IPv6 and the Grid
Work in Progress

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Plan

• 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
Why bother with IPv6 for grid

- 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
Advantages of IPv6 Addresses

• 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**
Other Activities

- 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
Non-Web Services

- 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
Longer Term Aims

• 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 seemlessly
• 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