Binary variable-N_{cpu} restart: 3-stage distributed I/O

1 Detection & Assignment

- Probe header: read N_{cpu}^{file}
- Round-robin file mapping
- $(f - 1) \bmod N_{cpu} = r - 1$
- Each rank: ≤ 2 files

2 AMR Reconstruction

- Read grid positions $\mathbf{x}_g$
- Ownership via cpumap
- MPI_ALLTOALLV exchange
- Build local AMR tree
- Store exchange metadata

reuse metadata

3 Hydro & Gravity Scatter

- Read hydro/gravity files
- Reuse send ordering
- Reuse ALLTOALLV counts
- Scatter to local cells
- Primitive → conservative