z/OS 1.12 Sysprog Goody Bag

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z/OS 1.12 Preview*

Improving Usability and Skills

zDAC, VARY CU, RMF support for 4K reporting classes, Multiple TSO/E logons in a JESPlex, METAL C headers for Health Checker and sample check, Health check history display, More checks, z/OSMF WLM Policy Editor, Incident Log improvements, …

Integrating new Applications and Supporting Industry and Open Standards

XML dynamic schema and fragment parsing; Language Environment support for calendar dates beyond 2038, C/C++ BSAM Record I/O for >64K tracks, and VSAM AIX in EAS on EAV; z/OS UNIX support for FILEDATA=RECORD …

Scalability & Performance

EAV support for more data set types & more exploiters, Duplicate Temporary DSNs, Large Pages for NUCLEUS, DFSMSdss Dump/ Restore/ Copydump performance, VSAM/RLS Striping, XTIOT …
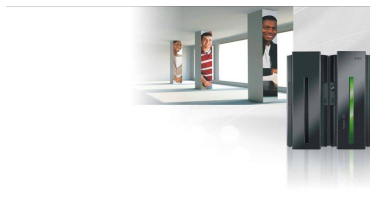
Enhancing Security

VISA smart cart support, LDAP ACL by IP address and password policy; PKI Services multibyte character support; ECC support in RACF, System SSL, and PKI; Health Checker support for BPX.SUPERUSER, SAF controls on sysplex-scope CPF commands, …

Improving Availability

CA Reclaim, XCF monitoring of critical members; SMF record flood detection and automation, filtering and Predictive Failure analysis, MTTR, Run Time Diagnostics …

Self Managing Capabilities

Capacity Provisioning interval averaging, CP monitoring of CICS and IMS transaction classes, Improved WLM batch management, WTOR Auto-Reply, IMBED/REPLICATE removal on Recall/Restore …

Extending the Network

Continued focus on IPV6 and security related RFCs, TN3270 Virtual Storage Constraint Relief, AT-TLS Improvements, …

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z/OS Release 12

- Runtime Diagnostics
- Allocation and Access Method Constraint Relief
- Enhancements to EAV Support
- IDCAMS DELETE of all members of PDS or PDSE
- VSAM CA Reclaim
- Enhancements to Dynamic Exits
- Enhancements to Dynamic LPA and LLA
- New **Vary CU** Command
- Auto-Reply for WTORs
- Less Disruptive SVC Dump Data Capture
- Controlling Discretionary Time Slice
- Setting LE Parameters as non-overrideable
- TSO/E enhancements
- z/OSMF WLM Policy Editor
- And other miscellany

Runtime Diagnostics

- Runtime Diagnostics can quickly analyze a sick system for the following classes of problems:
    - Component problems emitted as critical messages in OPERLOG
    - ENQ contention for system address spaces
    - Address spaces with lock contention
    - Address spaces using high CPU
    - Address spaces that appear to be in a TCB enabled loop

- Runtime Diagnostics can advise the system programmer what actions to take next
    - Potentially what jobs might need to be cancelled
    - Further investigation on class of resources, or a single address space using a monitor like RMF or Tivoli Omegamon

Runtime Diagnostics

- Runtime Diagnostics is invoked via a START command from the console
  - START HZR,ANALYZE
- The output of Runtime is a multi-line Write-to-Operator message
  - The Runtime Diagnostics response is issued to the console that issued the START HZR command
    - If the MCS console that issued the START HZR command has an out-of-line display area setup (via a K A,xx) the output will be displayed in the display area
  - The output of Runtime Diagnostics can also be directed to a sequential dataset

Allocation Constraint Relief

- **Memory Data Set ENQ management**
  - Moves data set ENQ info created by Allocation out of SWA and into efficient memory structures
  - Enabled by installation via MEMDSENQMGMT in ALLOCxx (parmlib) and SETALLOC
  - Requested by program with IEFDDSRV macro

- **Suppress DD accounting (in SMF 30 records)**
  - Suppresses creation of SMF Type 30 EXCP section data on a per-DD basis
  - Reduces CPU in Allocation and Unallocation processes
  - Requested by program with S99DASUP flag on DynAlloc

Unique Temporary Data Set Names

- When &&tdsnlabel is specified in the JCL as a DSNAME, the system-generated qualified name for the temporary dataset may **not** be unique

  - When the JES2 option "dupl_job=nodelay" is specified.
  - Multiple jobs with same name execute at the same time, and the DD statements with the same temporary DS names. (i.e. &&tdslabel)

- z/OS R12 provides a new statement in ALLOCxx to specify the format of temporary data set names when dsn=&&tdslabel is coded in the JCL.

    SYSTEM TEMPDSFORMAT(UNIQUE | INCLUDELABEL)

  - TEMPDSFORMAT(**UNIQUE**) generate temp data set names:
      SYSddddd.Thhmmss.RA000.jobname.Rggnnnnn

  - TEMPDSFORMAT(**INCLUDELABEL**) generate temp data set names:
      SYSddddd.Thhmmss.RA000.jobname.tdslabel.Hgg

Basic Access Method Support for XTIOT

- **Problem:**
  - Middleware like DB2 allocates many BSAM, BPAM and QSAM data sets
  - These access methods have required TIOT and UCB to be below 16MB
  - This limits the number of data sets and constrains virtual below the 16MB line
- **Solution**
  - Provide BSAM, BPAM and QSAM support for the XTIOT, UCB nocapture and UCB-above-the-line options of dynamic allocation.
- **Benefit**
  - Virtual Storage Constraint Relief - use less storage below the 16 MB line:
    - Minimum of 20 Bytes for TIOT entry
    - 96 bytes for DSAB
    - Possibly 4096 bytes for UCB not being captured
  - Designed to support more than about 3200 Basic Access Method data sets.
- **Dynamic Allocation Options**
  - XTIOT (S99TIOEX) – requires APF authorization
  - DSAB above the line (S99DSABA) – requires APF authorization
  - Nocapture (S99ACUCB)
  - The application itself does not need to run in 31-bit addressing mode

EAS Eligible data set sets in z/OS

- A data set on an EAV that is eligible to have extents in the extended addressing space and described by extended attribute DSCBs
- Can reside in track or cylinder-managed space
- SMS-managed or non-SMS managed
- Any data set type can reside in track-managed space
- Data set types supported

  - **VSAM data types (KSDS, RRDS, ESDS, linear)**
    - ***This covers DB2, IMS, CICS, zFS and NFS***
    - ***CA sizes: 1, 3, 5, 7, 9 and 15 tracks***

  - **Sequential (Extended Format)**

  - **Sequential (Basic and Large Format)**

  - **Direct (BDAM)**

  - **Partitioned (PDS, PDSE)**

  - **Catalog (VVDS and BCS)**

V1R10 VSAM

V1R11 VSAM EF SEQ

z/OS V1R12 ALL

Non-EAS-eligible data set list

- A data set that may exist on an EAV but is not eligible to have extents in the extended addressing space or have extended attribute DSCBs
  - VSAM data sets with incompatible CA sizes
  - VTOC (still restricted to within first 64K-1 <u>tracks</u>)
  - VTOC index
  - Page data sets
  - VSAM data sets with imbed or keyrange attributes
  - HFS file system
  - XRC Control, Master or Cluster non-VSAM data sets
    - State data set EAS eligible in z/OS V1R12
    - Journal data set EAS eligible in z/OS V1R11 and V1R12
  - Certain system data sets such as SYS1.NUCLEUS

VSAM CA Reclaim

VSAM KSDSs (key-sequenced data sets) must be "reorganized" on a regular basis in order to:

- Reclaim space previously used by deleted records
- Improve sequential read performance

A "reorganization" consists of:

1. Closing the KSDS
2. Unloading the KSDS to a backup file
3. Deleting and redefining the KSDS
4. Reloading the file from the backup file
5. Reopening the KSDS

VSAM CA Reclaim

- **Solution**
  - Enhance VSAM and VSAM RLS to reclaim empty space (CAs) in KSDSs.
    - Applies to SMS and non-SMS data sets.
  - Will resolve the main reasons for KSDS reorganizations:
    - Reclaim space
    - Improve both sequential and direct performance
  - Empty sequence set and high level index records will be placed on a free list after the last record in the CA is erased. The reclaimed CA may then be reused as new records are inserted anywhere in the data set.
  - Pre-existing empty CAs will not be reclaimed by CA Reclaim. Once all sharing systems are upgraded to z/OS 1.12 and enabled for CA Reclaim, the data sets may need to be reorganized one last time to reclaim any pre-existing empty CAs.

- **Benefit:**
  - CA reclaim will address the main reasons for reorganizations
  - Helps make data sets available 24 hours a day.

VSAM CA Reclaim

- CA Reclaim can be enabled/disabled on a system level or on a data set level.
  - CA Reclaim is disabled on a system level by default,
  - But it is <u>enabled by default</u> for all KSDSs without having to redefine the data set.
- New system level parameter in SYS1.PARMLIB(IGDSMSxx):
  CA_RECLAIM({<u>NONE</u> | DATACLAS})
- When system level "DATACLAS" is specified, the setting of new data class parameter CA_Reclaim(<u>Y</u>/N) will be used when the data set is defined to determine whether the data set is eligible for CA reclaim.
  - The CA reclaim attribute in data classes defined prior to z/OS V1R12 defaults to Yes.
- CA Reclaim is disabled for all KSDSs on a system when:
  - **CA_RECLAIM(NONE)** in PARMLIB and
    - System IPLed
    - RLS VSAM address space is recycled
    - SET SMS=xx issued
  - **SETSMS CA_RECLAIM(NONE)** issued
- IDCAMS ALTER can disable/enable individual KSDSs after DEFINE time
  ALTER 'ksdsname' RECLAIMCA/NORECLAIMCA

IDCAMS DELETE of all library members (either PDS or PDSE)

- Prior to z/OS R12, the IDCAMS DELETE command can delete only one member of a partitioned data set at a time. Wildcards are not allowed for member names. For example:
  - **DELETE A.B(member1)** will delete the member **member1** in the partitioned data set **A.B**

- With R12, DELETE command is enhanced to allow users to specify a single asterisk (*) as the member name of a PDS or PDSE. This will delete all the members in that PDS or PDSE. For example,
  - **DELETE A.B(*)** which will delete all the members residing in partitioned data set **A.B**

More granular time accounting in SMF Type 30

- **SMF30ICU** and **SMF30ISB** include time that was spent "in between" jobs. This includes step initiation and step termination

- New fields are added to the CPU accounting section of the SMF type 30 record:
  - SMF30ICU_STEP_INIT
    SMF30ICU_STEP_TERM
    SMF30ISB_STEP_INIT
    SMF30ISB_STEP_TERM

- Time accounting data is now more granular, allowing for greater precision in CPU accounting.

Program Management Enhancements

- ## Library Lookaside (LLA)
  - ### Dynamic Exits
    - *CSVLLIX1 (LLA fetch exit) and CSVLLIX2 (LLA staging exit)*
  - ### LLA busy
    - *up to 255 MODIFY commands can be started without getting "busy"*
  - ### LLA automatic restart when SUB=MSTR is omitted
    - *now automatically propagates nn=XY*

- ## PROGxx parmlib processing for dynamic exits
  - Can REPLACE exits without window of DELETE then ADD which leads to a time when there are either 0 or 2 active exits.
  - Can provide an 8-byte constant parameter to be passed to an exit
  - Exits can be differentiated by type: installation or used by program

- ## PROGxx parmlib processing for dynamic LNKLST
  - Dynamically changing linklist can be a problem for running jobs
  - Can now delay close/free of old linklist for a number of seconds

Program Management Enhancements

- PROGxx parmlib processing for dynamic LPA
  - Keyword to add all aliases on an LPA ADD
  - Keyword to update the SVC table entry if module is an SVC routine
    - *Cannot be used to add a new SVC, only replace exiting ones*
  - ADD from fully qualified HFS file name
  - LPA ADD statements in PROGxx load from PDSEs late in IPL
    - *Subsystems and applications can wait till LPA loading is complete*
- PROGxx parmlib defaults processing
  - Keyword to set defaults for other statements
  - For example: **DEFAULTS LPA ADDALIAS**
- PROGxx parmlib processing for SYSLIB
  - SYSLIB statement supports a VOLUME if data set is not cataloged in the master catalog
  - It's still important to catalog the data sets in a catalog used by LLA

New Vary CU **Command**

- **Problem:**
    - Recent technologies, like HyperPAV and multiple subchannel sets, have created scenarios where devices attached to a logical control unit are no longer in a consecutive numerical range.
    - Vary commands specify individual or ranges of devices.
    - Nonconsecutive device numbers complicate command syntax.
- **Solution:**
    - Use control unit number as the point of control for the Vary command.
    - New variant of the VARY device and VARY PATH commands that will operate on all eligible devices attached to a logical control unit.
    - Authorization required to run V CU command
        - Control access to MVS.VARY.CU
        - Control access to MVS.VARYFORCE.CU when OFFLINE,FORCE is specified

```
V CU {(cunumber)},{ONLINE[,UNCOND[,FORCE] | ,SHR | ,RESET]}
                  {OFFLINE[,FORCE]                         }
                  {AUTOSWITCH | AS [,ON | OFF]             }
                  {UNAVAILABLE | UNAVAIL]                  }
                  {AVAILABLE | AVAIL]                      }
V CU {(cunumber,chpid)},{ONLINE[,FORCE]            }
                        {OFFLINE[,UNCOND | ,FORCE]}
```

D M=DEV shows the CU number

```
IEE174I 09.18.14 DISPLAY M 825
DEVICE 1400    STATUS=ONLINE
CHP                      85    95    90
ENTRY LINK ADDRESS       6B22  19    3C
DEST LINK ADDRESS        6B11  32    7D
PATH ONLINE              Y     Y     N
CHP PHYSICALLY ONLINE Y        Y     Y
PATH OPERATIONAL         Y     Y     N
MANAGED                  N     N     N
CU NUMBER                1400 1400 1400
MAXIMUM MANAGED CHPID(S) ALLOWED:   0
DESTINATION CU LOGICAL ADDRESS = 04
SCP CU ND       = 002107.922.IBM.75.000000002471.0010
SCP TOKEN NED   = 002107.900.IBM.75.000000002471.0400
SCP DEVICE NED  = 002107.900.IBM.75.000000002471.0400
HYPERPAV ALIASES CONFIGURED = 192
FUNCTIONS ENABLED = MIDAW, ZHPF
```

D M=CU shows devices attached to a control unit

```
RESPONSE=S5A
  IEE174I 09.08.54 DISPLAY M 564
  CONTROL UNIT 1400
  CHP                          85     95     90
  ENTRY LINK ADDRESS          6B22   19     3C
  DEST LINK ADDRESS           6B11   32     7D
  CHP PHYSICALLY ONLINE Y      Y      Y
  PATH VALIDATED        Y      Y      N
  MANAGED               N      N      N
  ZHPF - CHPID          Y      Y      Y
  ZHPF - CU INTERFACE   Y      Y      N
  MAXIMUM MANAGED CHPID(S) ALLOWED = 0
  DESTINATION CU LOGICAL ADDRESS = 04
  CU ND                = 002107.922.IBM.75.000000002471.0010
  CU NED               = 002107.922.IBM.75.000000002471.0400
  TOKEN NED            = 002107.900.IBM.75.000000002471.0400
  FUNCTIONS ENABLED = ZHPF
  DEFINED DEVICES
    01400-0143F
  DEFINED PAV ALIASES
    11440-114FF
```

Auto-Reply for WTORs

- **Problem:**
  - Operators no longer closely monitor the system waiting to immediately reply to WTORs.
    - Customers have said it's not unusual for a WTOR to be outstanding for **half an hour**
    - Reply delays can affect all systems in a sysplex.
  - Operators often do not have authority, experience, or system understanding to make their own decision on what to reply for uncommon WTORs.

- **Solution:**
  - Auto-Reply allows a policy to be defined which specifies a reply value and a time delay for specific WTOR message IDs.
  - The system will automatically issue the reply from the policy if the WTOR has been outstanding longer than the time delay specified.

- **Policy Definition**
  - Default policy in parmlib member AUTOR00 (supplied by IBM)
    - Default policy will be used unless requested not to activate or another policy is specified
    - Customer are recommended not to modify AUTOR00
      - *Customer can add their own policy or override AUTOR00 policy*
      - *Vendor products can provide their own parmlib members*
  - The policy will be activated during IPL
    - New system parameter AUTOR= specified in IEASYSxx parmlib member
    - Activated before XCF is initialized
    - Installation can provide set of parmlib members to contain Auto-Reply policy or to request that Auto-Reply processing not be activated.

Security Check Routing of CPF Commands

- **Problem:**
  - Command Prefix Facility (CPF) supports the transporting of commands across the sysplex
  - No security checks to verify operator can use the prefix to transport the command

- **Solution**
  - Prefixed commands now subject to MVS.ROUTE.CMD.*sysname* resource profile
  - For compatibility, security check only performed if profile MVS.CPF.ROUTE.CHECK is defined in the OPERCMDS class
  - Installation can now control whether an operator can issue a CPF prefixed command that will be transported to another system.

Less Disruptive SVC Dump Data Capture

- **Problem:**
  - SVC Dump capture time can be excessive in memory constrained environments:
    - When large amounts of data need to be paged-in from auxiliary storage for inclusion in the dump
    - When capturing large amounts of component SDUMP exit data
  - Capturing the data affects the page replacement algorithm
    - Data paged-in from auxiliary storage puts pressure on real memory availability
    - The data access for the dump looks like recently referenced and may force more important application data to be stolen to auxilliary storage

- **Solution:**
  - Batch page-in I/O operations during SDUMP capture phase to reduce I/O delay
  - Restore the reference state of data captured for the dump so it will no cause more important application data to be paged out
  - Certain components (e.g. GRS for SDATA GRSQ data, IOS) use a more efficient capture method in their SDUMP exits
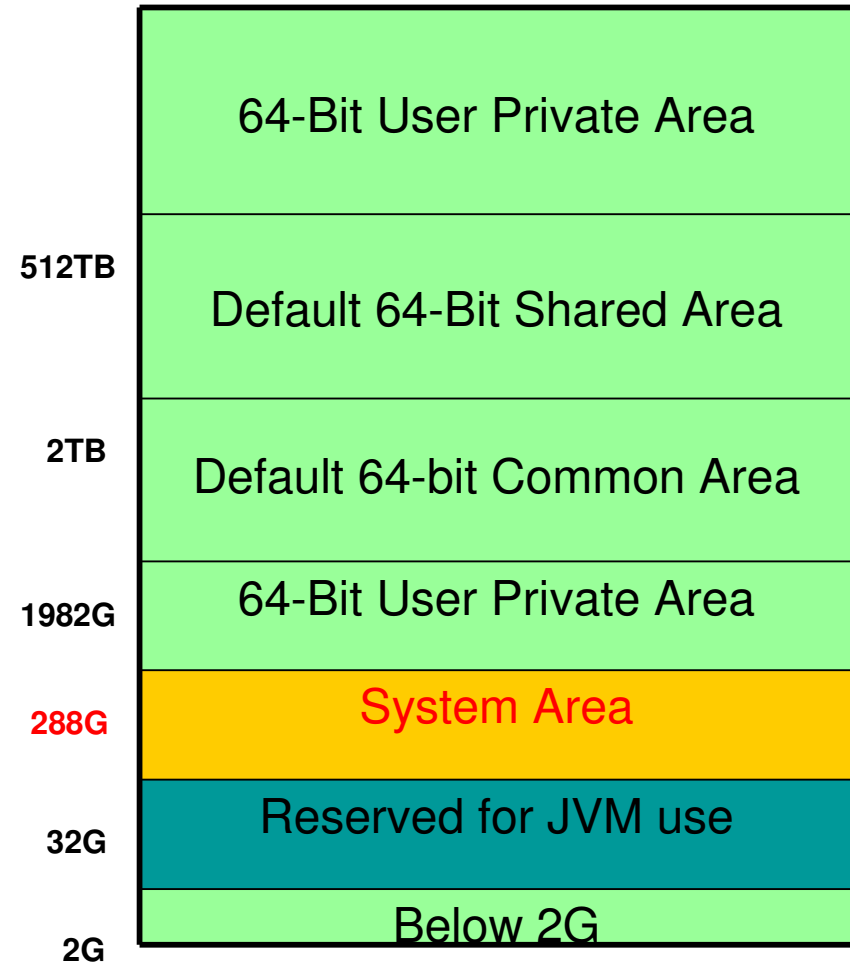
Controlling Discretionary Time Slice

- **Problem:**
  - Forcing ready work off a CPU causes cache disruption and overhead.
    - Yielding to higher priority work is necessary
    - Rotating equal priority nondiscretionary work is also important since it keeps processor delay low.
    - This rotation tends to be less important for discretionary work.
- **Solution:**
  - Allow the customer to give up to 254 additional timeslices to a dispatchable unit of CPU-intensive work with a discretionary goal before it must give up the CPU for equal priority work.
    - Not all discretionary work but only work most likely to use the additional time on the CPU – i.e. "CPU-intensive" work.
    - Installation defines "CPU-intensive" using the CCCSIGUR=x parameter
- **Benefit:**
  - The number of context switches occurring on a CPU when dispatching multiple units of CPU-intensive work at a discretionary goal is decreased
  - When work isn't switched, cache misses are reduced so throughput can increase

System Area above 2GB

- A new system area will be created in the address space 64-bit map
- Memory objects allocated in the System Area will start at x'8_00000000'
- *An authorized program can issue IARV64 REQUEST=GETSTOR, LOCALSYSAREA=NO/YES to indicate that the memory object should be allocated from the System Area above 2GB*
- In fork processing, during the 64-bit copy phase, memory objects that are allocated in the system area will not be copied to the child space

64-Bit Address Space Memory Map

	64-Bit User Private Area
512TB	Default 64-Bit Shared Area
2TB	Default 64-bit Common Area
1982G	64-Bit User Private Area
288G	System Area
32G	Reserved for JVM use
2G	Below 2G

Setting LE Parameters as non-overrideable

- **Problem:**

  - The only method for marking run-time options as nonoverrideable is at the installation-default level which requires installing SMP/E usermods.
  - Customers could not fully migrate customization to CEEPRM*xx,* which is strategic.

- **Solution:**

  - Allow the overrideable attributes (OVR and NONOVR) to be specified for run-time options in a CEEPRM*xx* parmlib member or from a SETCEE operator command.

- **Benefit:**

  - This support allows an installation to specify the options for Language Environment without installing user modifications, eliminating a repetitive migration task.
  - System-level run-time options can be specified as nonoverrideable and applied dynamically.

TSO/E multiple logons with JES2

- **Problem:**
  - JES2 allows TSO/E users to logon on once per system in a sysplex, however TSO/E could not support it because of the SEND command
  - If a message is issued on system A to a user on systems B and C, MVS SEND fails with IKJ572I and TSO/E SEND with IKJ55072I:

    USER(S) IBMUSER NOT LOGGED ON OR TERMINAL DISCONNECTED, MESSAGE CANCELLED

- **Solution:**
  - Now the message is sent to the first instance of a user that JESXCF finds

- **Prerequisites for installation**
  - Update the active GRSRNLxx member to delete or comment out:
    /* RNLDEF RNL(INCL) TYPE(GENERIC) */
    /* QNAME(SYSIKJUA) */

  - If you are using unique SYS1.UADS data sets you may need to add:
    RNLDEF RNL(EXCL) TYPE(SPECIFIC)
    QNAME(SYSDSN) RNAME(SYS1.UADS)

TSO/E Password Special Character Support

- TSO/E LOGON panel restricted eight character or less passwords to alphanumeric or national characters (a-z, A-Z, 0-9, @, #, $)
  - Not all security products for z/OS impose the same limit
  - Some security protocols require additional special characters

- In z/OS R12, users can enter other special characters in passwords if the security products allow users and adminstrators to do
  - However, line mode logon is not affected, as with password phrases

- Before this change TSO/E users would see:
  IKJ56464I You have entered unacceptable characters in the highlighted field(s).
  IKJ56465I Press PF1 or PF13 for help

- After this change they could still see:
  IKJ56414I NEW-PASSWORD IS INVALID FOR RACF
  IKJ56429A REENTER -

Health Checks in Metal C

- **z/OS supports writing health checks in either assembler language or REXX.**
  - **Assembler is not the easiest or most productive language**
  - **There are restrictions on what can be done in REXX**
- **C is a language that many programmers know**
- **Metal C can be used to authorized code with limited run-time support**
  - METAL C does not require a language environment (LE)
  - METAL C generates very efficient code, essentially allowing to "write an assembler program in C"
  - METAL C allows to embed assembler statements and in particular assembler (macro) service invocations
  - METAL C supports all the core functions of "regular" C
- C header files provided in SYS1.SIEAHDR.H
- Code samples are shipped in `/usr/lpp/bcp/samples`

Health Checker no longer requires uid(0) to use USS

- In order to successfully run health checks which use z/OS Unix System Services (USS), Health Checker must have a user profile with
  - OMVS segment and
  - USS super user authority
- Uid(0) user profiles are closely watched by auditors and might require extra explaining
- In z/OS V1R12 you can associate the Health Checker address space with a user profile which has
  - READ access to the BPX.SUPERUSER resource in the FACILITY class, and

  A non-zero uid

Standalone Dump ASID Prioritization

- ASIDs 1 – 4 are always dumped for minimal address spaces
- Prior to R12, the "summary" address spaces are hardcoded
  Address spaces like ANTMAIN, CONSOLE, XCFAS, IOSAS, SMXC, WLW, CATALOG, GRS, SMF, and ALLOCAS
- R12 changes the default summary address space list to:
  ALLOCAS, ANTAS000, ANTMAIN, CATALOG, CONSOLE, DEVMAN DUMPSRV, GRS, IEFSCHAS, IOSAS, IXGLOGR, JESXCF, JES2, JES3, OMVS, SMSPDSE, SMSPDSE1, SMSVSAM, WLM, SMF, SMFXC, XCFAS
- A new keyword ADDSUMM is provided to request additional address spaces

SADMP captures storage in following order:

1. Page frame table and its related structures
2. Real storage associated with the minimal address spaces
3. Real storage associated with the summary address spaces
4. Real storage associated with the swapped-in address spaces
5. In-use real storage
6. Page-out storage of minimal address spaces
7. Page-out storage of summary address spaces
8. Page-out storage of swapped-in address spaces
9. Storage of swapped-out address spaces
10. Available real storage

z/OSMF WLM Policy Editor

- **WLM Policy Editor is available on the z/OS Management Facility**
  - All the same function as in the Web-download tool and many new features
  - Direct access to the WLM Couple Data Set to install/extract service definitions. No need to FTP WLM policy files!
  - Activation of service policies and monitoring of the WLM status in the sysplex
  - Repository to store service definitions is starting point for edit, print, install operations
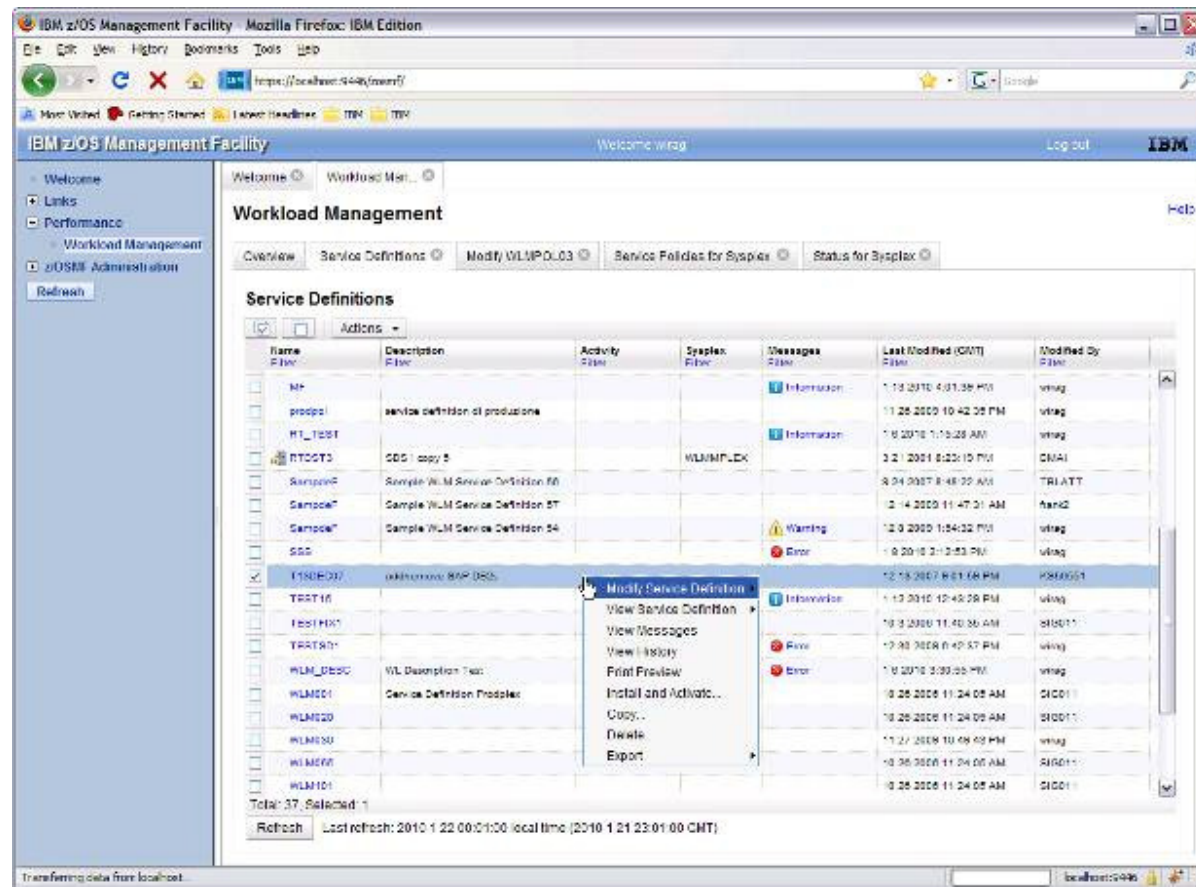
z/OSMF WLM Policy Editor

- **Simplified creation, modification and review of service definitions**
  - Policy elements are presented in tables
  - Tables can be filtered and sorted
  - Direct editing of policy elements within tables
  - Best-practice hints are displayed automatically while specifying policy elements
  - Several service definitions can be opened simultaneously
  - Cut, Copy, Paste of policy elements between service definitions
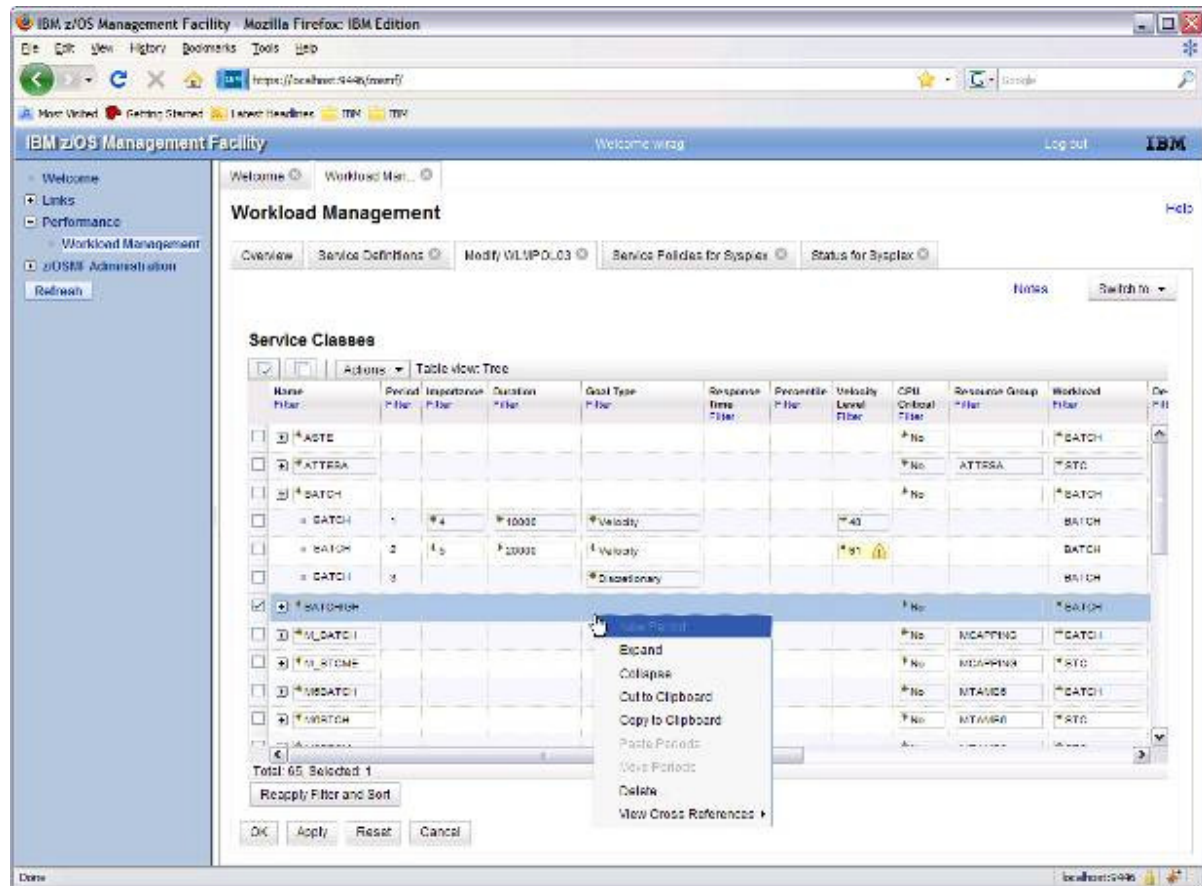
Elimination of Pre-built Unicode Image

- In z/OS V1R6, a pre-built image is provided to facilitate customer exploitation of DB2
  - The pre-built image is a binary file containing all the DB2-required conversion tables. It's automatically loaded at IPL time if the required conditions are met.

- In z/OS V1R7, Unicode Services added the support for "Unicode On Demand".
  - With "Unicode On Demand", conversion tables are loaded dynamically, if not already in storage, without requiring an IPL or disrupting the caller's request.

- "Unicode On Demand" eliminates the need to have a pre-loaded image. It is eliminated in z/OS R12