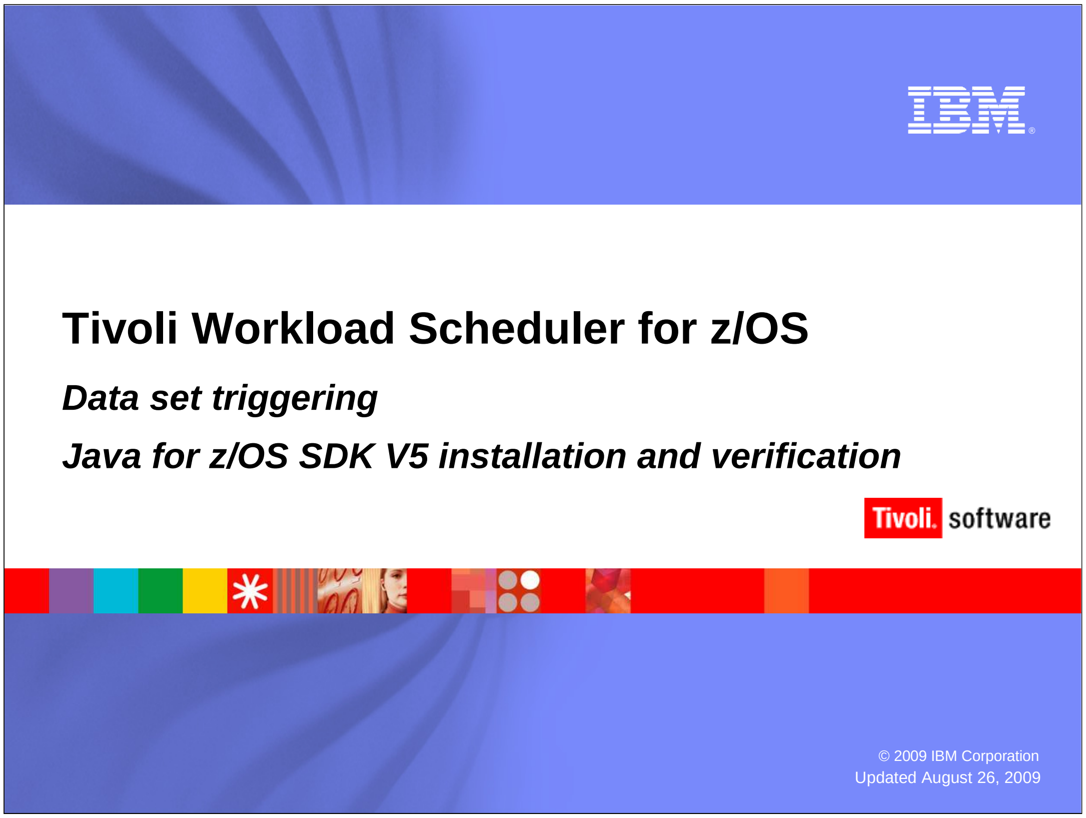


Tivoli Workload Scheduler for z/OS

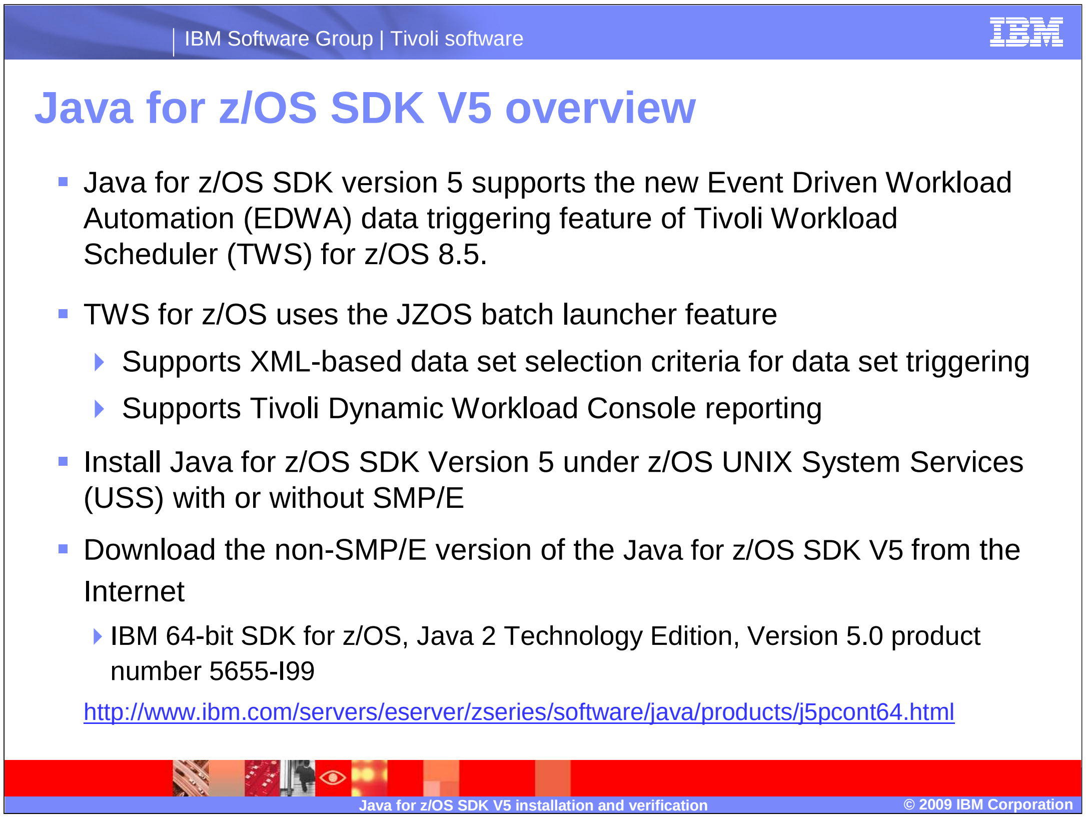
Data set triggering

Java for z/OS SDK V5 installation and verification

Updated August 26, 2009

Java™ for z/OS® SDK V5 installation and verification.

During this training module you will learn how to install and verify the z/OS-based Java SDK Version 5 under the UNIX System Services component of z/OS. This training prepares you for implementing the JZOS batch launcher and the new data set triggering features in Tivoli Workload Scheduler for z/OS 8.5.



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Java for z/OS SDK V5 overview

- Java for z/OS SDK version 5 supports the new Event Driven Workload Automation (EDWA) data triggering feature of Tivoli Workload Scheduler (TWS) for z/OS 8.5.
- TWS for z/OS uses the JZOS batch launcher feature
  - Supports XML-based data set selection criteria for data set triggering
  - Supports Tivoli Dynamic Workload Console reporting
- Install Java for z/OS SDK Version 5 under z/OS UNIX System Services (USS) with or without SMP/E
- Download the non-SMP/E version of the Java for z/OS SDK V5 from the Internet
  - IBM 64-bit SDK for z/OS, Java 2 Technology Edition, Version 5.0 product number 5655-I99

  http://www.ibm.com/servers/eserver/zseries/software/java/products/j5pcont64.html

Java for z/OS SDK V5 installation and verification

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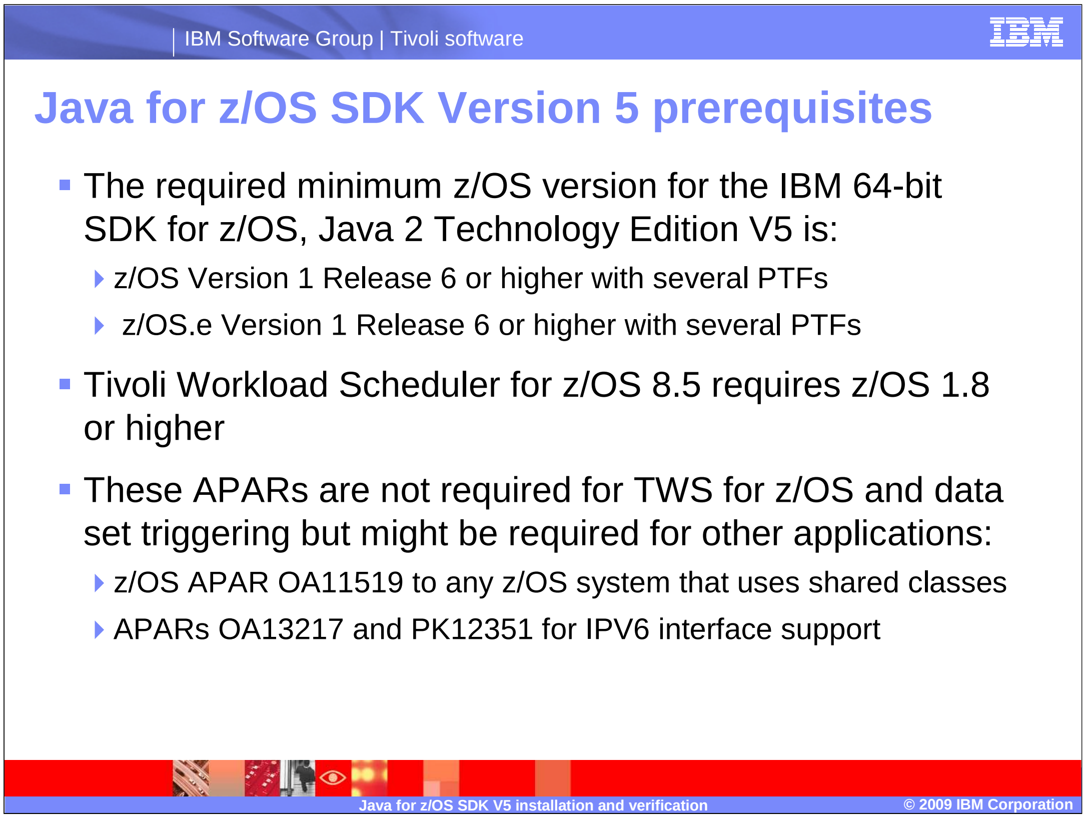
Java for z/OS SDK V5 overview.

The new Tivoli Workload Scheduler for z/OS 8.5 data set triggering feature must have the z/OS-based Java SDK. Java for z/OS SDK Version 5 supports the new Event Driven Workload Automation (EDWA) data triggering feature of Tivoli Workload Scheduler for z/OS 8.5.

Tivoli Workload Scheduler for z/OS uses the JZOS batch launcher that comes with the Java for z/OS SDK Version 5. The JZOS batch launcher supports Tivoli Workload Scheduler for z/OS XML data set selection criteria definitions for data set triggering. The JZOS batch launcher also supports historical run data archiving for Tivoli Dynamic Workload Console reporting. For more information about using XML and the JZOS batch launcher, see the *XML Implementation* training module and the *JZOS batch launcher implementation* module.

Install Java for z/OS SDK Version 5 under z/OS UNIX System Services (USS). You can use a standard SMP/E installable version or download the non-SMP/E version of Java for z/OS SDK Version 5 from the Internet. The required version is IBM 64-bit SDK for z/OS, Java 2 Technology Edition, Version 5.0 product number 5655-I99.

To obtain the download, see the URL listed on the slide. Instructions for downloading, installing, and verifying the Java for z/OS SDK Version 5 are available on the site.



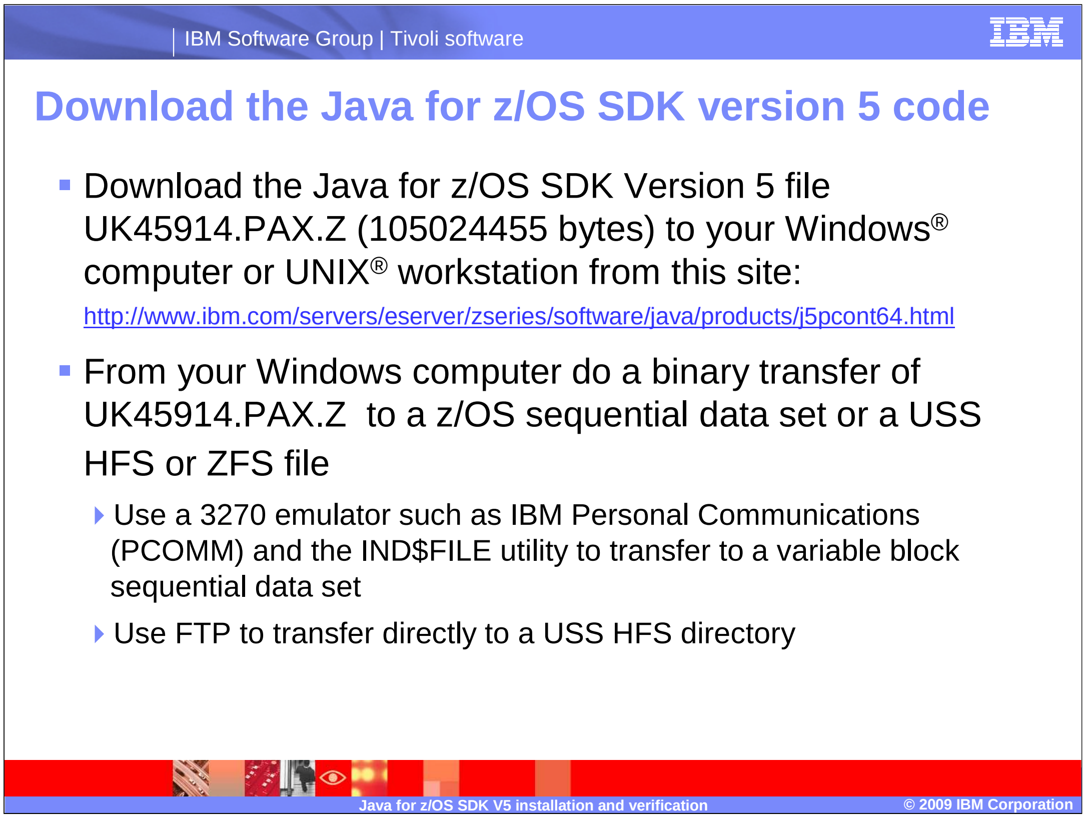
Java for z/OS SDK Version 5 prerequisites

- The required minimum z/OS version for the IBM 64-bit SDK for z/OS, Java 2 Technology Edition V5 is:
  - z/OS Version 1 Release 6 or higher with several PTFs
  - z/OS.e Version 1 Release 6 or higher with several PTFs
- Tivoli Workload Scheduler for z/OS 8.5 requires z/OS 1.8 or higher
- These APARs are not required for TWS for z/OS and data set triggering but might be required for other applications:
  - z/OS APAR OA11519 to any z/OS system that uses shared classes
  - APARs OA13217 and PK12351 for IPV6 interface support

Java for z/OS SDK version 5 prerequisites.

The IBM 64-bit SDK for z/OS, Java 2 Technology Edition, V5 requires a minimum of either z/OS Version 1 Release 6 plus PTFs or z/OS.e Version 1 Release 6 plus PTFs. See the Java for z/OS SDK Version 5 documentation on the download Web site for a list of these PTFs. There are no Java PTF requirements for higher version levels of z/OS.

Tivoli Workload Scheduler for z/OS 8.5 requires a minimum operating system level of z/OS 1.8. Tivoli Workload Scheduler for z/OS has no other prerequisite requirements concerning z/OS Java. However, you might need several APARs for other applications. These APARs are for shared classes and IP version 6 interface support. Install these APARs if you use Java for non-Tivoli Workload Scheduler for z/OS applications.



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Download the Java for z/OS SDK version 5 code

- Download the Java for z/OS SDK Version 5 file UK45914.PAX.Z (105024455 bytes) to your Windows® computer or UNIX® workstation from this site:
  http://www.ibm.com/servers/eserver/zseries/software/java/products/j5pcont64.html
- From your Windows computer do a binary transfer of UK45914.PAX.Z to a z/OS sequential data set or a USS HFS or ZFS file
  - Use a 3270 emulator such as IBM Personal Communications (PCOMM) and the IND$FILE utility to transfer to a variable block sequential data set
  - Use FTP to transfer directly to a USS HFS directory

Java for z/OS SDK V5 installation and verification

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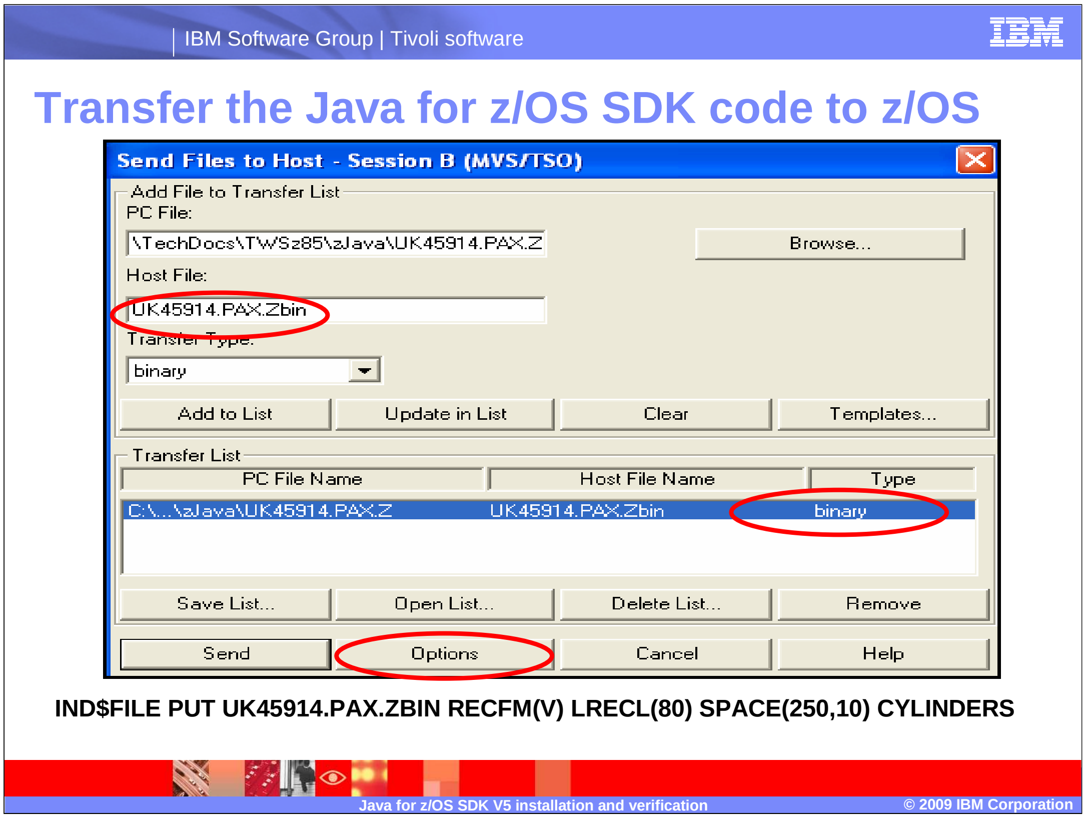
Download the Java for z/OS SDK Version 5 code.

Download the z/OS Java SDK installation package **UK45914.PAX.Z** from the Internet using the URL provided on this slide. You must be registered with IBM and have an IBM provided user ID and password to download the package. You can register when you prepare to download. After you download the package, verify that the file size is 105024455 bytes. Several releases of the Java for z/OS SDK Version 5 are available on the download site, and each release has a unique file name.

Use any viable file transfer software to transfer the downloaded file to your z/OS system. You can also use FTP to transfer the file directly into a UNIX System Services HFS directory. The transfer must be in binary mode. The examples in this training module use IBM Personal Communications (PCOMM) for the file transfer.

In the example on the next slide the Java for z/OS SDK Version 5 code file UK45914.PAX.ZBIN is transferred into a z/OS variable block sequential data set. You must expand the data set into a USS directory within an HFS or ZFS file system.



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Transfer the Java for z/OS SDK code to z/OS

Send Files to Host - Session B (MVS/TSO)

Add File to Transfer List

PC File: \TechDocs\TWSz85\zJava\UK45914.PAX.Z

Host File: UK45914.PAX.Zbin

Transfer Type: binary

Transfer List

PC File Name	Host File Name	Type
C:\...\zJava\UK45914.PAX.Z	UK45914.PAX.Zbin	binary

IND$FILE PUT UK45914.PAX.ZBIN RECFM(V) LRECL(80) SPACE(250,10) CYLINDERS

Java for z/OS SDK V5 installation and verification

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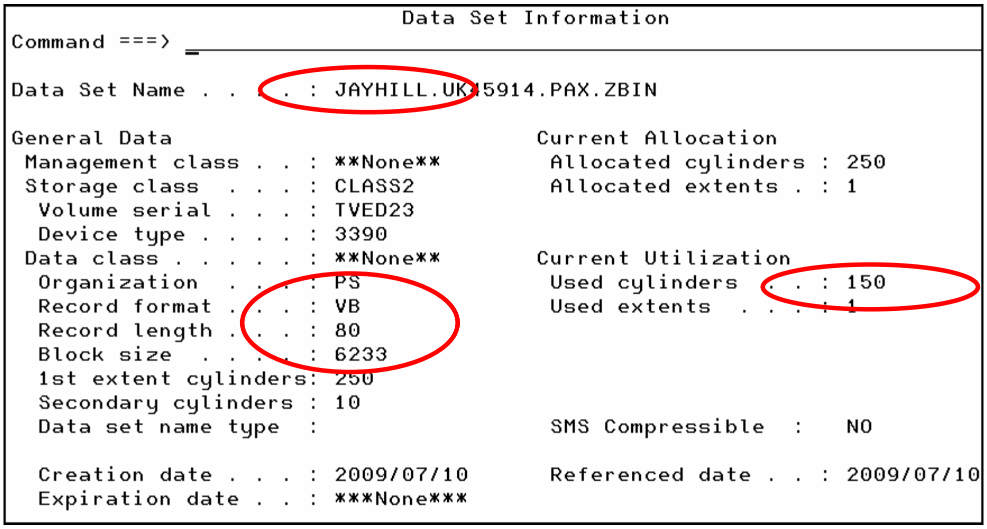
Transfer the Java for z/OS SDK code to z/OS.

On this slide is an example of a PCOMM session. The Java for z/OS SDK Version 5 code installation file is transferred to a z/OS sequential data set using this PCOMM session.

First, you use the Options button to set the PCOMM transfer options. Set the options to allocate an adequate amount of space for the sequential data set with variable blocked record format and record length set to 80. In this example, the 250 allocated cylinders are adequate for the file.

After you set the options, click the Send button. An IND$FILE command is created as shown on the slide. Note that PCOMM adds bin to the file extension of the installation file creating a file extension of **Zbin** when the file is transferred.

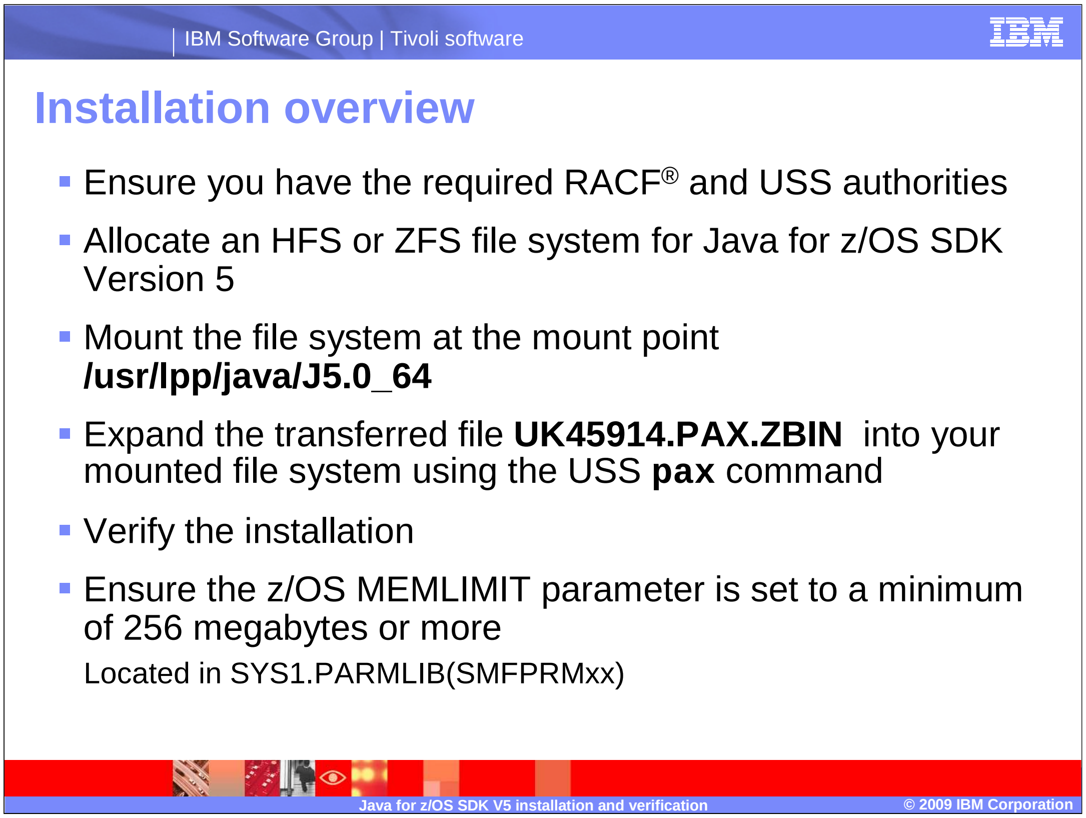
The z/OS data set



```
                             Data Set Information
Command ===> _

Data Set Name . . . . : JAYHILL.UK45914.PAX.ZBIN

General Data                           Current Allocation
 Management class . . : **None**        Allocated cylinders : 250
 Storage class  . . . : CLASS2          Allocated extents . : 1
  Volume serial . . . : TVED23
  Device type . . . . : 3390
 Data class . . . . . : **None**       Current Utilization
  Organization  . . . : PS              Used cylinders  . . : 150
  Record format . . . : VB              Used extents  . . . : 1
  Record length . . . : 80
  Block size  . . . . : 6233
  1st extent cylinders: 250
  Secondary cylinders : 10
  Data set name type  :                 SMS Compressible  :   NO

  Creation date . . . : 2009/07/10      Referenced date . . : 2009/07/10
  Expiration date . . : ***None***
```

The z/OS data set.

This slide shows a screen capture of the attribute information for the z/OS data set that contains the transferred file. The physical sequential data set is variable blocked and uses a total of 150 cylinders. In the example 250 cylinders were allocated for the data set JAYHILL.UK45914.PAX.ZBIN, but the data set is temporary. To recover your space, you can remove the data set after the installation is complete. Notice that the TSO user ID JAYHILL was added as a prefix in the data set name by the file transfer process.



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Installation overview

- Ensure you have the required RACF® and USS authorities
- Allocate an HFS or ZFS file system for Java for z/OS SDK Version 5
- Mount the file system at the mount point **/usr/lpp/java/J5.0_64**
- Expand the transferred file **UK45914.PAX.ZBIN** into your mounted file system using the USS **pax** command
- Verify the installation
- Ensure the z/OS MEMLIMIT parameter is set to a minimum of 256 megabytes or more

  Located in SYS1.PARMLIB(SMFPRMxx)

Java for z/OS SDK V5 installation and verification

Installation overview.

After you transfer the file you can start the installation process. Ensure that you log on with a user ID that has sufficient RACF and USS authority.

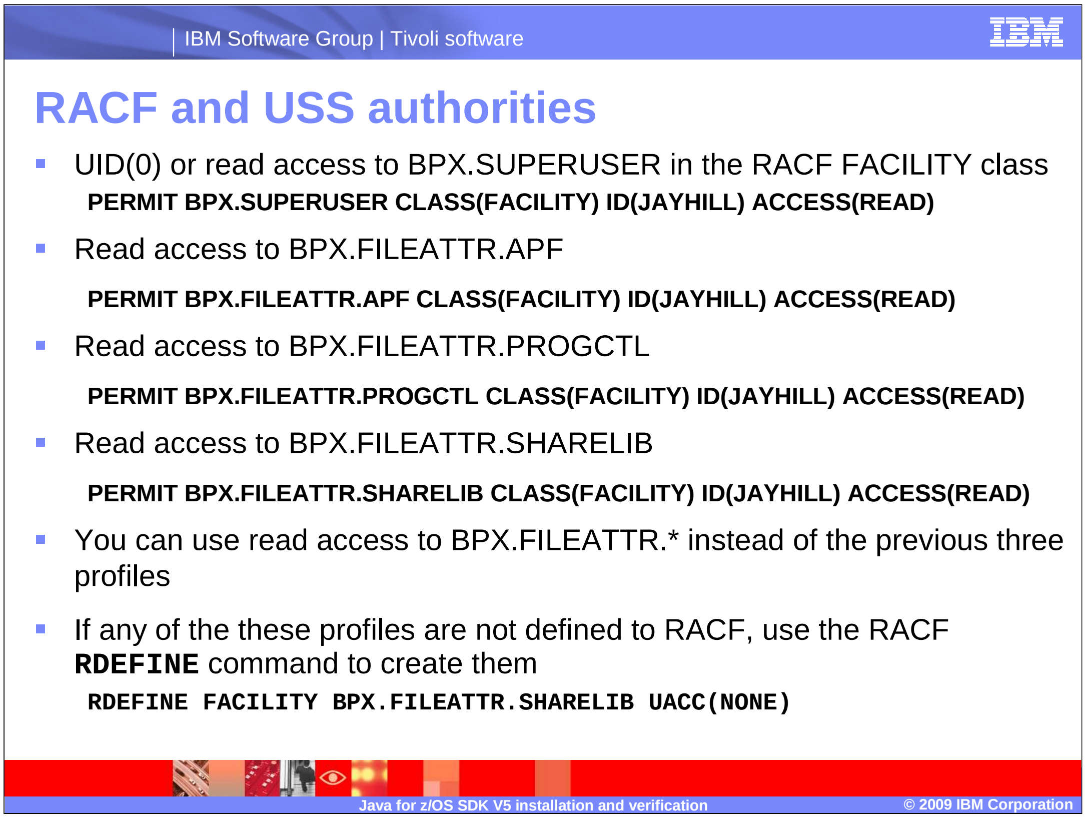
Allocate a HFS or ZFS because Java for z/OS SDK Version 5 installs into a USS HFS or ZFS file system. This example uses HFS.

Mount the HFS at the proper mount point ,which is /usr/lpp/java/J5.0_64 in this example.

The required J5.0_64 directory mount point does not have to be in the /usr/lpp/java path. The mount point can be anywhere, for example /mydir/J5.0_64.

If you use FTP to transfer the UK45914.PAX.ZBIN file directly into a USS directory, you can allocate the HFS before the transfer and use the HFS for the UK45914.PAX.ZBIN file.

Next, run the USS **pax** command to expand the installation file into the mounted HFS. Set the MEMLIMIT parameter to 256 megabytes or greater using the SMFPRMxx member of SYS1.PARMLIB. You might need to increase the MEMLIMIT depending on what applications are running. You can then verify the installation by running several Java commands.



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RACF and USS authorities

- UID(0) or read access to BPX.SUPERUSER in the RACF FACILITY class

```
PERMIT BPX.SUPERUSER CLASS(FACILITY) ID(JAYHILL) ACCESS(READ)
```

- Read access to BPX.FILEATTR.APF

```
PERMIT BPX.FILEATTR.APF CLASS(FACILITY) ID(JAYHILL) ACCESS(READ)
```

- Read access to BPX.FILEATTR.PROGCTL

```
PERMIT BPX.FILEATTR.PROGCTL CLASS(FACILITY) ID(JAYHILL) ACCESS(READ)
```

- Read access to BPX.FILEATTR.SHARELIB

```
PERMIT BPX.FILEATTR.SHARELIB CLASS(FACILITY) ID(JAYHILL) ACCESS(READ)
```

- You can use read access to BPX.FILEATTR.* instead of the previous three profiles
- If any of the these profiles are not defined to RACF, use the RACF **RDEFINE** command to create them

```
RDEFINE FACILITY BPX.FILEATTR.SHARELIB UACC(NONE)
```

Java for z/OS SDK V5 installation and verification

RACF and USS authorities.

To ensure a clean installation of the Java for z/OS SDK Version 5, make sure you have the user ID authorities listed on this slide. To restore the files with the proper permission bits, you must have these authorities. Work with your RACF administrator to ensure you have a TSO user ID with these authorities before starting the installation process. These RACF profiles are part of the FACILITY class under RACF.

This slide shows examples of the RACF **PERMIT** commands required to grant READ access to the TSO user ID JAYHILL. If these profiles are not defined for RACF, you can define them using the RACF RDEFINE command. An example of this command is at the bottom of the slide.

If the generic profile BPX.FILEATTR.* is available, you can use it instead of the other three discrete profiles listed on the slide.

The user ID must also have WRITE access to the **/usr/lpp/java/J5.0_64** and **/usr/lpp/java/J5.0_64/IBM** directory paths.

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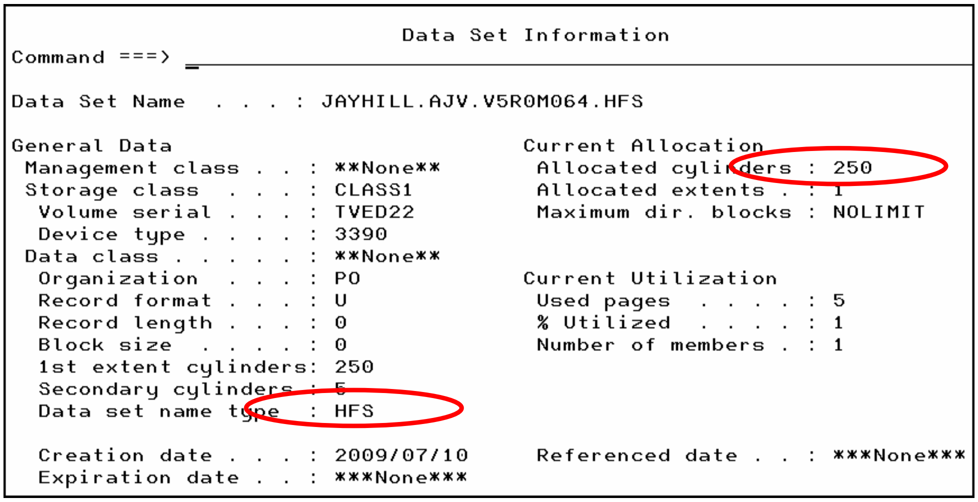
Allocate the HFS

Allocate an HFS large enough to accommodate the expanded **UK45914.PAX.ZBIN** file



```
                               Data Set Information
Command ===> _

Data Set Name  . . . : JAYHILL.AJV.V5R0M064.HFS

General Data                                  Current Allocation
 Management class . . : **None**               Allocated cylinders : 250
 Storage class  . . . : CLASS1                 Allocated extents . : 1
  Volume serial . . . : TVED22                 Maximum dir. blocks : NOLIMIT
  Device type . . . . : 3390
 Data class . . . . . : **None**
  Organization  . . . : PO                    Current Utilization
  Record format . . . : U                      Used pages  . . . . : 5
  Record length . . . : 0                      % Utilized  . . . . : 1
  Block size  . . . . : 0                      Number of members . : 1
  1st extent cylinders: 250
  Secondary cylinders : 5
  Data set name type  : HFS

  Creation date . . . : 2009/07/10             Referenced date . . : ***None***
  Expiration date . . : ***None***
```

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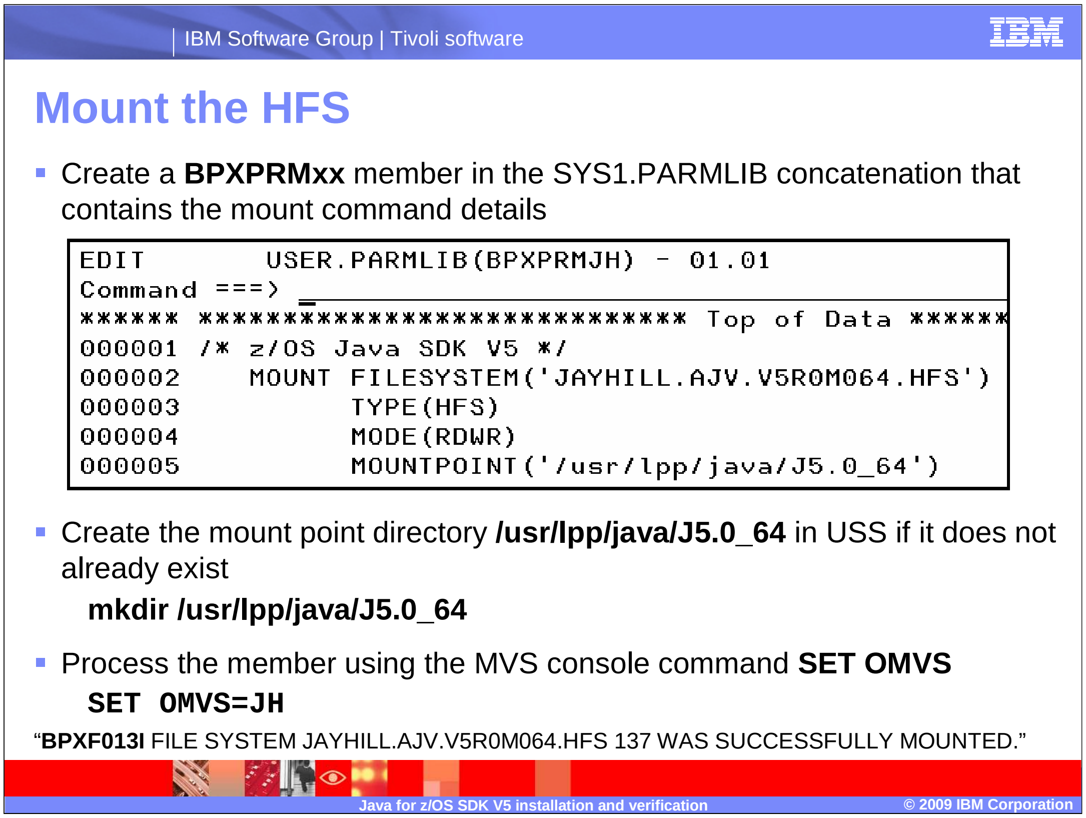
Allocate the HFS.

You will expand the Java for z/OS SDK Version 5 file **UK45914.PAX.ZBIN** into a directory under USS as part of the installation process. Before you expand the file, create an HFS that you can mount to the target directory under USS. The HFS must be large enough to contain the expanded file. In the example on the slide the HFS is 250 cylinders.



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Mount the HFS

- Create a **BPXPRMxx** member in the SYS1.PARMLIB concatenation that contains the mount command details

```
EDIT       USER.PARMLIB(BPXPRMJH) - 01.01
Command ===> _
****** ***************************** Top of Data ******
000001 /* z/OS Java SDK V5 */
000002    MOUNT FILESYSTEM('JAYHILL.AJV.V5R0M064.HFS')
000003          TYPE(HFS)
000004          MODE(RDWR)
000005          MOUNTPOINT('/usr/lpp/java/J5.0_64')
```

- Create the mount point directory **/usr/lpp/java/J5.0_64** in USS if it does not already exist

  mkdir /usr/lpp/java/J5.0_64

- Process the member using the MVS console command **SET OMVS**

  SET OMVS=JH

“**BPXF013I** FILE SYSTEM JAYHILL.AJV.V5R0M064.HFS 137 WAS SUCCESSFULLY MOUNTED.”

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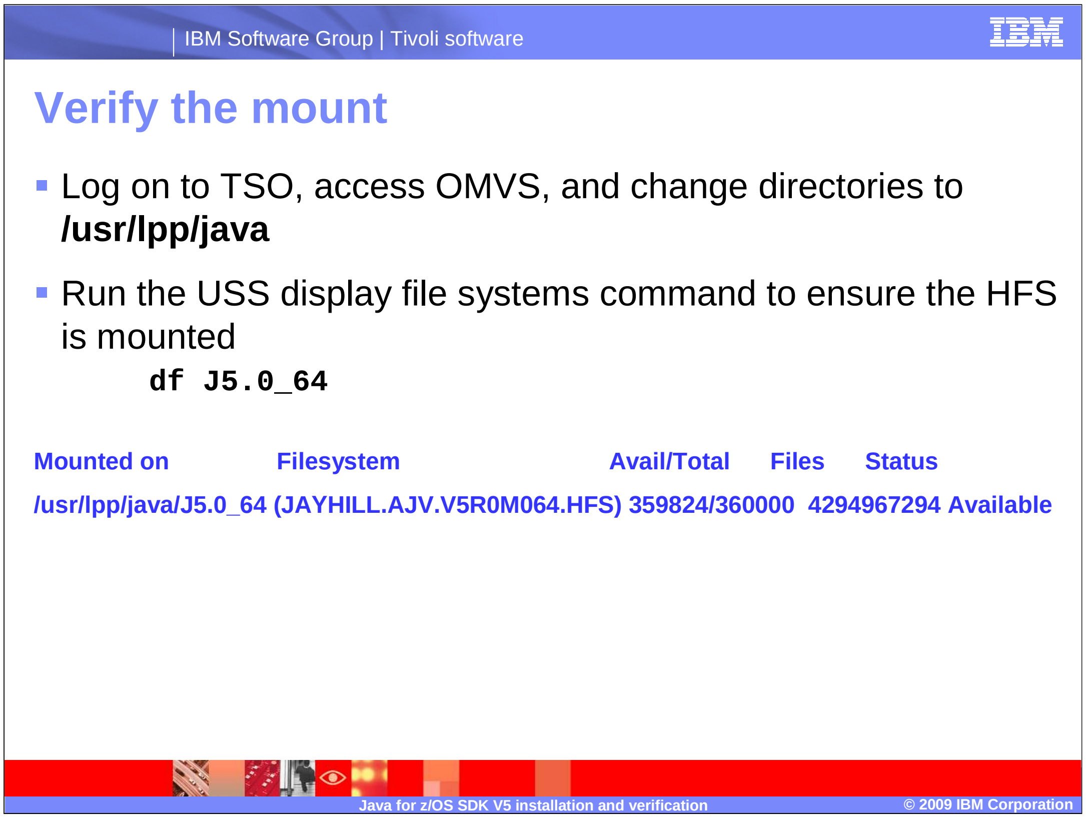
Mount the HFS.

Place the command to mount the HFS in a BPXPRMxx member of SYS1.PARMLIB. Create the mount point specified in the BPXPRMxx member if it does not already exist. You can create the mount point in OMVS using the **mkdir** command. The HFS in the example is mounted in read/write (RDWR) mode.

From SDSF use the SET OMVS=xx MVS console command to activate the BPXPRMxx member to mount the HFS without the need of an IPL. In the example the SET OMVS=JH command produced the message listed at the bottom of the slide. This message indicates that the mount was successful.



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Verify the mount

- Log on to TSO, access OMVS, and change directories to **/usr/lpp/java**
- Run the USS display file systems command to ensure the HFS is mounted

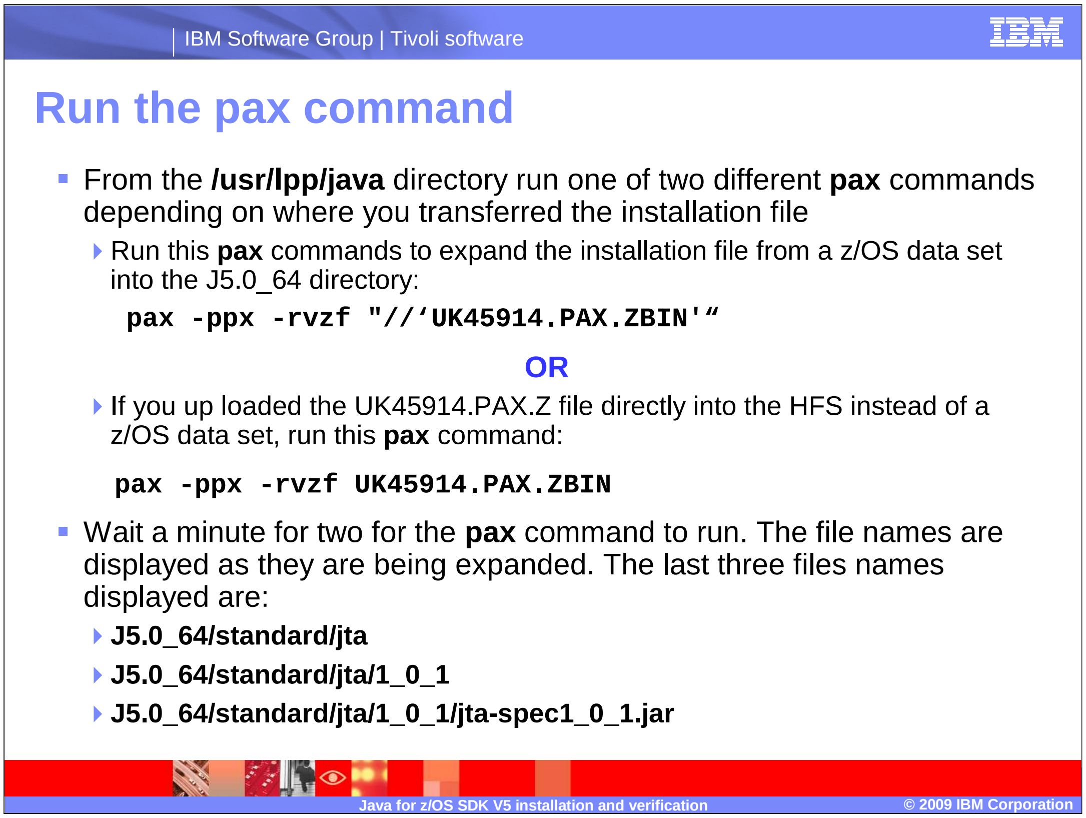
```
      df J5.0_64
```

```
Mounted on           Filesystem                       Avail/Total     Files      Status
/usr/lpp/java/J5.0_64 (JAYHILL.AJV.V5R0M064.HFS) 359824/360000  4294967294 Available
```

Java for z/OS SDK V5 installation and verification

Verify the mount.

Verify that the mount command worked as expected before expanding the installation file. Log on to TSO and access OMVS. Change directories to the **/usr/lpp/java** directory. From within that directory you can run the display file systems command **`df J5.0_64`**. The message that you see indicates that the HFS you allocated is mounted on the J5.0_64 directory with a status of Available.



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Run the pax command

- From the **/usr/lpp/java** directory run one of two different **pax** commands depending on where you transferred the installation file
  - Run this **pax** commands to expand the installation file from a z/OS data set into the J5.0_64 directory:

```
pax -ppx -rvzf "//‘UK45914.PAX.ZBIN'“
```

OR

  - If you up loaded the UK45914.PAX.Z file directly into the HFS instead of a z/OS data set, run this **pax** command:

```
pax -ppx -rvzf UK45914.PAX.ZBIN
```

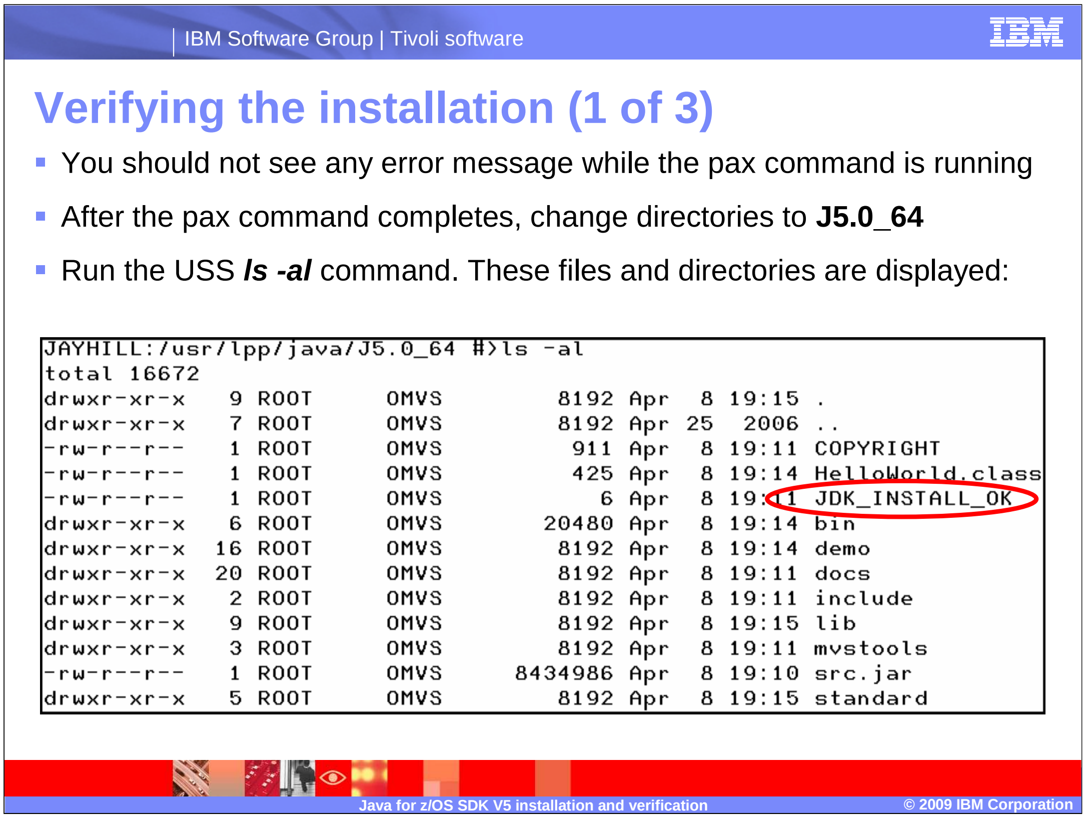
- Wait a minute for two for the **pax** command to run. The file names are displayed as they are being expanded. The last three files names displayed are:
  - **J5.0_64/standard/jta**
  - **J5.0_64/standard/jta/1_0_1**
  - **J5.0_64/standard/jta/1_0_1/jta-spec1_0_1.jar**

Java for z/OS SDK V5 installation and verification

Run the *pax* command.

The **pax** command expands the installation file into subdirectory J5.0_64 of the directory from where you are running the **pax** command. You can use two possible formats for the **pax** command. The correct format depends on where you transferred the **UK45914.PAX.ZBIN** installation file within your z/OS system. If you transferred the installation file into a z/OS data set, then you should use the first **pax** command format shown on the slide. If you transferred the installation file directly into an HFS, then you should use the second format. The example in this training module uses the first format.

After you run the **pax** command you see a long list of directory and file paths as they are being expanded and no error messages. The last three directory and file paths that you see are shown on the slide. After you see them, the **pax** command is complete. This process can take a few minutes.



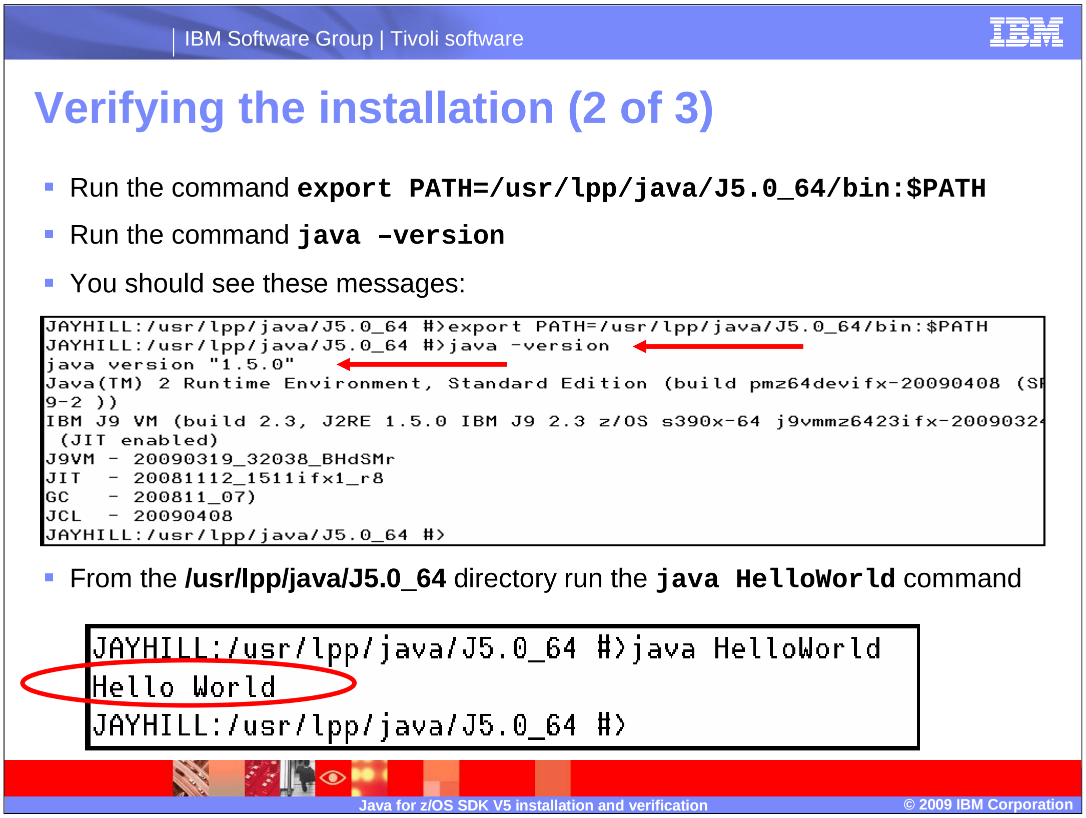
Verifying the installation (1 of 3)

- You should not see any error message while the pax command is running
- After the pax command completes, change directories to **J5.0_64**
- Run the USS ***ls -al*** command. These files and directories are displayed:

```
JAYHILL:/usr/lpp/java/J5.0_64 #>ls -al
total 16672
drwxr-xr-x   9 ROOT     OMVS         8192 Apr  8 19:15 .
drwxr-xr-x   7 ROOT     OMVS         8192 Apr 25  2006 ..
-rw-r--r--   1 ROOT     OMVS          911 Apr  8 19:11 COPYRIGHT
-rw-r--r--   1 ROOT     OMVS          425 Apr  8 19:14 HelloWorld.class
-rw-r--r--   1 ROOT     OMVS            6 Apr  8 19:11 JDK_INSTALL_OK
drwxr-xr-x   6 ROOT     OMVS        20480 Apr  8 19:14 bin
drwxr-xr-x  16 ROOT     OMVS         8192 Apr  8 19:14 demo
drwxr-xr-x  20 ROOT     OMVS         8192 Apr  8 19:11 docs
drwxr-xr-x   2 ROOT     OMVS         8192 Apr  8 19:11 include
drwxr-xr-x   9 ROOT     OMVS         8192 Apr  8 19:15 lib
drwxr-xr-x   3 ROOT     OMVS         8192 Apr  8 19:11 mvstools
-rw-r--r--   1 ROOT     OMVS      8434986 Apr  8 19:10 src.jar
drwxr-xr-x   5 ROOT     OMVS         8192 Apr  8 19:15 standard
```

Verifying the installation (1 of 3).

Change directories to the **J5.0_64** directory. Run the USS `ls -al` command to list the files and directories that were created when you ran the **pax** command. A file called JDK_INSTALL_OK indicates that the installation completed successfully. If this file is not present, investigate the messages displayed during the **pax** command to look for possible errors. You can rerun the **pax** command if needed. Also verify your RACF and USS authorities.



Verifying the installation (2 of 3)

- Run the command **`export PATH=/usr/lpp/java/J5.0_64/bin:$PATH`**
- Run the command **`java -version`**
- You should see these messages:

```
JAYHILL:/usr/lpp/java/J5.0_64 #>export PATH=/usr/lpp/java/J5.0_64/bin:$PATH
JAYHILL:/usr/lpp/java/J5.0_64 #>java -version
java version "1.5.0"
Java(TM) 2 Runtime Environment, Standard Edition (build pmz64devifx-20090408 (SR
9-2 ))
IBM J9 VM (build 2.3, J2RE 1.5.0 IBM J9 2.3 z/OS s390x-64 j9vmmz6423ifx-2009032
 (JIT enabled)
J9VM - 20090319_32038_BHdSMr
JIT  - 20081112_1511ifx1_r8
GC   - 200811_07)
JCL  - 20090408
JAYHILL:/usr/lpp/java/J5.0_64 #>
```

- From the **/usr/lpp/java/J5.0_64** directory run the **`java HelloWorld`** command

```
JAYHILL:/usr/lpp/java/J5.0_64 #>java HelloWorld
Hello World
JAYHILL:/usr/lpp/java/J5.0_64 #>
```

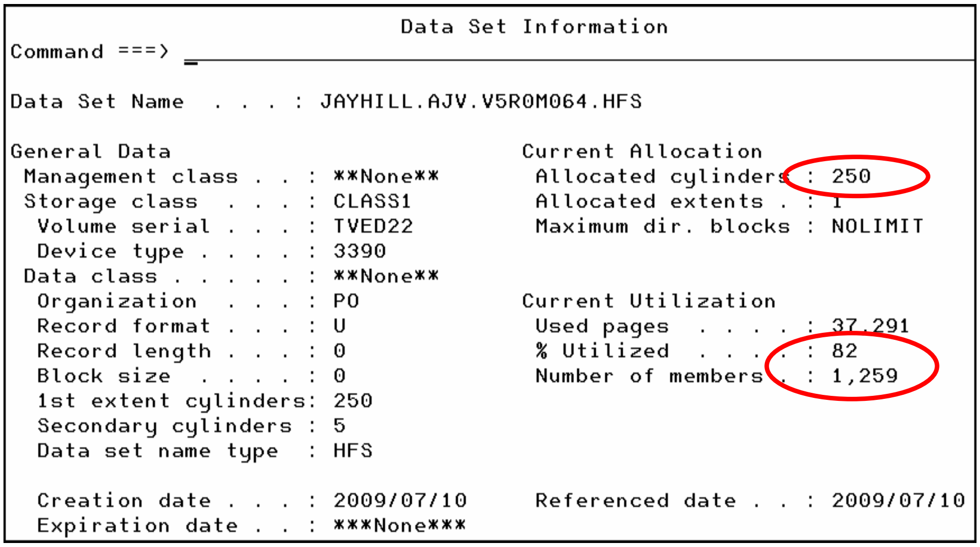
Verifying the installation (2 of 3).

From OMVS run the **`export PATH`** command to establish access to the Java for z/OS SDK Version 5 binary executables. Run the **`java -version`** command. If the installation was successful, you see the messages shown in the slide. The message **java version "1.5.0"** should be the first message you see.

You can also run the export path command and then run the **`java HelloWorld`** command from the J5.0_64 directory. This command runs the HelloWorld class located in that directory and displays the text Hello World if the installation is successful.

Verifying the installation (3 of 3)

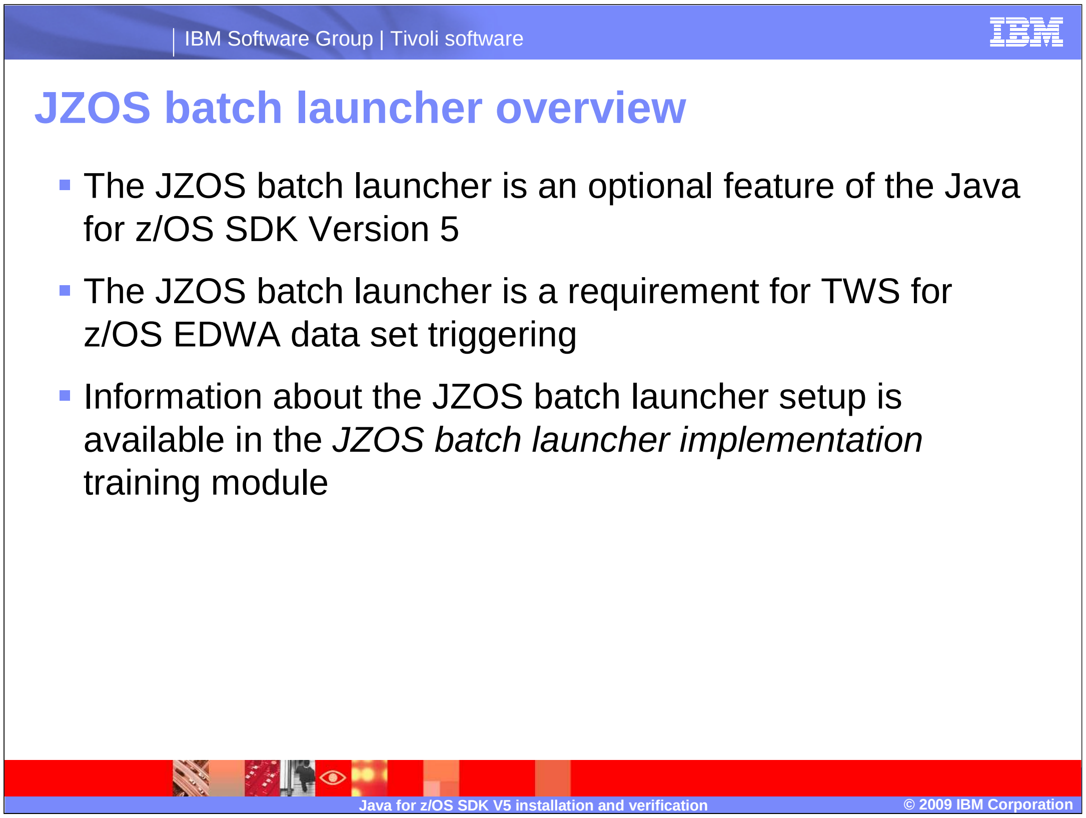
Review the HFS data set space utilization from TSO/ISPF option 3.4



```
                              Data Set Information
Command ===> _

Data Set Name  . . . : JAYHILL.AJV.V5R0M064.HFS

General Data                          Current Allocation
 Management class . . : **None**       Allocated cylinders : 250
 Storage class  . . . : CLASS1         Allocated extents . : 1
  Volume serial . . . : TVED22         Maximum dir. blocks : NOLIMIT
  Device type . . . . : 3390
 Data class . . . . . : **None**
  Organization  . . . : PO            Current Utilization
  Record format . . . : U              Used pages  . . . . : 37,291
  Record length . . . : 0              % Utilized  . . . . : 82
  Block size  . . . . : 0              Number of members . : 1,259
  1st extent cylinders: 250
  Secondary cylinders : 5
  Data set name type  : HFS

  Creation date . . . : 2009/07/10     Referenced date . . : 2009/07/10
  Expiration date . . : ***None***
```

Verifying the installation (3 of 3).

You can also confirm a successful installation by reviewing the amount of disk space the installation used in the HFS. If you specified 250 cylinders when you allocated the HFS, the **% Utilized** is **82**, and the **Number of Members** is **1,259**.



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JZOS batch launcher overview

- The JZOS batch launcher is an optional feature of the Java for z/OS SDK Version 5
- The JZOS batch launcher is a requirement for TWS for z/OS EDWA data set triggering
- Information about the JZOS batch launcher setup is available in the *JZOS batch launcher implementation* training module

Java for z/OS SDK V5 installation and verification

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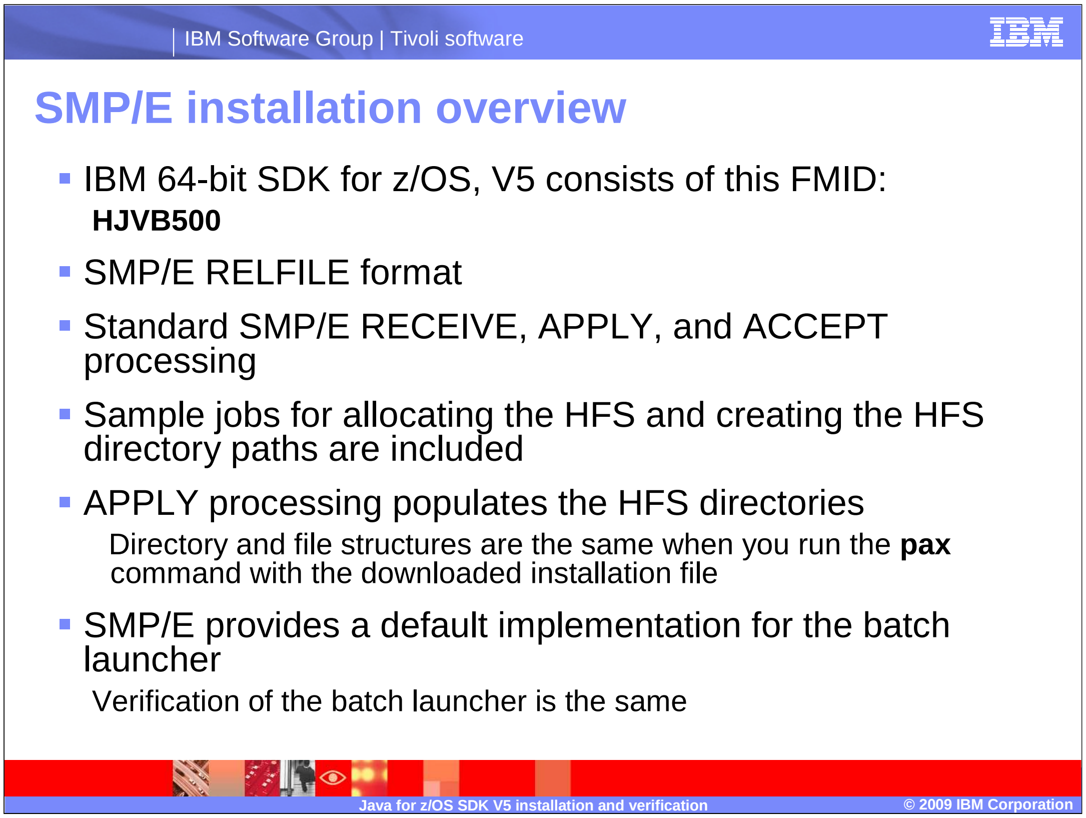
JZOS batch launcher overview.

The JZOS batch launcher is an optional feature of Java for z/OS SDK Version 5 . However, you must have this feature to use Tivoli Workload Scheduler for z/OS EDWA data set triggering and to implement EDWA.

Information about the JZOS batch launcher setup is available in the *JZOS batch launcher implementation* training module.



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SMP/E installation overview

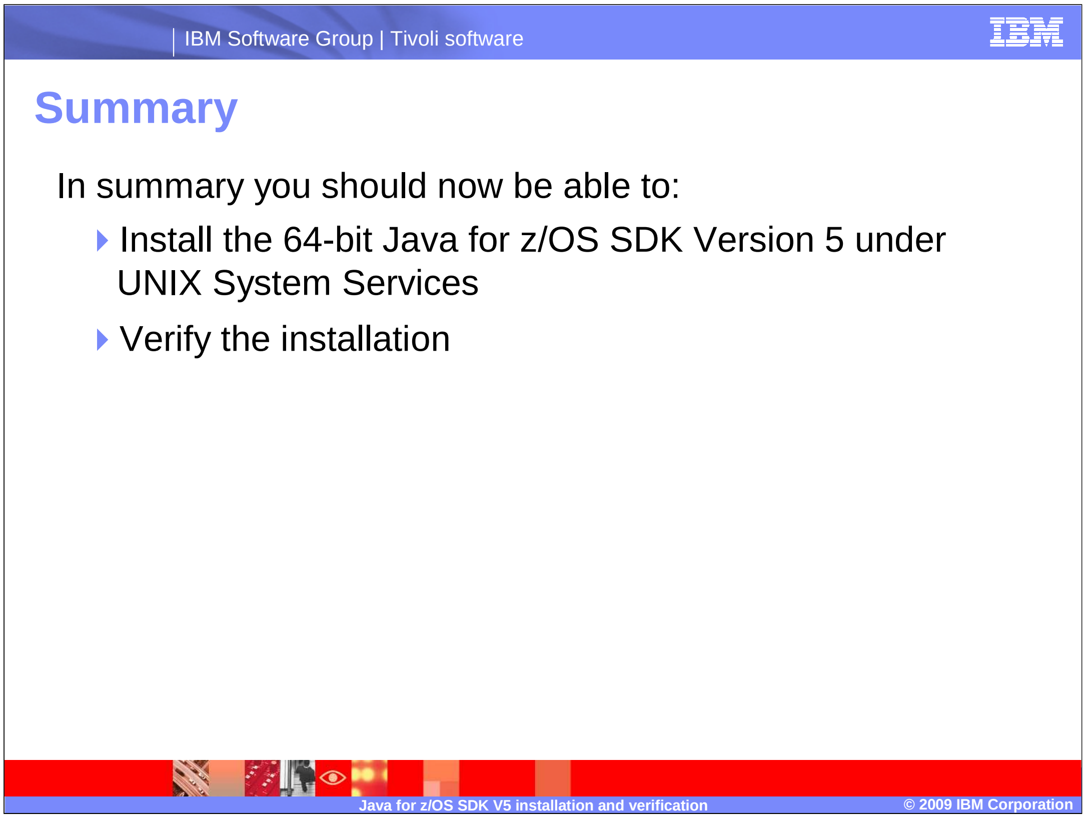
- IBM 64-bit SDK for z/OS, V5 consists of this FMID:
  HJVB500
- SMP/E RELFILE format
- Standard SMP/E RECEIVE, APPLY, and ACCEPT processing
- Sample jobs for allocating the HFS and creating the HFS directory paths are included
- APPLY processing populates the HFS directories
  Directory and file structures are the same when you run the **pax** command with the downloaded installation file
- SMP/E provides a default implementation for the batch launcher
  Verification of the batch launcher is the same

Java for z/OS SDK V5 installation and verification

SMP/E Installation Overview.

If you have access to the SMP/E installable files for the 64 bit Java for z/OS SDK Version 5 , you can use SMP/E for the installation. The SMP/E files are in RELFILE format, and the installation is a standard SMP/E RECEIVE, APPLY, and ACCEPT process. The SMP/E installation provides sample jobs for allocating the required HFS and directory path structure. The SMP/E APPLY process populates the HFS directory in the same way as the **pax** command. The subsequent verification process is also the same. The SMP/E installation implements a default JZOS batch launcher setup.

The SMP/E installation process by default places a load module in SYS1.SIEALNKE for the JZOS batch launcher. The SMP/E installation also includes a sample procedure in SYS1.PROCLIB and a sample JCL in SYS1.SAMPLIB. For more information about these items, see the *JZOS batch launcher implementation* training module.



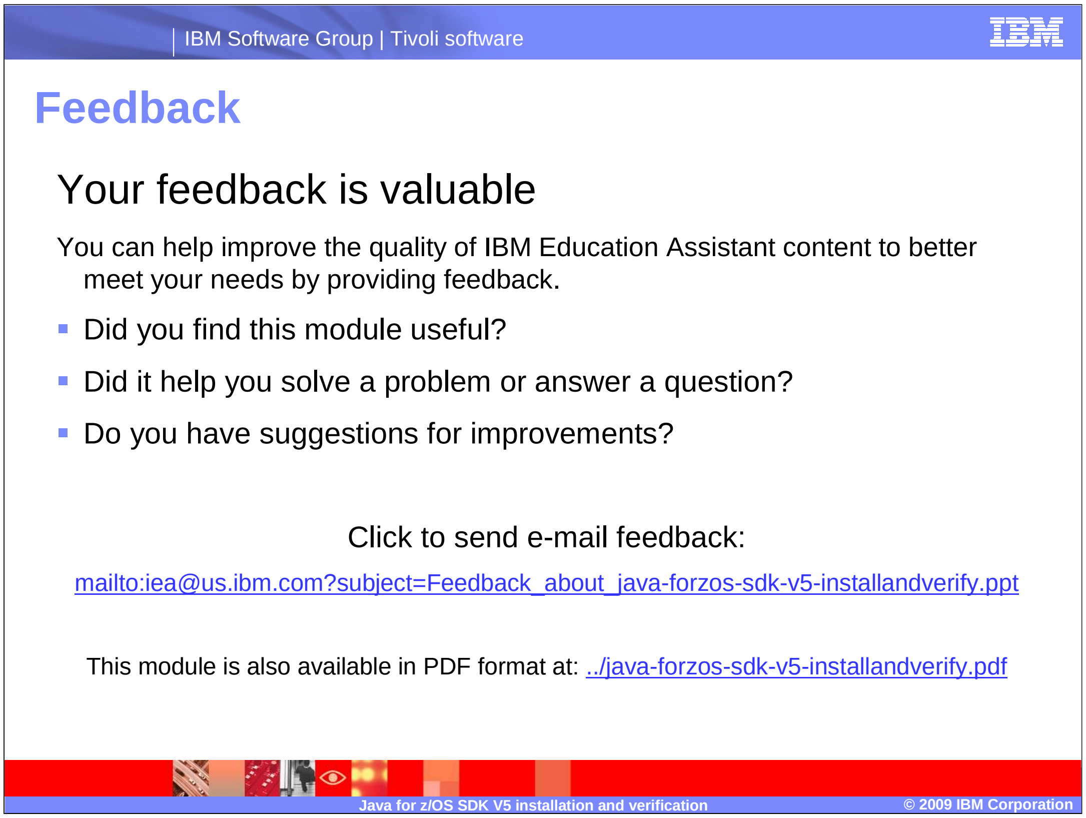
Summary

In summary you should now be able to:

- Install the 64-bit Java for z/OS SDK Version 5 under UNIX System Services
- Verify the installation

Summary.

In summary you should now be able to install the 64 bit Java for z/OS SDK Version 5 under UNIX System Services and verify the installation.



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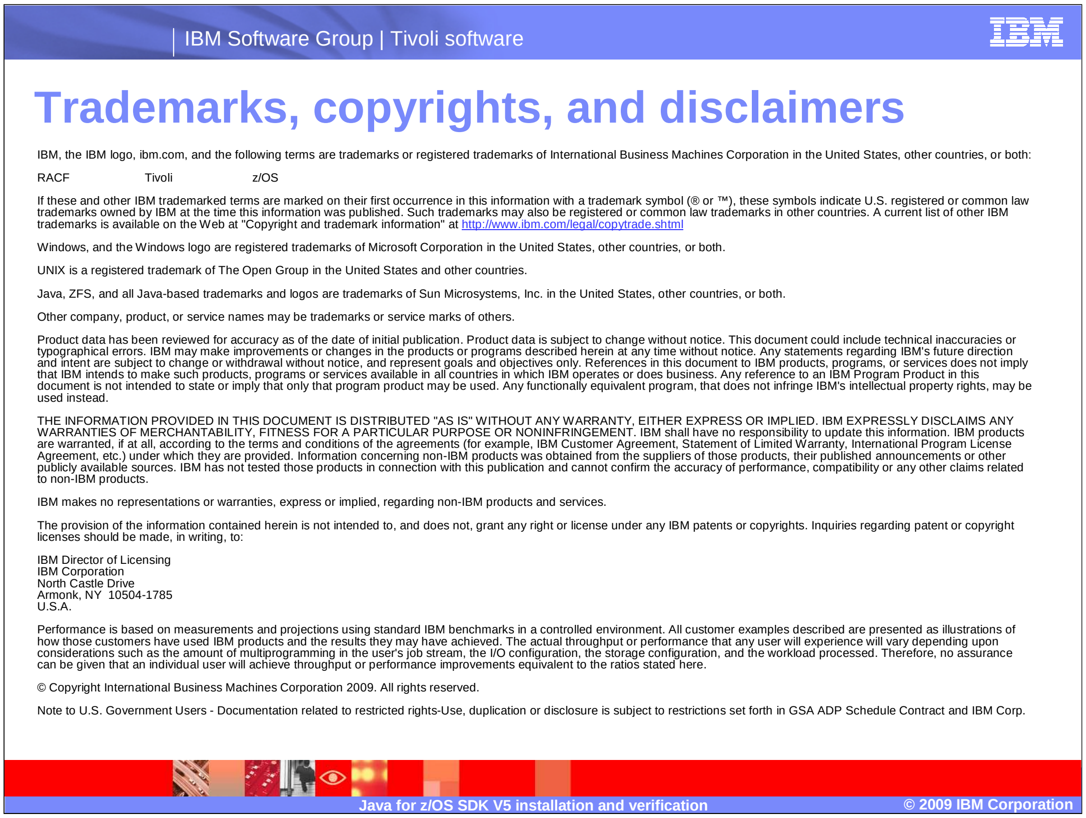

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