

2nd Conference on Enabling Technologies for PetaFLOPS Computing

PetaFLOPS Initiative

by

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U.S. Department of Energy

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PetaFLOPS I

A time remembered

Major Findings

-from PetaFLOPS I Conference

- PetaFLOPS is possible / feasible in 15 - 20 years
- Applications will demand PetaFLOPS (10^{15}) performance
 - Science
 - Engineering
 - Manufacturing
 - Information Management
- Memory size need not scale linearly with performance for some applications
- PetaByte computer also important and perhaps very different from the Peta(FL)OPS computer

Major Findings - Continued

-from PetaFLOPS I Conference

- Planned system software technology is inadequate to support PetaFLOPS goals
 - A new paradigm necessary if program development time and costs are not to become prohibitive
- Memory is dominant implementation factor
- Semiconductor estimates (SIA) allow for 10^{15} (FL)OPS
 - 20 years
 - Up to \$1 Billion
 - 60 Megawatts
 - Fits in room
- Superconducting technology very promising for processor performance
 - Low power consumption for logic circuits
 - Future improvements in refrigeration required
 - No superconductor memory on horizon

Major Findings - Continued

-from PetaFLOPS I Conference

- Optical Technology
 - Very promising for chip to chip and module to module interconnects
 - Could lead to high speed mass archival storage
- Cannot rely on optics to perform logic functions in desired time frame
- Most components within PetaFLOPS computing will be off-the-shelf
 - A few key devices may be required to be special purpose
 - Therefore the investment needs to be in specific devices
- No major paradigm shift in architecture required to achieve Petaops capability
 - Architecture includes vector and scalable parallel

Implementation of Recommendations

[-from PetaFLOPS I Conference](#)

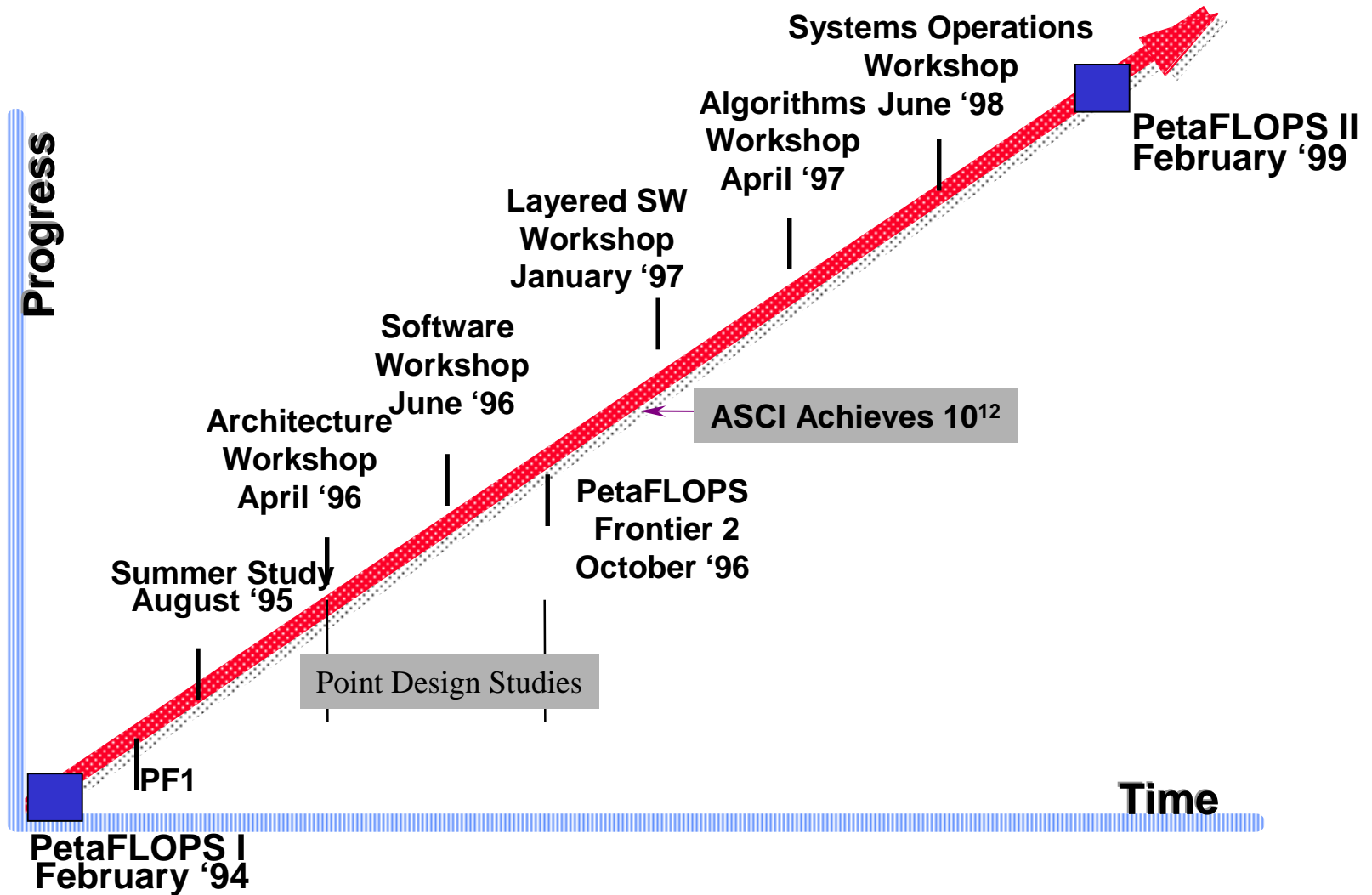
- Publish Workshop Report
- Discuss Workshop results among interested federal agencies to identify potential courses of action
- Pasadena II System Software Workshop will have one track to consider alternate programming paradigms
- Sponsor PetaFLOPS II Workshop in 2 years to review progress

— SCIENTIFIC
— AND
— ENGINEERING
— COMPUTATION
— SERIES

Enabling Technologies for Petaflops Computing

Thomas Sterling,
Paul Messina,
and Paul H. Smith

The Series of PetaFLOPS Workshops

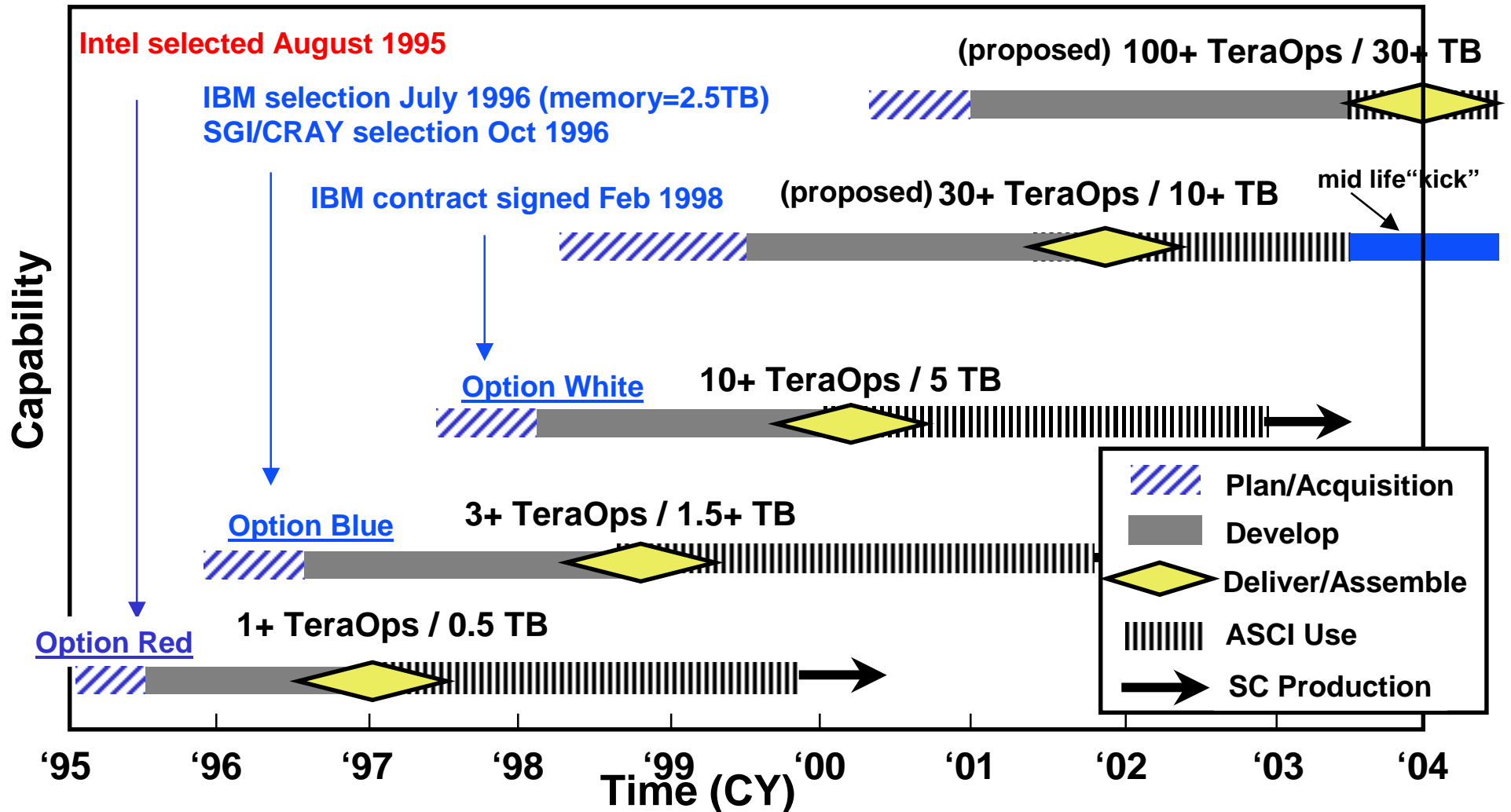


TeraFLOPS 1st Achieved

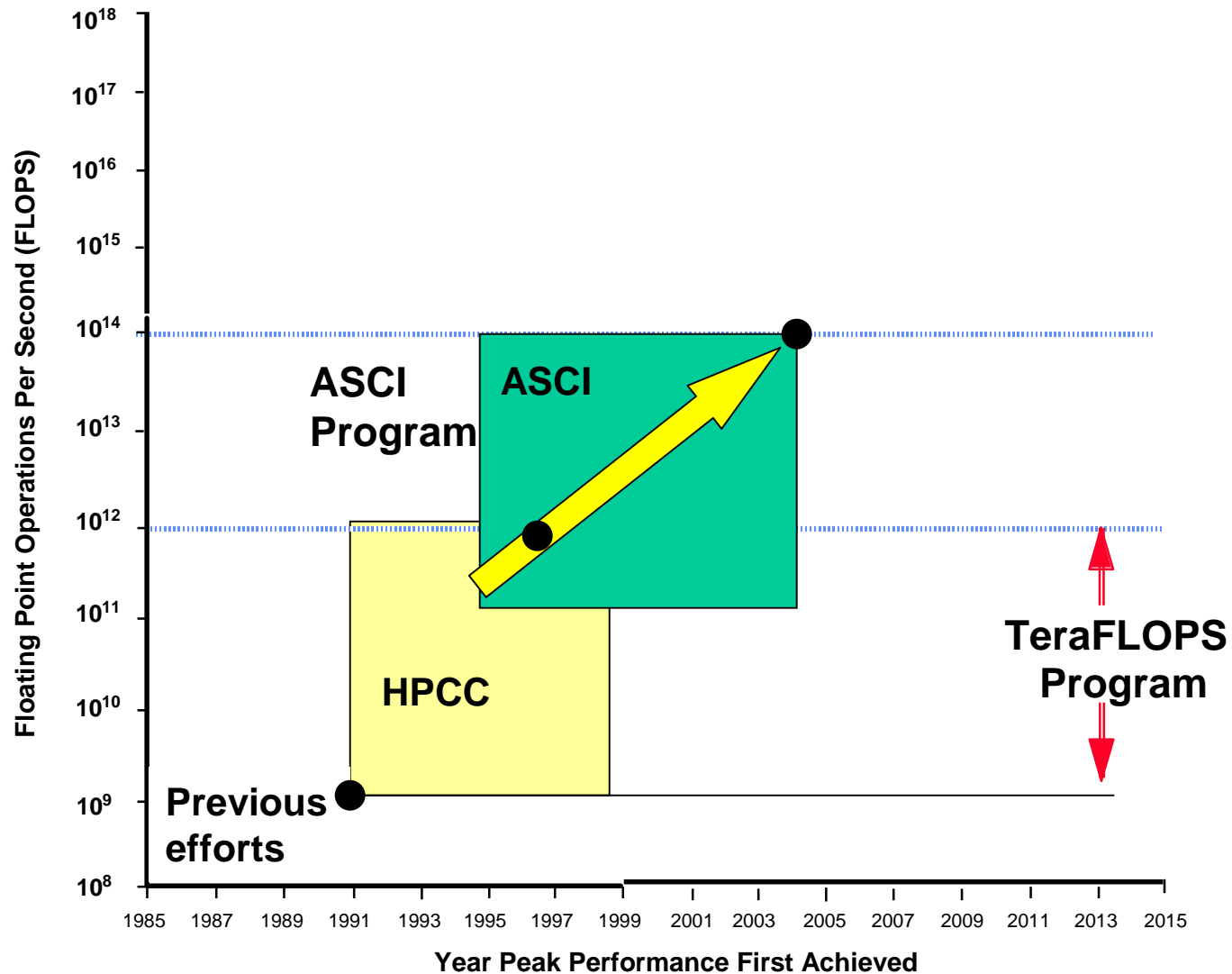
- December 4, 1996
- ASCI's "Red" Intel Machine
- 1.069 TeraFLOPS for 1.75hrs.
- Using 7000+ processors
- Running MP Linpack

ASCI Computing Systems Roadmap

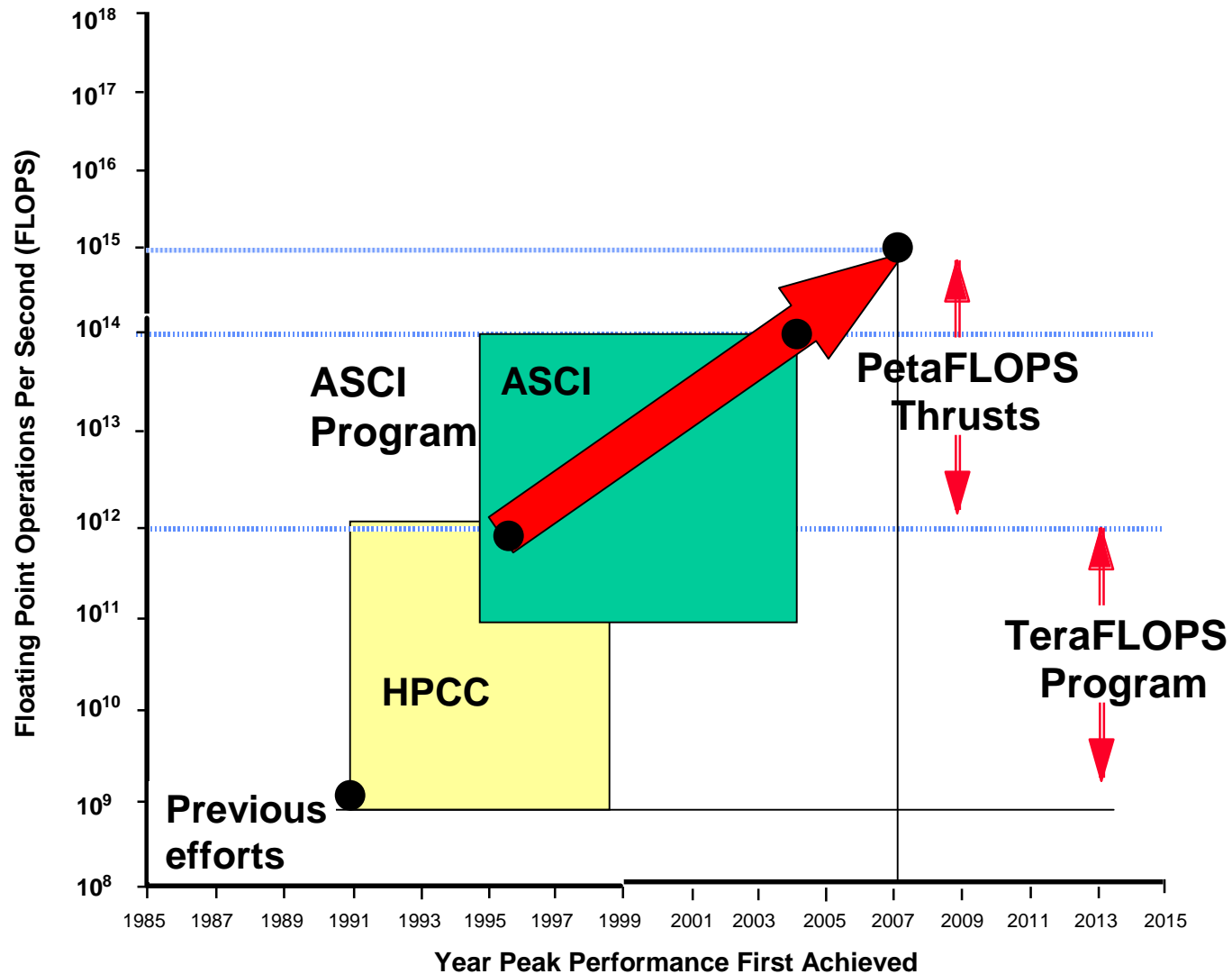
--working with the U.S. computer industry to reach unprecedented computer performance--



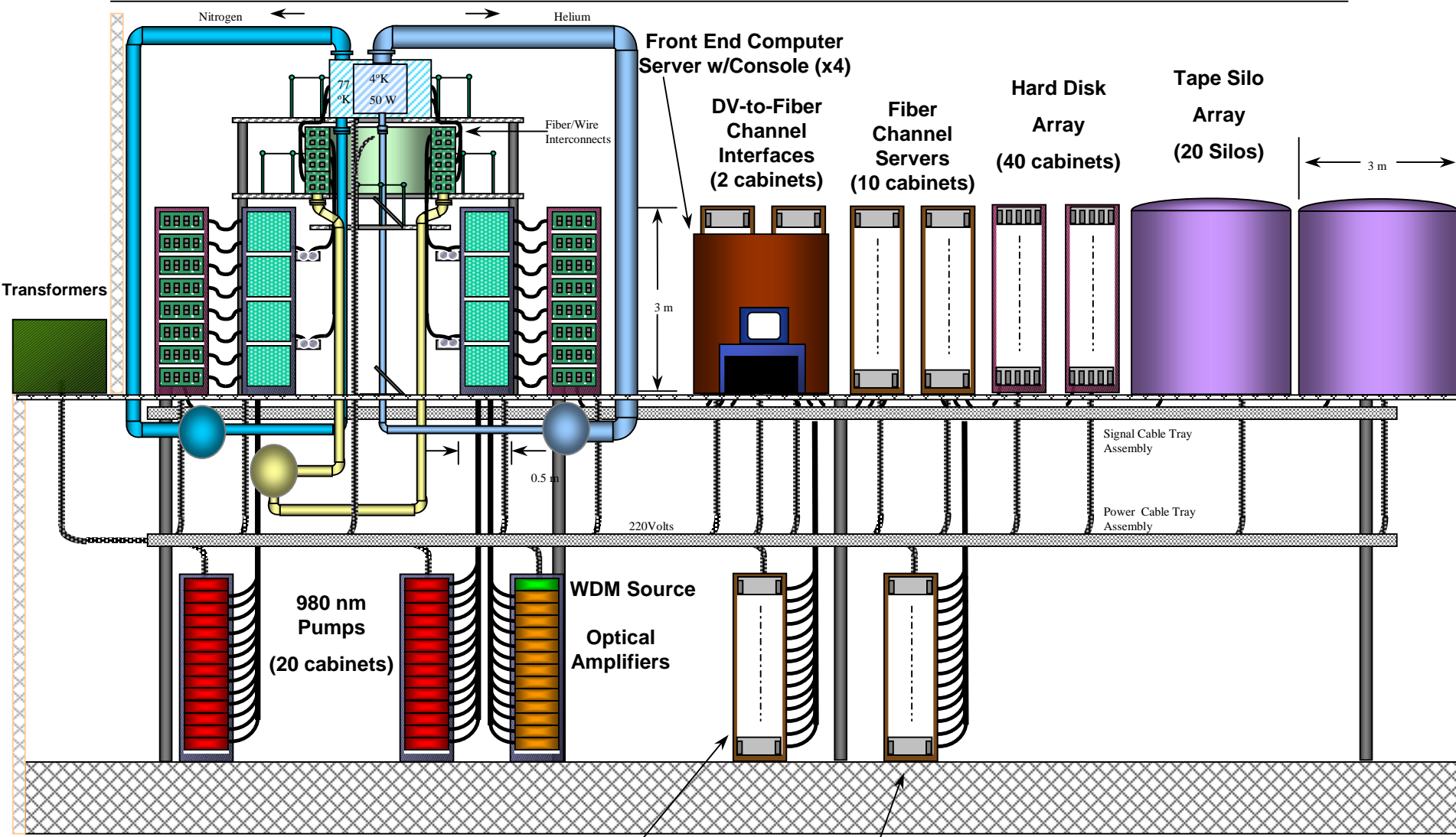
Moving to PetaFLOPS



Moving to PetaFLOPS



HTMT Machine Room



Monitor and Control Computer w/
Data Acquisition Cards (3 cabinets)

WAN
Gateways
(1 cabinet)

SIDE VIEW

End of Slides