Leveraging the Newest Capability in z/VM

v7.1.c

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June 2019

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Abstract

With z/VM's continuous delivery strategy, most new function is now being delivered as New Function APARs. The "z/VM Platform Update" covered the business value of the newest enhancements to z/VM; in this session we'll cover technical information that you need to take advantage of the newest enhancements that are available in z/VM 7.1.

Agenda

- z/VM 7.1 Notes
- Continuous delivery enhancements – recent New Function APARs
- Keeping up with releases, service, and new function updates

z/VM 7.1

z/VM 7.1

http://www.vm.ibm.com/zvm710/index.html

- GA September 21, 2018

- Single System Image and Live Guest Relocation included in the base
  - –In z/VM 6.4 it was the VMSSI priced feature

- New Architecture Level Set of zEC12, zBC12, or newer processor families

- Includes SPEs shipped for z/VM 6.4
  - –Virtual Switch Enhanced Load Balancing, EAV Minidisks, Encrypted Paging, etc.

- Additionally, includes:
  - –Dump scalability improvements
  - –Foundation work for future New Function APARs

Initial Dump Scalability Improvements in z/VM 6.4

- Larger systems mean larger dumps

- Performance enhancement for hard abend and snap dumps to 3390 DASD
  - –More intelligent channel programs
  - –Decreases **dump time** significantly
    - 30 to 40% improvement in lab testing

- Create **smaller** snap dumps by not dumping guest PGMBKs (page tables)
  - –Optionally can select to include them

- Available May 31, 2017

Component	APAR	PTF	RSU
CP	VM65989	UM35132	1702

z/VM 7.1 Dump Scalability Improvements

- Reduce size of both snap dumps and hard abend dumps

- Reduce time to create and process dumps

- No longer dump the Frame Table and Page Tables by default
  - –Unless it is an abend code where they are helpful for problem determination
  - –Dump size reduction varies
    - Lab testing showed often 20% of the size of former dumps

- New options to override defaults on what data is dumped
  - –**SET DUMP** and **SNAPDUMP** commands

- We still calculate the maximum size needed when doing the reserve space in spool for dumps

- No longer support dumping to tape devices

z/VM 7.1 Additional Dump Scalability Improvements

- Reduce CPU required for snap dump and hard abend dump processing
  - –Further improves performance of dump processing from a processor requirement perspective.
  - –Applies to snap dump and hard abend processing

- Available September 21, 2018

Component	APAR	PTF	RSU
CP	VM66176	UM35352	TBD

Single System Image (SSI) *Function*

- SSI (including Live Guest Relocation) is included in the base of z/VM 7.1

- A **PRODUCT** statement for the VMSSI feature is no longer necessary in the z/VM 7.1 system config file
  - –If specified, it will be displayed by the **QUERY PRODUCT** command
  - –If your software audit people use **QUERY PRODUCT** to determine the software that you purchased, be ready to explain to them that it is free or remove from the system config file.

- If an **SSI** statement is included in the system config file, the following will be displayed during IPL:

z/VM 7.1 Memory Management Changes

- Some changes were introduced in z/VM 7.1 for upcoming New Function APARs

- Minimum memory size for a second level z/VM is now 128MB (previously 32MB)
  - –First level z/VM minimum is unchanged (256MB)

- **SET STORAGE** command changes
  - –New **PERMANENT** keyword
  - –Remove **AS** keyword
  - –No more rounding up to the increment boundary

z/VM 7.1 User Directory Modifications

- Changes to IBM supplied directory to make more consistent with recommended security policies
  - –IBM-provided virtual machines changed to be either:
    - Autolog Only (AUTOONLY)
    - Logon By (LBYONLY)

- Changes to other IBM-provided virtual machines
  - –Deleted those that are no longer used
  - –New virtual machines
    - Some as infrastructure/placeholders for upcoming new function
  - –Release-specific userids renamed
    - e.g. MAINT640 -> MAINT710
  - –Specifications changed for some

- See *z/VM Enhancements Guide*
  - –Chapter 2, section *[V7.1] User Directory Modifications*

z/VM 7.1 Security Modes

- z/VM 6.4
  - –January 8, 2018 APAR VM65396 (PTF UM34851) introduced the **CP SET SPECEX** command
  - –March 23, 2018 APAR VM65414 (PTF UM34853) introduced the **CP SET CPPROTECT** command
    - **CP SET SPECEX** still recognized but recommended adopting syntax used with **CP SET CPPROTECT**
- z/VM 7.1 Base
  - –**CP SET SPECEX** is no longer supported or recognized
  - –**CP SET CPPROTECT** is supported with same defaults and syntax as previously supported
- If you're using **SET SPECEX**, please convert to **SET CPPROTECT** prior to going to z/VM 7.1

Other z/VM 7.1 Changes

- No longer install to 3390-3 Volumes
  - –z/VM does support 3390-3, just not for install
  - –Install can be done on
    - 3390 with minimum size of 10016 cylinders
    - SCSI volumes with minimum size of 6 GB

- Kanji is no longer supported as a system default language

- OSA/SF is no longer shipped with z/VM

- No longer support dedicating logical processors to individual virtual machines.

z/VM 7.1 New Function APARs

New Function APAR:
DEFINE HYPERPAVALIAS and PAVALIAS Enhancements

DEFINE HYPERPAVALIAS/PAVALIAS Enhancements

- A range of virtual alias devices may now be defined with a single command
  - –**DEFINE HYPERPAVALIAS**
  - –**DEFINE PAVALIAS**

- Especially useful if the **COMMAND** directory statement is used to define aliases
  - –Fewer statements are now needed to define the same number of aliases
    - Helps avoid limits on **COMMAND** statements for each guest

- Available February 8, 2019 for z/VM 7.1

Component	APAR	PTF	RSU
CP	VM66249	UM35427	TBD

New Function APAR:
New RSCS Query Command

New RSCS QUERY Command

- New command option that shows the service level for each of the RSCS parts
  - –Highest level PTF that is applied to each part
- **QUERY SYSTEM SERVICE**
  - –"BASE" is displayed if no APARs are applied
  - –User updates may be displayed in place of the above

```
14:11:11 * MSG FROM RSCS : RSCS Service Level
14:11:11 * MSG FROM RSCS : ---- ------- -----
...
14:11:11 * MSG FROM RSCS : SLVL DMTCMX BASE
14:11:11 * MSG FROM RSCS : SLVL DMTCMY BASE
14:11:11 * MSG FROM RSCS : SLVL DMTCMZ VM66174
14:11:11 * MSG FROM RSCS : SLVL DMTCMA BASE
14:11:11 * MSG FROM RSCS : SLVL DMTCMB BASE
14:11:11 * MSG FROM RSCS : SLVL DMTCMQ INTEST1
14:11:11 * MSG FROM RSCS : SLVL DMTCQX BASE
14:11:11 * MSG FROM RSCS : SLVL DMTCQY BASE
...
```

QUERY SYSTEM SERVICE Command

- Available November 29, 2018 for RSCS 7.1

Component	APAR	PTF	RSU
RSCS	VM66174	UV99342	TBD

New Function APAR:
Elliptic Curve Cryptography

Elliptic Curve Cryptography Support

- z/VM TLS/SSL Server enhanced with enablement of Elliptic Curve Cryptography (ECC) cipher suites

- ECC ciphers provide a more secure mechanism for asymmetric encryption than standard RSA or DSS algorithms.
  - Smaller key sizes for same levels of encryption

- Specific cipher suites can be enabled or disabled by name
  - `:parms` tag in DTCPARMS

- Output from the following commands shows information about the new cipher suites and TLS version:
  - `SSLADMIN QUERY SESSIONS`
  - `SSLADMIN QUERY STATUS DETAILS`
  - `NETSTAT IDENTIFY SSL`

Elliptic Curve Cryptography Support

- New Cipher Suites have been added to Table 39 in *z/VM TCP/IP Planning and Customization*
  - –Includes strength and symmetric key length

- z/VM Performance Report
  http://www.vm.ibm.com/perf/reports/zvm/html/4q8qk.html

- Available December 6, 2018 for TCP/IP 7.1

Component	APAR	PTF	RSU
TCP/IP	PI99184	UI60128	TBD

New Function APAR:
IBM Adapter for NVMe

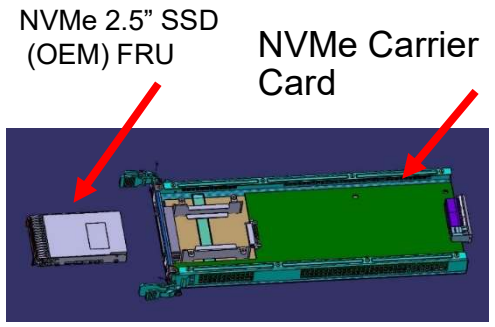
IBM Adapter for NVMe

- Support for NVMe (non-volatile memory express) drives

- Available on LinuxONE Emperor II and Rockhopper II with driver D36
  - –Client must procure the SSD device

- SSD device directly connected though an IBM PCIe adapter
  - –Ability to have embedded storage for some applications

- High I/O throughput can help with various workloads
  - –Memory intensive
  - –Real-time analytics
  - –Fast storage workloads
  - –Relational databases



I/O Card

Using the IBM Adapter for NVMe on z/VM

- Requires system configuration file changes and a system IPL
  - –Enable PCI support
    - **`FEATURES ENABLE PCI`**
  - –Configure memory for PCIe functions
    - **`STORAGE IOAT`**
  - –See *z/VM CP Planning and Administration,* Chapter 16: "Using PCIe Functions for z/VM Guests"

- Guest enablement
  - –Create PCI function dynamically and attach to guest
    - **`DEFINE PCIFUNCTION / ATTACH`** commands
  - –Ensure setting on **`SET IO_OPT UID`** allows for guest to define options
    - **`QUERY IO_OPT`**

IBM Adapter for NVMe – z/VM Support

- Available October 31, 2018
  - –z/VM 6.4 and 7.1

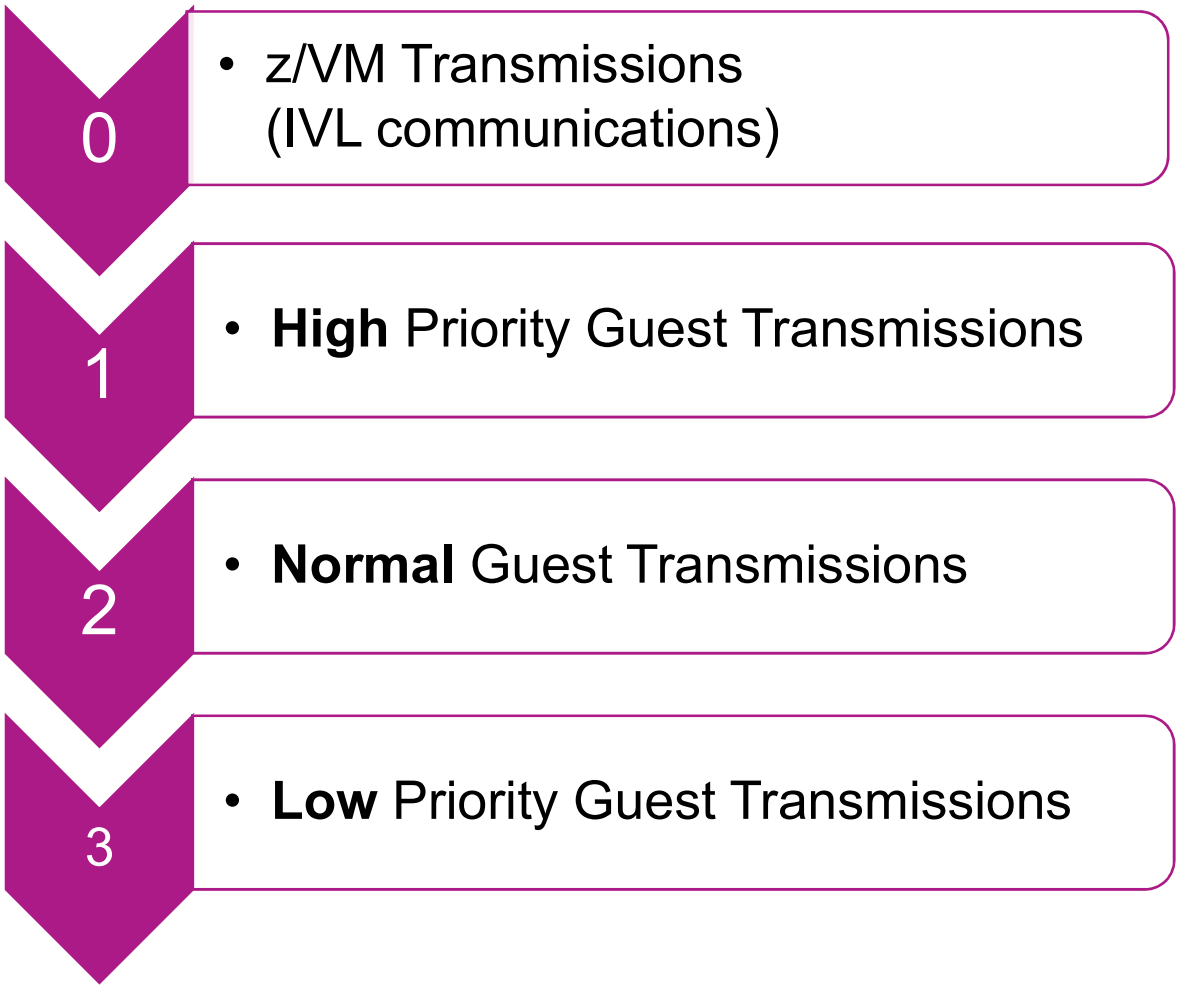
Component	APAR	PTF	RSU
CP	VM66180	UM35381 (6.4) UM35382 (7.1)	TBD TBD

New Function APAR:
Virtual Switch Priority Queuing

Virtual Switch Priority Queuing

- Introduces multiple priority levels for transmissions on a Virtual Switch
- Allows VSwitch management communication (IVL) to operate at highest priority to ensure better management
- Three optional user priority levels allow:
  - Different SLAs for different groups of guests
  - Combining different priority workloads onto fewer, or a single, VSwitch
  - Eliminating need for separate heartbeat network in some clustering solutions

Virtual Switch Priority Assignments



Enabling VSwitch Priority Queuing

- Priority Queuing is enabled in OSA-Express hardware by default
  - –IOCP or dynamic I/O change is required to disable
- IVL VSwitches always exploit priority queuing if not disabled
- Exploitation must be enabled for non-IVL VSwitches
  - –**`DEFINE VSWITCH`** command/config statement
- Set guest priority (default is NORMAL)
  - –**`NICDEF`** directory statement
  - –Can be changed dynamically with **`MODIFY VSWITCH`** command
- If you want to relocate a guest that is using priority other than NORMAL, then the VSwitch on the target system must also be enabled for priority queuing
  - –Or set guest priority to NORMAL before relocating guest

How to get VSwitch Priority Queuing

- Available – May 2019
  - –z/VM 7.1

Component	APAR	PTF	RSU
CP	VM66219	UM35465	TBD
TCP/IP	PH04703	UI62768	TBD
DirMaint	VM66223	UV99352	TBD

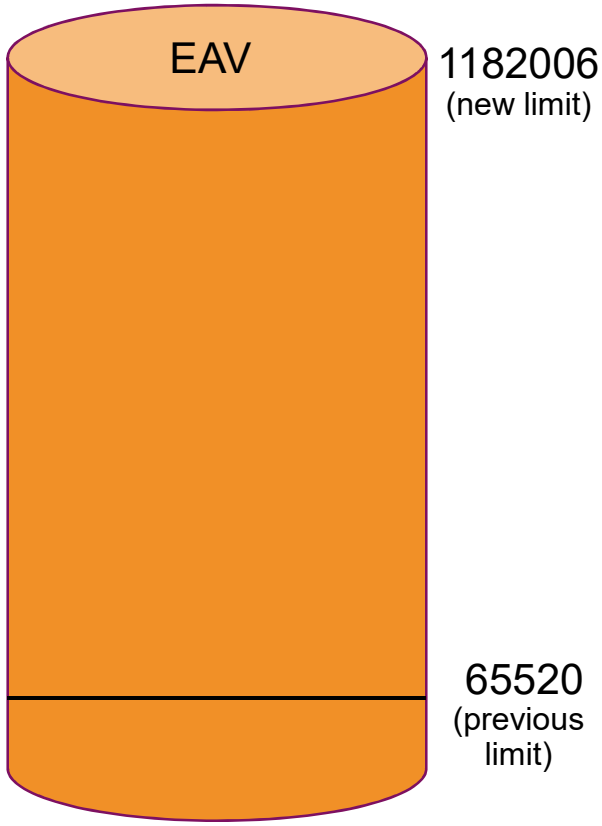
New Function APAR:
EAV Paging

EAV Paging: Overview

- Allows use of ECKD paging volumes larger than 65520 cylinders (~45 GB)
  - Up to 1,182,006 cylinders

- Benefits:
  - Can use fewer volumes to meet the page space requirements
  - Increases the total page space possible when using ECKD paging space
  - Will be helpful when increasing the amount of virtual memory used in conjunction with future increases in real memory supported

- **CPFMTXA** is enhanced to allow paging space to be allocated on cylinders 65520 and above
  - For an EAV the range is 0-1,182,005



EAV Paging

- Maximum ECKD paging volume sizes

	Number of Cylinders	Usable Space (approx.)
Before EAV paging	65520	45 GB
With EAV paging	1,182,006	812 GB

- Consider enabling HyperPAV and High Performance FICON (HPF) to increase paging I/O rates if you are paging to EAVs.

How to Get EAV Paging Support

- Available – June 2019
  - –z/VM 7.1

Component	APAR	PTF	RSU
CP	VM66263	UM35475	TBD
CMS	VM66297	UM35483	TBD

New Function APARs Coming Soon

New Function APAR:
80 Logical Processor Support

How to Get 80 Logical Processor Support

- Availability target – July 2019
  - –z/VM 7.1

Component	APAR	PTF	RSU
CP	VM66265	TBD	TBD
Stand Alone Dump	VM66296	TBD	TBD

80 Logical Processor Support

- Requires z14 or LinuxONE Emperor II
  - –Disaster Recovery system the same?

- Share settings are a percentage of the system, so increasing the number of processors, typically increases the share entitlement

- SMT-1 will restrict to 40 cores
  - –(80 logical processors = 80 threads = 2 threads * 40 cores)

Keeping Up with Releases, Service, and New Function Updates

z/VM Release Status Summary

z/VM Level	GA	End of Service	End of Marketing	Minimum Processor Level	Maximum Processor Level	Security Level
7.1	9/2018			zEC12 & zBC12		
6.4	11/2016			z196 & z114®	-	Common Criteria Complete FIPS 140-2 Complete

IBM Z Servers Supported by z/VM 6.4 and 7.1

- z/VM 6.4
  - –LinuxONE Emperor/Emperor II
  - –LinuxONE Rockhopper/Rockhopper II
  - –z14 (all models)
  - –z13
  - –z13s
  - –IBM zEnterprise EC12
  - –IBM zEnterprise BC12
  - –IBM zEnterprise 196
  - –IBM zEnterprise 114
- z/VM 7.1
  - –LinuxONE Emperor/Emperor II
  - –LinuxONE Rockhopper/Rockhopper II
  - –z14 (all models)
  - –z13
  - –z13s
  - –IBM zEnterprise EC12
  - –IBM zEnterprise BC12

Upgrade Installation

- Easier upgrade to a new z/VM release from existing systems
  - –Avoids a full and fresh install
  - –Especially helpful in a Single-System-Image (SSI) environment
    - All members of your SSI cluster must be on the same release

- Supports upgrades to
  - –z/VM 7.1 from z/VM 6.4
  - – (also z/VM 6.4 from z/VM 6.2 and 6.3)

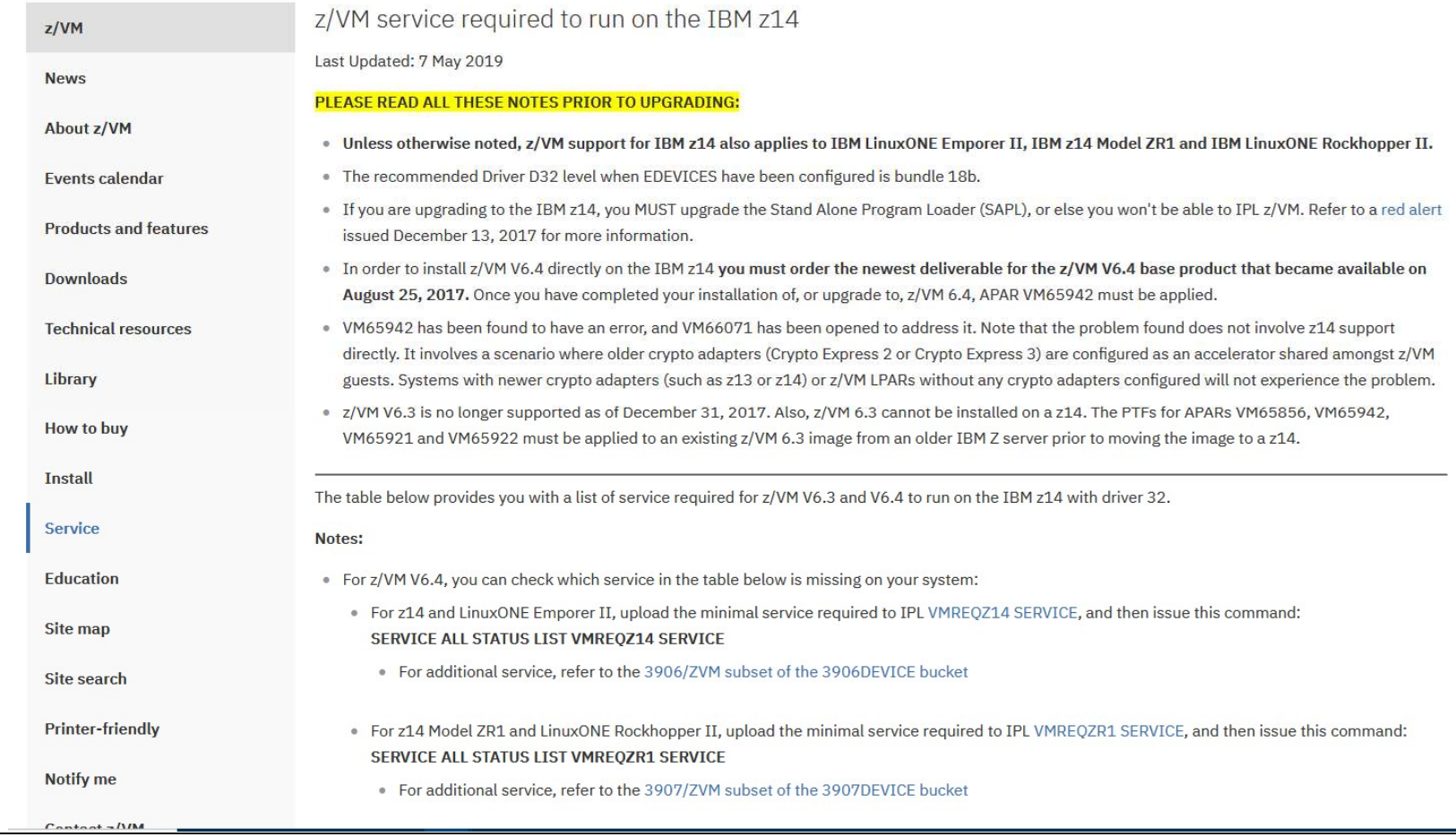
- Requires appropriate service on the old z/VM release

- Support for vendor products, local mods, and backing out if necessary

- See the z/VM Installation Guide for details

Service Required to Install z/VM on an IBM z14, LinuxONE Emperor II, or LinuxONE Rockhopper II

- Background and required service information at http://www.vm.ibm.com/service/vmreqz14.html



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z/VM service required to run on the IBM z14

Last Updated: 7 May 2019

PLEASE READ ALL THESE NOTES PRIOR TO UPGRADING:

- **Unless otherwise noted, z/VM support for IBM z14 also applies to IBM LinuxONE Emporer II, IBM z14 Model ZR1 and IBM LinuxONE Rockhopper II.**
- The recommended Driver D32 level when EDEVICES have been configured is bundle 18b.
- If you are upgrading to the IBM z14, you MUST upgrade the Stand Alone Program Loader (SAPL), or else you won't be able to IPL z/VM. Refer to a red alert issued December 13, 2017 for more information.
- In order to install z/VM V6.4 directly on the IBM z14 **you must order the newest deliverable for the z/VM V6.4 base product that became available on August 25, 2017.** Once you have completed your installation of, or upgrade to, z/VM 6.4, APAR VM65942 must be applied.
- VM65942 has been found to have an error, and VM66071 has been opened to address it. Note that the problem found does not involve z14 support directly. It involves a scenario where older crypto adapters (Crypto Express 2 or Crypto Express 3) are configured as an accelerator shared amongst z/VM guests. Systems with newer crypto adapters (such as z13 or z14) or z/VM LPARs without any crypto adapters configured will not experience the problem.
- z/VM V6.3 is no longer supported as of December 31, 2017. Also, z/VM 6.3 cannot be installed on a z14. The PTFs for APARs VM65856, VM65942, VM65921 and VM65922 must be applied to an existing z/VM 6.3 image from an older IBM Z server prior to moving the image to a z14.

The table below provides you with a list of service required for z/VM V6.3 and V6.4 to run on the IBM z14 with driver 32.

Notes:

- For z/VM V6.4, you can check which service in the table below is missing on your system:
  - For z14 and LinuxONE Emporer II, upload the minimal service required to IPL VMREQZ14 SERVICE, and then issue this command:
    SERVICE ALL STATUS LIST VMREQZ14 SERVICE
    - For additional service, refer to the 3906/ZVM subset of the 3906DEVICE bucket
  - For z14 Model ZR1 and LinuxONE Rockhopper II, upload the minimal service required to IPL VMREQZR1 SERVICE, and then issue this command:
    SERVICE ALL STATUS LIST VMREQZR1 SERVICE
    - For additional service, refer to the 3907/ZVM subset of the 3907DEVICE bucket

Verify That You Have Required Service for z14/etc.

http://www.vm.ibm.com/service/vmreqz14.html

- z/VM 7.1
  - For z14 and LinuxONE models running driver D36
    - Get file VM710D36 SERVICE
    - Issue: **`SERVICE ALL STATUS LIST VM710D36 SERVICE`**
- z/VM 6.4
  - For z14 and LinuxONE Emperor II
    - Get file VMREQZ14 SERVICE
    - Issue: **`SERVICE ALL STATUS LIST VMREQZ14 SERVICE`**
  - For z14 model ZR1 and LinuxONE Rockhopper II
    - Get file VMREQZR1 SERVICE
    - Issue: **`SERVICE ALL STATUS LIST VMREQZR1 SERVICE`**
  - For z14 and LinuxONE models running driver D36
    - Get file VM640D36 SERVICE
    - Issue: **`SERVICE ALL STATUS LIST VM640D36 SERVICE`**
  - If running SSI, make sure VM65976 is applied to all z/VM 6.4 members ***before*** IPLing any member on a z14

Installing z/VM on an IBM z14 (etc.) …

- The Stand Alone Program Loader (SAPL) **must** be rewritten with the z/VM 6.4 or 7.1 SALIPL utility
  - Otherwise you will not be able to IPL

- Upgrade installation does **not** rewrite SAPL
  - Must be done manually

- See red alert http://www.vm.ibm.com/service/redalert/index.html#SAPLZ14

```
STAND ALONE PROGRAM LOADER: z/VM VERSION 6 RELEASE 4.0
DEVICE NUMBER: 018B MINIDISK OFFSET: 35 EXTENT: -
MODULE NAME: CPLOAD LOAD ORIGIN: 2000
```

- Other stand alone utilities also need to be updated in order to IPL on z14
  - Standalone Dump, DDR, etc.

Stay Informed about Future New Function

- New web page to subscribe to:
  - http://www.vm.ibm.com/newfunction/

- Lists enhancements IBM is pursuing and gives:
  - Tentative dates for planning purposes
  - A high level view of impact and compatibility
  - Interaction with ISV products, Linux, and hardware

- Allows clients to
  - Express interest in being a sponsor user for the item
  - Plan for upcoming new support
  - Avoid surprises

Stay Informed about New-Function PTFs

- Off z/VM service page http://www.vm.ibm.com/service/ is new page for new-function APARs
  - http://www.vm.ibm.com/service/vmnfapar.html

- Applies to z/VM operating system and related products:
  - Operations Manager for z/VM
  - Backup and Restore Manager for z/VM
  - OMEGAMON XE on z/VM and Linux
  - Etc.

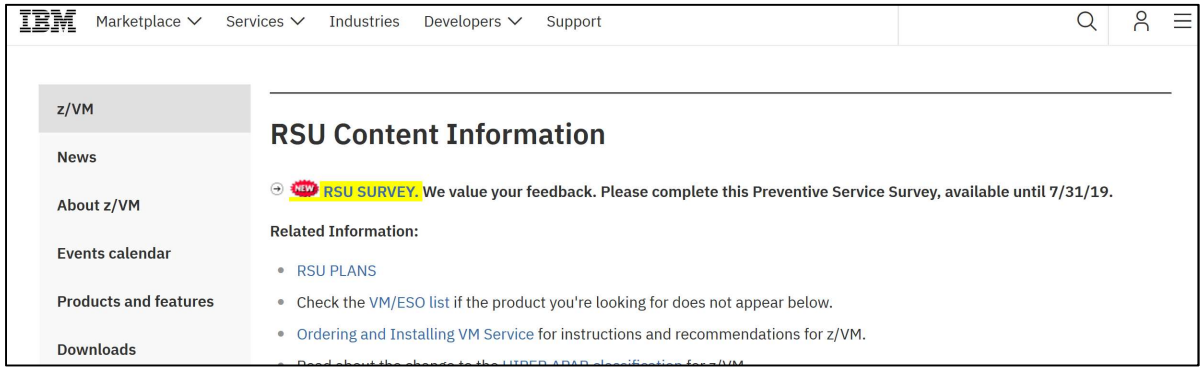
- Subscribe to receive notifications automatically when new-function APARs become available

- Obtain lists of previously shipped new-function APARs

z/VM RSU News

- z/VM 6.4 RSU 1901 scheduled for June 28, 2019
  - Includes a RACF template change
  - Please remember to validate your RACF database prior to applying (and afterwards)
    - White paper on validating and repairing the database is available: https://www.ibm.com/downloads/cas/LVOL5P8Q

- We're looking for input and direction on the RSU. Please see the RSU news page http://www.vm.ibm.com/service/rsu/ on June 28th or later for link to a brief survey. You'll have until July 31st to complete the survey



Summary

Summary

- z/VM 7.1 is the newest release of z/VM
  - –Enhancements for dump scalability and infrastructure for future enhancements
  - –Includes all New Function APARs shipped for z/VM 6.4

- New Function APARs are continuing to be delivered on z/VM 7.1
  - –Heavy dependence on the sponsor user program
  - –Plans for new function will be published on the z/VM website

- Subscribe to or follow the websites referenced throughout this presentation for the latest news on new function, required service, and more