z/OS and OS/390: Possible Data Corruption or Undetected Data Loss

ABSTRACT: There is a potential exposure for data corruption or undetected loss of data when using the Additional Floating-Point (AFP) registers in programs which were compiled with certain versions of the Enterprise PL/I for z/OS or OS/390 / z/OS C/C++ compilers and which run in a CICS transaction environment.

PRODUCTS AFFECTED:
The following products are affected when used to compile programs to run in all supported levels of a CICS transaction environment**:**

Enterprise PL/I for z/OS V3R2
Enterprise PL/I for z/OS V3R3
Enterprise PL/I for z/OS V3R4

OS/390 V2R10 C/C++
z/OS V1.4 C/C++
z/OS V1.5 C/C++
z/OS V1.6 C/C++
z/OS V1.7 C/C++

APAR NUMBERS:

PK12521	Enterprise PL/I for z/OS
PK12800	OS/390 V2R10 C/C++ - target availability 11/30/05
PK13061	z/OS V1.4 C/C++ - available
PK12801	z/OS V1.5 C/C++ - available
PK12991	z/OS V1.6 C/C++ - available
PK12992	z/OS V1.7 C/C++ - available

BACKGROUND: The Additional Floating-Point(AFP) registers feature provides for 12 additional floating-point registers. The Additional Floating-Point registers, numbered 1,3,5,7 and 8 through 15, combined with the standard floating-point registers, numbered 0,2,4 and 6, provide a total of sixteen floating-point registers. Certain versions of the Enterprise PL/I and C/C++ compilers for the mainframe support the use of AFP registers with the convention that floating-point registers 8 through 15 are not volatile. If a program uses any of the AFP registers numbered 8 through 15, it is required that the used registers be preserved upon entry and restored upon exit by that program.

DESCRIPTION: In order to avoid errors, the Additional Floating-Point (AFP) registers must be saved between task switches. CICS does its own task switching and does not rely on the operating system task switching facility. The Additional Floating-Point registers are not preserved by CICS in a transaction environment. Therefore, using the AFP suboption in certain versions of the Enterprise PL/I for z/OS or the OS/390 / z/OS C/C++ compilers for programs running in a CICS transaction environment can result in abends or potential undetected loss of data. There are no other environments known to be at risk for this issue, such as batch programs, since the full set of Additional Floating-Point registers are saved by the operating system in these environments.

The default for Enterprise PL/I for z/OS is to use the AFP suboption which specifies the convention described above. Therefore, code compiled with AFP and running in a CICS environment is at risk.

For the C/C++ compilers:

- If the ARCH level is 2 or lower (this is the default for the z/OS V1.5 C/C++ and earlier compilers), the default is NOAFP.
- If the ARCH level is 3 or higher (this is the default for the z/OS V1.6 C/C++ and later compilers), the default is AFP.

Therefore, C/C++ applications running in a CICS environment will be at risk if:

- compiled with the FLOAT(AFP) option, or;
- compiled with z/OS V1.5 C/C++ (or earlier) using the default options and ARCH level 3 (or higher), or;
- compiled with z/OS V1.6 C/C++ and later compilers using the default options.

RECOMMENDED ACTIONS:

1. For CICS programs compiled with an affected version of the Enterprise PL/I for z/OS compiler, users will need to apply HIPER APAR PK12521, and then recompile any CICS programs that use the AFP registers using the new FLOAT(AFP(VOLATILE)) compiler option.

2. For CICS programs compiled with the OS/390 V2R10 C/C++ compiler or the z/OS C/C++ compiler, users will need to apply the appropriate HIPER APAR, listed above, and then recompile any CICS programs that use the AFP registers using the new FLOAT(AFP(VOLATILE)) compiler option.

Note: As a workaround to installing the recommended compiler maintenance, customers can recompile their programs with the NOAFP suboption. When programs are recompiled with the NOAFP suboption, users may see a performance degradation.

Load Module Analyzer Tool ***(NEW!)***
IBM is providing a Load Module Analyzer tool that runs against program load libraries to help identify programs compiled to use the Additional Floating-Point registers described above. This tool is available as part of the IBM CICS SupportPacs Category 2 Freeware offering. To **download the tool** and for additional information go to URL:

http://www-1.ibm.com/support/docview.wss?rs=1083&uid=swg24010925

Any programs identified by the tool that may be executed in a CICS transaction environment must be recompiled after application of the APAR/PTF for the appropriate compiler.

It is also recommended that you install Binder APAR OA13793 which has a target availability of 11/28/05. The problem addressed by this APAR was encountered while testing the Load Module Analyzer tool described above.

LE DOC APAR PK13345 describes the updates needed to the Language Environment Vendor Interfaces publication.

For any additional questions please contact the IBM Support Center for the appropriate compiler support.