Intro to Parallelism

Running jobs in parallel means to use more than one core at a time to get the work done.

- Two main types
  - “embarrassingly parallel”
  - Tightly coupled parallelism
Intro to Parallelism (Cont.)

“Embarrassingly Parallel” vs. Tightly Coupled Parallel Jobs

- “embarrassingly parallel” (EP)
  - Multiple copies of the same code are simultaneously run.
    - Each run gets different inputs (that may differ slightly or greatly).
  - When an EP job is run, copies of the code are paired with the differing inputs, and each pair is then run on a different core.
  - This is known as EP due to the relative efficiency with which the entire job may be spread across multiple cores.
Intro to Parallelism (Cont.)

- Tightly coupled parallelism
  - Involved a code designed to process a single data domain using multiple cores.
  - The data domain is split up into subdomains.
    - Each subdomain is sent to a different core along with a copy of the code.
    - The core runs the code on the subdomain.
    - At every time-step of the code, the boundary conditions of each subdomain are exchanged with the boundary conditions of its neighboring subdomains.
      - Due to this data exchange a fast internal network is often essential for the timely execution of tightly coupled codes (vs. EP codes).
- Domain decomposition