

Enabling IPv6 in Products and Services

Bill Cervený
GogoNetLive!
November 4, 2010

Outline

- **Goals of Introducing New Features**
- **Developing and Testing IPv6 in Applications**
- **Testing IPv6 Product/Service Functionality**
- **Development and Test Environment**
- **Development Issues and Guidelines**
- **System Tools**

Goals of Introducing New Features (as it relates to IPv6)

- **Product or service must perform at least as well as it did before feature was added**
- **Feature must behave well in supported environments**
- **Should not be expensive to support the new feature**
- **Early adopters may use IPv6. Product or service must still work for everyone else (the majority of customers)**

IPv6 Development Infrastructure

- There are many TCP and UDP *nix system applications with no IPv6 support (don't open socket in PF_INET6 domain at all).
- Chase down IPv4-centric code in the third-party libraries. If IPv6 support is needed in those libraries, ask for it or provide it yourself.
- Watch out for unusual legacy behavior in testing and deployment
 - Example: DNS name not being found because A record isn't present even though AAAA record is only record needed
 - Example: Mixed support for DNS across IPv6 transport

Operating System Issues

- A “default” route no longer refers to one address -- now there is an IPv6 default route and an IPv4 default route.
- Some applications may prefer `::1` to `127.0.0.1` (or vice versa) for localhost.
- Beware of operating system nooses such as the ability to delete OS-assigned link-local address combined with evil behavior when this address is deleted.
- IPv4-centric firewall rules must be updated with IPv6-specific rules

User Interface Design Issues

- **Use 2001:db8::/32 (RFC3849) for documentation examples.**
- **User interface (UI) screens must accommodate the additional characters that comprise an IPv6 address.**
- **Where prefixes are used in UI, they must support up to /128**
- **Challenges of supporting unknown mix of user legacy operating systems and browsers.**
 - Services with large user bases will be difficult to support

Beneficial Side-effects of adding IPv6 functionality

- Hardening of parallel IPv4 capabilities
- Revisit core software processes

Development and Test Environment

- **Many production client operating systems and network devices can support IPv6 and in fact support IPv6 now**
 - “ping6” all-nodes multicast address (ff02::1) to get a feel for number of devices on a local network that already have IPv6 enabled.
- **Will likely need to work around legacy network devices that will never support IPv6 (or support it incorrectly) and are too expensive to replace.**

Development and Test Environment (cont)

- **Manual client IPv6 configuration allows pockets of IPv6 in production networks that doesn't disrupt users focused on IPv4-centric features (hereby also avoiding the whole SLAAC/DHCPv6 debate)**
- **While some testing and development may occur in an separate IPv6 lab, it is actually pretty easy (and important) to introduce IPv6 into core testing and development environments.**

Lab Addressing

- **Consider Unique Local Addressing (ULA) blocks (RFC4193) for development and testing, particularly if access to the global Internet isn't available.**
- **Very easy to make addressing errors with 128-bit addresses**
 - Cut-and-paste errors easy

Testing IPv6 Product/Service Functionality

- **Conduct tests of supported user hardware / operating system / software environments**
- **Enable new functionality in development and test environments and watch for unforeseen behavior**
- **Test in as many places as possible, even if IPv6 functionality is passive**
- **Just because underlying operating system claims specific IPv6 functionality doesn't mean it shouldn't be tested.**
- **System tools and supporting products that claim IPv6 support may have basic flaws/bugs**

Testing IPv6 Functionality (cont)

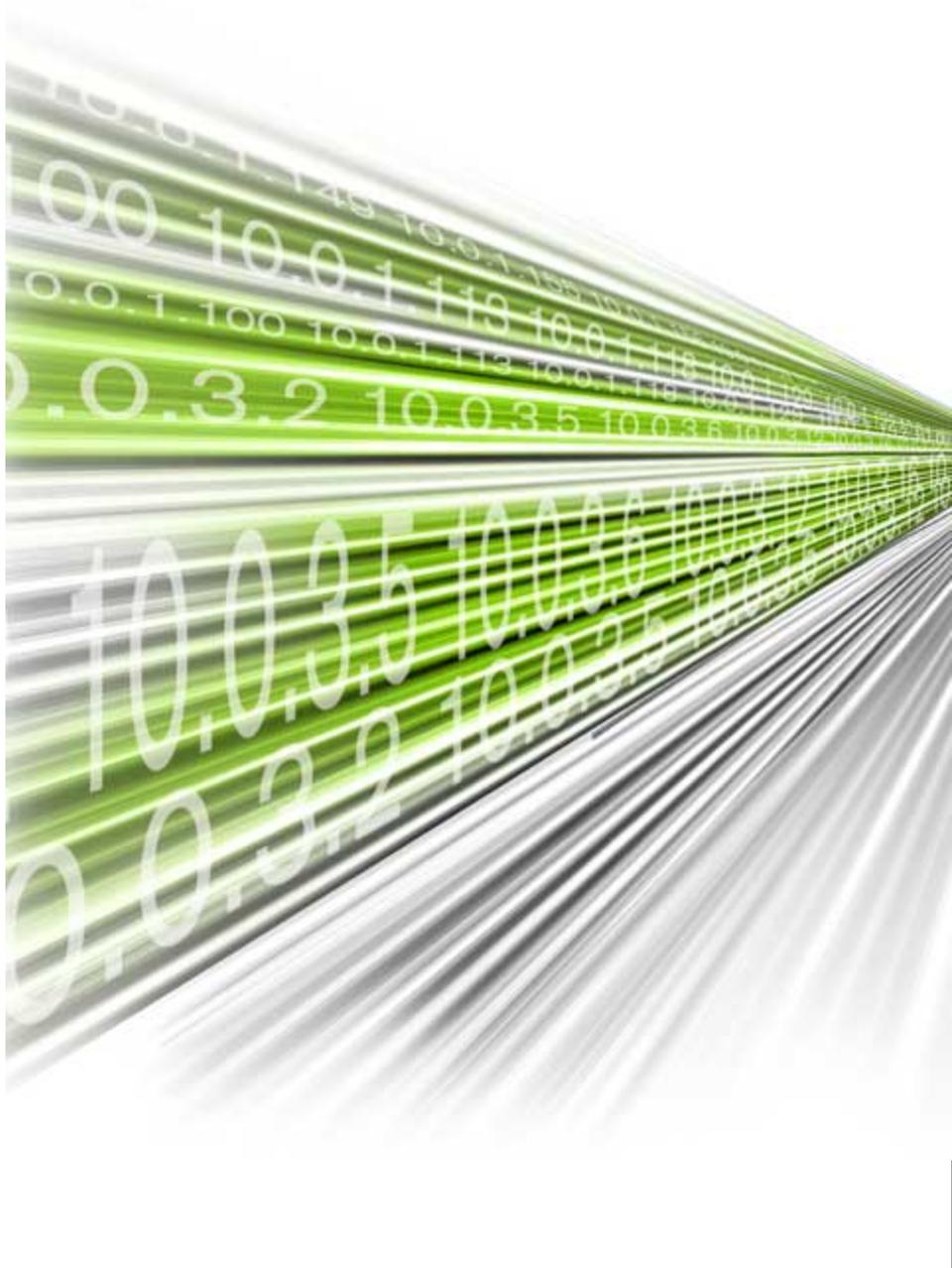
- **Confirming IPv6 is Tested**
 - Since correctly behaving IPv6 is indistinguishable from correctly behaving IPv4, must confirm that IPv6 is being tested:
 - Look at logs
 - Monitor network interface(s)
 - Only enter AAAA IPv6 addresses for DNS names
- **Where supported, it is worthwhile to develop and test functionality in an IPv6-only environment to shake out IPv4-only dependencies**

Operating System Tools

- **OS/tool documentation for IPv6 can be sparse**
- **Configuration of IPv6 options in tools can be significantly more complex than equivalent IPv4 options**
- **Cryptic error messages don't help migration of products and services to IPv6**
 - Examples: route, snmpwalk, etc.
 - “IPv6-ready” should mean that tool not only supports IPv6 operations, but actually provides the same level of message and documentation support.

Tools (cont)

- **Don't expect operating systems and tools to support same level of capabilities for IPv6 functionality as for IPv4**
 - Dramatic difference in demand
 - Fundamental bugs will be found years after IPv6 functionality is widely deployed



Thank You

Bill Cervený
wcervený@arbor.net