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
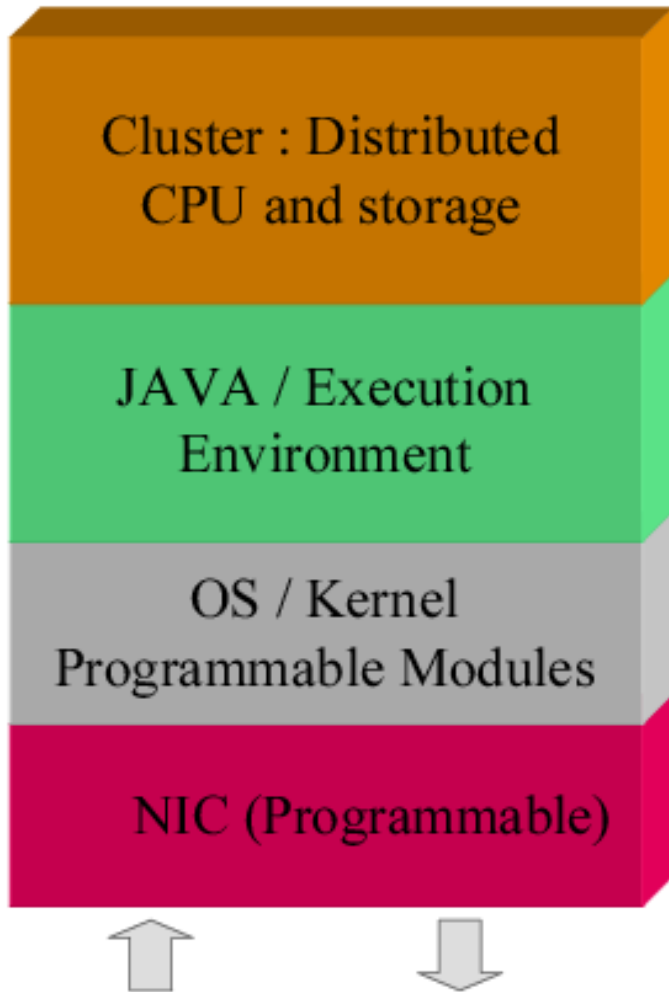- HP-WebS: High Performance Web Services for eScience

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
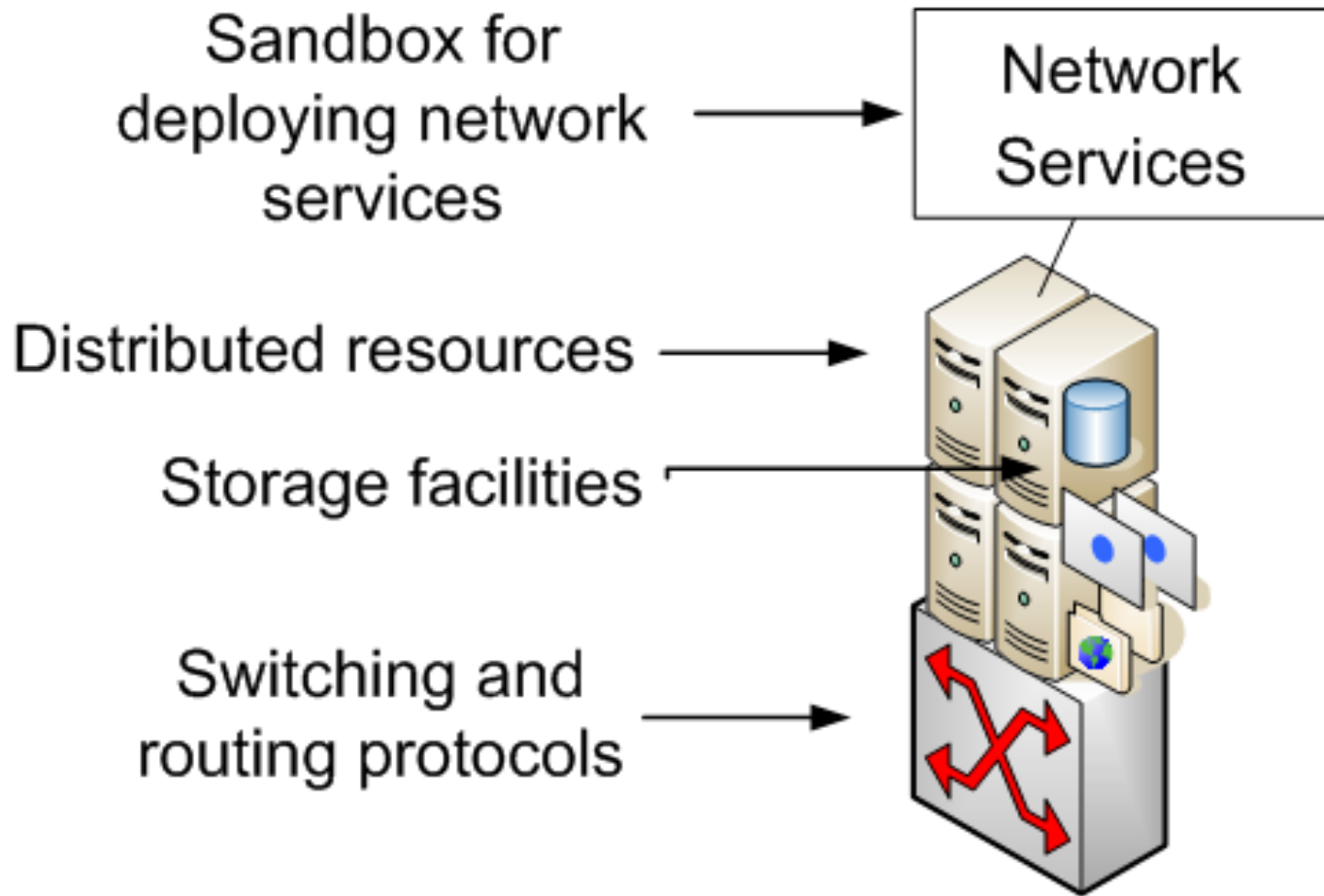 - The intermediate nodes can build the payload of packets, not just headers

Applications

- Monitoring inc auditing and accouting
- 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

Cluster : Distributed CPU and storage

JAVA / Execution Environment

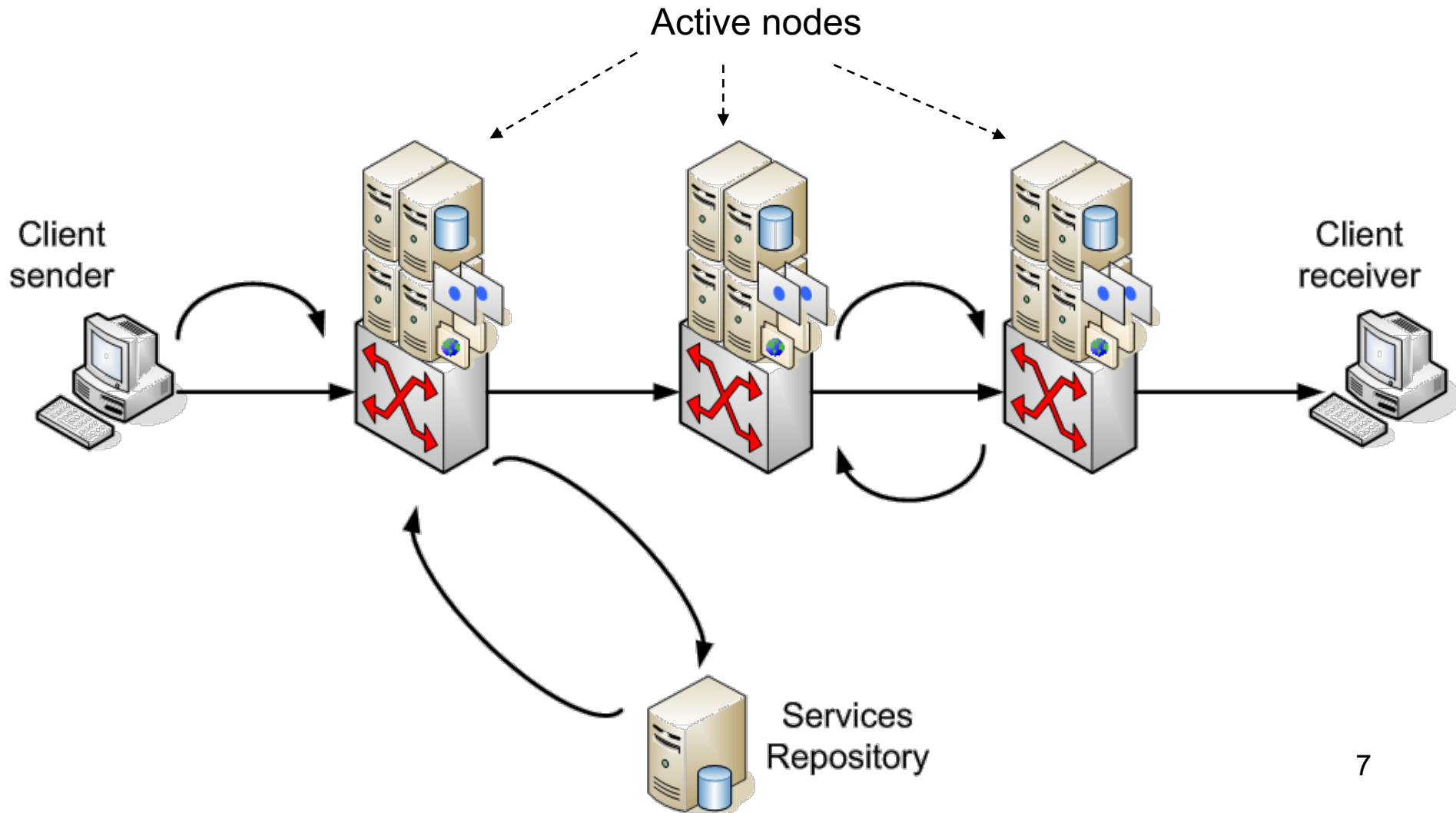OS / Kernel Programmable Modules

NIC (Programmable)

- 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
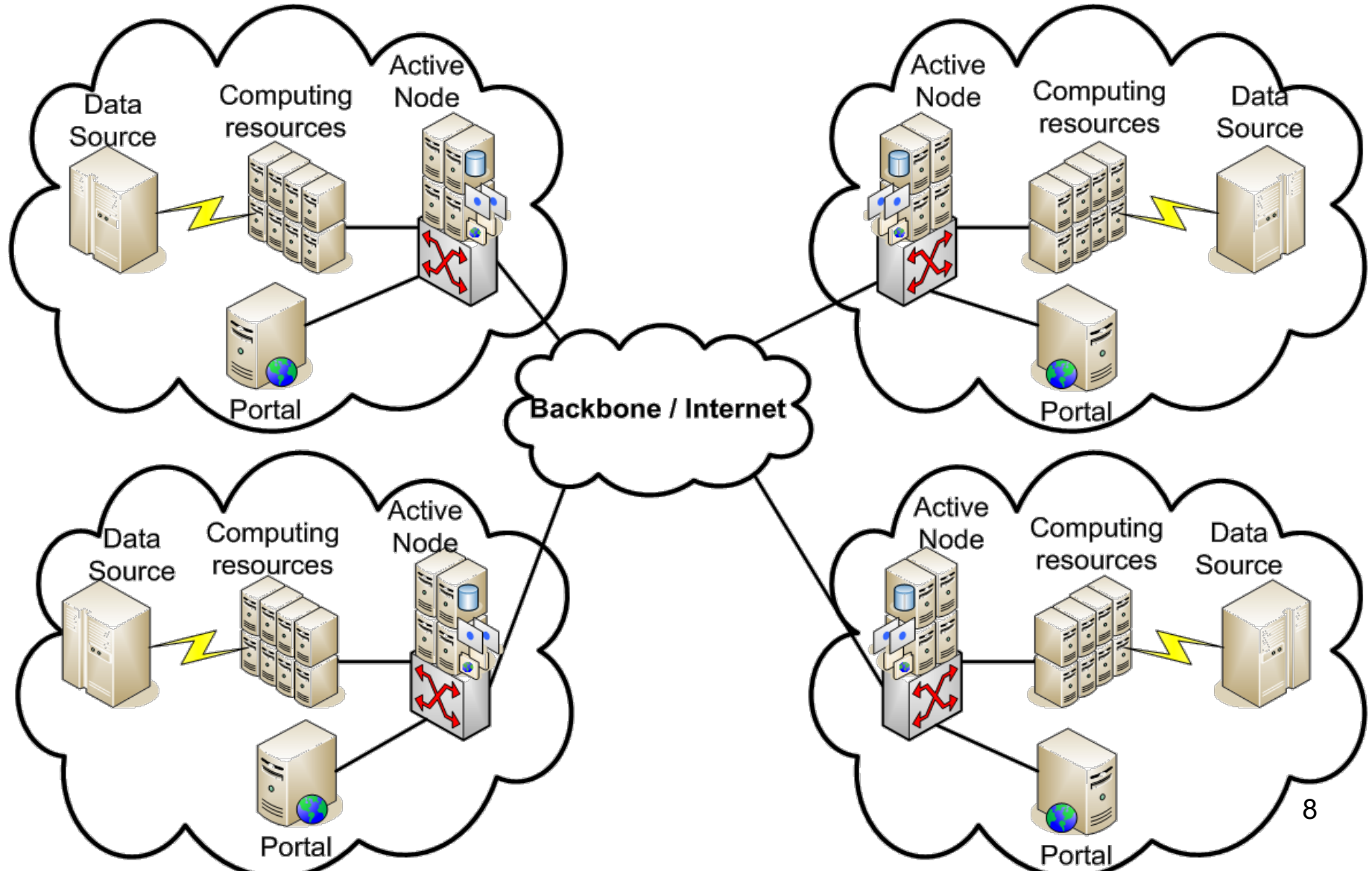- www.ens-lyon.fr/LIP/RESO/Tamanoir/

Tamanoir Active Node (TAN)

Sandbox for deploying network services → Network Services

Distributed resources →

Storage facilities →

Switching and routing protocols →

Active Network

Active nodes

Client sender

Client receiver

Services Repository

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Active Grid Architecture

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
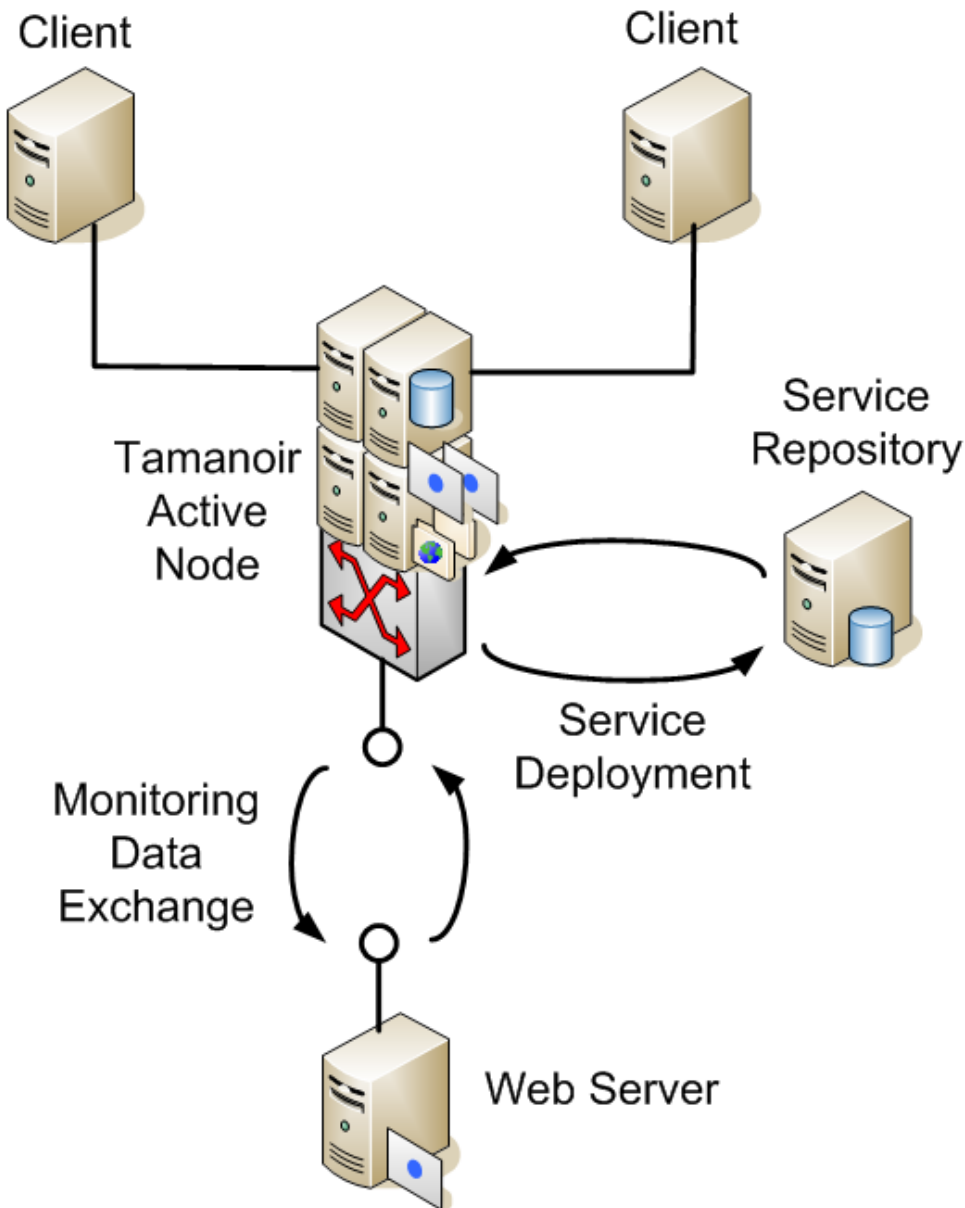
- Two Grid clients exchanging data streams through a Tamanoir active network node

- 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