MIGRATING TO INTERNET PROTOCOL VERSION 6 (IPV6)

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Problems

- Infrastructure migration to IPv6 is a long term necessity

- Experience with protocol is limited.

- Implementation and usage policies need to be established.

- IPv6 capabilities are present on most networks.

Issues for Consideration

- IPv4 to IPv6 migration affects entire network
  - Improper procedures could result in service unavailability
- Replace "middleware" with End to End (E2E) administration policy
- New protocol capabilities ease network administration
- Rapidly developing associated technologies (IPsec, QOS, etc.)

Policy First

- Policy is key to a successful IPv6 strategy
- Options for IPv6 Migration:
  - Ignore IPv6
  - Immediate IPv6 migration
  - Develop an immediate, short term and long term migration strategy

Option: Ignore IPv6

- Not feasible in the long term
- Current enterprise Operating Systems are already equipped with IPv6
  - Windows Vista, Windows Server 2008
  - Linux, UNIX
  - Installable on:
    - Windows XP
    - Windows Server 2003
- Common risks associated with unmanaged IPv6
  - Covert communication channels
  - Unauthorized resource use

Option: Immediate Migration

□ Advantages

   □ Nearly unlimited, (currently) free IP addresses

   □ Native QoS functionality

   □ Native IPSec functionality

   □ MTU advertisement to eliminate packet fragmentation

   □ Auto-configuration on a large scale

   □ Increased network service availability

      ■ Multiple routers create a "no single point of failure" environment

      ■ all available routes and subnets used automatically

Option: Immediate Migration

- Disadvantages
  - Management and security models are still developing
  - Associated technologies are still maturing to leverage IPv6 abilities
  - Software compatibility
    - IPsec for IPv6 on XP not production-quality
    - Custom software requires patching
  - Vendors may not leverage all IPv6 capabilities

Option: Develop Strategies

- Immediate Policy
  - Deal with unmonitored IPv6 communication
  - Administration details:
    - Block IPv6 and IPv6-over-IPv4 tunneled traffic
    - Monitor intranet and network border for unauthorized IPv6 traffic

Option: Develop Strategies

- Short-term Policy
  - Provide limited IPv6 connectivity necessary for training or business needs
  - Use one of many IPv6 transition mechanisms
  - Provide linear path for eventual full IPv6 connectivity
- Administration Recommendations:
  - Train necessary staff.
  - Audit equipment for IPv6 compatibility, then upgrade as business needs require
  - Enable gateway IPv6 addressing at the gateway as necessary, via tunneling or allotment from the ISP
  - Enable dual IPv4 and IPv6 stacks as necessary

IPv4 to IPv6 Transition Mechanisms

- **Dual Stack**: Requires using both an IPv4 and an IPv6 stack on a single host. Allows the host to send and receive both types of packets.

- **Tunneling**: Encapsulating IPv6 packets in IPv4 packets to allow transmission over IPv4 only devices and tunnels.

- **6to4**: Creating a mock IPv6 address space, using current IPv4 addresses. Tunneling is used to transmit IPv6 packets. Use on isolated networks is preferred.

- **Teredo**: Transmission of IPv6 packets using UDP. Requires *Teredo* specific hardware.

- **Stateless IP/ICMP Translation** (SIIT): Allows IPv4-only hosts to translate IPv6 packets into IPv4 and vice versa. Requires a SIIT gateway.

- **Application Layer Proxy:** A web proxy running a dual-stacked host can provided connections to both IPv4 and IPv6 regardless of the sending or receiving IP version.

Recommended Option: Develop Strategies

- Long-term Policy
  - IPv6 implementation and administration methodologies to mature rapidly as the U.S. Federal Government migrates to IPv6
  - Ensure long-term policy is malleable
    - Dramatic changes may be necessary in case technology changes dramatically
    - Expect associated technologies to also change as they mature
  - Goal is eventual full IPv6 connectivity
    - Expect IPv4 capability to be maintained indefinitely

Conclusion

- IPv6 policies need to be addressed now because it is already present in most networks

- Proper immediate, short-term, and long-term policy will:
    - Minimize risk to service availability in both short and long term
    - Provide a straight migration path from IPv4 to IPv6
    - Maximize the connectivity, manageability, and security advantages of IPv6 as it is implemented