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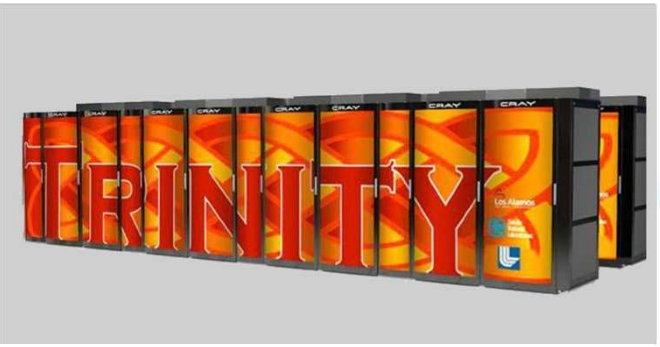

Power API for HPC: Standardizing Power Management and Control

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U.S. DEPARTMENT OF ENERGY

NNSA National Nuclear Security Administration

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Outline

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- What is the Power API?
- System Model
- Example Use Cases

What is the Power API?

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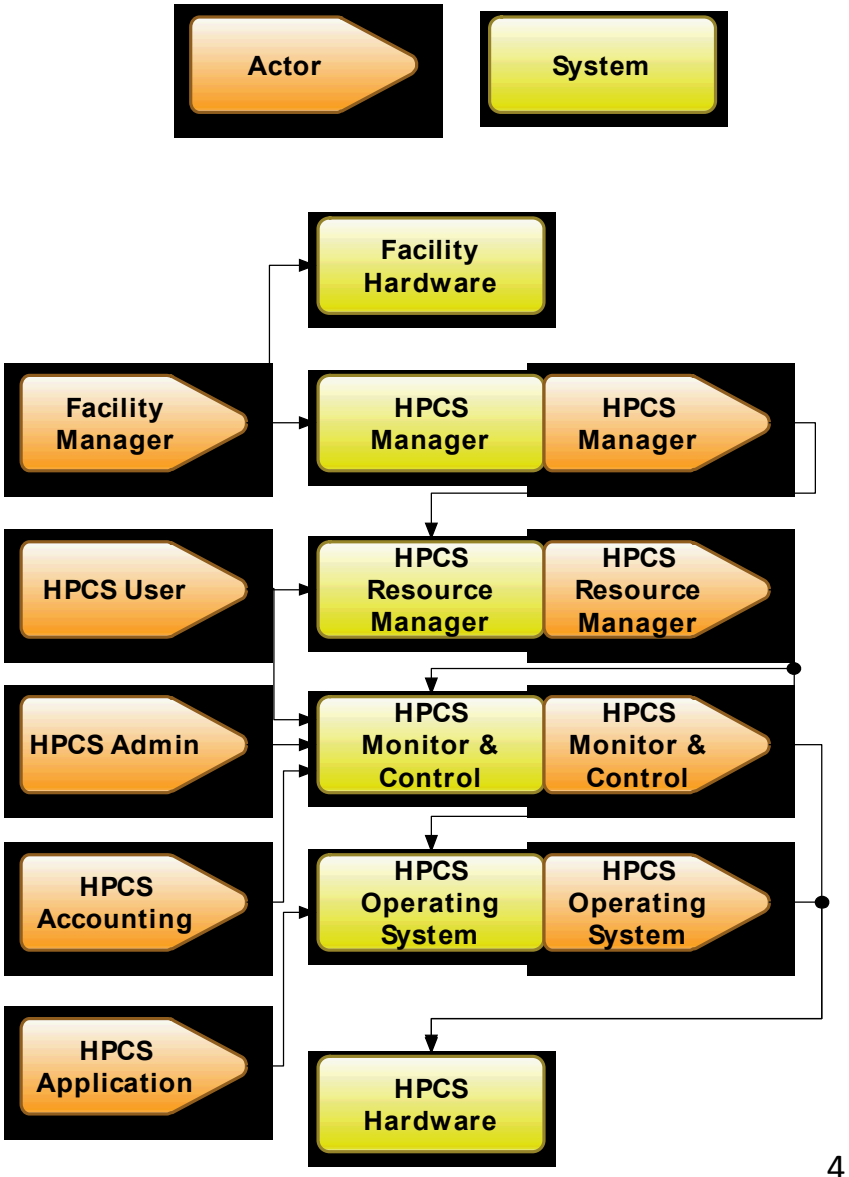
- The Power API is a comprehensive system software API for interfacing with power measurement and control hardware
- Designed to be comprehensive across many different levels of a data center
- Many different actors can interface with a single API to perform several different roles
- Encompasses facility level concerns down to low level software/hardware interfaces

What is the Power API?

- Broad scoped Portable API
- Multiple actors can interact with the system at different levels
- Each interaction represents an interface that is defined in the PowerAPI



Power API System Model

The Power API System model
-Provides basic building blocks for discoverable hierarchy

Platform – only one platform can exist, encompasses whole machine

Cabinet – racks or other logical grouping of nodes, cabinet level power measurements may be supported by some hardware

Board – a piece of hardware containing multiple nodes (may not exist in all system configurations)

Node – a piece of hardware that can contain one or several sockets/cores

Socket – a physical socket that can support one or more computational cores

Core – a computational core

Other elements like memory, power planes, NICs etc can be added to the objects shown here

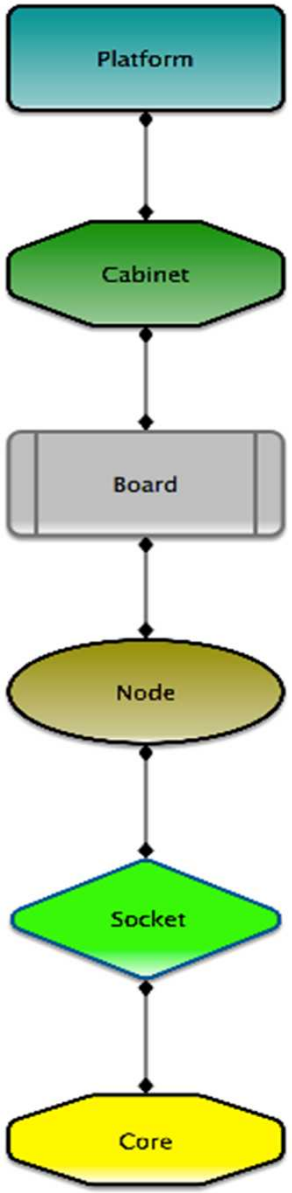


Image credit: James Laros III, Sandia National Laboratories

Common Functions

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- System model allows for navigation through system objects
- Basic measurement and control via getting/setting of exposed object attributes
- Attributes for objects (node, socket, core, etc.) can be manipulated depending on role
- Metadata interface provides information about quality/frequency of exposed attributes and other information
- Statistics can be gathered on one or many object attributes over time

Who is Behind PowerAPI?

Sandia National Laboratories

- Use case document reviewed by Labs, Universities and Commercial partners
- Use case document released as a Sandia Report in 2013
- Power API Specification reviewed by panel of experts in July 2014 at SNL
- August 2014 – Power API Specification Release (http://powerapi.sandia.gov)
- Meeting in Denver for public comments in Denver, September 2014

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Example Use Cases

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- Control power in a hardware overprovisioned system with a given MW power cap
- Accounting and prediction of power load for cooperation with power utilities
- Oversight entities wish to have long term historical power/energy data for the platform
- Users wish to monitor their jobs on fine-grained scales to understand/improve power/energy consumption
- Enables studies of whole system power/energy consumption

Thank you

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http://powerapi.sandia.gov/

Acknowledgments:

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