

SPAWAR



Systems Center
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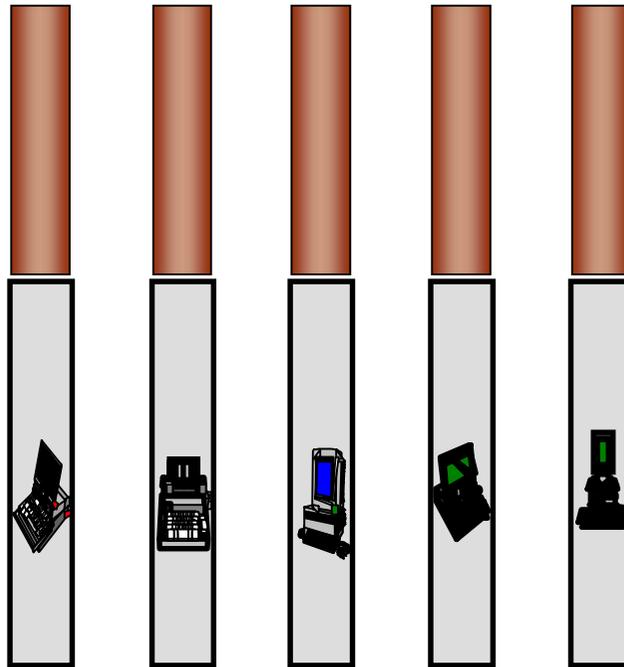
The Next Generation Internet (NGI) and Warfare

***Michael P. Brig
NGI Program Manager
(843)-218-4675
brigm@spawar.navy.mil***

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Before the Defense Communications Standardization Effort (DCSE)



**DoD communications were principally stove piped
and proprietary.**

History of the DCSE

- **The DARPA ARPANET, which was then based on a layer 3 protocol called the Network Control Protocol (NCP), became operational in 1971.**
- **In 1973 work began developing the Internet Protocol version 4 (IPv4) as a replacement for NCP.**
- **In December 1978, the Principal Deputy Under Secretary of Defense for Research and Engineering (USDR&E), Gerald P. Dinneen, issued a memorandum mandating the use of TCP/(IPv4) for all DoD packet-oriented data networks.**
- **In November 1981, the official plan and schedule for transitioning the ARPANET to TCP/IPv4 was published. The transition of the ARPANET to TCP/IPv4 was completed on January 1, 1983.**
- **In May 1983, the National Research Council Committee on Computer-Computer Communications Protocols was formed to develop recommendations and guidelines for resolving differences between the National Bureau of Standards (NBS) and the Department of Defense (DoD) on data communications protocol standardization.**
- **The NRC committee recommended in February 1985 the DOD move toward adoption of TP-4/CLNP as a co-standard with TCP/IPv4. The council also recommended a long-term standardization on TP-4/CLNP.**

History of the DCSE

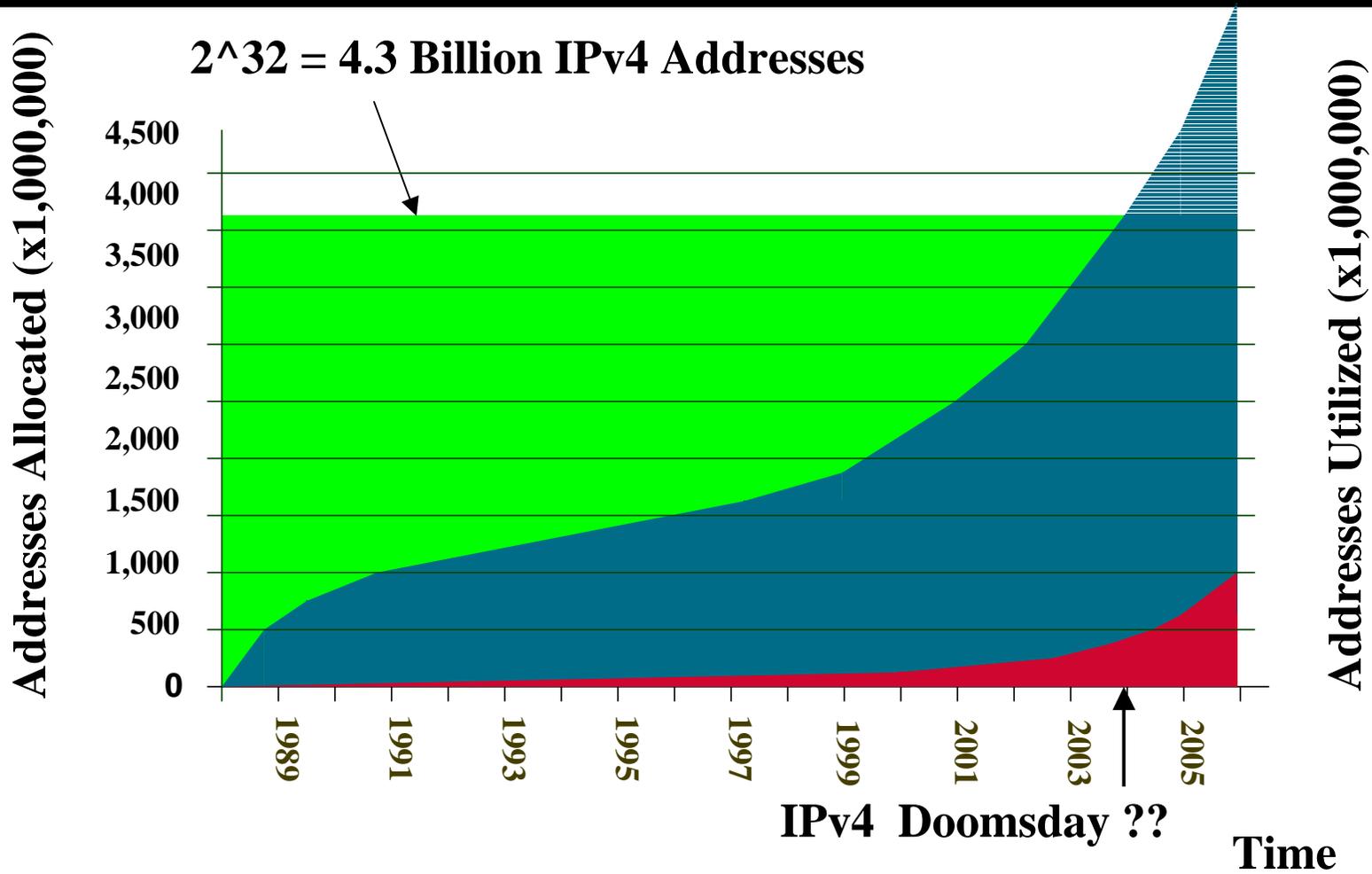
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- In July 1987, ASDC3I, Donald C. Latham issued a memorandum mandating the adoption of TP-4/CLNP as a replacement for TCP/IPv4 within two years of the finalization of the federal Government Open Systems Interconnection Profile (GOSIP). Interoperation with existing TCP/IPv4 systems for their expected life times was also required.
- In 1990, control of the Internet moves from the US military to the Commerce department as the ARPANET is decommissioned and replaced by the National Science Foundation Network (NSFNET).
- Congress gave NSF statutory authority to allow commercial activity on the NSFNET under the Scientific and Advanced-Technology Act of 1992.
- IPNG development begins in December 1993 with the publication of “IP: Next Generation (IPng) White Paper Solicitation”. Dr. Steven Deering first published the “Internet Protocol, Version 6 (IPv6) Specification” in December 1995.
- Internet Corporation for Assigned Names and Numbers (ICANN) was formed in 1998 to take over certain Internet administrative functions from the United States government.
- By October 2000, the Internet has grown to 93+ million hosts in approximately 50 countries worldwide.

Internet Trends

- **Dramatic growth in the number of Internet connected devices.**
- **Proliferation of simple, self-configuring info appliances.**
- **Skyrocketing value of e-commerce (\$3.2+ trillion by 2002).**
- **Accelerated technology development & deployment.**
- **Internet privatization and internationalization**
- **Proliferation of strong commercial encryption.**
- **Proliferation of 'Always On' and mobile internetworking.**
- **Proliferation of Quality of Service (QoS) and multicast**

Size of the Internet



“Information” Appliances



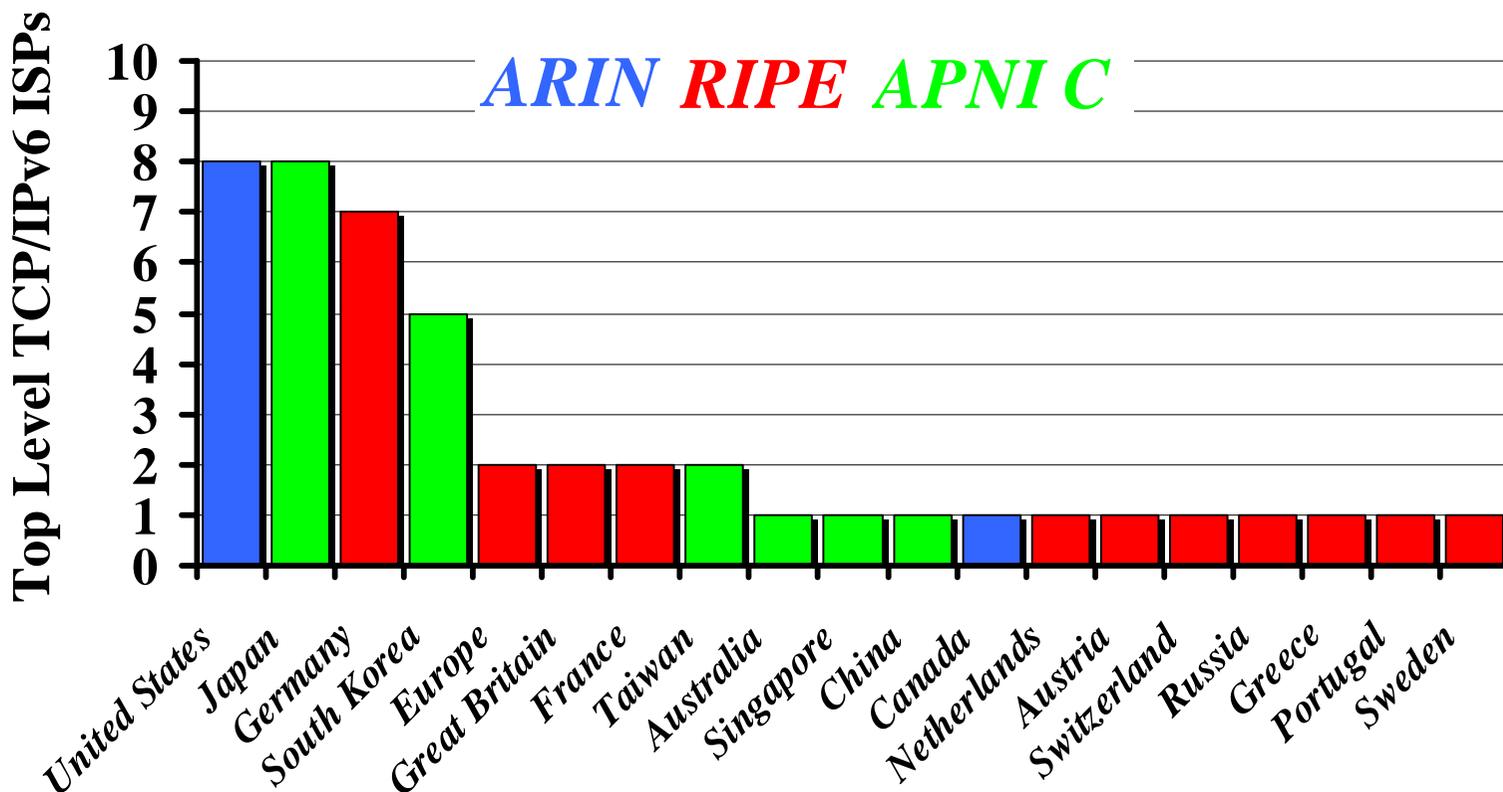
DoD and NATO TCP/IPv6 Directives

- **DISA Joint Technical Architecture (JTA) 3.0**
- **USA Joint Technical Architecture (JTA-A)**
- **USAF Joint Technical Architecture (JTA-AF) version 2**
- **USN Information Technology Standards Guidance (ITSG).**
- **NATO Open Systems Interconnection Profile (NOSIP) Strategy Edition 1998**

USN Info Appliances

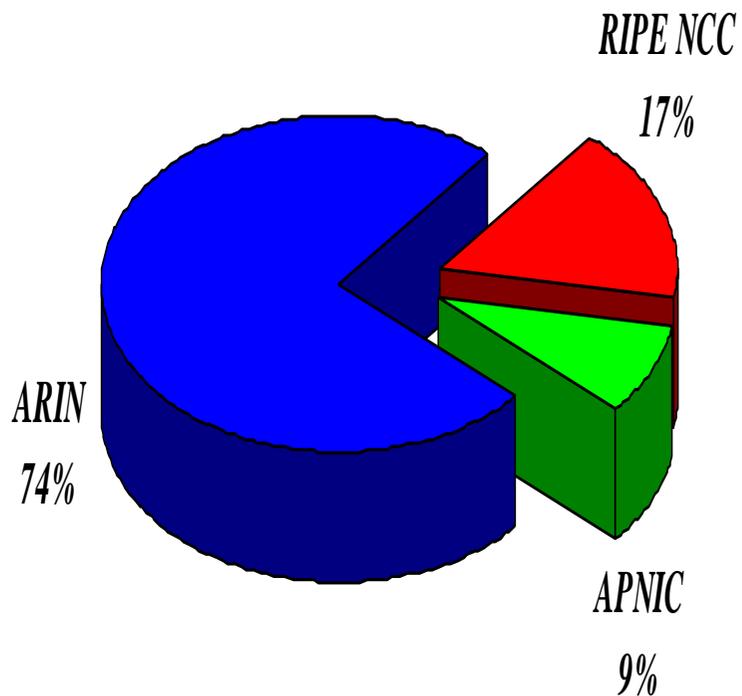


NGI Exists Today!

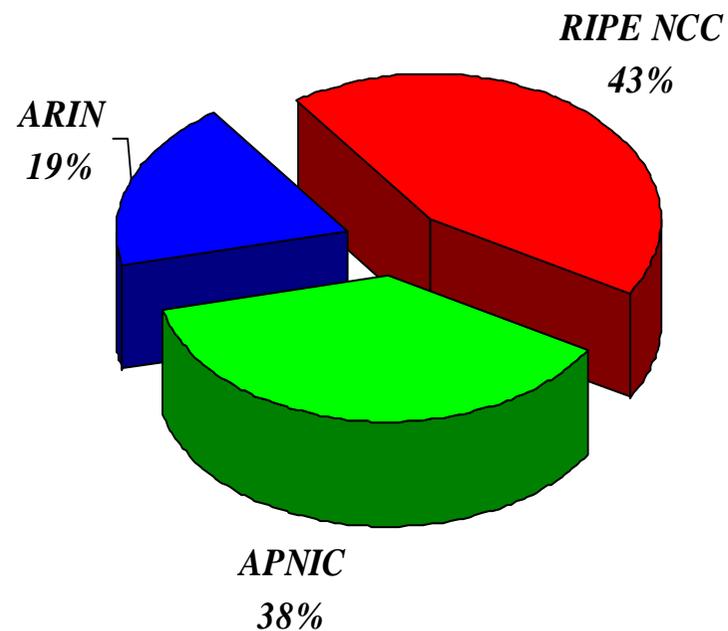


*Internet Assigned Numbers Authority (IANA) began allocating the first production IPv6 address blocks to the RIRs on 15 July 1999. Today there are 47 Top Level ISPs in existence throughout the world!

Comparison of IP Resources



Today's TCP/IPv4 Internet



Today's TCP/IPv6 NGI

Top Level TCP/IPv6 ISPs

- **American Registry for Internet Numbers (ARIN).**
 - ESNET, vBNS, CANET3, VRIO, CISCO, QWEST, DEFENSENET, ABOVE NET, and SPRINT.
- **Asian Pacific Network Information Centre (APNIC).**
 - WIDE, NUS, CONNECT, KIX, NTT, JENS, ETRI, HINET, IIJ, IMNET, CERNET, BIGLOBE, 6DION, DACOM-BORONET, ODN, KOLNET, and TANET.
- **Reseaux IP Europeans Network Coordination Centre (RIPE NCC).**
 - UUNET, SPACENET, SURFNET, BT, SWITCH, ACONET, JANET, DFN, FREENET, GRNET, ECRC, TRMD, RENATER, NACAMAR, EUNET, GIGABELL, XLINK, TELECOM, RCCN, SWIPNET, and ICM.

Principle DoD TCP/IP_{v6} Issues

- **COTS and GOTS software upgrades required.**
- **Infrastructure upgrades may be required.**
- **Transition planning and coordination required.**
- **Transition and interoperability testing required.**
- **How to best deploy the new security paradigm of the NGI?**
- **Funding for the NGI upgrade.**
- **Increased support costs during the NGI upgrade.**
- **Interoperability with allies, coalition partners, government agencies, contractors, research institutions, and potential adversaries.**

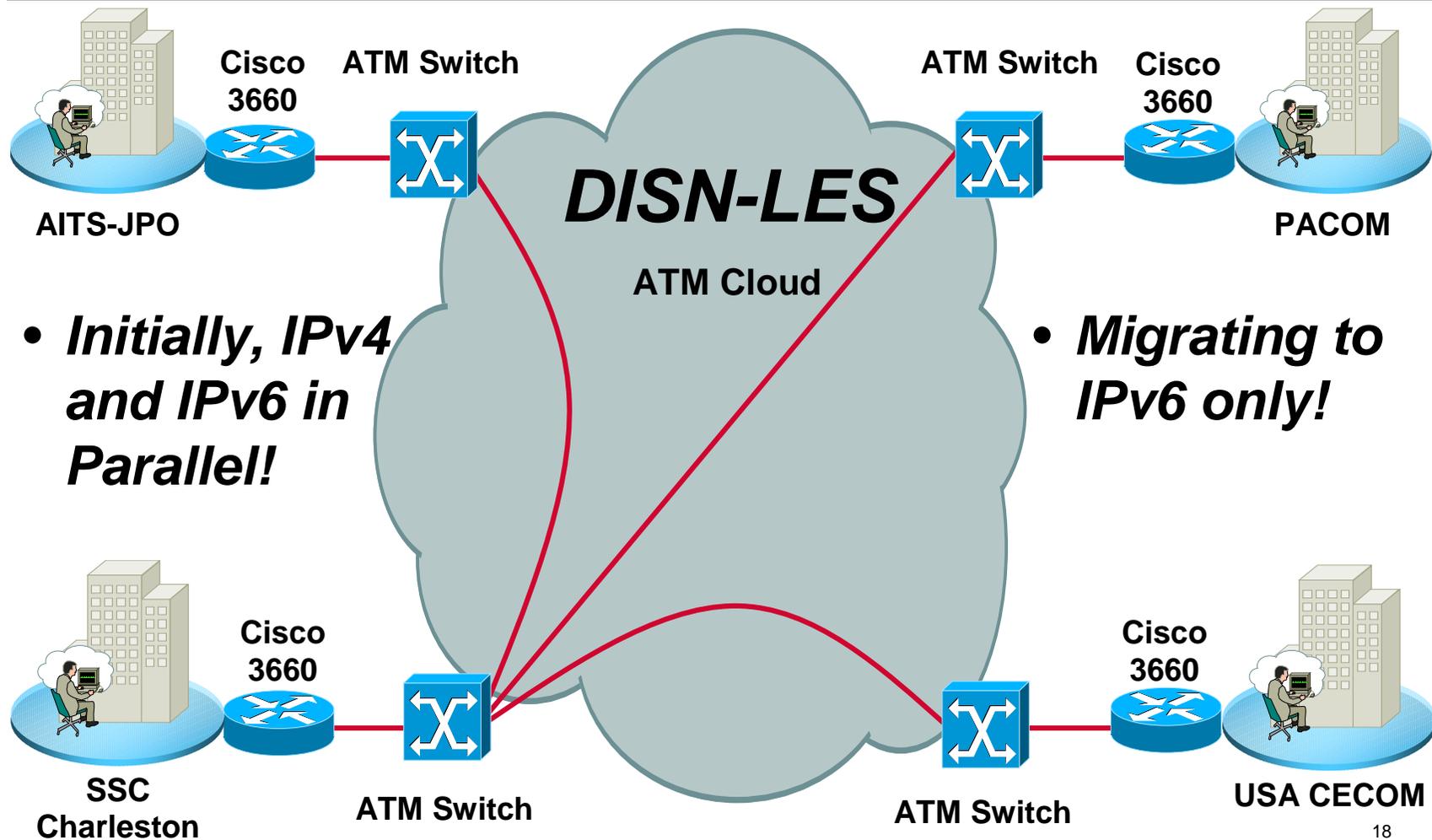
SSCC Plans

- **Focus on an IPv6 operational backbone (NIPRNETv6) in FY01 using the DEFENSENET subTLA!**
- **CINC21 ACTD network for coalition experimentation.**
- **2000 SPAWAR IPv6 conference November 28&29.**
- **Contracted with OPNET technologies to develop an IPv6 model library by close of FY01.**
- **Beginning to be tasked with lots of IPv6 impact studies.**
- **Closely watch commercial TCP/IPv6 developments.**
- **Coordinate and collaborate with the other services, the other branches of government, and our allies.**
- **Coordinate and collaborate with Industry.**

CINC21 ACTD

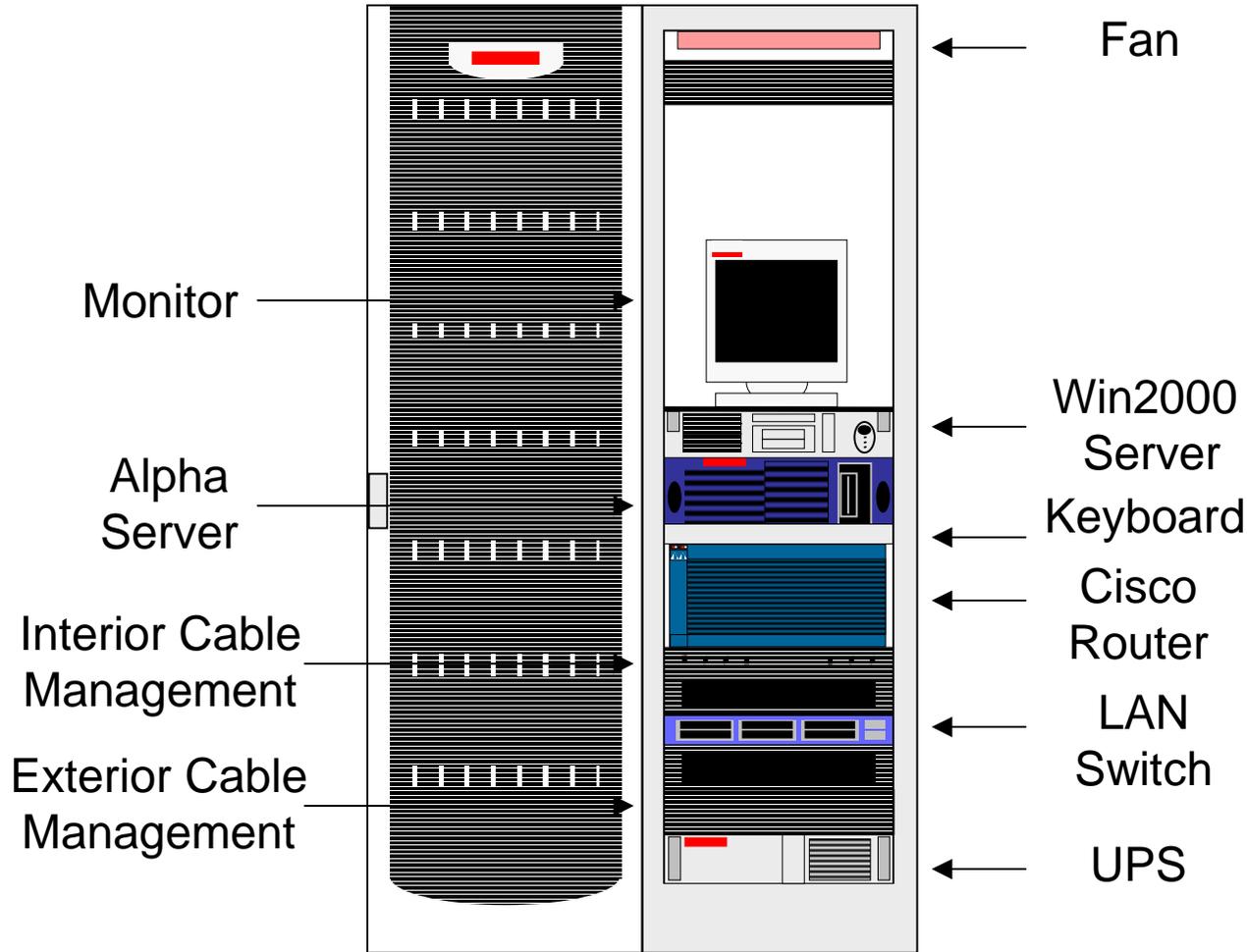
- **Commander and Chief for the 21st Century (CINC21).**
- **Advanced Concept and Technology Demonstration (ACTD).**
- **Sponsored by the Deputy Undersecretary of Defense (Advanced Systems and Concepts).**
- **The principle goal is to examine IPv6's inherent security features to provide coalition interoperability.**
- **A secondary goal is to collect data to determine the value of migrating to IPv6 vs. the cost.**

CINC21 IPv6 ACTD Concept

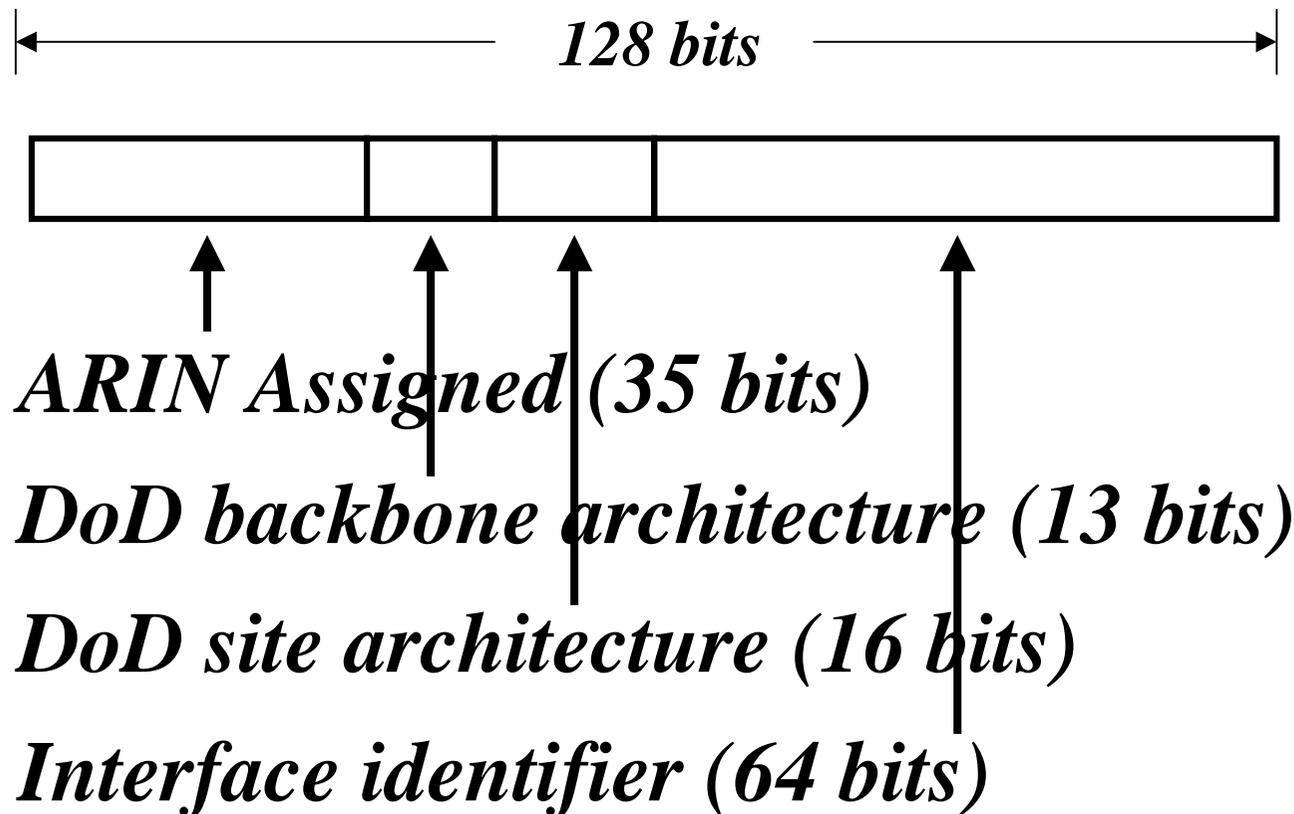


CINC21 IPv6 ACTD

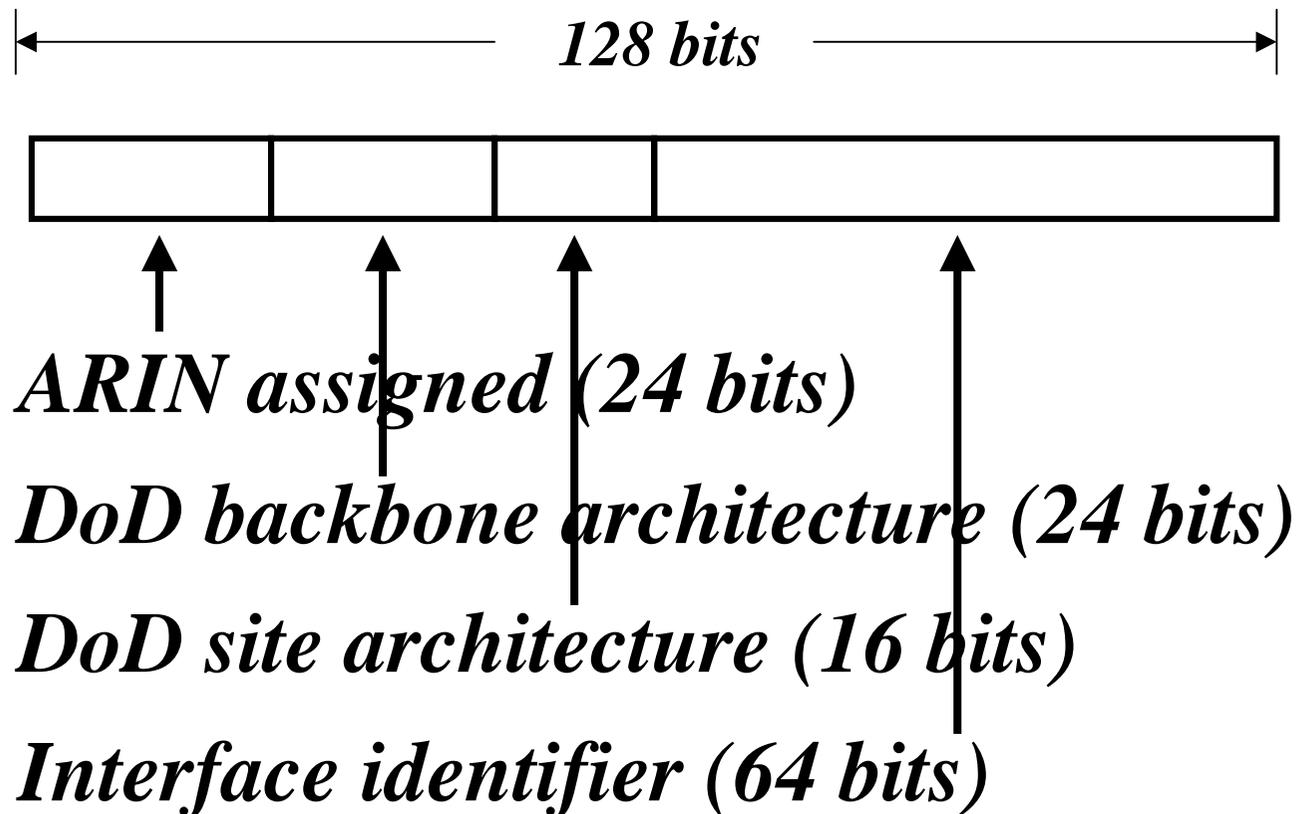
Equipment Configuration



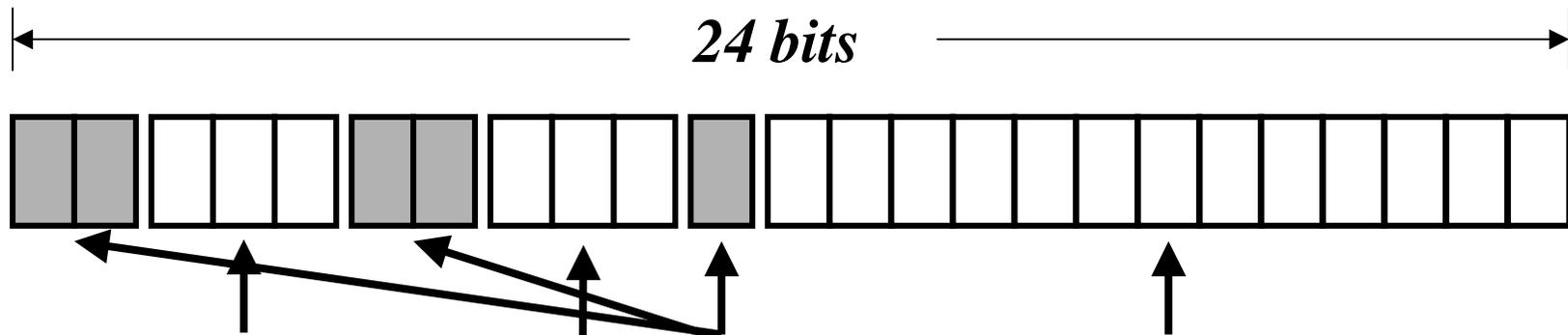
Proposed IPv6 subTLA Addressing Scheme



Proposed IPv6 TLA Addressing Scheme



Proposed DoD (TLA) Backbone Architecture



- Security Theater
 - 00 Security Level #1
 - 01 Security Geographic Area #1
 - 10 Security Task Force
 - 11 Security Geographic Area #2
 - 100 Geographic Task Force
 - 101 Geographic Area #5
 - 110 Geographic Area #6
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