National Polar-orbiting Operational Environmental Satellite System (NPOESS)
NPOESS Preparatory Project (NPP) Interface Data Processing Segment (IDPS) Hardware Evolution

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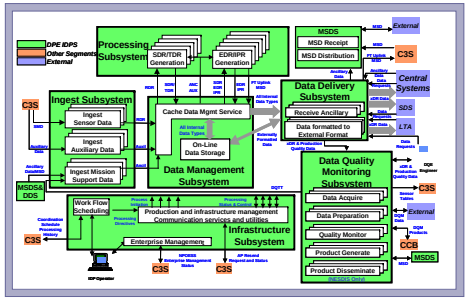
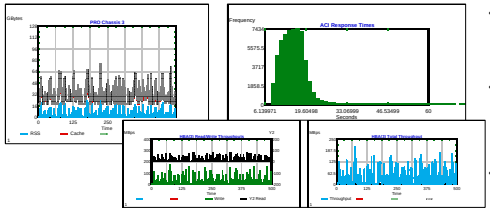
IDPS System Functions

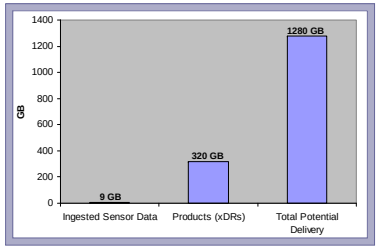


Modeling is an integral part of our HW procurement decisions

- Algorithm Timing & Dependency Simulation (ATDS)
  - Discrete event simulation tool based on Extend™
  - Used to estimate system resource requirements and performance
    - Processors, Memory and IO bandwidth
  - Calibrated with empirical performance data



NPP per orbit data volumes

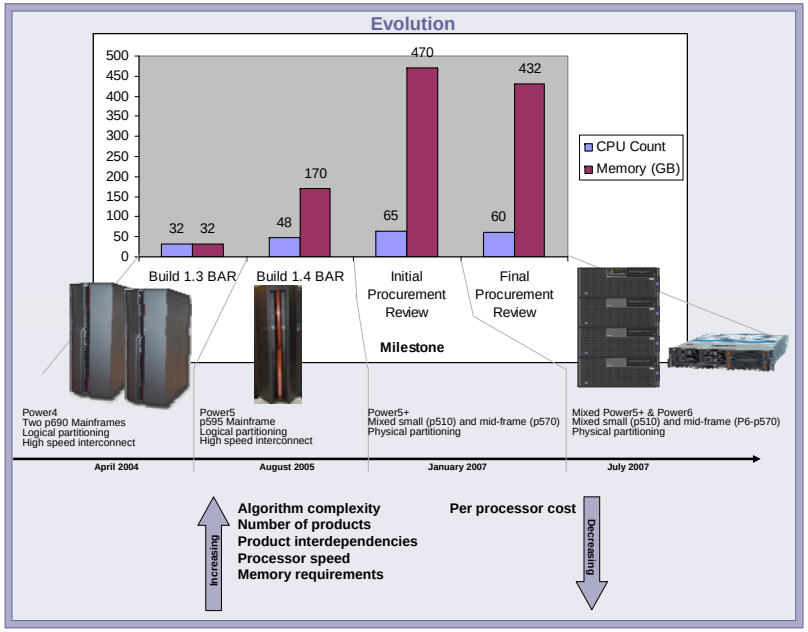


Daily, this amounts to 4.4 TB of products produced from 126 GB of input sensor data, a 35X expansion

System Characteristics

- IDPS is currently based on IBM's Power processing architecture
  - Industry leading floating point performance for a highly floating point intensive problem
  - Symmetric Multi-Threading allows multiple threads of execution simultaneously on each core
- HW architecture support for the software architecture
  - Hardware partitioned to isolate IDPS sub functions
- Right balance of cost vs. features
  - IDPS did not need to leverage key aspects of mainframe technology
    - Ability to have an Symmetric Multi Processing (SMP) resource partition in excess of 16 CPUs
    - The total IO flexibility far exceeds the IDPS requirements
- Evolution of the small and mid-frame class of servers
  - Reliability on the same scale as Mainframe class machines
  - Application of Moore's corollary allowing computing power to "catch up" to IDPS processing requirements
  - CPU cost evolved to be the non-dominate cost factor in small to mid-sized hosts
- Architected for NPOESS, sized for NPP
  - Processing and storage architectures are extensible to larger NPOESS era requirements

Evolution

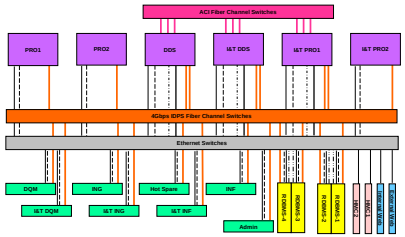


IDPS Hardware at NSOF

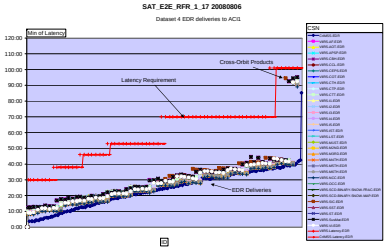
- Partially cabled OPS hardware at NSOF
  - p570s
  - p510s
  - SAN Switches
  - SAN Controllers
  - Disk Trays

- IDPS OPS at NSOF
  - Two compute racks and one storage rack
  - Rack at far left is a test interface simulator

Processing Architecture



Delivery vs. Latency Requirement

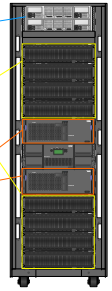


p570 Characteristics

- A "mid-sized" server
- 16 CPUs, 4.2 GHz Power6 CPUs
  - Specint®_rate2006 = 478
  - Specfp®_rate2006 = 426
- 128 GB RAM deployed per instance
  - 768 GB maximum RAM
- Per block:
  - 4U, 19-inch form factor
  - 63.6 kg (140 lbs) maximum weight
  - 1416 watts maximum power consumption
  - 4863 BTU/hr maximum thermal output
- Operational ranges
  - 5° to 35° Celsius (41° to 95° Fahrenheit)
  - 8% to 80% relative humidity
  - 200-240 volts AC 50/60 Hz

IDPS Storage Area Network

- 4 Gbps connectivity throughout
  - From Host to SAN switches to SAN controllers to disk trays
- 146 GB, 15K RPM disks allow for 14 TB of storage
  - With 300 GB, 15K RPM disks a storage density of 28 TB per rack can be achieved
- Dual DS4800 SAN controllers allow redundant 4Gbps connectivity to disks and SAN switches
  - Redundant 4x4 Gbps inputs



Total potential disk bandwidth available is 3.2 GBps