

Multi Resolution



Societal Applications



3D Geographic Models



Seamless Fly Through



Thematic Vectors



Bhuvan

Indian Earth Observation Visualization

<http://bhuvan.nrsc.gov.in>

Indian Space Research Organisation



UN-COPUOS
Scientific and Technical Subcommittee, 47th Session
Vienna, February 08-19, 2010



Vision

**To evince the distinctiveness of
Indian imaging capabilities
through online rendering of
multi- resolution, multi-temporal and
multi-sensor IRS imagery
overlying value added thematic maps
on 3D globe
whilst serving for societal good.**

Integrated into everyday decision making



What is Bhuvan?

- Primarily a EO visualization tool
- Indian remote sensing satellite imagery-based geo-portal, representing in essence, the whole India on a computer
- Enables users to "fly" from space to street level to find geographic information and explore places around India
- Like a video game and a search engine rolled into one – ease of use
- A 3D model of India that lets you grab, spin and zoom down into any place

User Satisfaction is our Mission



Bhuvan: Genesis and Intent

- A Geoportal of Indian Space Research Organisation
- Showcase Indian Imaging Capabilities in Multi-sensor, Multi-platform and Multi-temporal geospatial domain
- A gateway to explore and discover virtual earth in 3D space
- Specific emphasis on Indian region and utility for society
- Premiered in Aug 2009





Highlights

Typical Objectives

- Visualization of IRS images on 3D Globe
- Support for 2D and 3D client tools & utilities
- Display of geospatial raster and vector layers
- Scalable solution, commensurate with the vision
- Optimised solution - Large no. of concurrent users
- System design and architecture – Distributed comp.

Challenges

- Server side - H/W, S/W, Security and Networking..
- Application S/W - Server side & client side dev....
- Database organisation, Standards, implementation..
- Content generation, deployment & management...
- Quality Assurance (s/w, geometry & Radiometry)...



Broad Areas of Development

- **Features - client side and server side solutions**
- **Three Tier Architecture**
- **Value addition in Client-end functionalities**
- **Server-end challenges - operations/ services**
- **Hardware requirements analysis & design**
- **Metadata preparation and cataloguing**
- **Raster and Vector data standards & preparation**
- **Database Organisation and design**
- **Analysis for optimal performance - simulations**
- **Road Map - Short term & Long term**



Bhuvan Design - Challenges

- **Cater to large no. of users concurrently - efficient streaming**
- **Application software solution - adaptable/scalable**
- **To meet large concurrent users' demands - design issues**
- **Customisation of client-end s/w - Design & development**
- **Optimal database design, preparation & management**
- **Multi-resolution, multi-sensor, multi-temporal data mgt.**
- **High Quality image Geo-referencing – Automation**
- **Variable sized Tiles/ Mosaics for optimal services**
- **Radiometric normalisation for virtual seamlessness**
- **Large volume of data processing/ storage/ updates**
- **Large number of Vector layers - Themes/ infrastructure**
- **Vector data overlay on images and query/ info. extraction**
- **Innovative value addition /research - software & services**





Bhuvan Architecture





Bhuvan Hardware Set-up

Power scalable and Storage scalable Architecture

Four Servers with blade technology - 8 Cores

Storage Area Network (SAN) Storage - 50 TB

Active-Active Configuration of server for load balancing and failover situation

High availability with Failover, SAN and Redundant SAN switch

Salient Features of Application Software

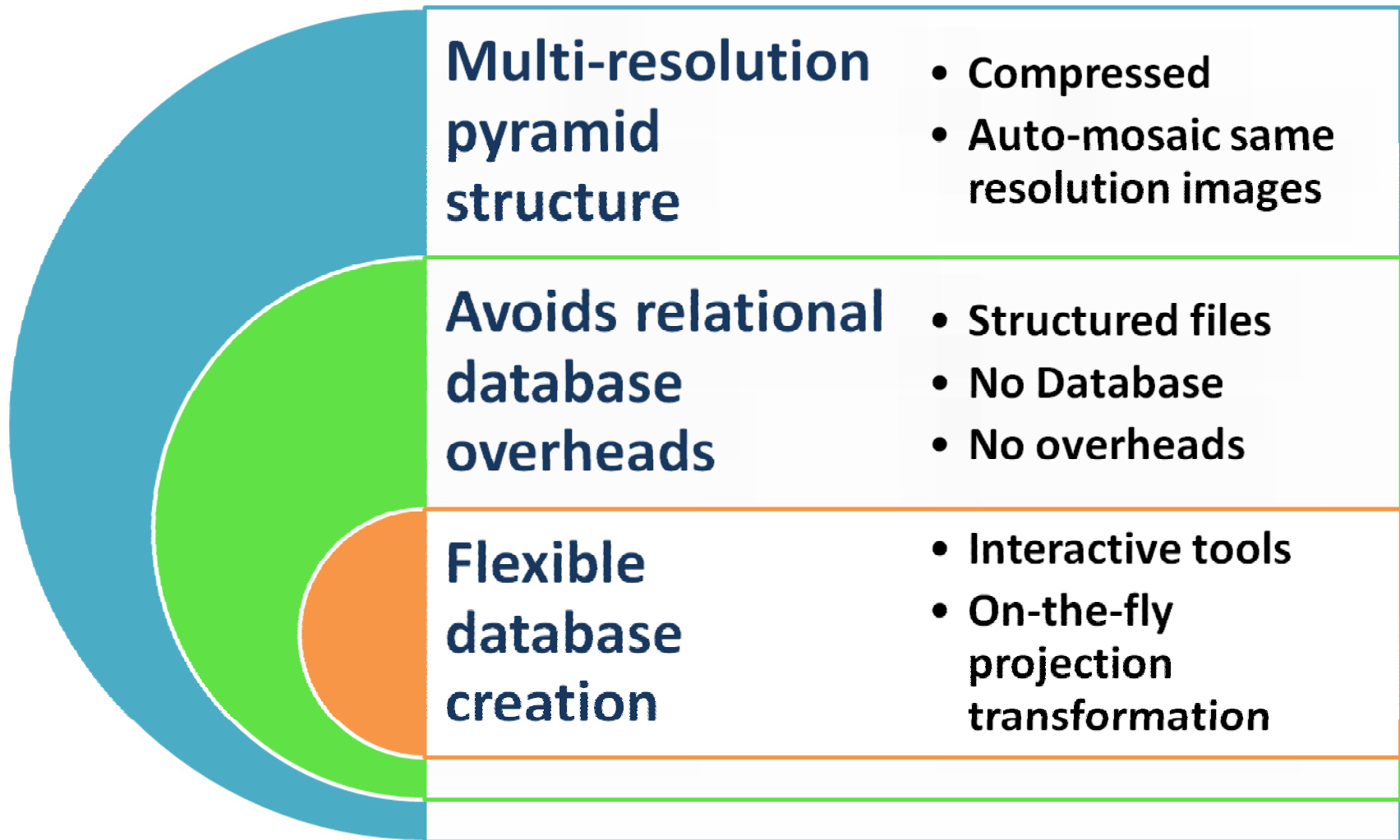


- Powerful Network data server technology to stream massive geographic databases
- Designed by easy scalability of images and vectors
- Works with firewalls and proxy servers
- **Enable SSL (Secure Socket Layer Protocol)**

Client

- **Simple Browser based client even for 3D globe**
- **Optimized to work with client bandwidth limitations**

Databases for Bhuvan





Data on Bhuvan

• Data as per RSDP

- AWiFS for entire world
- AWiFS Full India (Three seasons of 2008)
- LISS-III Mosaic for India (2007)
- Synthatic L4MX (IRS-1C/1D PAN + LISS-III) covering entire India
- IRS-P6 LISS-4 covering western part of India
- OCM Full India mosaic.

- IRS-P6 L4MX for full India.
- IRS-P6 L4MX some Foreign cities.
- Full India LISS-III Mosaic for 2008

Administrative Boundaries

- Country
- State
- District
- Taluk
- Village

Thematic Information

- Wasteland Data
- Soil
- Ground Water Prospects

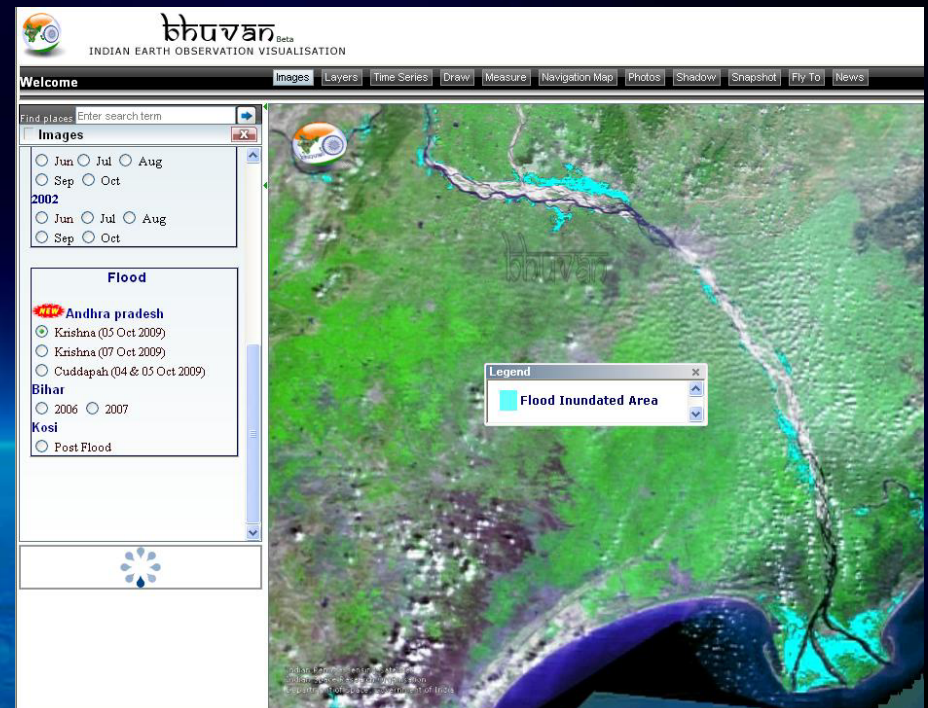
Value added Information

- Watershed Boundary
- Weather Parameters (AWS)
- Disaster Specific Datasets (Flood & Drought)

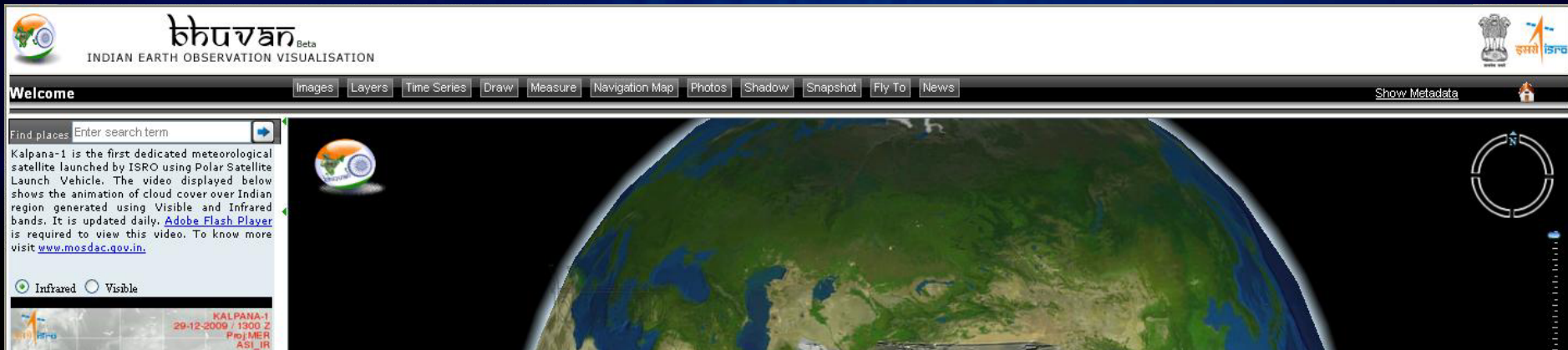
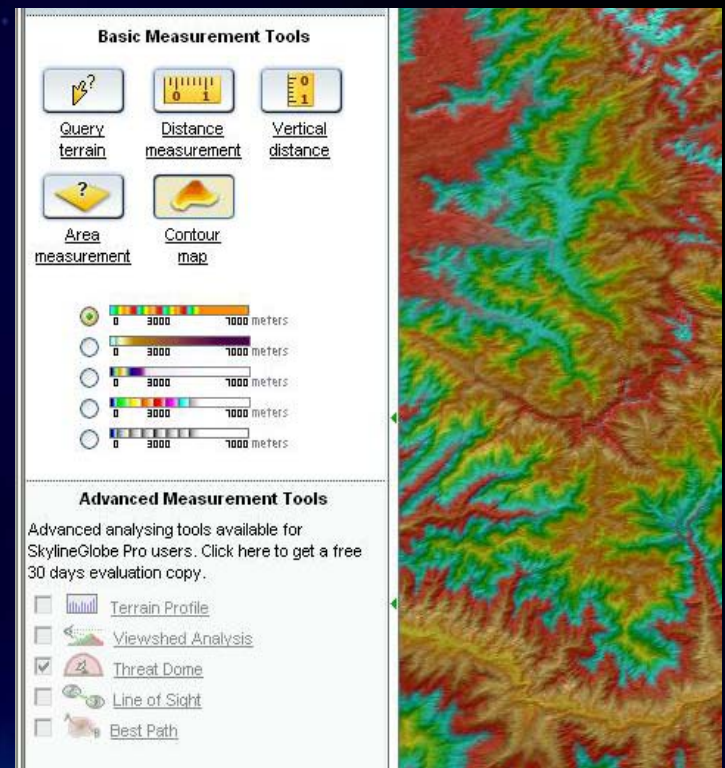
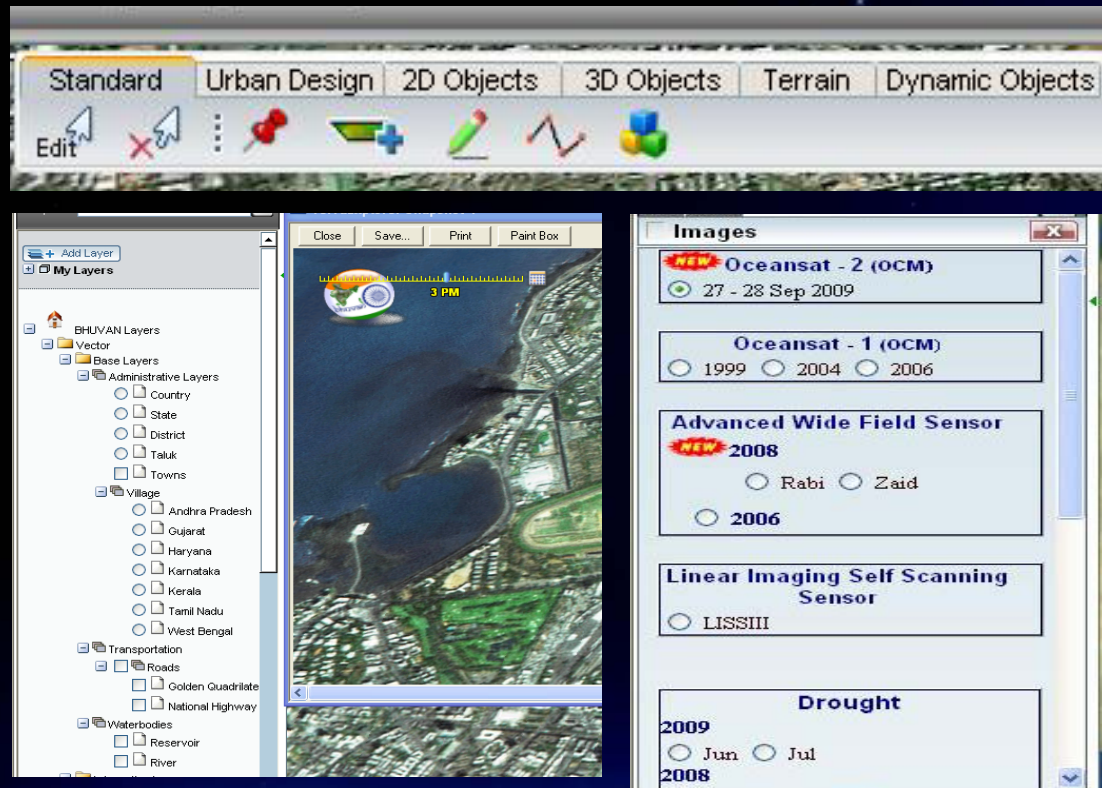


Distinctive Attributes

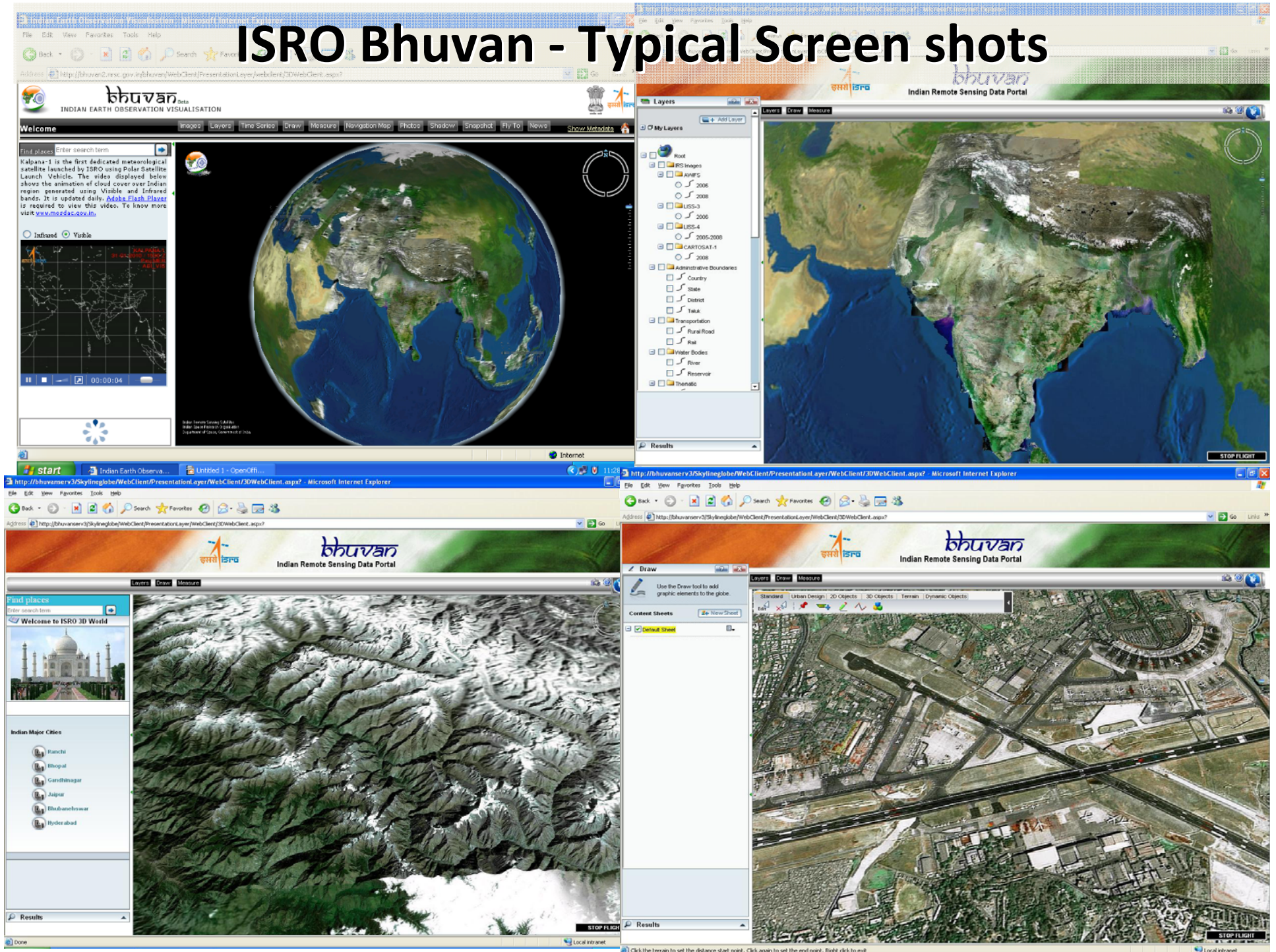
- A complete net-centric 3D visualization solution
- Solution using optimal Web Cache and data streaming Server
- Customised client/browser based utilities
- 3D Visualization in browse
- Create, view, analyze, and share 3D environments
- Highly scalable architecture & open standards
- Feature rich 3D object tools
- Rich thematic information
- Focus on societal applications
- Current events update



Bhuvan Tools and Capabilities



ISRO Bhuvan - Typical Screen shots





Bhuvan goes Global

Indian Earth Observation Visualisation - Microsoft Internet Explorer

File Edit View Favorites Tools Help



Address <http://10.71.1.233/Bhuvan/WebClient/PresentationLayer/WebClient/3DWebClient.aspx?>



bhuvan
Beta Version
INDIAN EARTH OBSERVATION VISUALISATION



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Find places Italy

Kalpana-1 is the first dedicated meteorological satellite launched by ISRO using Polar Satellite Launch Vehicle. The video displayed below shows the animation of cloud cover over Indian region generated using Visible and Infrared bands. It is updated daily. [Adobe Flash Player](#) is required to view this video. To know more visit www.mosdac.gov.in.

☒ Infrared ☐ Visible



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Done

Internet

start listofcities - Notepad Indian Earth Observa... 4:00 PM

Part of Vienna city in Bhuvan

LOCALIZATION

Layers Images Time Series Video Draw Measure Photos Snapshot NavigationMap More... News DailyWeather

Sign Out



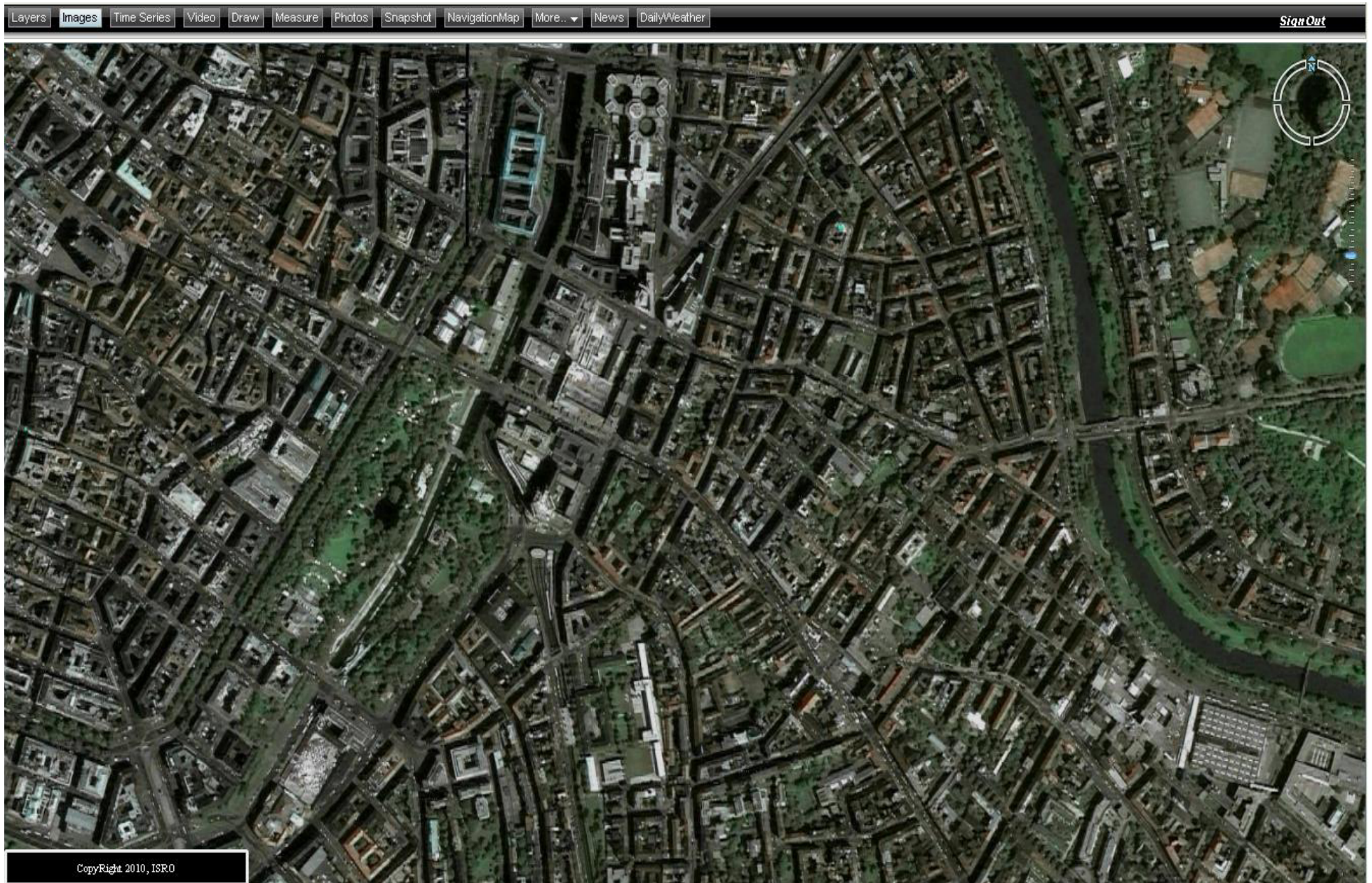
Internet

hosts - Notepad

Indian Earth Observa...

3:40 PM

Part of Vienna city in Bhuvan



Video Demo

