



# ***Enclave Approach to IPv6 Deployment***

***4 August 2010***



**AFNIC/ENNE  
DSN 779-5892**



# Overview



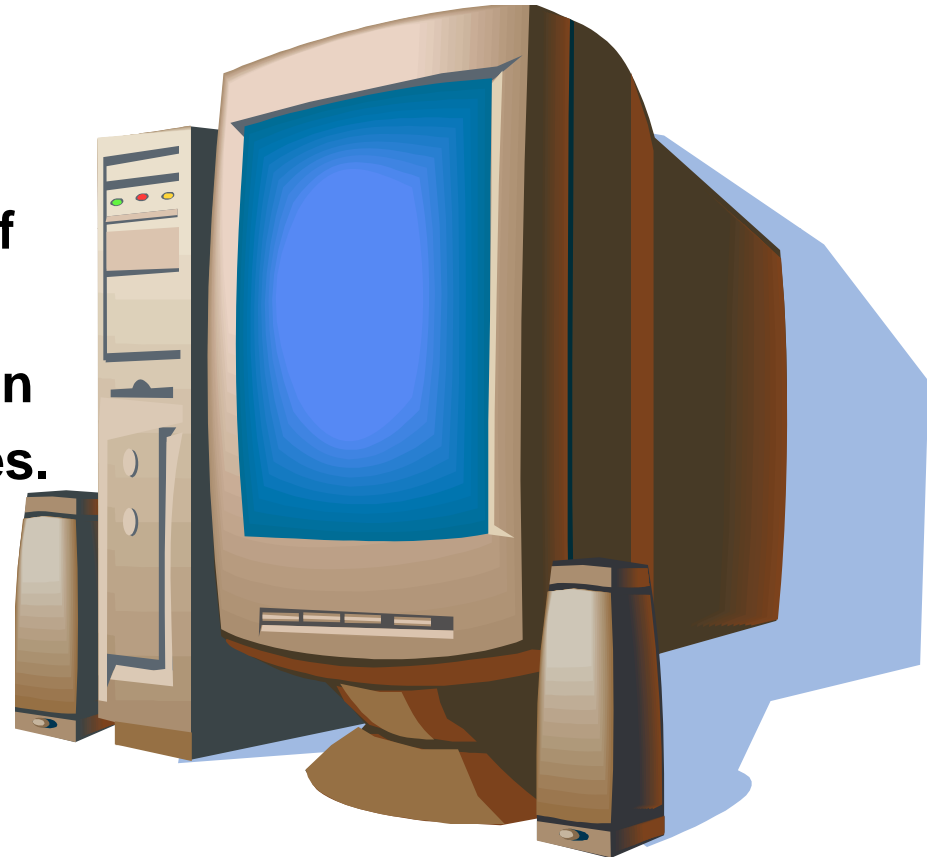
- **Milestone Objective 1 Definition**
- **What is the IPv6 migration process, MO1, MO2...**
- **Migration Process, Checklists**
- **Lessons Learned**
- **MO2**
- **MO2 Architecture**



# *What is Milestone Objective One?*



- **Milestone Objective 1 (MO1) states that services and agencies are authorized to operate IPv6 systems within an enclave. The MO1 allows the use, familiarization, and testing of IPv6 protocol and applications for operational pilots in order to ascertain issues and derive migration strategies. Pilots are authorized to operate at MO1, effective 1 October 2005.**





## ***Current/Proposed MO1s***



- **Eglin AFB, FL; First MO1 in DoD**
- **Travis AFB, CA**
- **Grand Forks, ND**
- **Fairchild AFB, WA**



# What is the IPv6 Migration Process



## Milestone Objective One

States that services and agencies are authorized to operate IPv6 systems within an enclave. The MO1 allows the use, familiarization, and testing of IPv6 protocol and applications for operational pilots in order to ascertain issues and derive migration strategies. Pilots are authorized to operate at MO1, effective 1 October 2005.

## Milestone Objective Two

Provides the ability to evaluate the scalability and further evaluate the IPv6 Information Assurance (IA) implications using tunneling and native IPv6 routing, as available. The MO2 permits applications to test IPv6 specific end-to-end capabilities and routing schema efficiencies.

## Milestone Objective Three

Will be authorized when all policy, planning, and technical transition guidance has been provided to allow tunneled and native IPv6 traffic to exist on DoD operational networks. The MO3 will permit applications and data owners to complete operational transition to IPv6 with at least the same functionality as currently found in IPv4.



# MO1 Checklist



- **First and foremost, this checklist is a guide for MO1 implementation. Should you or your team establish an MO1 and find improved ways to implement, please send us your suggestions.**
- **Notify the TMO you would like to be considered for an MO1.**
- **Ensure the enclave has an approved IATO/ATO**
- **Review the MO1 Technical Implementation Strategy located on IPv6**
- **Identify areas of possible conflict such as the VPN policy for the enclave.**



## ***MO1 Checklist Continued***



- **Complete a transition plan – template located on CoP**
  - **Document the network infrastructure; include IPv6 Enclave boundary**
  - **Verify all proposed enclave equipment is IPv6/dual stack capable**
    - **Verify all IOSs are capable of using IPv6 – TMO will post known incompatibilities on CoP**
  - **Submit the transition plan to the TMO.**
  - **Continue remaining steps while TMO reviews and provides feedback.**



# MO1 Checklist Continued



- **Generate and have signed a project charter – template located on CoP (this serves as chain of command approval)**
  - **Charter serves as formal agreement between stakeholders**
  - **Charter must identify all stakeholders and have concurrence from all**
  - **Notify TMO of approval**
- **Update ATO – submit a minor modification**
  - **IAM must sign “no impact” statement - located on CoP**
  - **Update IA control DCP-1 stating IPv6 will not leave the enclave**
- **Request addresses from ELSG with TMO approval**
  - **Complete the Sample IPv6 Request Letter**
  - **Submit completed letter to Alan Newton at James.Newton.Ctr@Gunter.Af.Mil**





## ***MO1 Checklist Continued***



- **Capture “before IPv6” data – examples on CoP**
  - **CPU utilization**
  - **DNS quad A records**
- **Implement security guidance and follow TIS guidance – document where TIS guidance must be altered and why it was altered**
  - **Review DNS logs – identify existing quad A records and verify their sources are no longer running IPv6 on the network. Remove quad A records as each is verified**
  - **Implement Security Architecture (Access Control List updates for all router interfaces - Block IPv6 traffic and IPv4 tunneled traffic) (commands located on CoP)**



## ***MO1 Checklist Continued***



- **Initiate IPv6 implementation**
  - **Start at core and work out – disable router interfaces one at a time, never disabling interfaces that carry traffic out of the enclave**
  - **Monitor traffic and DNS logs for 24-hrs before moving on**
  - **Commands to enable IPv6 and IPv6 OSPF routing located on CoP**
- **Identify to the TMO which core services are controlled by base and which are controlled by other organizations**
- **Initiate and integrate core services as directed by TMO**
- **Enable IPv6 on clients as directed by TMO**
- **Update lessons learned and provide feedback to TMO**



## *Lessons Learned*



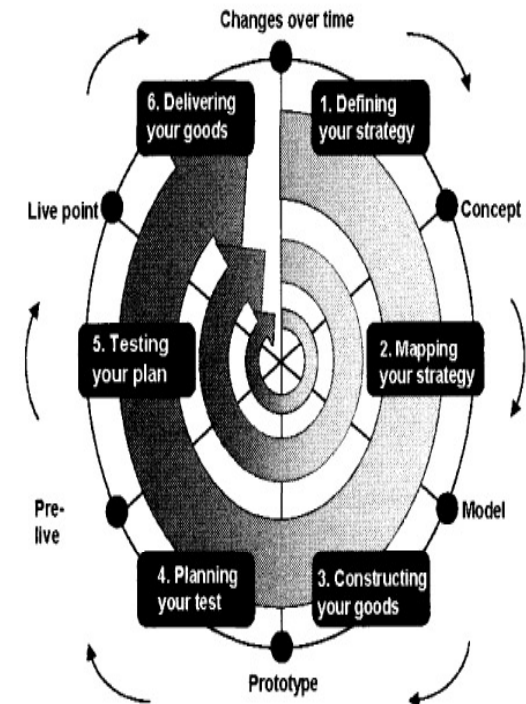
- **IPv6 routing support varies depending on IOS – Eglin routers supported IPv6 OSPF but not IPv6 EIGRP**
- **Install ACLs as permits/logs initially. This enables you to track down the unexpected.**
- **Check Active Directory for bogus quad A records prior to enabling IPv6.**
- **Hosts intermittently will respond back to HP Openview on port 3544 (Teredo). This should be allowed.**
- **Eglin utilized VLANs to segregate IPv4 and IPv6 traffic**



## MO2 Purpose



**MO2 provides the ability to evaluate the scalability and further evaluate the IPv6 Information Assurance (IA) implications using tunneling and native IPv6 routing, as available. The MO2 permits applications to test IPv6 specific end-to-end capabilities and routing schema efficiencies. Pilots are authorized to operate at MO2, effective 1 December 2006.**

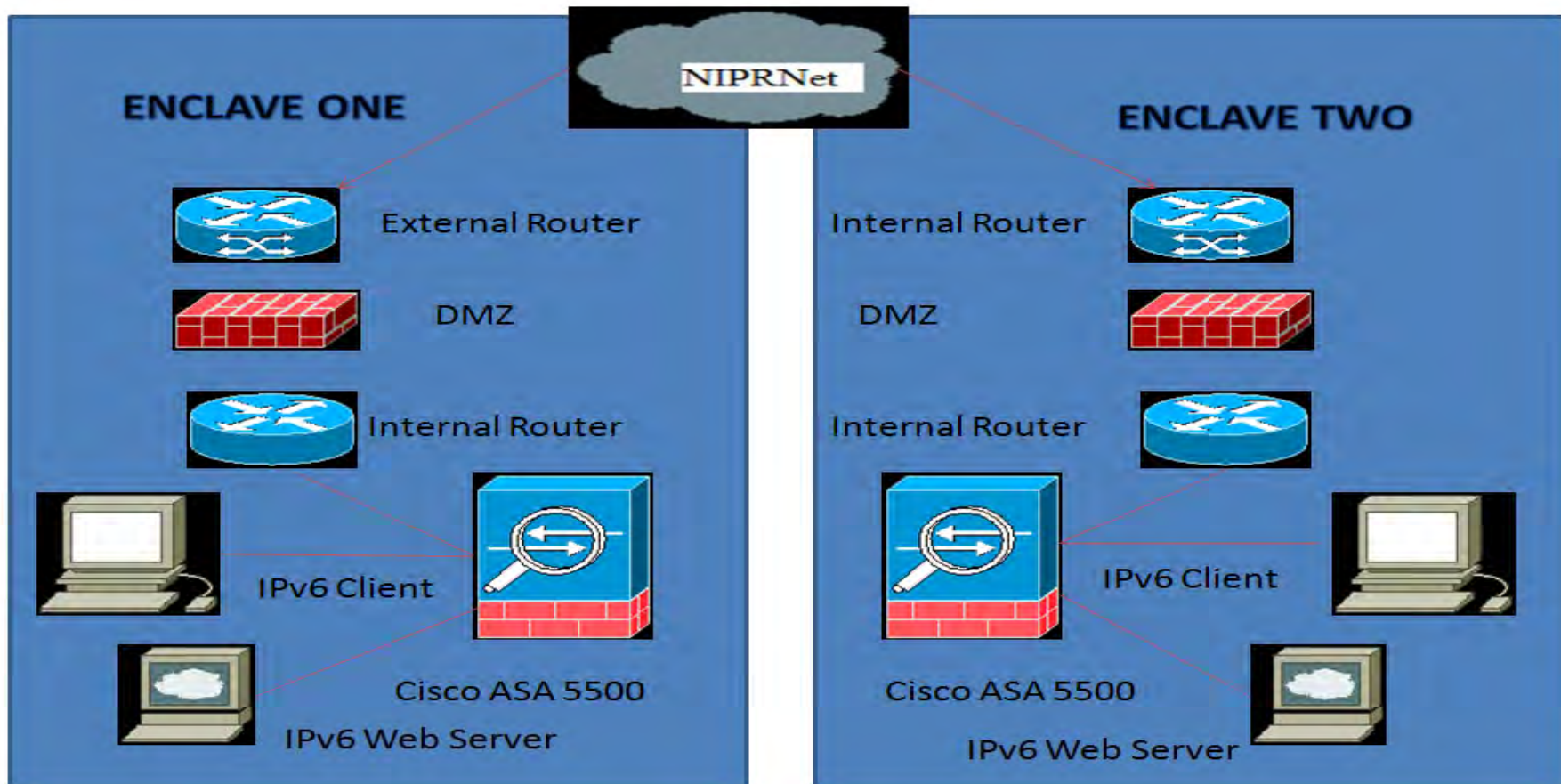




# MO2 Architecture



- General MO2 Technical Architecture





# Questions





# ***Backup Slides***



## **Access Control List**

- **Block IPv6 traffic and IPv4 tunneled traffic**
- **Block ipv6 in and out**
- **Block specific ipv4 (tunneled traffic) in and out**
  - **block ipv6 in ipv4 (port 41)**
  - **block ipv4 in ipv4 (port 4)**
  - **block source demand routing protocol (port 42)**
  - **block AX.25 (port 93)**
  - **block ip-within-ip (port 94)**
  - **block ethernet-within-ip encapsulation (port 97)**
  - **block encapsulation header packets (port 98)**
  - **block L2TP (port 115)**
  - **block GRE (port 47)**
  - **block Teredo (port 3544) \*except Openview traffic**



# ***Backup Slides***



## **Enabling IPv6 Commands**

- **ipv6 unicast-routing**
- **ipv6 router ospf 1**
- **router-id 129.61.n.n (IP address of loopback0)**
- **area 0 range 2609:e200:1::/48**
- **no passive-interface default**
- **redistribute connected**
- **redistribute static**





# Backup Slides

