HPC X GAMES

Or, Experiences in going to eXtreme Scale in HPC Computing
Large Scale Computing Helps to Prove Einstein’s Last Untested Prediction: G-Waves

- Laser Interferometer Gravitational-wave Observatory (LIGO)
  - ~5-35 sustained Tera-Flops 24/7
  - Embarrassingly Parallel at ~5x10^4 cores
  - Massive matched filtering (search) problem
LIGO Detected G-Waves...
14Sep15 and again 26Dec15
Some Questions to Stimulate Discussion

• Is LIGO “HPC” or “Cloud”? What’s the Diff?
• Students
  – Experience writing message passing algorithms?
  – Experience running $10^3$, $10^4$, $10^5$, or $10^6$ ranks?
  – Experience profiling or debugging at X scale?
• Panelists
  – What is largest scale your code has run?
  – Does strong scaling matter in practice?
  – What fraction of MPI interface used? Most common calls?
  – What was biggest hurdle in reaching X scale?
  – Ever hit bugs that manifest only at X scale?
  – Are all MPI implementations the same?
  – Parallelizing existing sequential code vs. writing anew?
  – Anything appreciably different in $10^5$ vs $10^6$ scale?
  – Time vs. Space performance...which is the bigger issue?
  – When should a student use one of these packages vs. rolling their own?