



Small Business Administration

SBA IPv6 Transition Sequence Plan

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SBA IPv6 Transition and Sequence Plan

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1.0	8/28/08	Initial Draft to address OMB guidance, strategic direction, governance, and task deliverables
1.1	10/22/08	Draft to incorporate comments from IPv6 Tiger Team members and reviewers

1 Executive Summary

The SBA IPv6 Transition and Sequence Plan describes the transition of the current SBA network backbone from an IPv4-only network layer to a combined IPv4 and IPv6 network layer. The goal of this transition is to introduce the IPv6 protocol to the SBA network environment gradually over a period time through a series of initiatives based on the SBA Enterprise Architecture target environments utilizing anticipated technology refresh cycles.

As these technology refresh initiatives take place, the SBA network will begin to operate with both network protocols in parallel in a dual stack configuration. The dual stack environment will exist for a number of years until the IPv6 protocol stack reaches maturity in the industry and the SBA has specific requirements for the protocol. Once the IPv6 protocol is widely adopted, the requirement for IPv4 protocol will begin to decrease as the protocol reaches end of life and can ultimately be removed from the network at which point IPv6 will be the predominant network protocol.

To meet this goal, it is necessary to incorporate IPv6 with all information technology infrastructure and service initiatives, to ensure that all IP enabled devices on the SBA network are IPv6 capable, that network management tools are adequate to the task of managing both network protocols in the network layer of the OSI model, and that security policies, procedures, controls and devices are in place and functioning properly in order to minimize the risk associated with the insertion of IPv6 protocol.

The following areas are included in this plan and must be managed as the plan progresses.

- Governance
- Strategy
- Requirements
- Acquisition and Procurement
- Deployment and Implementation
- Assurance
- Test Plan
- Funding Requirements
- Sequencing
- Training Plan
- Training
- Risk Mitigation
- Personnel
- Operations



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2 Introduction

The SBA IPv6 Transition Sequencing Plan (ITSP) is a high-level strategic roadmap for implementing the IPv6 protocol into the SBA information technology environment. It is a plan that will tie together SBA's strategic technology mandated by OMB, SBA's Security plan, and enhance and augment SBA's Enterprise Architecture (EA) Target Plan (EATP) such that a well-structured, comprehensive, sound ITSP can be approved and followed. Some portions of the EA and Security Architecture Plans - including goals, business processes, applications and services, technology, data, and security - will be referenced where appropriate. This ITSP includes agency governance and concepts of operations for the IPv6 transition, and therefore will include a framework for transitioning the Agency network to IPv6.

2.1 Purpose

The SBA ITSP shall be implemented in parallel and conjunction with the EATP as the foundation for IT modernization. All business, IT investment decisions, program management, and execution activities shall need to consider the ITSP. The focus of the SBA ITSP is on SBA's IT Infrastructure Services segment of the SBA Enterprise Architecture. The SBA ITSP defines and sequences the transition activities to the desired future state, in light of relevant priorities, dependencies, and constraints. The SBA ITSP will identify phases to accomplish the IPv6 transition and will include:

- Agency Governance
- Concept of Operations for the IPv6 Transition
- Program Major Milestones and Schedules
- Task Dependencies and Critical Paths
- IPv6 Capable Definitions and Requirements
- Technical, Security, and Programmatic Risks

2.2 Audience

This Transition Plan is applicable to all SBA offices, representing a high-level roadmap for moving the SBA towards utilizing the IPv6 protocol for business services. All SBA executives, managers, and staff are encouraged to read, discuss, and comment on this document. The primary focus for specific SBA stakeholder groups is summarized below:

1.2.1 SBA Executives – as the primary force within the SBA responsible for ensuring that the agency fulfills its business mission and progresses toward its vision, SBA executives must understand and use the SBA IPv6 Transition and



Sequencing Plan as primary guide in the Agency Capital Planning and Investment Control (CPIC) process.

1.2.2 Office of the Chief Information Officer (OCIO) Staff – all OCIO staff should be familiar with IPv6 Transition and Sequence Plan. As the Office with primary responsibility for planning and deploying technology in support of the agency's mission, OCIO staff must understand the transition activities required to move SBA to the Target EA.

1.2.3 IT Investment Management and Productivity Enhancement Staff – Staff responsible for IT investment management must understand the IPv6 Transition and Sequence Plan and be able to apply that understanding in the evaluation of SBA's IT investment portfolio. The programs, program offices' CIOs, and ITIM governance bodies have the primary responsibility of IT investment management.

1.2.4 Program/Project Managers – Program and project managers responsible for IT initiatives must ensure that the initiatives are associated to the transition activities in the IPv6 Transition and Sequence Plan.

1.2.5 Business Managers – Managers within SBA's mission areas should understand the IPv6 Transition and Sequence Plan activities and how they relate to their business needs. They should closely review those activities that are related or address their mission areas.

3 Agency Governance

The SBA IPv6 Transition Plan has been developed in coordination with SBA management and enterprise architecture teams; and in consideration of agency-established policies and procedures. This document provides the transition framework for the IP infrastructure during the transition from IPv4 to IPv6.

As the SBA transitions to IPv6, all major Internet Protocol concerns across the enterprise shall be addressed. SBA shall use a dual-stack (IPv4/IPv6) approach throughout the transition to provide for greater interoperability. IPv6 will be phased in over time and throughout the transition the use of IPv4 will gradually be removed from SBA's environment.

Buy-in from all SBA stakeholders is important to ensure SBA benefits from a well-developed, phased IPv6 rollout. Challenges encountered during the transition will change over time. The method and use of IPv6 may change as well as the protocol evolves and new services and applications utilizing the capabilities of the protocol are developed. The initial deployment of IPv6 is expected to operate very similarly to IPv4 in the beginning phases of the transition. However, SBA, as with most other agencies, will move away from pure enclave-based architectures to support the growing requirement for service oriented architectures that will be necessary to implement many of the advanced IPv6 capabilities.



3.1 Mission

The SBA's prime objective is to maintain and strengthen the Nation's economy by aiding, counseling, assisting, and protecting the interests of small business and by helping business and families recover from natural disasters. The SBA champions small businesses by providing managerial and technical support, and financial and management assistance. These services help America's entrepreneurs remain a strong economic force in the U.S. and around the world. The mission serves as a common thread that transcends the current and target business architectures. As defined by law, The Small Business Act states that SBA's mission is to:

"...aid, counsel, assist, and protect, insofar as is possible, the interests of small business concerns in order to preserve free competitive enterprise, to ensure that a fair proportion of the total purchases and contracts or subcontracts for property and services for the Government.... Be placed with small business enterprises, to ensure that a fair proportion of the total sales of Government property be made to such enterprises, and to maintain and strengthen the overall economy of the Nation."

The SBA Strategic Plan FY 2008-2013 identifies the following set of goals and long term objectives for the agency:

Goal 1 - Expand America's ownership society, particularly in underserved markets

1. Improve access to SBA programs and services by small businesses to drive business formation, job growth, and economic activity
2. Support entrepreneurship in markets with higher poverty and unemployment, and in our military community
3. Ensure stewardship and accountability over taxpayer dollars through prudent financial portfolio management and oversight

Goal 2 - Provide timely financial assistance to homeowners, renters, nonprofit organizations and businesses affected by disaster

1. Respond quickly, efficiently and effectively to disaster applicants

Goal 3 - Improve the economic environment for small business

1. Protect, strengthen and effectively represent the Nation's small businesses to minimize the regulatory burden
2. Foster a more small-business friendly environment

Goal 4 - Ensure management and organizational excellence to increase responsiveness to customers, streamline processes, and improve compliance and controls

1. Deploy a skilled workforce capable of executing high-quality programs
2. Provide a safe and secure information system environment to support business decisions and Agency operations
3. Provide financial and performance management services to support efficient and effective program delivery

These goals and objectives are important directives in establishing initiatives to drive change and the adoption of the IPv6 protocol.

3.2 IPv6 Change Drivers

The SBA should ensure that the implementation of a new technology such as IPv6 has strategic value to the agency. The expiration of available IPv4 addresses, foreign competition with countries adopting the IPv6 protocol, globalization of markets, mobile workforce, on demand collaboration, explosive growth and evolutions in technology and increased competition among small businesses combined and individually drive the need for migrating to IPv6. The following list identifies the major forces for change that affect the SBA's decision making.

3.2.1 Executive Drivers

The President's Management Agenda, including the President's Small Business Agenda will play a considerable role in the Federal government's transition to IPv6 with regards to direction, mandates, future transition milestones and deadlines, and policy guidance. With a new administration taking office, there is an uncertainty and increased risk with potential changes in guidance for the Federal transition to IPv6.

3.2.2 Legislative Drivers

Legislative Acts as outlined in the SBA Enterprise Architecture Transition Plan for the adoption of IPv6 have not been released.

3.2.3 SBA-Specific Drivers

The SBA OCIO Guiding Principles have identified in the SBA Strategic Plan FY 2008-2013 and include:

1. Substantial growth in the SBA's outstanding loan portfolio over the past five years, resulting in increased demands upon the SBA in maintaining its operations and fulfilling its oversight responsibilities
2. The transformation of the SBA workforce in recent years, resulting in functions being centralized and many roles and responsibilities being realigned
3. Natural disasters of significant magnitude during recent years, resulting in heightened demand for immediate disaster response



- 4. Aging workforce, with 34 percent being eligible for retirement by 2009, and muted employee morale revealed from employee surveys, resulting in focus on improved communication, training opportunities, and recruiting

The SBA needs to identify the goals and objectives the business decisions for changing to the IPv6 protocol, including benefits and improvements to the organization, and align those goals with the future Strategic Plans of the agency.

3.2.4 External Drivers

External drivers identified in the SBA Enterprise Architecture Blueprint include globalization of markets, increasing numbers of small businesses and unpredictability of disasters. Worldwide and national IT strategies for IPv6 will require the SBA to provide services using IPv6 to the small business community in the not so distant future.

4 SBA Architectural Segments

The SBA has adopted the Federal Enterprise Architecture (FEA) Practice Guidance in pursuing a segmented approach to agency-wide enterprise architecture development. To date, the agency has analyzed two core mission segments in detail and produced segment architectures, including strategic roadmaps, for the two segments. The following section presents the plan for developing further segment architectures at the agency.

4.1 Segment Definitions

The SBA currently defines its architectural segments as follows:

Table 1: SBA SEGMENTS

Segment Name	Office / Program	Segment Type	Description
Financial Assistance	OCA ODA	Core Mission Segment	The Financial Assistance segment provides a number of financial assistance programs for small businesses including 7(a), 504 and disaster assistance loans/loan guarantees. This segment is closely integrated with both the Disaster Assistance segment and the Financial Management segment.
Disaster Assistance	ODA	Core Mission Segment	The purpose of the Disaster Assistance segment is to provide various types of loans for businesses of all sizes and homeowners and renters in the event of a disaster. This includes physical disaster loans, economic injury loans, military reservists' loans and



Segment Name	Office / Program	Segment Type	Description
			home and personal property loans. The Disaster Assistance segment is closely related to the Financial Assistance segment, since both segments deal primarily with loans and loan guarantees.
Contracting Assistance	GC/BD	Core Mission Segment	This segment involves the Office of Government Contracting and Business Development (GC&BD) business line of the Small Business Administration.
Management & Technical Assistance	OED	Core Mission Segment	Management and Technical Assistance is offered primarily through the Office of Entrepreneurial Development, which develops programs to assist small businesses in starting, growing, and competing in global markets by providing quality training, counseling, and access to resources.
Business Gateway	BG	Core Mission Segment	E-Government initiative that oversees and operates Business.Gov, the one-stop business compliance resource for small business
Human Resources	OM&A	Business Services Segment	Business services for human resources, operating in support of core mission segments. The potential for aligning with specific government-wide initiatives make segment architecture critical for this business service.
Procurement and Grants Management	OM&A	Business Services Segment	This segment provides the internal procurement planning and processing for the agency and manages the grants programs offered by SBA.
Financial Management	OCFO	Business Services Segment	This segment covers the internal administrative accounting and financial management functions of the agency.
IT Infrastructure / Services	OCIO	Enterprise Services Segment	The IT Infrastructure / Services segment provides the enterprise-wide information technology support required by the agency. It includes several sub-segments including IT Infrastructure and Operations, Data Management, Knowledge Management, Data Center Operations, and several others.

The IT Infrastructure and Services portion of the enterprise Architecture contains the current IPv6 initiative. Since IPv6 will ultimately be a critical component



providing key services to all other segments of the architecture, greater focus and more attention must be placed on all IT Infrastructure and Services current and future initiatives to ensure proper IPv6 planning and consideration. Future initiatives on technology refresh in the LAN/WAN Networks and Desktop, Telecommunication Networks, Email, and Communication need to have specific IPv6 dependencies.

5 Concept of Operations

The goal of SBA is to achieve a similar level of capabilities within an IPv6 operational environment as is with the original IPv4 operational environment, with the desire to review and incrementally improve business systems by an enhanced IPv6 operational environment. SBA shall develop and implement the necessary posture to identify activities and mitigate risks for the SBA's business.

The objective of the SBA's IPv6 Transition Sequence Plan is to facilitate the implementation of IPv6. Planning for IPv6 is a multidimensional project and requires a comprehensive approach to ensure success. IPv6 will touch all aspects of the SBA IT environment including the network platforms that not only allow users and customers to access information, services and devices but to also allow devices to communicate with each other and with services to leverage information. The overall SBA IPv6 transition will take a number of years, significant planning, and shall eventually include every device and application which interacts with IP.

The SBA is contemplating a phased implementation in order to reduce the risk and impact of transition. The enterprise network has been defined as all routers and switches within the 90 field offices plus the interconnecting vendor-provided IP frame relay virtual private network. Advanced IPv6 capability enablement and enterprise application and desktop operating system conversion are scheduled for implementation post FY10 due to the challenges with upgrading the current operating systems and the expected capabilities of commercial products recently released with IPv6 out of the box functionality. Phased implementation also reduces the impact on previously planned projects already underway.

Additionally since IPv4 is not sufficiently scalable, the transition teams anticipate the need to support dual stack technology until such time that business needs are supported solely by IPv6 native technology and the Agency deems the old protocol, IPv4, no longer required and can be retired.

5.1 SBA Phased IPv6 Transition Strategy

The SBA IPv6 Transition and Sequence will provide high-level SBA IPv6 requirements and milestones required to transition the agency to the new protocol. The SBA has been in a somewhat reactionary mode to the OMB mandate for IPv6 and needs to take a more proactive approach in order to adopt the protocol as a replacement for the IPv4 protocol, which in all likelihood will take over a decade to complete.

The SBA will need to review and refine the previous IPv6 Business Impact Analysis in order to develop specific SBA IPv6 strategic goals and objectives that



are aligned with the SBA Business and Mission objectives and to define the potential benefits and services the IPv6 protocol can do for the agency. Furthermore, specific IPv6 initiatives need to be created and inserted into the Target Architecture for the SBA IT Services Enterprise Architecture segment in order to facilitate the transition to IPv6.

Although ad hoc implementation planning for IPv6 into the existing SBA network environment is feasible, the prime opportunity to deploy the IPv6 protocol in a dual stack configuration with IPv4 to the internal SBA network will be during the next SBA Enterprise wide hardware and software technology refresh. The refresh has not been scheduled yet but will probably occur in the FY2011 timeframe with planning commencing in the years prior. Microsoft Windows Server 2008, Microsoft Vista, and Exchange Server 2007 all support IPv6 out of the box and are logical candidates for replacing the current operating systems in the SBA internal network. Other Enterprise Architecture initiatives involving technology refreshes and changes to application technology environments, such as the SBA Data Center move initiative scheduled for 2012, are ideal opportunities for insertion of the IPv6 protocol into those environments. Consideration and planning for IPv6 should become a mandatory project requirement and dependency for all major SBA technology initiatives. IPv6 specific initiatives, such as enabling public facing SBA websites with IPv6, should also be considered.

5.1.1 SBA IPv6 Gap Analysis

Prior to beginning the IPv6 enterprise wide deployment planning, the SBA should conduct an IPv6 Gap Analysis. A gap analysis is the study of the differences between two different information systems or applications, often for the purpose of determining how to get from one state or current state to a new state or future state. A gap is sometimes spoken of as the space between where we are and where we want to be. Recent IPv6 project planning efforts have centered more around meeting the OMB June 2008 deadline and need to be expanded and augmented for the next phase and the IPv6 Gap Analysis is undertaken as a means of bridging the space.

5.1.2 SBA IPv6 Communication Plan

The SBA IPv6 Communication Plan consists essentially of a matrix of notification priorities covering all possible routine and emergency events related to the IPv6 project, planning, lists responsible parties, affected groups (stakeholders), and preferred communication methods. The matrix's intended use is as a reference tool for project members to ensure that any change in IPv6 project, status, policies and procedures is communicated to the appropriate stakeholders in a

timely and consistent manner. The current SBA IPv6 Communication Plan should be reviewed and updated for the next phase of the project. An IPv6 workspace should be established on the OCIO Portal and current project and future artifacts should be stored and maintained on the site.

5.2 SBA IPv6 Transition Planning

The Trusted Internet Connection (TIC) initiative and the Networkx communications contract have an impact on the planning and deployment of IPv6 with regards to requirements and planning for providing native IPv6 capabilities. In the wake of these initiatives, the SBA needs to review current internet and wide area network services in order to determine impact and proper course of action with regards to the interaction of IPv6 and these services. Services to review include Verizon Internet Services and SBA Headquarters and not yet implemented Verizon Internet Services in Denver COOP Location, AT&T Managed Internet Services and AT&T Wide Area Network Services.

An update to the SBA IPv6 Transition Plan is required for the next phase of the IPv6 project. The project artifacts needing to be updated to reflect the SBA enterprise wide deployment include the definition IPv6 Transition Scope Statement, refinement of IPv6 Transition Project Charter, development of the IPv6 Transition Project Schedule, review of the IPv6 Risk Management Plan, and updates and modifications to the overall IPv6 Project Management Plan.

5.2.1 SBA IPv6 Application Transition Plan

The transition to IPv6 will have an impact on SBA applications and will be an ongoing task over the life of the project. Although the dual stack transition strategy will ease the initial impact of IPv6 on applications, the SBA will need to review all Commercial Software Packages, SBA Mission Critical (Major) Applications, and SBA Non-Mission Critical Applications on a continual basis. Additionally, current Enterprise Architecture Initiatives for applications and systems including the Loan Management Accounting System, Disaster Credit Management Modernization, Business Development Management Information System, Electronic Procurement Center Representative and Business Gateway (e-Gov) need to consider IPv6 impacts and have dependencies and requirements incorporating the protocol.

Upon completion of the planning phase of the project, the SBA should publish SBA IPv6 Transition Plan to all project stakeholders, review SBA IPv6 Project Milestones and Timelines, and identify IPv6 risks and mitigation measures.

5.2.2 SBA IPv6 Transition Security Planning

The SBA IPv6 Information Security Plan will need to be updated and will be another ongoing task. The current plan focused on the OMB June 2008 deadline and will need to be expanded for an enterprise wide deployment of IPv6. As outlined in the current IPv6 Security Plan, the SBA will need to develop an IPv6 Reactivation Plan to re-enable the protocol. The protocol was turned off and key components removed after the IPv6 Demonstration Plan was executed and completed.

5.2.3 SBA IT Security Devices Planning

The transition to IPv6 will present new risks to the SBA enterprise network environment and all security devices will require detailed planning. SBA Firewalls, Intrusion Detection Systems, and scanning capabilities will need to be reviewed and all policies and procedures will need to be modified to support the inclusion of the IPv6 protocol. New initiatives, products and services, including Network Forensics and Network Access Control solutions need to incorporate IPv6 as a requirement and dependency.

5.2.4 SBA IPv6 Transition Infrastructure and Services Planning

The SBA has received blocks of IPv6 addresses and will need to review the SBA IPv6 Addressing Plan. The plan calls for the allocation of /64 IPv6 subnets to each SBA location which will provide 18,446,744,073,709,551,616 per SBA location or network. The American Registry for Internet Numbers (ARIN) has provided a block of addresses using a /48 subnet and has reserved additional contiguous space along this range in the form of a /44 subnet mask in the event the SBA needs additional address space. Additionally, Verizon has provided an IPv6 address range to the SBA. Verizon assigned a /48 subnet to the SBA. AT&T has verbally indicated they can provide address space to the SBA and the Trusted Internet Connection initiative may also provide an address space to the SBA. The SBA will need to identify and procure an IPv6 Address Management Tool to assist with the administration and assignment of address space throughout the agency.

5.2.5 SBA IPv6 Routing Protocols

The SBA currently utilizes a number of different routing protocols, both internally and externally, including Enhanced Interior Gateway Routing Protocol, Border Gateway protocol as well as static routes. The Next Generation Routing Information Protocol (RIPng) was used during the IPv6 Demonstration tests. The SBA should review current and future routing protocol needs and determine SBA

IPv6 Routing Protocols required for the transition. External Routing Protocols to Service Providers, Internal Local Area Network Routing Protocols, and Wide Area Network Routing Protocols need to be reviewed and a determination made on which routing protocol to use in the future.

5.2.6 SBA Network Services

The SBA will need to begin planning for the changes required for the Domain Name Service and Dynamic Host Configuration Protocol (DHCP) with regards to the IPv6 protocol. The domain name system (DNS) stores and associates many types of information with domain names, but most importantly, it translates domain names (computer hostnames) to IP addresses. It also lists mail exchange servers accepting e-mail for each domain. In providing a worldwide keyword-based redirection service, DNS is an essential component of a network environment. DNS makes it possible to attach easy-to-remember host or domain names (such as "www.sba.gov") to hard-to-remember IP addresses (such as 199.171.55.4). People take advantage of this when they recite URLs and e-mail addresses. DHCP for IPv6 (DHCPv6) enables DHCP servers to pass configuration parameters such as IPv6 network addresses to IPv6 nodes. It offers the capability of automatic allocation of reusable network addresses and additional configuration flexibility

The SBA IPv6 Domain Name Service planning needs to include both external and Internal SBA Domain Name Spaces. A new DNS resource record type, AAAA (called "quad A"), is used for resolving a fully qualified domain name to an IPv6 address. It is comparable to the host address (A) resource record used with IPv4. The resource record type is named AAAA (Type value of 28) because 128-bit IPv6 addresses are four times as large as 32-bit IPv4 addresses. Due to the limitations of IP version 6 (IPv6) it is not possible to allocate IP addresses to all computers or devices on a permanent basis in most enterprise environments. Instead, a mechanism is required to allocate IP addresses to resources when they connect to the network, either at startup or physical connection time. In a majority of cases, DHCPv6 is chosen as the most appropriate solution for IP address allocation. The SBA IPv6 Dynamic Host Configuration Protocol Plan will address the DHCPv6 Service Design requirements for the SBA.

Note: OMB Memorandum 8-23 states the Federal Government will deploy DNSSEC to the top level .gov domain by January 2009. The top level .gov domain includes the registrar, registry, and DNS server operations. This policy requires that the top level .gov domain will be DNSSEC signed and processes to enable secure delegated sub-domains will be developed. Signing the top level .gov domain is a critical procedure necessary for broad deployment of DNSSEC, increases the utility of DNSSEC, and simplifies lower level deployment by agencies. DNSSEC will place additional requirements on the IPv6 DNS service design.

5.2.7 SBA IPv6 Circuit Modernization

Upon completion of the SBA IPv6 Transition Infrastructure and Services planning steps, the SBA should develop detailed SBA IPv6 Circuit Modernization initiatives. The initiatives will have Trusted Internet Connection dependencies and IPv6 service availability and capabilities from providers should be reviewed and assessed. A detailed plan for the implementation of IPv6 into the SBA communication infrastructure needs to be developed as well. The plan should include the review of IPv6 routing and addressing for each network, procedures for configuring and enabling IPv6 on routers, policy for enabling IPv6 on infrastructure devices, and policy for IPv6 enabled devices. All policies and procedures should adhere to guidance and directives from the SBA IPv6 Reactivation Plan.

5.3 SBA Phased IPv6 Implementation Strategy

5.3.1 SBA IPv6 Information Security Device Implementation

A plan detailing the SBA IPv6 Information Security Device Implementation to support IPv6 needs to be developed. The plan should review IPv6 capabilities and status on SBA security devices and contain policies and procedures for configuring and enabling IPv6 on firewalls and other security devices. The implementation plan will have a strong dependency on the SBA IPv6 Security Plan, which will provide overall guidance and direction for the secure implementation of IPv6 into the SBA environment.

5.3.2 SBA IPv6 Test Environment Planning

The SBA will require an IPv6 Test Environment and will need a detailed plan for establishing one. The Test environment will be used to prototype new the Windows Server 2008 SBA Active Directory environment utilizing IPv4/IPv6 Dual Stack, prototype Windows Vista operating system environment using IPv4/IPv6 Dual Stack configuration, and to establish IPv6 training environment for system administrators and support staff. The IPv6 Test network will use Federal Desktop Core Configuration and NIST configuration recommendations.

5.3.3 SBA Enterprise IPv6 Dual/ Stack Transition Planning

A plan detailing the SBA Enterprise infrastructure equipment refresh incorporating an IPv6/IPv4 Dual Stack and service implementation requirements will be an ongoing task for the IPv6 transition initiative. The plan needs to address the SBA Hardware Replacement Plan, Workstation Operating System



Upgrade Plan, Server Operating System and Application Upgrade Plan, Messaging Server Upgrade, Security Devices and System Upgrades, and Network Attached Devices Plan. Plans for application servers, database and web servers running on Solaris and Linux operating systems will also need to be developed. The planning effort will cover a number of different areas and departments within the SBA and will need to work closely with the overall IPv6 transition effort.

5.3.4 Native IPv6 Services

Native IPv6 services are not a requirement for the transition to a dual stack IPv6/IPv4 environment but are desirable to a tunnel scenario. Communication services from each Internet Service Provider vendor should be examined for IPv6 native implementation, which are currently limited in terms of service offerings from vendors. The task will involve comparison and review of service capabilities for the Verizon Internet Connections and AT&T WAN and Managed Internet Services will have dependencies with Networx contract and Trusted Internet Connection initiative.

5.3.5 SBA Extranets

An assessment of the SBA Extranets and External Trading Partners with regards to IPv6/IPv4 Dual Stack capabilities and potential implementation schedules if applicable will need to be drafted. This will be an ongoing task tied to current and future Enterprise Architecture initiatives and target architectures. Changes to these environments, including application upgrade plans, hardware refreshes plans, and circuits and connectivity requirement changes should be tracked and have IPv6 dependencies placed on them. If feasible, initiatives to spur IPv6 implementation should be considered and developed.

5.3.6 SBA IPv6 Test Environment Implementation

The implementation of the SBA IPv6 Test Environment will follow the planning stage for this task. The environment will provide a secure place to test and prototype new desktop and workstation operating systems, such as Windows Server 2008 and Microsoft Vista. The SBA Active Directory environment can be simulated in this environment and the impact of utilizing IPv6/IPv4 dual stack can be researched and tested. Baseline configurations for the Microsoft Windows Vista operating system can be developed in the environment for services and applications using the IPv6/IPv4 Dual Stack configuration and recommended security settings. Solaris 10 and Linux operating system platforms will also need to be added to the IPv6 Test Lab environment.

5.3.7 SBA Enterprise IPv6 Dual/ Stack Application Transition Planning

In addition to the transition steps for new operating systems, applications transition plans need to be developed for key SBA applications such as Microsoft Exchange and Blackberry Enterprise Server. Since the future of these products is not set in stone with the agency contemplating Voice over IP and Windows Mobile technology, a draft plan detailing the future state of the SBA Messaging and Blackberry Enterprise Server needs to be determined and an IPv6/IPv4 dual stack configuration for these services need to be defined. Equipment and service implementation planning as well as requirements will be an ongoing task in order to transition the Blackberry Enterprise Server application, Messaging Applications and SBA personal data communication devices to function in an IPv6/IPv4 dual stack configuration. Additional application transition plans for SBA line of business applications, Oracle and SQL databases, and web based applications running Windows, Unix, or Linux operating systems need to be developed.

5.3.8 IPv6-Ready Workstation/Server Modernization

As testing and planning progresses with IPv6/IPv4 dual stack, planning for IPv6-ready Workstation and Server Modernization needs to commence. Procurement planning for server equipment replacement, server hardware configurations, quantities, models, etc. needs to be performed. Replacement capabilities for current SBA workstations, hardware configurations, models, quantities, monitors and other desktop components also needs to be planned and determined. Requirements for data center servers running Microsoft, Sun Solaris, and Linux operating systems need to be determined and captured. Procurement vehicles and integration and implementation services required to facilitate the effort should be identified.

5.3.9 IPv6-ready Desktop Application Modernization

In conjunction with the operating system upgrades and hardware replacement efforts, planning for IPv6-ready Desktop Application Modernization needs to be performed as applications that are capable will begin to leverage the features of the IPv6 protocol. Although the dual stack transition method should minimize and reduce the impact of the new protocol, the Microsoft Office automation product suites, SBA Commercial Off-the Shelf (COTS) products, and SBA Government Off-the Shelf (GOTS) will need to be reviewed and tested for functionality under the new configurations.

5.3.10 Major Business Segment Projects

Planning for IPv6/IPv4 integration with Major Business Segment Projects will be an ongoing requirement. Active and future Enterprise Architecture initiatives introducing functionality changes, new procurements or product enhancements, and new equipment purchases for Business Segments need to incorporate IPv6 planning into their charters and ensure the protocol is listed and defined as a requirement. Analysis of both dual stack and native IPv6 implementation and deployment in support of Business Segment needs to be planned and mapped out.

5.4 Finalize SBA Enterprise IPv6/IPv4 Dual Stack Plan

After planning and testing the proposed configurations in a Test Lab environment, the finalized SBA Enterprise IPv6/IPv4 Dual Stack plan will be ready. Equipment implementation and service integration combined with the SBA Hardware Replacement Plan, SBA Workstation Operating System Upgrade Plan, SBA Server Operating System and Application Upgrade Plan, SBA Exchange Server Upgrade, SBA Security Devices and System Upgrades, SBA Network Attached Devices Plan, and plans for infrastructure services, including DNS and DHCPv6 will be complete.

5.4.1 Service Providers for Native IPv6

As the IPv6 protocol is still maturing and vendors are still adopting and the protocol to their service offerings, services from Internet Service Providers and wide area networks will need to routinely reviewed and their services assessed for IPv6 Native implementation. Service providers include Verizon and AT&T but may change as a result of the Networx contract and Trusted Internet Connection directive.

5.4.2 SBA Extranet

Although it is expected to be an ongoing task during the life of the project, a final assessment of the SBA Extranet and External Trading Partners using an IPv6/IPv4 Dual Stack configuration needs to be completed. The assessment should detail capabilities, implementation schedules, application upgrade plans, equipment and hardware refreshes plans, circuits and connectivity requirement changes required to transition the environments to a dual stack configuration. The results of the assessment should be published, the IPv6 Transition Plan updated, recommendations for SBA Extranets detailed, hardware and application refreshes plans and IPv6 project risks and mitigation measures captured.



5.4.3 SBA Enterprise IPv6/IPv4 Dual Stack Rollout, Configuration, Acceptance Test Planning

Finalizing SBA IPv6/IPv4 Dual Stack rollout and IPv6/IPv4 Dual Stack Pilot, IPv6/IPv6 Dual Stack rollout schedule and creating the SBA IPv6/IPv4 Dual Stack Test and Acceptance Plans are the next steps in the plans. The acceptance test plan will identify specific tests and criteria for IPv6/IPv4 connectivity and application tests are working properly in the new configuration.

5.4.4 SBA IPv6/IPv4 Dual Stack Configuration Guides

Configuration guidelines and instructions for implementing the new operating systems will need to be documented. Build guides for Microsoft Windows Vista, Windows Server 2008, and Windows Server 2008 Applications using Ipv6/IPv4 will be the deliverable of this task. Network Services Configuration Guides for DNS and DHCPv6 will also need to be created and configuration settings documented. Procedures for configuring, installing and deploying IPv6/IPv4 dual stack configurations for applications, databases and services utilizing Solaris and Linux servers need to be prepared during this step.

5.4.5 SBA Enterprise Infrastructure IPv6/IPv4 Dual Stack Pilot Rollout

In preparation of the IPv6/IPv4 dual stack pilot, a series of activities will need to be accomplished prior to the pilot in order to support the IPv6 pilot devices and secure the environment. The first step will be to enable IPv6/IPv4 Dual Stack capabilities on SBA Security Devices. The process will include enabling IPv6 on SBA Firewalls, enabling IPv6 capabilities on SBA security devices, and establishing monitoring and incident response procedures for IPv6 traffic.

5.4.6 IPv6/IPv4 Dual Stack on SBA Routers and Switches

Although all SBA routers and switches were replaced and upgraded to support the IPv6 protocol, the devices have not been configured to run the protocol. SBA routers will need to be reconfigured to enable IPv6/IPv4 Dual Stack capabilities. SBA routers and switches that need to be configured to run the protocol and IPv6 routing needs to be enabled on edge routers and internal routers to enable IPv6 traffic communicate throughout the initial pilot locations and ultimately throughout the agency.

5.4.7 SBA IPv6/IPv4 Dual Stack Implementation Pilot SBA Headquarters

The introduction of new technology within the SBA environment is typically piloted on select devices within the Office of the Chief Information Officer. The pilot will require the implement Windows Vista IPv6/IPv4 on SBA pilot workstations, implement of Windows Server 2008 IPv6/IPv4 on SBA pilot

servers, and implementation of Windows Server 2008 Application Ipv6/IPv4 SBA on pilot systems. During the pilot, the environment will need to be tested and monitored using the Acceptance Plan test cases and criteria. Procedures and configurations for the pilot will need to be reviewed and refined and the guides used for the pilot will need to be updated to capture deviations from the initial baseline configurations and to document lessons learned. Once configurations are final and the environment stabilizes, the SBA IPv6/IPv4 Dual Stack Application tests will be conducted in order to validate the pilot and enable management to approve moving forward with the rollout.

5.4.8 SBA Enterprise Infrastructure IPv6 Dual/ Stack Rollout

The next step of the SBA IPv6/IPv4 Dual Stack Implementation will be for SBA Headquarters workstations, servers, devices and user community. Microsoft Windows Vista desktops configured with an IPv6/IPv4 configuration will be systematically rolled out to all SBA HQ workstations. Microsoft Windows Server 2008 configured with an IPv6/IPv4 stack will be rolled out to all SBA HQ servers and specific application servers will implement Microsoft Windows Server 2008 as well. It is understood that not all server applications will be migrated and that some applications will be replaced by newer products during this phase of the project and other applications will begin to be phased out over time and will remain in their current state.

Data center servers utilizing Solaris and Linux operating systems supporting SBA applications, databases and services will begin transition in this phase. Extensive testing and the dual stack deployment should mitigate problems with transition of these environments.

5.4.9 SBA IPv6/IPv4 Dual Stack Implementation Regional Office Pilot

Upon completion of the SBA Headquarters environment, the focus of the technology upgrade will shift the Regions, District Offices and Service Centers. Pilot sites will be designated and the implementation of Microsoft Windows Vista IPv6/IPv4 and Microsoft Windows Server 2008 will begin. Where required, Microsoft Windows Server 2008 Applications will be updated and replace existing capabilities. Upon successful completion of the pilot, the remaining offices will be scheduled based on Region.

5.4.10 SBA IPv6/IPv4 Dual Stack Regional Office Implementation

Implement Windows Vista IPv6/IPv4 on SBA District Office workstations, implement Windows Server 2008 IPv6/IPv4 on SBA District Office servers, and implement Windows Server 2008 Application Ipv6/IPv4 SBA District Office servers in the following locations:

- SBA IPv6/IPv4 Dual Stack Implementation Region 1 and 2



- SBA IPv6/IPv4 Dual Stack Implementation Region 3 and 4
- SBA IPv6/IPv4 Dual Stack Implementation Region 5 and 6
- SBA IPv6/IPv4 Dual Stack Implementation Region 7 and 8
- SBA IPv6/IPv4 Dual Stack Implementation Region 9 and 10
- SBA IPv6/IPv4 Dual Stack Implementation Service Centers

Remaining application servers, running Microsoft, Solaris and Linux based operating systems will begin transition at the completion of this phase.

5.5 The SBA Office of Disaster Assistance

The Office of Disaster Assistance has similar requirements to the rest of the agency with regards to the implementation of the IPv6/IPv4 dual stack configuration but has different application and business lines concerns. The procedure and mechanisms for updating the Disaster Assistance office will need to be finalized and the procedure IPv6/IPv4 dual stack implementation for equipment and services will be similar to the rest of the agency. Implementation for Office of Disaster sites will require a Hardware Replacement Plan, Workstation Operating System Upgrade Plan, Server Operating System and Application Upgrade Plan, Messaging Server Upgrade Plan, Security Devices and System Upgrades, Network Attached Devices Plan, and a DNS and DHCPv6 plan.

5.5.1 SBA Office of Disaster Assistance IPv6 Dual/ Stack Planning

Once the plan has been finalized for the SBA Office of Disaster Assistance, the IPv6/IPv4 Dual Stack rollout can begin. The rollout will begin an IPv6/IPv4 Dual Stack pilot in select locations to specific machines and a detailed rollout schedule will be developed for the entire program. Test and Acceptance Plans will be tailored for ODA and will include connectivity and application tests. Office of Disaster Assistance Configuration Guides Configuration Guides will be developed for the Office of Disaster Assistance and will provide specific instructions on how to properly install and configure Microsoft Windows Vista with an IPv6/IPv4 dual stack configuration, Microsoft Windows Server 2008, Microsoft Application build guides, and IPv6/IPv4 Network Services configuration guides for DNS and DHCPv6. Configurations and build guides for Solaris and Linux based systems supporting ODA applications will also be developed.

5.5.2 SBA Office of Disaster Assistance IPv6 Routers and Switches

The first phase for enable IPv6/IPv4 dual stack capabilities will be to enable the protocol on ODA routers and switches. Once the devices have been configured

to support the protocol, IPv6 routing will need to be enabled on ODA edge routers and internal routers.

5.5.3 ODA IPv6/IPv4 Dual Stack Office of Disaster Assistance Pilot and Implementation

Once the proper planning has been completed and the initial IPv6 steps have been completed, a pilot can be started. The pilot will implement Microsoft Windows Vista with IPv6/IPv4 capabilities on ODA pilot workstations; implement Microsoft Windows Server 2008 IPv6/IPv4 on ODA pilot servers, and Microsoft Windows Server 2008 applications on ODA pilot servers. The pilot environment will be tested and monitored and the procedures used for the pilot will be reviewed and refined, lessons learned will be documented, and connectivity and application tests will be conducted and results captured. Upon completion of the pilot, a phased implementation for each ODA location will be scheduled. Solaris and Linux based systems will also be tested during this stage as required.

5.6 SBA Extranets

Once the internal SBA network has been completed and all workstations and servers are running in an IPv6/IPv4 dual stack configuration, attention can be shifted to the SBA Extranets. For the environments that have not already started a planning cycle for IPv6 or technology refresh that will incorporate IPv6 functionality, Enterprise Architecture initiatives should be created to start the process. The SBA Data Center Migration hardware refreshes plan and SBA IPv6 Application transition plans for commercial, mission critical and non-mission critical software packages and applications should be reviewed to ensure IPv6 planning is factored into the environments. Detailed information and updates should be published to the IPv6 Transition Plan and project risks discussed and assessed.

5.7 SBA IPv6 Native Initiatives

As the SBA nears completion of a dual stack IPv6/IPv4 configuration, attention needs to shift to native IPv6 capabilities. Planning efforts need to commence and SBA IPv6 Strategic Goals and Objectives need to be refined and developed with a focus on native IPv6 capabilities and the phasing out and removal of the IPv4 protocol stack. Native IPv6 specific initiatives need to be established for the Target Architecture for the SBA IT Services Enterprise Architecture segment. Opportune time for this type of upgrade would during the next SBA Enterprise Infrastructure upgrade with a tentative 2016 timeframe. During this refresh, the SBA Workstation and Server Operating System Environments will be upgraded to the next generation platforms. Converting the agency to pure IPv6 native capabilities and removing IPv4 may be an option to consider at this time. A SBA Native IPv6 Gap Analysis should be considered to outline steps for transitioning



to the next iteration and specific SBA Native IPv6 Strategic goals aligned to SBA Business and Mission Objectives should be created.
Strategic Initiatives for IPv6 Native Implementation

5.8 SBA IPv6 Native Planning

Planning for Native IPv6 will follow a similar five year cycle as dual stack with creation of IPv6 strategic goals and objectives being establishing through Enterprise Architecture initiatives, GAP analyses for moving away from IPv6/IPv4 dual stack environments, and planning cycles to address Native IPv6 Transition. Application testing and Security will be of paramount concern as the requirement for maintaining the IPv4 protocol begins to diminish.

5.9 SBA IPv6 Native Implementation and Deployment

Testing, technology initiative and technology refresh planning efforts will take several years as new hardware platforms, operating systems, technological advances and new applications are considered for implementation at the SBA. Design of the next generation infrastructure services, devices, and applications will be followed by pilots, SBA enterprise wide implementation and ongoing operational support will follow the planning phases.

5.10 Retire IPv4 and Complete Transition Sequence

Consideration for sun setting the IPv4 protocol will need to be weighed against the ongoing need from customers still utilizing the protocol for accessing SBA services and applications, governance provided, security risks, support by vendors.

6 IPv6 Program Major Milestones and Schedules

This section provides the summary of all the steps necessary to implement the SBA enterprise-wide IPv6 transition from a security perspective.

6.1 Schedule of Tasks and Activities

The High-Level Milestones below depicts an overview of the major transition steps and phases related to the SBA IPv6 transition.

High-level Milestones:

<i>Id</i>	<i>Description</i>	<i>Completion Date</i>
<i>Finalize High-Level SBA IPv6 Requirements and Milestones</i>		
1	Complete SBA IPv6 Transition and Sequence Plan	September 30, 2008
<i>SBA IPv6 Business Impact Analysis</i>		
2	Develop specific SBA IPv6 Strategic Goals and Objectives <ul style="list-style-type: none"> • Alignment with SBA Business and Mission Objectives • IPv6 services and benefits to the Agency 	December 31, 2008
3	IPv6 specific initiatives Target Architecture for SBA IT Services Enterprise Architecture segment <ul style="list-style-type: none"> • SBA Enterprise Infrastructure Upgrade 2011 Timeframe • Microsoft Windows Server 2008 • Microsoft Vista • Exchange Server 2007 • SBA Data Center Move Initiative 	December 31, 2008
4	SBA IPv6 Gap Analysis <ul style="list-style-type: none"> • IPv6 Enterprise wide deployment planning • Project initiation and planning • Office of Disaster Assistance IPv6 Capable Infrastructure Devices 	December 31, 2008



5	Update SBA Transition Communication Plan <ul style="list-style-type: none">• Establish IPv6 Sharepoint on OCIO Portal• Transfer IPv6 artifacts from Network Information Branch portal	December 31, 2008
<i>SBA IPv6 Transition Planning</i>		
6	Trusted Internet Connection and Network impact, requirements and planning to determine for providing native IPv6 capabilities <ul style="list-style-type: none">• Verizon Internet Services• Verizon Internet Services (Denver COOP Location)• AT&T Managed Internet Services• AT&T Wide Area Network Services	March 31, 2009
7	Update SBA IPv6 Transition Plan <ul style="list-style-type: none">• Define IPv6 Transition Scope Statement• Define IPv6 Transition Project Charter• Develop IPv6 Transition Project Schedule• Develop IPv6 Risk Management Plan• Develop IPv6 Project Management Plan• Identify IPv6 Training Requirements	March 31, 2009
8	SBA IPv6 Application Transition Plan (Ongoing) <ul style="list-style-type: none">• Commercial Software Packages• SBA Mission Critical (Major) Applications• SBA Non-Mission Critical Applications Current Enterprise Architecture Initiatives <ul style="list-style-type: none">• Loan Management Accounting System• Disaster Credit Management Modernization• Business Development Management Information System• Electronic Procurement Center Representative• Business Gateway (e-Gov)	March 31, 2009



<i>SBA IPv6 Transition Security Planning</i>		
10	Publish SBA IPv6 Transition Plan <ul style="list-style-type: none">• SBA IPv6 Project Milestone Review• Identify IPv6 risks and mitigation measures	June 30, 2009
11	Update SBA IPv6 Information Security Plan (Ongoing Task)	June 30, 2009
12	Develop IPv6 Reactivation Plan	June 30, 2009
13	SBA IT Security Devices Planning <ul style="list-style-type: none">• SBA Firewalls• SBA Intrusion Detection Systems• SBA IPv6 Scanning Capabilities• SBA Network Forensics• SBA Network Access Control	June 30, 2009
<i>SBA IPv6 Transition Infrastructure and Services Planning</i>		
14	Review SBA IPv6 Addressing Plan <ul style="list-style-type: none">• ARIN Address Allocation• Verizon Address Allocation• AT&T Address Allocation (TBD)• Trusted Internet Connection Allocation (TBD)• Identify and procure IPv6 Address Management Tool	September 30, 2009
15	Determine SBA IPv6 Routing Protocols <ul style="list-style-type: none">• External Routing Protocols to Service Providers• Internal Local Area Network Routing Protocols• Wide Area Network Routing Protocols	September 30, 2009



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16	SBA IPv6 Domain Name Service Planning <ul style="list-style-type: none">External and Internal Name SpacesQuad AAAA records	September 30, 2009
17	SBA IPv6 Infrastructure Services Dynamic Host Configuration Protocol <ul style="list-style-type: none">DHCPv6 Service DesignLogical Service DesignPhysical Service Design	September 30, 2009
<i>SBA IPv6 Transition Infrastructure and Services Planning</i>		
18	Plan Detailed SBA IPv6 Circuit Modernization <ul style="list-style-type: none">Trusted Internet Connection dependenciesService Availability from providers	December 31, 2009
19	Plan Detailed SBA IPv6 Infrastructure Implementation <ul style="list-style-type: none">Review IPv6 routing and addressing for each networkProcedure for configuring and enabling IPv6 on routersPolicy for enabling IPv6 on infrastructure devicesPolicy for IPv6 enabled devicesSBA IPv6 Reactivation Plan dependency	December 31, 2009
20	Plan Detailed SBA IPv6 Information Security Device Implementation <ul style="list-style-type: none">Review IPv6 capabilities and status on SBA security devicesProcedure for configuring and enabling IPv6 on firewallsSBA IPv6 Security Plan dependency	December 31, 2009
21	Plan Detailed SBA IPv6 Test Environment <ul style="list-style-type: none">Prototype new Windows Server 2008 SBA Active Directory environment utilizing IPv4/IPv6 Dual StackPrototype Windows Vista operating system environment using IPv4/IPv6 Dual Stack configurationEstablish IPv6 training environmentUse FDCC and NIST configuration recommendations	December 31, 2009



SBA Enterprise IPv6 Dual/ Stack Transition Planning		
21	Draft Plan detailing SBA Enterprise <i>IPv6/IPv4 Dual Stack</i> equipment implementation and service implementation requirements (Ongoing Task) <ul style="list-style-type: none">• SBA Hardware Replacement Plan• SBA Workstation Operating System Upgrade Plan• SBA Server Operating System and Application Upgrade Plan• SBA Exchange Server Upgrade• SBA Security Devices and System Upgrades• SBA Network Attached Devices Plan	March 31, 2010
22	Vendor Service Provider services for IPv6 Native Implementation <ul style="list-style-type: none">• Verizon Connection• AT&T WAN and Managed Internet Services• Networx Dependencies• Trusted Internet Connection Dependencies	March 31, 2010
23	Draft assessment SBA Extranet and External Trading Partners <i>IPv6/IPv4 Dual Stack</i> capabilities, implementation schedules if applicable (Ongoing Task) <ul style="list-style-type: none">• Application Upgrade Plans• Hardware Refreshes Plans• Circuits and connectivity requirement changes	March 31, 2010
24	Implement SBA IPv6 Test Environment <ul style="list-style-type: none">• Prototype new Windows Server 2008 SBA Active Directory environment utilizing IPv4/IPv6 Dual Stack• Prototype Windows Vista operating system environment using IPv4/IPv6 Dual Stack configuration• Use FDCC and NIST configuration recommendations	March 31, 2010



SBA Enterprise IPv6 Dual/ Stack Transition Planning		
25	Draft Plan detailing SBA Blackberry Enterprise Server <i>IPv6/IPv4 Dual Stack</i> equipment and service implementation requirements (Ongoing Task) <ul style="list-style-type: none">• SBA BES Application Planning• SBA Personal Data Communications Device Planning	June 30, 2010
26	Plan IPv6-ready Workstation/Server Modernization <ul style="list-style-type: none">• Procurement planning for equipment replacement• Server hardware configurations, quantities, etc• Workstation configurations, models, quantities, etc	June 30, 2010
27	Plan IPv6-ready Desktop Application Modernization <ul style="list-style-type: none">• Microsoft Office automation product suites• SBA Commercial Off the Shelf (COTS)• SBA Government Off the Shelf (GOTS)	June 30, 2010
28	Plan IPv6/IPv4 integration with Major Business Segment Projects (as required) <ul style="list-style-type: none">• Procurement planning for equipment replacement• Server hardware configurations, quantities, etc• Workstation configurations, models, quantities, etc	June 30, 2010
Analyze <i>IPv6 Native Implementation</i> deployment in support of Business Segment needs		



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29	<p>Finalize SBA Enterprise <i>IPv6/IPv4 Dual Stack</i> equipment implementation and service implementation</p> <ul style="list-style-type: none">• SBA Hardware Replacement Plan• SBA Workstation Operating System Upgrade Plan• SBA Server Operating System and Application Upgrade Plan• SBA Exchange Server Upgrade• SBA Security Devices and System Upgrades• SBA Network Attached Devices Plan• DNS and DHCP	September 30, 2010
30	<p>Vendor Service Provider services for IPv6 Native Implementation</p> <ul style="list-style-type: none">• Verizon Connection• AT&T WAN and Managed Internet Services• Networx Dependencies• Trusted Internet Connection Dependencies	September 30, 2010
31	<p>Finalize assessment SBA Extranet and External Trading Partners <i>IPv6/IPv4 Dual Stack</i> capabilities, implementation schedules if applicable (Ongoing Task)</p> <ul style="list-style-type: none">• Application Upgrade Plans• Hardware Refreshes Plans• Circuits and connectivity requirement changes	September 30, 2010
32	<p>Publish Details of IPv6 Transition Plan</p> <ul style="list-style-type: none">• Recommendations for SBA Extranets• Hardware Refreshes Plans• Circuits and connectivity requirement changes• IPv6 project risks and mitigation measures	September 30, 2010



<i>SBA Enterprise IPv6 Dual/ Stack Rollout, Configuration, Acceptance Test Planning</i>		
33	Finalize SBA IPv6/IPv4 Dual Stack Rollout <ul style="list-style-type: none">• IPv6/IPv4 Dual Stack Pilot• IPv6/IPv6 Dual Stack rollout schedule	December 31, 2010
34	SBA IPv6/IPv4 Dual Stack Test and Acceptance Plans <ul style="list-style-type: none">• Finalize IPv6/IPv4 connectivity tests• Finalize IPv6/IPv4 application tests	December 31, 2010
35	SBA IPv6/IPv4 Dual Stack Configuration Guides <ul style="list-style-type: none">• Windows Vista IPv6/IPv4 build guides• Windows Server 2008 IPv6/IPv4 build guides• Windows Server 2008 Application Ipv6/IPv4 build guides	December 31, 2010
36	SBA IPv6/IPv4 Network Services Configuration Guides <ul style="list-style-type: none">• IPv6/IPv4 Domain Name Server• Dynamic Host Configuration Protocol Version 6	December 31, 2010
<i>SBA Enterprise Infrastructure IPv6 Dual/ Stack Pilot Rollout</i>		
37	Enable IPv6/IPv4 Dual Stack capabilities on SBA Security Devices <ul style="list-style-type: none">• Enabled IPv6 on SBA Firewalls• Enabled IPv6 capabilities on SBA security devices• Monitor IPv6 traffic	March 31, 2011
38	Enable IPv6/IPv4 Dual Stack capabilities on SBA Routers and Switches <ul style="list-style-type: none">• Configure and enable IPv6 routing on edge routers• Configure and enable IPv6 routing in internal routers	March 31, 2011



39	SBA IPv6/IPv4 Dual Stack Implementation Pilot SBA Headquarters <ul style="list-style-type: none">• Implement Windows Vista IPv6/IPv4 on SBA pilot workstations• Implement Windows Server 2008 IPv6/IPv4 on SBA pilot servers• Implement Windows Server 2008 Application Ipv6/IPv4 SBA pilot servers	March 31, 2011
40	Test and monitor SBA IPv6/IPv4 Dual Stack pilot environment <ul style="list-style-type: none">• Review and refine IPv6/IPv4 procedures and guides used for pilot• Document lessons learned• Conduct SBA IPv6/IPv4 Dual Stack Application tests	March 31, 2011
<i>SBA Enterprise Infrastructure IPv6 Dual/ Stack Rollout</i>		
41	SBA IPv6/IPv4 Dual Stack Implementation SBA Headquarters <ul style="list-style-type: none">• Implement Windows Vista IPv6/IPv4 on SBA HQ workstations• Implement Windows Server 2008 IPv6/IPv4 on SBA HQ servers• Implement Windows Server 2008 Application Ipv6/IPv4 SBA HQ servers	June 30, 2011
42	SBA IPv6/IPv4 Dual Stack Implementation Regional Office Pilot <ul style="list-style-type: none">• Implement Windows Vista IPv6/IPv4 on SBA District Office pilot workstations• Implement Windows Server 2008 IPv6/IPv4 on SBA District Office pilot servers• Implement Windows Server 2008 Application Ipv6/IPv4 SBA District Office pilot servers	June 30, 2011
43	SBA IPv6/IPv4 Dual Stack Implementation Region 1 and 2 <ul style="list-style-type: none">• Implement Windows Vista IPv6/IPv4 on SBA District Office workstations• Implement Windows Server 2008 IPv6/IPv4 on SBA District Office servers• Implement Windows Server 2008 Application Ipv6/IPv4 SBA District Office servers	June 30, 2011



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44	<p>SBA IPv6/IPv4 Dual Stack Implementation Region 3 and 4</p> <ul style="list-style-type: none">• Implement Windows Vista IPv6/IPv4 on SBA District Office workstations• Implement Windows Server 2008 IPv6/IPv4 on SBA District Office servers• Implement Windows Server 2008 Application Ipv6/IPv4 SBA District Office servers	June 30, 2011
45	<p>SBA IPv6/IPv4 Dual Stack Implementation Region 5 and 6</p> <ul style="list-style-type: none">• Implement Windows Vista IPv6/IPv4 on SBA District Office workstations• Implement Windows Server 2008 IPv6/IPv4 on SBA District Office servers• Implement Windows Server 2008 Application Ipv6/IPv4 SBA District Office servers	June 30, 2011
46	<p>SBA IPv6/IPv4 Dual Stack Implementation Region 7 and 8</p> <ul style="list-style-type: none">• Implement Windows Vista IPv6/IPv4 on SBA District Office workstations• Implement Windows Server 2008 IPv6/IPv4 on SBA District Office servers• Implement Windows Server 2008 Application Ipv6/IPv4 SBA District Office servers	June 30, 2011
<i>SBA Enterprise Infrastructure IPv6 Dual/ Stack Rollout</i>		
47	<p>SBA IPv6/IPv4 Dual Stack Implementation Region 9 and 10</p> <ul style="list-style-type: none">• Implement Windows Vista IPv6/IPv4 on SBA District Office workstations• Implement Windows Server 2008 IPv6/IPv4 on SBA District Office servers• Implement Windows Server 2008 Application Ipv6/IPv4 SBA District Office servers	September 30, 2011



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48	<p>SBA IPv6/IPv4 Dual Stack Implementation Service Centers</p> <ul style="list-style-type: none">• Implement Windows Vista IPv6/IPv4 on SBA Service Centers workstations• Implement Windows Server 2008 IPv6/IPv4 on SBA Service Centers servers• Implement Windows Server 2008 Application Ipv6/IPv4 SBA Service Centers servers	September 30, 2011
49	<p>Finalize SBA Enterprise <i>IPv6/IPv4 Dual Stack</i> equipment implementation and service implementation for Office of Disaster Equipment sites</p> <ul style="list-style-type: none">• SBA Hardware Replacement Plan• SBA Workstation Operating System Upgrade Plan• SBA Server Operating System and Application Upgrade Plan• SBA Exchange Server Upgrade• SBA Security Devices and System Upgrades• SBA Network Attached Devices Plan• DNS and DHCP	September 30, 2011
50	<p>Publish Details of IPv6 Transition Plan</p> <ul style="list-style-type: none">• SBA Extranets Review• SBA Data Center Migration Hardware Refreshes Plans• IPv6 project risks and mitigation measures	September 30, 2011
<i>SBA Office of Disaster Assistance IPv6 Dual/ Stack Planning</i>		
51	<p>Finalize SBA Office of Disaster Assistance IPv6/IPv4 Dual Stack Rollout</p> <ul style="list-style-type: none">• IPv6/IPv4 Dual Stack Pilot• IPv6/IPv6 Dual Stack rollout schedule	December 31, 2011



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52	SBA Office of Disaster Assistance IPv6/IPv4 Dual Stack Test and Acceptance Plans <ul style="list-style-type: none">• Finalize IPv6/IPv4 connectivity tests• Finalize IPv6/IPv4 application tests	December 31, 2011
53	SBA Office of Disaster Assistance IPv6/IPv4 Dual Stack Configuration Guides <ul style="list-style-type: none">• Windows Vista IPv6/IPv4 build guides• Windows Server 2008 IPv6/IPv4 build guides• Windows Server 2008 Application Ipv6/IPv4 build guides	December 31, 2011
54	SBA Office of Disaster Assistance IPv6/IPv4 Network Services Configuration Guides <ul style="list-style-type: none">• IPv6/IPv4 Domain Name Server• Dynamic Host Configuration Protocol Version 6	December 31, 2011
<i>SBA Office of Disaster Assistance IPv6 Dual/ Stack</i>		
55	Enable IPv6/IPv4 Dual Stack capabilities on SBA Routers and Switches <ul style="list-style-type: none">• Configure and enable IPv6 routing on ODA edge routers• Configure and enable IPv6 routing in ODA internal routers	March 31, 2012
56	SBA IPv6/IPv4 Dual Stack Implementation Pilot ODA <ul style="list-style-type: none">• Implement Windows Vista IPv6/IPv4 on ODA pilot workstations• Implement Windows Server 2008 IPv6/IPv4 on ODA pilot servers• Implement Windows Server 2008 Application Ipv6/IPv4 SBA pilot servers	March 31, 2012
57	Test and monitor SBA IPv6/IPv4 Dual Stack ODA pilot environment <ul style="list-style-type: none">• Review and refine IPv6/IPv4 procedures and guides used for pilot• Document lessons learned• Conduct SBA IPv6/IPv4 Dual Stack Application tests	March 31, 2012



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58	SBA IPv6/IPv4 Dual Stack Implementation Office of Disaster Assistance <ul style="list-style-type: none">• Implement Windows Vista IPv6/IPv4 on ODA workstations• Implement Windows Server 2008 IPv6/IPv4 on ODA servers• Implement Windows Server 2008 Application Ipv6/IPv4 ODA servers	March 31, 2012
<i>SBA Extranet IPv6 Dual/ Stack</i>		
59	SBA Extranets IPv6/IPv4 Dual Stack Initiatives Planning	June 30, 2012
60	SBA Data Center Migration Hardware Refreshes Plans	June 30, 2012
61	SBA IPv6 Application Transition Plan (Ongoing) <ul style="list-style-type: none">• Commercial Software Packages• SBA Mission Critical (Major) Applications• SBA Non-Mission Critical Applications	June 30, 2012
62	Publish Details of IPv6 Transition Plan <ul style="list-style-type: none">• IPv6 project risks and mitigation measures	June 30, 2012
<i>SBA IPv6 Native Initiatives</i>		
63	Develop/Refine SBA IPv6 Strategic Goals and Objectives <ul style="list-style-type: none">• Native IPv6 Capabilities• Sunset for IPv4	September 30, 2012
64	IPv6 specific initiatives Target Architecture for SBA IT Services Enterprise Architecture segment <ul style="list-style-type: none">• SBA Enterprise Infrastructure Upgrade 2016 Timeframe• Workstation Operating System Environment TBD• Server Operating System Environment TDB	September 30, 2012



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65	<p>SBA Native IPv6 Gap Analysis</p> <ul style="list-style-type: none"> • IPv6 Enterprise wide deployment planning • Project initiation and planning • Office of Disaster Assistance IPv6 Capable Infrastructure Devices 	September 30, 2012
66	<p>Develop specific SBA IPv6 Strategic Goals and Objectives</p> <ul style="list-style-type: none"> • Alignment with SBA Business and Mission Objectives • IPv6 services and benefits to the Agency 	September 30, 2012
67	<p>SBA IPv6/IPv4 Extranets and Application Dual Stack Transition Plan (Ongoing)</p>	September 30, 2012
<i>SBA Extranet and Application IPv6/IPv4 Dual Stack Planning</i>		
68	<p>SBA IPv6/IPv4 Extranets and Application Dual Stack Transition Plan (Ongoing)</p>	December 31, 2012
69	<p>SBA IPv6/IPv4 Extranets and Application Dual Stack Transition Plan (Ongoing)</p>	March 30, 2013
70	<p>SBA IPv6/IPv4 Extranets and Application Dual Stack Transition Plan (Ongoing)</p>	June 30, 2013



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71	SBA IPv6/IPv4 Extranets and Application Dual Stack Transition Plan (Ongoing)									September 30, 2013
<i>SBA Extranet and Application IPv6/IPv4 Dual Stack Testing and Development</i>										
72	SBA Extranet IPv6/IPv4 Dual Stack Transition Plans									December 31, 2013
73	Strategic Initiatives for <i>IPv6 Native Implementation</i>									March 30, 2014
74	SBA Extranet Communication and Infrastructure Plans									June 30, 2014
75	SBA Extranet Application Transition Plans									September 30, 2014
	SBA IPv6 Native Transition Planning									
76	Finalize Approvals for rollout <i>IPv6 Native Implementation</i>									September 30, 2015
77	IPv6 Native GAP Analysis, Tech Refresh Initiatives									
78	Migrate all Business Segment Architectures to <i>IPv6 Native Implementation</i>									September 30, 2016
79	Begin Retirement IPv4 and Complete Transition Sequence									January 1, 2018

The sequence timeline shall follow existing and evolving laws and regulations, guidelines, standards and procedures, and shall be updated and coordinated through appropriate review boards as established by the SBA. Dates are preliminary estimates; Work Breakdown Structure and associated Schedule are to be developed and updated as part of the IPv6 Transition Sequence Plan.



6.2 Work Breakdown Structure

This section provides a breakdown of the tasks involved in the IPv6 Transition Plan.

WBS Element	<u>ACTIVITY/TASK NAME</u>	<u>EFFORT / DURATION</u>	<u>RESOURCE NAMES</u>
1.0	IPv6 Project Initiation ~ FY2009		
1.1	IPv6 Transition and Sequence Plan	09/30/08	IPV6 Tiger Team
1.2	IPv6 Transition Project Kickoff	12/31/08	IPV6 Tiger Team
1.3	IPv6 Draft Project Charter	12/31/08	IPV6 Tiger Team
1.4	IPv6 Transition Preliminary Scope Statement	12/31/08	IPV6 Tiger Team
1.5	IPv6 Strategic Goals	12/31/08	IPV6 Tiger Team
1.6	IPv6 Target Architecture	12/31/08	IPV6 Tiger Team
1.7	IPv6 GAP Analysis	12/31/08	IPV6 Tiger Team
2.0	IPv6 Transition Planning ~ FY2009		
2.1	IPV6 Project Management Plan Support	03/31/09	IPV6 Tiger Team
2.2	IPV6 WBS	03/31/09	IPV6 Tiger Team
2.3	IPV6 Project Schedule	03/31/09	IPV6 Tiger Team
2.4	IPV6 Communications Plan	03/31/09	IPV6 Tiger Team
2.5	IPV6 Risk Plan	03/31/09	IPV6 Tiger Team
2.6	IPV6 Quality Plan	03/31/09	IPV6 Tiger Team
2.7	IPV6 Resource Plan	03/31/09	IPV6 Tiger Team
2.8	IPV6 Transition Plan	06/30/09	IPV6 Tiger Team
2.9	IPV6 Security Plan	06/30/09	IPV6 Tiger Team
2.10	IPV6 Reactivation Plan	09/30/09	IPV6 Tiger Team
2.11	IPV6 Routing Plan	09/30/09	IPV6 Tiger Team
2.12	IPV6 Addressing Plan	09/30/09	IPV6 Tiger Team
2.13	IPV6 Network Services Planning	09/30/09	IPV6 Tiger Team
3.0	IPv6 Transition Planning ~ FY2010		
3.1	IPV6 Infrastructure Services	12/31/09	IPV6 Tiger Team
3.2	IPV6 Communications Services	12/31/09	IPV6 Tiger Team
3.3	IPV6 Security Devices	12/31/09	IPV6 Tiger Team
3.4	IPV6 Dual Stack Transition Planning	03/31/10	IPV6 Tiger Team
3.5	IPV6 Test Environment Development and Support	03/31/10	IPV6 Tiger Team
3.6	IPV6 Application Transition Plan Development and Support	06/30/10	IPV6 Tiger Team
3.7	IPV6 Requirements Updates and Maintenance Support	09/30/10	IPV6 Tiger Team
3.8	IPV6 Compliance Equipment	09/30/10	IPV6 Tiger Team
4.0	IPv6/IPv4 Dual Stack Deployment ~ FY2011		
4.1	Finalize IPv6 Dual Stack Plan	12/31/10	IPV6 Tiger Team
4.2	IPV6 Configuration Guides and Acceptance Plans	12/31/10	IPV6 Tiger Team
4.3	IPV6 Security and Infrastructure Devices Deployment	03/31/11	IPV6 Tiger Team
4.4	IPV6 SBA Pilot Rollout	03/31/10	IPV6 Tiger Team
4.5	IPV6 SBA Headquarters Tech Refresh Deployment	06/30/10	IPV6 Tiger Team
4.6	IPV6 SBA Regional Office Tech Refresh Deployment	06/30/10	IPV6 Tiger Team
4.7	IPV6 SBA Regional Office Tech Refresh Deployment	09/30/10	IPV6 Tiger Team
4.8	IPV6 SBA Regional Office Tech Refresh Deployment	09/30/10	IPV6 Tiger Team



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5.0	IPv6/IPv4 Dual Stack Deployment ~ FY2012		
5.1	Finalize IPv6 Dual Stack Plan Office Disaster Assistance	12/31/11	IPV6 Tiger Team
5.2	IPv6 ODA Configuration Guides and Acceptance Plans	12/31/11	IPV6 Tiger Team
5.3	IPv6 ODA Security and Infrastructure Devices Deployment	12/31/11	IPV6 Tiger Team
5.4	IPv6 SBA ODA Pilot Rollout	03/31/12	IPV6 Tiger Team
5.5	IPv6 SBA ODA Tech Refresh Deployment	03/31/12	IPV6 Tiger Team
5.6	SBA IPv6 Application Transition Plan Development and Support	06/30/12	IPV6 Tiger Team
5.7	SBA Extranet IPv6 Planning Initiatives	09/30/12	IPV6 Tiger Team
5.8	SBA Data Center Migration Dual Stack Initiatives	09/30/12	IPV6 Tiger Team
6.0	SBA Extranet IPv6 Planning ~ FY2013		
6.1	SBA Extranet IPv6 Dual Stack Transition Plans	12/31/12	IPV6 Tiger Team
6.2	SBA Extranet Testing and Development Plans	12/31/12	IPV6 Tiger Team
6.3	SBA Extranet IPv6 Security Considerations	03/31/13	IPV6 Tiger Team
6.4	SBA Extranet Application Plans	03/31/13	IPV6 Tiger Team
6.5	SBA Extranet Communications and Infrastructure Plans	06/30/13	IPV6 Tiger Team
6.6	SBA Extranet IPv6 Application Transition Plan	09/30/13	IPV6 Tiger Team
7.0	SBA Extranet IPv6 Transition FY2014		
7.1	SBA Extranet Initiatives and Strategic Goals	12/31/13	IPV6 Tiger Team
7.2	SBA Extranet Transitioning Planning	03/31/14	IPV6 Tiger Team
7.3	IPv6 Native Transition Planning	06/30/14	IPV6 Tiger Team
7.4	IPv6 Native Application Transition Planning	09/20/14	IPV6 Tiger Team
8.0	IPv6 Native Planning FY2015		
8.1	IPv6 Native Initiatives and Goals	12/31/14	IPV6 Tiger Team
8.2	IPv6 Native GAP Analysis	03/31/15	IPV6 Tiger Team
8.3	IPv6 Native Transition Planning	06/30/15	IPV6 Tiger Team
8.4	IPv6 Native Application Transition Planning	09/20/15	IPV6 Tiger Team
9.0	IPv6 Native Transition FY2016		
9.1	IPv6 Native Security Planning	12/31/15	IPV6 Tiger Team
9.2	IPv6 Native Tech Refresh Initiatives and Planning	03/31/16	IPV6 Tiger Team
9.3	IPv6 Native Testing	06/30/16	IPV6 Tiger Team
9.4	IPv6 Native Application Transition Planning	09/30/16	IPV6 Tiger Team
10.0	IPv6 Native Transition FY2017		
10.1	IPv6 Native Piloting	12/31/16	IPV6 Tiger Team
10.2	IPv6 Native Deployment	03/31/17	IPV6 Tiger Team
10.3	IPv6 Native Operations	06/30/17	IPV6 Tiger Team
10.4	IPv6 Native	09/30/17	IPV6 Tiger Team
11.0	Control		
11.1	IPV6 Project Status Reports	Monthly	IPV6 Tiger Team
11.2	IPV6 Project Change Management Plan	Monthly	IPV6 Tiger Team
11.3	IPV6 Risk Management Plan	Monthly	IPV6 Tiger Team
11.4	IPV6 Quality Management Plan	Monthly	IPV6 Tiger Team
12.0	Closeout		
12.1	Lesson Learned	TBD	IPV6 Tiger Team
12.2	Post Implementation Evaluation	TBD	IPV6 Tiger Team
12.3	PMM Feedback	TBD	IPV6 Tiger Team

7 IPv6 Capable Definitions and Requirements

Spec/Reference	Section	Title/Definition	Installed	Host	Router	NPD
IPv6 Basic Requirements						
RFC2460		IPv6 Specification	<input type="checkbox"/>	M	M	
	2	IPv6 Packets: send, receive	<input type="checkbox"/>		M	
	2	IPv6 packet forwarding	<input type="checkbox"/>	M	M	
	4	Extension headers: processing	<input type="checkbox"/>	M	M	
	4.3	Hop-by-Hop & unrecognized options		M	M	
	4.5	Fragment headers: send, receive, process	<input type="checkbox"/>	M	M	
	4.6	Destination Options extensions	<input type="checkbox"/>	M	M	
RFC5095		Deprecation of Type 0 Routing Headers	<input type="checkbox"/>	M	M	
RFC2711		IPv6 Router Alert Option	<input type="checkbox"/>		M	
RFC4443		ICMPv6	<input type="checkbox"/>	M	M	
RFC1981		Path MTU Discovery for IPv6	<input type="checkbox"/>	M	M	
	4	Discovery Protocol Requirements	<input type="checkbox"/>	M	M	
RFC4861		Neighbor Discovery for IPv6	<input type="checkbox"/>	M	M	
	4.1, 4.2	Router Discovery	<input type="checkbox"/>	M	M	
	4.6.2	Prefix Discovery	<input type="checkbox"/>	M	M	
	7.2	Address Resolution	<input type="checkbox"/>	M	M	
	7.2.5	NA and NS processing	<input type="checkbox"/>	M	M	
(RFC4862)	7.2.3		<input type="checkbox"/>	M	M	
	7.3	Neighbor Unreachability Detection	<input type="checkbox"/>	M	M	
	8	Redirect functionality	<input type="checkbox"/>		M	
Auto Configuration						
RFC4862		IPv6 Stateless Address Autoconfig				
	5.3	Creation of Link Local Addresses	<input type="checkbox"/>	M	M	
(RFC4861)	5.4	Creation of Global Addresses	<input type="checkbox"/>	M	M	



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Notes: NSA– National Security Agency, Systems and Network Attack Center (SNAC); NPD – Network Protection Device; NIST– National Institute of Standards and Technology.

M – Mandatory feature installation

Spec/Reference	Section	Title/Definition	Installed	Host	Router	NPD
Addressing Requirements						
RFC4291		IPv6 Addressing Architecture	<input type="checkbox"/>	M	M	
RFC4007		IPv6 Scoped Address Architecture	<input type="checkbox"/>		M	
*		Ability to manually configure Addresses	<input type="checkbox"/>	M	M	
RFC4193		Unique Local IPv6 Unicast Address	<input type="checkbox"/>	M	M	
RFC3879		Deprecating Site Local Addresses	<input type="checkbox"/>	M	M	
RFC3484		Default Address Selection for IPv6	<input type="checkbox"/>	M	M	
RFC5095	RFC2526	Reserved IPv6 Subnet Anycast Addresses	<input type="checkbox"/>	M	M	
IPsec-V3(V2)						
RFC4301		Security Architecture for the IP	<input type="checkbox"/>	M	M	
	4.1	Support of Transport Mode SAs	<input type="checkbox"/>	M		
	4.5.1	Manual SA and Key Management	<input type="checkbox"/>	M	M	
	4.5.2	Automated SA and Key Management	<input type="checkbox"/>	M	M	
RFC4303		Encapsulating Security Payload (ESP)	<input type="checkbox"/>	M	M	
RFC4835		Cryptographic Algorithms for ESP and AH	<input type="checkbox"/>	M	M	
IKEv2						
RFC4306		Internet Key Exchange (IKEv2) Protocol	<input type="checkbox"/>	M	M	
	4	Pre-shared secrets	<input type="checkbox"/>	M	M	
	4	RSA sig auth	<input type="checkbox"/>	M	M	
	3.3.3	ESN	<input type="checkbox"/>	M	M	
RFC4307		Cryptographic Algorithms for IKEv2	<input type="checkbox"/>	M	M	
	3.1.2	Diffie-Hellman group 2 MODP	<input type="checkbox"/>	M	M	



Uses of Cryptographic Algorithms						
RFC2410		NULL Encryption	<input type="checkbox"/>	M	M	
RFC4835	3.1.1	NULL Encryption	<input type="checkbox"/>	M	M	
RFC2451		ESP CBC-mode Algorithms	<input type="checkbox"/>	M	M	
	2.6	3DES-CBC				
RFC4835	3.1.1	3DES-CBC	<input type="checkbox"/>	M	M	
RFC4307	3.1.1	3DES-CBC	<input type="checkbox"/>	M	M	
RFC3602		AES-CBC	<input type="checkbox"/>	M	M	
RFC4835	3.1.1	AES-CBC with 128 bit keys	<input type="checkbox"/>	M	M	
RFC4835	3.1.1	AES-CBC with 128 bit keys	<input type="checkbox"/>	M	M	

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Spec/Reference	Section	Title/Definition	Installed	Host	Router	NPD
Uses of Cryptographic Algorithms						
RFC2404		HMAC-SHA-1-96	<input type="checkbox"/>	M	M	
RFC4835	3.1.1/3.2	HMAC-SHA-1	<input type="checkbox"/>	M	M	
RFC4307	3.1.1	HMAC-SHA-1	<input type="checkbox"/>	M	M	
RFC4307	3.1.4	HMAC-SHA-1 as a PRF	<input type="checkbox"/>	M	M	
Network Management Requirements						
RFC3411		SNMP v3 Management Framework	<input type="checkbox"/>	M	M	
RFC3412		SNMP Message Process and Dispatch	<input type="checkbox"/>	M	M	
RFC3413		SNMP Applications	<input type="checkbox"/>	M	M	
	1.2	Command Responder	<input type="checkbox"/>	M	M	
	1.3	Notification Generator	<input type="checkbox"/>	M	M	
RFC3414		User-based Security Model for SNMPv3	<input type="checkbox"/>	M	M	
Management Information Bases						
RFC4293		MIB for the IP	<input type="checkbox"/>		M	
RFC4292		MIB for IP Forwarding Table	<input type="checkbox"/>		M	
RFC4807		MIB for Ipsec Policy Database Configuration	<input type="checkbox"/>		M	
RFC3289		MIB for DiffServ	<input type="checkbox"/>		M	
Multicast Requirements						
RFC3810		MLD Version 2 for IPv6	<input type="checkbox"/>	M	M	
Mobility Requirements						
RFC3775		Mobility Support in IPv6				
	8.1	All Nodes as Correspondent Node	<input type="checkbox"/>	M		
	8.3	All IPv6 Routers	<input type="checkbox"/>		M	



Quality of Service Requirements					
RFC2474		Differentiated Services (DiffServ)	<input type="checkbox"/>		M
RFC3140		Per Hop Behavior (PHB) Identification Codes	<input type="checkbox"/>		M

Notes: NSA– National Security Agency, Systems and Network Attack Center (SNAC); NPD – Network Protection Device; NIST– National Institute of Standards and Technology.

M – Mandatory feature installation

Spec/Reference	Section	Title/Definition	Device	Installed	NPD
Network Protection Device Requirements					
SP500-267	6.12.3.1	IPv6 connectivity	NPD	<input type="checkbox"/>	M
SP500-267	6.12.3.2	Dual Stack	NPD	<input type="checkbox"/>	M
SP500-267	6.12.3.3	Administrative Functionality	NPD	<input type="checkbox"/>	M
SP500-267	6.12.3.4	Authentication and Authorization	NPD	<input type="checkbox"/>	M
SP500-267	6.12.3.5	Security of Control and Comms	NPD	<input type="checkbox"/>	M
SP500-267	6.12.3.6	Persistence	NPD	<input type="checkbox"/>	M
SP500-267	6.12.3.7	Logging and Alerts	NPD	<input type="checkbox"/>	M
SP500-267	6.12.3.8	Fragmented Packets Handling	NPD	<input type="checkbox"/>	M
SP500-267	6.12.3.9	Tunneled Traffic Handling	NPD	<input type="checkbox"/>	M
SP500-267	6.12.4.1.1	Asymmetrical blocking	FW	<input type="checkbox"/>	M
SP500-267	6.12.4.1.2	Port/protocol/address blocking	FW	<input type="checkbox"/>	M
SP500-267	6.12.4.1.3	Performance under load	FW & IDS	<input type="checkbox"/>	M
SP500-267	6.12.4.2.1	No violation of trust barriers	APFW	<input type="checkbox"/>	M
SP500-267	6.12.4.2.2	Session Traffic Auth	APFW	<input type="checkbox"/>	M
SP500-267	6.12.4.2.3	Email, File Filtering	APFW	<input type="checkbox"/>	M
SP500-267	6.12.5.1.1	Known Attack Detection	IDS	<input type="checkbox"/>	M
SP500-267	6.12.5.1.2	Malformed packet detection	IDS	<input type="checkbox"/>	M
SP500-267	6.12.5.1.3	Port scan detection	IDS	<input type="checkbox"/>	M
SP500-267	6.12.5.1.4	Tunneled traffic detection	IDS	<input type="checkbox"/>	M

Notes: NSA– National Security Agency, Systems and Network Attack Center (SNAC); NPD – Network Protection Device; NIST– National Institute of Standards and Technology. M – Mandatory feature installation



8 IPv6 Risk Inventory and Assessment

Risk Inventory and Assessment					
OMB Circular, A-11, Section 300,					
I.F. Risk Inventory and Assessment (All Assets)					
Risk assessment Areas:					
1) Schedule	7) Dependencies and interoperability between investments	13) Business			
2) Initial cost	8) Surety (asset protection) Considerations	14) Data/information			
3) Life-cycle cost	9) Risk of creating a monopoly for future procurements	15) Technology			
4) Technical obsolescence	10) Capability of agency to manage the investment	16) Strategic			
5) Feasibility	11) Overall risk of failure	17) Security			
6) Reliability of systems	12) Organizational and change management	18) Privacy			
		19) Project resources/Human capital			
Date Identified	Area of Risk	Description	Probability of Occurrence	Strategy for Mitigation	Current Status
	1	Non-availability of IPv6 capable routers from vendors	Basic	Research with upgrade path in mind	New routers ordered are IPv6 capable
	1	Non-availability of IPv6 capable switches from vendors	Basic	Research with upgrade path in mind	New switches ordered are IPv6 capable
	1	Non-availability of IPv6 capable desktop/server operating system (i.e. Solaris 10, VISTA)	Basic	1. Delay application transition until significant portion of network systems are IPv6 capable	Delay implementation until newer desktop operating systems are adopted by the SBA and NIST/NSA configuration guidance available



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				2. Delay LAN implementation of IPv6 until critical mass of applications is ready	Delay implementation until new server operating systems are adopted by the SBA and NIST/NSA configuration guidance available
	1	Application upgrade path (e.g., Cold Fusion, etc.)	Basic	1. Identify capabilities claimed by vendor 2. Test capabilities to meet needs	
	1	WAN service provider capability	Basic	Contact provider and validate capabilities	Tunnels available over existing circuits or new circuits provisioned for native IPv6
	1	Internet service provider capability	Basic	AT&T and Verizon both contacted	Tunnels available over existing circuits or provision new circuits for native IPv6
	1	Lack/delay of funding availability	Basic	FY08 requirement submitted	FY09 requirement identified. Prioritizing within SBA.
	1	Staff inexperienced with implementing IPv6	Med	Contract for training of staff and IPv6 technical resources	IPv6 Training and Contractors in place.
	2	Upgrade cost of replacing routers and switches is above tech-refresh costs	Basic	Identify costs and capabilities of routers and switches	Router refresh project in place
	2	Improper engineering of IPv6 transition	Med	Provide adequate resources to properly engineer IPv6 transition	Resources in place FY08
	2	Improper planning for IPv6 transition	Med	Provide adequate resources to properly plan IPv6 transition	Resources in place FY08
	2	Lack of testing IPv6 components may result in system non-availability which disrupts business operation, increasing costs	Basic	1. Enhance SBA test facility to enable testing of IPv6-capable equipment and applications before introduction into the network 2. Assign test resources to support introduction of IPv6 into SBA network	IPv6 Test facility resources in place. Other federal agencies and vendors have test facilities available to SBA Test equipment identified



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	3	Managing dual-stack network, extra operators to monitor both capabilities	Med	Managing IPv6 after initial implementation	Training for SBA and contractor staff to support IPv6.
	3	Implementing basic IPv6 capability to meet mandate may require re-engineering costs and upgrades to meet future mission needs	Med	1. Define potential capabilities desired from IPv6 to improve business processes.	
2. Build to expected needs rather than replace current needs.					
3. Adjust schedule to capabilities availability in equipment to match					
	4	Purchasing early-capability equipment to meet minimal implementation will require early replacement. Waiting for fully-capable devices will miss due dates and cause greater one-time purchase costs.	Med	1. IPv6 capability still maturing. Advanced features will need to be added later.	Infrastructure equipment being placed on lease to facilitate upgrades
2. Require software upgradeable components. Consider maintenance agreement in purchase contract.					
3. Purchase equipment that has identified upgrade capability (e.g., card replacement)					
	5	Lack of funding availability	Med	1. Identify funding requirement in FY09 (initiated)	
				3. Identify funding requirement post-FY09 to complete IPv6 transition to meet capabilities required	
	6	Improper fielding of IPv6 impacts business operations during transition.	Basic	Adequate planning, engineering, and testing to ensure reliability of core business processes.	
	7	HSPD-12 capability integration with IPv6 capabilities	High	Ensure HSPD-12 equipment is IPv6 capable as part of	



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				purchasing contract	
	7	Data Cable plant upgrade needed to take advantage of IPv6 advanced capabilities; web casting, etc	High	Fund cable plant upgrade for earlier FY (currently FY10)	
	7	IPv4 and IPv6 are not directly compatible. Access could be refused from existing customers/clients.	High	Plan, engineer and test the use of mitigation strategies (dual stack, gateways, tunnels, etc) to prevent denial of access to applications.	
	7	Multi-vendor implementations of IPv6 are not interoperable (new standard)	Med	Emphasize open-standard solutions and test prior to implementation.	
	8	NO ISSUES			
	9	Use proprietary implementation of a single vendor	Basic	Emphasize open-standard solutions and test prior to implementation	
	10	Lack of adequate network administration tools	Med	Requires maintaining dual stack infrastructure. Purchase net management tool that is IPv6 and IPv4 capable.	Ciscoworks ordered to manage network infrastructure components.
	11	Failure to make the FY08 mandate to enable backbone networks for IPv6	Basic	Early funding and planning	IPv6 Implementation Plan on track to meet deadline.
	11	Inability to perform SBA mission due to IPv6 implementation	Basic	1. Continue IPv4 operations, test to ensure IPv6 implementations do not prohibit IPv4 operations. 2. Develop IPv4 configuration roll-back plan	
	11	Overall risk of failure....	High		
		Schedule:			
		Scope:	Basic		
		Funding:	High		
	12	Management training - capability definition and expectation management.	Basic	Acquire training, acquire expertise through staff	



SBA IPv6 Transition and Sequence Plan

				augmentation	
	12	Inexperienced IPv6 network operator	Basic	Acquire training, acquire expertise through staff augmentation	
	12	Network security operator training	Basic	Acquire training, acquire expertise through staff augmentation	
	12	Application integration training	Basic	Acquire training, acquire expertise through staff augmentation	
	12	Lack of inter- and Intra- agency coordination	Med	1. Establish lead person	IPv6 Tiger Team in place
				2. Participate in Federal IPv6 working group and AIC	Currently attending Federal IPv6 working group meetings
	12	Failure to use an adequate change management process	Med	Institute change management process improvements for IPv6. Ensure consistent service to the customers	
	13	Degradation of day-to-day operations due to funding re-allocated to IPv6	Med	1. Obtain direct funding	
				2. Phased deployment of capability to reduce per year costs	
	13	Lack of separate IPv6 funding may result in under funding other SBA mission critical programs to comply with OMB mandate.	High	1. Obtain direct funding for IPv6	
				2. Identify funding strategies	
				3. Phased deployment of capability to maintain critical program funding levels	
	14	No change to the data or info by instituting IPv6			



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	14	Initial IPv6 implementation may result in higher security risks affecting availability of data.	Med	<ol style="list-style-type: none"> 1. Evaluate, test, and implement policies and configuration controls 2. Establish configuration controls of operating systems using IPv6 3. Implementation of IPSec is expected to improve data security in transit. 	IPv6 Security Plan being developed.
	15	IPv6 advanced features are not fully mature	Basic	Require software upgradeable components. Consider maintenance agreement in purchase contract.	New Cisco equipment can be upgraded using Ciscoworks Mgmt SW
	16	Failure to implement IPv6 by 2008 may result in incompatibility of SBA systems with Federal service-oriented architecture strategy	Basic	<ol style="list-style-type: none"> 1. Establish and execute SBA IPv6 transition initiative 2. Allocate additional risk-mitigation funds 	
	16	Implementing IPv6 without additional funds may affect current and future initiatives that were designed to improve customer-centric services	Med	Evaluate funding priorities to identify effects on customer support. Make funding decisions based on impact. Let customers know about improvement delays	
	16	Future system development will have to work in an IPv6 environment.	High	1. Plan for use of IPv6 in current and future developments	



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				2. Communicate the implementation strategy for IPv6	
				3. Training for managers on IPv6 capabilities	
	17	Early installation of IPv6-capable operating systems/applications may introduce vulnerabilities the network is not monitoring	Med	1. Perform application audits to identify IPv6 capabilities.	
				2. Configure applications to secure high risk processes in IPv6	
				3. Delay installing applications until network management/security services are available	
	17	Existing security policies may not sufficiently address IPv6 issues	Med	1. Review and update security policies	
				2. Review NIST recommendations, include in policy	
				3. Develop security procedures and guidance	
				4. Update and perform training for security staff and users on IPv6 issues	
				5. Manage roll-out consistent with available security policies and guidance	
				6. Test guidance and configurations to ensure security objectives met	
				7. Define how use of security services (i.e., IPSec) will be implemented and managed	
	17	Vulnerability scanning tools used to configure and manage networks may not	Med	1. Evaluate products and upgrade as needed	



SBA IPv6 Transition and Sequence Plan

		recognize IPv6		2. Delay IPv6 implementation until adequate tools are available	
	17	Firewall rules for IPv6 neither developed nor tested	Med	1. Develop configuration and test	
				2. Evaluate individual PC firewall implementation	
				3. Delay IPv6 implementation until adequate tools are available.	
	17	Network intrusion detection systems may not recognize IPv6 nor IPv6 encapsulated in IPv4 tunnels	High	1. Review IDS capability and test.	
				2. Set firewall and IDS settings to address security threats identified	
				3. Delay IPv6 implementation until adequate tools are available.	
	18	Security vulnerabilities may compromise access to network and application data		See item 17	
	19	Inadequate staff size to manage and execute transition	Basic	1. Hire new staff	
				2. Re-assign personnel within staff	
				3. Hire temporary (contractor) staff	
	19	Inadequate network operations staff to manage both IPv6 and IPv4 protocols, especially during initial operations	Basic	1. Hire new staff	
				2. Hire temporary (contractor) staff	
				3. Design an IPv4 exit strategy to get to a native IPv6 network	
	19	Availability of IPv6 technical professionals in labor market	Med	1. Train existing staff	
				2. Train new staff	