Subject: Re: [ckrm-tech] [RFC] [PATCH 0/3] Add group fairness to CFS
Posted by William Lee Irwin III on Wed, 30 May 2007 20:13:59 GMT
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On Sat, May 26, 2007 at 08:41:12AM -0700, William Lee Irwin III wrote:
>> The smpnice affair is better phrased in terms of task weighting. It's
>> simple to honor nice in such an arrangement. First unravel the
>> grouping hierarchy, then weight by nice. This looks like
[...]
>> conveniently collapse to 1). Now that the hierarchy is flattened,
>> nice numbers can be factored in for t_1's final weight being
>> 0.7*0.36/(0.7*0.36+0.3*0.24+0.7*0.24+0.3*0.16) = 0.252/0.54 = 0.467..
>> and the others being 0.133.. (t_2), 0.311.. (t_3), and 0.0889.. (t_4).

On Wed, May 30, 2007 at 10:44:05PM +0530, Srivatsa Vaddagiri wrote:
> Hmm ..so do you think this weight decomposition can be used to flatten
> the tree all the way to a single level in case of cfs? That would mean we can
> achieve group fairness with single level scheduling in cfs ..I am
> somewhat skeptical that we can achieve group fairness with a single
> level rb-tree (and w/o substantial changes to pick_next_task logic in cfs
> that is), but if it can be accomplished would definitely be a great win.

Yes, the hierarchy can be flattened completely and global task weights
computed and used to achieve group fairness. The changes aren't to
pick_next_task() but rather to the ->fair_key computations. In fact, I
went a step beyond that.

On Sat, May 26, 2007 at 08:41:12AM -0700, William Lee Irwin III wrote:
>> In such a manner nice numbers obey the principle of least surprise.

The step beyond was to show how nice numbers can be done with all that
hierarchical task grouping so they have global effects instead of
effects limited to the scope of the narrowest grouping hierarchy
containing the task. I had actually assumed the weighting and
flattening bits were already in your plans from some other post you
made and was building upon that.

-- wli

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> > that is), but if it can be accomplished would definitely be a great win.
>
> Yes, the hierarchy can be flattened completely and global task weights
> computed and used to achieve group fairness.

ok, lets say we are are considering a hierarchy of user->process->thread as
below:

Users = {U1, U2, U3}

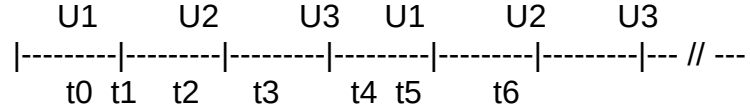
where process in a user are:

U1 = {P0, P1, P2, P3, P4}
U2 = {P5, P6}
U3 = {P7}

and where threads/tasks in a process are:

P0 = {T0, T1}
P1 = {T2}
P2 = {T3, T4, T5}
P3 = {T6}
P4 = {T8}
P5 = {T9, T10}
P6 = {T11}
P7 = {T14, T15, T16}

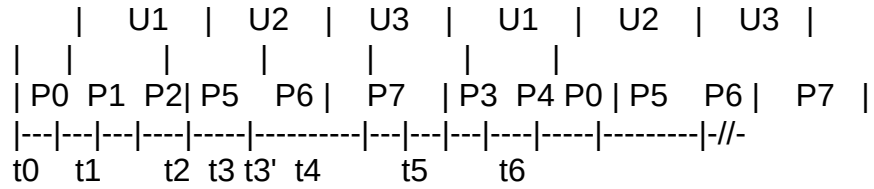
If we need to achieve group fairness given single-level hierarchy,
then tasks need to be spread out in rb-tree like something below?



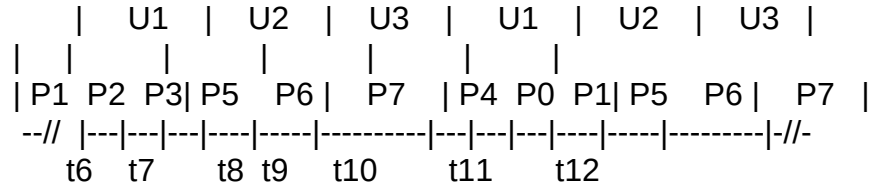
[t0, t1 ..tN are equally spaced points in time. t1 = t0 + K, t2 = t1 + K ..]

Viewed at the top hierarchy level (users) tasks are spread such that each user
gets "equal" execution over some interval (lets say b/n t0-t3).

When viewed at the next lower hierarchy level (processes), it should look like:

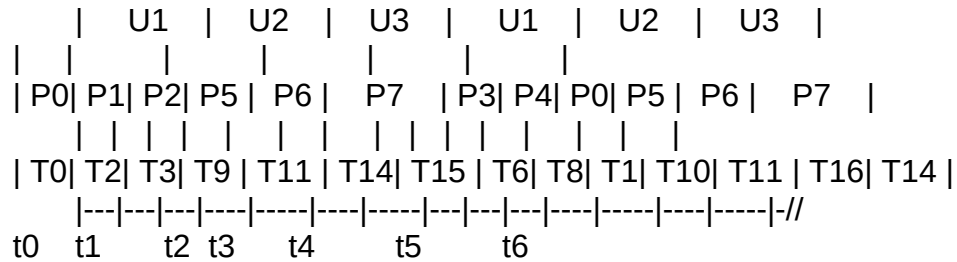


[contd below ..]

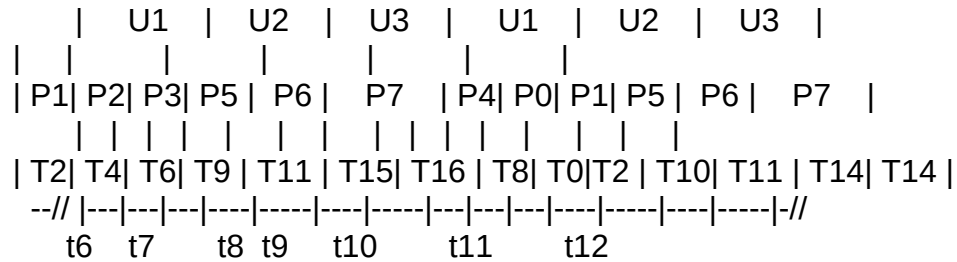


The available bandwidth to a user is dividided "equally" between various processes of the user over some time (say between t0 - t3').

When viewed at the next lower hierarchy level (threads), it should look like:



(continuting below)



Available bandwidth to a process is divided "equally" between threads of the process.

Although I have been using "equally" everywhere above, it needs to take

into account relative importance of tasks/processes/users.

> The changes aren't to pick_next_task() but rather to the ->fair_key
> computations.

Thats the $$ question I guess :) What computation of ->fair_key can we use
such that task execution sequence is (from the above example):

T0, T2, T3, T9, T11, T14, T15, T6, T8, T1, T10, T11, T16, T14 ...

?

Of course, this ->fair_key computation should default to what it is
today when hierarchical res mgmt is disabled?

> In fact, I went a step beyond that.
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> effects limited to the scope of the narrowest grouping hierarchy
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> flattening bits were already in your plans from some other post you
> made and was building upon that.

I would definitely be willing to try out any experiments you think of,
esp those that allow the hierarchy to be flattened. atm fair_key
calculation (in the context of cfs) seem to be the biggest challenge to
surmount for this to work.

--
Regards,
vatsa

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Containers mailing list
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https://lists.linux-foundation.org/mailman/listinfo/containers