NaradaBrokering

Grid Computing: Making the Global Infrastructure a Reality Chapter 22

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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



Failure and Recovery

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

Test Topology Publisher 22 -10 k (11) 12) (5 4 i 6 $1_{\tilde{h}}$ 13) 2 **14** 15 3 8 9 7 16 17-m 18 20 n 19 Measuring (21) Subscriber

Results

Transit Delay under different matching rates:22 Brokers 102 Clients



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



Performance Graphs



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



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