



IBM Software Group Enterprise Networking Solutions  
z/OS® V1R11 Communications Server

***z/OS V1R11 Communications Server – application  
integration, data consolidation, and standards***

***z/OS Communications Server Development, Raleigh, North Carolina***



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This presentation will give you an overview of the enhancements to the Communications Server in z/OS V1R11 for application integration, data consolidation, and standards.

## Application integration, data consolidation, and standards

- New SMTP client for sending Internet mail
- FTP access to z/OS UNIX® named pipes
- FTP large-volume access
- FTP passive mode enhancements
- CICS® sockets enhancements
  - Customizable pre-logout banner for otelnetd
  - Remote execution server enhancements
- TN3270 support of TSO logout reconnect

This slide and the next slide list the enhancements for this theme.

CSSMTP is a new standard application replacing SMTP/NJE when you send Internet mail from the JES spool. The new SMTP client supports a range of requirements that have been raised against the old SMTP/NJE gateway (known as SMTPD).

FTP reads and writes files to and from z/OS UNIX named pipes.

FTP reads and writes extended format sequential data sets that have been allocated in the extended addressing space (EAS) of an extended address volume (EAV). This also includes support for data sets which are eligible for such an allocation (Format 8 DSCB).

The newest version of CICS Transaction Server implements a few changes that are not compatible with previous releases of CICS TS. CICS Sockets needs a few modifications to work on CICS TS 4.1 and they are being implemented in this release. This support is planned to be made available on z/OS releases back to z/OS V1R9 to allow CICS TS to run on those releases with CICS Sockets enabled. The issue only exists for installations that use the OTE option of CICS Sockets in combination with limiting the number of open TCBs that can be used by CICS Sockets (the TCBLIM option in CICS Sockets).

## Application integration, data consolidation, and standards (continued)

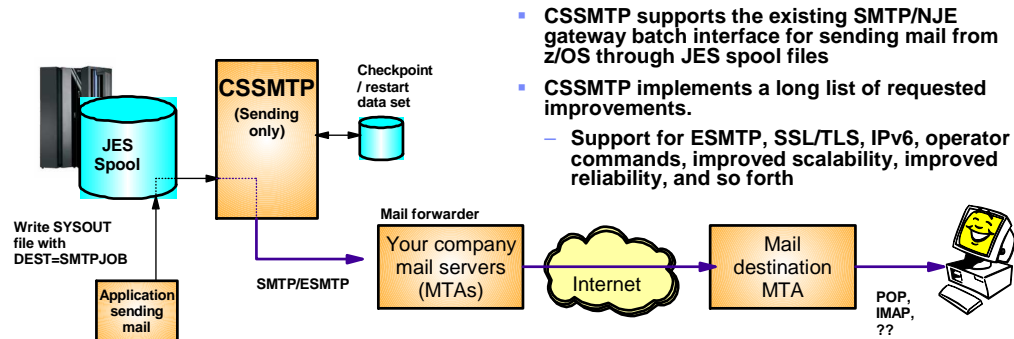
- 🔍 IPv6 stateless address auto-configuration enhancements
  - *New API to obtain IPv4 network interface MTU*
  - *RFC 5095 deprecation of IPv6 type 0 route header*

Another major topic of this theme is IPv6 standards compliance within the stateless address auto-configuration area.

## New CSSMTP component to replace SMTP/NJE for sending mail from JES spool



- Main use of the old SMTP/NJE gateway is to send mail from JES spool to the Internet
  - Only a very few users use TSO to receive Internet mail
- The SMTP/NJE gateway has a long history (it is old)
- z/OS Communications Server has registered a very long list of requested improvements to bulk Internet mailing from z/OS
- Sendmail has not been very popular among z/OS installations
  - Perceived as being too complex for the purpose of just mailing from z/OS



- CSSMTP supports the existing SMTP/NJE gateway batch interface for sending mail from z/OS through JES spool files
- CSSMTP implements a long list of requested improvements.
  - Support for ESMTP, SSL/TLS, IPv6, operator commands, improved scalability, improved reliability, and so forth

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SMTP/NJE is a very old standard application. Continued maintenance and improvements have become increasingly complex over the last few years – a retirement of the application is needed.

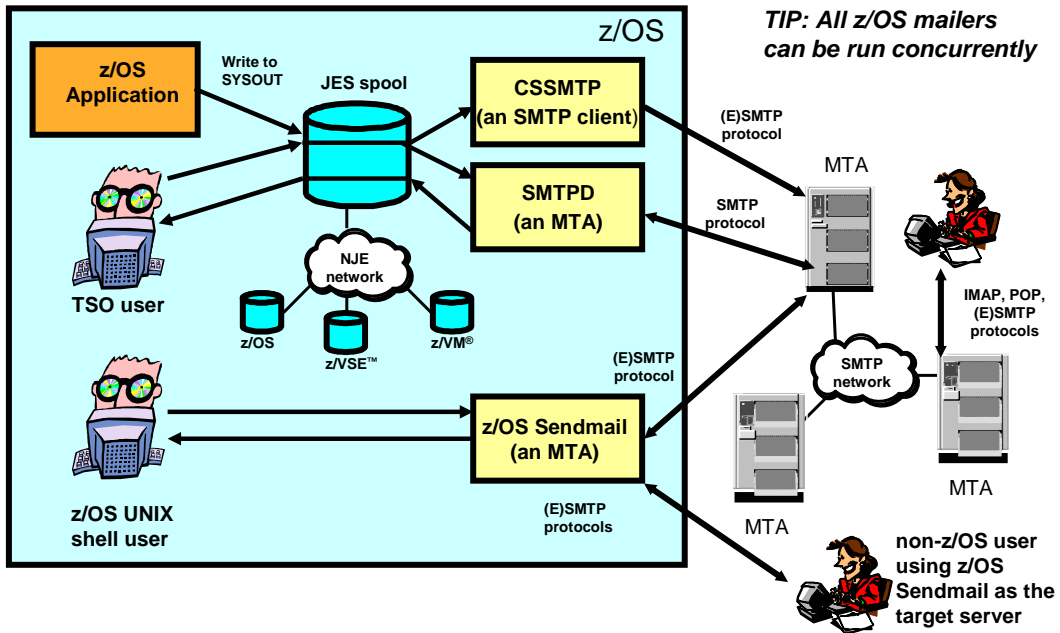
SMTP/NJE is a full-function Internet Mail Transfer Agent (MTA). It can send Internet mail from the JES spool and receive Internet mail into the JES spool. Internet mail is received by TSO users, who use their TSO environment as their mail user agent (MUA).

Sendmail is also supported on z/OS, but does not have support for sending mail that has been written to the JES spool. Most customers have expressed concern with the complexity of sendmail and have also expressed a continued need to be able to send bulk mail from their existing applications that write the mail to the JES spool.

CSSMTP is a new standard application that will send mail from the JES spool to the Internet. The JES spool interface is compatible with the current interface applications use with SMTP/NJE to send their mail.

CSSMTP requires fewer resources than SMTP/NJE. It does not use sequential MVS data sets for all mail messages. It supports parallel processing of multiple mail spool files. CSSMTP is intended to be used with a mail forwarder to which CSSMTP hands the mail. The mail forwarder then resolves the final recipients, tries to send the mail to those recipients, and handles general retry and time out processing. CSSMTP has some limited retry support, but is not as robust as a full mail forwarder.

### Internet mailer co-existence on z/OS

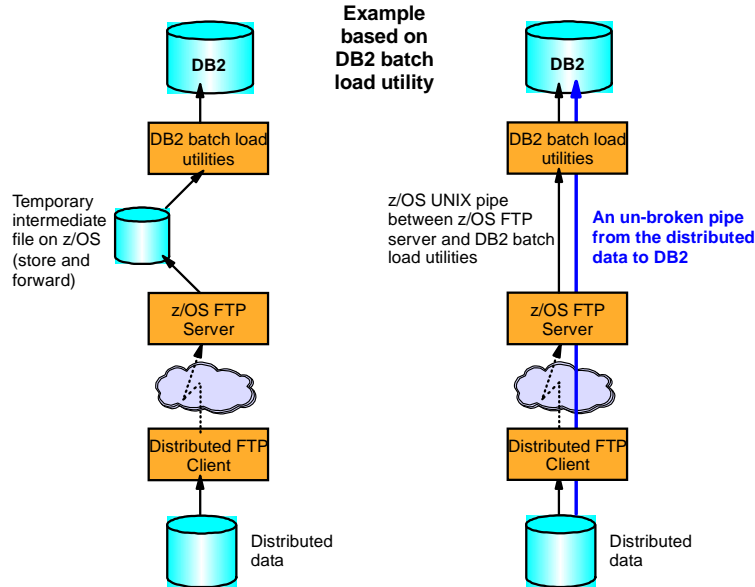


This slide shows the available z/OS mailers and will give you direction on picking the best z/OS mailer for you. The previous slide showed the advantages of using CSSMTP. The next slide will discuss when you might continue to use SMTPD (Simple Mail Transfer Protocol daemon) or z/OS UNIX sendmail (ESMTP server).

## FTP access to UNIX named pipes (also known as FIFOs)



- Helps save total processing time when pre/post processing is needed for files transferred from/into z/OS
- Support available in both the z/OS FTP client and server
- FTP can be either the reading end or the writing end of the pipe
- PTFs for prior releases



The z/OS FTP client and server are enhanced in z/OS V1R11 to write and read data directly into or from a z/OS UNIX named pipe (also known in UNIX jargon as a FIFO – First In First Out).

The intention with this enhancement is better performance when files, for example, are transferred into z/OS and then need to be processed by a z/OS application. If that application supports reading from a z/OS UNIX named pipe, the transfer from the remote site can overlap processing by that z/OS application. That is, you have an unbroken pipe from the remote site that goes through a TCP connection and continues into a z/OS UNIX named pipe. When data is written from the remote client onto the TCP data connection, that data continues all the way into the post-processing application without further store and forward delays.

This z/OS FTP server support has been PTFed back to prior releases and will initially be exploited by DB2®/SAP workloads.

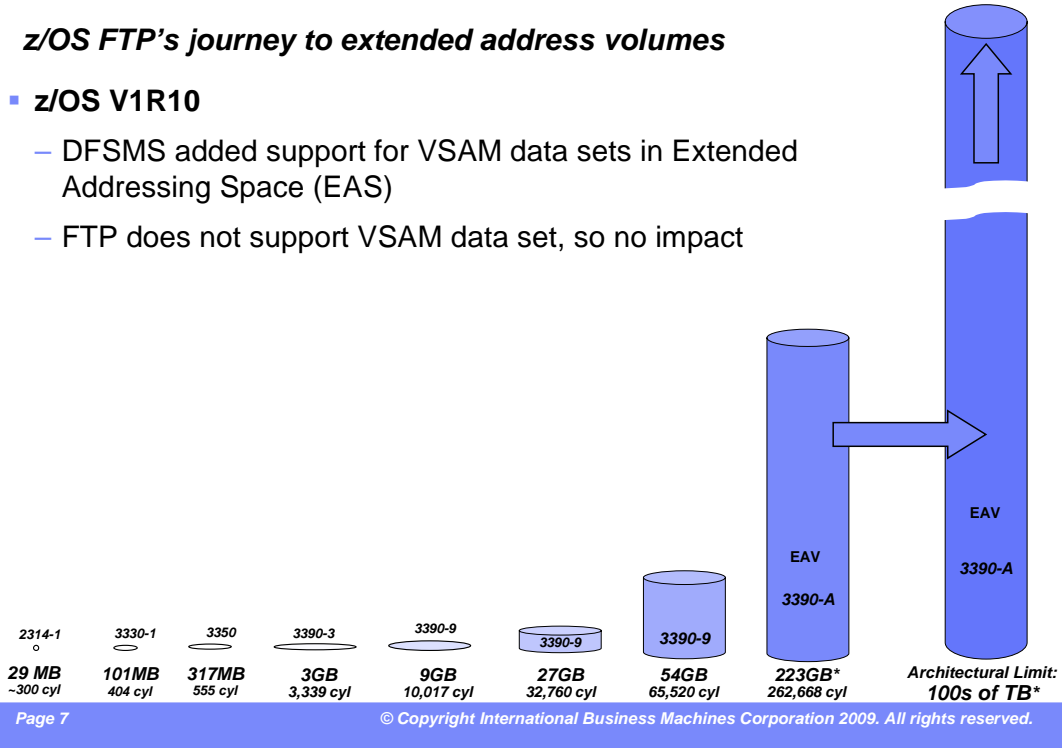
Combined with the z/OS FTP Client API, some very interesting integrated solutions can be developed. One example is splitting large files into multiple streams and transmitting them over parallel FTP sessions for improved performance. Another example is collecting information from multiple sources on z/OS, building a stream of data, and sending it directly to a remote site without ever storing it on z/OS.

The SAP on DB2 for z/OS Unicode FASTLOAD conversion utility exploits named pipes. This product migrates SAP installations to UNICODE. You can learn more about this SAP product and how it exploits named pipes by consulting the document *SAP Unicode Conversion on DB2 for z/OS – Cookbook*. Joachim Rese, IBM Germany, 04 November 2008.

### z/OS FTP's journey to extended address volumes

- **z/OS V1R10**

- DFSMS added support for VSAM data sets in Extended Addressing Space (EAS)
- FTP does not support VSAM data set, so no impact



DFSMS is adding support over several releases for data sets in the extended addressing space (EAS) of extended address volumes (EAV). Initially DFSMS supported only VSAM data sets on the EAS.

**z/OS FTP's journey to extended address volumes continues**■ **z/OS V1R11**

- DFSMS adds support for extended format sequential data sets eligible to reside in the EAS
- FTP adds support for reading/writing to/from existing EAS data sets, but not creating them (toleration mode)
  - FTP to understand Format-8 DSCBs
  - FTP to use TRKADDR for track calculations
  - FTP qdisk option for SITE/LOCSITE output format will change to (sample)

```
ftp> quote site qdisk
200-          Percent      Free      Free      Largest      Free
200- Volume Free      Cyls      Trks      Cyls-Trks  Exts  Use Attr
200- CPDLB3  45          1507      108      1440  2    22 Storage
200- CPDLB0  44          80486    156      461  0    25 Storage
200- CPDLB1  99          66619     5       65362  5     3 Storage
200 SITE command was accepted
ftp>
```

In z/OS V1R11, DFSMS adds support for extended format sequential data sets (not normal sequential data sets).

Data sets that are eligible to reside in the EAS are allocated by DFSMS using a format-8 DSCB.

FTP will read and write to such data sets in the EAS. FTP does not provide explicit configuration options to allocate data sets in the EAS or to specify data sets as eligible to reside in the EAS (unless implicitly done by way of SMS data class assignments).

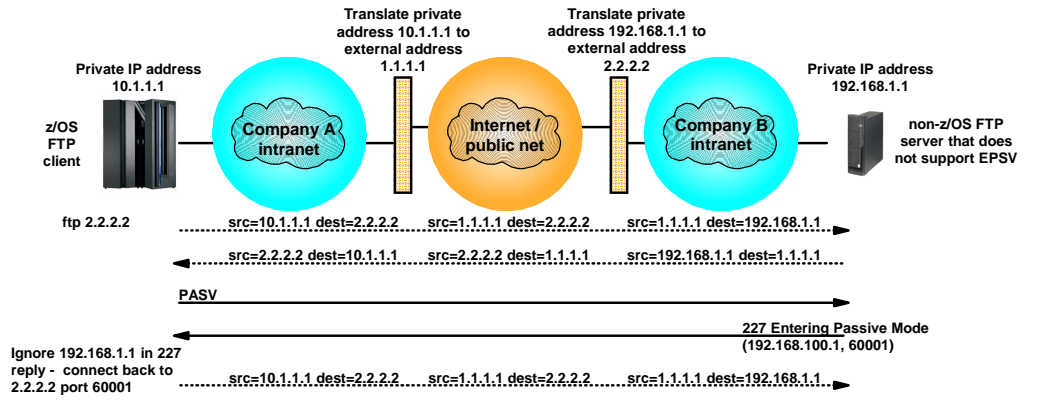
FTP has added support for providing information about EAV volumes on the qdisk command.

If you “screen-scrape” qdisk output, note that you will have to modify the “screen-scraping” logic, since the qdisk output was changed between R10 and R11 to accommodate EAVs.



## FTP extended passive mode (even when servers don't know what it is)

- Extended passive mode FTP transfer solves a set of problems with FTP through NAT firewalls
  - But not all FTP servers support extended passive mode
- New z/OS FTP client support emulates extended passive mode behavior even when remote FTP server does not support EPSV



In z/OS V1R11, the z/OS FTP client implements an option that allows the FTP client to simulate the use of extended passive mode - even in cases where the remote FTP server does not support EPSV.

This option instructs the z/OS FTP client to ignore the IP address it receives in the PASV reply from the server. Also with this option, the z/OS FTP client uses the same IP address for the data connection that was used for the control connection.

## Improved TSO LOGON reconnect processing through TN3270



*If old SNA session exists, when user attempts reconnect, disconnect old SNA session and proceed with TSO logon reconnect*

- Combined effort by TSO and Comm Server
- New LOGONHERE option in IKJTSOxx member to enable new support
- Enables reconnecting TSO user from a new SNA session
- Helps further reduce number of "USERID already in use" errors

TSO Reconnect Possible	Single session	Multiple sessions	NATed connectivity
TKOGENLU[RECON]	✓		
CheckClientConn	✓	✓	
TKOSPECLU[RECON]	✓	✓	✓
TSO LOGONHERE	✓	✓	✓
TIMEMARK/SCANINTERVAL	✓	✓	✓

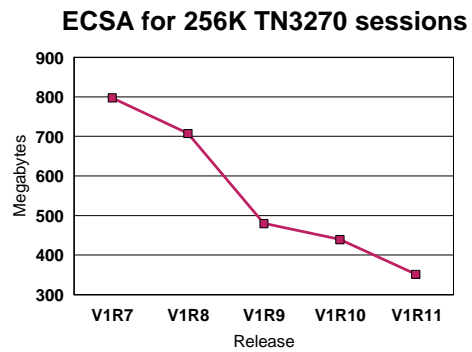
TSO reconnect is already supported in the case where the original SNA session was disconnected. If an SNA session was still active, it was not possible to use reconnect. In the case where a TN3270 client lost a TCP connection with the TN3270 server, but the SNA session remained active, you can not reconnect.

A modification has been made to TSO in V1R11. The modification is governed by a new option in IKJTSOxx – a LOGONHERE option. With that option enabled, users can reconnect even when an old SNA session exists. The old SNA session is disrupted (LOSTERM exit), and reconnect for the new session is processed.

This function is an alternative to other TN3270 server options for cleaning up old TCP connections and SNA sessions.

## TN3270 server ECSA usage improvement up to and including z/OS V1R11 Communications Server

Release	ECSA for 256K TN3270 sessions
V1R7	798M
V1R8	708M
V1R9	480M
V1R10	440M
V1R11 <sup>(1)</sup>	352M



The numbers are configuration dependent, but they should give you an idea of the magnitude of the savings achieved in the recent releases.

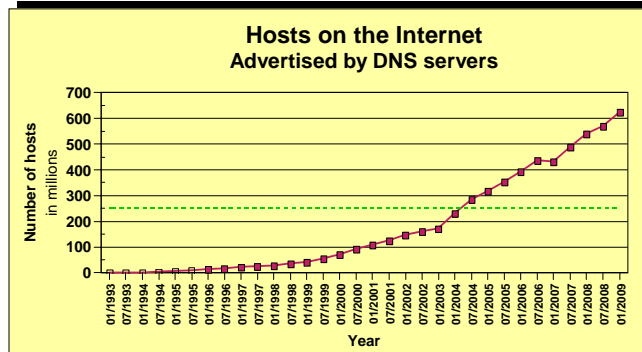
**Note (1):** The V1R11 number is a preliminary number - it may change before general availability of z/OS V1R11 Communications Server

The TN3270 server has significantly lowered the amount of extended common storage it needs to support large numbers of TN3270 clients.

This has been a focus area through the last four releases, and the preliminary z/OS V1R11 numbers indicate that ECSA usage in R11 is around 44% of what it was in z/OS V1R7.

## Is this IPv6 stuff something you need to care about?

- Projected Internet Assigned Numbers Authority (IANA) Unallocated Address Pool Exhaustion
  - May 2011
- Projected Regional Internet Registries (RIR) Unallocated Address Pool Exhaustion
  - Sep 2012
- z/OS Communications Server continues to focus on IPv6 standards currency
  - US DoD/NIST
  - IPv6 Forum



- What is the upper practical limit (the ultimate pain threshold) for number of assigned IPv4 addresses? Some predictions said 250,000,000 (250 million), others go up to 1,000,000,000 (one billion or one milliard).
- Source: <https://www.isc.org/solutions/survey>
- Source: <http://www.potaroo.net/tools/ipv4/index.html>
- Source: <http://penrose.uk6x.com/>

**If you want to stay in business after 2011/2012, you'd better start paying attention!**  
 Do not worry, the sky isn't falling – IPv4 and IPv6 will coexist for many years to come. Your applications need to be able to use both. If you write directly to the TCP/IP sockets layer, you need to start changing those applications

There are many unknowns around IPv6, but one thing is well known: IPv4 addresses are running out. Various internet-related organizations keep track of the number of assigned IPv4 addresses. They all indicate that within the next two to four years the Internet will run out of IPv4 addresses. First, the Internet Assigned Numbers Authority (IANA) will run out of IPv4 address blocks that can be assigned to the Regional Internet Registries. Shortly afterward (one to two years), those regional registries will run out of IPv4 addresses. At that point, no more IPv4 addresses can be assigned to ISPs or private companies that need internet accessible IPv4 addresses. Remember that even NAT-based Internet connectivity technologies require a certain amount of public IPv4 addresses.

Various government organizations have begun to plan for a deployment of IPv6 connectivity. Best known are the US Department of Defense and National Institute of Standards and Technology. Both organizations have defined IPv6 compliance requirements that IT solutions must meet. z/OS is tracking these compliance requirements carefully. z/OS V1R10 achieved the "Special Interoperability Test Certification of the IBM z/OS Version 1.10 Operating System for IBM Mainframe Computer Systems for Internet Protocol Version 6 Capability" of the US Department of Defense. The Web site is [http://jitc.fhu.disa.mil/adv\\_ip/register/certs/ibmzosv110\\_dec08.pdf](http://jitc.fhu.disa.mil/adv_ip/register/certs/ibmzosv110_dec08.pdf)

## **IPv6 development on z/OS Communications Server – z/OS V1R4**

- **z/OS V1R4**
  - Stack support for IPv6 base functions - (APIs, Protocol layers)
  - Resolver
  - High speed attach (OSA Express QDIO))
  - Service tools (Trace, Dump, and so on.)
  - Configuration and netstat, ping, traceroute, SMF
  - Static Routing
  - FTP, otelnetd, UNIX rexec, UNIX rshd/rexecd

z/OS is on a long path to implement IPv6 support. It started in z/OS V1R4.

## IPv6 development on z/OS Communications Server – z/OS V1R5

### ■ z/OS V1R5

- Network Management
- Applications and DPI®
- Version-neutral TCP/IP Standard MIBs
- Additional SMF records
- Applications/Clients/APIs
- TN3270 server, **CICS sockets**, sendmail,ntp,dcas, rxserve,rsh client
- Enterprise Extender
- Point to Point - type DLCS
- Dynamic Routing Protocol with OMPROUTE (RIPng)



z/OS V1R5 was certified for IPv6-Ready Logo phase 1.

## **IPv6 development on z/OS Communications Server – z/OS V1R6 and V1R7**

- **z/OS V1R6**
  - Sysplex exploitation (Dynamic VIPA, Sysplex Distributor functions)
  - Dynamic Routing Protocol with OMPROUTE (OSPFv3)
  - Additional Network Management MIBs
- **z/OS V1R7**
  - SNMP UDP standard MIB (RFC2013) and IBM MVS TCP/IP Enterprise-specific MIB for UDP
  - Advanced Socket API support - RFC3542
  - IPv6 Two Default Routers - required for IPv6 compliance
  - IPv6 over HiperSockets™

Additional IPv6 capability was added in z/OS V1R6 and V1R7.

## IPv6 development on z/OS Communications Server – z/OS V1R8, V1R9, V1R10

- **z/OS V1R8**
  - Integrated filtering and IPSec for IPv6
  - RPCBIND Server
- **z/OS V1R9**
  - RFC currency
  - Scoped IPv6 architecture APIs
  - Extended Stats MIB, OSPFv3 MIB (after z/OS V1R9)
- **V1R10**
  - FRCA
  - Resolver enhancements



z/OS V1R8 was IPv6-Ready Logo phase 2 certified.



## ***IPv6 development on z/OS Communications Server – status per z/OS V1R11***

- V1R11
  - SMTP client IPv6 enabled from start
  - Privacy extensions and stateless address auto-configuration enhancements
  - Type 0 Routing Header deprecation

In z/OS V1R11, z/OS Communications Server adds support for RFC 4941 “Privacy Extensions for Stateless Address Auto-configuration in IPv6” and for RFC 5095 “Deprecation of Type 0 Routing Headers in IPv6”.

The new CSSMTP application is IPv6 enabled from the start and is able to use both IPv4 and IPv6 for communication with a mail forwarder.

With z/OS V1R11, all of the main capabilities for IPv6 are in place, including sysplex support, dynamic routing, and many management-related functions.

z/OS Communications Server is not finished yet – and will likely not be for some time to come. Existing IPv6 standards are being revised and improved upon all the time, and z/OS will need to stay current with commonly accepted standards levels.

## ***z/OS and IPv6 - certifications***

- **z/OS V1R5 is IPv6 Ready Phase 1 certified by the IPv6 Forum**
- **z/OS V1R8 is IPv6 Ready Phase 2 certified by the IPv6 Forum**
- **z/OS V1R10 is IPv6 certified according to the US DoD IPv6 requirements**
  - See “Special Interoperability Test Certification of the IBM z/OS Version 1.10 Operating System for IBM Mainframe Computer Systems for Internet Protocol Version 6 Capability”
  - From US government, Defense Information Systems Agency, Joint Interoperability Test Command
    - ([http://jitc.fhu.disa.mil/adv\\_ip/register/certs/ibmzosv110\\_dec08.pdf](http://jitc.fhu.disa.mil/adv_ip/register/certs/ibmzosv110_dec08.pdf))

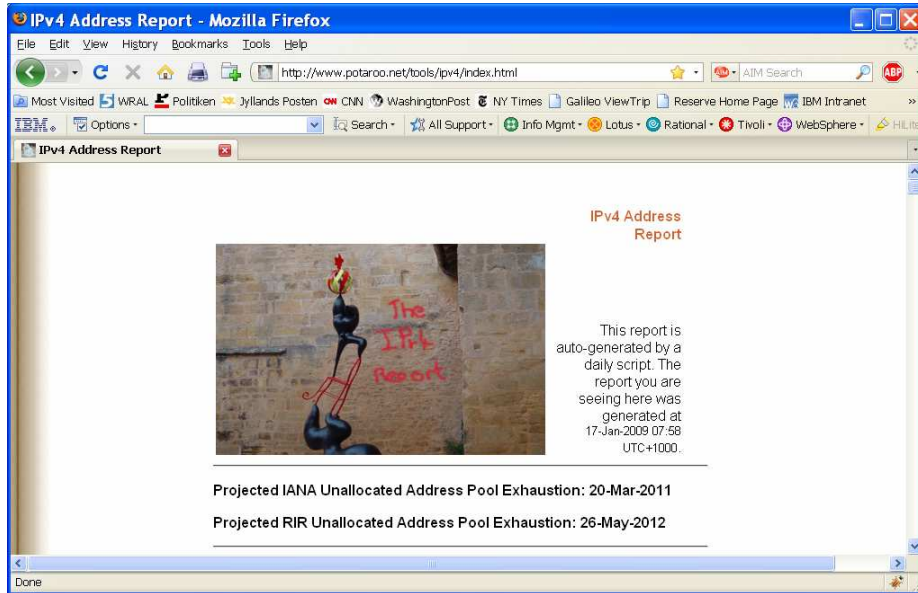
The world is running out of IP addresses (those addresses with the four numbers – like 9.42.156.248).

So far, networks have been stable with IPv4 and the amount of allotted address space. IPv4, however, offers a strict ceiling of 4.3 billion addresses. Each device connected to the Internet requires a unique address. Work-through tactics such as network address translation, though, have effectively extended the life of IPv4. The date for true IPv4 address scarcity, hindering a network's growth potential, has been predicted to be some time in 2010.

The US government Defense Information Systems Agency, Joint Interoperability Test Command are beginning to require IPv6 compliance. Here are the results of the latest certification.

“The IBM z/OS Version 1.10 operating system for IBM mainframe computer systems has met the Internet Protocol (IP) Version 6 (IPv6) Capable interoperability requirements of an Advanced Server as described in the Department of Defense (DoD) Information Technology Standards Registry, “DoD IPv6 Standard Profiles for IPv6 Capable Products Version 2.0,” 1 August 2007, reference (c). The IBM z/OS Version 1.10 operating system for IBM mainframe computer systems has successfully completed the related IPv6 Interoperability portions of the “DoD IPv6 Generic Test Plan (GTP) Version 3,” August 2007, reference (d), and is certified for listing on the Unified Capabilities (UC) Approved Products List (APL) as IPv6 Capable.”

16-Jan-2009 - <http://www.potaroo.net/tools/ipv4/index.html>



Various Web sites count down to the point in time when there are no more IPv4 addresses to hand out.

## ***Security concern with stateless address auto-configuration***

- RFC 4941 “Privacy Extensions for Stateless Address Auto-configuration in IPv6”
  - RFC 4941 addresses a potential security concern that can arise with the use of stateless address auto-configuration.
    - An auto-configured address contains an embedded static interface identifier.
    - The static interface ID makes it possible to correlate independent transactions even if the overall IPv6 address changes.
  - RFC 4941 also defines solutions:
    - A mechanism to generate a random interface ID that changes over time
    - A mechanism to generate an IPv6 temporary auto-configured address using the random interface ID

IPv6 has a concept of stateless address auto-configuration (as opposed to stateful as known in DHCP-based addressing technologies). The original standards for stateless address auto-configuration proved to have a potential security flaw where IP packets to/from a given laptop can be correlated across multiple network domains.

RFC 4941 “Privacy Extensions for Stateless Address Auto-configuration in IPv6” defines a mechanism to generate a random interface ID that changes over time. This random interface ID can be used in place of the static interface ID in generating temporary auto-configured addresses. Based on configuration values, the random interface ID and temporary addresses are regenerated periodically.

## ***z/OS V1R11 implements recommended solution to security concern with stateless address auto-configuration***

- Temporary auto-configured addresses have same characteristics as public auto-configured addresses.
  - generated when router advertisement processed
  - deprecated at the end of the preferred lifetime
  - deleted at the end of the valid lifetime.
  
- A short-lived client application can use temporary addresses to make it more difficult to correlate activity.
  - a server needs a known IP address so that it can be reached by clients
  - a long-lived client connection can become unusable if the source IP address is deleted while the connection is active

Temporary auto-configured addresses are designed to be used by short-lived client applications.

Servers need to have a known IP address (or DNS name) so that clients can reach them. A long-lived client connection can become unusable if its source IP address is deleted while the connection is active.

Temporary auto-configured addresses have the same characteristics as public auto-configured addresses. The address is generated as the result of a received router advertisement. The address is deprecated at the end of its preferred lifetime. The address is deleted at the end of its valid lifetime.

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