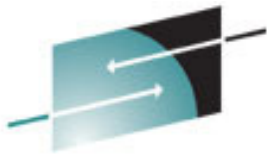
What's New in z/OS Language Environment – C runtime Library?



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Agenda

- What's New in z/OS V1.12?

- Additional information available in Appendix:
- What's New in z/OS V1.11?

What's New in z/OS V1.12?

- BSAM >64K Track support for type=record
- C++ TR1 support
- realloc() optimization
- VSAM EA KSDS

BSAM >64K Track support for type=record

- Provide support for large format sequential data sets greater than 65,535 tracks/volume opened for **BSAM (seek) under record I/O**.
  - Read, write, reposition
  - Must be opened **type=record** without specifying **noseek**
  - ftell() and fseek() continue to be limited to 2G-1 records.
  - fgetpos() and fsetpos() may reposition past the 2G-1 limit with the following restrictions:
    - **The data set contains 256 TB - 256 bytes or less**
    - **The data set uses 2 GB blocks or less**

C++ TR1 support

- Exposes the C99 namespace and provides C++ overloads for math functions.
- Expose the functionality by either defining _TR1_C99 or __IBMCPP_TR1__
- The focus of LI178 was Chapter 8, ‘C’ compatibility, of the ISO/IEC DTR 19768 Technical Draft Technical Report on C++ Library Extensions Report.

realloc() optimization

- The C/C++ function realloc() supports a new environment variable
  - _CEE_REALLOC_CONTROL
    - Parameter 1 – Lower bound threshold
      - The number of bytes above which the tolerance percentage (parm 2) will be applied
    - Parameter 2 – Tolerance Percentage
      - The percentage of extra storage to be obtained
      - 0 to 100

realloc() optimization

- Example
  - _CEE_REALLOC_CONTROL=100,20
    - First request is for 80 bytes
      - Storage obtained as normal
    - A request to change this storage to 90 bytes
      - Storage obtained as normal
    - A request to change this storage to 100 bytes
      - At or above threshold, percentage is applied
      - Storage obtained is 120 bytes (100 + 100 * 20%)
    - A request to change this storage to 110 bytes
      - No storage need be obtained (we already have 120 bytes)

realloc() optimization

- Can be very useful for programs that make many requests to reallocate storage larger than originally requested.
  - Many string manipulation routines make heavy use of storage reallocation.
- If tolerance percentage is 0 or _CEE_REALLOC_CONTROL is not set no change in behavior.

VSAM EA for KSDS with alternate indexes

- z/OS XL C/C++ applications can now read/write/position beyond the 4GB boundary in VSAM KSDS data sets using alternate index keys.
  - Using fopen() or freopen() against an existing VSAM KSDS extended addressable data set using an alternate index pathname
  - Once opened, using other FILE functions like flocate() to process the stream
- DOC APAR PK83456 extends this support back to z/OS 1.8

The End..

Thank you!

Appendix

- Decimal Floating Point

```
2 (and WithMetalWings) for this hide. Beautiful views further down the trail. Thanks fo
```

Appendix – Decimal Floating Point

- **<math.h>**
  - The following math functions are new for C/C++ decimal floating point:

cbrtd32()	cbrtd64()	cbrtd128()
expm1d32()	expm1d64()	expm1d128()
exp2d32()	exp2d64()	exp2d128()
fmad32()	fmad64()	fmad128()
fmodd32()	fmodd64()	fmodd128()
hypotd32()	hypotd64()	hypotd128()
log1pd32()	log1pd64()	log1pd128()
log2d32()	log2d64()	log2d128()
quantexpd32()	__remquod32()	quantexpd64()
__remquod64()	quantexpd128()	__remquod128()

Appendix – Decimal Floating Point

- **<math.h>**
  - For C++ applications, the following functions are overloaded for the _Decimal32, _Decimal64, and _Decimal128 data types:

cbrt()	expm1()
exp2()	fma()
fmod()	hypot()
log1p()	quantexp()
log2()	

- For example: _Decimal32 cbrt(_Decimal32)

What's new in z/OS R11?

- Decimal Floating Point Part 3 Support
- C/C++ compiler dependencies
- Globalization White Paper 2007
- CCSID functions under CICS
- File I/O Tracing

Decimal Floating Point Support - Part 3

- The new decimal floating point functionality made available in this release is an expansion of the initial support from z/OS V1R9. C/C++ applications can now take advantage of functions and macros that were previously unavailable.
  - Note: APAR PK71899 rolls back the V1R11 decimal floating point support to V1R8.
- **The following support is added for decimal floating point in z/OS V1R11:**
  1. New decimal floating point math functions are provided (see appendix)
  2. New conversion specifiers for printf() family of functions are provided
     - %a and %A are provided for the printf() family of functions to be used with Decimal Floating Point types.
     - These new conversion specifiers determine which type of formatting style is to be used by printf(). Either e/E or f/F style formatting.

Decimal Floating Point Support - Part 3

- Hardware with the Decimal Floating Point Facility must be installed.
- The DFP and ARCH(7) compiler options are required.
- The __STDC_WANT_DEC_FP__ feature test macro must be defined.

C/C++ Compiler Dependencies

- inline versions of four wmem* functions (performance)
- extended character types (capability)
- detect accidental use of Language Environment C headers under Metal C (usability)

C/C++ Compiler Dependencies

- inline versions of four wmem* functions (performance)
  - Using inline wmem* functions, the customer can:
    - Improve application performance by using the inline versions of wmemchr(), wmemcmp(), wmemcpy(), and wmemset()
    - The inline versions of functions always perform better because it eliminates the overhead of a library call
    - The inline versions are not available under LP64

C/C++ Compiler Dependencies

- To use inline wmem* functions:
  - #define appropriate feature test macro
  - #include <wchar.h>
  - use wmemchr(), wmemcmp(), wmemcpy(), or wmemset()
  - compile with ARCH(7)
  - compile with z/OS XL C/C++ V1R11 compiler
  - do not use LP64 compile option

C/C++ Compiler Dependencies

- Using extended character types, the customer can:
  - Use certain width character types, char16_t and char32_t, that are guaranteed consistent across platforms (where the types are supported)
- To use extended character types:
  - #include <uchar.h>
  - use char16_t or char32_t types
  - compile with LANGLVL(EXTENDED) under XL C
  - compile with z/OS XL C/C++ V1R11 compiler

C/C++ Compiler Dependencies

- Using Metal C header detection, the customer can:
  - Detect misuse of Language Environment C headers during compilation of Metal C application
  - This change provides earlier problem detection should any Language Environment C supported feature be attempted to be used in a Metal C application
  - when Language Environment C headers are included in a compile that uses the XL C METAL option, an error message will be issued from each Language Environment C header that is processed

Globalization White Paper 2007

- A new locale for Serbia, sr_RS.UTF-8 is provided
  - This support provides the ability for XL C/C++ applications to now be run under the Serbia locale
  - The new locale for Serbia is an ASCII locale

CCSID functions under CICS

- CCSID functions are now supported under CICS
  - __toCcsid()
  - __CSNameType()
  - __toCSName()
  - __CcsidType()
- Provides the ability for XL C/C++ applications running under CICS to convert between code set names and their CCSID and also determine the type for a given code set name or CCSID (ASCII or EBCDIC)

File I/O Tracing

- Generate a high-level trace for C/C++ file I/O
  - The file I/O trace is controlled with an environment variable
  - By default, file I/O tracing will be turned off
  - The function trace is limited to functions that work with a (FILE *) stream
  - Significantly reduce time spent to recreate error
  - Improve accuracy and focus of problem determination
  - This is not meant for first-failure data capture
  - The initial implementation adds the framework for more detailed levels of trace information

File I/O Tracing

- The File I/O Trace is invoked by:
  - An Environment Variable
    - _EDC_IO_TRACE
    - **Description:**
      - Indicates which files to perform file I/O tracing on, the level of detail to provide for file I/O tracing, and the trace buffer size to use for each file.
      - The _EDC_IO_TRACE format is: _EDC_IO_TRACE=(*Filter*,*Detail*,*Buffer Size*)
  - Details of the values and default settings are described in the **C/C++ Programming Guide**

File I/O Tracing

- Locating the trace file:
  - Under TSO or BATCH
    - DDname EDCTRACE
    - Batch log (SYSOUT=* by default)
  - Under z/OS UNIX System Services
    - Directory found in environment variable *_CEE_DMPTARG*
    - The current working directory, if the directory is writable
    - The directory found in environment variable TMPDIR
    - The /tmp directory

The name of this file uses the following format: /path/EDCTRACE.Date.Time.Pid