

# Knowledge GRID



by

**Dr. A.P.J. Abdul Kalam**

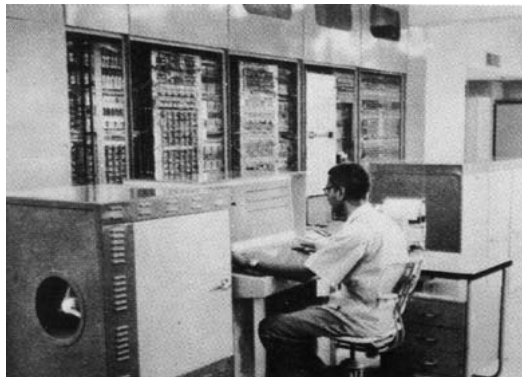
**Address at the Valedictory Function of the  
XV International Conference on Computing in High Energy and  
Nuclear Physics (CHEP06)  
Mumbai**

**17 February 2006**

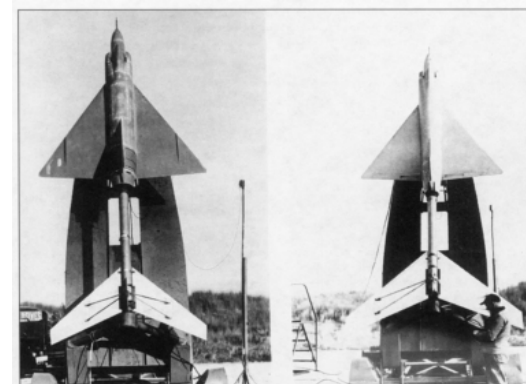
# My Experience with TIFR



टाटा मूलभूत अनुसंधान संस्थान  
TATA INSTITUTE OF FUNDAMENTAL RESEARCH



**TIFRAC-2**



**NASA Wallops Rocket Station**

# Graduating towards GRID Computing for R&D



BARC- ANUPAM



DRDO



DAE



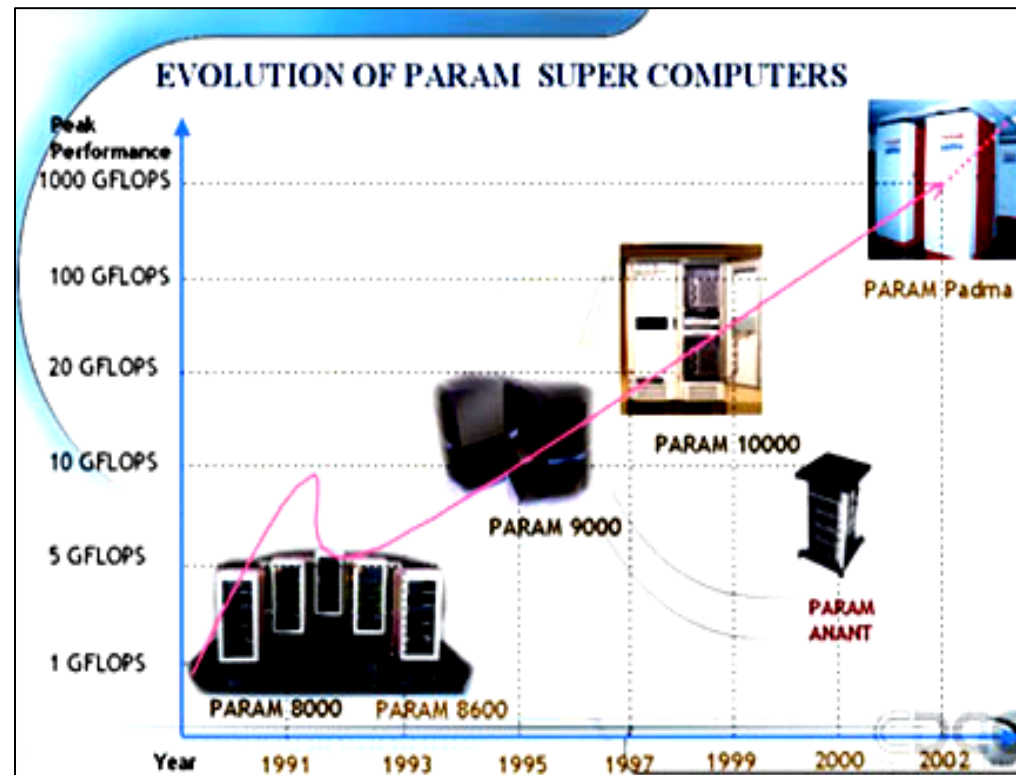
ISRO



NAL-  
FLOSOLVER

**Early  
1980's**

**INDIA  
Embarked  
on a  
Mission  
To Develop  
Super  
Computers**



CDAC – PARAM Super Computers

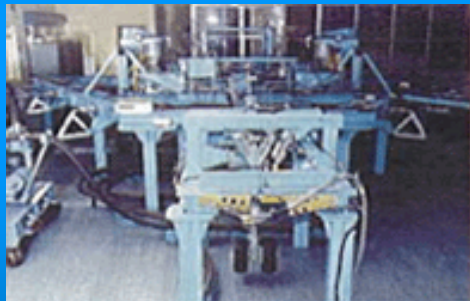
**Paradigm  
Shift  
From  
Mainframe  
To Parallel  
Computing**

# ADVANCED S/W MODELLING & SIMULATION FOR LCA

## Simulation



Cockpit Environment Facility (CEF)



Iron bird – Hardware-in-loop simulator

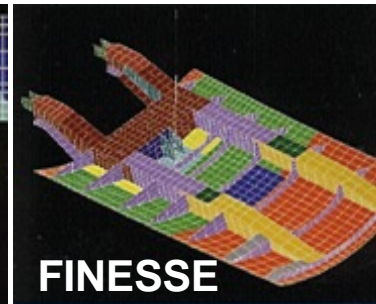
Evaluation of integrated flight control system software & hardware and aircraft hydraulic system

## CAD



FINEGRAF

Interactive graphics for finite element modeling



FINESSE

Finite element analysis package



PRANA

Analyze CAD data in virtual world

## Virtual Reality

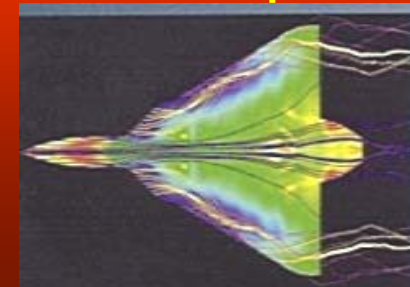


Environmental control system bay

## CFD



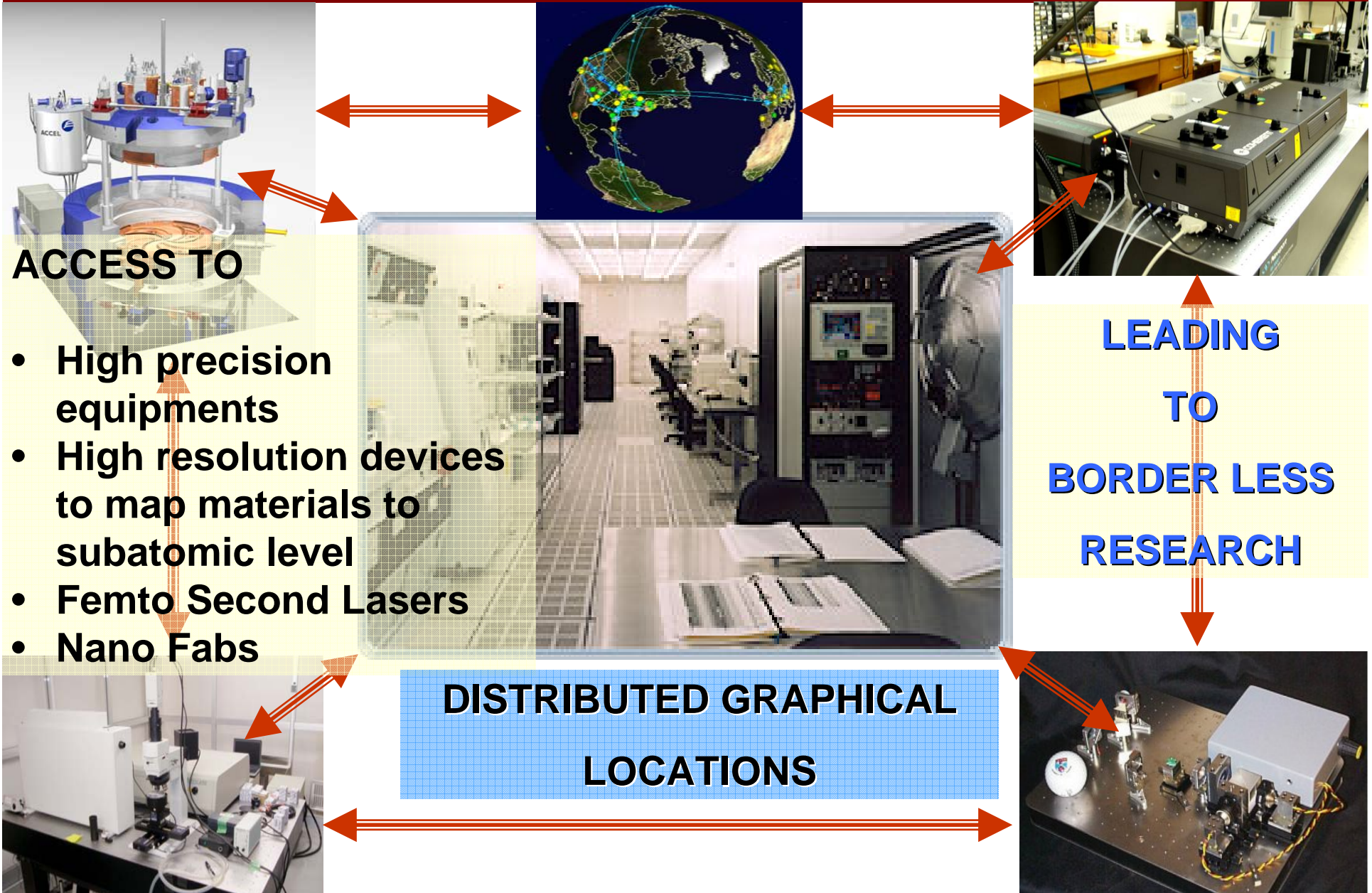
Development of CFD Codes for design and analysis of internal / external flows for subsonic and transonic speed



## SOFTWARE

- VRTRANS : TRANSLATION OF STATIC CAD DATA (DIGITAL MOCKUP) INTO VR MODEL
  - PRANA: ADD LIFE TO VR MODEL
- ➔ VIRTUAL PROTOTYPE

# GRID Connected LABS



# High bandwidth Network for GRID



Computer Cluster



Gigabit Switch

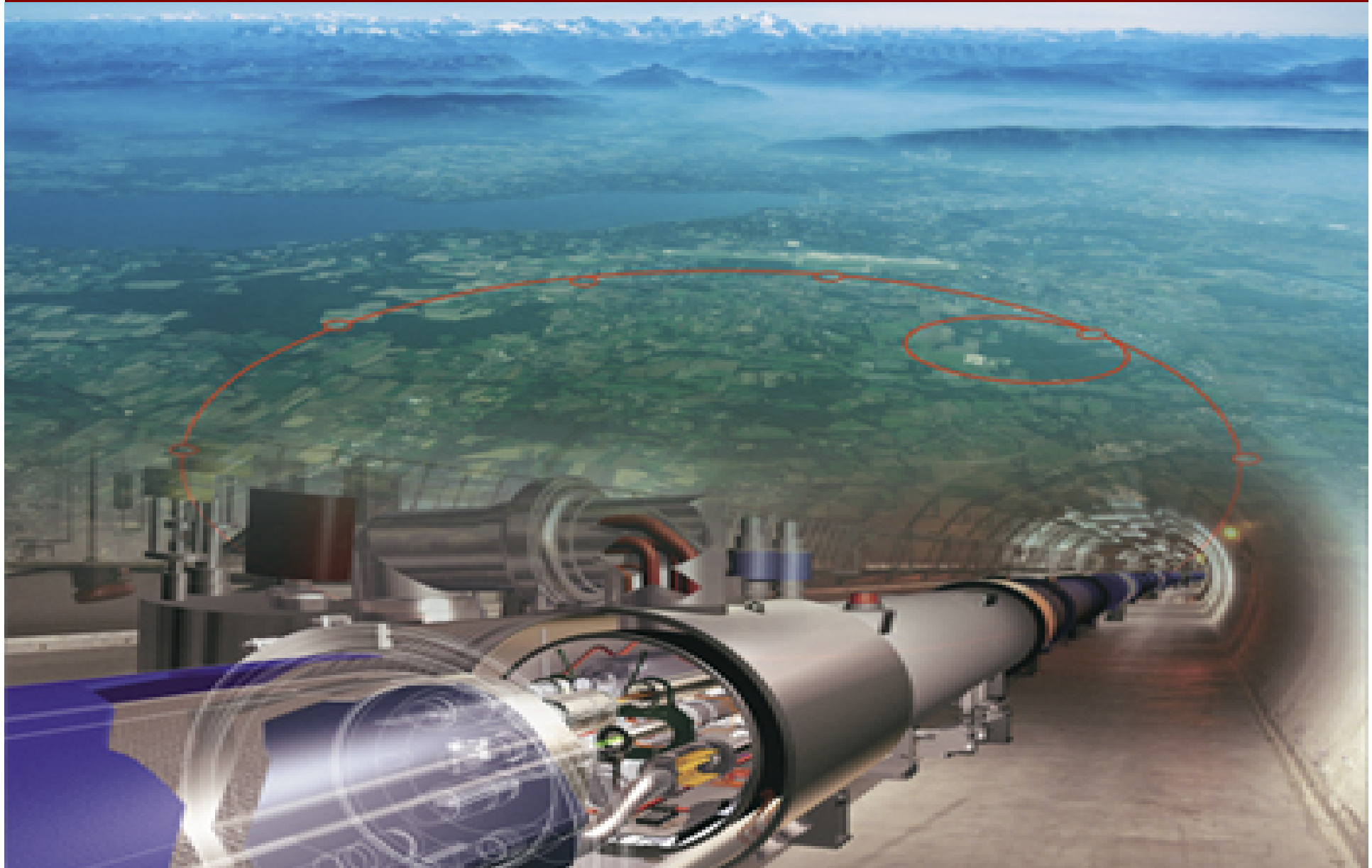


Computer Cluster

## Layers

- TGN
- TIC
- SAFE/SAT3/WASC
- SEA-ME-WE-2
- SEA-ME-WE-3
- SEA-ME-WE-4
- FLAG (FEA)
- Indo-UAE
- Locations & Services
- Ethernet
- MPLS Global PoPs
- NOCs
- Multiple Landings
- World Map

# CERN - LHC Tunnel Location



# CERN and INDIA

## INDIA in High Energy Physics Experiment

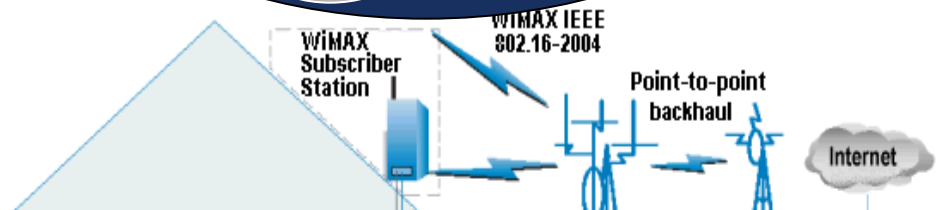
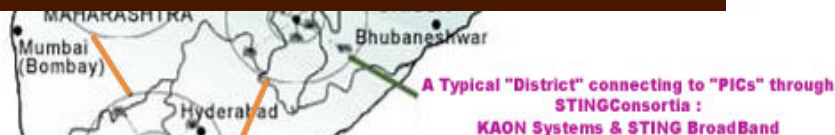
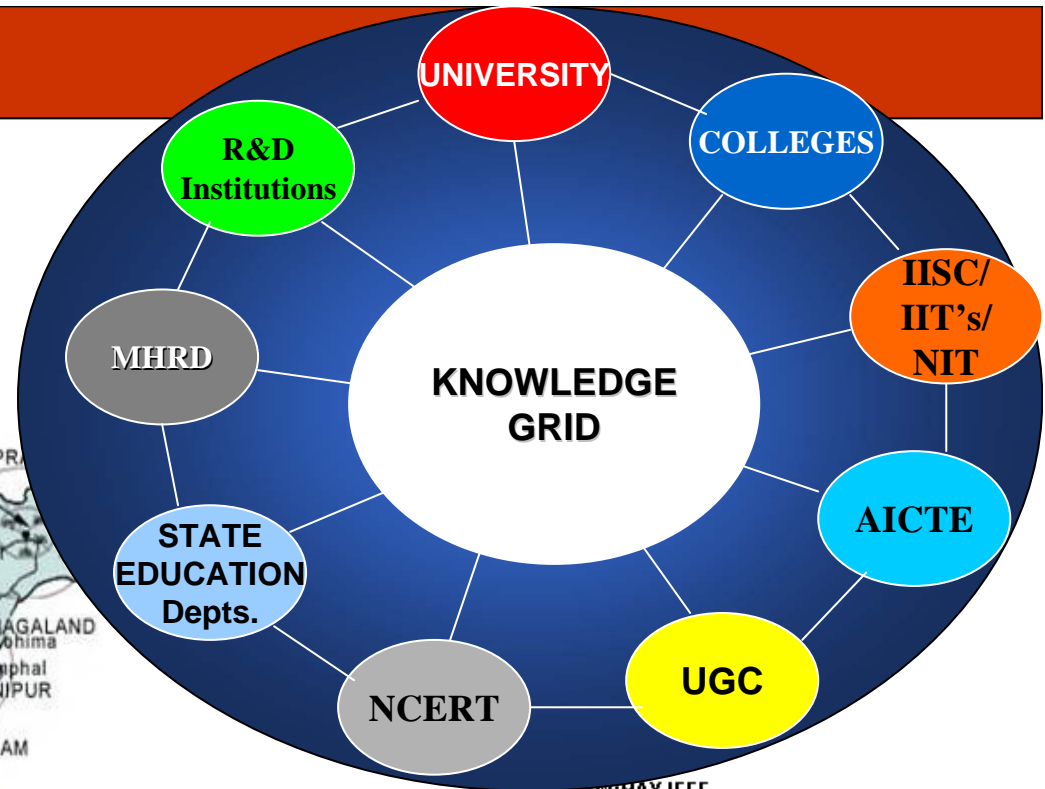
1. TIFR
2. VECC
3. SINP
4. Indian Institutions
5. Universities

## India Participates in TWO out of 5 CERN Projects

1. CMS (Compact Muon Solenoid) and
2. ALICE (A Large Ion Collider Experiment).

# Knowledge GRID

- ERNET Connects the Educational and Research Institutions
- 1500 institutions are connected for internet and email access
- ERNET is connecting 45 institutions with 100 mbps connectivity through GARUDA project.



## VPN - FIBER BROADBAND

100 mbps – 1 to 10 GB across the institutions

Wi-MAX : 2 – 10 mbps for last mile

DATA CENTRE at University Level

MESSAGING AND COLLABORATION ACROSS THE GRID, Internet2 access

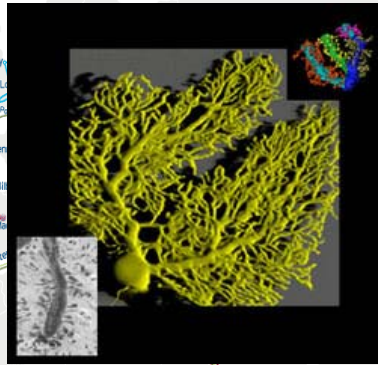
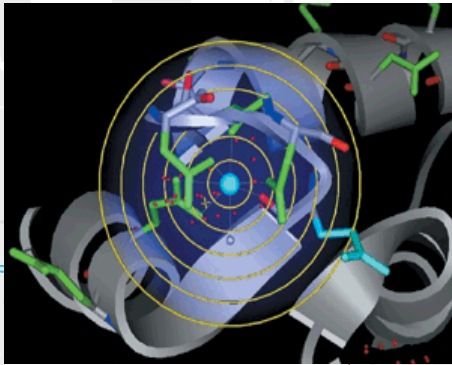
Tele-Education, Virtual Reality Simulation, Parallel processing, Super computer access

Thiruvananthapuram Total Panchayats: 2.37 lakh  
[Total Representatives: 34 Lakh, Women (Representatives): 10 Lakh]

Ethernet

WIMAX Base Stations

# INTERNET-2



## INTERNET-2

### ENABLES

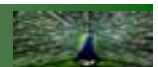
1. Immersive Collaboration
2. Resource & Knowledge Sharing
3. Real-time computation
4. Intensive Simulation
5. HDTV Quality Video on Demand

Leads to fundamental transformation on

The way we work  
The way we learn  
The way we entertain  
The way we govern  
The way we live

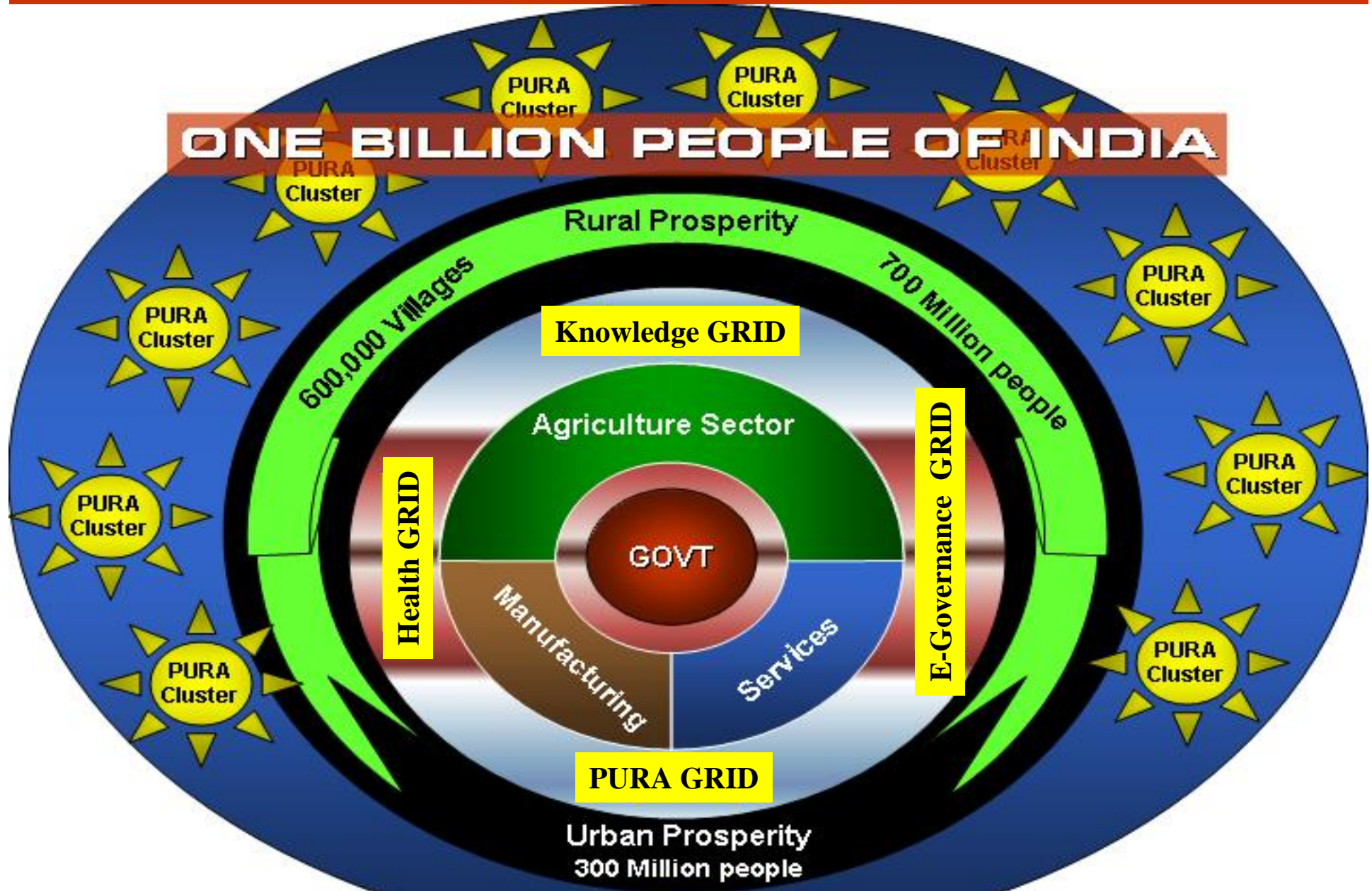
INTERNET 2 – needs high bandwidth Network

- 1. Mission for Computers in particle physics**
- 2. Mission for Space research and particle research**
- 3. Mission for Energy**



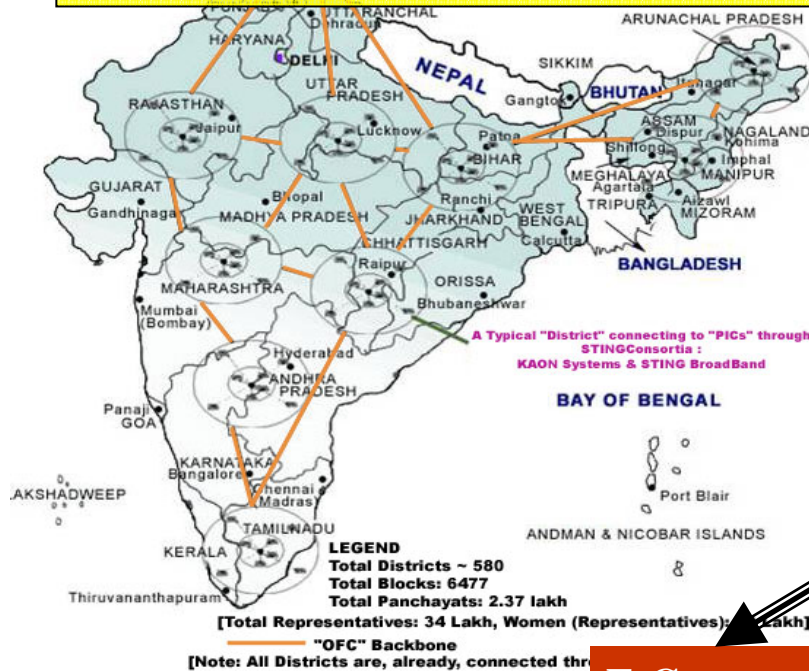


# Connectivity for Billion people is the Key



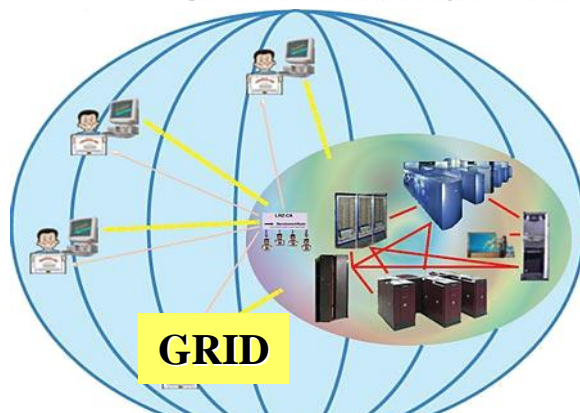
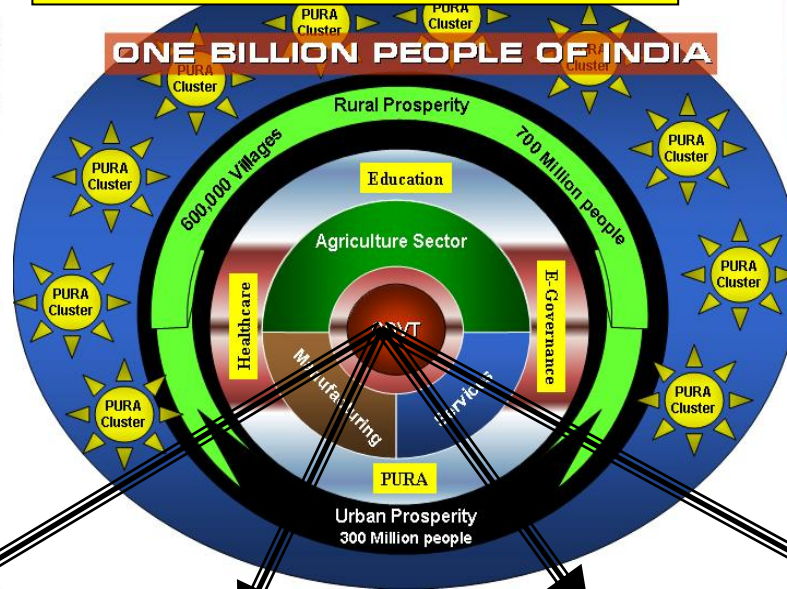
# Societal GRID Connectivities

**FIBER BROAD BAND with GIGABIT NETWORK CONNECTED to STATE/DISTRICT/BLOCK LEVEL**



**EDUSAT/Satellite for Remote & Difficult Areas**

**Wi-MAX for Last Mile Access**



**E-Governance GRID**

Central/State Governments

**Health Care GRID**

Healthcare/ Medical Institutions

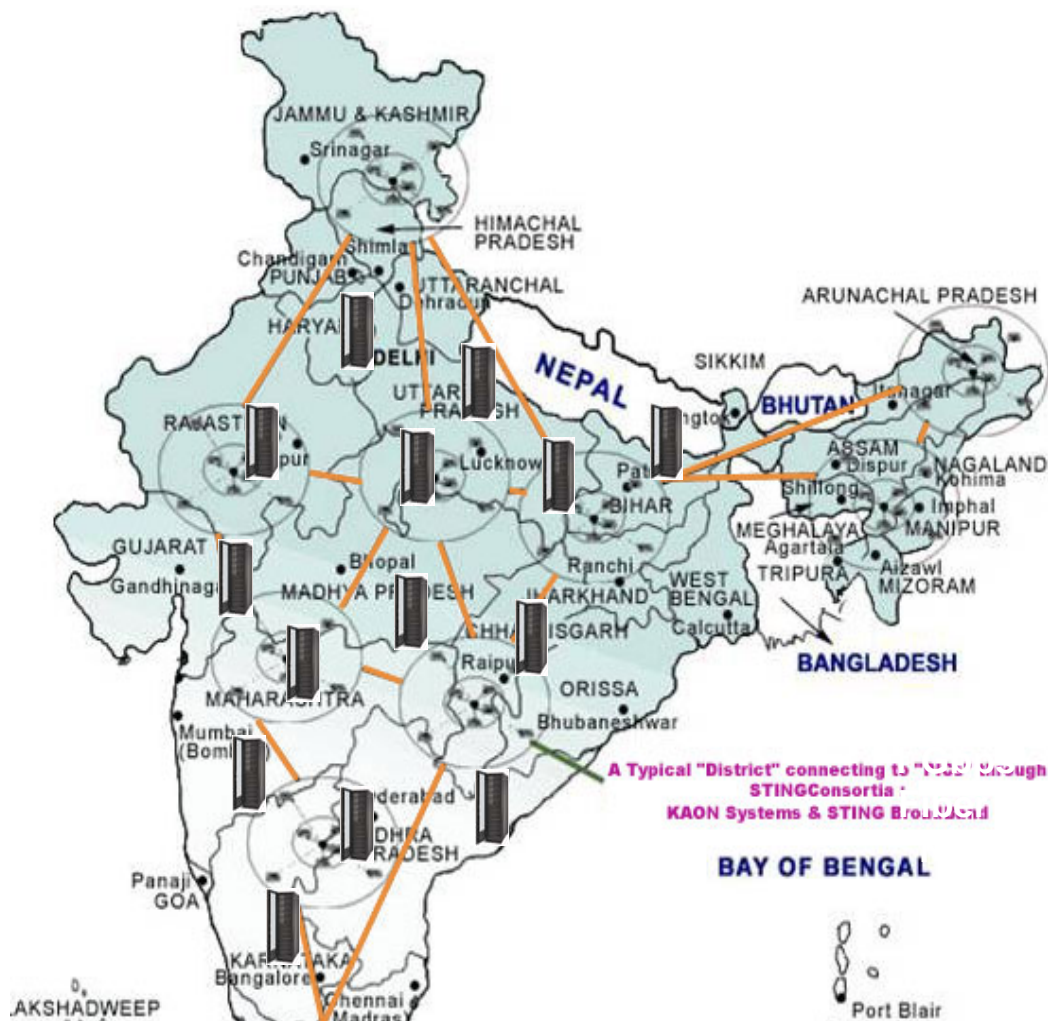
**Knowledge GRID**

Universities Institutions

**PURA GRID**

Rural PURA Clusters

# Knowledge GRID

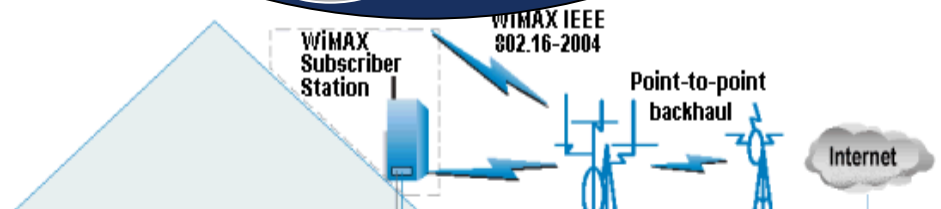
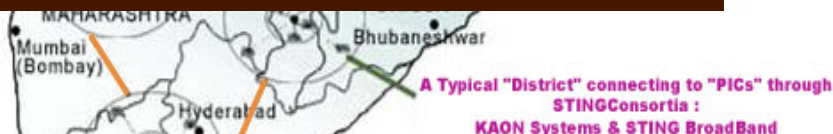
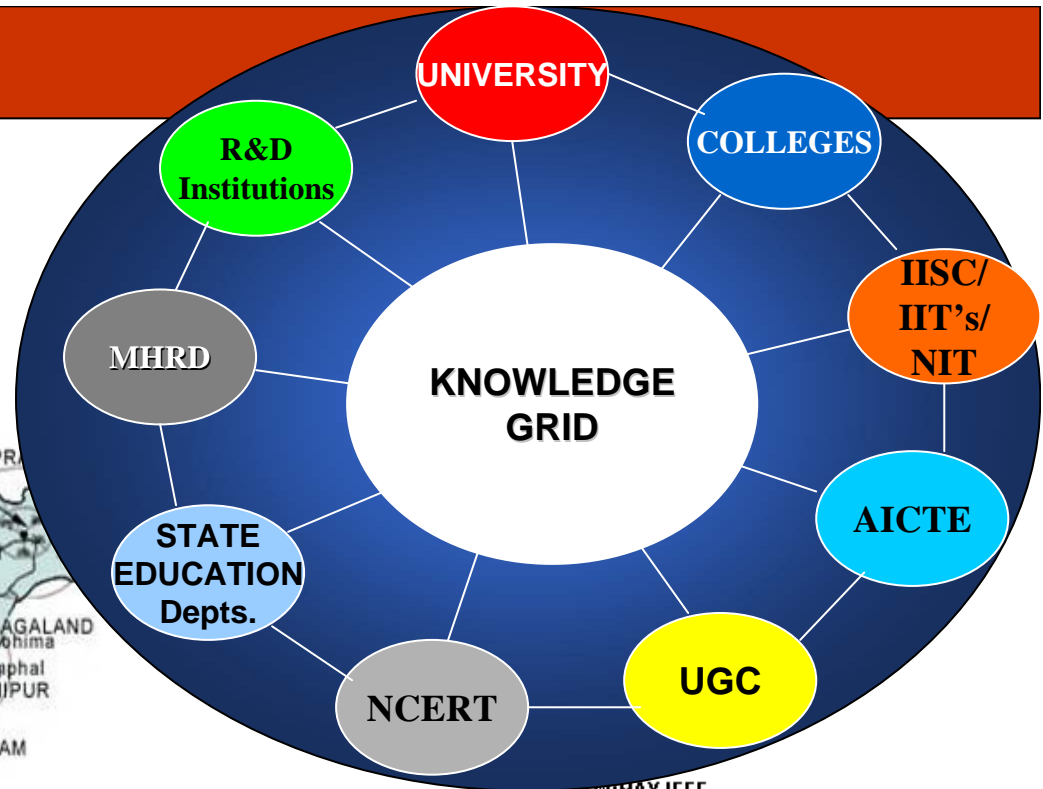


On 2nd June 2005, the Government of India has constituted a **Knowledge Commission**

- **Connects the Knowledge institutions such as :**
  - Academic institutions (Universities)
  - Research Institutions,
  - R&D Labs and Organizations
  - Related Industries
- **Connected with the High bandwidth Gigabit network ( 1 – 10 Gbps)**
- **Access to High performance Computing environment, Virtual Reality, Simulation systems, Parallel Servers, Clustered Servers, Super Computer Infrastructure from any part of the GRID**
- **Lectures, Laboratory, Library access**
- **Knowledge creation, sharing, dissemination and reuse – Knowledge GRID**
- **Collaborative Learning**
- **Internet-2 applications**
- **IPV6 (More space, QOS)**

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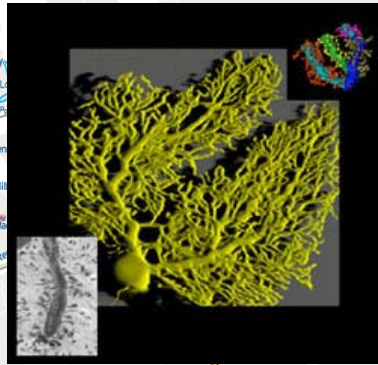
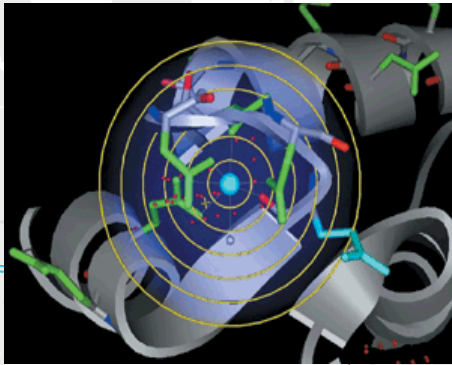
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