Raw:
Microprocessor for extroverted computing support

ICCA'03

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Outline

- Motivation
- Architecture overview
- The Raw tile
- Network support
- Application mapping in Raw
- Conclusions

Motivation

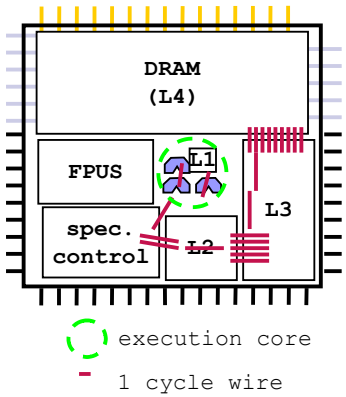
- Application workloads that emphasize stream-based multimedia.
- Number of transistors on chip growing rapidly.

Problem:

The amount of logic reachable in one cycle is staying constant, but chips are getting bigger.

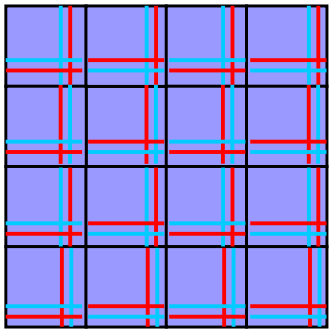
Adapt Current Microprocessor architectures?

This would result in only using a small portion of the chip for actual computation.



Raw approach

- Make a tile, avoiding complex hardware structures.
- All resources, including neighbour tiles, are reachable in one clock cycle.



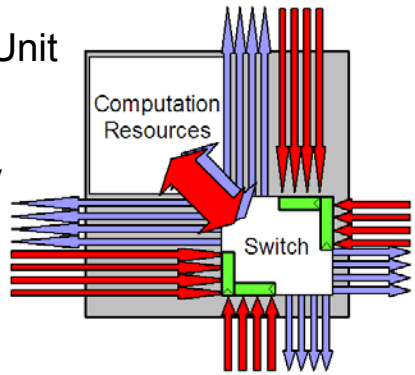
- Replicate the tile.
- Add a highly integrated network interconnect.
- Communications longer than one clock cycle are exposed to the software.

Raw approach (Continued)

- Wire delay handled by exposing resources to the software.
- Wire delay manifests itself as network hops.
- Resources are orchestrated with spatially-aware compilers.

Raw Tile

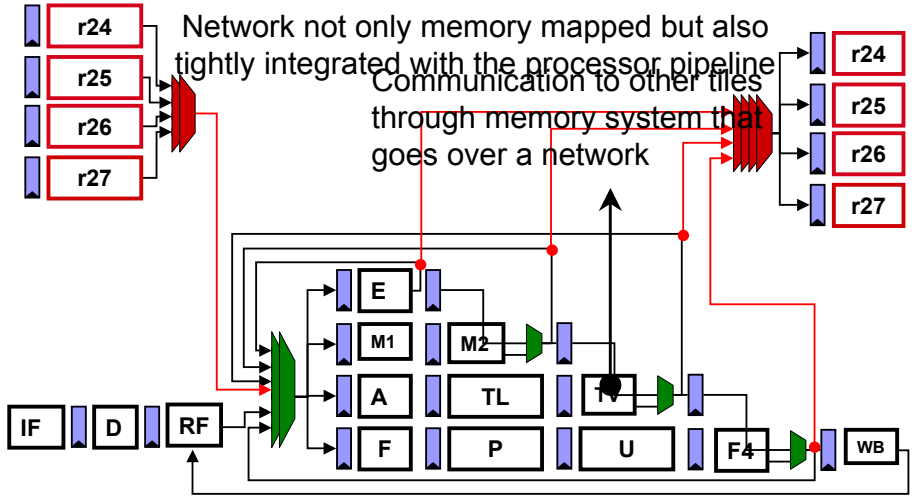
- 8 stage pipelined MIPS-like 32 bit processor
- Pipelined Floating Point Unit
- 32Kb Data Cache
- 32Kb Instruction Memory
- Interconnect switch processor



Network Support

Network not only memory mapped but also tightly integrated with the processor pipeline

Communication to other tiles through memory system that goes over a network

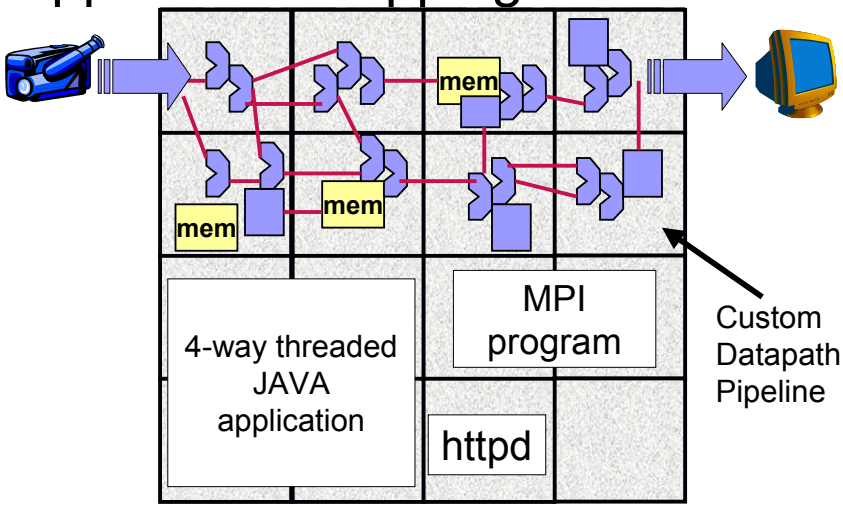


Static and Dynamic Networks

Switch processor multiplexes two *logically distinct* networks:

- Static Network:
  - Ordered, flow-controlled, and reliable transfer of single-word operands and data streams.
- Dynamic Network:
  - Support for memory accesses that cannot be statically analyzed.
  - Support other dynamic activities, like interrupts, dynamic I/O accesses, speculation, synchronization, and context switches.

Application Mapping in Raw



Conclusions

- Evolutionary response, given the increasing number of on-chip resources.
- Raw exposes all resources, enabling the software to take full advantage of them.
- Simple, replicated architecture that scales.
- In short term better suited for stream-based signal processing computation.
- In 10 to 15 years, performance-to-cost ratio will enabled the general use of raw.

The End!

Thank You.

Questions?