

z/TPF EE V1.1

z/TPFDF V1.1

TPF Toolkit for WebSphere® Studio V3

TPF Operations Server V1.2



IBM Software Group

## *TPF Users Group Spring 2007*

### *Check Processor Utilization (LODIC Extensions)*

Name: Bill Cousins

Venue: SCP Subcommittee

**AIM Enterprise Platform Software**

IBM z/Transaction Processing Facility Enterprise Edition 1.1.0

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# Agenda

- Review of current LODIC support
- LODIC extension infrastructure
- New ZSYSL parameters
- Internal support
- Questions?

# Current LODIC Support

- Resource priority classes
  - New name for old lodic priority classes
- Definitions are contained in CTKA
- Tables are located in CP copybook cics.cpy
  - At tag CPLODTAB
  - Cinfc tag CMMLODIC

# LODIC Extension Support

- For z/TPF only!
- Utilization priority classes
  - Up to 32 classes may be defined
- Exclusion list
  - Up to 16 owner names per class
- Classes are created/modified/removed with ZSYSL
  - No classes are predefined
- Class definitions are kept in the z/TPF file system
  - /etc/ibm\_lodic.conf
  - ZFILE cp /etc/ibm\_lodic.conf /etc/ibm\_lodic.bak/<datastamp>

# ZSYSL Parameters

- New and updated parameters to support the new utilization priority classes
  - Create - new
  - Alter - updated
  - Delete - new
  - Display - updated
  - Refresh - new

# ZSYSL Create parameter

```
|
|                                     .- --TARGET-100----.
+-Create-- --UTILClass-class--+-----+-----+-----+-----+
|                                     '- --TARGET-target-'   '- --ADOWNER-owner-' |
```

```
zsysl create utilclass-myutil1 target-65
SYSLO010I 13.42.18 UTILIZATION PRIORITY CLASS MYUTIL1 ADDED+

zsysl c utilclass-myutil2 target-75 addowner-ismp.zrecp
SYSLO010I 13.42.48 UTILIZATION PRIORITY CLASS MYUTIL2 ADDED+
```



# ZSYSL Alter parameter

```

+-Alter--  +-Class--+--BATCH--+-----+ ,CMB--+---value+-----+-----+
          +-LOBATCH--+-----+ ,ECB--+-----+
          +-IBMBATCH--+-----+ ,FRM--+-----+
          +-IBMHI--+-----+ ,IOB--+-----+
          +-USRL0D1--+-----+ ,SWB--+-----+
          +-USRL0D2--+-----+ '- ,FRM1MB-'
          +-USRL0D3--+-----+
          '-USRL0D4--'

          .-----+-----+-----+-----+-----+-----+-----+
          V
          '-UTILClass-class+-----+TARGET-target+-----+-----+-----+
                                           '- --PROC+procid-'
                                           owner+-----+-----+
                                           owner+-----+-----+'
    
```

```

+-ADDOWNER-
'-DELOWNER-
    
```

# ZSYSL Alter Output

```
zsysl alter utilclass-myutil2 addowner-ismp.zdupd
```

```
SYSL0011I 13.46.33
```

```
CURRENT TARGET SHUTDOWN LEVELS FOR UTILIZATION CLASS: MYUTIL2
```

```
DEFINITION FROM FILE:
```

```
UTIL CLASS      : MYUTIL2
```

```
EXCLUDE OWNER: ISMP.ZRECP
```

```
CPU TARGETS    :      E      J      K      L      M      _
                  B5  C5  D5  75  Z5  Q5  F5  G5  H5  I75  75  75  75  75
                  :
                  :      1      2
                  :      N5  O5  P5  Q5  R5  S5  T5  U5  V5  W5  X5  Y5  75  75
                  :
                  :      35  45  55  65
```

```
ALTERED TO:
```

```
UTIL CLASS      : MYUTIL2 _
```

```
EXCLUDE OWNER: ISMP.ZDUPD  ISMP.ZRECP
```

```
CPU TARGETS    :      E      J      K      L      M
                  B5  C5  D5  75  Z5  Q5  F5  G5  H5  I75  75  75  75  75
                  :
                  :      1      2
                  :      N5  O5  P5  Q5  R5  S5  T5  U5  V5  W5  X5  Y5  75  75
                  :
                  :      35  45  55  65
```

```
END OF DISPLAY+
```



# ZSYSL Delete parameter

```
+ -DELeTe-- --UTILClass-class-----+ 
```

```
zsysl delete utilclass-myutil1
```

```
SYSL0012I 13.48.46 UTILIZATION PRIORITY CLASS MYUTIL1 DELETED+
```

# ZSYSL Display parameter

```

>---+-Display--  ---+-Class--+-BATCH-----+-----+-----+-----><
|                |                +-LOBATCH--+
|                |                +-IBMBATCH--+
|                |                +-IBMHI-----+
|                |                +-USRL0D1--+
|                |                +-USRL0D2--+
|                |                +-USRL0D3--+
|                |                '-USRL0D4--'
|                |                .- --COPY-C-----|.
|                |                +-UTILClass--+-class--+-----+
|                |                '-ALL----'  '- --COPY---+F--+-'
|                |                '-UTIL---+-----+'-B-'
|                |                '- --STATS---+class--+-'

```

'-ALL----'

# ZSYSL Display Output

## zsysl display utilclass-all copy-b

SYSL0044I 14.45.54 DISPLAY FROM CORE AND FILE FOR ALL UTILIZATION CLASSES

DEFINITION FROM CORE:

```
UTIL CLASS      : MYUTIL2
EXCLUDE OWNER: ISMP.ZDUPD  ISMP.ZRECP
CPU TARGETS    :   B
                :   75
```

DEFINITION FROM FILE:

```
UTIL CLASS      : MYUTIL2 _
EXCLUDE OWNER: ISMP.ZDUPD  ISMP.ZRECP
CPU TARGETS    :
                :           E      J      K      L      M
                :   B75 C75 D75 75 Z75 Q75 F75 G75 H75 I75 75 75 75 75
                :
                :   N75 O75 P75 Q75 R75 S75 T75 U75 V75 W75 X75 Y75 75 75 1 2
                :
                :   375 475 575 675
```

END OF DISPLAY+

# ZSYSL Display Output

## zsysl display util

SYSL0018I 14.42.30 DISPLAY OF PROCESSOR UTILIZATION STATISTICS  
CURRENT PSEUDO PROCESSOR UTILIZATION: 48

OWNER	UTILIZATION
ISMP.ZDUPD	32
ISMP.ZRECP	0

END OF DISPLAY+

## zsysl display util stats-all

SYSL0018I 14.42.36 DISPLAY OF PROCESSOR UTILIZATION STATISTICS  
CURRENT PSEUDO PROCESSOR UTILIZATION: 91

OWNER	UTILIZATION
ISMP.ZDUPD	0
ISMP.ZRECP	42

  

CLASSES	TARGET	TARGET	—
MYUTIL2	SHUTDOWN	75	
			UTILIZATION

END OF DISPLAY+

# ZSYSL Refresh parameter

+--Refresh-----+

## **zsysl refresh**

SYSL0013I 13.50.06 REFRESH UTILCLASS DEFINITIONS FROM FILE TO CORE

DEFINITION FROM CORE:

NOTHING TO DISPLAY

REFRESHED TO:

UTIL CLASS : MYUTIL2  
EXCLUDE OWNER: ISMP.ZDUPD ISMP.ZRECP  
CPU TARGETS : B  
                  : 75  
END OF DISPLAY+

# System Tables

- Utilization Class Table
  - Storage allocated above 2GB bar, key 'F'
  - Holds entries for 32 utilization priority classes
- Updated with current lodic configuration file information
  - Restart Processing
  - ZSYSL REFRESH command
- Each entry contains
  - Class name
  - Class target shutdown level (0-100 percent)
  - Exclusion list (up to 16 owner names allowed)
  - Count of active ECBs using class



# System Tables

- Owner Utilization Table
  - Storage allocated above 2GB bar, key 'F'
  - Table consists of 3 parts
    - Hash bucket area for owner name entry chains
    - Owner utilization arrays (1 per I-stream)
    - Owner Name Entries
- Owner utilization arrays
  - Each array contains 6000 elements (one for each 50ms interval)
  - Each element points to owner name entry that was assigned that interval
  - Array control area points to first, last and “oldest” array element
- Owner name entries include
  - High and mid-level qualifiers of ECB owner names
  - Utilization Sampling count for current 5-minute rolling window

# Owner Utilization Sampling

- Sample once every 50ms interval on each I-stream
- “floating” CPU timer interrupt used
  - Similar to that used for ZTRAP EI sampling
- If ECB was running, search owner utilization table for owner name entry with ECB’s owner name
- If no ECB, use “No ECB” owner name entry
- Increment entry’s utilization count to assign the 50ms to owner name.

# Owner Utilization Sampling

- I-stream's utilization array has element for each 50ms interval in 5-minute rolling window
- “Oldest” element is reused
  - Decrement utilization count in current owner name entry
  - Update element with owner name entry address
  - Bump to next element as “oldest” entry
- Owner utilization =  $(\text{utilization count} * 100) / (6000 * \text{number of I-streams})$

# CPU Pseudo Utilization Calculation

- Calculate once every 50ms interval per I-stream
- “floating” CPU timer interrupt used
  - Similar to that used for ZTRAP EI sampling
- Each I-stream’s utilization saved in array in CP
- Subtract idle-time and “delay/defer” time from total time since last calculation
- $\text{Utilization} = (\text{“busy” time} * 100) / \text{total time}$
- Indicate CEC utilization needs to be calculated by LODIC processing.

# CEC Utilization Calculation

- Only calculated as needed by LODIC processing
  - LODIC ECBCREATE/SUSPEND/CHECK macro processing for ECB using utilization priority class
  - CP calls to LODIC CHECK processing after LODIC ECB has “waited” (e.g. after FINWC, DLAYC, DEFRC, WAITC)
  - Processing of new “utilization” suspend list (every 50ms on each I-stream) to determine if suspended ECB should be dispatched
- CEC Utilization =  $\left( \frac{\text{sum of I-stream utilizations} * 100}{\text{number of I-streams}} \right)$

# Any Questions?



# LODIC CHECK

- Perform resources availability calculations
  - Physical blocks (priority class from CLASS= parm)
  - CPU utilization (utilization priority class from UTILCLASS= parm)
- Utilization class calculations
  - Class utilization = CEC utilization – Owner Utilization
  - Owner utilization
    - Utilization class table entry holds class exclusion list
    - List contains owner name entry addresses which hold sampling counts
    - Calculate owner utilization of all owners in exclusion list
  - Compare class target shutdown level with calculated class utilization

# LODIC ECB CREATE, SUSPEND

- LODIC ECB set up for utilization priority class
  - Mark ECB as LODIC ECB (CE2LODIC\_UTL bit)
  - Save utilization class table entry address, based on LODIC UTILCLASS= parm, in ECB (CE2UTLCLASS)
  - Save “create” utilization class table entry address, based on LODIC CREUTIL= parm, in ECB (CE2UTLCRCLASS)
- Invoke LODIC CHECK processing
  - If resources are not available, return code = 0
  - If resources are available, return code = 1
- If LODIC SUSPEND and resources not available
  - Add ECB to new “utilization” portion of suspend list
  - If MAXSUSP= parm supplied and ECB suspends for maximum time, return code = 2 and MAXRTN= code is invoked

# LODIC PUSH/POP Support

- Mechanism to save/restore ECB LODIC settings
- LODIC PUSH=YES|NO
  - Allowed on LODIC ECBCREATE, SUSPEND, or UNMARK
  - Default is PUSH=NO
  - Saves current ECB LODIC fields into “last saved” entry in SWB for this ECB
  - SWB allocated on first PUSH=YES for ECB
- LODIC POP
  - Restores ECB LODIC fields from “last saved” entry in ECB
  - No resource checking performed

# LODIC UNMARK

- New TYPE= parameter to reset LODIC settings
- TYPE= values
  - CLASS resets priority class settings (default value)
  - UTILCLASS resets utilization priority class settings
  - BOTH resets all class settings.
- PUSH=YES can be supplied to save ECB's current LODIC settings

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