PetaFlops Router

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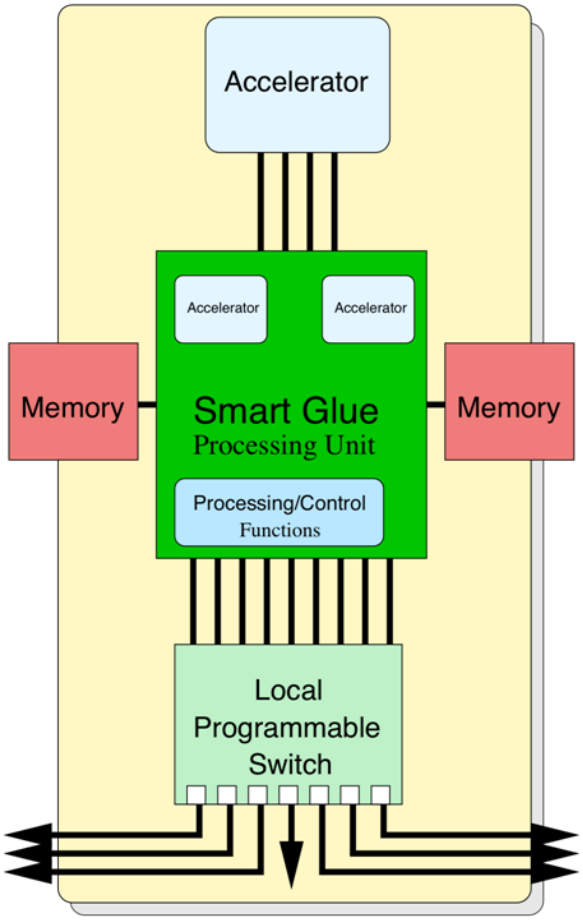
Methods

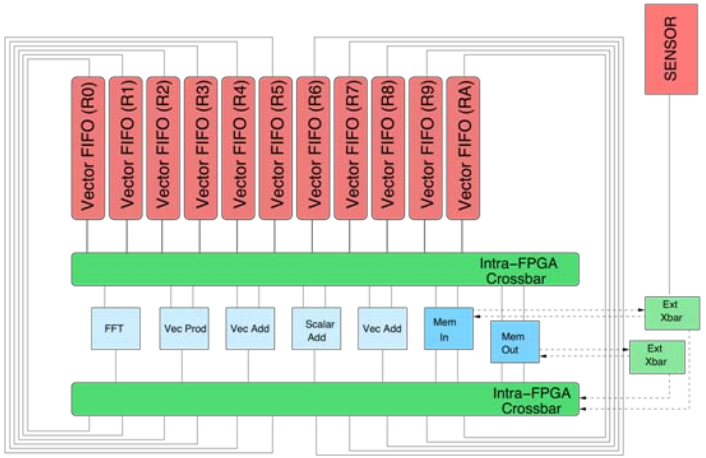
Smart Glue: Self-guided computation

- Achieving high performance does not require explicit design-time decisions
  - Hardware decides how to implement computation, on-the-fly
  - Automatic extraction of available parallelism
  - Automatic stream pipelining if possible
- Allows for efficient parallel computation
  - Allows scientist end-users to design
- Provides failure robustness through awareness of system state
  - If a link or node fails, system routes around the failure transparently



Methods, continued

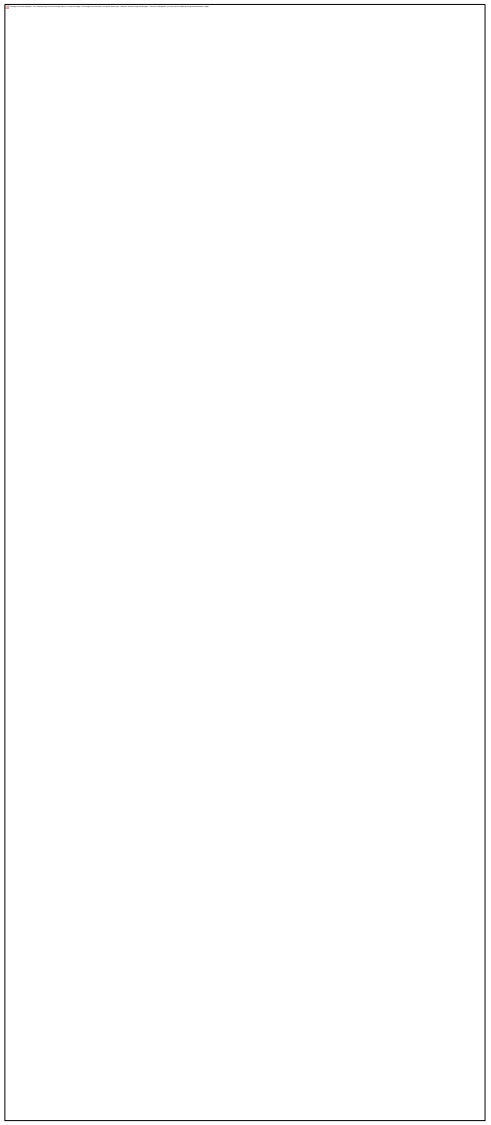
- Functional demo of PFRouter system
  - FFT-based signal processing engine
    - Streaming, automatically pipelined
      - One solution every 8.3 ns
    - Similar to Threat Reduction-style applications
    - Process:



- Code is assembled into byte code
- Byte code is processed by SmartGlue
  - FPGA Crossbar is configured according to byte code
  - With no unmet dependencies, parallel streaming is enabled

Results and Accomplishments

- SmartGlue running on a single FPGA node, controlled by embedded processor
  - Crossbars, FIFO structure functional
  - Interprets byte-code programs generated by assembler
  - Automatic pipelining of stream operators
- Delivery of first hardware
  - Populated with fast serial optics, crossbar, and FPGA



SmartGlue General Structure