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HPC Solution

Technology for a New Era in Computing

TEL IN HPC & Storage

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…. 20 years of changing with Technology

Complete Solution Integrators for Select Verticals

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- Mechanical Design & Engineering
- High Performance Computing
- Virtual Reality Environments
- Film, Video & Broadcast Solutions
- Storage & Disaster Recovery Solutions

PARTNERS

- SGI
- HP
- Dell
- EMC
- DDN
- IBM
- FUJITSU
- QUANTUM
- TANDBERG
- BAKBONE
- APC
- VOLTAIRE

Our Storage & HPC value proposition

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1) High Performance Computing
2) Shared File System
3) Parallel File System
4) Storage, Network & Management Consolidation
5) Backup & Policy based Archive
6) De-duplication
7) Business Continuity & Disaster Recovery Plan
8) Server & Storage Virtualization
9) Information Life Cycle Management

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HPC

Efficient, Economical Cluster Computing

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- Quad-core Intel® Xeon® processor architecture
- Fully integrated, tested, customizable clusters
- Industry standard operating environments:
  - SUSE® Linux® Enterprise Server
  - Red Hat Enterprise Linux®
  - Microsoft® Windows® Compute Cluster Server 2008 (CCS)
- TEL service & support for complete solution
- Cluster Management (Platform Manager , MOB , ROCK)
- Workload Manager (Altair PBS Professional , Open PBS Pro)
- IB Fabric Management
- Performance Optimization

Intel / Linux HPC solution has everything

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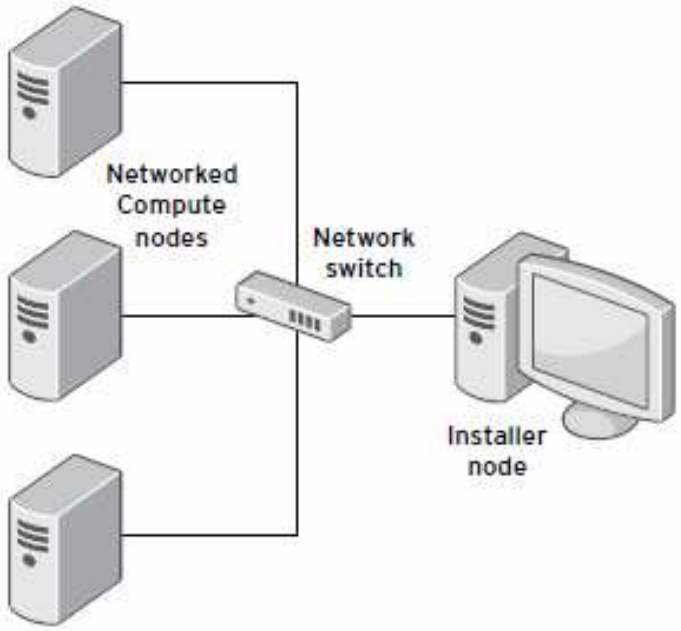
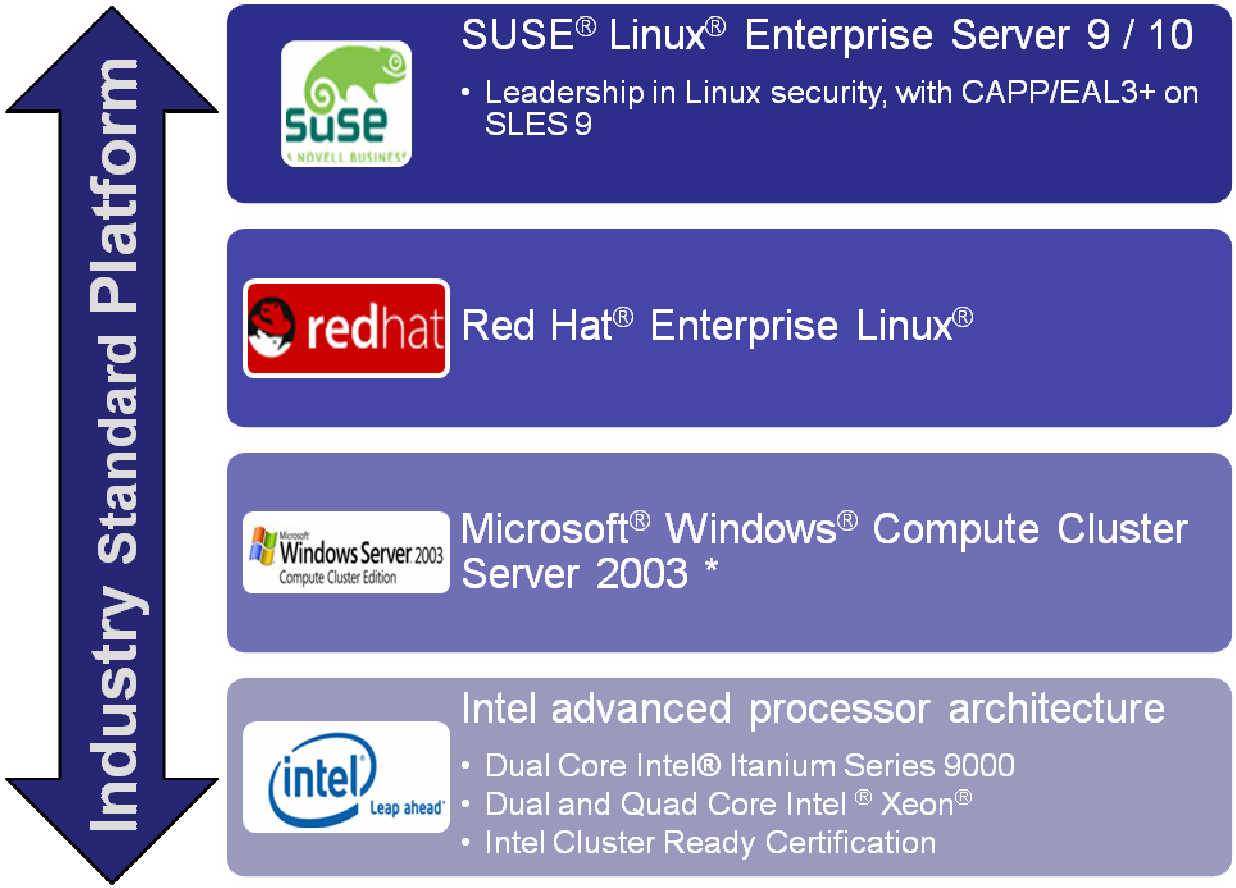
The 10 components need for a HPC Software Stack

1) Operating System
2) Cluster Deployment tools
3) Node & Cluster monitoring tools
4) Network & node file system
5) Message passing libraries
6) Application workload manager
7) Certification tools
8) Support for high speed interconnect
9) Performance benchmarking tools
10) Development tools

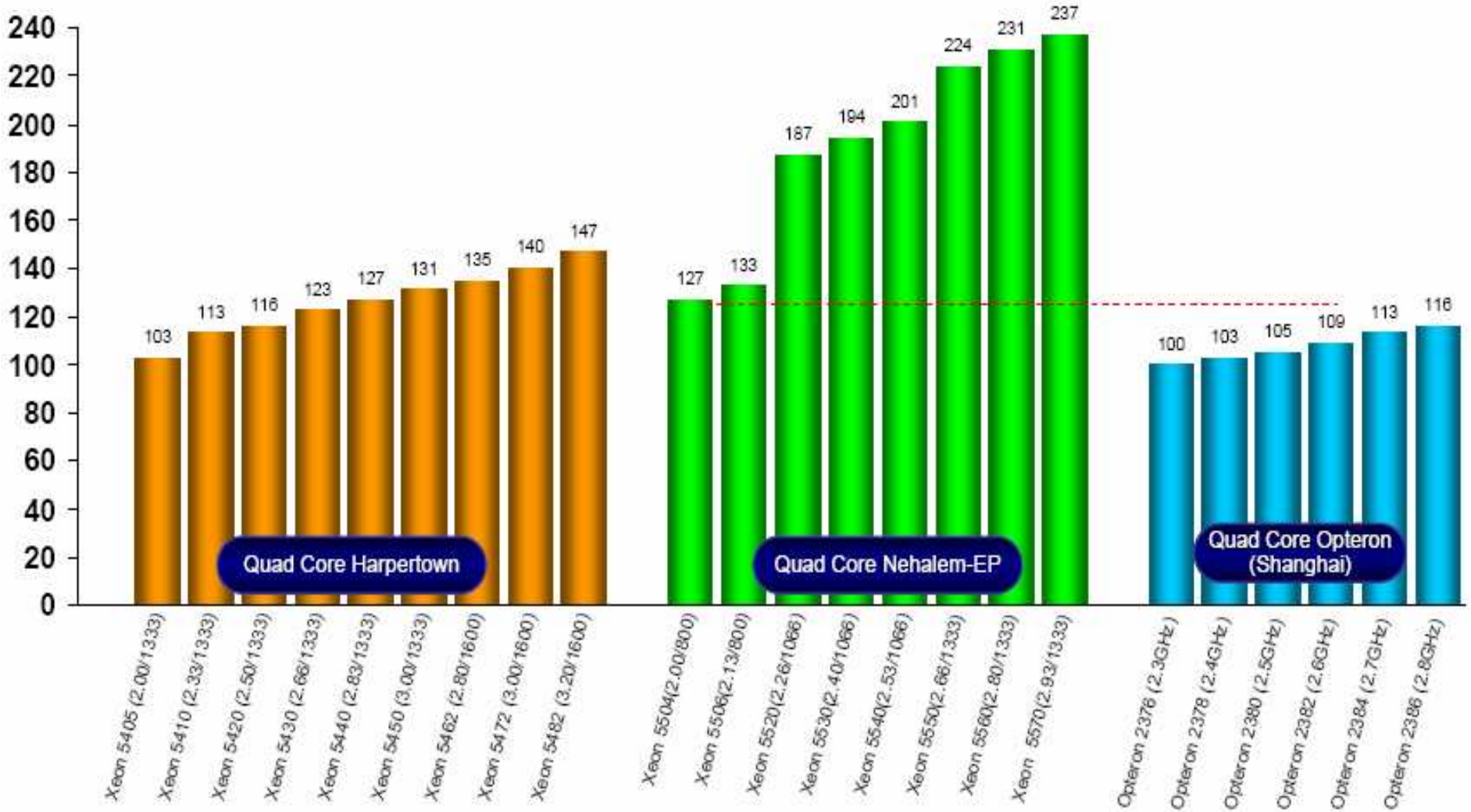


Standards-based Scalability



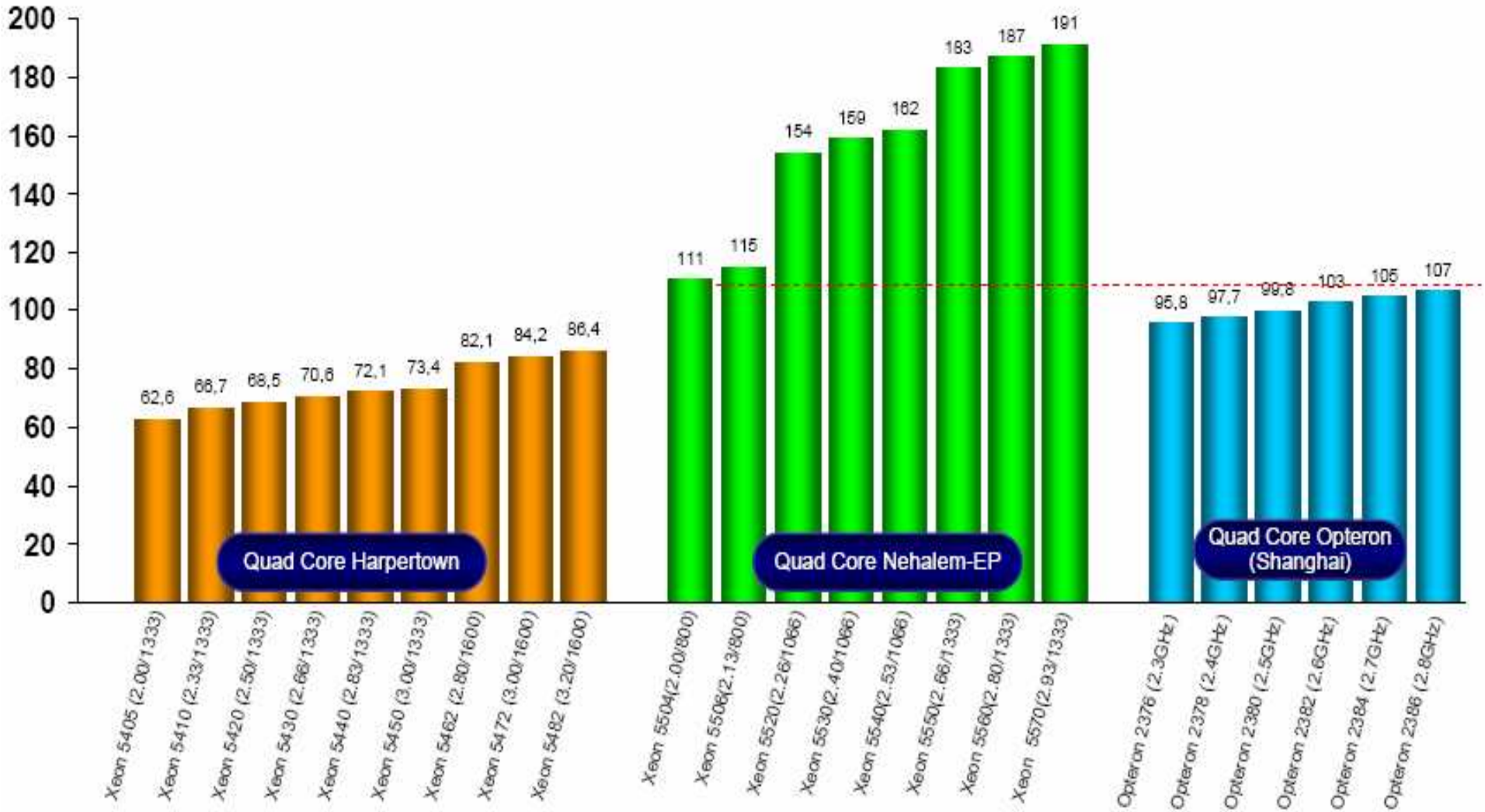
- **World's most scalable systems – all on Linux, all commercially available:**
  - **128 TB shared memory**
  - **1024 processor cores**
- **Clusters that easily scale to 1000s of nodes**

SPECint_rate_base2006 for Nehalem, Harpertown and Shanghai



All Nehalem-EP bins are faster than the fastest AMD Shanghai bin

SPECfp_rate_base2006 for Nehalem, Harpertown and Shanghai



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Intel Microarchitecture Nehalem

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Intel Microarchitecture Nehalem helps lower energy costs with automated energy – efficiency features that put processor power & memory into the lowest available states needed to support current workloads without compromising performance

Key Benefits

- Up to 3.5x greater bandwidth for data-intensive applications23
- Up to 18 slots DIMM with up to 144 GB DDR3 memory
- Up to 42 lanes PCI Express (36 lanes PCI Express 2.0)

Key Technologies

- Two Intel Xeon processors 5500 series
- Intel Turbo Boost Technology
- Intel Hyper-Threading Technology
- 8 MB shared L3 cache featuring Enhanced Smart Cache
- Intel QuickPath Technology
- Intel Intelligent Power Technology

Key Usage

- Bandwidth-intensive applications
- HPC clusters
- Multi-tasking user environments

PERFORMANCE ENHANCMENT

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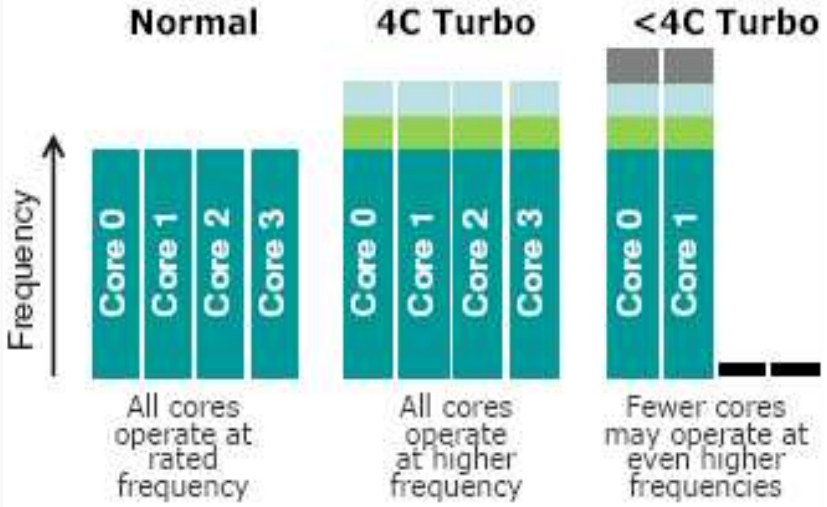
Intel® Turbo Boost Technology

Increases performance by increasing processor frequency and enabling faster speeds when conditions allow



Higher performance on demand

Intel® Hyper-Threading Technology

Increases performance for threaded applications delivering greater throughput and responsiveness

Higher performance for threaded workloads

GPGPU computing solutions

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Hybrid cluster solutions & services that fully leverage the performance of accelerators

Demand for computing power is growing steadily, as scientists & engineers seek to tackle increasingly complex problems. The emergence of multi-core CPUs has allowed to keep pace with their demands, but energy consumption, space, & cooling have become major inhibitors to computing systems expansion. Hence the success of acceleration technologies such as GPGPUs (General-Purpose Graphics Processing Units), which offer both breakthrough performance & outstanding space & energy efficiency

GPGPUs can accelerate processing by a factor of 1 to 100!

Turn Key HPC Solution

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HPC Solution

- » HPC Cluster Configuration
- » Architectural Layout
- » Wiring Diagram (HPC Cluster & Parallel Storage)
- » Power Layout
- » Application Benchmark
- » Power & Cooling requirement

HPC System Configuration

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1) Head Node
2) Compute Node
3) Interconnect
4) Management Network
5) Storage (NAS / SAN)
6) Parallel File System
7) Software Stack

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TATA Elxsi HPC Competence

- **Expertise in choosing the most appropriate architectures**
- **Expertise in optimizing user applications**
- **High-level skills relating to Linux and its support**
- **In-depth knowledge of the Open Source software integrated in TATA Elxsi's HPC offering**

CASE 1

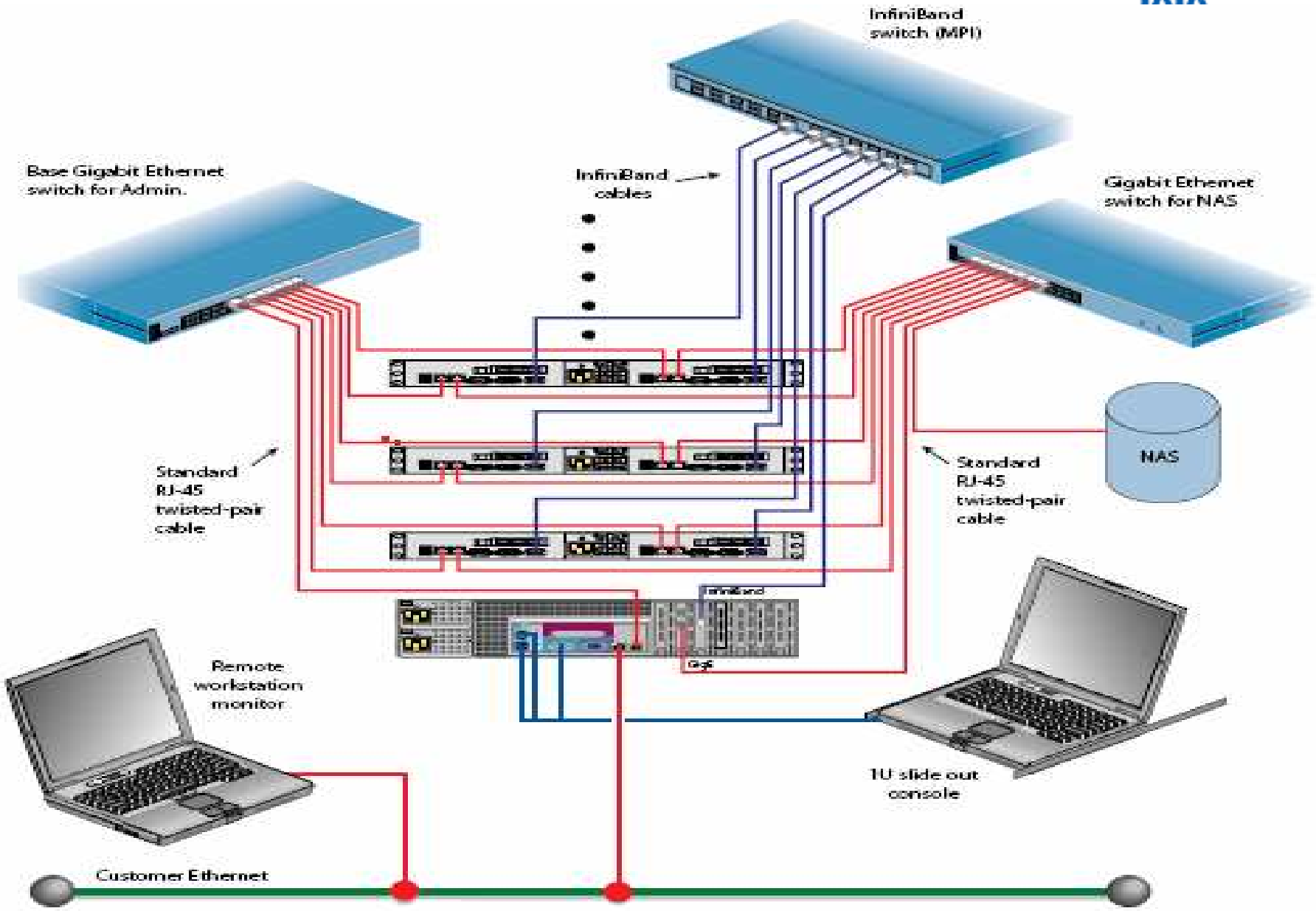

Figure 6-4 InfiniBand Cluster with NAS and Base Admin Network

CASE 2

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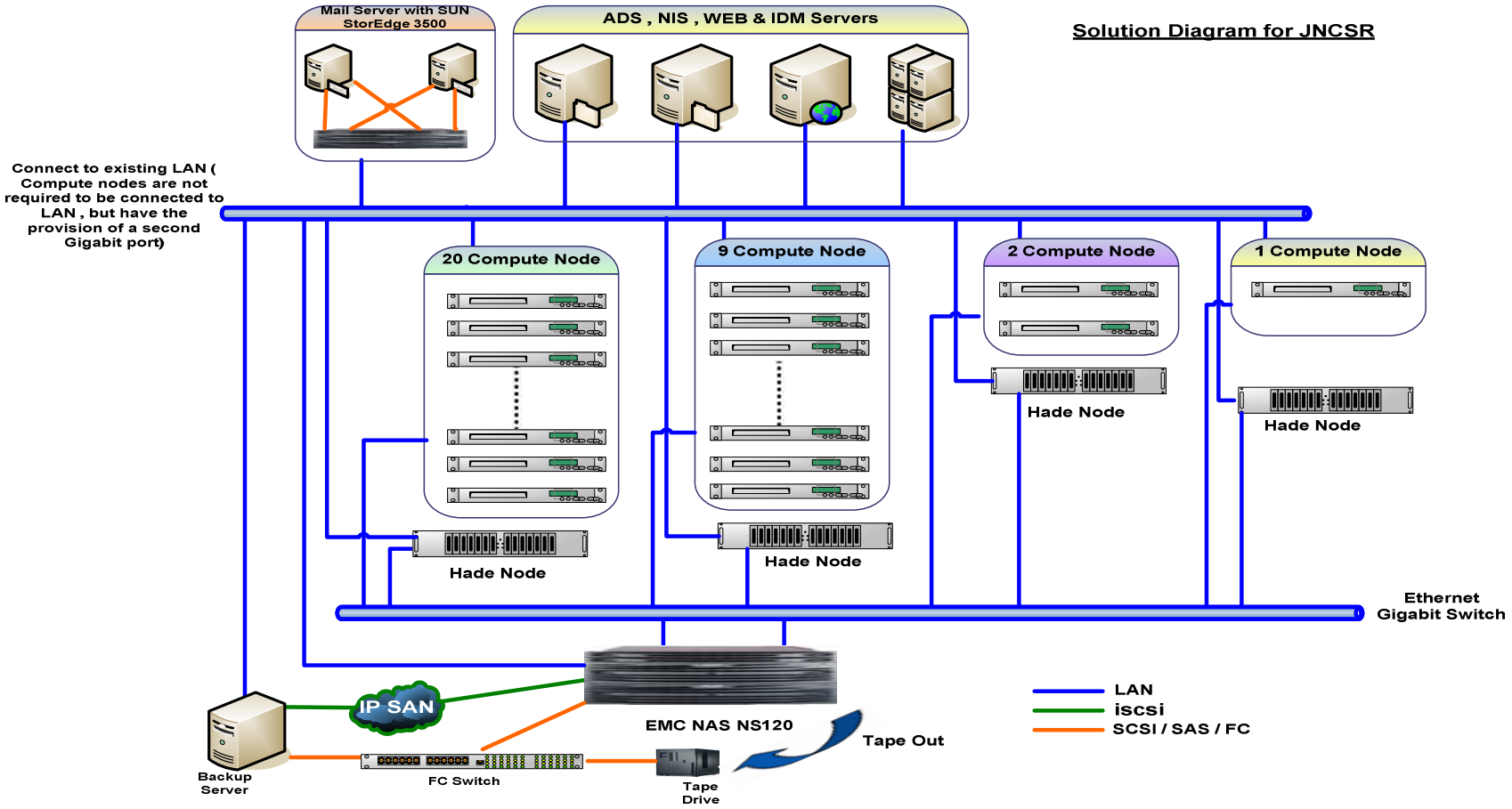

CASE 3

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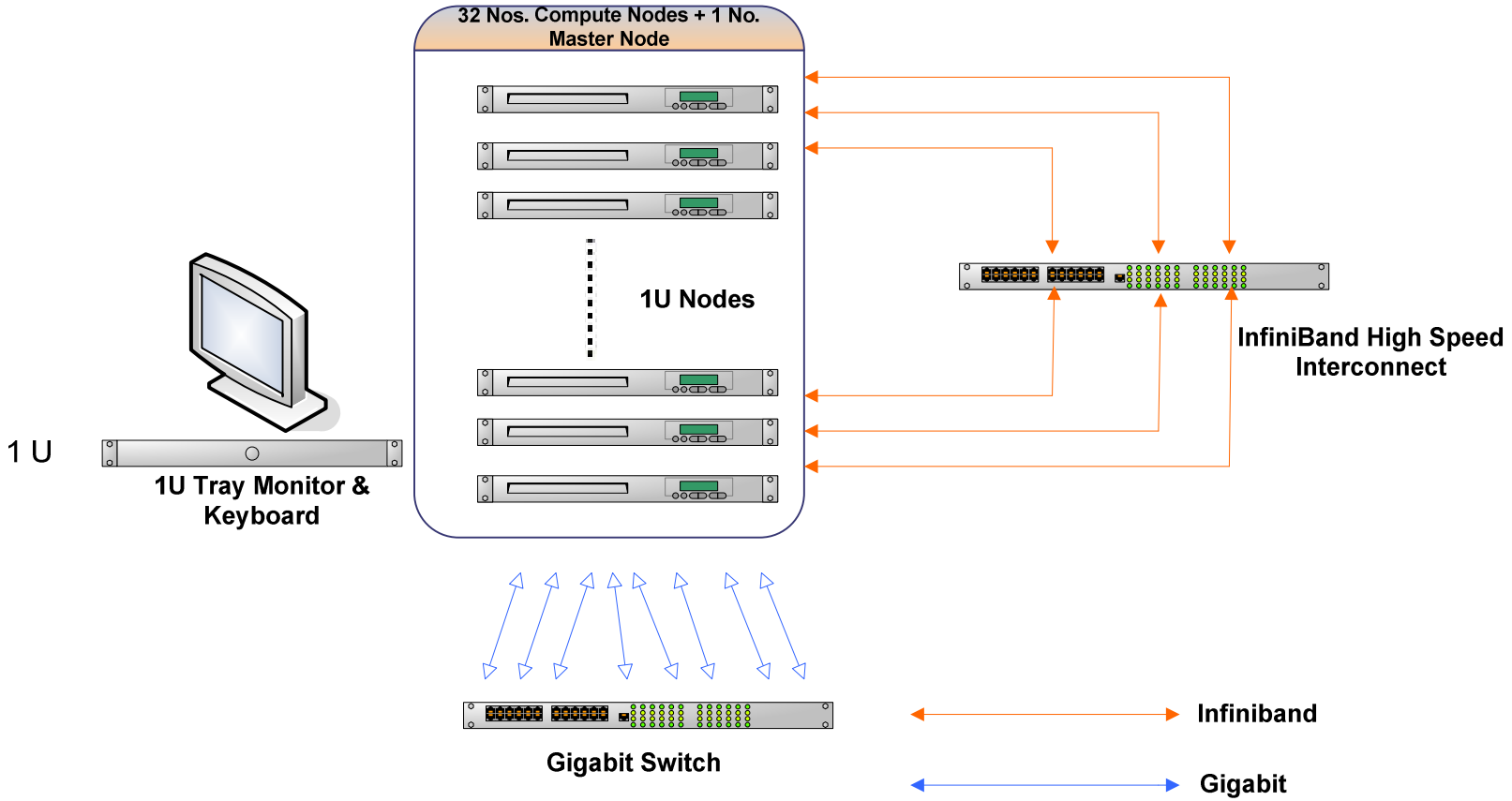

CASE 4

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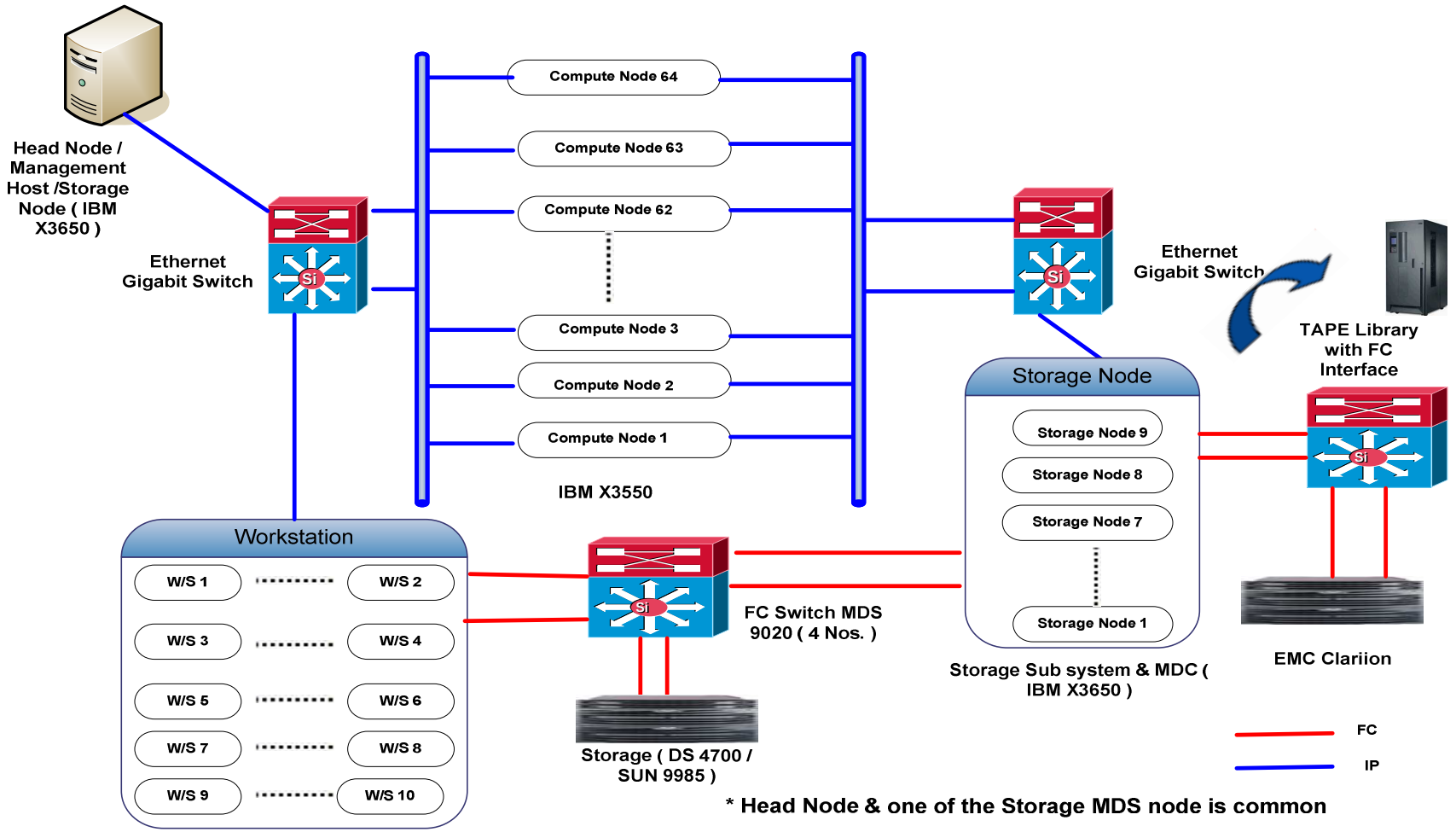

* Head Node & one of the Storage MDS node is common

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Recent HPC success stories across India

Indian Institute of technology - IIT - Chennai (For Computer center facility to be used across IIT – Chennai):

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Solution:

HP – Intel based servers of 2048 Cores with PFS & Large Storage in cluster

Applications :

Abaqus, Fluent, Gambit, Star-CD, Nastran, Dytran, Marc, Ansys, icem-cfd and amber.

Computations / CAD CAM applications / High performance computing - Compilations / Analysis Software.

Vega Supercomputer (IIT Madras , Computer Centre)

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The High Performance Computing Environment (HPCE) is set up to cater to the every increasing demand for Super Computing facilities of researchers at IIT Madras. This facilities for

- Material Science & engineering
- Atmospheric & Ocean modeling
- Aerospace engineering
- Modeling Social
- Ecological & Physical Network
- Design of large structures & VLSI
- Understanding flows & combustion
- Spectroscopy & Molecular modeling

Vega is ranked 436th in the World's Top 500 supercomputers in Nov 2008

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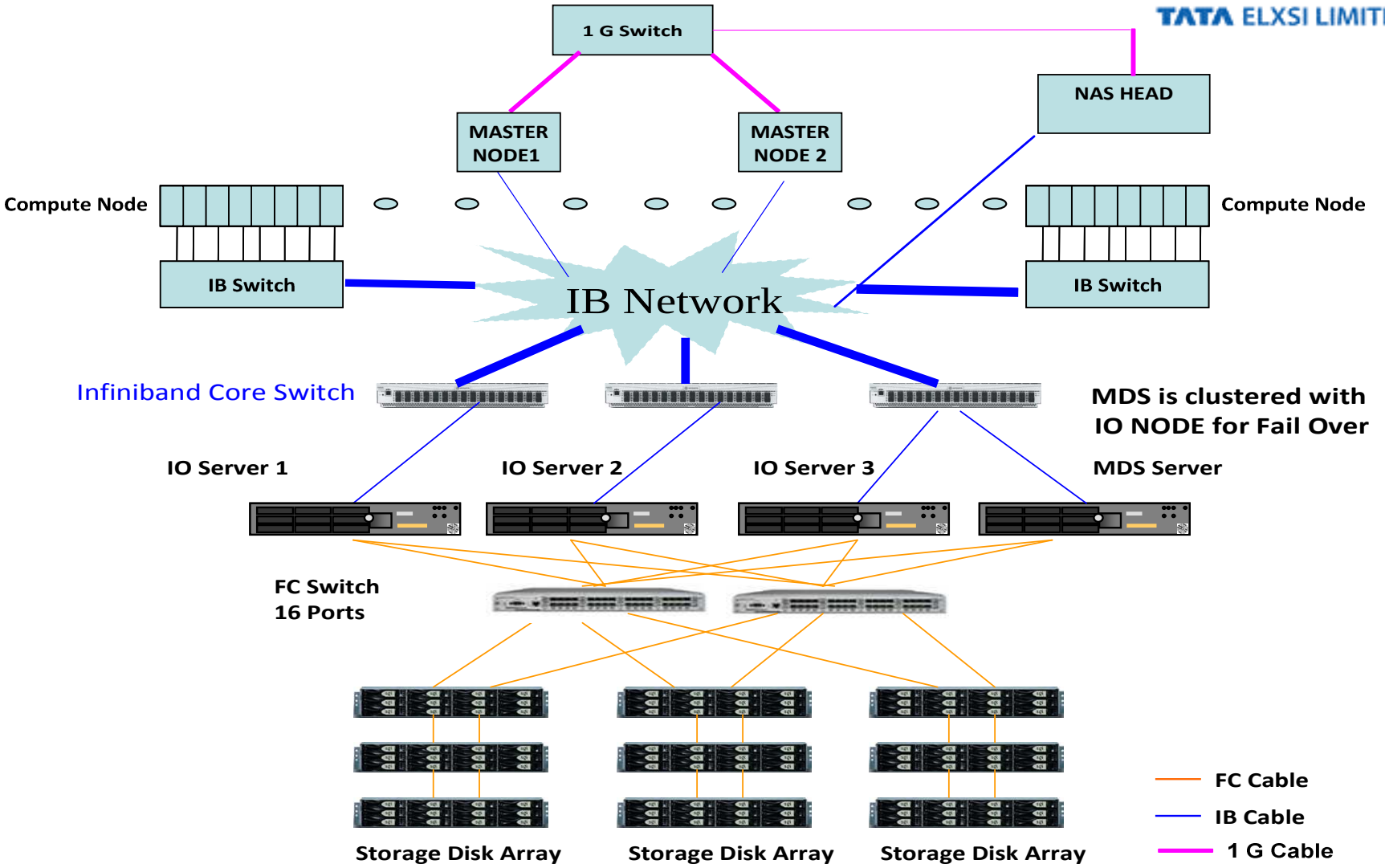

IB Cluster with Parallel Storage Architecture

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BEML - R & D Complex - Technogy center Bangalore:

Solution:

RX Serious of HP systems with Itanium based servers + AMD based servers - 6 Numbers clustered with IB and GB.

Applications :

CAD / CAM Applications :: MS Nastran / Partan / Catia / Solid works etc.,

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TATA CONSULTANCY SERVICES :

Solution:

SGI ALTIX CLuster + Compute Nodes with SGI TP storage - 64 cores

Applications :

CAD / CAM Applications :: MS - Nastran / Star CD / UG etc.,

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Nation Institute of Ocean Technology : NIOT - Chennai

Solution:

SGI Cluster and HPC of 4700 series 64 cores & Storage (SMP)

Applications :

Weather modeling and High performance computing

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National Geographical Research Institute : NGRI

Solution:

SGI Altix 4700 with 32 cores + SGI TP Storage. (SMP)

Applications :

Geogical applications and GIS applications.

INCOIS - HYDERABAD

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Solution:

SGI Altix Server / Origin Servers - 16 and 24 CPU + Storage (SMP)

Applications :

Weather modeling / Satellite data receptions / HPC environments

TATA MOTORS - PUNE :

Solution:

ALtix 4700 with Two Altix 450 with PFS Storage

Application:

PLM

TIFR - Mumbai

Solution:

HP Intel Itanium & XEON based Cluster & Storage

Application:

Home Grown

DELHI University :

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Solution:
HP C 8000 Chasis Based HP Cluster with IB and Gigabit

Application:
Home Grown

TATA STEEL :

Solution:
SGI Altix 1300 system 80 core Cluster with IB and Gigabit

Application:
Ansys & Fluent

SI's Core Competence

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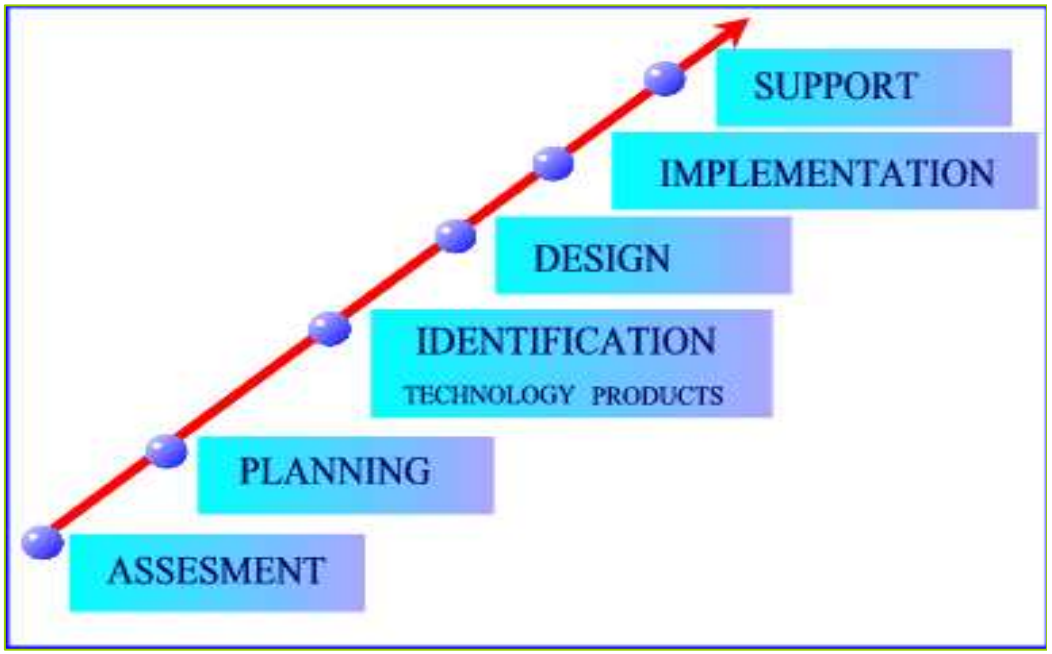
- Assessing requirements
- Understanding the problem
- Recommending the complete solution
- Suggesting the right products and services
- Supply, installation and commissioning
- Implementation and support



Long Lasting Customer Relationships

Tata Elxsi Advantage

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- Well reputed SI partner across industries.
- Ability to identify and recommend right technology solutions.
- Can provide a clear road map/scalability.
- Will suggest the best technology and recommend a cost effective integration and implementation plan.
- Strong after sales support and maintenance.
- Have a very large satisfied installed base spread across the country.

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Thank you !

Look forward to start our mutually beneficial, successful journey !