Improving the flexibility of Active Grids through Web Services

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HP-WebS project

• Joint project with Laurent Lefèvre, INRIA, Lyon, France
• Concerns the use of Web services in Active Networks
• DEST International Science Linkage (ISL): FAST - French Australian Science and Technology Programme
• HP-WebS: High Performance Web Services for eScience
What are Active Grids?

• Active Grids use active networks to provide greater levels of flexibility and performance to grids
• Active Grids provide intelligence and processing power inside networks to
  – Improve usage of network resources
  – Dynamically deploy new protocols
  – Manage equipment heterogeneity
  – Support data stream heterogeneity
  – Enable new network services to operators and applications
• The network is considered "active"
  – User code can be injected into intermediate systems to customize network services to particular applications
  – The intermediate nodes can build the payload of packets, not just headers
Applications

• Monitoring inc auditing and accounting
• Stream adaptation
• On the fly compression e.g. video
• Security e.g. network attack traceback against distributed denial of service attacks
• Data caching and staging
• Content based routing
• Efficient reliable multicast
• QoS
Tamanoir Active Network

- High performance active network
- Execution environment based on Java
- Distributed multi-threaded architecture
- Frontend active node, backend cluster
- Active packets
- Dynamic deployment of services
- Streams: UDP and TCP
- Compiled optimization (GCJ)
- Supports Gigabit streams
- www.ens-lyon.fr/LIP/RESO/Tamanoir/
Tamanoir Active Node (TAN)

- Sandbox for deploying network services
- Distributed resources
- Storage facilities
- Switching and routing protocols

Network Services
Active Network

Client sender

Active nodes

Client receiver

Services Repository
What are web services?

- XML based messaging for internet, LAN, inter and intra-process communication
- Platform neutral
- Contract based compatibility (WSDL / XML schema)
- Set of standards for web services including:
  - Representation (SOAP)
  - Addressing
  - Security
  - Transactions
  - Management
  - ...
How can Web Services benefit Active Grids and vice versa?

1. Active grids need:
   – Monitoring
   – Management
   – Control (e.g. service deployment, removal etc)

2. Web services need:
   – Efficiency – offload XML processing
   – Intelligent networking which understands XML e.g. for service: routing, adaptation, monitoring, caching

• Currently addressing former
Initial Research

• Web services for service deployment: deploy active node services (Java jar files) via web services

• Web services for monitoring and controlling Tamanoir Active Nodes
  – Can start, stop, deploy, remove and interrogate services and the TAN itself

• Implemented simple WS management interface (incomplete)
Experimental Platform

- Two Grid clients exchanging data streams through a Tamanoir active network node
- Service deployment, monitoring and control implemented
- Data logging scenario: periodically log packet data statistics
Results

• Need to compress logs
• Performance as expected
  – Ok for infrequent logging
  – Frequently logging kills node performance
• Web services mean
  – Can log to any client
  – Can deploy Java files from any machine
  – Can manage and monitor active nodes from any client (just need WS)
Web service implementation

• To support web services want a simple light weight web service server
  – Tomcat and Axis too heavy, complex install

• Built simple and efficient web service server using:
  – Pygmy web server
  – Java XML streaming library STAX

• Result web service server comprising two small jar files of few hundred Kbytes
  – system suitable for embedding in other systems
Future work

- Deployment and testing on French Grid5000 network
- Publish/subscribe – notification interface
- Full WS management compatibility

- Phase two – process web (grid) services using active networking technology