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IPv6 and Grid middleware

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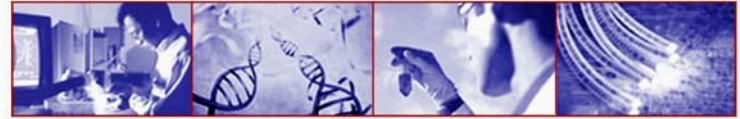
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IPv6 and middleware

- ▶ Here we give a sketch about publications on the main components of middleware glite.
- ▶ Our goal is to arise a productive discussion about the work that has to be done to ensure a transiction of middleware from IPv4 to IPv6.
- ▶ All comments and suggestions will be very appreciate.



Report on implications of IPv6 usage for Grid

- ▶ Both IP protocols will coexist for many years
- ▶ Applications and middleware will have to live in the resulting “Dual stack” worldwide network
- ▶ The emergence of new countries (India, China and Latin American) may accelerate IPv6 arrival
- ▶ *They are interested in Grid computing and perhaps gLite.*
- ▶ gLite is not IPv6-enabled yet
- ▶ Not a high priority to address
- ▶ From a network point of view, including infrastructure deployment, services and programming, there is no obstacle to tackle integration of IPv6 in EGEE
- ▶ Existing recommendations from international bodies (IETF, GGF) must be followed
- ▶ Resources and experience from various activities need to team up
Development, integration, testing, operations



Grid middleware

- ▶ [...] Grid systems are normally considered as network middleware, since they lie between applications and network resources. The data of Grid systems is currently transported using Internet Protocol version 4 (IPv4).
- ▶ The next generation Internet Protocol, IPv6, is replacing IPv4 with **improvements**.



Grid middleware

- ▶ Since IPv6 is expected to become the core protocol for next generation networks, Grid computing systems must track the migration of the lower-layer network protocols to IPv6.
- ▶ The period of transition from IPv4 to IPv6 will not be short.
- ▶ It's important to make Grid systems work on both IPv4 and IPv6, and to be able to communicate in heterogeneous IPv4/IPv6 networks.



gLite Middleware

- ▶ Between several middlewares we are involved in glite.
- ▶ gLite WMS is not a “simple” monolithic application
 - is a mixture of
 - “proprietary” services (i.e. developed within EGEE)
 - third-party services
 - running together and interacting each other
 - fulfill user requests
 - supply end user with functionalities for authenticating, submitting jobs, inquiring job status etc, etc
- ▶ So one of our goal is to understand and distinguish between different components.



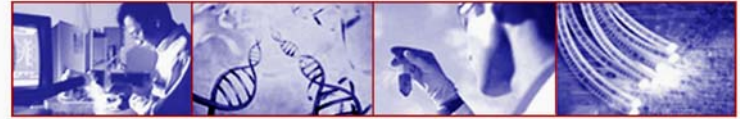
Java

- ▶ For the java code we know that from version 1.5 the code is IPv6 compliant.
 - The code has only to be compliant with a double network core (IPv4/IPv6).



Web containers

- ▶ A Web container is the execution infrastructure for operating OGSA services. The container environments need to provide IPv6 Web services for OGSA.
 - Tomcat5 is recommended with fully IPv6 support.
 - For Tomcat4 some problems could be experienced mainly due to the use of JDK 1.4 [6].



GLOBUS

- ▶ Developed at Argonne National Laboratories (ANL).
- ▶ Could be described like a toolkit and a set of services that could be applied to several applications domains.
- ▶ Use everywhere is possible “open source” solutions.
- ▶ A lot of review could be found on work done on GT3 systems running over mixed IPv4/IPv6 networks carried out jointly by University College London and the University of Southampton.
- ▶ On the architectural point of view:
 - The High Level Services are independent of the network layer, and need not be considered in the porting exercise. The local services are independent of Globus. Here it is vital that they support dual-stack working, and that the dual-stack configurations are chosen. Thus the porting is mainly concerned with the Grid Core Services (GCS).



GLOBUS

- ▶ The Globus system also use external applications. All network-associated applications need to be IPv6-enabled as well (ie: Java DataBase Connectivity).
- ▶ Within the Globus project, GridFTP is currently implemented in standard C.



Test GLOBUS-IPv6 compatibility

- ▶ The Grid was also an item in 6Net mainly from the University College of London (UCL) and the University of Southampton (UoS):
 - UCL and UoS completed work on Grid Technologies topic with a survey of the GlobusToolkit (GT). This activity was carry out in collaboration with the Globus development team in Argonne National Laboratory. Their studies contributed to make both GT3 and GT4 IPv6-enabled;
 - UCL released a set of patches and tools for the IPv6-enabled AccessGrid (<http://wwwmice.cs.ucl.ac.uk/6net/>). The Access Grid is a Globus Alliance project which use Grid resources to support large-scale distributed meetings (high quality videoconferencing).
 - Employing some patches [...] all the tests were carried out successfully; it is now possible to run the GT3 application in a heterogeneous environment. The implementation was also tested with externally developed GT3 services as well. The eProtein project, which is a large protein analysis project in UCL, had developed a remote execution service based on GT3 GRAM, using GT3 GridFTP to transfer data between clusters in different domains. It was successfully transplanted to the IPv6-enabled Globus infrastructure [7,8].



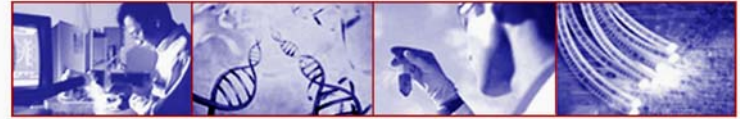
CONDOR

- ▶ Developed from University of Wisconsin from '80 years.
- ▶ Two of the main features of this software is to enable full time use of CPUs and to enable the use of etherogeneous computers.
- ▶ Some restrictions:
 - Monolithic system and not completely open source;
 - Not very efficient when access to big amount of distributed data;
 - Network communications are not encrypted;
 - Lack of information about IPv6 compatibility.



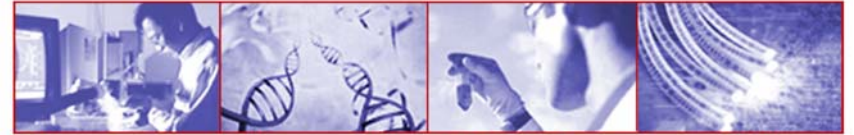
Biogrid and Naregi Project

- ▶ For example in Asia we can see they was able to build new infrastructure IPv6 compliant [5]:
 - IPv6-based GSI-SFS, a secure file system on the Grid has been developed to satisfy the strong demands and needs on data security by bio scientists and researchers. As the name of the file system shows, the file system runs on IPv6 network as well as IPv4 network.
 - All this work was realized developing a set of patches to the middleware to enable the Globus toolkit to be IPv6 compliant (ie:6grid web site).



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- [7] Sheng Jiang, Piers O'Hanlon, Peter Kirstein, UCL - THE COMBINATION OF IPv6 AND GRID SYSTEMS (Grid Today – January 2005)
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Thank you for your kind attention !



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