



**U.S. Department of Education**  
Enterprise Architecture Program Office (EAPO)  
**IPv6 Transition Overview**  
October 2011

**Steven Corey-Bey**  
Chief Enterprise Architect  
ED IPv6 Transition Manager

**On September 28, 2010, the Federal CIO issued a memo instructing all agencies to transition to native IPv6 according to the following schedule:**

1. Upgrade public/external facing servers and services (e.g. web, email, DNS, ISP services, etc) to operationally use native IPv6 by the end of FY 2012.
2. Upgrade internal client applications that communicate with public Internet servers and supporting enterprise networks to operationally use native IPv6 by the end of FY 2014.
3. Designate an IPv6 Transition Manager to serve as the person responsible for leading the agency's IPv6 transition activities, and liaison with the wider Federal IPv6 effort as necessary.
4. Ensure agency procurements of networked IT comply with FAR requirements for use of the USGv6 Profile and Test Program for the completeness and quality of their IPv6 capabilities.

# Interpreting the Federal CIO's IPv6 Memo



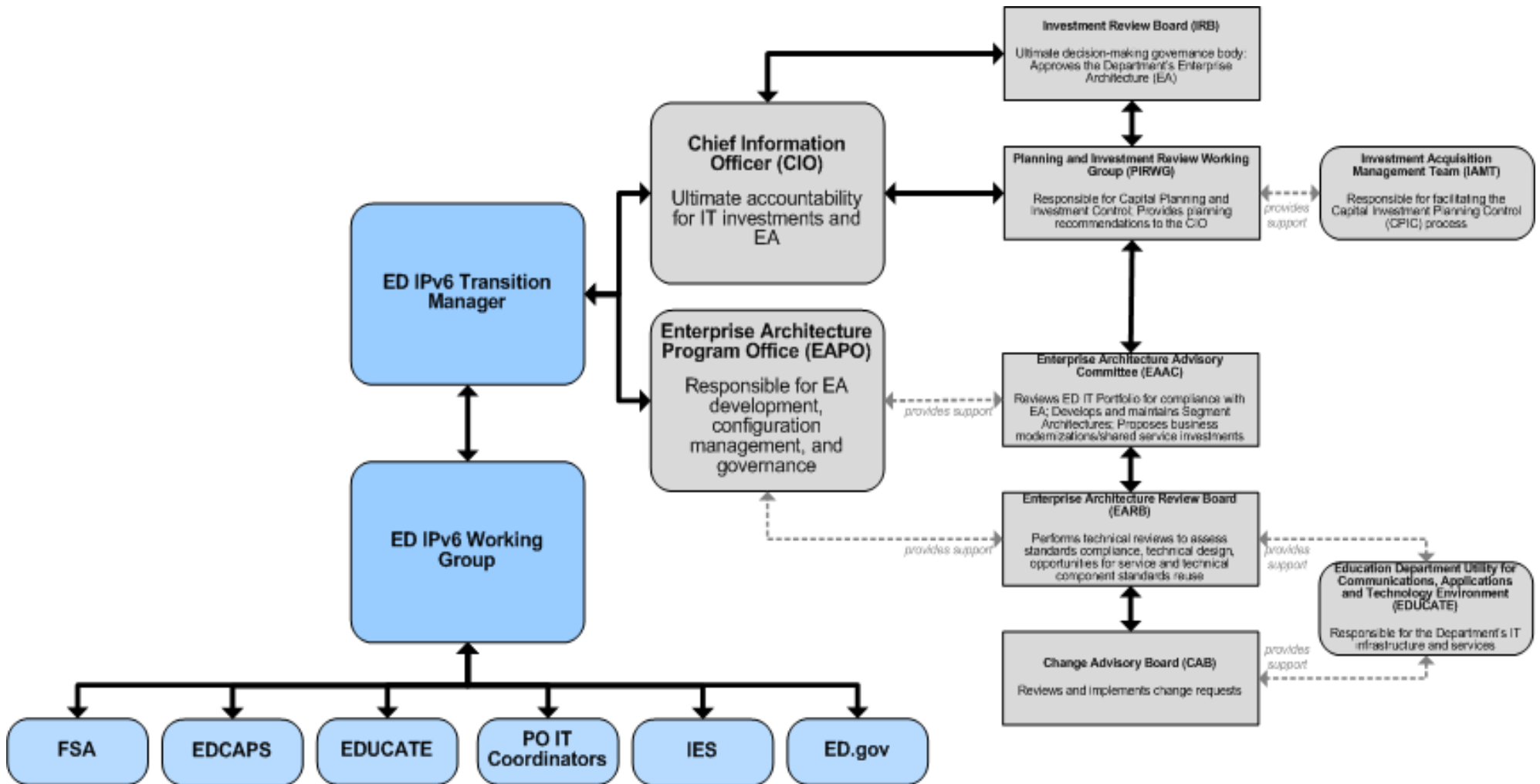
## 2012: Public External Facing Servers and Services

- Defining characteristic is that direct connectivity is available to the general public over the Internet
- From a technical perspective, in-scope systems will be at the far side of the socket connection made by the public (e.g. the web server that presents pages to a customer's web browser).
- Includes DNS servers and Mail servers
- **Does not** include systems that provide services to internet facing servers (e.g. backend database servers)
- **Does not** include utility or internal support servers (e.g. software deployment servers, servers for backup operations)

## 2014: Internal Client Applications that communicate with public Internet Servers

- *Internal client applications* refers to software running on computer systems within ED that are originating connections as clients to other systems
- *That communicate with public internet servers* further restricts scope to server systems that are on the Internet and provide services to the public as a whole
  - Systems that are on the Internet but provide only restricted access to a limited audience would be private Internet servers and are thus out of scope
- **Supporting Enterprise Networks:** The network infrastructure that provides the connectivity from in scope ED systems to the Internet

# ED's IPv6 Governance Framework



# ED's IPv6 Approach – Transition Plan to Date



Task Force Phase	Group	Activities	Milestones	Owner	Milestone Date	
Externally-Facing Servers/Services/Applications/Systems	Inventory 10/2010 - 5/2011	Application	Develop IPv6 inventory that includes the IP (IPv4, 6, dual) and retirement status of external-facing applications	IPv6 inventory data call to POC	Application Owner	3/30/2011
		Application	Submit funding requests for select phase to POC.	Non-major data call, Select Presentations	Application Owner	4/30/2011
		Application	Develop high-level transition milestones for external apps	IPv6 data call Update	Application Owner	5/1/2011
		Governance	Appoint Agency Transition Manager	Appointment of Agency Transition Manager	OCIO-EA	10/30/2010
		Governance	Establish an internal tiger team reporting to the CIO	Internal Tiger Team meeting notes	OCIO-EA	3/30/2011
		Governance	Update IPv6 Transition Plan	Updated IPv6 Transition Plan	OCIO-EA	4/30/2011
		Infrastructure	Identify a website for enablement (www.ed.gov)	IPv6 enabled website	OCIO-ITS	3/30/2011
		Infrastructure	IPv6 service request completed	IPv6 service	OCIO-ITS	5/15/2011
		Infrastructure	Develop inventory of network components that support external systems.	Updated Inventory List	OCIO-ITS	4/30/2011
		Infrastructure	Determine requirement for IPv6 test lab	Test lab requirements	OCIO-ITS	4/30/2011
		Infrastructure	Submit funding requests for select phase to POC.	Non-major data call, Select Presentations	OCIO-ITS	5/16/2011
		Infrastructure	Develop IPv6 Addressing, Network Management, and Testing Plan	IPv6 Addressing Plan, Network Management Plan, Testing Plan	OCIO-ITS	5/30/2011
		Infrastructure	Begin inventory of agency Mail Exchanges (MX)	MX Inventory	OCIO-ITS	5/30/2011
Assessment 4/2011 - 9/2011	Application	Certify external apps for IPv4, IPv6 or Dual Stack Capability	IPv6 inventory data call to POC	Application Owner	4/30/2011	
	Application	Examine external applications for IPv4 dependency	IPv4 dependency report	Application Owner	8/30/2011	
	Application	Prioritize external applications for upgrades or retirement	Priority list	Application Owner	6/30/2011	
	Application	Develop Transition and Remediation Plans for external applications	Transition Strategy, Remediation Plan (per application or system)	Application Owner	8/30/2011	
	Governance	Participate in World IPv6-day	Participation	OCIO-EA	6/8/2011	
	Governance	Record the agency's first public ipv6-enabled web site	IPv6 Web Site AAAA record	OCIO-EA	6/8/2011	
	Governance	Begin research, develop, & vet security concerns	Security report on IPv6	OCIO-IA	9/30/2011	
	Governance	Begin development of IPv6 security policy	Security policy document	OCIO-IA	9/30/2011	
	Governance	Begin development of IPv6 security procedures	Security procedures document	OCIO-IA	9/30/2011	
	Governance	Begin development of IPv6 security technical implementation guides (STIG)	STIGs for network devices	OCIO-IA	9/30/2011	
	Infrastructure	Develop Test Lab Requirements and budget requests	Requirements document, POC budget request	OCIO-ITS	7/1/2011	
	Infrastructure	Enable IPv6 Web server (www.ed.gov)	IPv6 Web server (www.ed.gov) enabled	OCIO-ITS	5/15/2011	
	Infrastructure	Establish one (minimum) DNS server with AAAA record	Authoritative DNS with AAAA record	OCIO-ITS	5/15/2011	
	Infrastructure	Examine MX for IPv4 dependency	IPv4 dependency report	OCIO-ITS	7/1/2011	
	Infrastructure	Ensure addressing plan ready to implement	Addressing plan certification	OCIO-ITS	6/30/2011	
Infrastructure	Prioritize network components for upgrade or retirement	Priority list	OCIO-ITS	8/30/2011		
Infrastructure	Develop Transition and Remediation Plans for network components	Transition Strategy, Remediation Plan	OCIO-ITS	8/30/2011		

# ED's IPv6 Approach – Transition Plan to Date



Remediation 4/2011 - 4/2012	Application	Begin upgrade of external applications to support IPv6	Application upgrade	Application Owner	8/30/2011
	Application	Develop an application Test Plan	Test plan	Application Owner	4/30/2012
	Governance	Update Transition Plan	Updated Transition Plan	OCIO-EA	9/30/2011
	Governance	Begin deployment of IPv6 security procedures	Security procedures document	OCIO-IA	10/1/2011
	Governance	Identify additional public services and services, including sub-agencies	Updated URL List	OCIO-EA	12/30/2011
	Governance	Begin support staff, operations and security staff training	Training class	OCIO-EA	4/30/2012
	Infrastructure	Finalize plan for DNS, review IPSec signing to include AAAA records	Updated DNS Plan	OCIO-ITS	9/30/2011
	Infrastructure	Begin deployment of IPv6 security technical implementation guides (STIG)	implemented STIGs in configurations of network devices	OCIO-ITS	10/1/2011
	Infrastructure	Prioritize MX for upgrades or retirement	MX Upgrade Plan	OCIO-ITS	9/30/2011
	Infrastructure	Upgrade MX components to support IPv6	MX component upgrade certification	OCIO-ITS	9/30/2011
		Upgrade DNS to support IPv6		OCIO-ITS	9/30/2011
	Infrastructure	Authoritative DNS servers to provide transport over IPv6	IPv6 Transport validated	OCIO-ITS	12/30/2011
Infrastructure	Upgrade network components to support IPv6		OCIO-ITS	12/30/2011	
Testing 5/2012-8/2012	Application	Begin testing IPv6 applications	Test Plan Results	Application Owner	5/30/2012
	Application	Certify operation of needed IPv4 applications on network	Test Plan Results	Application Owner	8/30/2012
		Certify external-facing applications as IPv6 Operational	Test Plan Results	Application Owner	8/30/2012
	Application	Certify external-facing applications as Dual Stack Operational	Test Plan Results	Application Owner	8/30/2012
	Governance	Update Transition Plan	Updated Transition Plan	OCIO-EA	8/30/2012
	Infrastructure	Test Lab in Place	Test Lab	OCIO-ITS	5/1/2012
	Infrastructure	Begin testing IPv6 systems	Test Plan Results	OCIO-ITS	5/30/2011
		Certify external/public-facing servers as IPv6 Operational	Security Authorization	OCIO-ITS	8/30/2012
Infrastructure	Certify external/public-facing servers as Dual Stack Operational		OCIO-ITS	8/30/2012	
Implementation 9/2012 - 10/2012	Application	Deploy external-facing IPv6 Applications	Security Authorization	Application Owner	9/30/2012
	Application	Begin decommission of IPv4 applications as needed	Updated IPv6 inventory data call	Application Owner	10/1/2012
	Infrastructure	Implementation IPv6 systems	Security Authorization	OCIO-ITS	9/30/2012
	Infrastructure	Begin Decommission of IPv4 Nodes asneeded	Updated IPv6 inventory data call	OCIO-ITS	10/1/2012
	Governance	Validate upgrade of public/external facing servers	IPv6 report to OMB, updated Transition Plan	OCIO-EA	10/1/2012





# ED's IPv6 Challenges & Responses

**Challenge:** Stakeholder Participation

**ED's Response:** Coordinate IPv6 Transition Activities with Stakeholders

**Challenge:** Stakeholder Understanding

**ED's Response:** Personalized communication and involvement

**Challenge:** Evolving IPv6 Standards and Products

**ED's Response:** Develop Procurement Plan ensuring viable upgrade path, and engage with Federal IPv6 Task Force to drive vendor compliance and availability of IPv6 compliant products

**Challenge:** Operating in a managed service environment

**ED's Response:** Engage our service providers via service level agreements and contract negotiations

**Challenge:** Maintaining interoperability and security during the transition

**ED's Response:** Implement a Dual Stack environment that will initially have a separate path for IPv6 traffic with IPv6 compliant firewalls and security appliances

# ED's Recent IPv6 Activity

---



- **October 2010:** Appointed ED IPv6 Transition Manager
- **April 2011:** Updated Departmental IPv6 Transition Guidance
- **April 2011:** Collect Inventory for Externally Facing Applications
- **May 2011:** Develop IPv6 Milestones for Externally Facing Applications
- **June 2011:** Participated in World IPv6 Day
- **September 2011:** Data Call on IPv6 Implementation Progress
- **Currently in Progress:** IPv6 Remediation Activity



# ED's Current IPv6 Implementation Status



## **Inventory Changes:**

- Starting Inventory: 168
- Remove systems: 7
- Add systems: 2
- Total Inventory: 163

## **Data Call Participation:**

- Participated: 11 POCs
- Did not Participate: 6 POCs
- Participated: 141 systems – 86.5% of Total Inventory
- Did not Participate: 13.5% of Total Inventory

## **IPv6 Requirements Definition Completion Status:**

- Complete: 109 systems – 67% of Total Inventory
- Incomplete: 32 systems – 20% of Total Inventory

## **IPv6 Remediation Activity Progress:**

- 100% complete – 5 systems
- 51-99% complete – 48 systems
- 1-50% complete – 49 systems
- 0% not started – 5 systems