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REDEFINING MOBILITY

Standalone MP-Decision Tuning Guide

80-N9277-1 A

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Revision History

Version	Date	Description
A	Jan 2012	Initial release

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106.37.230.218 2014.07.01 at 03:00:41 PDT
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Contents

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MP-Decision Parameters – Overview

- MP-decision takes as input the average *runQ* depth (the average of the sum of all the tasks in the CPU *runQ*s) in a fixed time interval.
- Let N be the value that represents the average *runQ* depth. Then:
  - Nw is the upper threshold for N.
  - Tw is the time duration (in ms) for which the Nw threshold has been exceeded before the second core is woken up.
  - Ns is the lower threshold for N.
  - Ts is the time duration (in ms) for which the Ns threshold must be exceeded before the second core is put to sleep.
  - decision_ms is the time interval (in ms) for which N is computed.
  - --no_sleep is the option to disable idle power collapse while the second core is online (Dual Core mode).
  - --debug enables verbose debug logging.

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MP-Decision Parameters – Nw, Tw

- *Nw* and *Tw* control the decision to bring the second core online. When the system is in Single Core mode (CPU1 offline) the runQ average samples read from kernel are compared to the threshold *Nw*.
- The second core is brought online only if the *Nw* threshold is exceeded for *Tw* time. In other terms, the second core is brought online if a set of consecutive samples with value greater than *Nw* are read from kernel and the total duration of those samples is greater than *Tw*.
- The lower the value of *Nw*, the more sensitive *mpdecision* is to runQ changes.
- The shorter the *Tw* time, the more responsive *mpdecision* is to bring the second core online.

MP-Decision Parameters – Ns, Ts

- *Ns* and *Ts* control the decision to take the second core offline. When the system is in Dual Core mode (CPU0-1 online) the runQ average samples read from kernel are compared to the threshold *Ns*.
- The second core is taken offline only if the sampled runQ average is below the *Ns* threshold *Ts* time. In other terms, the second core is brought offline if a set of consecutive samples with a value lower than *Ns* are read from kernel and the total duration of those samples is greater than *Ts*.
- The lower the value of *Ns*, the more sensitive *mpdecision* is to runQ changes.
- The shorter the *Ts* time, the more responsive *mpdecision* is to take the second core offline.

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MP-Decision Parameters – mp_decision

- *mp_decision* is the rate at which *mpdecision* reads the runQ average computed by the kernel component. At the end of each *mp_decision* interval, *mpdecision* compares the read value with its thresholds to determine whether the second core needs to be taken offline/online.

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MP-Decision Parameters – --no_sleep

- *--no_sleep* option prevents the cores to idle power collapse while mpdecision decisdes to keep the second core online (while the system is in Dual Core mode).
- If *--no_sleep* is used, then when *mpdecision* brings the second core online, idle power collapse is disabled on both cores. It is restored the moment mpdecision takes the second core offline (while the system is in Single Core mode).
- Conceptually, if *mpdecision* keeps the second core online is because the runQ average is above the *Nw* threshold meaning that a certain level of workload parallelism is detected in the system. Enabling the *--no_sleep* option (thus preventing the cores to idle power collapse) allows the system to run at max performance when in Dual Core mode and avoid those cases in which short idles in the workload might cause a core to idle power collapse. If this occurs and a new task is scheduled on that core, then there is a performance impact due to the overhead to wake up the core from power collapse.

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MP-Decision Parameters – --debug

- *--debug* enable verbose debug logging
- If *--debug* is enabled, mpdecision prints these type of messages at the end of each decision interval:
  - Runqueue depth :<AVG> time :<TIME>\n
    - where <AVG> is the average runq for the sample of duration <TIME>ms (just) read
  - UP Nw:%f Tw:%d rq:%f seq:%f\n
    - Printed when mpdecision brings cpu1 online. Nw and Tw are the values to which the parameters are set. rq is the runq average of the last sample read. seq is the total time the avg runq has been greater than Nw. Assert: seq > Tw.
  - DOWN Ns:%f Ts:%d rq:%f seq:%f online_time: %lli\n
    - Printed when mpdecision brings cpu1 offline. Ns and Ts are the values to which the parameters are set. rq is the runq average of the last sample read. seq is the total time the avg runq has been less than Ns. Assert: seq > Ts. online_time is the time cpu1 has been online (the time since the last “UP” decision).

MP-Decision Parameters – Plotting RQ Depth

- To generate a rq depth plot, you must collect the logs twice:
  - In Single Core mode: for Nw, Tw determination. To force Single Core:

```
/system/bin/mpdecision --no_sleep --avg_comp --Nw=999 --Tw=9999 --
Ns=999 --Ts=1
```

  - In Dual Core mode: for Ns, Ts determination. To force Dual Core:

```
/system/bin/mpdecision --no_sleep --avg_comp --Nw=0.1 --Tw=1 --Ns=0.0
--Ts=99999
```

- Copy and paste (import) the output of messages of the form: (Runqueue depth :<AVG> time :<TIME>) into excel. In the log, each entry looks like this:

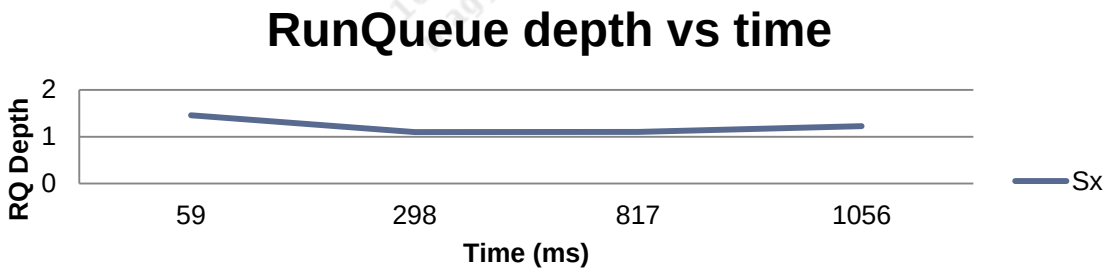
```
….
E/MP-Decision( 1865): Runqueue depth :1.457627 time :59.000000
E/MP-Decision( 1865): Runqueue depth :1.100418 time :239.000000
E/MP-Decision( 1865): Runqueue depth :1.104046 time :519.000000
E/MP-Decision( 1865): Runqueue depth :1.225941 time :239.000000
…
```

MP-Decision Parameters – Plotting RQ Depth (cont.)

- Assume you imported two columns Lx, Ly in Excel where:
  - Lxi=<time_interval_from_log_entry> and Lyi=<Runq_depth>
  - Create another series S where each entry (Sxi, Syi) corresponds to an entry (Lxi, Lyi), where:

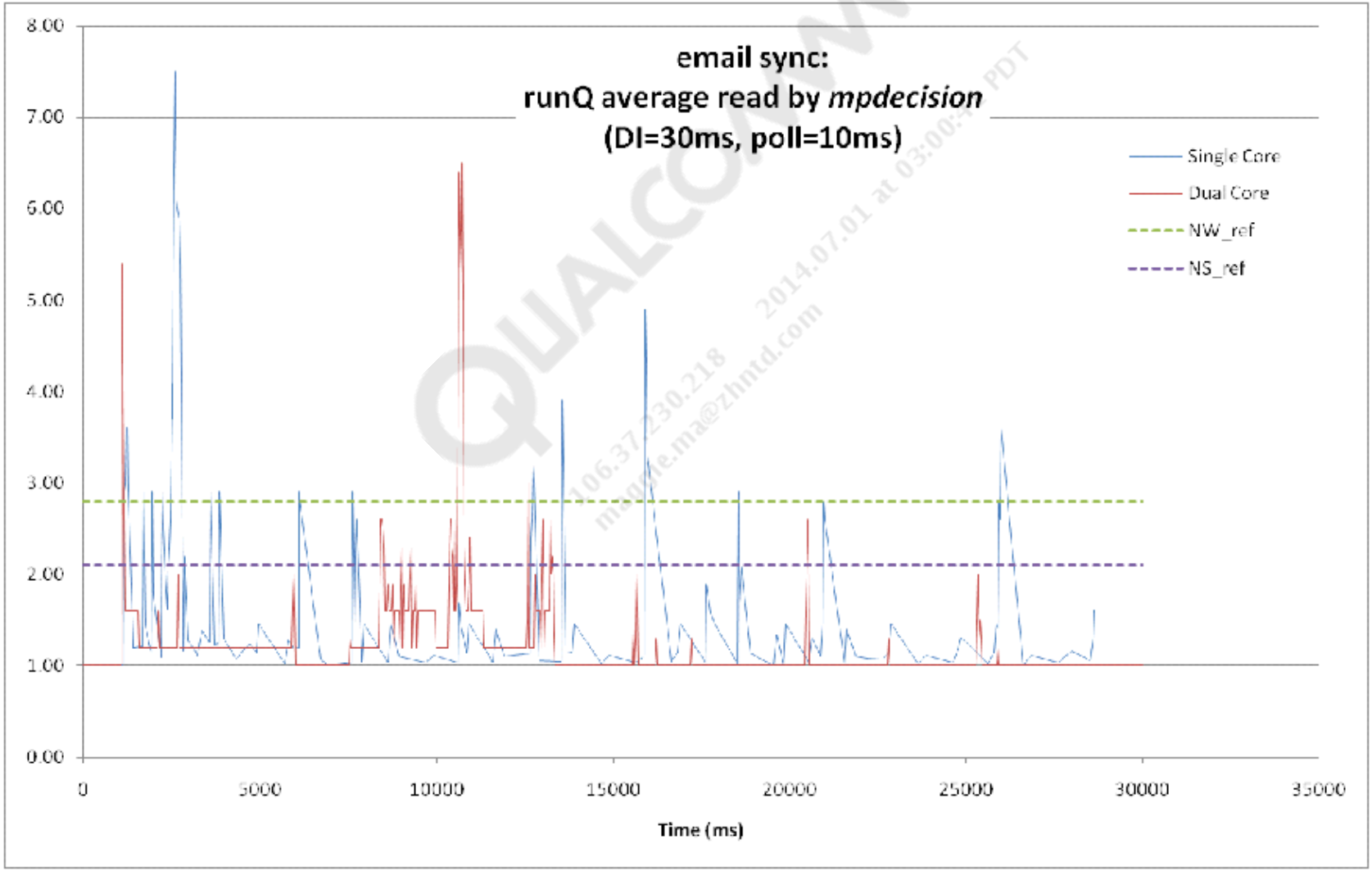
```
Sy0=Ly0, Sx0=Lx0;  Sy1=Ly1,  Sx1= Sx0+Lx1;        …        Syi=Lyi,
Sxi= Sx(i-1)+Lxi;  …
```

  - Using the sample log:
    - Plot the series (Sx, Sy)



- For each test case, create a series (Sx,Sy) for the Single Core and Dual Core cases. The synchronization between the series is done just looking at the waveform, and you can typically detect where the app starts/finish.

MP-Decision Parameters – Plotting RQ Depth (Example Plot)



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Questions?

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