Realtime BoF Session

Realtime Preempt Patch Adaptation Experience
(including Commercial Product)

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Content

• Realtime Preempt Patch
• Related Experience
• Todo of RTWG
Real-Time Preemption Patch

• Real-Time Preemption
  – Reimplemented and announced by Ingo Molnar in Linux 2.6.12-rc2
    • Downloadable site: http://people.redhat.com/mingo/realtime-preempt
  – Recommended for systems with 100usec preemption latency or less
  – Added as kernel option “Complete Preemption”
    • Preemptible kernel + voluntary preemption
    • Interrupt thread
    • Mutex based preemption
    • Priority inheritance mechanism
Related Experience - Test (1/2)

- System: Via Nehemiah 1GHz, 256Mbyte memory
- Kernel version: Linux 2.6.15.2
- Stress: find (per 5min), ping (per 1usec), hackbench 50 (per 5min)
- Test time: 10 hours

<table>
<thead>
<tr>
<th></th>
<th>Max latency time (usec)</th>
<th>Min latency time (usec)</th>
<th>Ave latency time (usec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vanilla</td>
<td>17388</td>
<td>2.11627</td>
<td>7.8942</td>
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<tr>
<td>Voluntary</td>
<td>17972</td>
<td>2.13827</td>
<td>5.31433</td>
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<tr>
<td>Preemptible</td>
<td>5272.43</td>
<td>2.30229</td>
<td>5.956</td>
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<tr>
<td>Realtime-reempt</td>
<td>33.7593</td>
<td>5.5507</td>
<td>6.71805</td>
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</tbody>
</table>
Related Experience - Test (2/2)

- System: Via Nehemiah 1GHz, 256Mbyte memory
- Kernel version: Linux 2.6.20
- Stress: find (per 5min), ping (per 1usec), hackbench 20 (per 5min)
- Test time: 1 hours

<table>
<thead>
<tr>
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<th>Max latency time (usec)</th>
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<td>Vanilla</td>
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<td>Voluntary</td>
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<td>Realtime–reempt</td>
<td>41.0612</td>
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<td>6.63489</td>
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</table>
Related Experience - adaptation

• Adaptation on medical measurement equipment
  – Excellent!

• Adaptation on smartphone
  – Smartphone requires real-time feature for call processing, multimedia processing and so on.
  – Realtime requirement has satisfied but declined system throughput.
Related experience - adaptation

Throughput test (1/2)

- Throughput test result (1/2)
  - System: 2.8 GHz CPU x86 architecture
  - Test method: hackbench
  - Conclusion: Realtime-preemption patch caused to decline kernel’s throughput.

<table>
<thead>
<tr>
<th>hackbench option</th>
<th>hackbench 1</th>
<th>hackbench 10</th>
<th>hackbench 20</th>
<th>hackbench 40</th>
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</thead>
<tbody>
<tr>
<td>Vanilla kernel</td>
<td>0.1824</td>
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<td>Realtime-preemption kernel</td>
<td>0.1378</td>
<td>0.1672</td>
<td>1.443</td>
<td>0.834</td>
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</tbody>
</table>

hackbench test result table
Related experience - adaptation

Throughput test (2/2)

![Graph showing throughput test results for hackbench socket and pipe.](image)
Related experience - adaptation

• Reduce the number of applications in smartphone to apply the realtime preempt patch.
Todo of RTWG

• Realtime performance Test
  – Various test methods
  – Various architectures

• Documentations
  – Technical documents on
    • Source code level description
    • Performance analysis
  – Realtime requirements

• What else?