IPv6 In z/VSE

IBM z/VSE Live Virtual Class 2012

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IPv6 in z/VSE

- IPv6 News is everywhere
- With z/VSE 4.2.2 IBM announced IPv6/VSE
- Full IPv4 and IPv6 TCP/IP solution
  - Stacks and applications
- IPv6/VSE will take z/VSE and you into the future!

IPv4 Review

- IP addresses are 32-bits

- 4,294,967,296 different IP addresses

- Many are reserved

  - 288 Million in fact

- Dotted decimal notation

  - 192.168.1.1
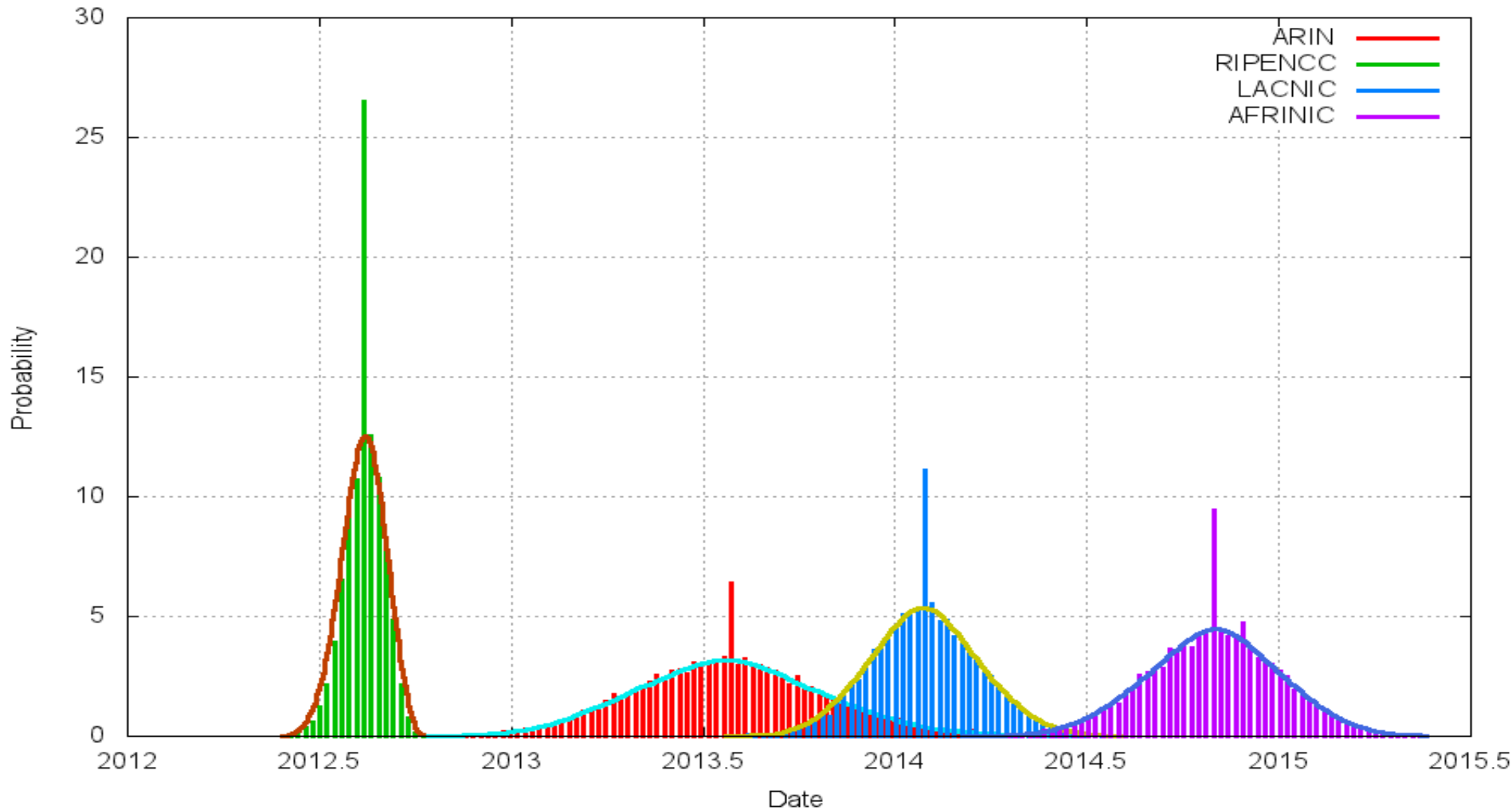
IPv4 Addresses Remaining

- Time is up

Feb 3, 2011

All IPv4 Addresses allocated!

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IPv4 Addresses Remaining

RIR IPv4 Address Run-Down Model - Variance Analysis

IPv4 Issues

- Asia already out of IPv4 addresses
- Europe will run out of IPv4 addresses very soon
- Are you ready?

- How will this affect your business operations?
- How will you communicate with your customers when they are using IPv6?

IPv4 Issues

- NAT (Network Address Translation)
- Map multiple internal addresses to single external address
- Most routers (cable/DSL) do this
- Time consuming
- Complicated

IPv4 Issues

- Variable length IP Header Options are time-consuming

- IP Header checksum is redundant and time-consuming

- Fragmentation of IPv4 packets is inefficient

- Classification of IPv4 packets still exists

What is the Answer?

- The solution is IPv6

- Wait! What happened to IPv5?

- Internet Stream Protocol (ST/ST-II) experimental protocol used IP version number 5.

- ST/ST-II was never known as IPv5

Why is IPv6 Better?

- Designers tried to avoid IPv4's mistakes

- 128 bit IP addresses (16 bytes)

- Large Packet support

- Fixed headers

- No fragmentation

- No checksums

Why is IPv6 better?

- Easily extendable

- Simplier routing

- True multicasting

- Automatic configuration

- Full mobile device support

IPv6 Basics

- IPv6 addresses are big. Very Big.

- IPv6 addresses are 16 bytes in length (vs. 4 bytes for IPv4 addresses).

- That's 2^{128} IPv6 addresses (about 3.4×10^{38}) unique addresses.

- Or about 5×10^{28} IPv6 addresses for each person in the world.

IPv6 Basics

- IPv6 addresses are usually written as groups of four hexadecimal digits (base 16) with each group representing 2 bytes of the 16-byte address.

- 2001:0db8:85a3:08d3:1219:8a2e:0370:7344

- Now that's a mouthful!

IPv6 Basics

- To help, leading zeroes can be omitted
- fd00:0806:0001:0000:0000:0000:0000:0001
- would become
- fd00:806:1:0:0:0:0:1
- and consecutive all-zero groups can be replaced by two colons
- Fd00:806:1::1

IPv6 Basics

- An IPv6 address is assigned to a network interface

- Each interface (network adapter) can have multiple IPv6 addresses

- All network interfaces have at least two

    - the assigned IPv6 address

    - the Link Local IPv6 address

Here is a list of interesting IPv6 address prefixes and their meaning.

IPv6 Address/Prefix	Description
::1	Loopback
::	Unspecified (all zeroes)
FF00::/8	Multicast
FE80::/10	Link Local
FEC0::/10	Site Local (no longer used)
FC00::/7	Unique local

IPv6 Addresses

IPv6 Address	Description
FD00:806:1::1	Assigned IPv6 address
FE80 + MacAddress (02000000017) - FE80:0:0:0:0200:0000:0100:0017 - FE80:0:0:0:200:0:100:17 - FE80::200:0:100:17	Link Local

IPv6 Basics

- Plug-n-Play IP addressing

- Hosts solicit

- Routers Advertise

- ICMPv6 Neighbor Discovery eliminates ARP processing (and its overhead!)

Migrating from IPv4 to IPv6

- IPv6 is NOT backward compatible with IPv4

- IPv4 and IPv6 can coexist

- Dual stack approach is best

    - IPv4 continues unchanged

    - IPv6 introduced

    - Running together on the same system

- Windows and Linux provide excellent dual stack support

Can my ISP do this for me?

- Carrier-Grade NAT (CGN)

- Large-Scale NAT (LSN)

- All companies and users provided local IP addresses

- ISP uses a single (or a few) public IP addresses

- Shifts NAT from users to the ISP

CGN/LSN Issues

- It breaks the end-to-end principle, resulting in security issues (think SSL)

- It has significant security, scalability, and reliability problems due to its stateful design

- It makes record keeping for law-enforcement operations more difficult

- It makes it impossible to host services on well-known ports

CGN/LSN Issues

- Poorly suited to handling business customers

- Best suited to residential internet users

- At best, a temporary solution

OK, What about z/VSE?

- Bet you are hearing about IPv6 now

- Perhaps your ISP has made it available to you

- Other businesses or customers have requested it

- The US Government DoD requires it

- US Unified Capabilities Approved Products List (UC APL) requires it

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Introducing IPv6/VSE

- IBM licensed IPv6/VSE as their TCP/IP product solution for the future

- IBM's IPv6/VSE announcement (210-066) was made on April 6, 2010

- The availability of IBM's IPv6/VSE allows z/VSE users to participate in an IPv6 network and bring the benefits of IPv6 functionality to z/VSE users

Introducing IPv6/VSE

- While the product is named IPv6/VSE, it supports both IPv4 and IPv6 communications

- IPv6/VSE provides a full-function IPv4 stack and applications as well as a full-function IPv6 stack and applications

- Both TCP/IP stacks (IPv4 and IPv6) can be run together, individually or even standalone.

IPv6/VSE Applications

IPv4 Support	IPv6-Enabled	Description
Yes	Yes	FTP Server
Yes	Yes	FTP Client
Yes	Yes	TN3270E Server with DIRECT/LPR printing
Yes	Yes	Network Time Protocol Server
Yes	Yes	Network Time Protocol Client
Yes	Yes	System Logger Client
Yes	Yes	Mail Transport Protocol Client
Yes	Yes	Remote Execution Client
Yes	Yes	Batch PING Utility
Yes	Yes	GZIP Data Compression
Yes	Yes	REXX Automation Support

IPv6/VSE Application Support

Application	Supported by IPv6/VSE
CICS TS Web Services	Yes
CICS TS Listener	Yes
VTAPE	Yes
Connector Server	Yes
DB2 Server and DB2 Client	Yes
MQSeries	Yes
MQ Client	Yes
PSF/VSE	Yes
Linux Fast Path	Yes
VSAM Redirector	Yes
VSE Health Checker	Yes
VSE Script Server	Yes
VSE Navigator	Yes

IPv6/VSE Programming APIs

- ASM SOCKET API
    - IPv6 and 64-bit virtual storage
- EZASOKET
- EZASMI
- LE/C

- The IBM IPv6/VSE Programming Guide has all the details

IPv6/VSE SSL Support

- Available in GA Build 252
- GSK API provided
- EZASMI, EZASOKET, LE/C support
- BSTTPRXY SSL Proxy Server

IPv6/VSE SSL Support

- Based on IJBSSL from IBM
    - Port of OpenSSL 1.0.0
- IJBSSL introduced with z/VSE 5.1
    - C/VSE application
    - Will run on any version of z/VSE
- Provides software SSL
- Supports CPACF and Crypto Express

IPv6/VSE SSL Restrictions

- IJBSSL API uses LE/C

  - Requires application be LE

- Only batch LE applications can use GSK() API. CICS not supported.

  - Restriction will be removed

- All applications are supported by the BSTTPRXY SSL Proxy Server

SSL Proxy Server

- BSTTPRXY z/VSE Proxy Server

  - Accepts clear text, SSL connections

    - IPv4 or IPv6

  - Proxy to clear text, SSL connection

    - IPv4 or IPv6

  - SSL Proxy server

  - 6to4 and 4to6 Proxy server

IPv6 in z/VSE

- There you have it

- z/VSE is IPv6-ready with IBM's IPv6/VSE

- IBM's IPv6/VSE provides both a full-function IPv4 stack and applications as well as a full-function IPv6 stack and applications

- IPv6/VSE is a single product providing a complete solution, TCP/IP stacks, IPv6-enabled applications, and programming interfaces

IPv6 in z/VSE

- Thank you!

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