

Scalable and Robust Active Element Network

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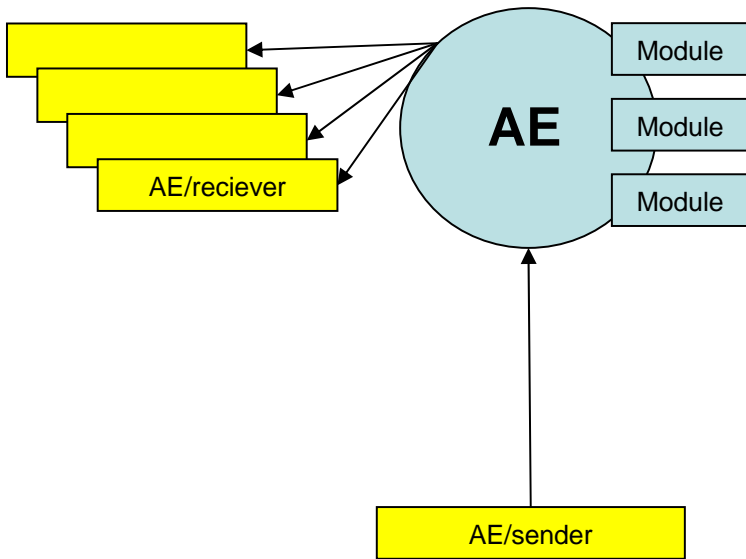
Content

- Motivation
- Related work
- Type of selected network
- Implementation
- Evaluation

Motivation

- Collaborative environment support
- Multimedia content
- Native multicast problems
- Reflector
- Network of reflectors

Active element



What is it?

- UDP packet reflector, Active element (AE)

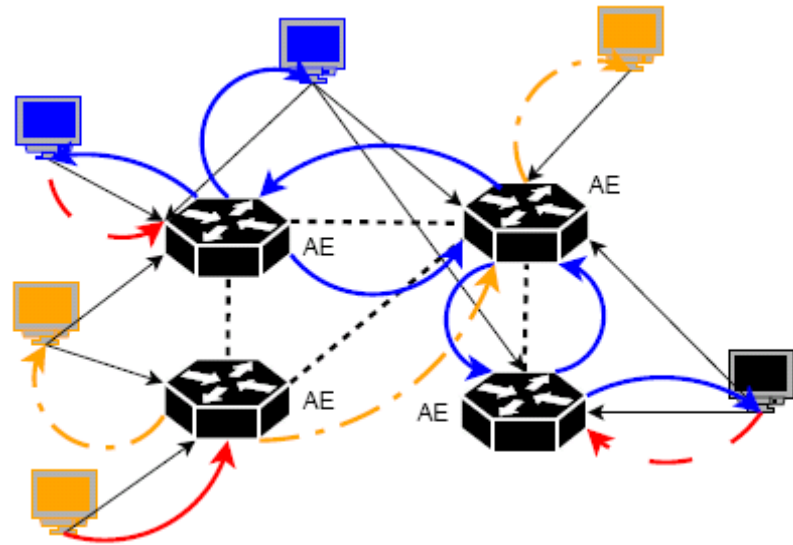
Properties of AE

- user-empowered
- modular conception
- per user data processing
- zero-copy processing
- end-to-end security

AE network

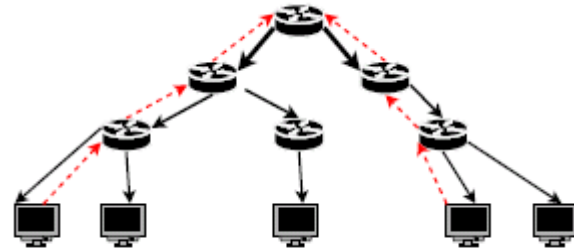
Requirements on AE network

- user-empowered
- robust
- scalable
- pervasive
- self-organize



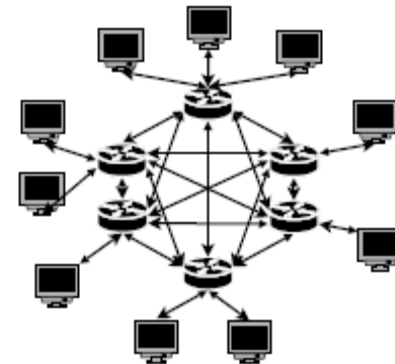
Distribution schemas

- Multicast



- 2D Full-Mesh

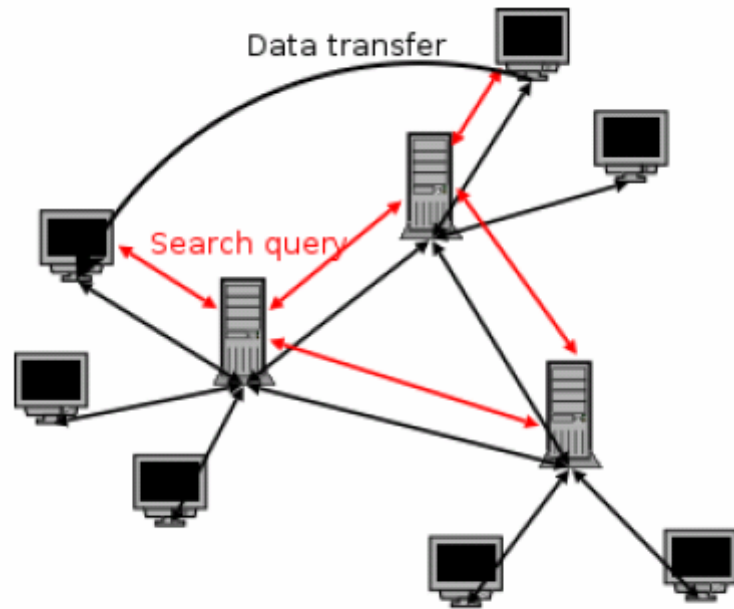
- 3D Layered-Mesh



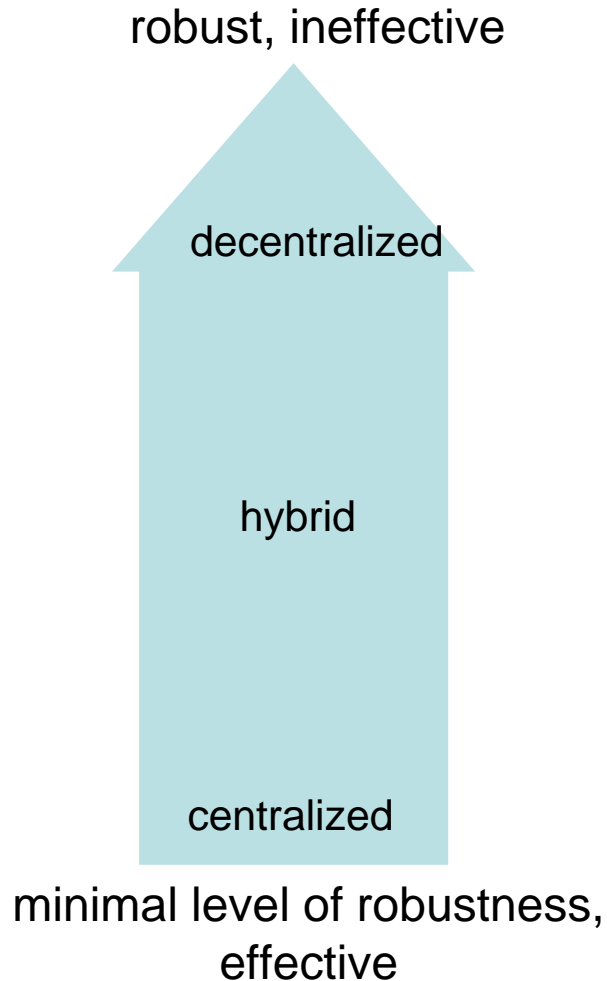
Peer-to-Peer

Properties of P2P networks

- decentralized management
- robust
- scalable
- user-empowered
- pervasive
- lower efficiency does not limit use



Organization of nodes in P2P



Decentralized

- pure P2P networks
- flooding search mechanism
- distributed hash table DHT
- Gnutella

Hybrid

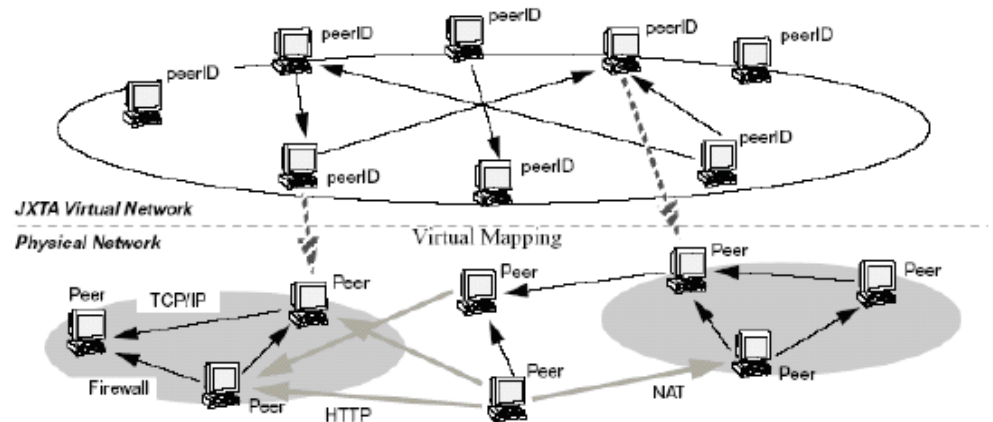
- has partial structure
- quite effective flooding search mechanism
- Loosely-Consistent DHT
- FastTrack, JXTA

Centralized

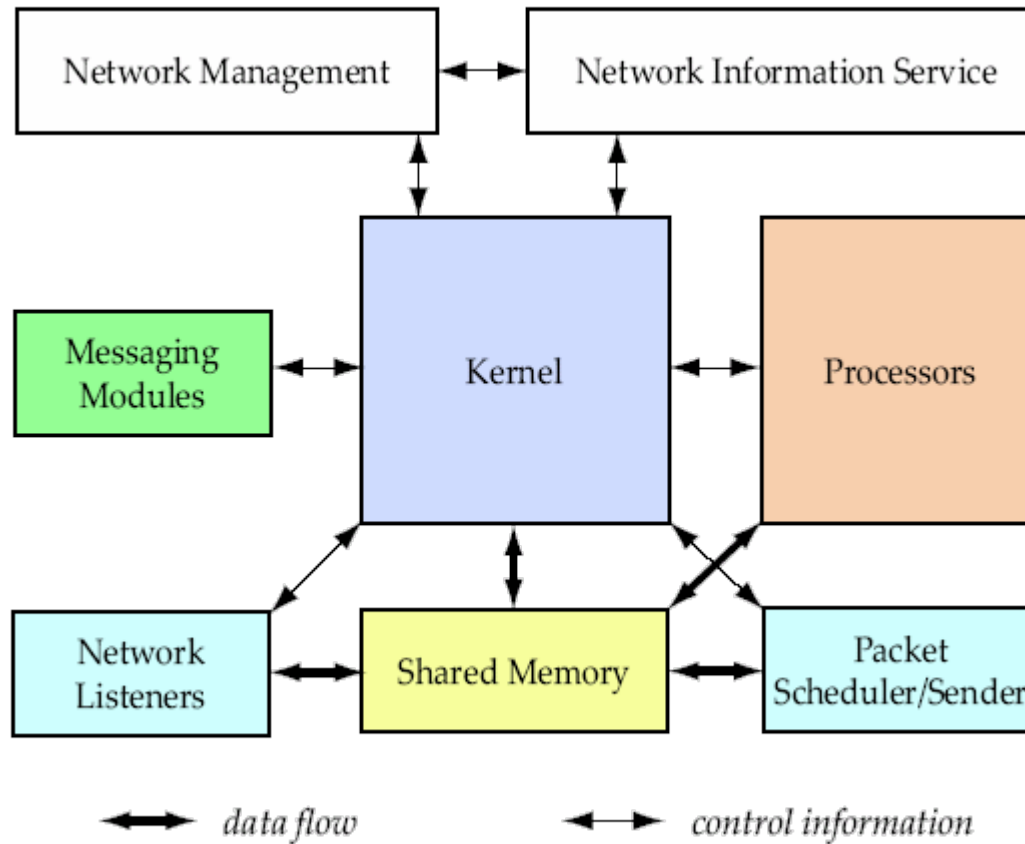
- central index servers
- Napster

JXTA

- Set of protocols based on XML
- Platform and network independent
- User-empowered, robust, scalable and pervasive
- Uniform address model
- Advertisements
- Security
- Loosely-Consistent DHT



Architecture of AE



NIS and MN module

MN – Management module

- connecting AE to AE network
- messages handling
- monitoring of topology of AE network
- monitoring of state of AE network
- management of distribution schemas

NIS – Network Information Service module

- providing information of AE and AE network
- provide information about content available on AE network

jSon

- Implementation of MN and NIS modules
- Modular conception
- AE and client side
- Changes of JXTA-C framework
- Implementation problems

jSon modules (1)

ID generating module

- override default JXTA ID generating algorithm

Information module

- gather state information about AE and AE network
- manage information about available content

Messenger module

- broadcast messages, messages to single AE or to group of AEs
- handle incoming messages

jSon modules (2)

Network management module

- topology monitoring
- provide information about underlying network for distribution schemas

Group management module

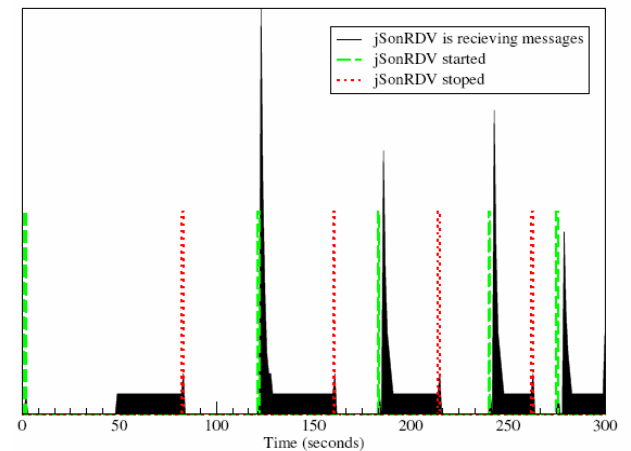
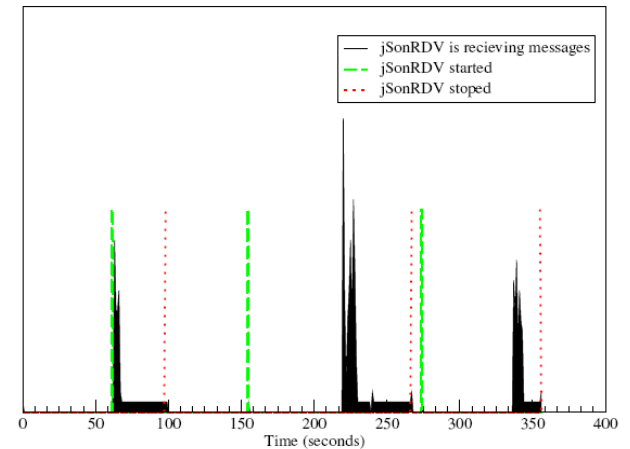
- membership in appropriate group
- management of groups

Monitoring module

- support for JXTANetMap protocol

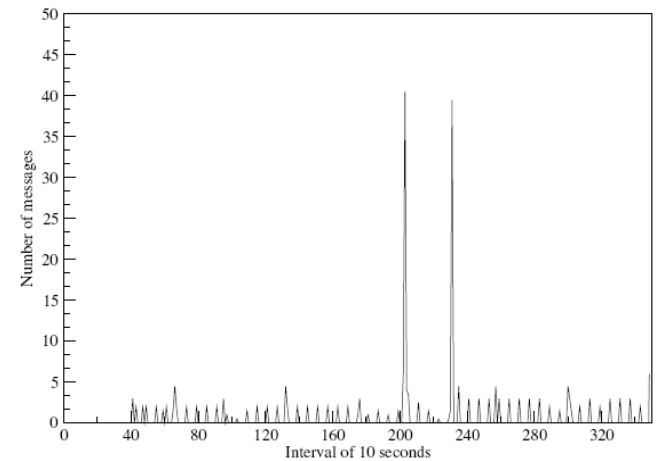
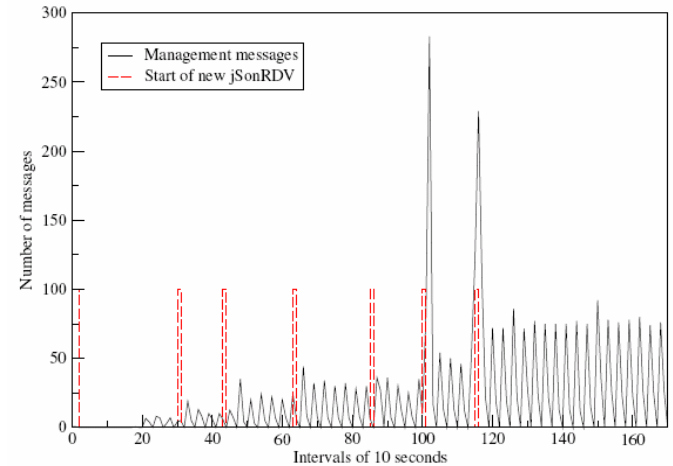
Evaluation - Robustness

- Robustness on different levels
 - JXTA network
 - jSon network
 - distribution schemas
- Quick reaction on the failure
- Fast recovery after disconnect
- Information for distribution schemas



Evaluation - scalability

- Linear dependency on the number of peers in the network
- Constant number of messages sent by one peer



Conclusion

- Selected appropriate type of network
- Designed architecture of AE network and their services
- Partially implemented prototype
- Evaluation of robustness and scalability

Thank you for your attention