IPv6 and AccessGrid

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Acknowledgements

- Socrates Varakliotis, UCL
- Sheng Jiang, UCL
- Peter Kirstein, UCL
- Brian Carpenter, IBM
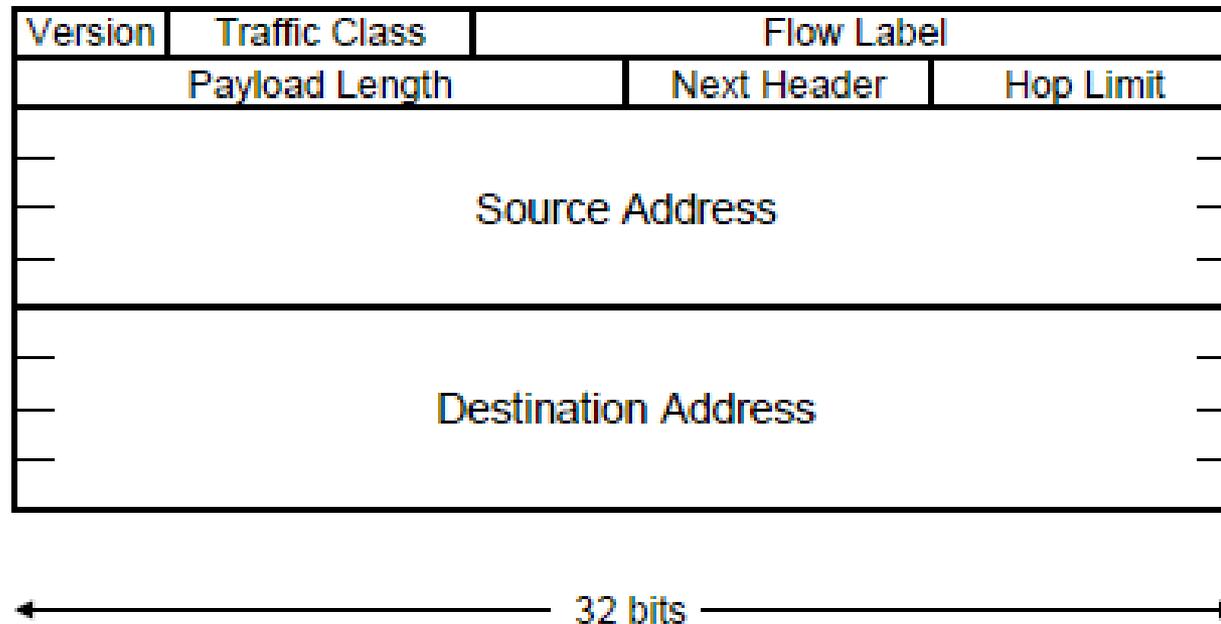- Ian Foster, Argonne National Labs
- Others in GGF WGs

Outline

- What is IPv6?

- Why IPv6?

- System Support for IPv6

- Benefits of IPv6 to AG

- Access Grid on IPv6
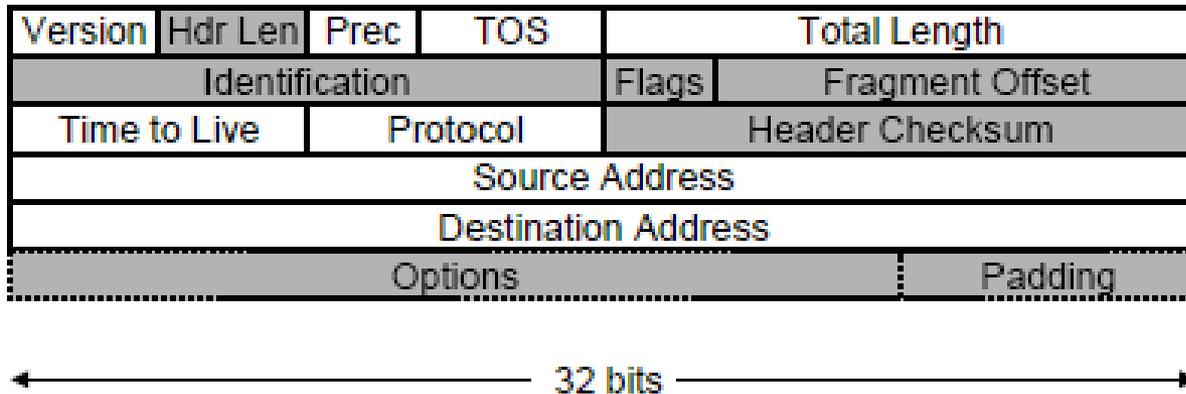
- Other Issues

- Plans

6NET Project

- 6NET.org is a three-year EU-funded project to demonstrate that continued growth of the Internet can be met using IPv6

- Setup and running Europe+ wide IPv6 network

- Includes a work package for IPv6 Middleware and User Application Trials:

- Begun porting AccessGrid to IPv6

- Porting and testing of Globus on IPv6
  - Targeting Globus Toolkit 3.X (i.e. OGSA)
  - Deployed GT3 IPv6 test beds at UCL and UoS
  - Collaboration with Globus team

IPv6 Packet

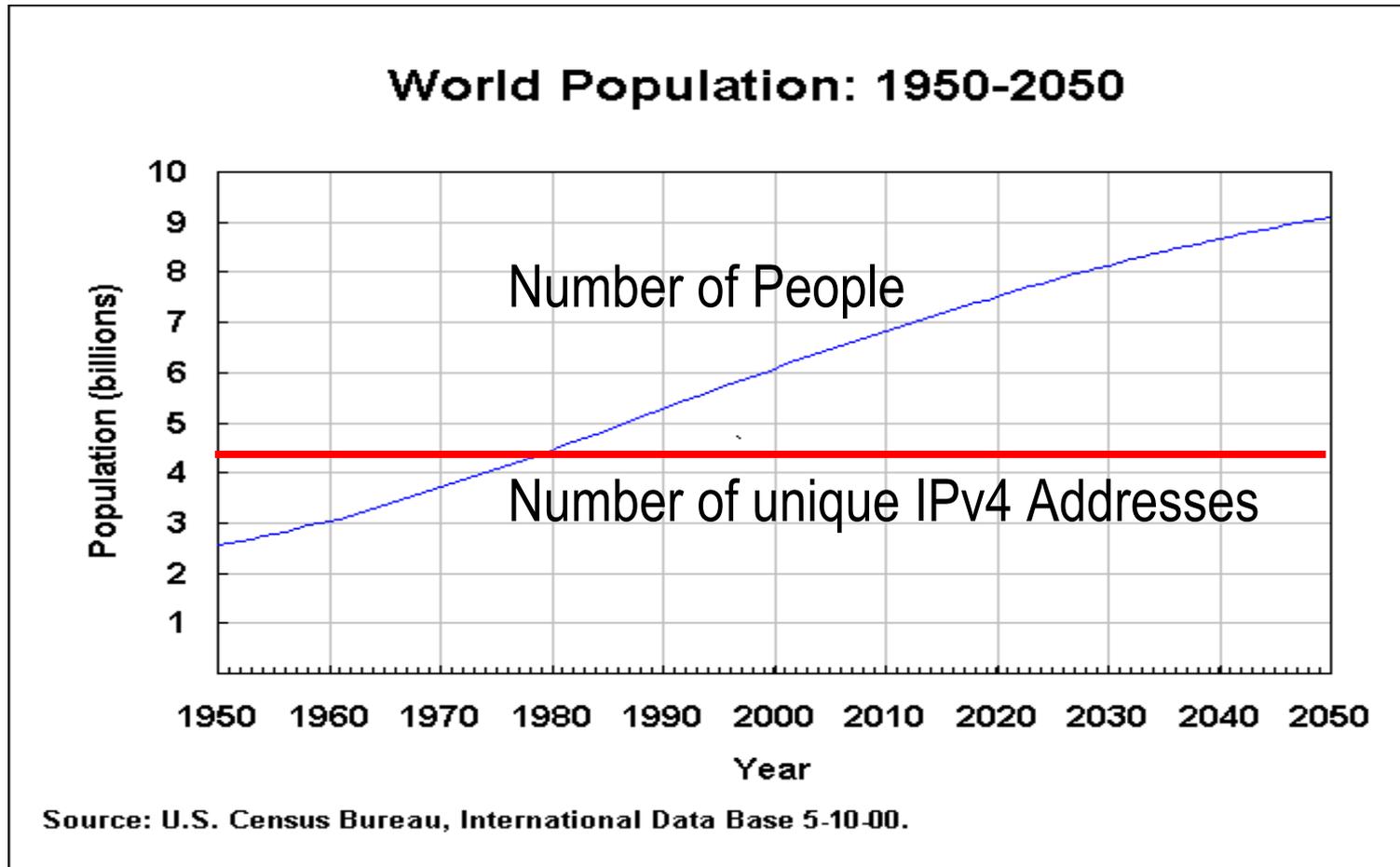| Version	Traffic Class		Flow Label	
Payload Length			Next Header	Hop Limit
Source Address				
Destination Address				

←──────────── 32 bits ────────────→

credit: Steve Deering

IPv4 Packets

Version	Hdr Len	Prec	TOS	Total Length		
Identification				Flags	Fragment Offset	
Time to Live		Protocol		Header Checksum		
Source Address						
Destination Address						
Options					Padding	

⟵———————— 32 bits ————————⟶

Shaded fields are absent from IPv6 header

credit: Steve Deering

Why we need IPv6

World Population: 1950-2050

Number of People

Number of unique IPv4 Addresses

Population (billions) vs Year

Source: U.S. Census Bureau, International Data Base 5-10-00.

Benefits of IPv6 to AG

- **Vastly bigger address space (128 bits vs. 32bits)**
  - Massive scaling potential >> 4 Billion(IPv4) nodes
- **End-to-end addressing**
  - Reduce need for NATs, Proxies etc
  - Enables full network level security (IPsec)
- **Simplified multicast**
  - Provider based multicast addr allocation, Embedded RP, SSM
- **Auto-configuration, renumbering**
  - Simplifies network (re)configuration
- **Complete mobility solution**
- **Modular design with clean extensibility**
  - Streamlined processing, effective header compression etc
- **Additional hooks for QoS – Flow Label**

IPv6 Host Support

- **IPv6 platform support**
  - Linux IPv6 shipped since Redhat 7.2
    - Available in kernel for a number of years prior to that.
  - Windows
    - Win2K/NT had IPv6 from MSR/MSDN
    - WinXP/03 has built-in IPv6
  - OSX, Solaris, FreeBSD, HPUX, etc all have support
- **Application level support**
  - Preliminary investigations indicate:
    - Python 2.2 – Limited IPv6
    - Python 2.3 – Fully functional IPv6
  - Globus ToolKit 3.x supports IPv6 with JDK1.4+

IPv6 Networking

- **All major router vendors provide basic IPv6**
  - Cisco, Juniper, 3Com, Hitachi etc
- **All major Services are (can be) IPv6 aware**
  - DNS, SSH, SMTP, FTP, NTP, etc
- **Deployment options**
  - Dual stack – i.e. IPv4 and IPv6 + Transition
  - Pure IPv6 with IPv4 overlays
- **A number of ISPs offering IPv6 (.jp .kr .se …)**
  - Increasing number of ISPs requesting IPv6 address space…

GGF IPv6-Working Group

- **Setup and co-chaired by 6NET**
  - Brian Carpenter (IBM) & Piers O'Hanlon (UCL)
- **Global Grid Forum (IPv6-Working Group)** http://forge.gridforum.org/projects/ipv6-wg/
  - IP version dependencies in GGF specifications
  - Guidelines for IP independence in GGF specifications
  - Status for Java Developers Kit API for IPv6

Access Grid Client

- **Venue Client**
  - Node Service
    - Service Managers
  - TextClient, DataClient, EventClient etc
- **Node Management**
- **IPv6 Issues**
  - Client & Management UI, Session description, WSpy, GSI

Virtual Venue Server

- **Venue management client**
- **Virtual Venue Server**
  - Multicast Address Allocator
  - TextService/Jabber, DataStore, EventService etc
- **IPv6 Issues**
  - Management UI, WSpy, GSI, Session description (Simplified address allocation), Service access – WS and TCP/GSI

Media Tools

- ## Video – VIC (Others are IPv6 e.g. VLC)
  - Already support for IPv6 (including multicast)
  - Requires some updates
    - AG mods merge with latest UCL-VIC

- ## Audio – RAT
  - Already support for IPv6 (including multicast)
  - Requires some updates
    - AG mods merge with latest UCL-RAT

Further IPv6 Concerns

- **Security**
  - GSI, PKI, WS-Security?
- **IPv4-IPv6 Inter-working/transition**
  - Gateway media streams
    - Automatic (special addresses), or static config
  - Venue address conversion
  - Venue server listens on IPv4+6

Plans

- **Working with University of Southampton**
- **First stage**
  - Port Session descriptions, and media tools
- **Second stage**
  - Port AG transport and communications (maybe without GSI)
- **Deploy IPv6 AG over 6Net**
  - IPv6 Venue server and clients
- **Transition considerations**
  - IPv6 only
  - IPv6 and IPv4 coexistence
  - Devise appropriate policy and configuration

Q&A, Some Links

- **www.6net.org**

- **Draft report on IPv6 and Access Grid:**
  - www.cs.ucl.ac.uk/staff/s.varakliotis/6net/

- **GGF IPv6 Working Group:**
  - forge.gridforum.org/projects/ipv6-wg

- **Globus IPv6**
  - www.cs.ucl.ac.uk/staff/s.jiang