Demand Response
Interface to datacenters beyond HPC

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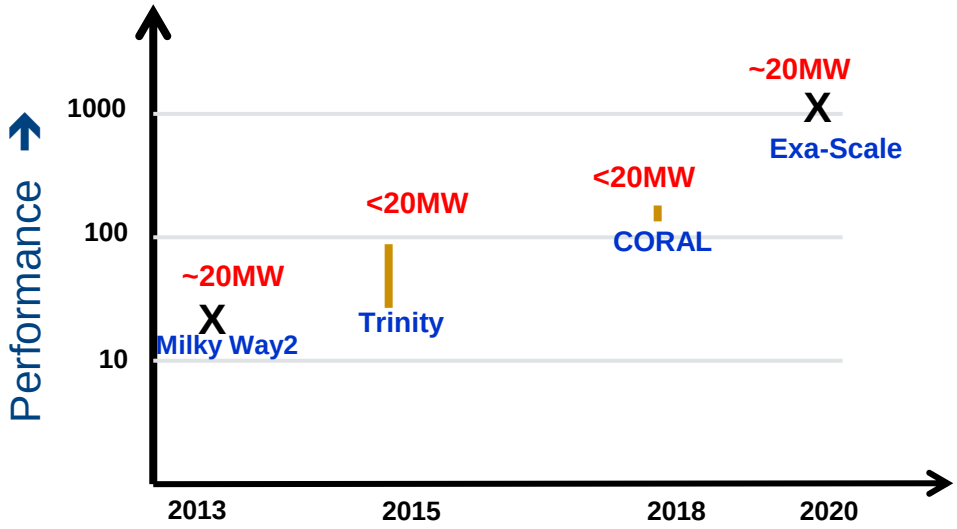
Power-performance expectations for future supercomputers

Power-performance expectations of future Supercomputers



With growing demands facility may not get all the power asked for

Performance expected to grow at exponential scale while power has to be flat

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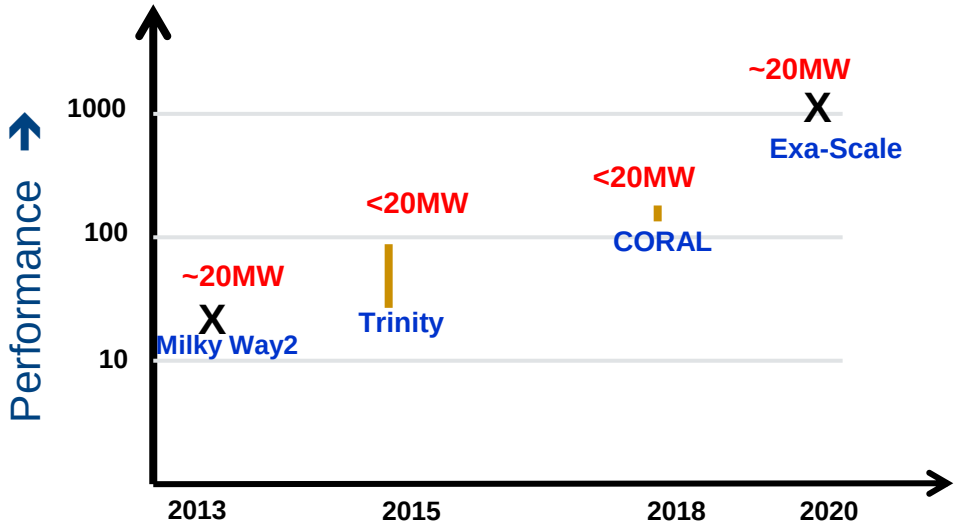

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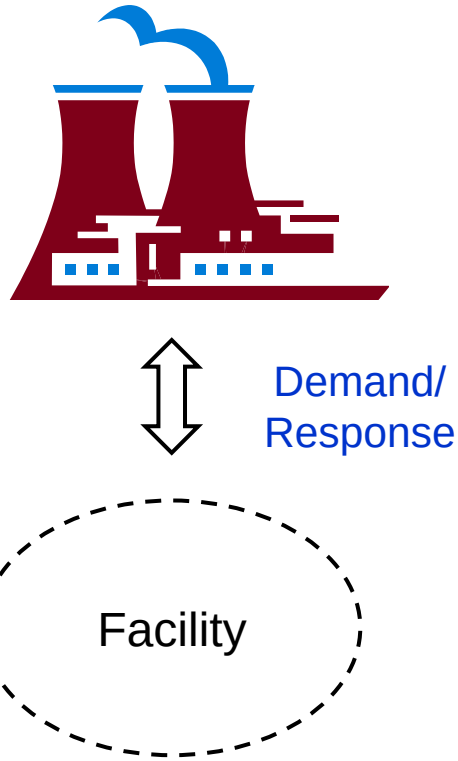

Future Supercomputers:
Allocation of power will be limited and dynamic

Power Challenges and Opportunities
Not just HPC

- Growth in demand for power in all datacenters
  - More servers using high performance processor ➔ more power
- Cloud usage model
  - Virtualized servers with capacity on demand
  - Ability to shift load geographically
- Opportunities
  - Precision in demand (Low excess or “over Demand”)
  - Improvement in energy efficiency ➔ lower demand

HPC systems may get more power
if other datacenters are less conservative

Role for demand response

- Use of Demand Response
  - Minimize the “over” demand
    - Monitor and track use of energy
  - Optimize scheduling of work
    - Efficiency and pricing
  - Optimize pricing
    - Use incentive programs
      - » Most incentive programs are unused
    - Peak pricing control
      - » Role of local production of energy
    - Real time pricing

Demand-Response key to “right size” the provisioning and reduce cost

Challenges for adoption

- Control systems
  - Optimized control to comprehend local demand, local generation of energy and allocation by utility
- Industry standard interfaces
  - Ease of use and interoperability
  - External facing interface
    - Defined and developed by industry
  - Monitoring and control interface
    - Data Center Infrastructure Management (DCIM)

Interface needs automated controls to feed the right information

The Green Grid: A key enabler

- The Green Grid
  - International organization focused on end to end resource efficiency
  - Vendor neutral – ~200 members
    - Several examples of competing vendor driving for better solutions
  - Focused on technical matters: metrics, how to, BKMs
  - Followed by vendors, industry, policy makers and governments
  - Good place to drive wider deployment of Demand-Response
    - Workgroups focused on Utility and DCIM
- Example: Power Usage Effective (PUE)
  - Not a measure for efficiency but led to improving efficiency
    - Green Grid Data center maturity mode (DCMM)
    - PUE: Product impact, Influenced designs & processes for datacenter
    - Most data centers implement monitoring
    - Many improved PUE from over 2.0 to sub 1.5.

Summary and Call to actions

- Right size of demand/allocation will benefit everyone & HPC
- Must use Industry standards for interfaces
  - Internal and external
  - Easy to implement
  - Allow interoperability
- Green Grid provide venue to build the momentum