The JXTA way to Grid: a dead end?

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What is JXTA?

“JXTA technology is a set of open protocols that enable any connected device on the network, ranging from cell phones and wireless PDAs to PCs and servers, to communicate and collaborate in a P2P manner”.

- started by Sun Microsystems in 2001
  » http://www.sun.com/software/jxta/
- now an open source community project
  » https://jxta.dev.java.net/
- latest specification release 2.5.3, October 2007
JXTA building block

Peers group
- a collection of peers that share service and message

Advertisement
- an XML document which describes a resource (peer, group, pipe, service, etc...) in the P2P network
- advertisement are published via IP multicast on local networks and using a DHT-like\textsuperscript{[1]} approach on internets

JXTA socket and JXTA pipes

Identifiers and security
JXTA protocol suite

<table>
<thead>
<tr>
<th>Peer Info Protocol</th>
<th>Peer Discovery Protocol</th>
<th>Pipe Binding Protocol</th>
</tr>
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<tbody>
<tr>
<td>Peer Resolver Protocol</td>
<td>Rendezvous Protocol</td>
<td>Peer Endpoint Protocol</td>
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</table>

source [12]
JXTA peer types

Peers can form both pure and structured P2P networks

- Minimal-Edge peers
- Full-Edge peers
- Super-Peers (optionals):
  - Relay: stores and forwards messages between peers
  - Rendezvous: maintains global advertisement indexes and assists other peers with advertisement searches
  - Proxy: agent for minimal-edge peers
JXTA and Grid computing

At least 8 FOSS projects:

- P2P-MPI
- Jalapeno
- JNGI
- jxta-grid
- OurGrid
- P3: Personal Power Plant
- Triana
- Xeerkat

Others: NaradaBrokering? Codefarm Galapagos?
P2P-MPI

"P2P-MPI is a middleware framework which enables to form groups of computing resources to run parallel applications."

- http://grid.u-strasbg.fr/p2pmpi/
- it does not use JXTA anymore, since version 0.27.0, released in Sep. 2007
Jalapeno

“Jalapeno is a distributed computing system utilizing the otherwise wasted idle CPU cycles of desktop PCs and workstations to solve problems too large for any single desktop computer.”

- [http://jalapeno.therning.org/](http://jalapeno.therning.org/)
- Jalapeno is the result of a Master's of Science thesis of Niklas Therning[^4]
- no actively maintained
JNGI

"JNGI is a framework that users can use to submit jobs. These jobs are split and distributed among several peers. The use of JXTA peer groups helps us to localize communication, which in turn improves scaling. Also, by providing redundancy within peer groups, we ensure that failures do not affect job completion."[5]

- [https://jxta-jngi.dev.java.net/](https://jxta-jngi.dev.java.net/)
- developing seems stopped in 2004 (SVN commit in Apr. 2007)
jxta-grid

“The "JXTA Grid" objective is to enable turnkey JXTA Service management and leverage when deployed on the SunGrid”.

- https://jxta-grid.dev.java.net/
- vaporware
OurGrid

“OurGrid is a free-to-join peer-to-peer grid that has been in production since December 2004.”

- is primarily a Grid implementation, not a Grid middleware
- OurGrid is no longer JXTA-based
P3: Personal Power Plant

“P3 is middleware for distributed computing using volatile PCs, in which participants provide and also use other's computers.”

- http://p-three.sourceforge.net/
- developing seems stopped in 2005
Triana

“An open source problem solving environment developed at Cardiff University that combines an intuitive visual interface with powerful data analysis tools.”

- [http://www.trianacode.org/](http://www.trianacode.org/)
- Triana is a visual workflow environment, it uses the GridLab GAT API for job submission and file transfer to/from remote jobs
- latest release (3.2.3), April 2007
- now it uses P2PS instead of JXTA
Triana screenshot

source [6]
Triana P2PS

P2PS is a lightweight infrastructure for developing P2P style applications. Its architecture is inspired to and provides a subset of functionality of JXTA[7]
JXTA vs. P2PS

- advertisements publishing and queries use separate protocols
- queries are restricted to predefined advertisement types
- routing across multiple protocols is expressed explicitly in an XML message envelope
- allows remote services but also enables service code to be imported by a peer via module implementations

- queries are themselves advertisements
- a more expressive discovery language, peers can query for arbitrary advertisement types
- routing is an endpoint resolver implementation issue
- all services are remote instances contacted using pipes
Xeerkat

“Xeerkat is a P2P Grid computing project that uses a worker/hiring analogy to establish computational grids”.

- http://code.google.com/p/xeerkat/
- https://xeerkat.dev.java.net/
- the project switched to XMPP protocol in 2006:
  » there is a lot more infrastructure support (e.g. Google talk uses XMPP)
  » easy setup: all you need is a Jabber id on a federated server
  » there are plenty of implementation for XMPP
Summary

At least 8 projects started using JXTA to build computational Grid:

- 1 does nothing
- 3 are not developed from 2 years or more
- 4 switched to other protocols

Is JXTA not suitable to Grid?
Discovery protocol scalability

“JXTA offers no guarantee about neither the number of peers it will discover, nor the time the discovery is about to take”.[8]
Topology awareness

“JXTA is an abstract overlay with no knowledge of network topology”. [10]

For grid users

- locality
- latency
- bandwidth

matters
Performances

“… evaluations have revealed some weaknesses of JXTA in both the SAN and WAN areas.” [11]
Others and minors

JXTA pipes only handles maximal 64 kbyte per message, so it needs a mechanism to handle large job resource

- JXTA Sockets have no limit

Platform startup was long (about 30s)

JXTA bootstrap depends on Rendezvous

JXTA based Grids seem fit for problems that can be divided into “bag of tasks” (no interaction during computation)[9]
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References


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