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IPv6 in the Department of Defense

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Agenda

- Purpose
- Background
- DOD's Need for IPv6
- DOD IPv6 Policy
- DOD Timeline
- The DISA Plan
- JITC's Role
- The Approach
- IPv6 Lab Goal
- Benefits of this Approach
- Service's IPv6 Activities
- Exercise Participation
- Road Ahead

Purpose

- To let industry know DOD's commitment to IPv6
- To provide state of DOD's efforts to date

Background

- **Military Communications-Electronics Board tasking for IPv6 Transition Strategy (Oct 01)**
- **DOD IPv6 Policy released, June 9, 2003**

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DOD's Need for IPv6

- **Why is IPv6 needed?**

  Future combat systems demand:

  - **Network ubiquity (IP centric)**
  - **Mobility and ad-hoc networking (dynamic addressing)**
  - **Security (embedded IPsec)**

  IPv4 cannot support future required capabilities

- **Barriers to IPv6 implementation:**
  - **Sunk costs**
  - **Presumed satisfaction with IPv4**
  - **Misunderstood industry leadership (DOD as fast follower)**

DOD success depends on leadership and integration of efforts

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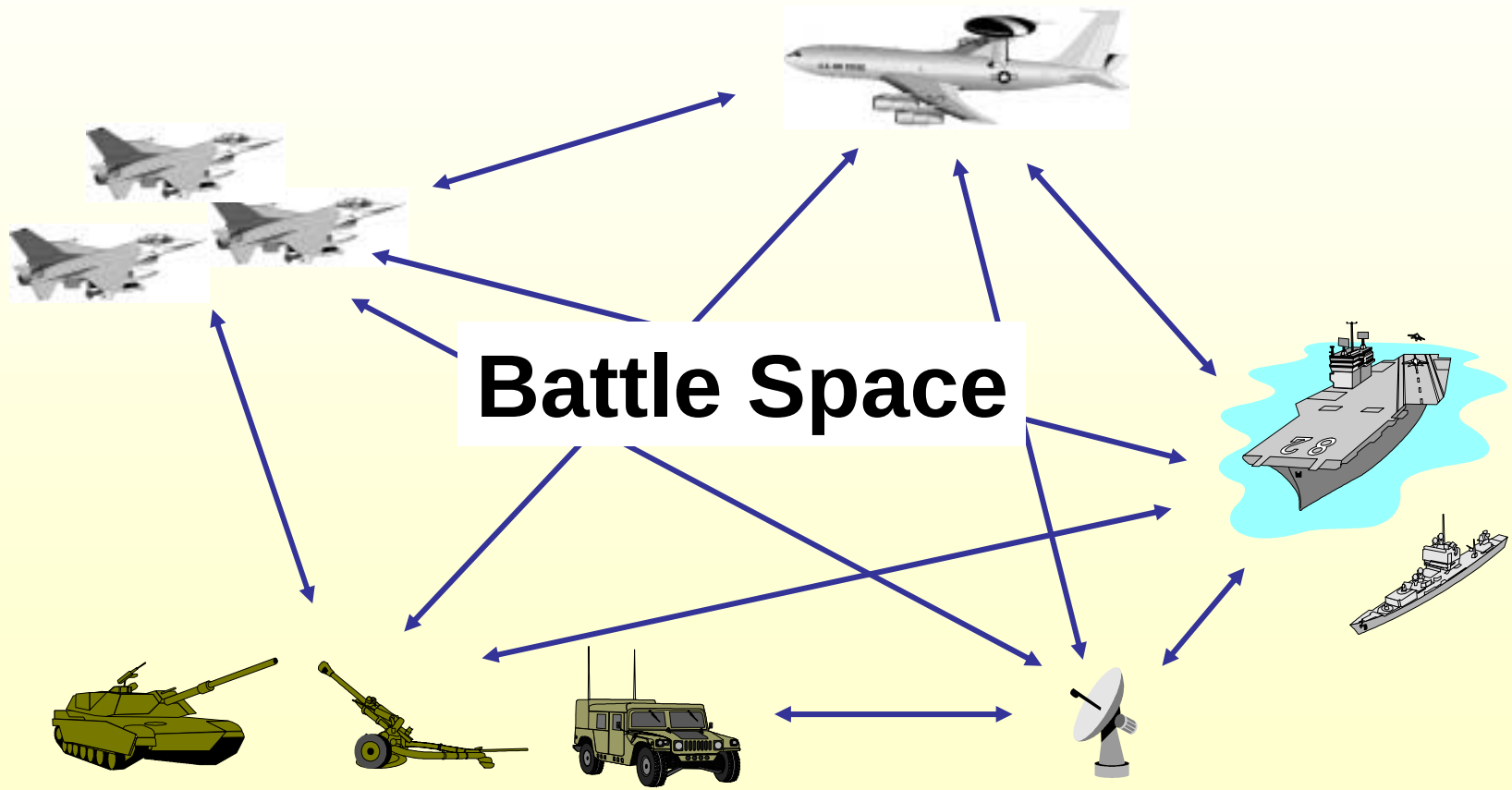
DOD's Need For IPv6 (Cont)



DOD IPv6 Policy

- **To <u>prepare</u> for eventual IPv6 migration and coexistence**
  - Effective Oct 03, all GIG assets acquired, procured and developed shall be IPv6 capable and maintain interoperability with IPv4
  - DOD CIO identify pilots, demonstrations, and test beds
  - GIG transition from FY 05 to FY 07
  - DISA to acquire, manage, allocate, and control necessary IPv6 address space for DOD

DOD IPV6 Policy (Cont)

- **To ensure that DOD IPv6 fielding is <u>coordinated and does not introduce interoperability and IA risks</u>**
  - Temporary restriction of IPv6 on networks carrying operations traffic
  - DISA will play a strong role in the development of DOD IPv6 Transition Plan
  - DOD CIO and Joint Staff with participation of DOD components and Services will develop a transition plan

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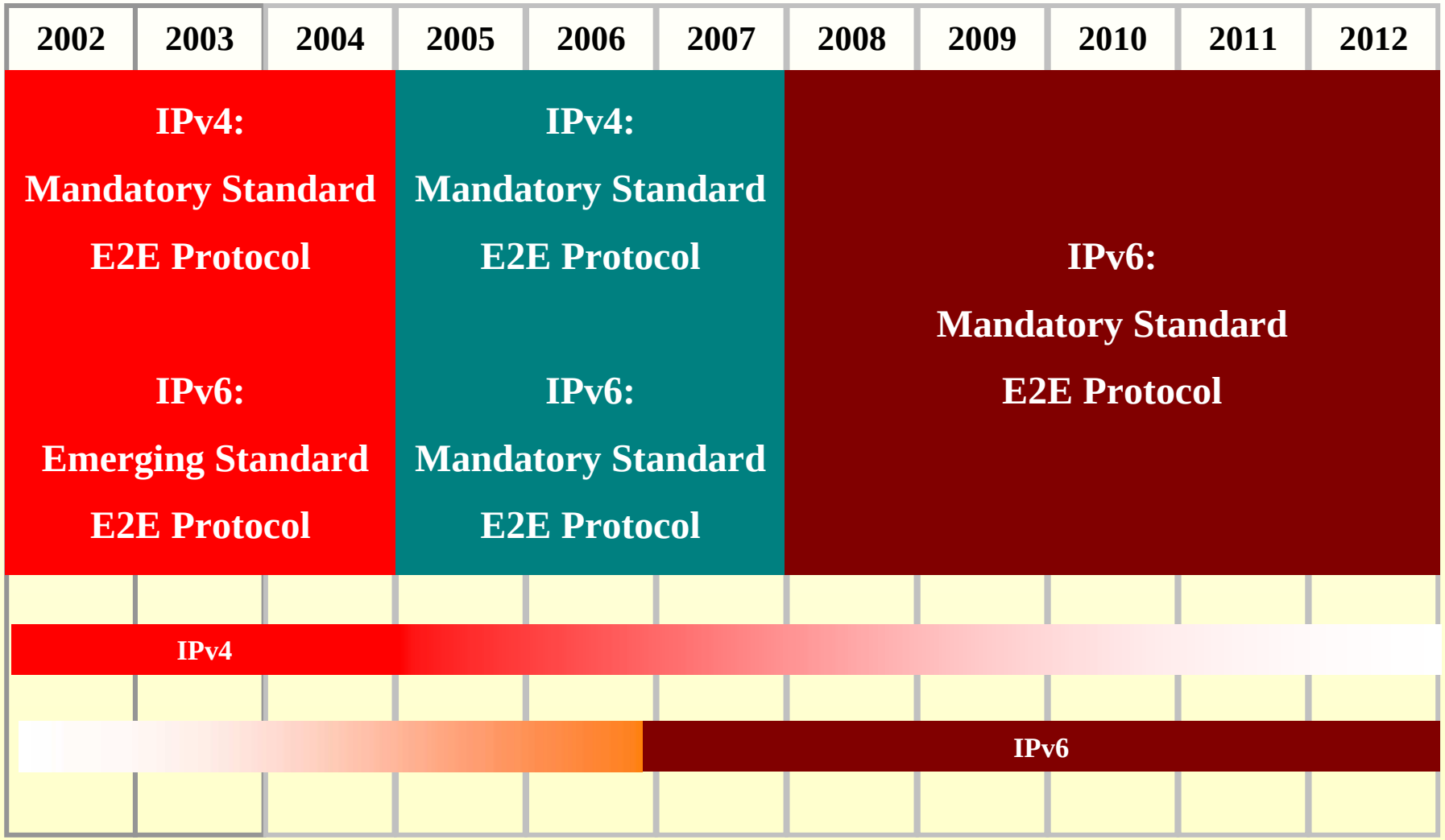
Projected DOD Timeline



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The DISA Plan
(WBS)

Lead Transition

Manage Effort

- Develop Master Plan
- Develop Transition Strategy
- Develop Policy
- Manage DOD IPv6 WG
- Perform DOD Cost Analysis
- Coordinate IPv6 Effort
  - DOD Entities
  - Partners
  - Coalitions
  - Gov't Agencies

Engineer Solutions

- Acquire Address Space
- Develop Addressing Plan
- Transition DNS
- Establish DNS Root Server
- Develop Ops Lab
- Integrate DOD Test Bed
- Perform Trade Studies
- Assess IPv6 Products
- Assess Information Assurance
- Conduct Tests & Evaluations
- Develop Net Mgmt Methods & Tools
- Develop Deployment Schema
- Develop Ops & Support Plan
- Develop Training
- Support Standards Development
- Provide Customer Support

Perform Research

- VOIP
- Wireless
- QOS
- Multicast
- Mobile Networking
- Ad-Hoc Networking
- Policy-Based Networking

Integrate DISA Efforts

- Information Assurance
- Standards
- Applications

Provide Ops Supp

- Support Deployment
- Provide Network Analysis
- Provide Engineering Support
- Provide Training
- Transition To DISA Elements

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JITC's Role

- **JITC is the test and evaluation arm of DISA**
- **JITC's primary mission is to certify systems and / or equipment for joint and combined interoperability**
- **JITC has the capability to replicate most strategic and tactical joint architectures**
  - Department of Defense Interoperability Communications Exercise (DICE) provides a venue to access all Services within DOD and Homeland Security

The Approach

- **Establish / participate in an IP distributed test network**
  - Realistic implementation / architecture
- **Make interoperability the guiding principle**
  - What will interoperate now and how
- **Encourage vendor participation**
  - Interoperability with other IPv6 systems
  - Interoperability with IPv4 using standard applications
  - Demonstrate ability to use various transition mechanisms
  - New features of IPv6 beneficial to military applications

The Approach (Cont)

- **Assist in the development of test criteria**
- **Certified products on JITC list of certifications**
- **Phased implementation process**
  - Test and analysis phase
  - Initialization phase
  - Core implementation phase

IPv6 Lab Goal

- **To provide PMs and acquisition agents with a resource matrix of equipment and operating systems**
  - PMs and acquisition agents purchasing certified systems and equipment will have reasonable assurance of interoperability

Benefits of this Approach

- **Utilizes vendor expertise**
  - Knowledge of what will and will not work
  - Will aid in the development of future test criteria
  - Provides experience for lab asset procurement -- key personnel will get to “kick the tires” of IPv6
- **Trains the tester**
- **Opportunity to demonstrate new functionality afforded by IPv6**
  - Flows
  - End-to-end security
  - ??????

Army Activities

- **Identified interoperability issues with legacy networks and systems**
  - Network address translation (IPv4 / IPv6 gateway)
  - Tunneling
- **Leveraging autoconfiguration to reduce net management burden**
- **Potential enhancements to QoS**
- **Performance issues with dual-stack networks**
- **Mobile IPv6 experiments**
- **JITC DICE03 experiments participation**
- **Participated in evolution of IPv6 policy**
- **Identified potential early IPv6-enabled adopter with Warfighter Information Network-Tactical Network Operation Center-Vehicle**
- **Participation in the DISN IPv6 testbed**

Air Force Activities

- Participation in the DISA-led DOD IPv6 transition working group
- Promoting use of IPv6 capability in future Air Force acquisitions
- Participation in the DISN IPv6 testbed network

Air Force Activities (Cont)

- Security analysis conducted by AF Information Warfare Center (AFIWC) in coordination with National Security Agency (NSA)
- AF / XICC hosted inter-Service IPv6 discussions
- Air Force Research Lab (AFRL) participation in the University of Indiana's Abilene IPv6 test network
- Future participation in the University of New Hampshire's MoonV6

Navy-Marine Activities

- **SPAWAR San Diego has conducted extensive IPv6 testing over the Defense Research and Engineering Network (DREN) for 3 years**
  - Test bed between five sites running IPv6 exclusively, with multiple OSs, FWs, IDSs, DNS, SMTP, FTP
  - Extensive findings / feedback to vendors of missing functionality, incompatibilities, security concerns

Navy-Marine Activities (Cont)

- **SPAWAR Charleston has been a principal participant in DISN-LES as part of CINC 21 Advanced Concept Technology Demonstration**
  - Running dual-stack environment, have run extensive compatibility testing with multiple technologies and products
  - Sharing test results to provide real-world experience and influence hardware and software development and designs

Navy-Marine Activities (Cont)

- **Navy-Marine Corps Intranet (NMCI)**
  - For present, stable infrastructure essential as NMCI proceeds towards full deployment of 365,000 seats
  - NMCI an identified candidate to be poised to implement IPv6 pilot in ~ Jan 2005.
- **Participation in the DISN IPv6 testbed network**

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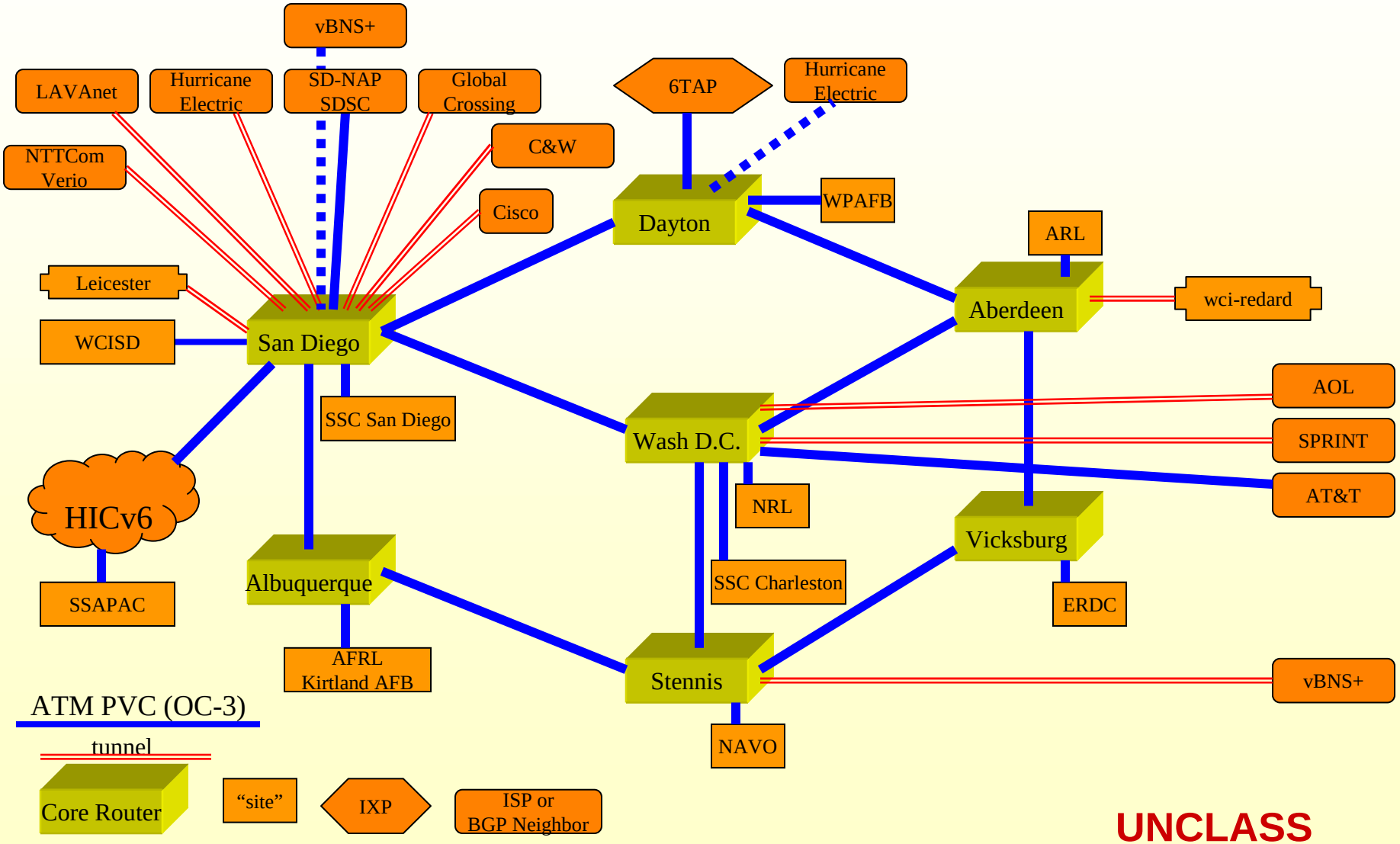
Current DREN IPv6 Logical Topology



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Exercise Participation

- DICE 03
- MoonV6
- DICE 04

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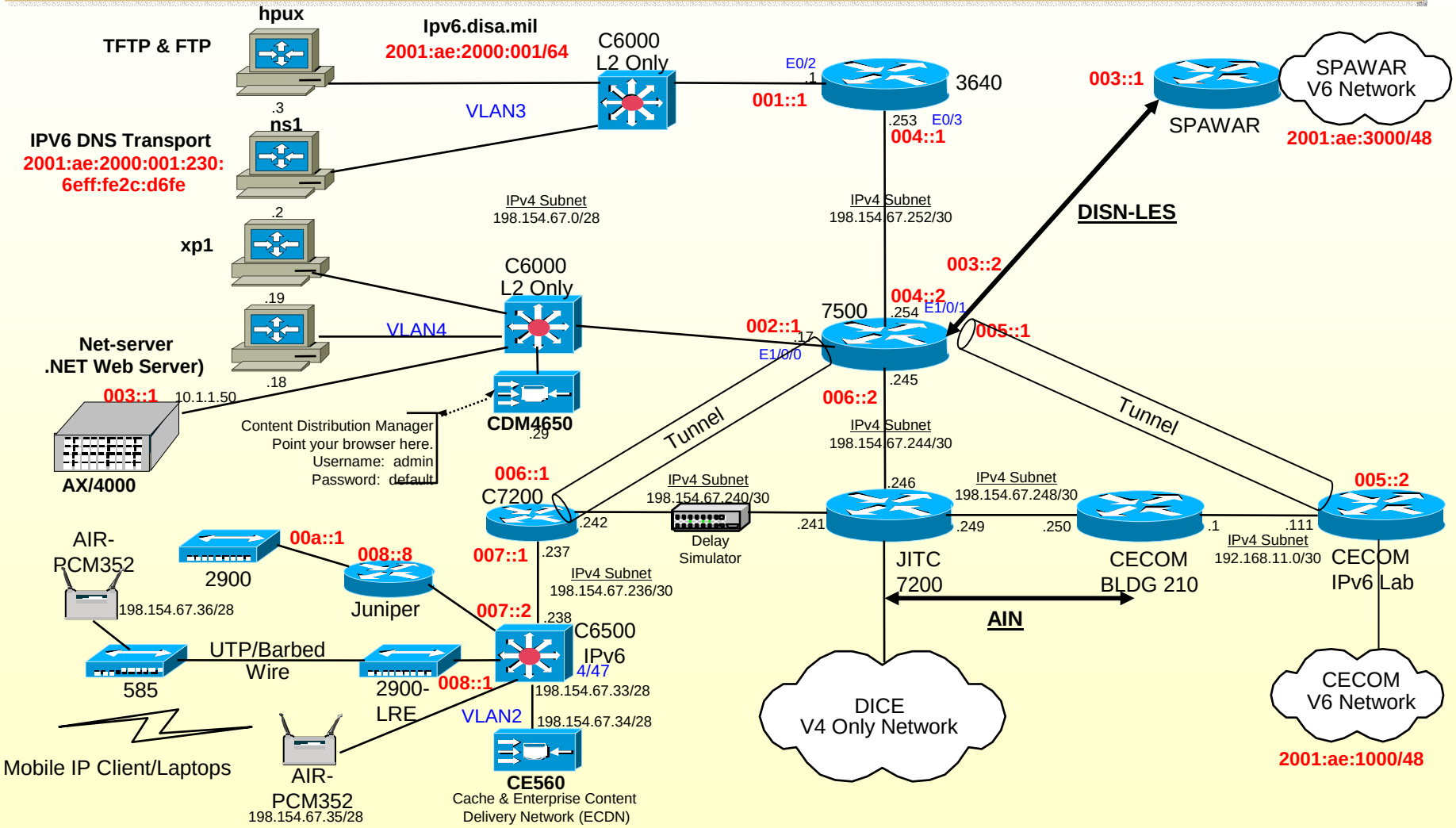
JITC Test Topology for DICE 03 – IP Addressing



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DICE 04

(IPv6 Opportunities for Participants)

- **Participants are encouraged to participate in the IPv6 assessment or demonstration**
  - Participation on a non-interference basis with data testing
  - Participants will typically provide the IPv4 elements of the assessment
  - A chance to gain exposure and implementation experience

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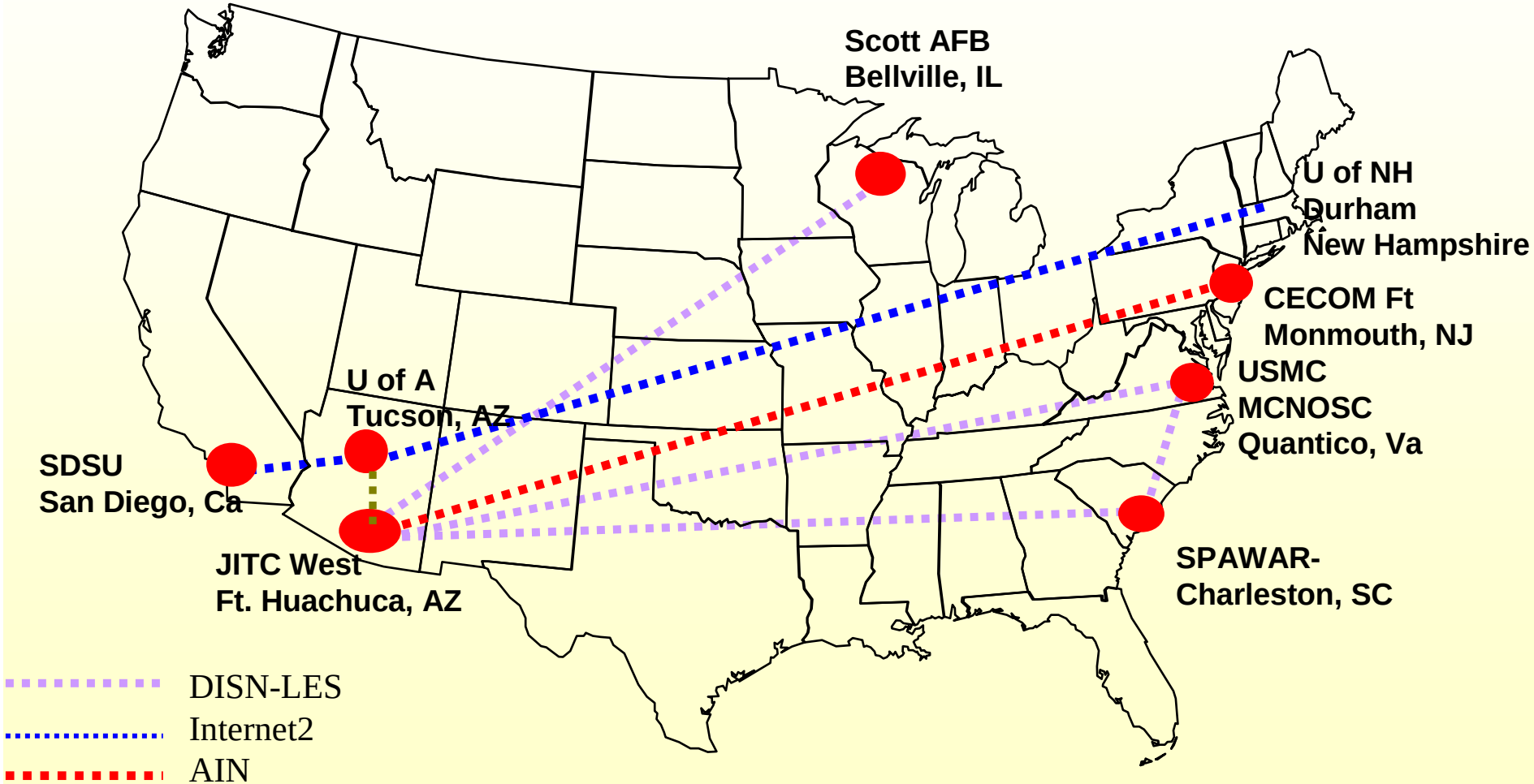
MoonV6 Participants
(6-14 Oct 03)



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Road Ahead

- **Continue to refine and validate requirements**
  - Do not duplicate efforts within DOD
- **Continue to work closely with the North American IPv6 Forum**
  - Continue participation in the NAv6TF
  - MoonV6 project 6-14 Oct 03
- **Continue to conduct IPv6 research, development, test & evaluation during DICE and other joint and combined exercises**

Questions?

Backup

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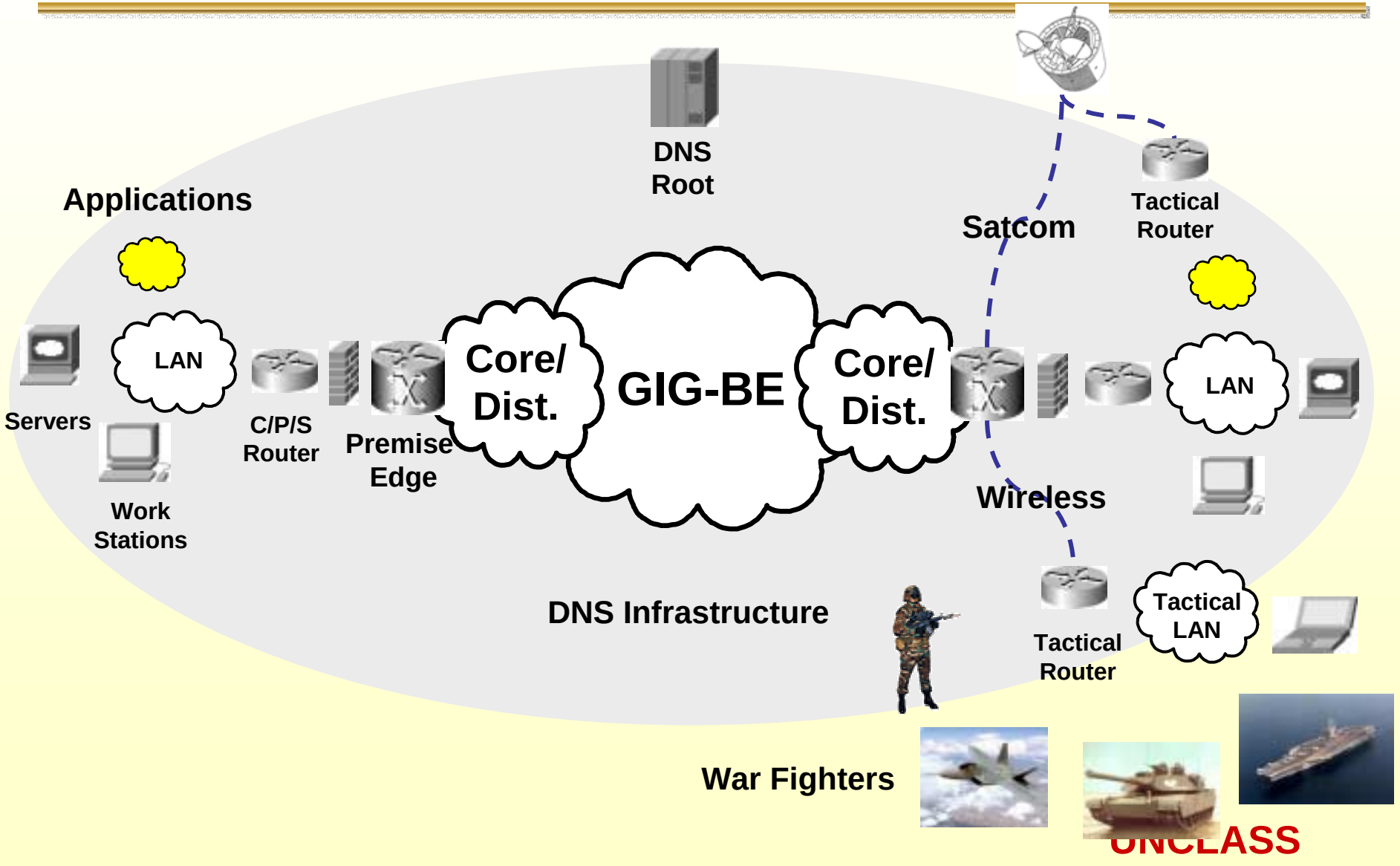
Transition Implications

IPv6 Will Touch Everything



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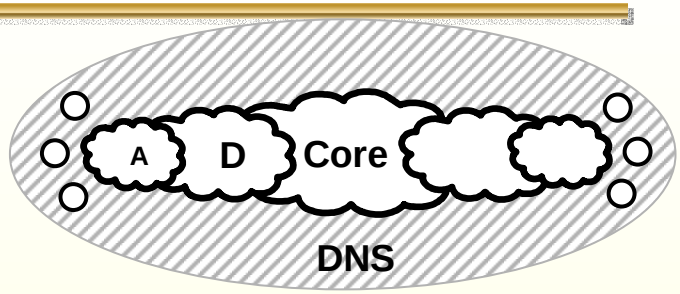
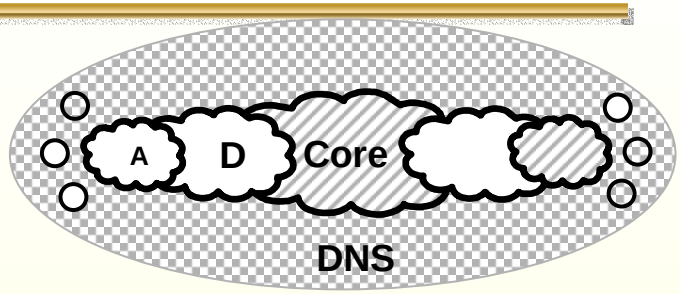
Test & Analysis Phase



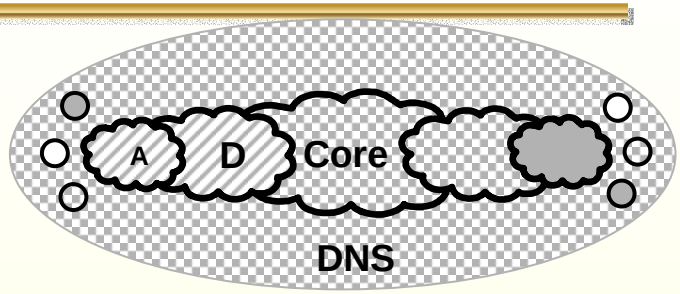
- Develop master plan
- Develop DOD transition strategy
- Acquire IPv6 address space
- Develop DOD IPv6 addressing plan
- Begin DNS infrastructure modification
- Establish DNS root server
- Develop operational laboratory (DISA)
- Establish DOD IPv6 test bed
- Perform DOD software modification analysis
- Perform DOD requirements analysis
- Perform IA assessments
- Initiate DOD cost assessment
- Develop DOD IPv6 initiation policy

Initialization Phase



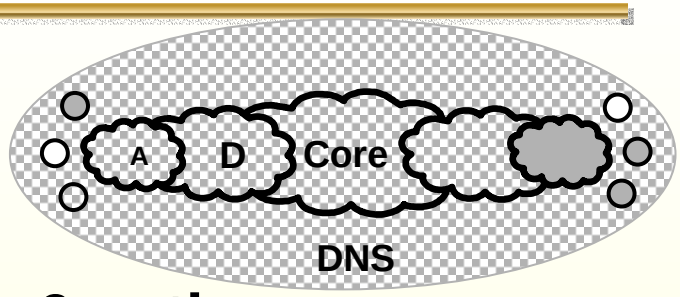
- Complete DNS infrastructure mod
- Extend IPv6 test bed
- Complete DOD cost assessment
- Develop information resources
- Begin edge migration to dual stack
- Translate and / or tunnel IPv6 through core networks
- Initiate IA functionality
- Begin application conversions to dual stack
- Begin core migration to dual stack (OSD option)
- Initiate IPv6 network management capability
- Initiate dual stack and IPv6 customer support
- Develop DOD IPv6 core implementation policy

Core Implementation Phase



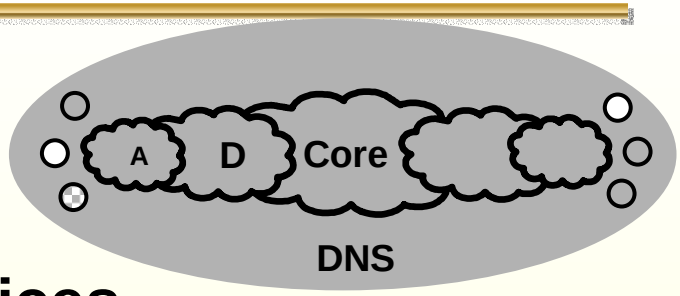
- Migrate core to dual stack
- Continue edge migration
- Introduce IPv6 native in the edge
- Introduce IPv6 native applications
- Finalize IA functionality
- Introduce advanced IPv6 functionality
- Finalize IPv6 network management capability
- Provide full support for dual stack and IPv6
- Develop DOD IPv6 co-existence policy

Co-Existence Phase



- Finalize core dual stack
- Finalize edge dual stack and IPv6 native
- Implement advanced IPv6 functionality
- Complete dual stack application conversions
- Begin IPv6 native application development
- Develop DOD IPv6 native policy
- Develop DOD legacy IPv4 policy

IPv6 Native Phase



- Finalize native IPv6 applications
- Finalize native IPv6 network devices
- Ensure complete IPv6 functionality
- Migrate edge network and device to native IPv6
- Migrate core networks to native IPv6
- De-integrate IPv4 (if necessary)
- Translate or tunnel IPv4 edge devices/networks through core