



Adaptive Wiring Manifold Research Update

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COSMIAC

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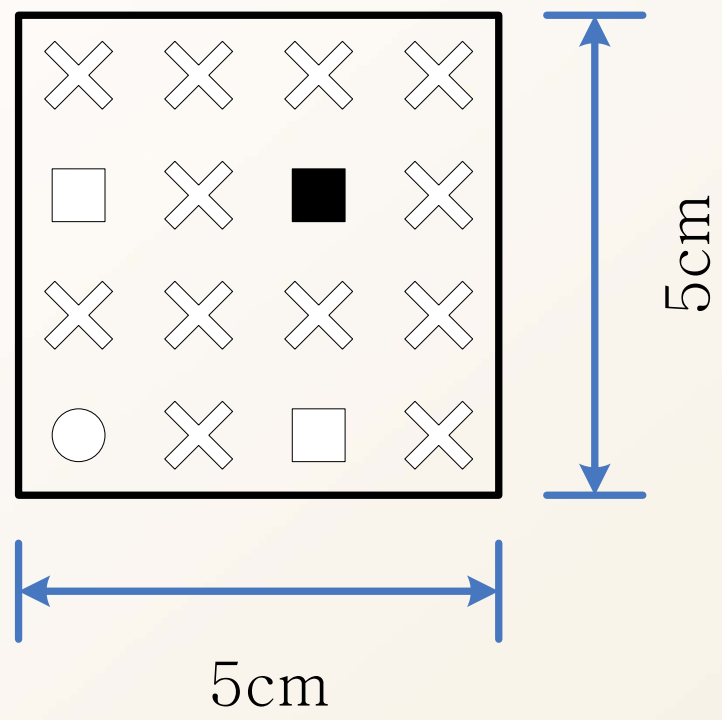


Project Overview

- Programmable wiring harness is being built
- Soft-configured at the time of use
- Useful properties
 - Self-healing - error diagnostics and dynamic re-routing.
- Software-defined probe signals facilitate the high level instructions of configuring the soft-wires and connections. Algorithms used in FPGA routing will be exploited to guide the formation of switchable wire paths in this adaptive wiring manifold.
- Modules connected to cells through a defined but flexible interface.



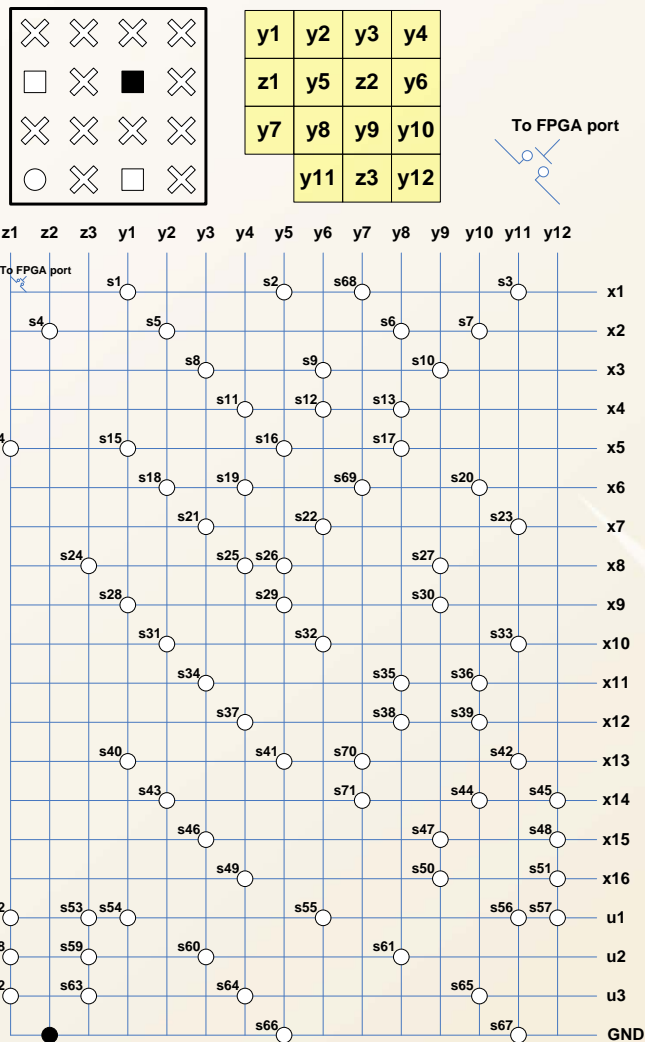
Unit Cell Arrangement



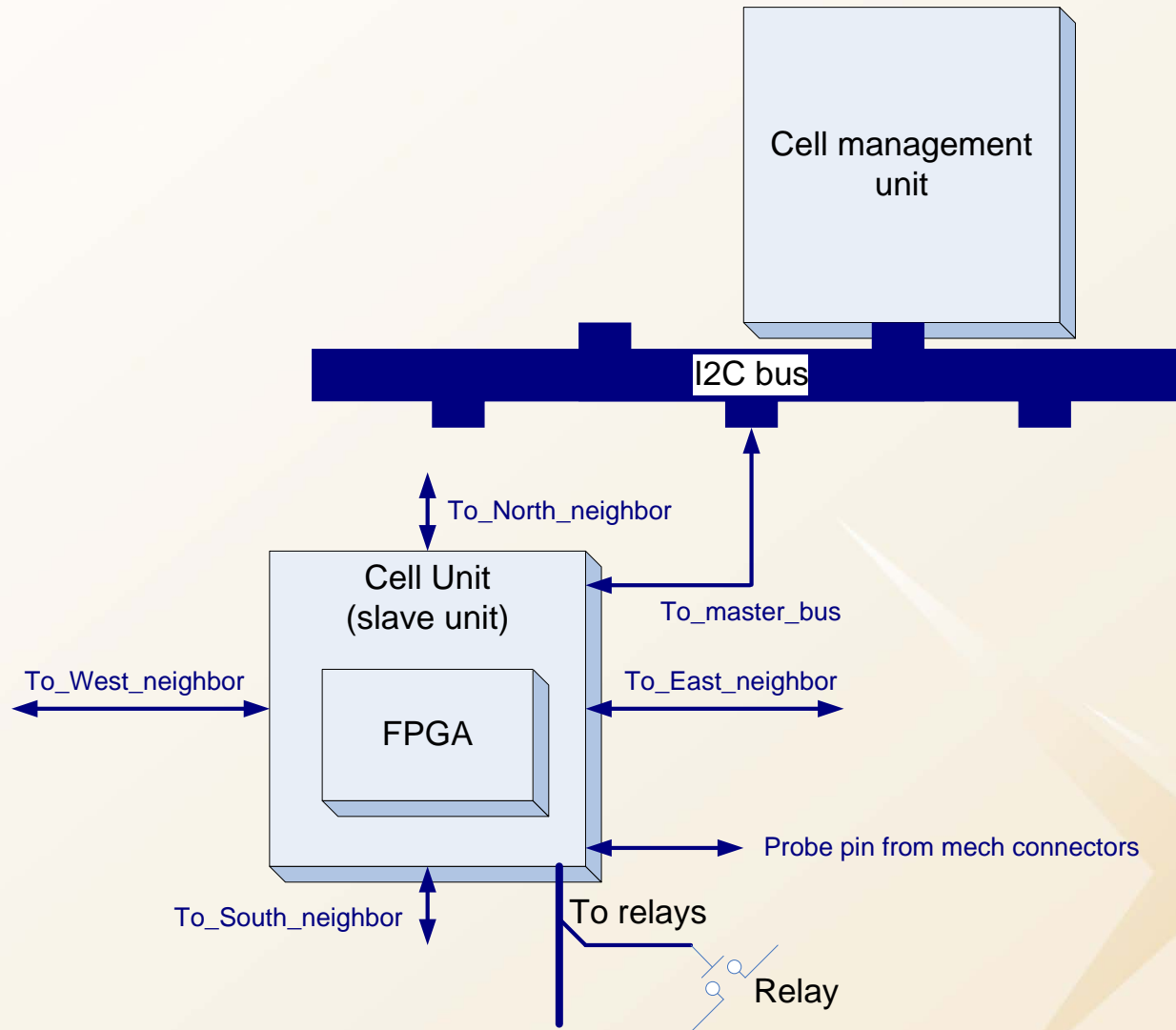
- X Signal connection
- Power connection
- Mechanical connection



Unit Cell Switch Arrangement - Updated



Communication Bus Architecture











Update of Work

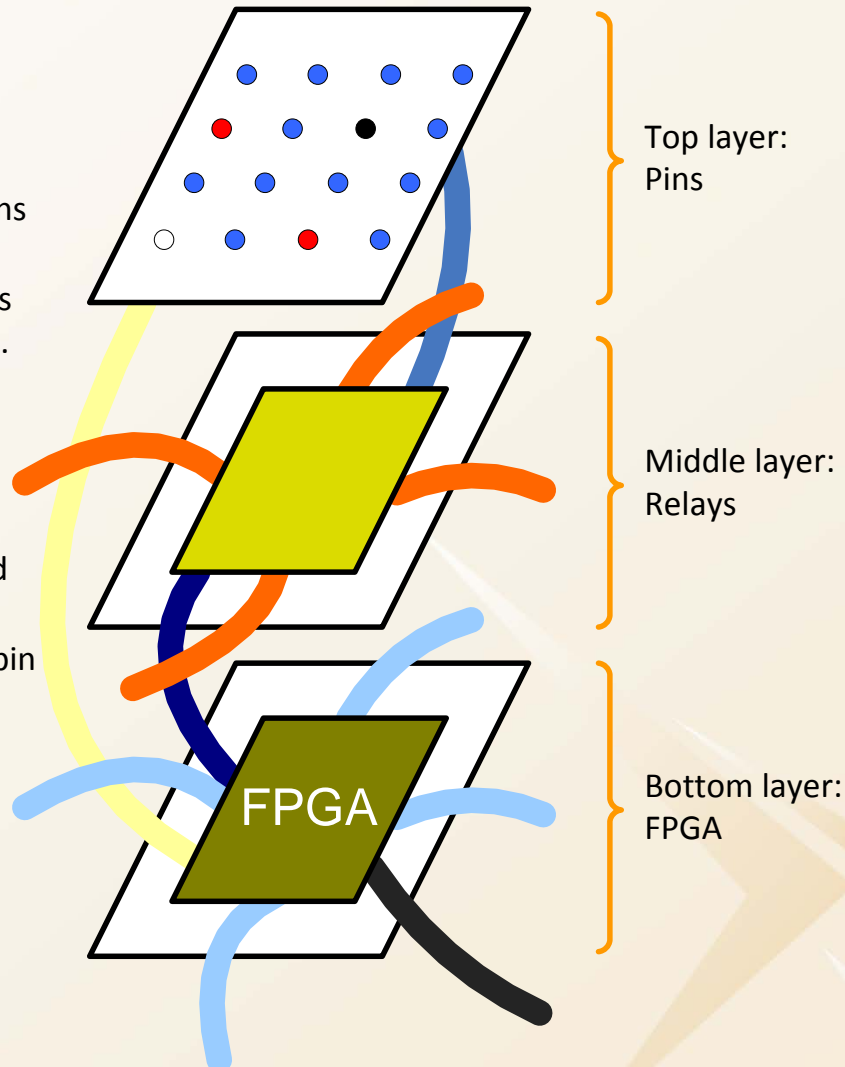
- Definition of Cells (including communication protocol)
 - I2C Implementation running from master to slaves
 - Working on I2C interface for all neighbors
- Module Probing Interface
 - To be completed Spring 2010
- Switch Master Controller
 - Matlab Modeling – First graphing model complete and functional
 - Graphviz Visualization
 - Shortest Paths graphing algorithm working in C++
 - Merging Subgraphs complete in modeling – working on implementation
- Hardware/ PCB design



Adaptive Wiring Panel Layers

Description of connections:

-  Between external pins and relays.
-  Between local signals and neighbor signals.
-  Between relays and the FPGA.
-  Between cells (I2C).
-  Between the cell and the master.
-  Between the probe pin and the FPGA.





Update of Work

- Next phase (January/Feb 2010): building and connecting a 64 node grid of cells (8x8 cells in a 2-D arrangement)
 - Define electronic data sheets (similar to XTEDS) to convey module information and wiring requirements to the master controller
 - Master control algorithm dynamically reconfiguring the status of the switch relays based on new modules being connected to the grid.
- PCB layout of cells – will need assistance
- Presentation of Concept to Aerospace Community
 - AIAA Infotech, April 6-9 2010
 - Extended Abstract Submitted and Accepted
- A working prototype of the 64 node cellular array is planned for the Spring of 2010, with a hopeful reduction of scale for cellular elements to be implemented once the initial concept is proven.
- Thesis Defense - May 2010

