This Year at SRC:
Dr. George is Right
Topics

- Has the reconfigurable computing era passed?
- Brief overview of SRC’s last years accomplishments
- Could HPC and HPEC really be one in the same?
Topics

• Has the reconfigurable computing era passed?
• Brief overview of SRC’s last years accomplishments
• Could HPC and HPEC really be one in the same?
Popular Views:
Reconfigurable Computing is Dead

• You don’t see any articles in the popular press
• Look at how much we hear about multi-core
• University work has moved on to other things
• Companies are getting out of it
• Conclusion: Obviously it did not work
Reality: Reconfigurable Computing is Very Alive

- Popular press always jumps on whatever is new often based on corporate promotion engines
- Yes multi-core is here and promoted by large companies as the future; But so was Itanium
- University work always follows the newest thing because that is were they can get money
- Too many companies jumped in incorrectly thinking they could sell a partial solution.
- System sales have moved from vocal lower revenue Universities to quiet higher revenue companies
- Conclusion: It does work and business is growing
Topics

• Has the reconfigurable computing era passed?
• Brief overview of SRC’s last years accomplishments
• Could HPC and HPEC really be one in the same?
SRC-7 Product Line Expanded

• SRC-7 MAPstations, Hi-bar systems and Infiniband clusters are all shipping
• 8 MAP configurations available
• 2 versions of Carte now available
• Systems starting at $17K
Radius Memory Hierarchy

• First system with 14 Tbytes delivered
• Programmer View
  – All memory accessed in a uniform manner
  – Any memory may be a target or source for block data transfer
SRC-7 Portable System

- Currently in design
- Uses Series H MAP and Intel Atom processor
- 9.2” x 6.75” x 3.64”
- Lightweight (<6 lb.) and sealed Mil Spec versions
- <100 watts typical
# New GPIOX Cards

<table>
<thead>
<tr>
<th><strong>A/D</strong></th>
<th><strong>Cameralink</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Dual 10 bit, 2 Gsample A/D with coherent clock source provides data for RADAR Backprojection directly to MAP</td>
<td>Full bandwidth cameralink interface provides data directly to MAP for biometrics, airborne identification and tracking applications</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>FPDP/Ethernet PCS</strong></th>
<th><strong>Other Possibilities:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Supports multi-box system interconnect direct to MAP</td>
<td>Direct network connections</td>
</tr>
<tr>
<td></td>
<td>Fiberchannel interfaces</td>
</tr>
<tr>
<td></td>
<td>D/A conversion</td>
</tr>
<tr>
<td></td>
<td>Sensor connections</td>
</tr>
</tbody>
</table>
Topics

- Has the reconfigurable computing era passed?
- Brief overview of SRC’s last years accomplishments
- Could HPC and HPEC really be one in the same?
Forward Looking Question

- 2002: Can you fit this system on a Predator?

Jay Keyworth
Fmr. Dir. HP
Dir. General Atomics
Forward Looking Answer

• 2002: Yes!

Maybe there’s a better solution
The Winding Road

• 2003: SRC moves from single to multi-MAP systems
The Winding Road

- 2004: Air Force contract to shrink MAPstation to fit on mid-flier UAV and publishes results in 2005

HPC

2003

1 MAP
512 Mbytes CM
Intel M µP
2” x 6” x 12”
100 Watt typical

HPEC

2004

7’ wingspan UAV
The Winding Road: Anatomy of the TRACER Program SDP

- Customer sees Air Force results; asks for larger system using standard SRC modules for a general purpose processor
- First app is 250K lines of C++ code; floats, fixed and integers
- Multicore ineffective due to per processor data access requirements
- Multiple simultaneous processes on $\mu$P need to access MAPs & CM
- Staff were programmers with no hardware skills
The Winding Road

- **2007**: Army awards LMCO a contract to use expanded MAPstation on Sky Warrior version of Predator

HPC

2003

2004

2007

HPEC

4 MAPs
80 Gbytes CM
Dual socket Intel Xeon μP
10.5” x 17” x 20”
600 Watt typical
Uses standard SRC modules
The Winding Road:
TRACER SDP

- 3 programmers took 3 months to port application to system
- Used Carte™ with standard debuggers; No debugging on hardware!
- Performance shown to equal 100 1.5 GHz Power PCs
- SRC COTs hardware meets required airborne MIL specs
- 10.5” x 17” x 20” package weighing 85 pounds
- 600 watts
The Winding Road

- 2008: Oil company starts talks to use rugged system in the field
- LMCO requests an air cooled version for non-airborne use

**HPC**

2003

10 Standard MAP or 16 Gbyte CM modules

Dual socket Xeon μP

10.5” x 17” x 26”

600 Watt typical

2004

**HPEC**

2007

2008

10 Standard MAP or 16 Gbyte CM modules

Dual socket Xeon μP

10.5” x 17” x 26”

600 Watt typical
• 2008: Oil company realizes it is a general purpose system and is now evaluating its use in their IT center
The Winding Road

- 2008: Major defense contractor requests a new rugged MAPstation be built from standard SRC-7 modules

HPC

2003

2004

2007

HPEC

2007

2008

2 Series H MAPs
19 Gbytes CM
Intel Atom \( \mu P \)
4” x 12” x 10”
200 Watt typical
Based on SRC’s Experience

• There is no real difference in HPC and HPEC
  – Hardware is the same
  – Carte programming environment is the same
  – There are not significant differences in application constructs
  – The only real difference is that HPEC takes size, weight and power constraints much more seriously

• Issues needing to be resolved to bring RC into both arenas are really the same
  – We would advocate closer ties between communities
  – CHREC is a good but embedded is often viewed as inferior

Dr. George was right in 2007!