River:
Reliable Parallel Computing

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Hardware Trends

- Computer processors are not getting as fast as they used to
- The good times: single CPU performance doubles every 1.5 years
- Now: single CPU performance may double every 5 years
- What can be done?

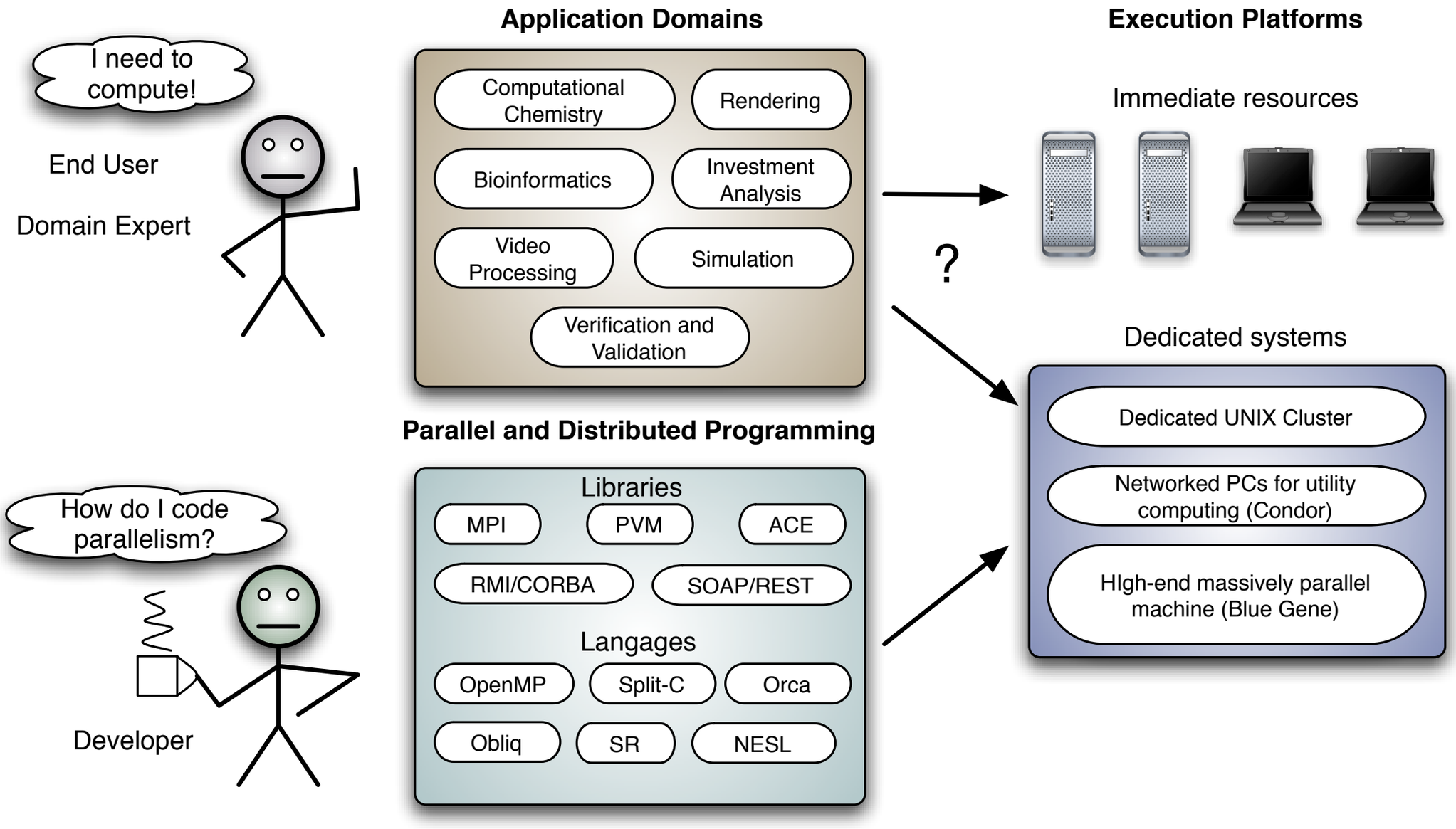
Parallel Computers

- Put multiple processors onto a single chip
  - Multicore Processors
    - IBM Cell: 9 processors (Playstation 3)
    - Intel in five years: 16 processors in a laptop
- Use multiple computers on a network
  - A cluster of multiprocessors

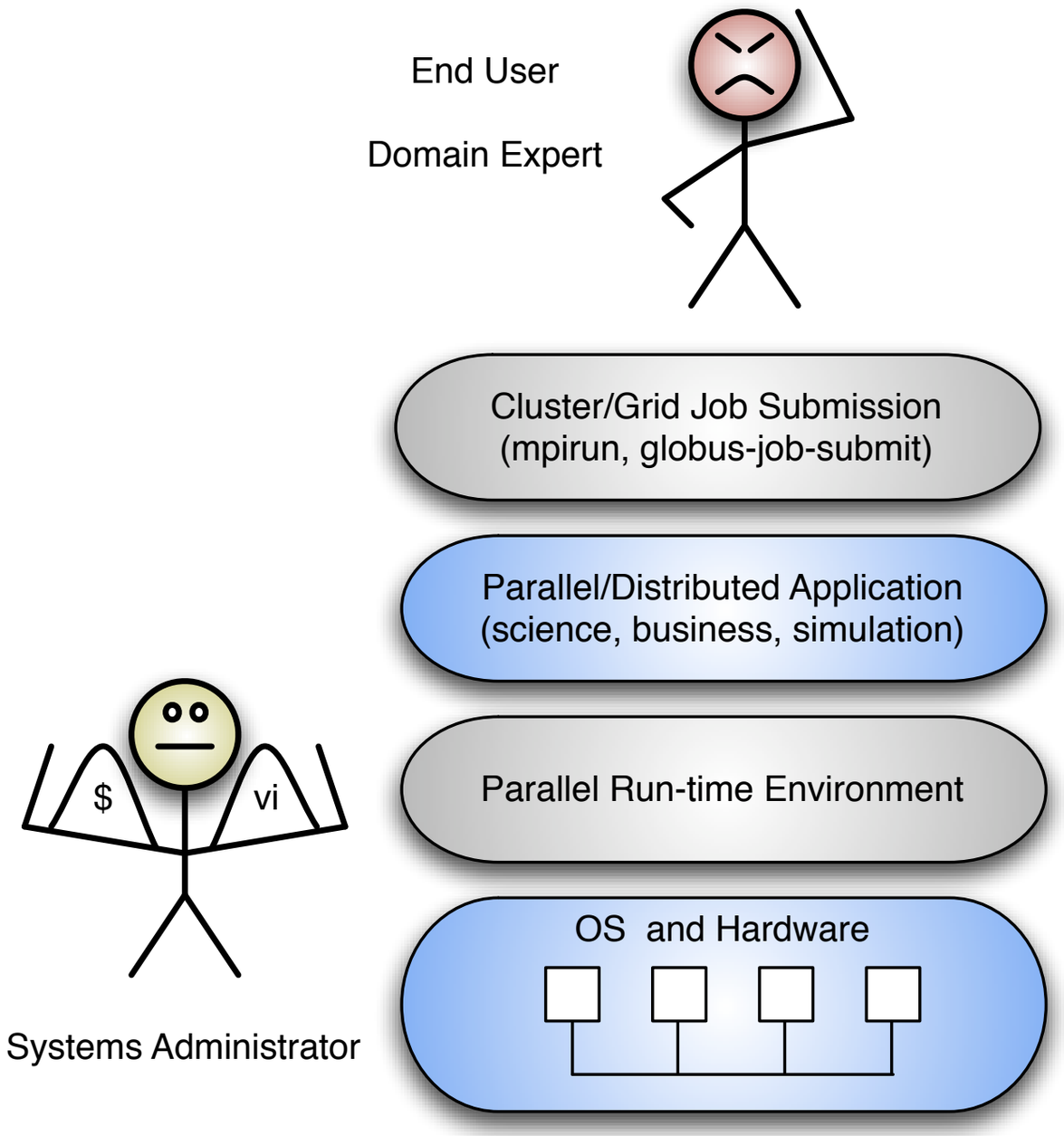
The Software Problem

- No more "free lunch"
- Application developers *must* write parallel programs to see performance gains
- Unfortunately, this is not trival
- But, what about the last 30 years of research in parallel computing?

Parallelism Problems



Execution in a Cluster

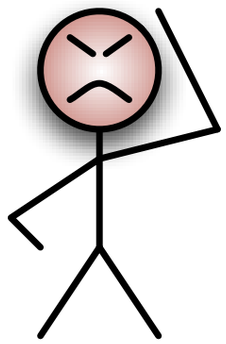


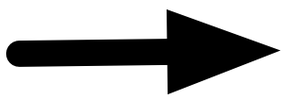
- Users must be cluster savvy
- Application tied to platform
- Costs

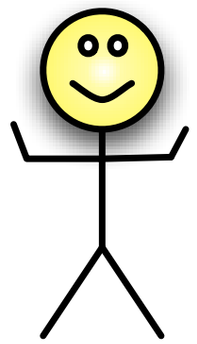
Self-Contained Applications

End User

Domain Expert





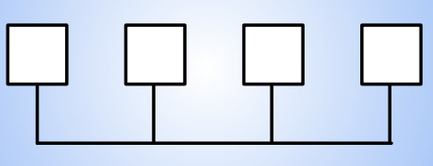


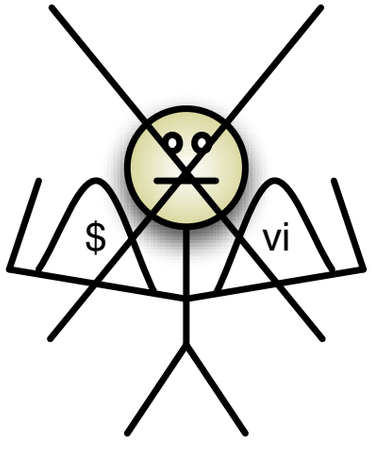
Cluster/Grid Job Submission
(mpirun, globus-job-submit)

Parallel/Distributed Application
(science, business, simulation)

Parallel Run-time Environment

OS and Hardware



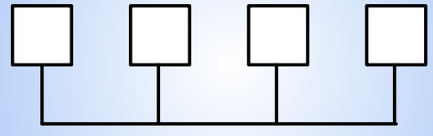


Systems Administrator

Parallel/Distributed Application
built with

River: Reliable Virtual Resources
An Integrated Run-time System

OS and Hardware



The River Approach

- Multi-model
- Application-integrated execution environment
- Reliable Virtual Resources
  - Compute and Disk
- Python Prototype

Get Involved

- Computer Science
  - Systems development
- Domain-specific applications
  - Solve real problems
  - Chemistry, Biology, Physics, Environmental Science

Summer Enrichment for High-School Girls

- Week-long exposure to computer science
- Programming projects, guest speakers
- Monday, June 26 -- Friday, June 30
- Contact me
  - benson@usfca.edu