Hardware-Aware Strategies for Software Solutions

University of Reading

- Java is suboptimal: 1.2x - 2x of cycles needed than in C[1]
- Utilise different hardware components concurrently
  - Pipeline computation, I/O, and communication
  - At best hide two of them $\Rightarrow$ 3x speedup vs sequential
  - Avoid barriers (waiting for the slowest component)
- Balance and distribute workload among all available servers
  - Linear scalability is vital (and not the programming language)
  - Add 10x servers, achieve 10x performance (or process 10x data)
- Allow monitoring of components to see their utilisation
- Avoid I/O, if possible (keep data in memory)
- Avoid communication, if possible

Examples for exploiting locality in SQL/data-flow languages

- Foreach, filter are node-local operations
- Sort, group, join need communication