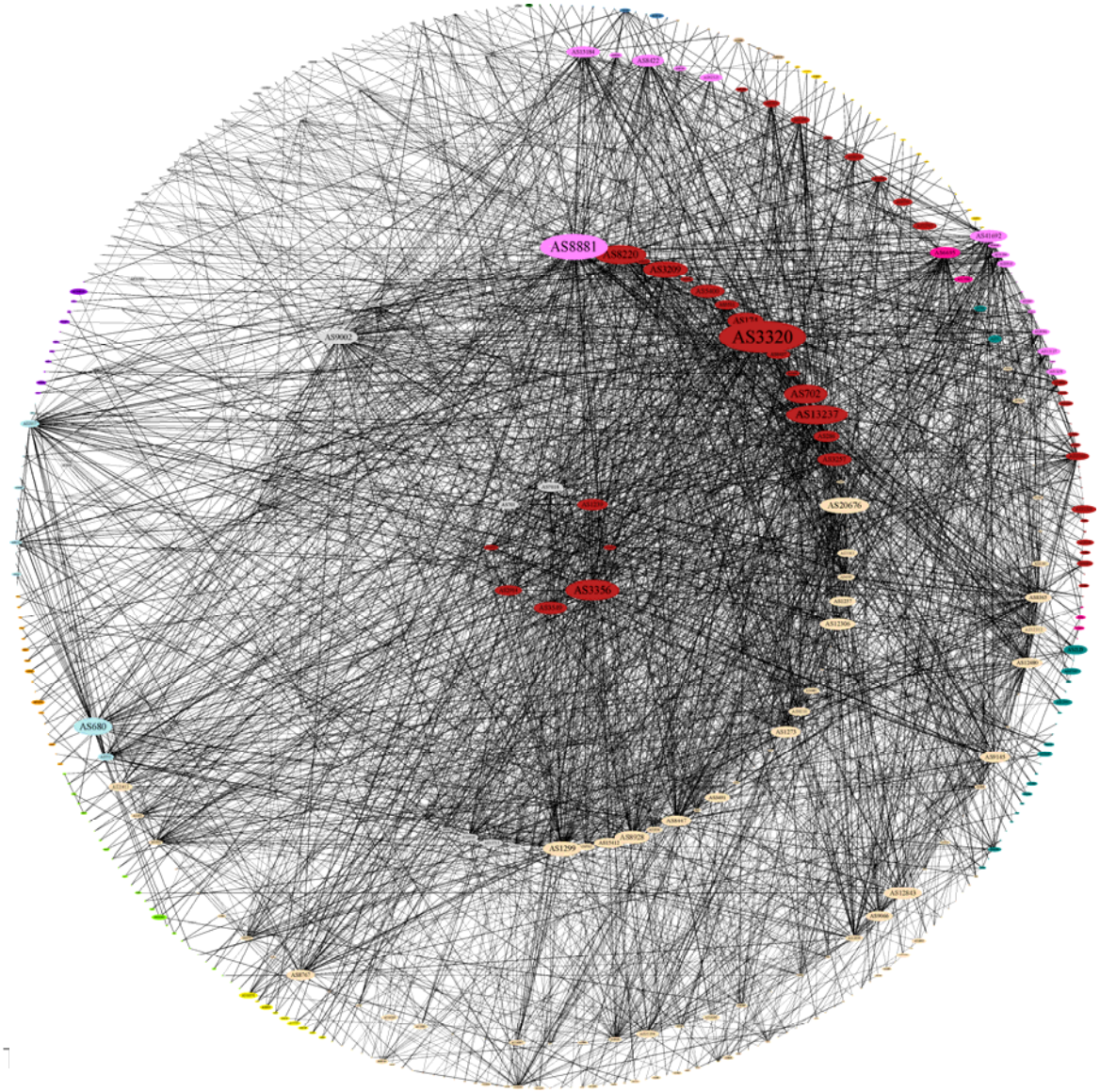
- Internet – was ist eigentlich gemeint?
- IP - Die Idee ist Teil des Problems
- Das H∀Mcast-Projekt
- Naming, Addressing & Programming
- Der H∀Mcast Systemansatz
- Resümee

Internet ???



Sonstiges: Wissenschaft, Forschung & Kultur (F&E)

Internet: Das Netz der Netze



Internet Protocol – Die Idee ist Teil des Problems

Die Kerninnovation des Internet Protokolls liegt in der Definition und Implementierung *einer* adaptiven Netzwerkabstraktion im Ende-zu-Ende Design.

- Anwendungen können überall kommunizieren
- Kommunikation nutzt implizit die Leistungskraft der zugrunde-liegenden Übertragungstechnologien, ohne explizit nach ihren Merkmalen gestaltet zu sein.

Problem: Die Einzigartigkeit – Änderungen sind kaum möglich, ohne das Gesamtkonzept aufzugeben.

Internet – Kontroverse Zukunft

"IP was the first "overlay network" designed from scratch to bring heterogeneous networks into a common, world-wide "network of networks" [...] Through a series of tragic events the Internet is gradually being taken back into the control of providers who view their goal as limiting what end users can do, based on the theory that any application not invented by the pipe and switch owners is a waste of resources. "

David Reed, May '07

Hybrid Adaptive Mobile Multicast - H∀Mcast

- Weg der Internet-Evolution:
  Konzept & prototypische Lösung
  - Erhöhe Intelligenz auf den Endsystemen/an den „Rändern“ des Internets
  - Abstrahiere von den Technologien im Kern des Internets (Deployment Status)
- G-LAB Forschungsprojekt im BMBF-Fachprogramm
- 09/09 – 08/12 – ca. 500 T€ für HAW

H∀Mcast: Starting Point and Objectives

Internet Layer is a mono-architecture

- IP forms the unique end-to-end abstraction
- Socket-API generates universal binding

➨ IPv4, Unicast vs. IPv6, Multicast vs. Mobility, ???

Objective: Evolutionary widening of the architecture heading towards a Multiservice Internet

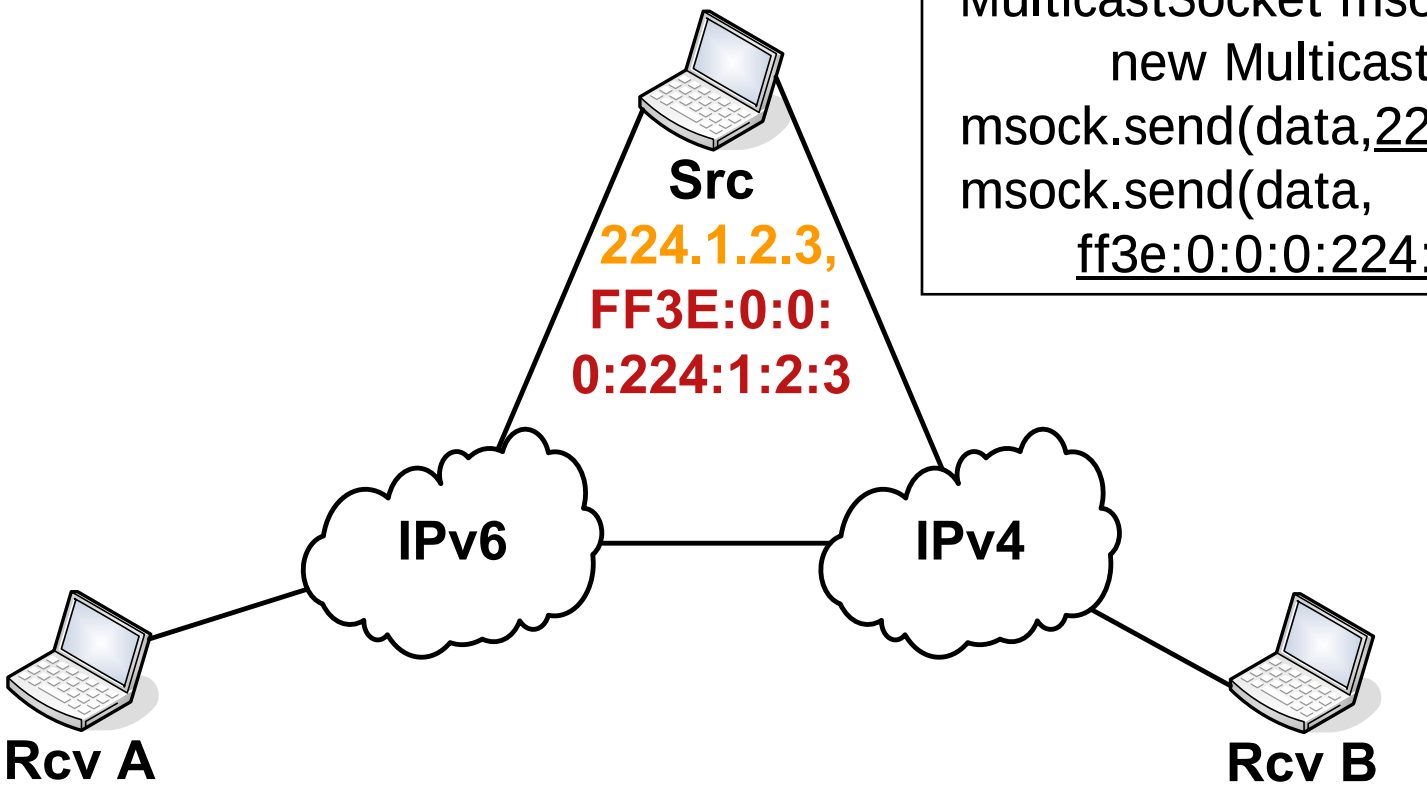
- Abstraction of the Socket API
- Increased, heterogeneous network functions at end systems
- Optional gateways (explicit and implicit)

➨ Open up an option of gradual, incremental service deployment

➨ Exemplary component: Multicast

Multicast Application Implementation – Early Binding

```
MulticastSocket msock =
        new MulticastSocket();
msock.send(data,224.1.2.3);
msock.send(data,
      ff3e:0:0:0:224:1:2:3);
```

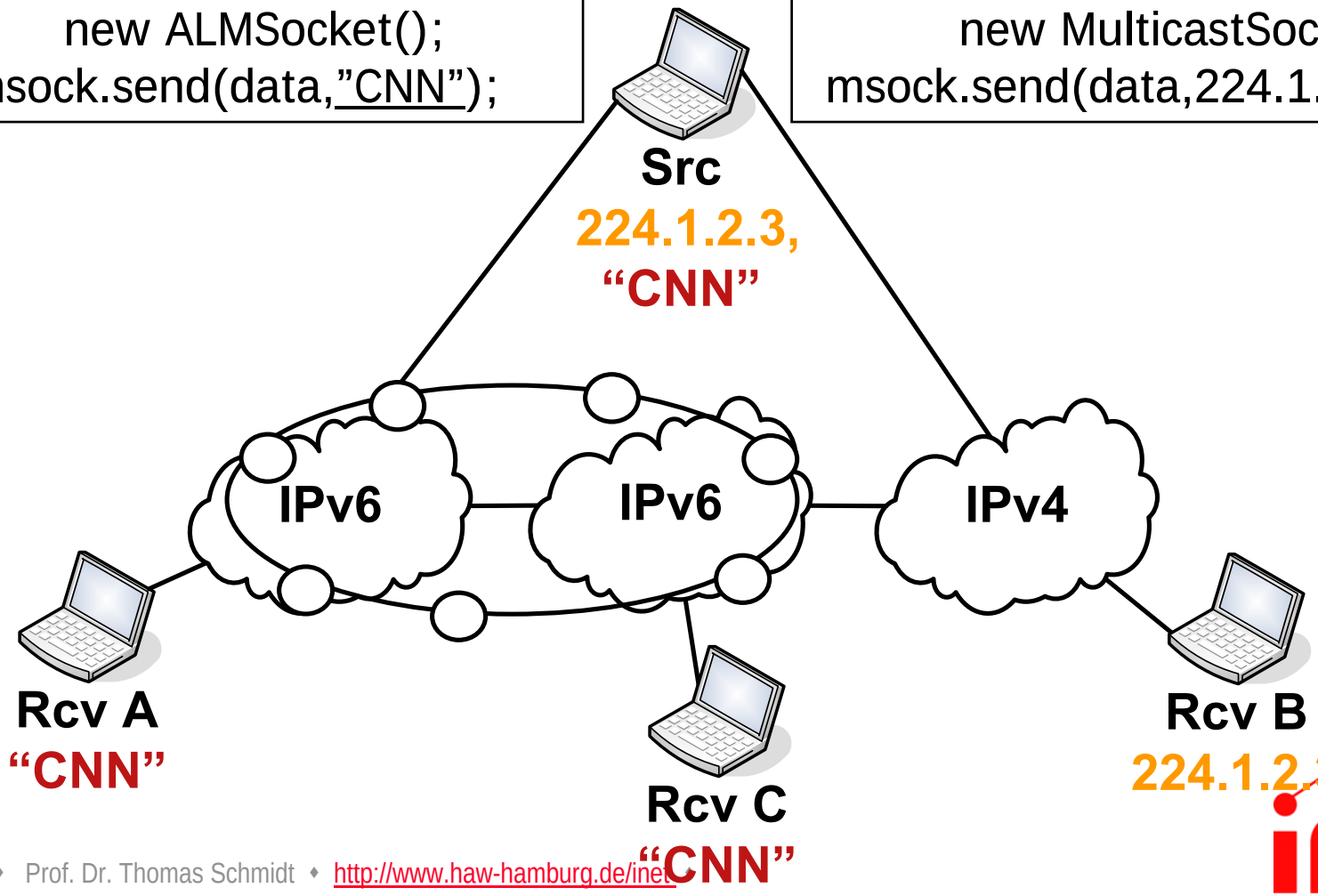


Additional problem:
No global multicast deployment

Multicast Application Implementation (2)

```
ALMSocket almsock =
        new ALMSocket();
almsock.send(data,"CNN");
```

```
MulticastSocket msock =
        new MulticastSocket();
msock.send(data,224.1.2.3);
```



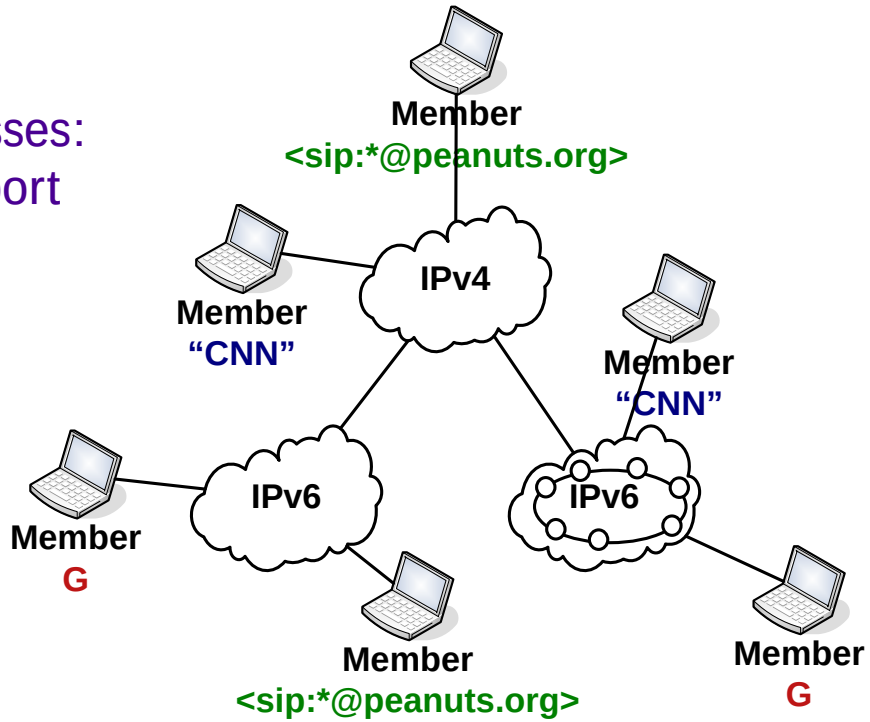
Naming and Addressing

"Multicast addresses are a set of distributed application names"

John Day (Patterns in Network Architecture)

Just use any application name?

- Problem of mapping to network addresses: out of control without namespace support
- Domains may run same technology but remain isolated
- Domains may run distinct technologies but host members of the same group
- High-level meta data type easy for programmers
- Proposal: Use abstract, namespace-aware data type - URIs for late binding + new API



Proposed URI Scheme

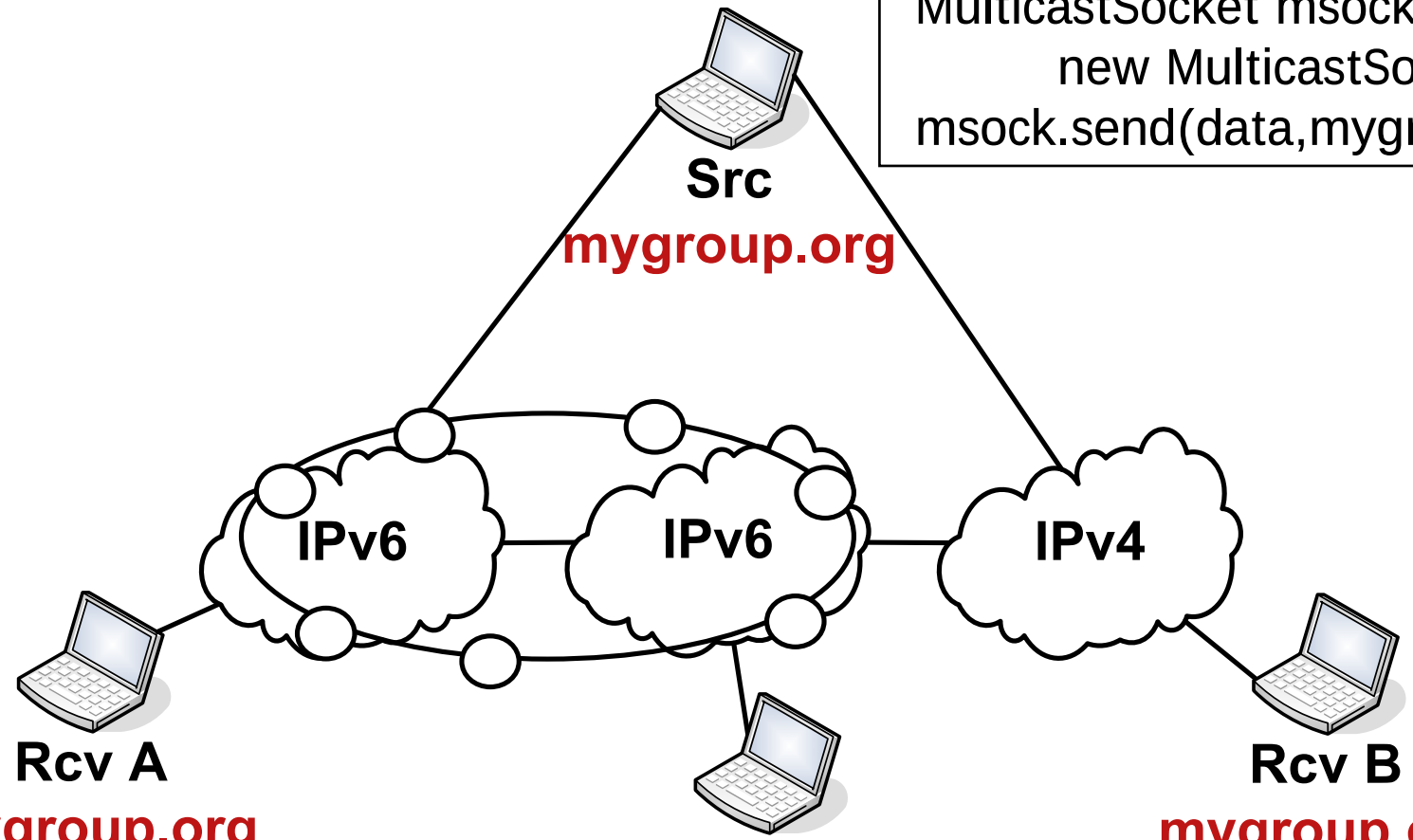
`scheme "://" group "@" instantiation`
`":" port "/" sec-credentials`

- `scheme`: specification of assigned ID
- `group`: identifies the group
- `instantiation`: ID of the entity that generates the instance of the group (SSM source, RP, overlay node)
- `port`: ID of a specific application at a group instance
- `sec-credentials`: optional authentication

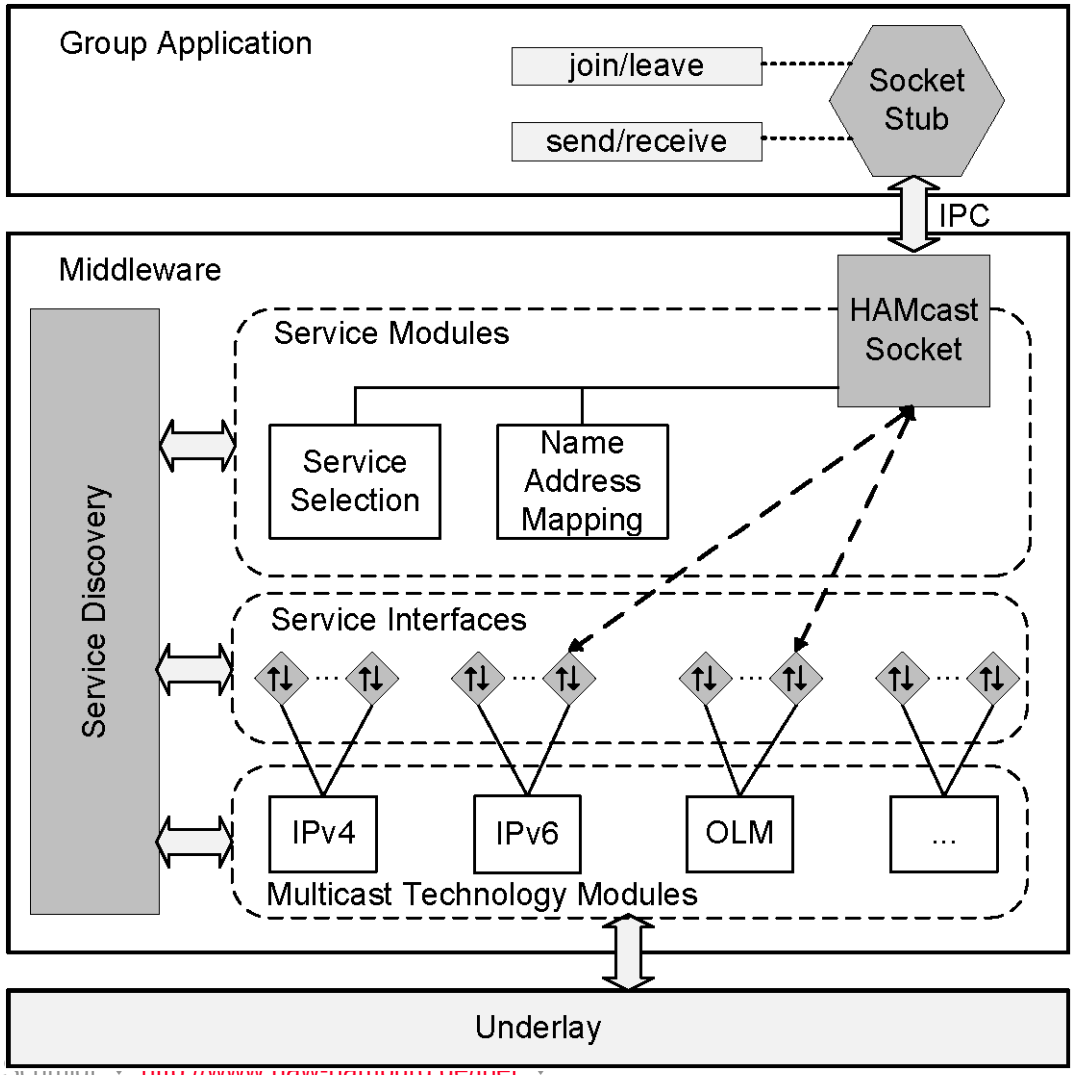
Example: ip://224.10.20.30@1.2.3.4:5000/groupkey

Common Multicast API – Late Binding

```
MulticastSocket msock =
        new MulticastSocket();
msock.send(data,mygroup.org);
```



Der H∀Mcast Systemansatz



Resümee

- Wir basteln am größten technischen System der Welt – autsch!
- Unser Ziel: Konzepte richtig denken *und* in praktikable Lösungen führen
- Unser Weg zur Praxis:
  - G-LAB Experimentalplattform
  - IETF/IRTF Standardisierung, s. `draft-waehlisch-sam-common-api`

Vielen Dank!

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