

P2P SIP using JXTA

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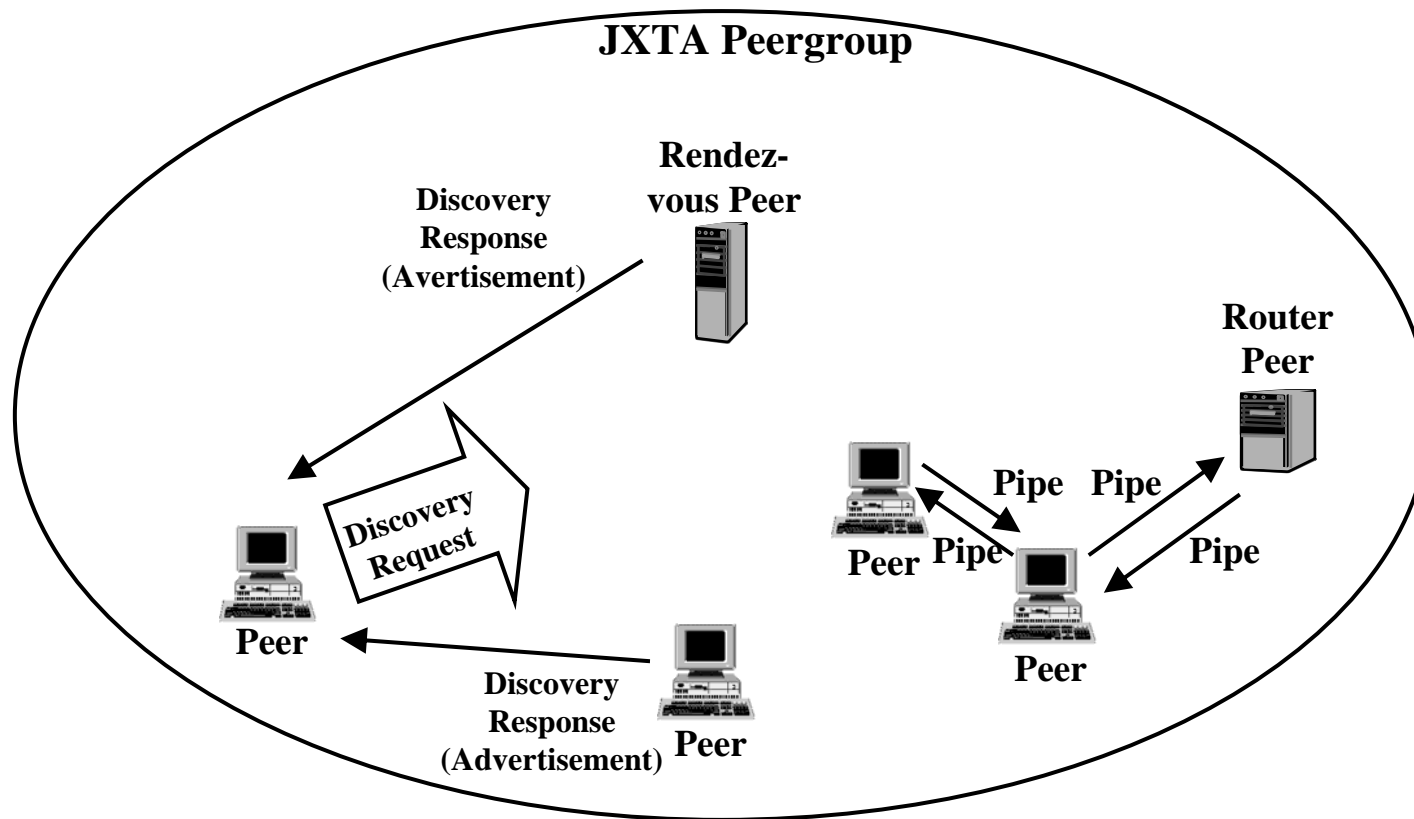
1 Introduction to the JXTA P2P architecture

- **JXTA (= juxtapose): open source P2P architecture, offering a set of standardized protocols to realize true P2P infrastructure**
- **Project founded (2001) and overseen by Sun microsystems**
- **Allows the development of standard-based P2P applications without relying on a centralized system**
- **XML-based protocols**
- **Independent of type of network, OS, and programming language** (reference implementations originally based on TCP/IP and Java)
- **Major releases: JXTA 1.0 (2002) and JXTA 2.0 (2003)**

[JXTA; Hale]



JXTA architecture



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- **Peer**
 - * **Basic unit within JXTA network**
 - * **Simple peer: Can provide a service** (e.g., as part of a P2P file sharing service) **and/or use a service** (→ application)
 - * **Peer parameters**
 - + **Peer name**
 - + **Peergroup(s) to which the peer belongs**
 - + **Peer ID**
 - + **Peer's network address**
 - * **Must belong to a peergroup before it can communicate with other peers**
 - * **Rendezvous peer: special peer that keeps list of available resources** (e.g., other peers or peergroups). **Peers get to know rendezvous peers by configuration, by multicast discovery** (within local network), **or via http-based internet service**
 - * **Router/relay peer: relay for JXTA messages, used for Firewall/NAT traversal, usually HTTP-based** (symmetric response routing)

[Wils; Gong]



– Peergroup

- * **JXTA peergroup = virtual group of JXTA peers which want to use or support a certain service provided by the group** (e.g., a file sharing service)
- * **Default peergroup for all peers: NetPeerGroup** (can not be left by the peers)
- * **Any peer can create, join, or leave further peergroups**
- * **Build virtual secure networks** (content can only be accessed by group members; authentication available) **and scaling areas** (only members of a peergroup see messages exchanged within this peergroup)
- * **Peers get to know other peergroup members by multicast discovery** (local network) **or by querying rendezvous peers**

– Pipes

- * **Unidirectional virtual data connections between peers**
- * **Can be point-to-point** (1 sender, 1 receiver) **or multicast** (1 sender, x receivers)
- * **Connect virtual communication sockets of peers** (so called endpoints) **within the same peergroup**
- * **Transport any kind of data (binary, XML, ...) as “messages“**

[Wils; Gong]



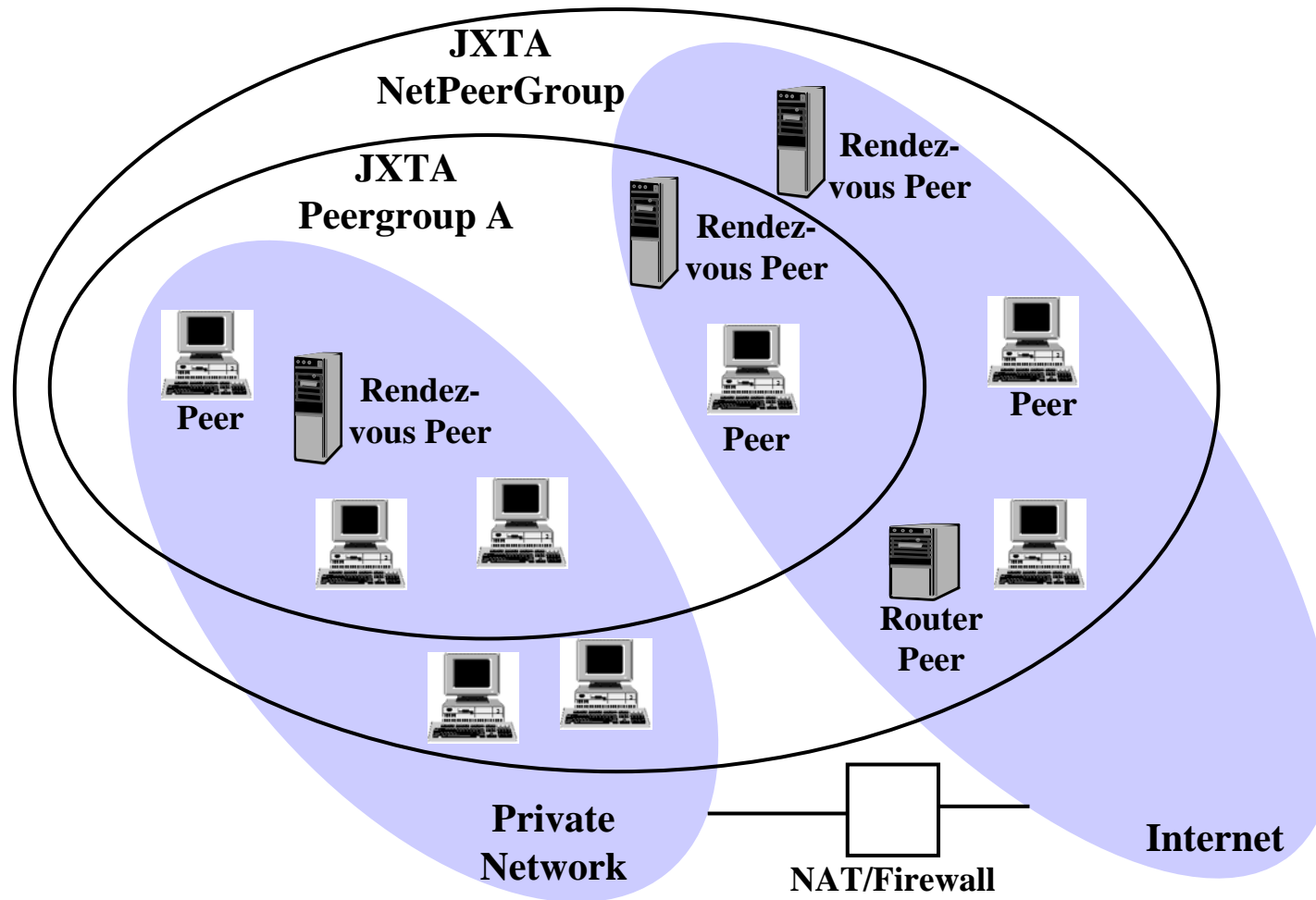
- **Advertisement**
 - * **XML documents that are used to spread the presence of JXTA resources (peers, peergroups, pipes, services, ...) and their contact attributes**
 - used for P2P SIP approach name resolution

- **Discovery**
 - * **Basic process by which peers locate advertisements**
 - * **Two principle methods (combinations depending on available JXTA infrastructure)**
 - + **Dynamic discovery** (based on multicast discovery requests within local networks, every receiving peer responds with its advertisement)
 - + **Static discovery** (based on unicast rendezvous peer query only, rendezvous peer sends advertisement of known resources)

[Wils; Gong]



JXTA infrastructure



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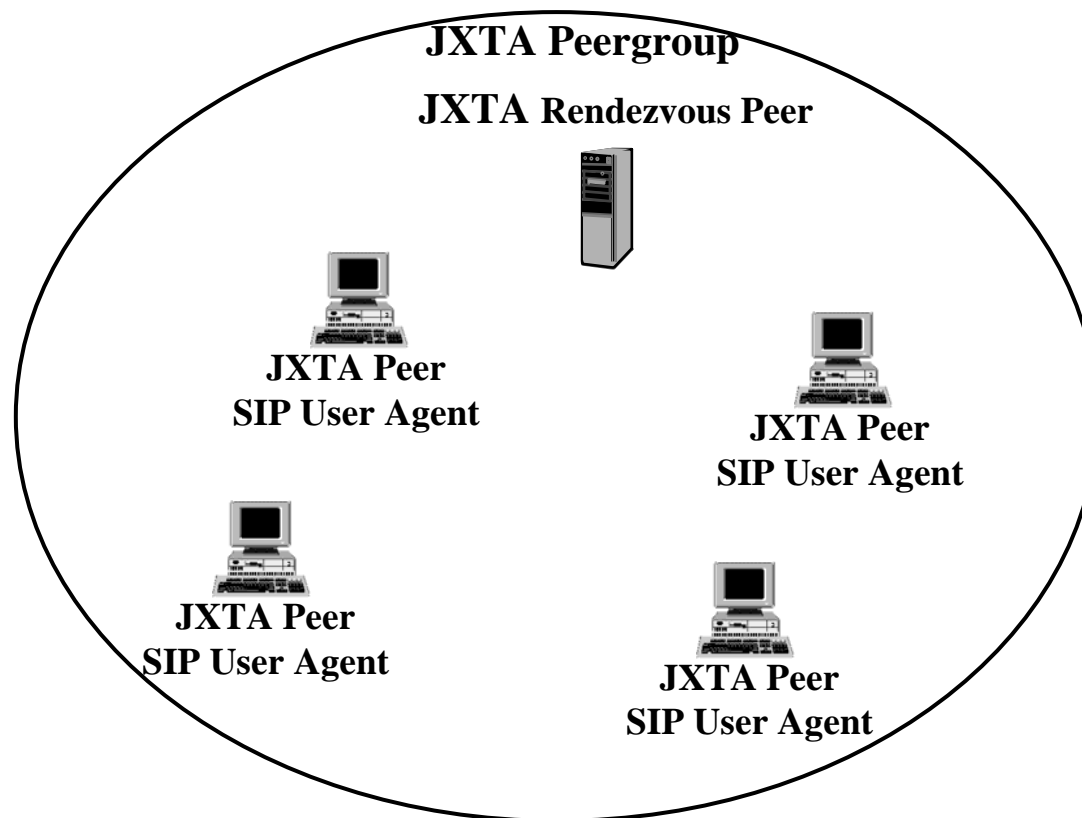


2 JXTA protocols

- **JXTA core protocols** (mandatory)
 - * **Endpoint Routing Protocol (ERP): Discover a route** (sequence of hops) **to be able to send a message to another peer**
 - * **Peer Resolver Protocol (PRP): Send queries to and receive responses from other peers**
- **JXTA standard protocols** (optional)
 - * **Peer Discovery Protocol (PDP): Advertise own resources and discover resources from other peers.**
 - * **Rendezvous Protocol (RVP): Propagate messages to all listening subscribers of a service** (e.g., used by peergroup's rendezvous peers)
 - * **Pipe Binding Protocol (PBP): Establish a pipe** (virtual communication channel) **between two or more peers**
 - * **Peer Information Protocol (PIP): Obtain status information** (e.g., uptime, traffic load) **about other peers**

[JXPS]



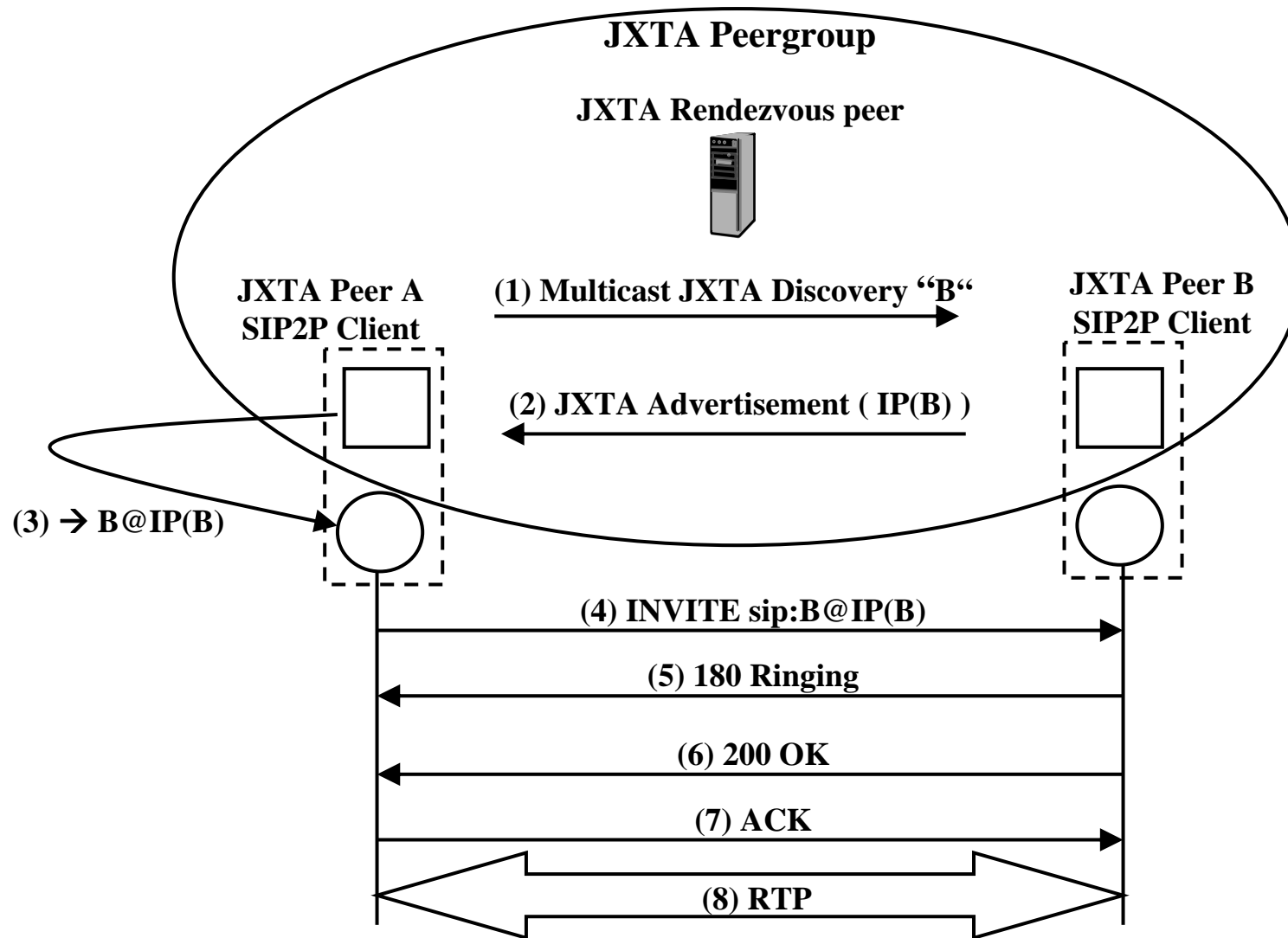


- **“SIP using P2P“ demo approach**
- **True P2P overlay, JXTA-based**
- **RFC 3261 compatible SIP user agents: requirements:**
 - * **Control interface available** (e.g., web interface → works even with HW IP Phones)
 - * **Must support sending SIP requests peer-to-peer** (no proxy/registrar server)
- **JXTA P2P infrastructure: Developed JXTA peer client “SIP2P client“, and JXTA rendezvous peers**
- **Software SIP2P Client**
 - * **Java-based JXTA simple peer implementation**
 - * **Joins JXTA peergroup**
 - * **Allows user to search peergroup for a certain username → sends JXTA discovery messages** (multicast within local network, or via rendezvous peer)
 - * **→ Receives and analyses JXTA advertisement of peer to contact**
 - * **Allows user to initiate call**

[Tric]



P2P SIP using JXTA architecture and functionality



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4 Summary and Outlook

- **Summary**
 - * **Basic “SIP using P2P“ approach**
 - * **RFC 3261-compatible SIP peer-to-peer communication without proxy/registrar**
 - * **JXTA-based P2P overlay for username resolution**
 - * **Interface between open source JXTA P2P network and ordinary SIP user agent**

- **Outlook: imaginable extensions**
 - * **NAT traversal: e.g., use STUN/TURN/ICE and spread alternative contact addresses within JXTA advertisement (→ calling peer receives callee’s public contact address by JXTA-based P2P name resolution system)**
 - * **Create JXTA peergroups that offer special services (such as interconnection services (e.g., PSTN, non-P2P SIP networks), emergency calling, location- or interest-based services)**
 - * **Combine P2P SIP communication with other JXTA-based P2P applications (e.g. P2P online games)**



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