

# Decentralized and Autonomous Bootstrapping for IPv6-based Peer-to-Peer Networks



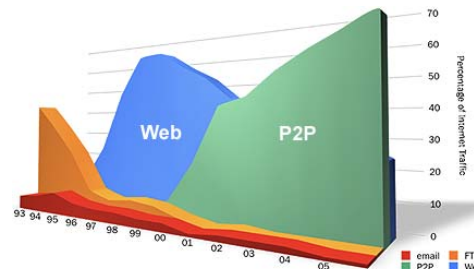
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IPv6 Contest – 2nd German IPv6 Summit  
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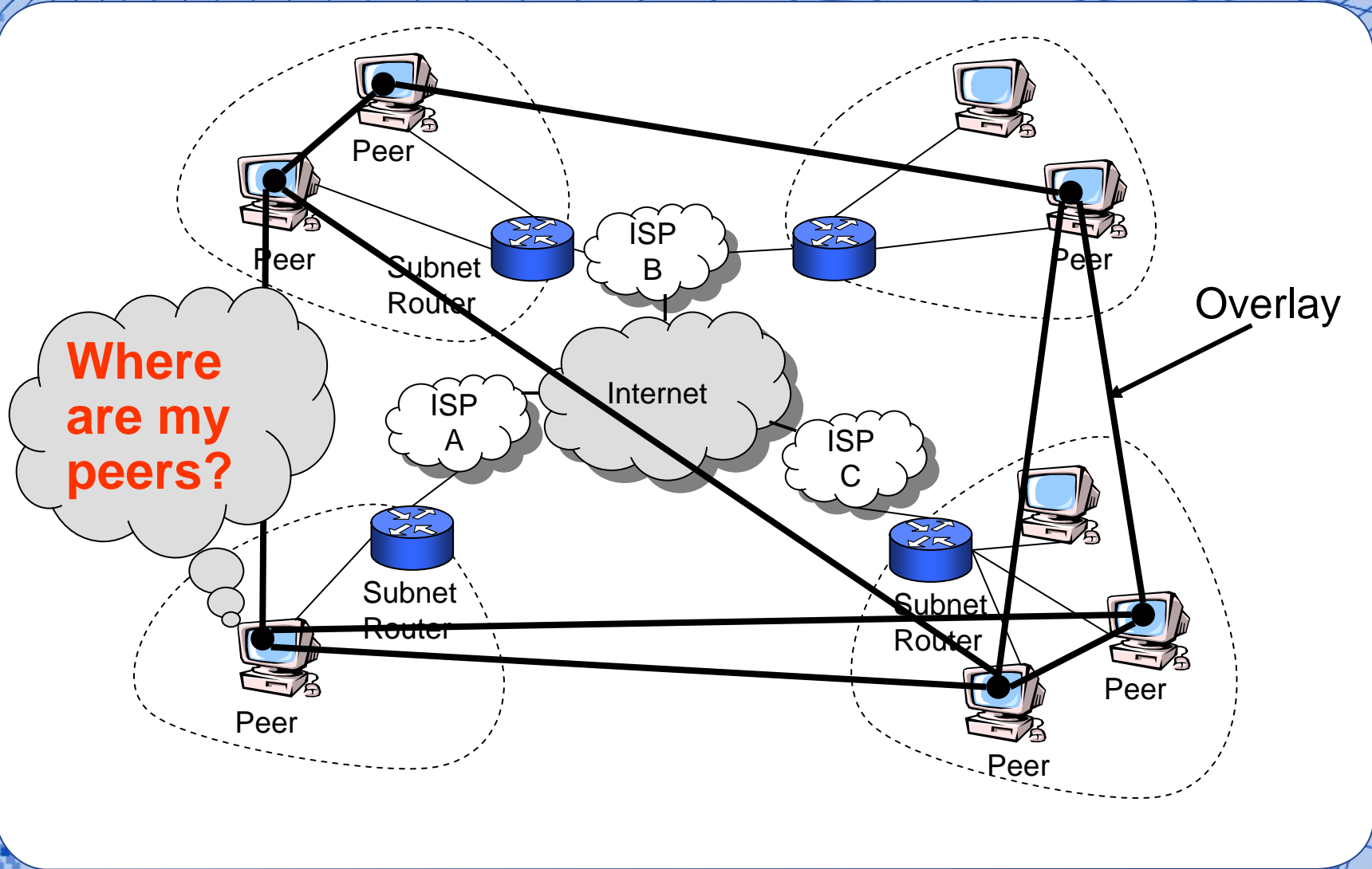
- Innovation through P2P-based overlays
  - file sharing, streaming videos, Internet telephony, multicast
  - decentralized, scalable
  - self-organizing, autonomous (not depending on servers)
  - seamless deployment, end-system based



Source: [www.openp4p.net](http://www.openp4p.net)

- One problem still insufficiently solved
  - **Bootstrapping**: process of initially finding a peer for joining of the P2P network
  - how to find nodes that are already part of the overlay?  
→ often only centralized part in decentralized P2P networks

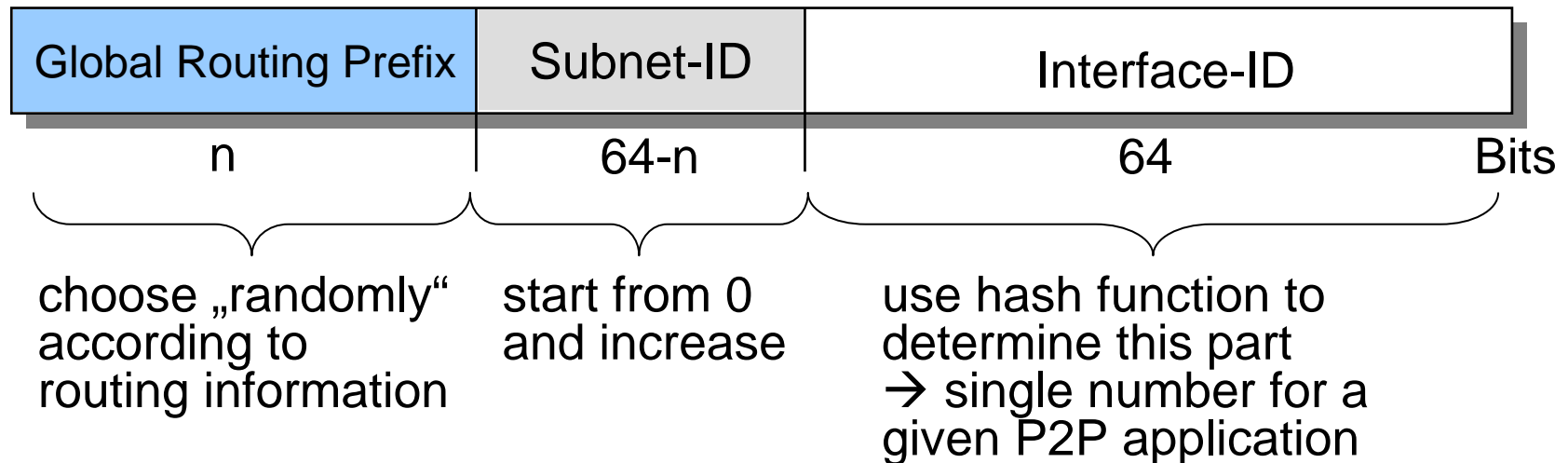
# Peer-to-Peer-Networking



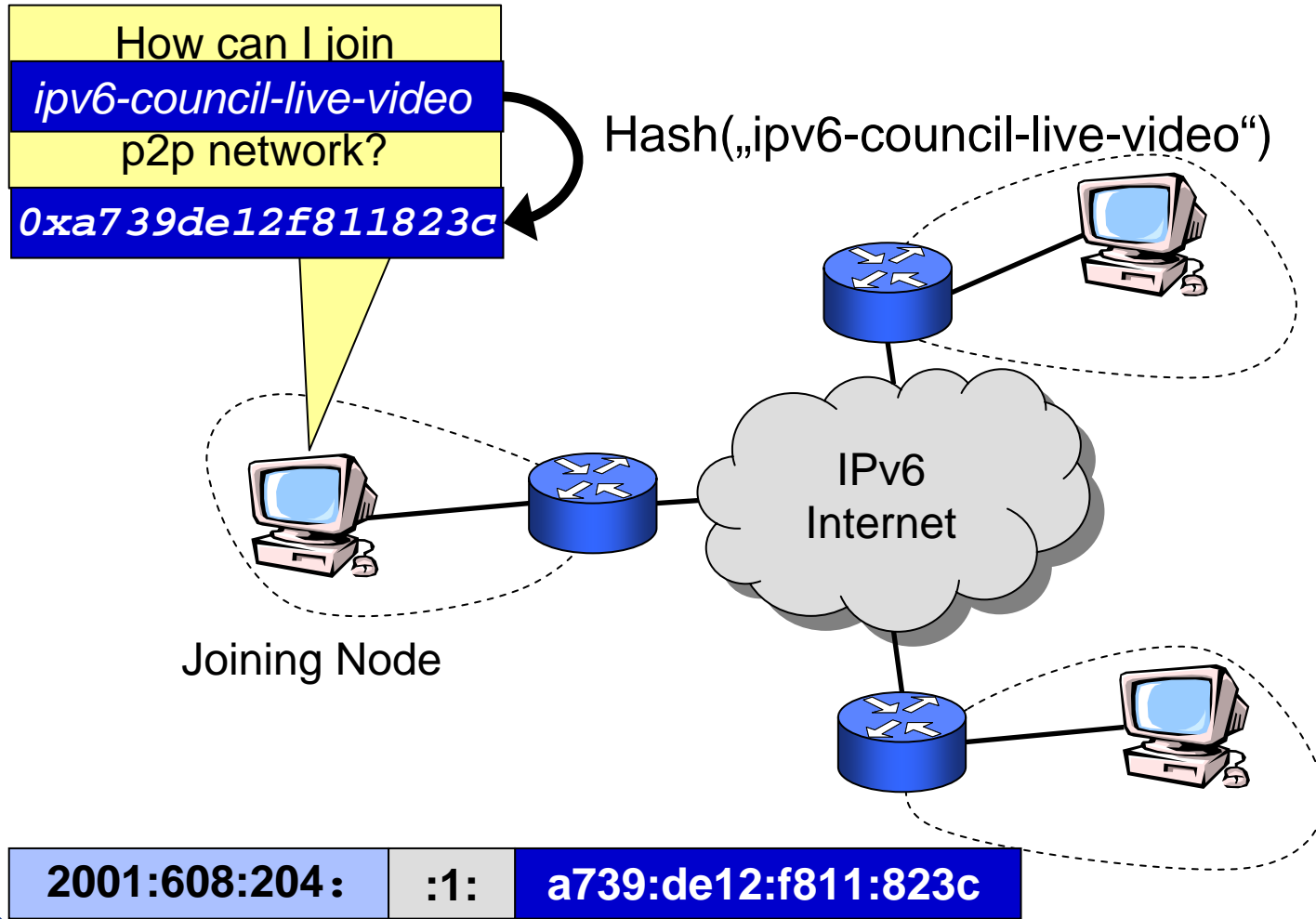
- Bootstrapping IPv4-based P2P networks
  - server-based peer list: download active peer list
  - host caches: connect to last-known hosts
  - random address probing: actively find peers
- Exemplary Problems
  - no well-defined or standardized approach
  - hard for small P2P networks
  - limited reachability of hosts due to NAT

Decentralized and autonomous bootstrapping is an unsolved problem  
→ IPv6 provides new possibilities!

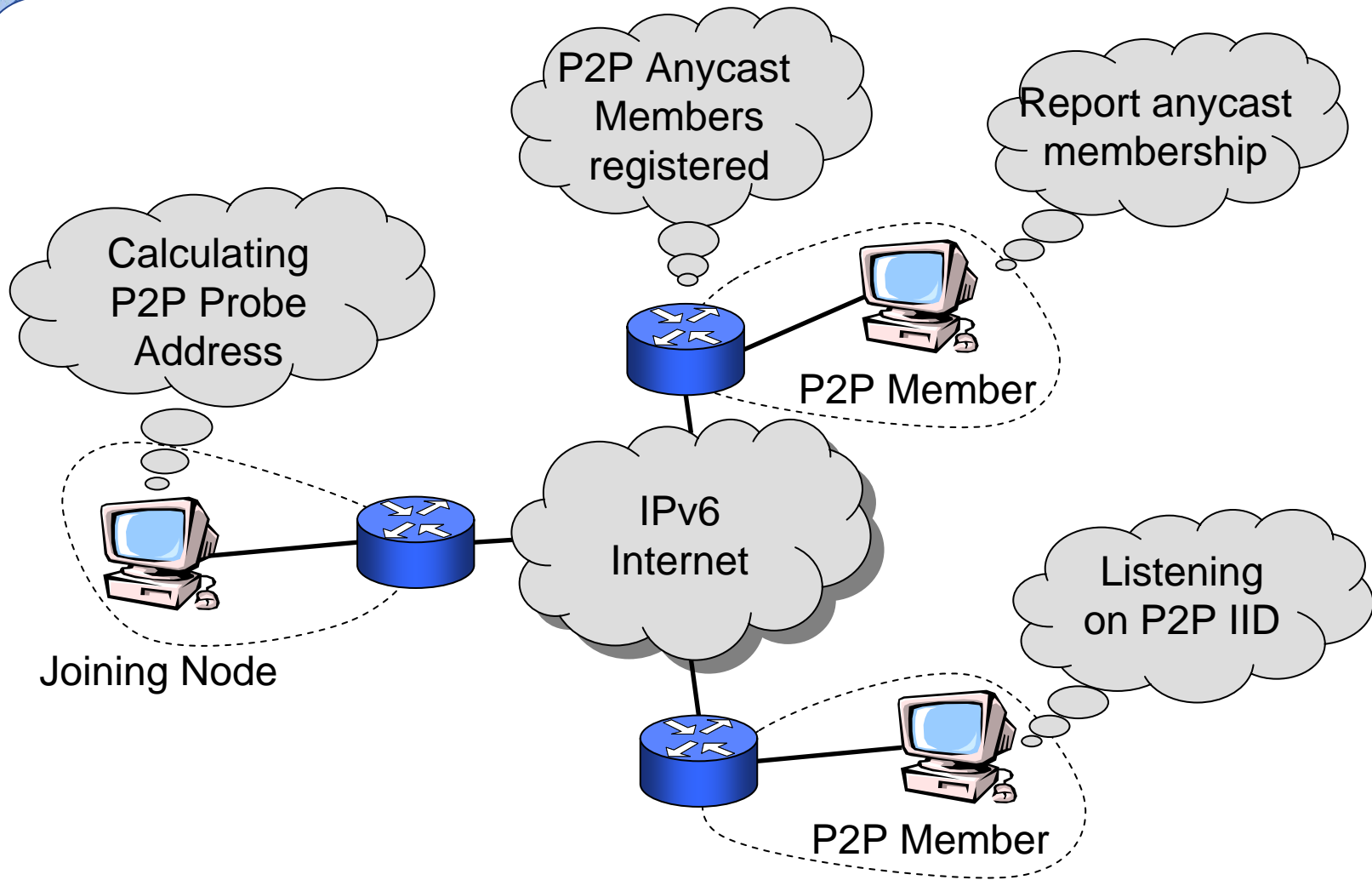
- Use **targeted random address probing** for IPv6
  - exploit the large IPv6 address space
  - probe network part „randomly“
  - probe host part deterministically



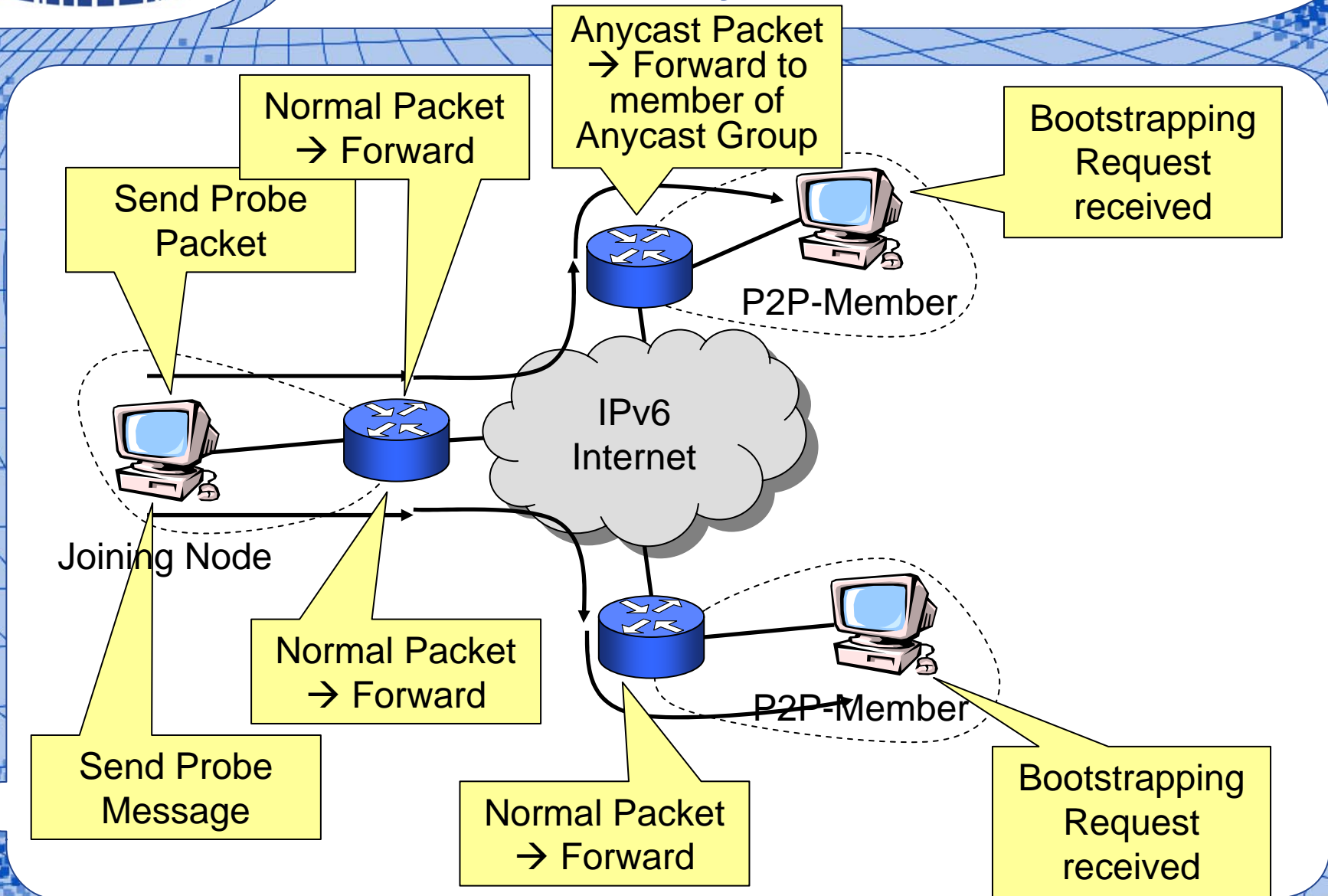
- Connected peers will register this address as
  - **unicast** address (simple approach), or
  - **anycast** address (advanced approach)



# Registration of Addresses



# Peer Discovery





- Really decentralized and autonomous bootstrapping makes P2P networks more robust
- Uses IPv6 features
  - larger addresses
  - end-to-end reachability
- Deployment via two approaches
  - simple approach: register unicast address
  - advanced approach: register anycast group
    - ▶ offers better resilience and scalability
    - ▶ we will work towards standardization of an MLD protocol enhancement in IETF

# Thanks! Questions?



[www.tm.uka.de/itm](http://www.tm.uka.de/itm)

