IBM

Program Directory for

IBM Open XL C/C++ 1.1 for z/OS

Program Number 5650-ZOS

FMIDs HLB77C2

for Use with
z/OS 2.4
z/OS 2.5

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GI13-5701-01

Contents

Figures

1.0 Introduction

This program directory is intended for the system programmers who are responsible for program installation and maintenance. It contains information about the material and procedures associated with the installation of the IBM Open XL C/C++ 1.1 for z/OS. This publication refers to IBM Open XL C/C++ 1.1 for z/OS as Open XL C/C++ 1.1.

The Program Directory contains the following sections:

- 2.0, "Program Materials" on page 2 identifies the basic program materials and documentation for Open XL C/C++ 1.1.

- 3.0, "Program Support" on page 5 describes the IBM support available for Open XL C/C++ 1.1.

- 4.0, "Program and Service Level Information" on page 7 lists the APARs (program level) and PTFs (service level) that have been incorporated into Open XL C/C++ 1.1.

- 5.0, "Installation Requirements and Considerations" on page 8 identifies the resources and considerations that are required for installing and using Open XL C/C++ 1.1.

- 6.0, "Installation Instructions" on page 15 provides detailed installation instructions for Open XL C/C++ 1.1. It also describes the procedures for activating the functions of Open XL C/C++ 1.1, or refers to appropriate publications.

Before installing Open XL C/C++ 1.1, read the 3.2, "Preventive Service Planning" on page 5. This section tells you how to find any updates to the information and procedures in this program directory.

1.1 Open XL C/C++ 1.1 Description

The IBM Open XL C/C++ 1.1 is the first C/C++ compiler on z/OS that is fully based on the open source LLVM infrastructure. It supports up to C17/C18 and C++17 language standard features and leverages the features of the IBM z16 mainframe. The Open XL C/C++ 1.1 for z/OS compiler supports EBCDIC and ASCII execution character sets, and generates AMODE 64 code, making it ideal for z/OS UNIX System Services users porting applications from distributed platforms. Open XL C/C++ 1.1 for z/OS is available as a no-charge add-on feature for clients that have enabled the XL C/C++ compiler (an optionally priced feature) on z/OS 2.4 or 2.5.

1.2 Open XL C/C++ 1.1 FMIDs

Open XL C/C++ 1.1 consists of the following FMIDs:

   HLB77C2 (OPEN XL C/C++)

2.0 Program Materials

An IBM program is identified by a program number. The program number for Open XL C/C++ 1.1 is 5650-ZOS. There is no feature number for Open XL C/C++ 1.1 as it is being delivered through the web download site.

Basic Machine-Readable Materials are materials that are supplied under the base license and are required for the use of the product.

2.1 Basic Machine-Readable Material

The distribution medium for this program is web delivery. The code for this deliverable can be downloaded from z/OS Downloads at https://www-40.ibm.com/servers/resourcelink/svc00100.nsf/pages/zosDownloads/.

The deliverable contains all the programs and data needed for installation. This program is in SMP/E RELFILE format and is installed by using SMP/E. See 6.0, "Installation Instructions" on page 15 for more information about how to install the program.

2.2 Optional Machine-Readable Material

No optional machine-readable materials are provided for Open XL C/C++ 1.1.

2.3 Program Publications

This section identifies the basic and optional publications for Open XL C/C++ 1.1.

2.3.1 Basic Program Publications

Figure 1 identifies the basic unlicensed publications for Open XL C/C++ 1.1. Those that are in softcopy format publications can be obtained from the URLs listed below.

Figure 1 (Page 1 of 2). Basic Material: Unlicensed		
Publication Title	**Form Number**	**Media Format**
What's new for IBM Open XL C/C++ 1.1 for z/OS	SC31-5712-00	See note below
Migration Guide for IBM Open XL C/C++ 1.1 for z/OS	SC31-5713-00	See note below
Compiler Reference for IBM Open XL C/C++ 1.1 for z/OS	SC31-5714-00	See note below
z/OS V2R4 XL C/C++ Runtime Library Reference	SC14-7314-40	See note below

Figure 1 (Page 2 of 2). Basic Material: Unlicensed		
Publication Title	**Form Number**	**Media Format**
Common Debug Architecture Library Reference	SC14-7311-40	See note below
DWARF/ELF Extensions Library Reference	SC14-7312-40	See note below

Note:

The publications can be obtained from:

- IBM Resource Link at http://www.ibm.com/servers/resourcelink

- IBM Publications Center at http://www.ibm.com/shop/publications/order

- z/OS XL C/C++ Documentation Library link at
  https://www-01.ibm.com/support/docview.wss?uid=swg27036892

Regardless of the method you use to obtain the publications, make sure you have the correct level of the documentation (as shown in the final two digits of the order number in the above table).

2.3.2 Optional Program Publications

No optional publications are provided for Open XL C/C++ 1.1.

2.4 Program Source Materials

No program source materials or viewable program listings are provided for Open XL C/C++ 1.1.

2.5 Publications Useful During Installation

You might want to use the publications listed in Figure 2 during the installation of Open XL C/C++ 1.1.

Figure 2 (Page 1 of 2). Publications Useful During Installation		
Publication Title	**Form Number**	**Media Format**
IBM SMP/E for z/OS User's Guide	SA23-2277-40	https://www-40.ibm.com/servers/resourcelink/svc00100.nsf/pages/zOSV2R4SmpeVersion3Publications?OpenDocument
IBM SMP/E for z/OS Commands	SA23-2275-40	https://www-40.ibm.com/servers/resourcelink/svc00100.nsf/pages/zOSV2R4SmpeVersion3Publications?OpenDocument

Figure 2 (Page 2 of 2). Publications Useful During Installation		
Publication Title	**Form Number**	**Media Format**
IBM SMP/E for z/OS Reference	SA23-2276-40	https://www-40.ibm.com/servers/resourcelink/svc00100.nsf/pages/zOSV2R4SmpeVersion3Publications?OpenDocument
IBM SMP/E for z/OS Messages, Codes, and Diagnosis	GA32-0883-40	https://www-40.ibm.com/servers/resourcelink/svc00100.nsf/pages/zOSV2R4SmpeVersion3Publications?OpenDocument

3.0 Program Support

This section describes the IBM support available for Open XL C/C++ 1.1.

3.1 Program Services

Contact your IBM representative for specific information about available program services.

3.2 Preventive Service Planning

Before you install Open XL C/C++ 1.1, make sure that you have reviewed the current Preventive Service Planning (PSP) information. The PSP Buckets maintain current lists (which have been identified since the package was created) of any recommended or required service for the installation of this package. This service includes software PSP information (ZOSV2R4 PSP Bucket, subset ZOSCCPP) that contains HIPER, and/or required PTFs against the base release.

Although SW, HW, and functional PSP Buckets might have overlap, review all that apply to this package to ensure that you identify all the known service that is required for your installation of this package.

For program support, access the Software Support web site at http://www.ibm.com/software/support/

PSP Buckets are identified by UPGRADEs, which specify product levels; and SUBSETs, which specify the FMIDs for a product level. The UPGRADE and SUBSET values for Open XL C/C++ 1.1 is shown in Figure 3

UPGRADE	SUBSET	Description	FMID
Figure 3. PSP Upgrade and Subset ID			
ZOSV2R4	ZOSCCPP	Open XL C/C++	HLB77C2

3.3 Statement of Support Procedures

Report any problems which you feel might be an error in the product materials to your IBM Support Center. You may be asked to gather and submit additional diagnostics to assist the IBM Support Center in their analysis.

Figure 4 lists the component IDs (COMPID) for Open XL C/C++ 1.1.

Figure 4. Component IDs			
FMID	**COMPID**	**Component Name**	**RETAIN Release**
HLB77C2	56551210A	OPEN XL C/C++	7C2

4.0 Program and Service Level Information

This section identifies the program and relevant service levels of Open XL C/C++ 1.1. The program level refers to the APAR fixes that have been incorporated into the program. The service level refers to the PTFs that have been incorporated into the program.

4.1 Program Level Information

The following APAR fixes against previous releases of Open XL C/C++ 1.1 have been incorporated into this release. They are listed by FMID.

  * HLB77C2

This is the first release of the product. There is no APAR fixes that have been incorporated into the program.

4.2 Service Level Information

No PTFs against this release of Open XL C/C++ 1.1 have been incorporated into the product package.

It is highly recommended that you frequently check the Open XL C/C++ 1.1 PSP Bucket (ZOSV2R4, subset ZOSCCPP) for HIPER and SPECIAL Attention PTFs against all FMIDs that you must install.

4.3 Understanding Open XL C/C++ 1.1 Support Service

You did not receive any service with your deliverable.

5.0 Installation Requirements and Considerations

The following sections identify the system requirements for installing and activating Open XL C/C++ 1.1. The following terminology is used:

- *Driving system*: the system on which SMP/E is executed to install the program.

  The program might have specific operating system or product level requirements for using processes, such as binder or assembly utilities during the installation.

- *Target system*: the system on which the program is configured and run.

  The program might have specific product level requirements, such as needing access to the library of another product for link-edits. These requirements, either mandatory or optional, might directly affect the element during the installation or in its basic or enhanced operation.

In many cases, you can use a system as both a driving system and a target system. However, you can make a separate IPL-able clone of the running system to use as a target system. The clone must include copies of all system libraries that SMP/E updates, copies of the SMP/E CSI data sets that describe the system libraries, and your PARMLIB and PROCLIB.

Use separate driving and target systems in the following situations:

- When you install a new level of a product that is already installed, the new level of the product will replace the old one. By installing the new level onto a separate target system, you can test the new level and keep the old one in production at the same time.

- When you install a product that shares libraries or load modules with other products, the installation can disrupt the other products. By installing the product onto a separate target system, you can assess these impacts without disrupting your production system.

5.1 Driving System Requirements

This section describes the environment of the driving system required to install Open XL C/C++ 1.1.

5.1.1 Machine Requirements

The driving system can run in any hardware environment that supports the required software.

5.1.2 Programming Requirements

Figure 5. Driving System Software Requirements				
Program Number	**Product Name**	**Minimum VRM**	**Minimum Service Level will satisfy these APARs**	**Included in the shipped product?**
Any **one** of the following:				
5650-ZOS	z/OS	V2.4.0	N/A	No
5650-ZOS	z/OS	V2.5.0	N/A	No

Note: Installation might require migration to new z/OS releases to be service supported. See z/OS Support Lifecycle at https://www.ibm.com/support/pages/lifecycle/search?q=5650-zos .

Open XL C/C++ 1.1 is installed into a file system, either HFS or zFS. Before installing Open XL C/C++ 1.1, you must ensure that the target system file system data sets are available for processing on the driving system. OMVS must be active on the driving system and the target system file data sets must be mounted on the driving system.

If you plan to install Open XL C/C++ 1.1 in a zFS file system, this requires that zFS must be active on the driving system. Information on activating and using zFS can be found in z/OS Distributed File Service zSeries File System Administration, SC24-5989.

5.2 Target System Requirements

This section describes the environment of the target system required to install and use Open XL C/C++ 1.1.

Open XL C/C++ 1.1 installs in the z/OS (Z038) SREL.

5.2.1 Machine Requirements

The target system can run in any hardware environment that supports the required software.

5.2.2 Programming Requirements

5.2.2.1 Installation Requisites: Installation requisites identify products that are required and *must* be present on the system or products that are not required but *should* be present on the system for the successful installation of this product.

Mandatory installation requisites identify products that are required on the system for the successful installation of this product. These products are specified as PREs or REQs.

			Minimum Service Level will satisfy these	Included in the shipped
Program Number	Product Name	Minimum VRM	APARs	product?
5650-ZOS	z/OS	V2.4.0	N/A	No
5650-ZOS	z/OS	V2.5.0	N/A	No

Figure 6. Target System Mandatory Installation Requisites

Note: Installation might require migration to new z/OS releases to be service supported. See http://www.ibm.com/systems/z/os/zos/support/zos_eos_dates.html.

To download IBM Open XL C/C++ 1.1 for z/OS see http://www.ibm.com/systems/z/os/zos/downloads/.

Conditional installation requisites identify products that are *not* required for successful installation of this product but can resolve such things as certain warning messages at installation time.

Note: The Open XL C/C++ 1.1 installation verification program (IVP) job uses the temporary directory /tmp as work directory for processing inputs and outputs. Ensure that the file system (either HFS or ZFS) is available on the target system before you run the job. Refer 6.1.11, "Run the Installation Verification Programs" on page 22 and the sample job, CNWJIVP for additional information.

5.2.2.2 Operational Requisites: Operational requisites are products that are required and *must* be present on the system or products that are not required but *should* be present on the system for this product to operate all or part of its functions.

Mandatory operational requisites identify products that are required for this product to operate its basic functions.

Program Number	Product Name and Minimum VRM/Service Level	Function
5650-ZOS	Language Environment for z/OS V2.4.0, or V2.5.0	
5650-ZOS	UNIX System Service for z/OS V2.4.0, or V2.5.0	
5650-ZOS	Runtime Library Extensions for z/OS V2.4.0	
5650-ZOS	Runtime Library Extensions for z/OS V2.4.0 with APARs(PTFs) PH44479(UI80106) applied.	OpenBLAS support for IBM Open XL C/C++ 1.1 for z/OS

Figure 7 (Page 1 of 2). Target System Mandatory Operational Requisites

Figure 7 (Page 2 of 2). Target System Mandatory Operational Requisites		
Program Number	**Product Name and Minimum VRM/Service Level**	**Function**
5650-ZOS	Language Environment for z/OS V2.4.0 with APARs(PTFs) PH45516/PH45537/PH45663(UI80155), PH39857(UI78103) and PH41221(UI78913) applied.	IBM Open XL C/C++ 1.1 for z/OS C++ runtime support header update for IBM Open XL C/C++ 1.1 for z/OS OpenBLAS support for IBM Open XL C/C++ 1.1 for z/OS Language Environment update
5650-ZOS	Language Environment for z/OS V2.5.0 with APARs(PTFs) PH45536/PH45538/PH45672(UI80156) and PH41221(UI78912) applied.	IBM Open XL C/C++ 1.1 for z/OS C++ runtime support header update for IBM Open XL C/C++ 1.1 for z/OS OpenBLAS support for IBM Open XL C/C++ 1.1 for z/OS Language Environment update

Conditional operational requisites identify products that are *not* required for this product to operate its basic functions but are required at run time for this product to operate specific functions.

There are no conditional operational requisites for this product.

5.2.2.3 Toleration/Coexistence Requisites: Toleration/coexistence requisites identify products that must be present on sharing systems. These systems can be other systems in a multisystem environment (not necessarily sysplex), a shared DASD environment (such as test and production), or systems that reuse the same DASD environment at different time intervals.

5.2.2.4 Incompatibility (Negative) Requisites: Negative requisites identify products that must not be installed on the same system as this product.

Open XL C/C++ 1.1 has no negative requisites.

5.2.3 DASD Storage Requirements

Open XL C/C++ 1.1 libraries can reside on all supported DASD types.

Figure 8 lists the total space that is required for each type of library.

Figure 8 (Page 1 of 2). Total DASD Space Required by Open XL C/C++ 1.1	
Library Type	**Total Space Required in 3390 Trks**
Target	15000

Figure 8 (Page 2 of 2). Total DASD Space Required by Open XL C/C++ 1.1	
Library Type	**Total Space Required in 3390 Trks**
Distribution	15000

Notes:

1. For non-RECFM U data sets, IBM recommends using system-determined block sizes for efficient DASD utilization. For RECFM U data sets, IBM recommends using a block size of 32760, which is most efficient from the performance and DASD utilization perspective.

2. Abbreviations used for data set types are shown as follows.

   U Unique data set, allocated by this product and used by only this product. This table provides all the required information to determine the correct storage for this data set. You do not need to refer to other tables or program directories for the data set size.

   S Shared data set, allocated by this product and used by this product and other products. To determine the correct storage needed for this data set, add the storage size given in this table to those given in other tables (perhaps in other program directories). If the data set already exists, it must have enough free space to accommodate the storage size given in this table.

   E Existing shared data set, used by this product and other products. This data set is *not* allocated by this product. To determine the correct storage for this data set, add the storage size given in this table to those given in other tables (perhaps in other program directories). If the data set already exists, it must have enough free space to accommodate the storage size given in this table.

   For more information about the names and sizes of the required data sets, see 6.1.5, "Allocate SMP/E Target and Distribution Libraries" on page 17.

3. Abbreviations used for the file system path type are as follows.

   N New path, created by this product.
   X Path created by this product, but might already exist from a previous release.
   P Previously existing path, created by another product.

4. All target and distribution libraries listed have the following attributes:

   - The default name of the data set can be changed.
   - The default block size of the data set can be changed.
   - The data set can be merged with another data set that has equivalent characteristics.
   - The data set can be either a PDS or a PDSE.

5. All target libraries listed have the following attributes:

   - These data sets can be SMS-managed, but they are not required to be SMS-managed.
   - These data sets are not required to reside on the IPL volume.
   - The values in the "Member Type" column are not necessarily the actual SMP/E element types that are identified in the SMPMCS.

6. All target libraries that are listed and contain load modules have the following attributes:

- These data sets can be in the LPA, but they are not required to be in the LPA.
- These data sets can be in the LNKLST.
- These data sets are not required to be APF-authorized.
- Open XL C/C++ 1.1 requires that the SMPLTS data set must be a PDSE. If your existing SMPLTS is a PDS, you will need to allocate a new PDSE and copy your existing SMPLTS into it and then change the SMPLTS DDDEF entry to indicate the new PDSE data set.

The following figures describe the target and distribution libraries and file system paths required to install Open XL C/C++ 1.1. The storage requirements of Open XL C/C++ 1.1 must be added to the storage required by other programs that have data in the same library or path.

Note: Use the data in these tables to determine which libraries can be merged into common data sets. In addition, since some ALIAS names may not be unique, ensure that no naming conflicts will be introduced before merging libraries.

Figure 9. Storage Requirements for Open XL C/C++ 1.1 Target Libraries								
Library DDNAME	Member Type	Target Volume	T Y P E	O R G	R E C F M	L R E C L	No. of 3390 Trks	No. of DIR Blks
SCNWJCL	SAMP	T2	U	PDS	FB	80	4	2

Figure 10. Open XL C/C++ 1.1 File System Paths		
DDNAME	T Y P E	Path Name
SCNWH11	N	/usr/lpp/IBM/cnw/v1r1/IBM/

Figure 11. Storage Requirements for Open XL C/C++ 1.1 Distribution Libraries							
Library DDNAME	T Y P E	O R G	R E C F M	L R E C L	No. of 3390 Trks	No. of DIR Blks
ACNWSR1	U	PDS	FB	80	68	40
ACNWSR2	U	PDS	VB	255	15000	20

5.3 FMIDs Deleted

This is the first release of the product. There is no earlier release FMID to delete.

5.4 Special Considerations

Open XL C/C++ 1.1 has no special considerations for the target system.

6.0 Installation Instructions

This chapter describes the installation method and the step-by-step procedures to install and to activate the functions of Open XL C/C++ 1.1.

Please note the following points:

- If you want to install Open XL C/C++ 1.1 into its own SMP/E environment, consult the SMP/E manuals for instructions on creating and initializing the SMPCSI and the SMP/E control data sets.

- You can use the sample jobs that are provided to perform part or all of the installation tasks. The SMP/E jobs assume that all DDDEF entries that are required for SMP/E execution have been defined in appropriate zones.

- You can use the SMP/E dialogs instead of the sample jobs to accomplish the SMP/E installation steps.

6.1 Installing Open XL C/C++ 1.1

This product is available as a web download package. If you are downloading this product from the web, follow the instructions below.

6.1.1 SMP/E considerations for using the SMP/E web download

The SMP/E web download package for Open XL C/C++ 1.1 is packaged using the SMP/E GIMZIP function, which was introduced in SMP/E for z/OS V3.1. Although GIMZIP and GIMUNZIP are used for the packaging, the full SMP/E RECEIVE FROMNETWORK function is not available with this package. The SMP/E GIMUNZIP function is required to process the downloaded package. See the z/OS SMP/E Reference for information about using GIMZIP and GIMUNZIP. Ensure that you meet the driving system requirements as documented in Driving System Requirements.

Perform the following tasks:

1. Ensure that the configuration requirements for using GIMUNZIP are completed. For a description of the GIMZIP and GIMUNZIP functions, see the SMP/E web page at http://www.ibm.com/servers/eserver/zseries/zos/smpe/.

2. Allocate a R/W file system directory on the z/OS system where the package will be staged. The R/W file system directory is the repository for the download package.

3. Download the web package from http://www.ibm.com/systems/z/os/zos/downloads/. The package contains two parts, OPNXLC1.README.txt and OPNXLC1.pax.Z. The file OPNXLC1.README.txt contains a sample job that performs the following tasks. You must update this file to reflect your environment. Make sure this file is transferred from the download site as a text file.

   - Executes the z/OS UNIX System Services pax command to extract the GIMZIP archives from the download package.

- Executes the GIMUNZIP program to expand the GIMZIP archives and places their contents in data sets that can be processed by SMP/E.
- Executes the SMP/E RECEIVE from DASD function to receive the FMIDs.

The file OPNXLC1.pax.Z contains the SMP/E MCS and the associated RELFILEs. You must download this pax archive file to a node that has connectivity to the target z/OS system. Transfer this file to the host using binary format.

4. Run the sample job in OPNXLC1.README.txt. This job will perform the required tasks up to and including the SMP/E RECEIVE from DASD step.

   Expected Return Codes: RC=0.

5. Upgrade your target system (z/OS V2.4.0 or V2.5.0) with current service. To obtain PTF service for the Open XL C/C++ 1.1 FMIDs, see 3.2, "Preventive Service Planning" on page 5.

6. Complete the installation by using the instructions in this program directory.

6.1.2 SMP/E Options Subentry Values

The recommended values for certain SMP/E CSI subentries are shown in Figure 12. Using values lower than the recommended values can result in failures in the installation. DSSPACE is a subentry in the GLOBAL options entry. PEMAX is a subentry of the GENERAL entry in the GLOBAL options entry. See the SMP/E manuals for instructions on updating the global zone.

Figure 12. SMP/E Options Subentry Values		
Subentry	**Value**	**Comment**
DSSPACE	Existing target CSI value	IBM suggests using your existing target system CSI's DSSPACE value.
PEMAX	SMP/E Default	IBM suggests using the SMP/E default for PEMAX.

6.1.3 SMP/E CALLLIBS Processing

Open XL C/C++ 1.1 uses the CALLLIBS function that is provided in SMP/E to resolve external references during installation. When Open XL C/C++ 1.1 is installed, ensure that DDDEFs exist for the following libraries:

- SCEEBND2
- SCEELIB

Note: CALLLIBS uses the previous DDDEFs only to resolve the link-edit for Open XL C/C++ 1.1 compiler. These data sets are not updated during the installation of Open XL C/C++ 1.1, except for SCEELIB, which is a Language Environment data set and is shared with Runtime Library Extensions.

6.1.4 Sample Jobs

The following sample installation jobs are provided as part of the product to help you install Open XL C/C++ 1.1:

Job Name	Job Type	Description	RELFILE
CNWWALOC	ALLOCATE	Sample job to allocate target and distribution libraries for Open XL C/C++ 1.1	IBM.HLB77C2.F1
CNWWZFS	ALLOMZFS	Sample job to allocate, create mountpoint, & mount zFS data sets **(Optional)** Open XL C/C++ 1.1	IBM.HLB77C2.F1
CNWWDDEF	DDDEF	Sample job to define SMP/E DDDEFs for Open XL C/C++ 1.1	IBM.HLB77C2.F1
CNWISMKD	MKDIR	Sample job to invoke the supplied CNWMKDIR EXEC to allocate file system paths	IBM.HLB77C2.F1
CNWJIVP	IVP	Sample job to verify installation has been successful for Open XL C/C++ 1.1	IBM.HLB77C2.F1

Figure 13. Sample Installation Jobs

You can access the sample installation jobs by performing an SMP/E RECEIVE and then copying the jobs from the relfiles to a work data set for editing and submission. See Figure 13 to find the appropriate relfile data set.

6.1.5 Allocate SMP/E Target and Distribution Libraries

Edit and submit sample job CNWWALOC to allocate the SMP/E target and distribution libraries for Open XL C/C++ 1.1. Consult the instructions in the sample job for more information.

Expected Return Codes and Messages: RC=0

6.1.6 Allocate, create and mount ZFS Files (Optional)

This job allocates, creates a mountpoint, and mounts zFS data sets.

If you plan to install Open XL C/C++ 1.1 into a new z/OS UNIX file system, you can edit and submit the optional CNWWZFS job to perform the following tasks:

- Create the z/OS UNIX file system
- Create a mount point
- Mount the z/OS UNIX file system on the mountpoint

Consult the instructions in the sample job for more information.

The recommended z/OS UNIX file system type is *zFS*. The recommended mount point is */usr/lpp/IBM/cnw/v1r1*.

Before running the sample job to create the z/OS UNIX file system, you must ensure that OMVS is active on the driving system. zFS must be active on the driving system if you are installing Open XL C/C++ 1.1 into a file system that is zFS.

If you create a new file system for this product, consider updating the BPXPRMxx PARMLIB member to mount the new file system at IPL time. This action can be helpful if an IPL occurs before the installation is completed.

```
 MOUNT FILESYSTEM('#dsn')
  MOUNTPOINT('/usr/lpp/IBM/cnw/v1r1')
  MODE(RDWR)         /* can be MODE(READ) */
  TYPE(ZFS) PARM('AGGRGROW') /* zFS, with extents */
```

See the following information to update the statements in the previous sample:

#dsn is the name of the data set holding the z/OS UNIX file system.
/usr/lpp/IBM/cnw/v1r1 is the name of the mount point where the z/OS UNIX file system will be mounted.

Expected Return Codes and Messages: You will receive a return code of 0 if this job runs correctly.

6.1.7 Allocate File System Paths

The target system HFS or zFS data set must be mounted on the driving system when running the sample CNWISMKD job since the job will create paths in the HFS or zFS.

Before running the sample job to create the paths in the file system, you must ensure that OMVS is active on the driving system and that the target system's HFS or zFS file system is mounted to the driving system. zFS must be active on the driving system if you are installing Open XL C/C++ 1.1 into a file system that is zFS.

If you plan to install Open XL C/C++ 1.1 into a new HFS or zFS file system, you must create the mountpoint and mount the new file system to the driving system for Open XL C/C++ 1.1.

The recommended mountpoint is */usr/lpp/IBM/cnw/v1r1*.

Edit and submit sample job CNWISMKD to allocate the HFS or zFS paths for Open XL C/C++ 1.1. Consult the instructions in the sample job for more information.

If you create a new file system for this product, consider updating the BPXPRMxx PARMLIB member to mount the new file system at IPL time. This action can be helpful if an IPL occurs before the installation is completed.

Expected Return Codes and Messages: You will receive a return code of 0 if this job runs correctly.

6.1.8 Create DDDEF Entries

Edit and submit sample job CNWWDDEF to create DDDEF entries for the SMP/E target and distribution libraries for Open XL C/C++ 1.1. Consult the instructions in the sample jobs for more information.

Expected Return Codes and Messages: RC=0

6.1.9 Perform SMP/E APPLY

1. Ensure that you have the latest HOLDDATA; then edit and submit sample job, as shown below, to perform an SMP/E APPLY CHECK for Open XL C/C++ 1.1.

   HOLDDATA introduces ERROR HOLDs against FMIDs for HIPER APARs. Before the installation, ensure that you have the latest Enhanced HOLDDATA, which is available through several different portals, including http://service.software.ibm.com/holdata/390holddata.html. Install the FMIDs regardless of the status of unresolved HIPERs. However, don't deploy the software until the unresolved HIPERs are analyzed to determine applicability.

   To receive the full benefit of the SMP/E Causer SYSMOD Summary Report, do not bypass the PRE, ID, REQ, and IFREQ on the APPLY CHECK. This is because the SMP/E root cause analysis identifies the cause of only errors but not warnings (SMP/E treats bypassed PRE, ID, REQ, and IFREQ conditions as warnings rather than errors).

   Here are two methods to install FMIDs when ++HOLDs for HIPERs exist for the FMIDs that you install:

   a. To ensure that all recommended and critical service is installed with the FMIDs, if you are using SMP/E 3.5 or higher and have received the latest HOLDDATA, add the FIXCAT operand to the APPLY command as shown below. If you are using a prior release of SMP/E, add the SOURCEID(HIPER,RSU*) operand to the APPLY command.

   ```
   If using SMP/E V3.5 or higher:
   APPLY S(HLB77C2) CHECK
   FORFMID(HLB77C2)
   SOURCEID(RSU*)
   FIXCAT(IBM.ProductInstall-RequiredService)
   GROUPEXTEND .

   If using SMP/E V3.4 or prior:
   APPLY S(HLB77C2) CHECK
   FORFMID(HLB77C2)
   SOURCEID(HIPER,RSU*,...)
   GROUPEXTEND .
   ```

   Some HIPER APARs might not have PTFs available yet. You should analyze the symptom flags for to determine if you want to bypass the specific ERROR HOLDs and continue the installation of the FMIDs.

This method requires more initial research, but can provide resolution for all HIPERs that have fixing PTFs available and are not in a PE chain. Unresolved PEs or HIPERs might still exist and require the use of BYPASS.

b. To install the FMIDs without regard for the HIPERs, you can add a BYPASS(HOLDCLASS(HIPER)) operand to the APPLY command. In this way, you can install FMIDs even though HIPER ERROR HOLDs against them still exist. Only the HIPER ERROR HOLDs are bypassed. After the FMIDs are installed, run the SMP/E REPORT ERRSYSMODS command to identify missing HIPER maintenance.

```
APPLY S(HLB77C2) CHECK
FORFMID(HLB77C2)
SOURCEID(RSU*)
FIXCAT(IBM.ProductInstall-RequiredService)
GROUPEXTEND
BYPASS(HOLDCLASS(HIPER)) .
other parameters documented in the program directory
```

This method is the quicker of the two, but requires subsequent review of the REPORT ERRSYSMODS to investigate any HIPERs. If you are running SMP/E V3.5 or higher and have received the latest HOLDDATA, you can also choose to run REPORT MISSINGFIX for Fix Category IBM.ProductInstall-RequiredService to investigate missing recommended service.

If you bypass HOLDs during the installation of the FMIDs because fixing PTFs are not yet available, you can be notified when the fixing PTFs are available by using the APAR Status Tracking (AST) function of ServiceLink or the APAR Tracking function of ResourceLink.

2. After you take actions that are indicated by the APPLY CHECK, remove the CHECK operand and run the job again to perform the APPLY.

A sample APPLY job is shown below.
```
//APPLY JOB <job parameters>
//STEP1 EXEC PGM=GIMSMP,REGION=0M,TIME=NOLIMIT
//SMPCSI DD DSN=#globalcsi,DISP=SHR
//SMPCNTL DD *
  SET BOUNDARY(#tzone) .
  APPLY CHECK
  FORFMID(HLB77C2)
  SELECT(HLB77C2)
  GROUPEXTEND(NOAPARS,NOUSERMODS)
  BYPASS(HOLDSYSTEM,
  HOLDUSER,HOLDCLASS(UCLREL,ERREL,HIPER)) .
/*
```

Required Updates:

1. Update the job parameters.

2. Replace the #globalcsi on the SMPCSI DD statement with your CSI name.

3. Update #tzone to your target zone name.

Note: The GROUPEXTEND operand indicates that SMP/E applies all requisite SYSMODs. The requisite SYSMODS might be applicable to other functions.

Expected Return Codes and Messages from APPLY CHECK: You will receive a return code of 0 if this job runs correctly.

Expected Return Codes and Messages from APPLY: You will receive a return code of 0 if this job runs correctly.

6.1.10 Customize Open XL C/C++ 1.1.

Once you have successfully performed SMP/E APPLY with the Open XL C/C++ 1.1, you must customize the product. Customization may be run from your driving system unless otherwise specified.

6.1.10.1 PARMLIB member considerations

You must tailor the system for Open XL C/C++ 1.1 to meet the needs of your installation.

PARMLIB Member	Description
Figure 14. PARMLIB members and description	
IFAPRDxx	Defines the enablement policy for XL C/C++ See 6.1.10.2, "IFAPRDxx considerations."

6.1.10.2 IFAPRDxx considerations

With z/OS, products can use registration services to determine if they are enabled to run on a particular system. This requires the product be defined appropriately in the enablement policy for the system using the IFAPRDxx PARMLIB member.

You must ensure that the policy in IFAPRDxx enables only what are licensed. Use of (and enablement of) z/OS features is subject to the z/OS license terms and conditions and must be done with the knowledge of your asset manager according to the terms and conditions for z/OS. See the Usage Restriction section of the *z/OS Licensed Program Specifications* for additional license terms and conditions.

See *z/OS Planning for Installation* for additional information on enabling z/OS features.

6.1.10.3 Customization file

A customization file clang.cfg on USS must be created for the IBM Open XL C/C++ 1.1 for z/OS compiler if the High Level Qualifier (HLQ) for Language Environment (LE) datasets or CSSLIB datasets deviate from the default values. The customization file can be created using the following instructions:

- The file must be created as a text file under the USS path '#PathPrefix/usr/lpp/IBM/cnw/v1r1/openxl/etc/clang.cfg', where '#PathPrefix' will be default to root '/'

directory if it's not changed in DDDEF entry. Note that the 'etc' directory must be created in the same parent direcotry as the 'bin' directory with UNIX permission 755.

- If the HLQ for LE datasets is not the default value CEE. A new line

  `-mzos-hlq-le=<hlq>`

  where <hlq> is the actual HLQ for LE datasets must be added to the file.

- If the HLQ for CSSLIB datasets is not the default value SYS1. A new line

  `-mzos-hlq-csslib=<hlq>`

  where <hlq> is the actual HLQ for CSSLIB datasets must be added to the file.

- Any lines in the files starting with the '#' character are treated as comments.

6.1.11 Run the Installation Verification Programs

The Open XL C/C++ 1.1 consists of a C/C++ compiler. Therefore, you need to run a IVP job to ensure that the Open XL C/C++ compiler were properly installed. The IVP job uses the directory /tmp as work directory for processing inputs and outputs. Ensure that the file system (either HFS or ZFS) is available on the target system before you run the job. If you use a customized TMPDIR instead of the default /tmp, the customized TMPDIR must not include the special charater _ (underscore) in directory name or the binder will fail to find the primary input file.

The following sections describe installation verification procedures for the Open XL C/C++ 1.1.

6.1.11.1 Run the Open XL C/C++ 1.1 Installation Verification Procedures:

If Open XL C/C++ 1.1 has been enabled (see 6.1.10.2, "IFAPRDxx considerations" on page 21), verify that the Open XL C/C++ 1.1 has been installed properly.

You need to run the following IVP job on the target system to ensure that the C/C++ compilers were properly installed. The JCL can be found in your SCNWJCL library. Refer to the JCL for instructions and expected output.

Figure 15. IVPs for Open XL C/C++ Compilers	
Job Name	**Job Description**
CNWJIVP	Verify the Open XL C/C++ compiler installation

Expected Return Codes and Messages: RC=0.

6.1.12 Perform SMP/E ACCEPT

Edit and submit the sample job, as shown in 6.1.9, "Perform SMP/E APPLY" on page 19, to perform an SMP/E ACCEPT CHECK for Open XL C/C++ 1.1.

To receive the full benefit of the SMP/E Causer SYSMOD Summary Report, do *not* bypass the PRE, ID, REQ, and IFREQ on the ACCEPT CHECK. This is because the SMP/E root cause analysis identifies the cause of only errors but not warnings (SMP/E treats bypassed PRE, ID, REQ, and IFREQ conditions as warnings rather than errors).

Before you use SMP/E to load new distribution libraries, it is recommended that you set the ACCJCLIN indicator in the distribution zone. In this way, you can save the entries that are produced from JCLIN in the distribution zone whenever a SYSMOD that contains inline JCLIN is accepted. For more information about the ACCJCLIN indicator, see the description of inline JCLIN in the SMP/E manuals.

After you take actions that are indicated by the ACCEPT CHECK, remove the CHECK operand and run the job again to perform the ACCEPT.

```
 A sample APPLY job is shown below.
//ACCEPT JOB <job parameters>
//STEP1 EXEC PGM=GIMSMP,REGION=0M,TIME=NOLIMIT
//SMPCSI DD DSN=#globalcsi,DISP=SHR
//SMPCNTL DD *
  SET BOUNDARY(#dzone) .
  ACCEPT CHECK
  FORFMID(HLB77C2)
  SELECT(HLB77C2)
  GROUPEXTEND(NOAPARS,NOUSERMODS)
  BYPASS(HOLDSYSTEM,
  HOLDUSER,HOLDCLASS(UCLREL,ERREL,HIPER)) .
/*
```

Required Updates:

1. Update the job parameters.

2. Replace the #globalcsi on the SMPCSI DD statement with your CSI name.

3. Update #dzone to your dlib zone name.

Note: The GROUPEXTEND operand indicates that SMP/E accepts all requisite SYSMODs. The requisite SYSMODS might be applicable to other functions.

Expected Return Codes and Messages from ACCEPT CHECK: You will receive a return code of 0 if this job runs correctly.

If PTFs that contain replacement modules are accepted, SMP/E ACCEPT processing will link-edit or bind the modules into the distribution libraries. During this processing, the Linkage Editor or Binder might issue

messages that indicate unresolved external references, which will result in a return code of 4 during the ACCEPT phase. You can ignore these messages, because the distribution libraries are not executable and the unresolved external references do not affect the executable system libraries.

Expected Return Codes and Messages from ACCEPT: You will receive a return code of 0 if this job runs correctly.

6.1.13 Run REPORT CROSSZONE

The SMP/E REPORT CROSSZONE command identifies requisites for products that are installed in separate zones. This command also creates APPLY and ACCEPT commands in the SMPPUNCH data set. You can use the APPLY and ACCEPT commands to install those cross-zone requisites that the SMP/E REPORT CROSSZONE command identifies.

After you install Open XL C/C++ 1.1, it is recommended that you run REPORT CROSSZONE against the new or updated target and distribution zones. REPORT CROSSZONE requires a global zone with ZONEINDEX entries that describe all the target and distribution libraries to be reported on.

For more information about REPORT CROSSZONE, see the SMP/E manuals.

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Program Directory for IBM Open XL C/C++ 1.1 for z/OS, May 2022

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