

Roadrunner System Overview



Operated by the Los Alamos National Security, LLC for the DOE/NNSA



Roadrunner at a glance

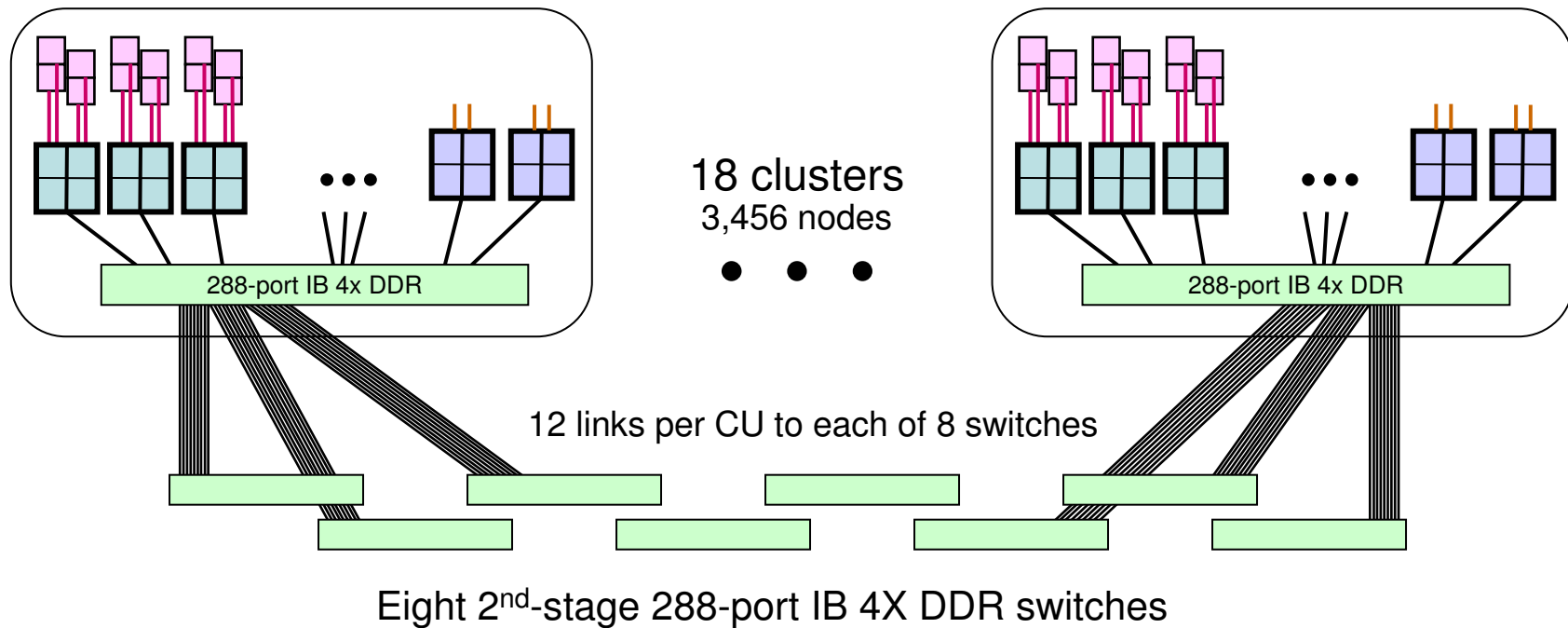
- **Cluster of 18 Connected Units**
 - 6,948 AMD Dual-core Opterons
 - 12,960 IBM Cell eDP accelerators
 - 49.8 Teraflops peak (host)
 - 1.33 Petaflops peak (accelerator)
 - 1PF sustained Linpack
- **InfiniBand 4x DDR fabric**
 - 2-stage fat-tree; all-optical cables
 - Full bi-section BW within each CU
 - 384 GB/s
 - Half bi-section BW among CUs
 - 3.4 TB/s
 - Non-disruptive expansion to 24 CUs
- **104 TB memory**
 - 52 TB Opteron
 - 52 TB Cell eDP
- **216 GB/s sustained File System I/O:**
 - 216x2 10G Ethernets to Panasas
- **RHEL & Fedora Linux**
- **SDK for Multicore Acceleration**
- **xCAT Cluster Management**
 - System-wide GigE network
- **3.9 MW Power:**
 - 0.35 MF/Watt
- **Area:**
 - 296 racks
 - 5500 ft²
- **Weight:**
 - 500,000 lb
- **IB Cables:**
 - 57miles



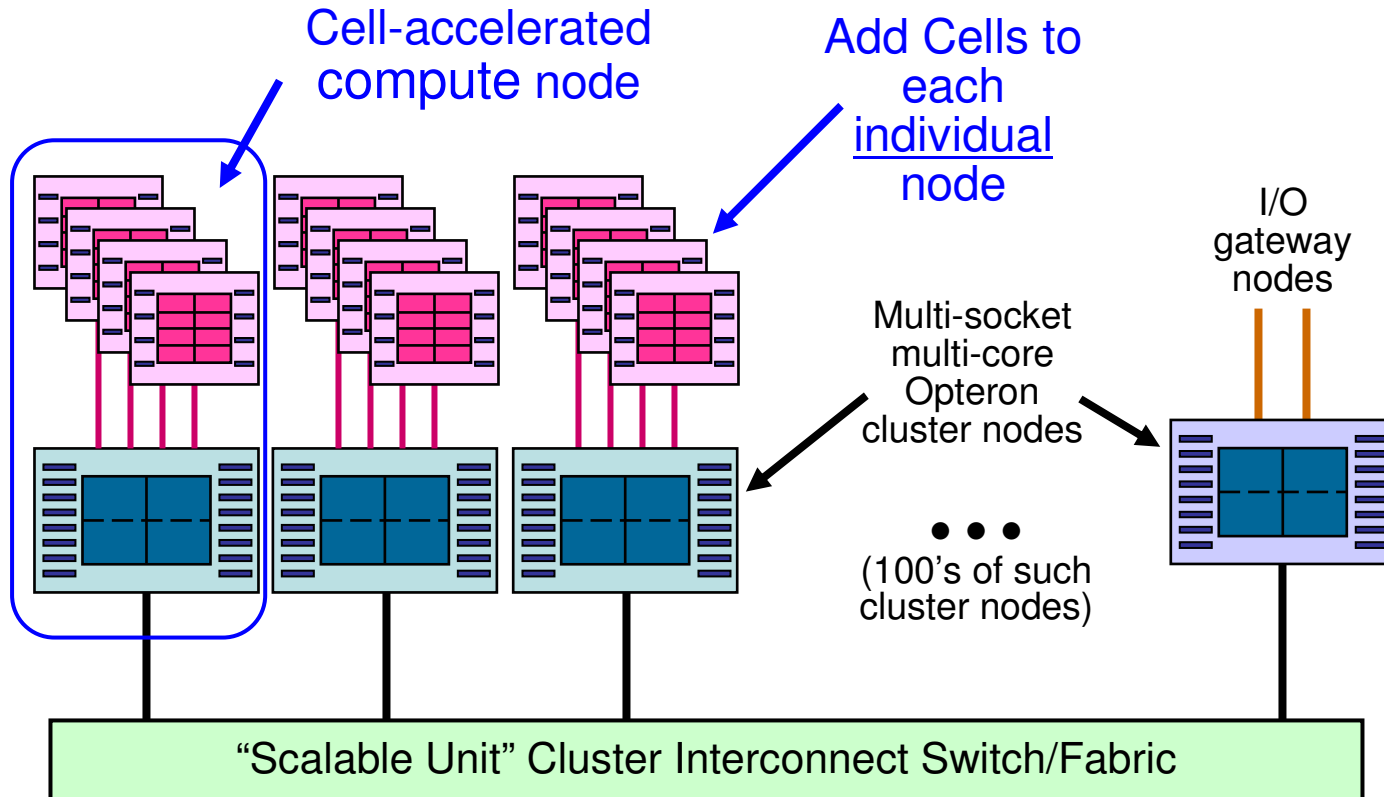
Roadrunner is a hybrid petascale system delivered in 2008

Connected Unit cluster
180 compute nodes w/ Cells
12 I/O nodes

6,912 dual-core Optrons \Rightarrow 50 TF
12,960 Cell eDP chips \Rightarrow 1.3 PF



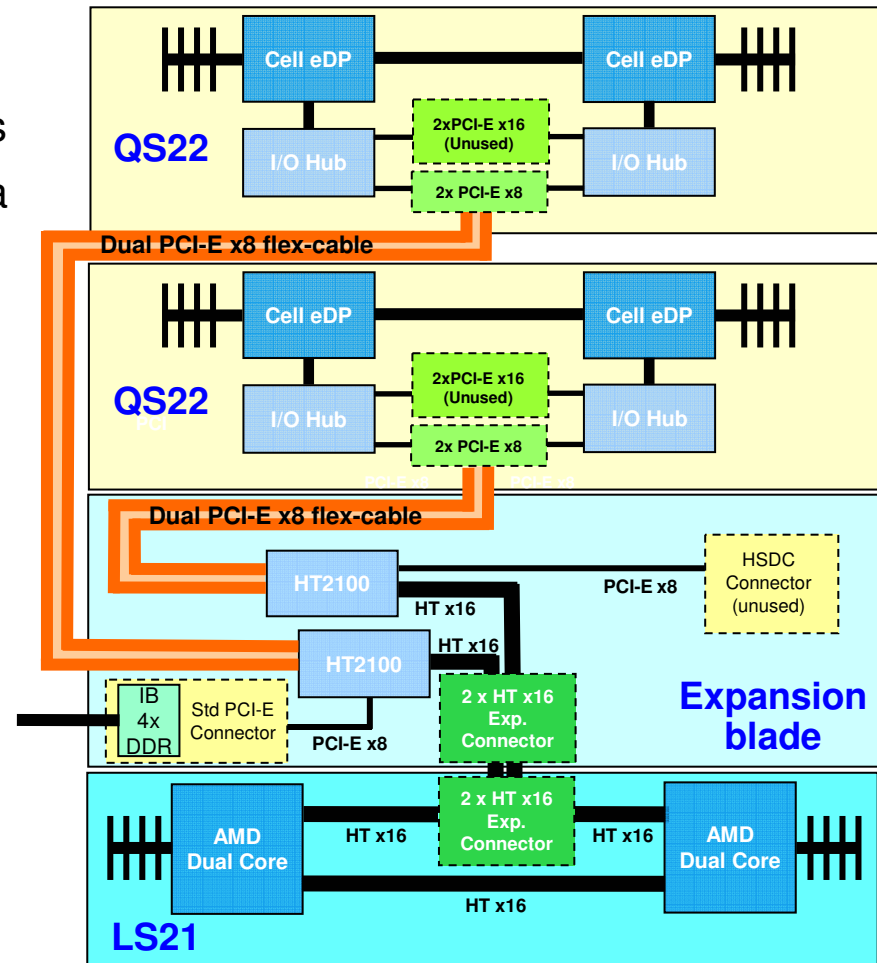
Roadrunner Phase 3 is Cell-accelerated, not a cluster of Cells



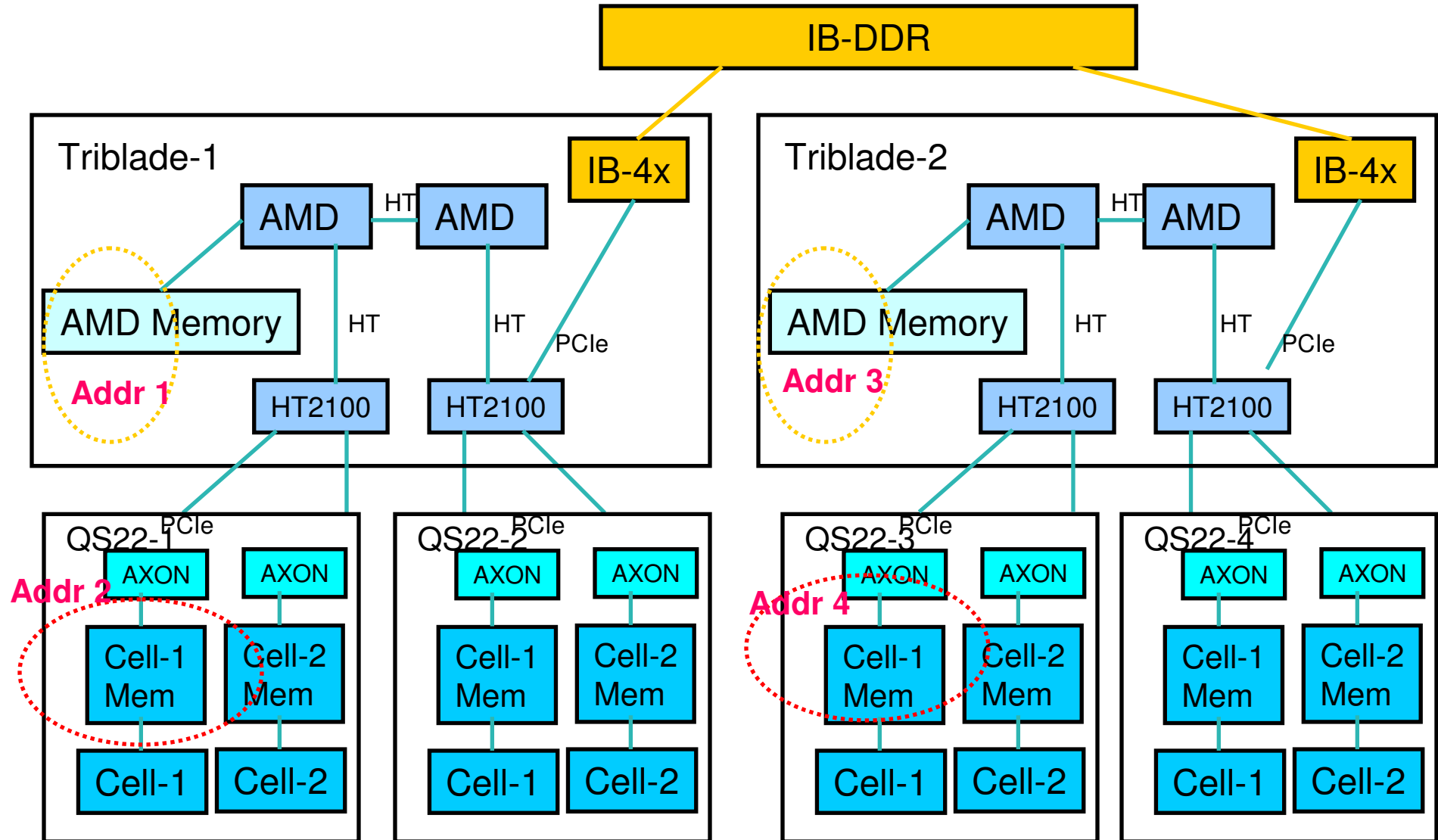
Node-attached Cells is what makes Roadrunner different!

A Roadrunner Triblade node integrates Cell and Opteron blades

- **QS22** is a future IBM Cell blade containing two new enhanced double-precision (eDP/PowerXCell™) Cell chips
- Expansion blade connects two **QS22** via four **PCI-e x8** links to **LS21** & provides the node's ConnectX IB 4X DDR cluster attachment
- **LS21** is an IBM dual-socket Opteron blade
- 4-wide IBM BladeCenter packaging
- Roadrunner Triblades are completely diskless and run from RAM disks with NFS & Panasas only to the LS21
- Node design points:
 - *One Cell chip per Opteron core*
 - *~400 GF/s double-precision & ~800 GF/s single-precision*
 - *16 GB Cell memory & 16 GB Opteron memory*



System Configuration



Roadrunner nodes have a memory hierarchy

