

IPv6 and the Grid

Work in Progress

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- **Why is IPv6 important for the Grid**
- **What has been our progress in porting Globus to the Grid**

The Nature of the Grid

- **Grid is ... a second chance to do distributed computing! ☺**
- **Many users:**
 - **Pure and Applied Sciences**
 - **Distributed Processing, High Performance**
 - **e.g. High Energy Physics, Bio-informatics**
- **Lots of investment (EU, national)**
- **Highly distributed - networking is vital!**
 - **It must track the best networking available**

- All better IPv4 features will come into later IPv6 implementations – but in a more integrated way
 - More likely to be standardly available in IPv4
 - Availability and functionality of implementations variable
- Examples of the above are already
 - Mobility support, security support, multicast and reconfiguration
- Large address space is used in a far better way
 - 128 bit addresses allows globally unique device addresses
 - Even many addresses per device allows tailoring of device

- **Will use 64 bit unique to device, 64 bit for network**
 - **Allows separation of addressing and routing**
 - **Can bind certificates to device address even when mobile**
 - **May allow convergence with UMTS methods of security**
- **Removes the need for NATs**
 - **Allows better end-end security**
 - **A fundamental problem in the grid environment**
 - **Removes artificial separation of client and servers**
 - **Fundamental to grid**
 - **Application protocols can rely on unique correlation of addresses and devices**
 - **More freedom in design of application protocols**

Specific Instance of IPv6 Addressing

- **IPv6 Addressing and routing**
 - **Global addresses for all end-systems (64 bits for the end systems)**
 - **Better addressing/routing scalability for all**
- **Mobile IP support in Basic Standard**
 - **Simplified addressing (mobile address has 64-bit prefix)**
 - **Simplified routing**
 - **Better than MIPv4**
 - **Inbuilt Security for Updates**
- **Multi-homing feasible, but still being defined**

IPv6 Configuration & Performance

- **Intrinsic support for Auto-configuration**
 - **Stateless (link-local, site-local) and state-full**
 - **Plug and Play**
 - **Neighbour discovery**
- **Performance potentially much better**
 - **Simplified header and header processing**
 - **Hardware assist - just coming in commercially**

Security & Group communications

- **Security in Basic Standard**
 - **IPsec: transport-level and tunnelling**
 - **AH: authentication**
 - **ESP: privacy**
- **Multicast in Basic Standard**
 - **Cleaner multicast address usage**
- **Anycast**
 - **Still being refined**

Globus IPv6 Port Work in Progress

**Where are we at UCL in making the main
Grid tool, Globus, IPv6-enabled**

Making Globus GT2 IPv6 Enabled

- **GT2 was the previous release**
- **Mainly written in C**
- **Had specific routines using calls to IP in Globus I/O (GIO)**
 - **Most modifications were in GIO**
 - **Worked on TCP/IP and UDP/IP porting**
 - **UoS started TCP/IP, UCL continued both IP ports**
- **Fairly straightforward to make either IPv4 or IPv6**
 - **Problem was to make it dual stack**

Current Globus GT3 Activity

- **GT3 is current release, mainly written in Java**
- **Initially tested with JDK1.3 (not IPv6 enabled)**
- **Moved over easily to JDK1.4 (IPv6 enabled)**
 - **Great advantage that most code was Java**
- **In following slides things done are underlined**

Different Aspects of Activity

- Java SDK – Ensure working with JDK1.4
 - Tested mainly in IPv4 mode
 - Only places where IP is called need testing for IPv6
- PostgreSQL – Installed IPv6 patch
- Tomcat – Use lightweight version, with JDK1.4
- **OGSA Relevant Network Communication Protocols**
 - **Probably needs little work**
 - **Need to know which parts are IPv6 sensitive**

- **GT3 Stand-alone Web Container**
 - **Used only for tests, but may need upgrade**
- **GT3 Server**
 - **Needs some work on where IPv4 calls are made**
- **GT3 Client**
 - **Needs some work on where IPv4 calls are made**
- **Tracking Globus changes**

- **OGSA is web based – little problem if correct initialisation JDK parameters are used**
- **Some other components not yet web based**
 - **Need more detailed analysis to identify changes**
 - **Grid FTP is an example of such a service**
- **The services needed are dependent on method of usage for specific applications**

OGSA Activity

- **GT3 is an implementation of the OGSA architecture**
 - **Includes sample OGSA services in distribution**
- **Will need to write own services**
 - **Initially just to exercise system**
 - **Later to make use of IPv6-specific facilities**
- **Have some high level media gateways**
 - **May make these operate in Globus environment**

- Making Globus IPv6-enabled is only a beginning
- Aim is then to use the underlying services that are thereby enabled in a uniform way
 - **Though transition services must be deployed at first**
 - **Will require considerable thought to do seamlessly**
- It is an IETF assumption that the following services will be universally available
 - **VPN/IPsec support, mobility, multicast, QoS, IPv6 autoconfiguration and addressing**
- Nevertheless it is not clear that all will be fully deployed

Full availability of IPv6 will allow provision of better Grid services