Multi-Computing
PC Card

Architectural Decisions
Part 2. Developing the architecture

Janicki Tomasz

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Agenda

1. Part 1: Short reference
2. Main Considerations
3. Choice of FPGA
4. Architecture
5. Future "TO DO" List
1. Part 1: MCPCC General Idea(s)

- To work as stand-alone board or as a PC card (PCI, PCIe,...)
- As low-cost as possible (thus not super-computing)
- To communicate over (various) digital interfaces
- Functional-educational platform
  - HDL implementations
  - Embedded programs (systems) implementations
  - Digital Signal Processing
- Not one high speed controller but Cluster
1. Part 1: OMAP – L138

(1) Note: Not all peripherals are available at the same time due to multiplexing.
2. Main Considerations

- Two L138 on-board
  - Direct connection, shared memory cluster (ethernet, or bus)

- OMAP L138 Specific
  - L138 hardware support for various interfaces
    - L138 programmable pins

- uP's and FPGA sharing
  - Obtaining and confronting Timing Requirements for peripherals and interfaces
    - Choice of FPGA (with different device/timing models tpd's vary =~4-12 ns) :(
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Some devices cannot be simply disconnected !!!
2. Main Considerations

- Two L138 on-board
  - Direct connection, shared memory cluster (ethernet or bus)

- FPGA acting as crossbar
  - L138 hardware support for various interfaces
    - L138 programmable pins

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  - Obtaining and confronting Timing Requirements for peripherals and interfaces
    - Choice of FPGA (with different device/timing models tpd's vary =~4-12 ns) :(
3. Choice of FPGA

<table>
<thead>
<tr>
<th>Full potential</th>
<th>Multiprocessing potential</th>
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<tbody>
<tr>
<td>✗ To fully pass OMAP interfaces → ~ 320 IO's</td>
<td>✓ More sharing</td>
</tr>
<tr>
<td>✗ To implement all interfaces → ~ 320 IO's</td>
<td>✓ Limit to the interfaces useful from processing and multiprocessing side of view</td>
</tr>
<tr>
<td>✗ Additional useful (ie. OPTO) interfaces → ???</td>
<td>✓ Do not pass every interface via FPGA</td>
</tr>
<tr>
<td>✗ To implement PCI → ~ 100 IO's</td>
<td>✓ Limit to FPGA's supported by free software</td>
</tr>
<tr>
<td>✗ Big FPGA's → Big Price</td>
<td>✓ Limit to rather Low–Cost FPGA's</td>
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<tr>
<td>✗ Free editions of softwares doesn't support big FPGA's</td>
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</tbody>
</table>
3. Choice of FPGA

- A lot of I/O standards
  - including compatible with OMAP L138

- 622 user I/O
  - 8 banks

- Low-Cost
  - ~1k PLN @ Farnell

- PCI / PCI X
  - 33/66/133 MHz

- PCIe 1x
  - with external PHY
  - PCIe compilant (says PCI-SIG)

- DDR/DDR2
  - up to 167 Mhz
5. Future ”TO DO” List

- To do pre-layout simulations using IBIS models
  – to save myself from eventual total failure

- To buy/recive the most important devices
  – Cyclone and OMAPs

- To finally do proper schematics and layout
  – including post layout simulations

- Produce, program and test the design
  – (not so) far future
Thank you for listening

tomasz.janicki.tj@gmail.com

Questions please