Welcome to:

POWER Systems Micro-Partitioning

Part 2

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Objectives

- Use AIX commands to view partition configuration and processor performance information
- Describe performance considerations when configuring Micro-Partitioning options
- Configure a partition using the advanced processor options

Viewing Processor Information

- Processors are seen with the **`lsdev`** command
  - **`lsdev`** shows *physical* or *virtual* processors

```
# lsdev -Cc processor
proc0 Available 00-00 Processor
proc2 Available 00-02 Processor
```

- Processor attributes are seen with the **`lsattr`** command

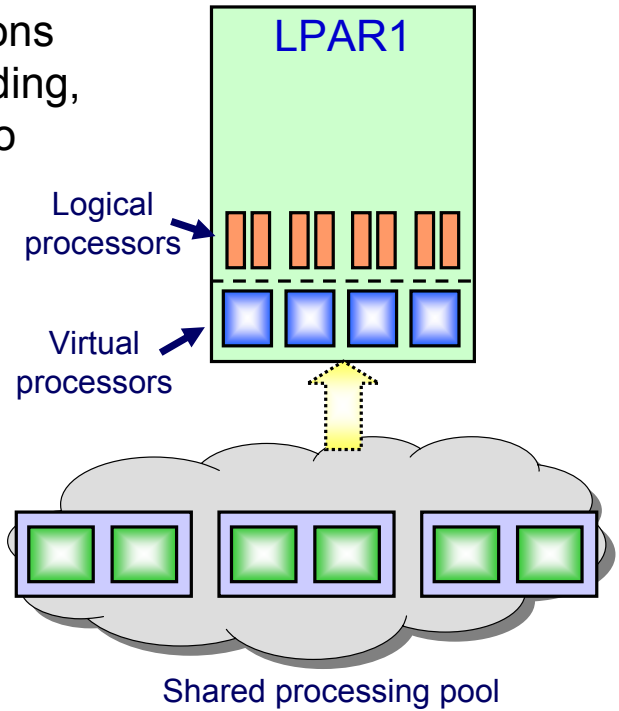
```
# lsattr -El proc0
frequency   1656000000     Processor Speed       False
smt_enabled true           Processor SMT enabled False
smt_threads 2              Processor SMT threads False
state       enable         Processor state       False
type        PowerPC_POWER5 Processor type        False
```

- Logical processors are seen with the **`bindprocessor`** command

```
# bindprocessor -q
The available processors are:  0 1 2 3
```

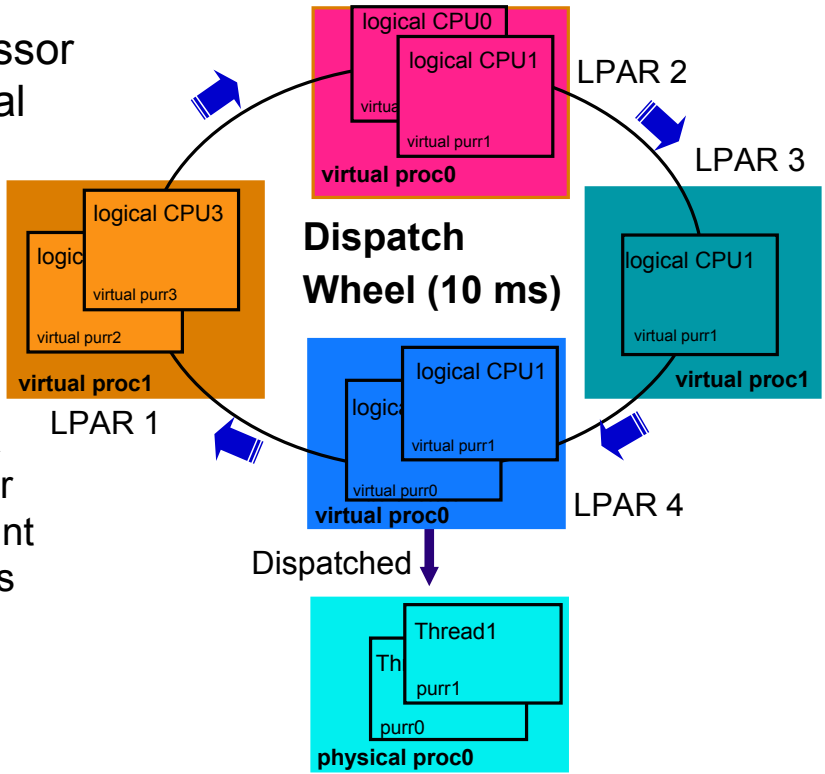
Simultaneous Multi-Threading and SPLPARs

- Simultaneous multi-threading can be used with Micro-Partitions
- With simultaneous multi-threading, each virtual processor runs two threads
  - Each thread is called a logical processor
- LPAR1 example:
  - 1.6 processing units
  - 4 virtual processors
  - Simultaneous multi-threading enabled
    - 8 logical processors



Metrics with Simultaneous Multi-Threading and SPLPAR

- Each virtual processor supports two logical processors
  - Dispatched at the same time
- PURR statistic
  - Still measures fraction of time partition runs on a physical processor (the relative amount of processing units consumed)



Viewing Partition Information (1 of 2)

- `lparstat -i` command

```
$ lparstat -i
Node Name                                  : lou162
Partition Name                             : LPAR2
Partition Number                           : 2
Type                                       : Shared-SMT
Mode                                       : Capped
Entitled Capacity                          : 0.50
Partition Group-ID                         : 32770
Shared Pool ID                             : 0
Online Virtual CPUs                        : 1
Maximum Virtual CPUs                       : 2
Minimum Virtual CPUs                       : 1
Online Memory                              : 1280 MB
Maximum Memory                             : 1536 MB
Minimum Memory                             : 1024 MB
Variable Capacity Weight                   : 0
Minimum Capacity                           : 0.10
Maximum Capacity                           : 1.00
Capacity Increment                         : 0.01
Maximum Physical CPUs in system            : 2
Active Physical CPUs in system             : 2
Active CPUs in Pool                        : 2
Unallocated Capacity                       : 0.00
Physical CPU Percentage                    : 50.00%
Unallocated Weight                         : 0
```

Viewing Partition Information (2 of 2)

- The HMC **`lshwres`** command

`lshwres -r proc -m` ***`mansys`*** **`--filter "lpar_names=`**<u>***`LPAR`***</u>**`" --level lpar`**

Managed System Name — **Partition Name**

```
hscroot@hmc:~> lshwres -r proc -m sputnik --filter \
"lpar_names=LPAR2" --level lpar -F curr_proc_units,curr_procs \
--header

curr_proc_units,curr_procs
0.6,6
```

AIX SPLPAR Tool Impact (1 of 2)

- SPLPAR tool impact:
  - Many standard AIX analysis tools and the Perfstat library have been enhanced to use the new Processor Utilization of Resources Register (PURR) or Scalable Processor Utilization of Resources Register (SPURR) in POWER6 systems
  - Additional metrics have been added
  - New tools have been added such as **`lparstat`** and **`mpstat`**

- **`lparstat`** is an easy way to view partition's configuration and processor usage:

```
# lparstat

System configuration: type=Shared mode=Capped smt=On lcpu=4
mem=1024 psize=2 ent=0.80

%user  %sys  %wait  %idle physc %entc  lbusy   app  vcsw phint
-----  ----  -----  ----- ----- ----- ------   ---  ---- -----
  0.1   0.1    0.0   99.8  0.00   0.3    0.0  1.99   580     0
```

AIX SPLPAR Tool Impact (2 of 2)

- **`vmstat, iostat, sar`**:
  - Automatically use new PURR-based metrics for %user, %sys, %wait, %idle with simultaneous multi-threading or shared processor partitions
  - New metrics:
    - Physical Processor Consumed (**pc** or **physc**) by the partition
    - Percentage of Entitlement Consumed (**pec** or **%entc**) by the partition which can go as high as 1000% for uncapped partitions
- **`mpstat`** can be used to monitor logical and virtual processor activity
- **`topas -L`** adds LPAR view (shows new metrics)
- Additional tools such as **`trace`**-based tools can utilize additional metrics

Using `sar` with SPLPAR (1 of 2)

```
# sar -P ALL 1 2

AIX train172 3 5 00C88F7D4C00    03/01/05

System configuration: lcpu=2 ent=1.00

20:20:57 cpu     %usr     %sys     %wio    %idle    physc    %entc
20:20:58  0        23       58        0       19     0.01      0.7
          1         0        2        0       98     0.00      0.2
          U         -        -        0       99     0.99     99.1
          -         0        0        0       99     0.01      0.9
20:20:59  0        15       60        0       25     0.01      0.5
          1         0        2        0       98     0.00      0.2
          U         -        -        0       99     0.99     99.3
          -         0        0        0      100     0.01      0.7

Average   0        20       59        0       21     0.01      0.6
          1         0        2        0       98     0.00      0.2
          U         -        -        0       99     0.99     99.2
          -         0        0        0      100     0.01      0.8
```

Idle System

Using `sar` with SPLPAR (2 of 2)

```
# sar -P ALL 1 1
AIX bud152 3 5 00CDEF8E4C00    03/21/06

System configuration: lcpu=4 ent=0.80

16:19:23 cpu    %usr    %sys    %wio   %idle   physc   %entc
16:19:24  0        0       7       0      93    0.03     3.3
          1      100       0       0       0    0.37    46.8
          2      100       0       0       0    0.38    46.9
          3        0       1       0      99    0.02     3.1
          -       94       0       0       6    0.80   100.0

# mpstat -s 1 1
System configuration: lcpu=4 ent=0.8

     Proc0            Proc2
     39.99%           39.76%
cpu0     cpu1     cpu2     cpu3
 2.55%   37.45%   37.57%    2.19%
```

Busy System

topas - Example Main Screen

```
Topas Monitor for host:    bud151
Wed Nov 23 20:29:20 2005   Interval:  2

Kernel     0.2   |#                           |
User      99.6   |############################|
Wait       0.0   |                            |
Idle       0.2   |#                           |
Physc =  0.80                     %Entc= 100.0

Network  KBPS   I-Pack  O-Pack   KB-In  KB-Out
en0       0.3      2.5     0.5     0.1     0.2
lo0       0.1      1.0     1.0     0.1     0.1

Disk    Busy%     KBPS     TPS KB-Read KB-Writ
hdisk0    0.0      0.0     0.0     0.0     0.0

Name            PID  CPU%  PgSp Owner
spload       221394  39.8   1.3 root
topas        188422   0.0   1.1 root
gil           65568   0.0   0.1 root
aixmibd      237726   0.0   0.6 root
rpc.lock     147580   0.0   0.2 root
rmcd         176292   0.0   2.5 root
snmpdv3n     258276   0.0   1.0 root

EVENTS/QUEUES     FILE/TTY
Cswitch     260   Readch     1078
Syscall     261   Writech     161
Reads         1   Rawin         0
Writes        1   Ttyout      162
Forks         0   Igets         0
Execs         0   Namei         0
Runqueue    8.0   Dirblk        0
Waitqueue   0.0

PAGING            MEMORY
Faults        0   Real,MB    1024
Steals        0   % Comp     28.0
PgspIn        0   % Noncomp   3.9
PgspOut       0   % Client    4.7
PageIn        0
PageOut       0   PAGING SPACE
Sios          0   Size,MB     512
                  % Used      1.0
NFS (calls/sec)   % Free     98.9
ServerV2       0
ClientV2       0   Press:
ServerV3       0   "h" for help
ClientV3       0   "q" to quit
```

Partition Data with `topas -L`

```
# topas -L

Interval:    2    Logical Partition: LPAR1              Wed Nov 23 20:32:04 2005
Psize:   2                    Shared SMT  ON            Online Memory:   1024.0
Ent: 0.80                      Mode: Capped             Online Logical CPUs:  4
Partition CPU Utilization                               Online Virtual CPUs:  2
%usr %sys %wait %idle physc %entc %lbusy   app   vcsw phint %hypv   hcalls
 100    0     0     0   0.8  99.98 50.00  1.18    240     0   0.0        0
================================================================================
LCPU  minpf majpf  intr   csw icsw runq lpa scalls usr sys _wt idl   pc   lcsw
Cpu0      0     0   263   134  119    2 100     99 100   0   0   0 0.41    100
Cpu1      0     0   106   112  103    2 100    123 100   0   0   0 0.39    100
Cpu2      0     0    10     0    0    0   0      0   0  23   0  77 0.00     20
Cpu3      0     0    10     0    0    0   0      0   0  27   0  73 0.00     20
```

Cross Partition Data with `topas -C`

```
Topas CEC Monitor              Interval:  10          Mon Nov 28 17:10:46
2005
Partitions     Memory (GB)                Processors
Shr:  3        Mon: 2.5  InUse: 1.2       Shr:  1  PSz:  0   Shr_PhysB:  0.01
Ded:  1        Avl:   -                   Ded:  1  APP:  0.0 Ded_PhysB:  0.00

Host         OS  M Mem InU Lp  Us Sy Wa Id  PhysB  Ent  %EntC Vcsw PhI
-------------------------------------shared-----------------------------------
--
bud151       A53 S 1.0 0.3  4   0  0  0 99   0.00  0.80   0.5  325   0
bud155       A53 S 0.5 0.3  2   0  1  0 98   0.00  0.10   3.7  279   0
bud152       A53 S 0.5 0.3  2   0  1  0 98   0.00  0.10   3.5  262   0
```

Shared processor partitions

```
-------------------------------------dedicated-------------------------------
bud153       A53 C 0.5 0.3  2   0  0  0 99   0.00
```

Dedicated processor partition

Micro-Partitioning and Applications

- Applications do not need to be aware of Micro-Partitioning
- Applications that may not benefit from Micro-Partitioning:
  - Applications with a strong response time requirement for transactions may find Micro-Partitioning detrimental:
    - Because virtual processors can be dispatched at various times during a timeslice
    - May result in longer response time with too many virtual processors:
      - Each virtual processor with a small entitled capacity is in effect a slower CPU
    - Compensate with more entitled capacity (2-5% PUs over plan)
  - Applications with polling behavior
  - CPU intensive application examples: DSS, HPC
- Applications that are good candidates for Micro-Partitioning:
  - Ones with low average CPU utilization, with high peaks:
    - Examples: OLTP, web applications, mail server, directory servers