UA Readiness of Command Line Networking Tools

1 May 2019

Modern operating systems have a variety of command line tools used in system management and program development. Many of these tools operate on Domain Names and a few on e-mail addresses. We look at these tools to see how well they support Universal Acceptance.

- ## **Readiness states**

The tools generally accept domain names as arguments from the command line, and then use them in the tools' operation, which includes looking them up in the DNS. They all return some sort of report to the console, sometimes including the domain name, sometimes not.

We say a tool can Accept and Validate a name if it receives a name from the command line and correctly recognizes it as an ASCII or IDN domain name. It can Process the name if it does something useful with it, typically a DNS lookup. Some tools put domain names in their output, so if they do so correctly, they can Display names.

- ## **Linux/BSD tools**

Many non-Windows systems are derived from Unix and linux. These include linux distributions such as Ubuntu and Centos, BSD systems including FreeBSD, OpenBSD, and NetBSD, and Apple's MacOS. (The Android system used on phones and tablets is derived from linux but does not generally include the command line tools described here so we don't consider it further.)

Many of the tools come from software packages that are bundled with the systems. This means that the version of those tools in any particular system depends on the version of the package they come from, so there's no need to test each tool individually, once we know which versions of the packages come with each system.

DNS software packages

ISC BIND from the Internet Software Consortium is the most widely used DNS server package. Along with the server program, it includes the lookup tools `dig` and `nslookup`. Versions since at least 9.6 can handle IDN U-labels as a build-time option, although versions older than 9.11 don't usually have the option enabled.

LDNS is a package of DNS tools from NLNet Labs, who provide the popular nsd and unbound DNS servers. It includes `drill` which is intended to be an alternative to `dig`. Currently drill does not support IDN U-labels.

Cryptography packages

Cryptographic packages can have IDN issues in two areas. One is certificate management, managing TLS and S/MIME certificates. They may handle U-labels in the domains they include and EAI addresses in optional contact addresses and, for S/MIME certificates, the address the certificate is issued for.

The other is connection debugging, tools that connect to web and other servers and check the certificates they use. The user provides the hostname of the server, which may include U-labels.

OpenSSL is the most widely used cryptography package. It has an `openssl` tool that has both options for certificate management and for connection debugging. The current versions as of February 2019 are 1.0.2r and 1.1.1b, although older versions remain in wide use. **LibreSSL** was forked from OpenSSL in 2014 and is separately maintained by the people who maintain OpenBSD. Its current versions are 2.9.0, 2.8.3, and 2.7.5 although older versions remain in wide use. MacOS includes LibreSSL 2.6.5.

GnuTLS is another popular package from the Free Software Foundation. It has `gnutls-certtool` for managing certificates and `gnutls-cli` for debugging TLS connections to other systems.

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Specific tools

Tool	MacOS 10.14 (BSD/Mach)	FreeBSD 12 (BSD)	Ubuntu 18 (linux)	Centos 7 (linux)	Windows 10
host	No	No	No	Yes*(D)	
ping	Yes*	No	Yes*(D)	Yes*(D)	Yes[1]
ping6	Yes*	No	Yes*(D)	Yes(D)	
traceroute	Yes*	No	Yes*(D)	Yes(D)	
traceroute6	Yes*	No	Yes*(D)	Yes(D)	
dig	No		No	Yes*(D)	
nslookup	No		No	Yes*(D)	No
telnet	Yes*	No	No		
openssl	Yes*	No	Yes*	No	
gnutls-cli		Yes	Yes		
tracert					Yes

Yes means that the command at least Accepts, Validates, and Processes. Yes(D) means it also displays domain names and shows IDNs as U-labels.
Yes* means that the command accepts IDNs, but processes them with IDNA2003 rather than IDNA2008
An empty box means that the system is not distributed with that tool.

About this document:
This document is aimed at system administrators and provides an evaluation of the UA Readiness of common command line tools. It was last produce in April 2019.

[1] Assuming Unicode Keyboard