Introduction

- Resource brokering system
  - Resource sharing
  - Peer interactions
    - Advertising
    - Search
    - Discovery
    - Request
    - Response
Proposal

- Scalable
- Durable for Peer to Peer (P2P) grids
- Clients
- Resources
- Dynamic P2P collections
Requirements

- Flexible
- Fault tolerant
- Efficient
- High Performance
NaradaBrokering

- Event brokering
- Network of cooperating brokers
- Link clients to resources
- Events are messages with timestamps
- Scale from PDAs to HPC
NaradaBrokering Outline

- Publish/Subscribe model
- Handles access to services
- Allow P2P clients at the edge to talk directly
- Allow P2P and traditional centralized broker model
Definition

- Event brokering system
- Large network of broker nodes
- Content based routing
- Publish/Subscribe model
Layout

- Cluster topology
  - Calculate routing information
  - Work around failures
- Asynchronous communication
- Publish interest in a resource
- Receive response
- Deliver matched events after reconnect
Event

- Source
- Destinations
- Event Descriptors
- Content Descriptors
- Content Payload
- Event Distribution Traces / TimeTo Live (TTL)

Event Origins

- Explicit Destinations
  - Used to compute Destinations

- Used to handle content

- Used for eliminating continuous echoing/attenuation of event.
Failure and Recovery

- Independent storage
  - State storage
- Multiple locations in the topology
- Thus, brokers are stateless
Test Topology
Results

Transit Delay under different matching rates: 22 Brokers 102 Clients

Match Rate=100%
Match Rate=50%
Match Rate=10%
JMS Compliance

- JMS
  - Unified API for pub/sub model
    - Like MPI for cluster computing
- Support JMS clients
  - Transparency
  - Access to JMS applications
- Bring NaradaBrokering functionality to JMS clients
  - Replace the single server with a distributed solution
  - Scalability, resilience, load balancing
JMS Support

- Bridge
  - Operations complete locally or mapped to NaradaBrokering infrastructure
- High availability
- Support JMS message types
- Encapsulate JMS messages with NaradaBrokering headers
JMS Transparency

- Insulate JMS clients from knowledge of all brokers
- Use broker locators to find valid brokers
  - Load balancing
  - Prefer new brokers
  - Multiple brokers available
    - Like DNS, no single point of failure
    - If one fails, no big deal
Broker Locators

- Locate valid broker
- Propagate broker information to client
  - Hostname/IP-address information
  - Port number on which it listens for connections
  - Transport protocol over which it communicates
- Client then uses info to establish communication channel with broker
  - Done transparently.
- Clients with multiple connections
  - A client could sometimes have connections to multiple brokers.

Taken from www.naradabrokering.org
Performance

- Compare to SonicMQ
- Publish and subscribe to the same topic
- 100 subscribers
- Measure the transit delay
Performance Graphs

Transit Delays for Message Samples in Narada and SonicMQ

Mean Transit Delay (Milliseconds)

Publish Rate (Messages/sec)

Payload Size (Bytes)

Narada
SonicMQ
Performance Graphs

System Throughputs - Narada

System Throughputs - SonicMQ

Receiving Rate (Messages/sec)

Publish Rate 300 (Messages/sec)

Payload Size (Bytes)
NaradaBrokering and P2P

- Discovery of services
- Routing
- Deliver content efficiently
- Locating peers
- Forward requests only to relevant peers
- Connect islands of peers
- Hybrid model for local peers
JXTA

- Open protocol to support P2P
  - Indexing, file sharing, searching, security
- Implemented by local forwarding of messages
  - Use TTL to prevent flooding
- Tends to be localized
JXTA integration

- Keep the NaradaBrokering and JXTA cores intact
- Peers don’t communicate with NaradaBrokering directly
- Develop a proxy
- Peers unaware that NaradaBrokering is routing some requests
JXTA Integrated Model

- NARADA-
- JXTA proxy

High end "long lived"/persistent resources

- NARADA broker cloud

- Peers

Dynamic/fluid peer groups

JXTA Rendezvous PEER
Proxy

- Initialized as a NaradaBrokering client and JXTA Peer
- Advertise as a JXTA proxy
- NaradaBrokering handles only sending events to peers that are appropriate
- Claim that peer discovery is faster ????
References

- Grid Computing: Making the Global Infrastructure a Reality
- www.naradabrokering.org
- java.sun.com/products/jms
- www.jxta.org