Future of Computer Architecture

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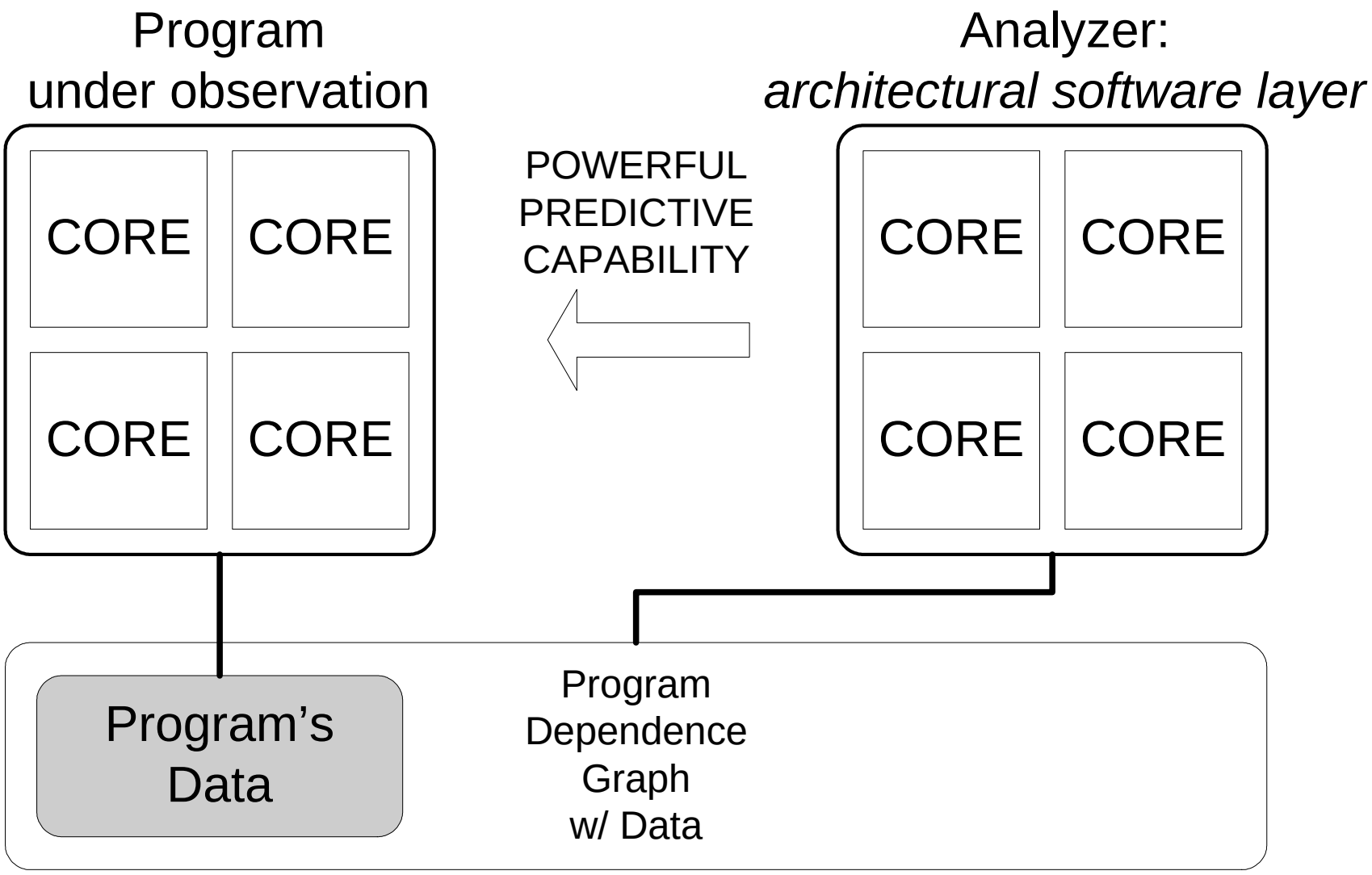
Moderator Question

- Which level of architecture is most important to performance / cost / power?
  - Corollary: How to get order of magnitude better?
  - Software will have most leverage, not microarchitecture

Pushing Performance

- Technology needs to be fixed
  - Bipolar → CMOS
  - CMOS → ?
- Microarchitecture too low level
  - Aggravates problem of no technology fix
  - Little leverage on general-purpose performance
- Software level
  - More leverage here
  - But static/dynamic compilation not empowered – no access to program data in real time

Self-Aware Computing



Self-Aware Computing

- Architectural software layer departure from dynamic optimization
  - Powerful predictive capability
    - Dependence graphs enhanced with program's data in real time
  - Data-driven exploration
    - "Wake up" when program data changes
    - Explore possibilities – anticipate at a large scale
  - Data-parallel
    - Workload: program's subroutines and data objects
    - Parallelize architectural software layer itself

Self-Aware Computing

- Apply predictive power to
  - Speculative multithreading
  - Computation reuse and specialization
  - Bulk control-flow and data-flow predictions

End

Some Q’s from Moderator

- Impact of Apps on Architecture?
  - What is general purpose computing?
  - Are there any new killer apps emerging that will drive new architecture?
- Role for Specialization?