Legal and Ethical Issues of Geospatial Technologies in Society

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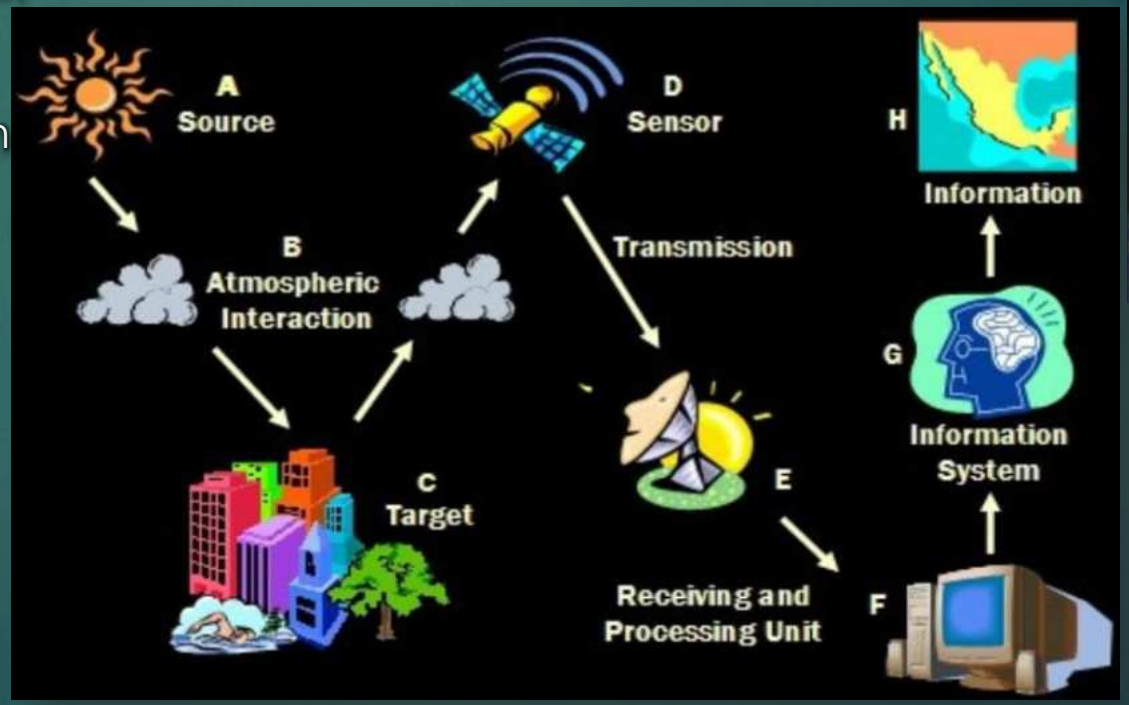
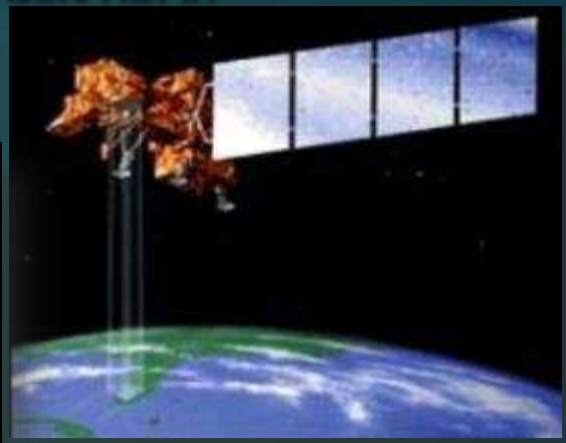
Remote Sensing and Geographic Information System (GIS)

Remote Sensing & GIS

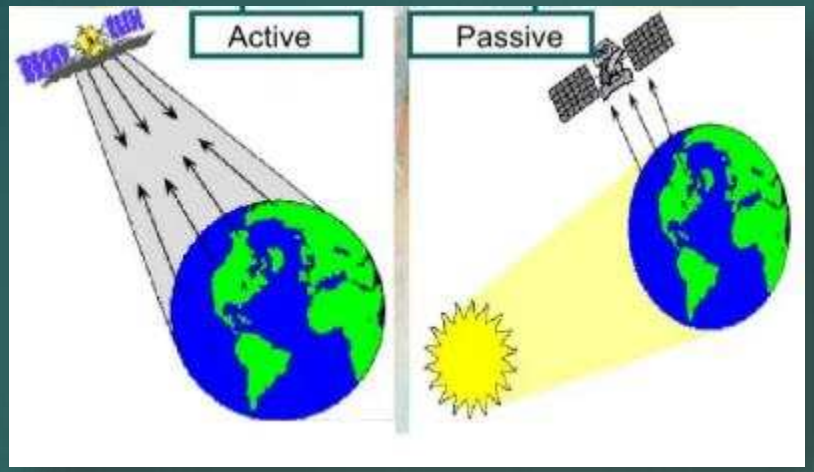
- Remote Sensing is the collection of information about an object without being in direct physical contact with the object.
- The process of collecting information about Earths surfaces and phenomena using sensors not in physical contact with the surfaces and the phenomena of interest
- Steps in Remote Sensing include,
  - A - Source
  - B - Atmospheric Interaction
  - C - Target
  - D - Sensor
  - E - Receiving Unit
  - F - Processing Unit
  - G - Information System
  - H - Information

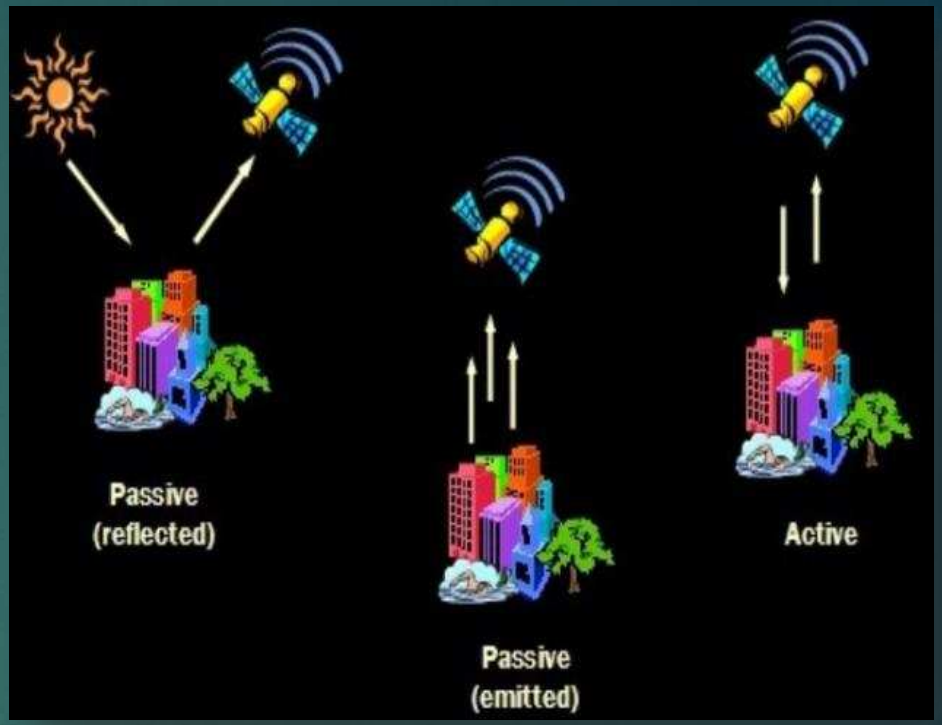




Types of Remote Sensing

- Types: Passive Sensors
  - Landsat
  - Aster
  - Quickbird
  - Ikonos
- Types: Active Sensors
  - LiDAR
  - RADAR
- Passive Sensing
  - Remote sensing systems which measure energy that is naturally available are Passive Sensors
  - Passive sensors can only be used to detect energy when naturally occurring energy is available
- Active Sensing
  - Sensor emits radiation which is directed towards target to be investigated
  - The radiation reflected from the target is detected and measured by the Sensor

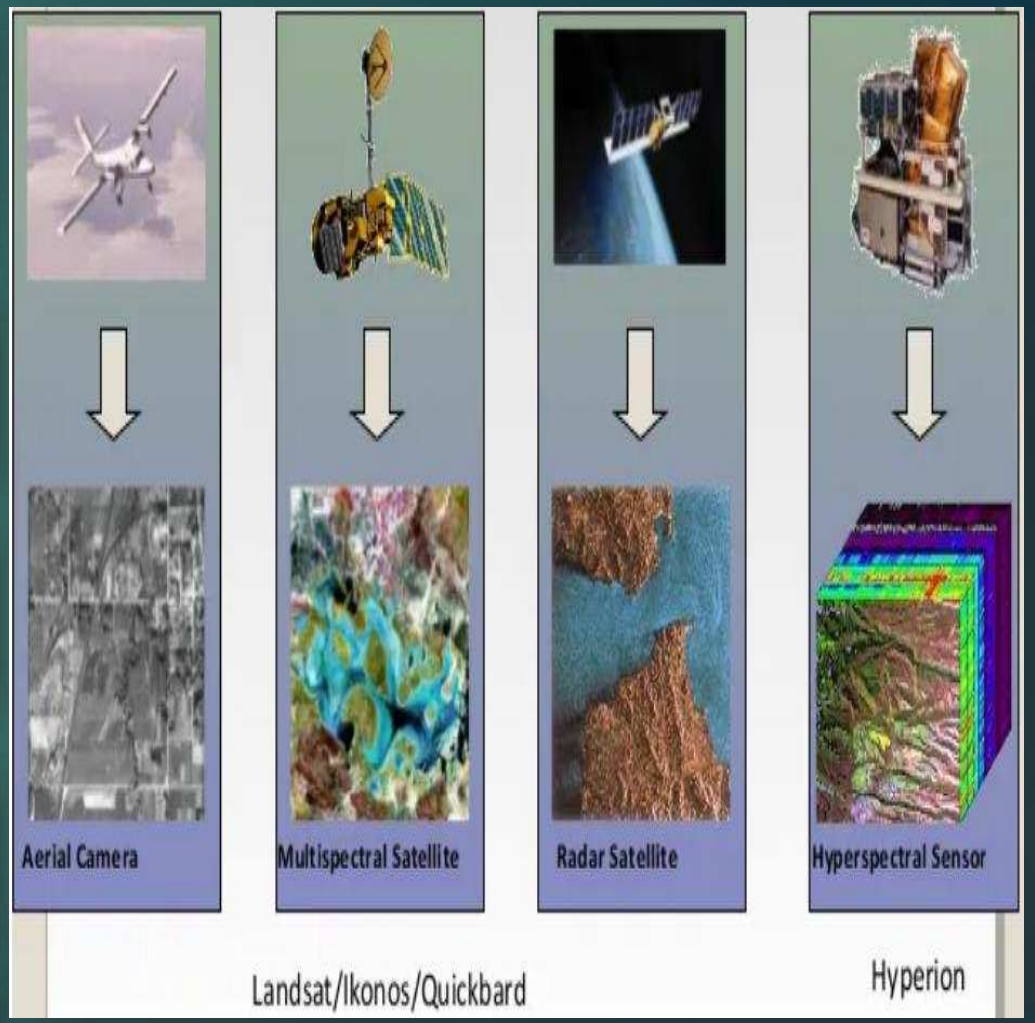




RS data and Applications

Applications of Remote Sensing (RS)

- **Urbanization and Transportation**
  - Updating Road Maps
  - Asphalt conditions and Wetland delineation
- **Agriculture**
  - Crop health analysis, Precision Agriculture
  - Compliance Mapping, Yield Estimation
- **Natural Resource Management**
  - Habitat Analysis, Environmental Assessment
  - Pest/ Disease outbreaks, Lake monitoring
  - Land use Land cover monitoring
  - Mineral province, Geomorphology
- **National Security**
  - Targeting, Disaster mapping and Monitoring
  - Damage Assessment, Weapons monitoring



Remotely Sensed Data

Geographic Information System

- **Geographic Information System (GIS)** is a computer based information for capturing, storing, checking, integrating, manipulating, analyzing and displaying data which are spatially referenced to Earth

What GIS does
Mapping & Cartography
Query, Select
Distance
Buffer, Overlay
Clip, Merge
Raster analysis & 3D

Techniques used in GIS
Relating info from different sources
Data capture
Data Integration
Projection and Registration
Data Structures
Data Modeling

Advantages of GIS
Can cope with larger amounts of Data
Can cover large study areas
Can cope with unlimited and frequent edits and changes
More Robust and resistant to damage
Faster and more efficient
Requires less person time and money

Legal and Ethical Issues of Geospatial (GIS) Technologies

Introduction

- Geospatial technology is an amalgamation of several technologies
- It includes,
  - Remote sensing (RS)
  - Geographic information systems (GIS)
  - Global Positioning Systems (GPS)
  - Location-based services (LBS), and related fields such as
  - Computer mapping
  - Spatial modeling, and
  - Data visualization
- Contributed to a new geography of hope and fear, which concomitantly raised a series of legal and ethical Issues
- Major tool for surveillance, and an integral component of the surveillance infrastructure
- Social implications of GIS have always been one of the major research areas in Geographic information science

Technological Landscapes

- Geotracking – obtaining the locational coordinates of the target being tracked
- Mostly relied on three primary techniques for determining location
  - Triangulation
    - which can be done via either lateration or angulation
  - Proximity
    - which measures nearness to a known set of points; and
  - scene analysis
    - which examines a view from a particular vantage point
- Different geotracking technologies use different combinations (three techniques)
- Different coverage, spatial-temporal resolution, and accuracy
- Embedded into a variety of consumer products such as,
  - car navigation systems, smart cellular phones,
  - printers, underwear cosmetics, and so on

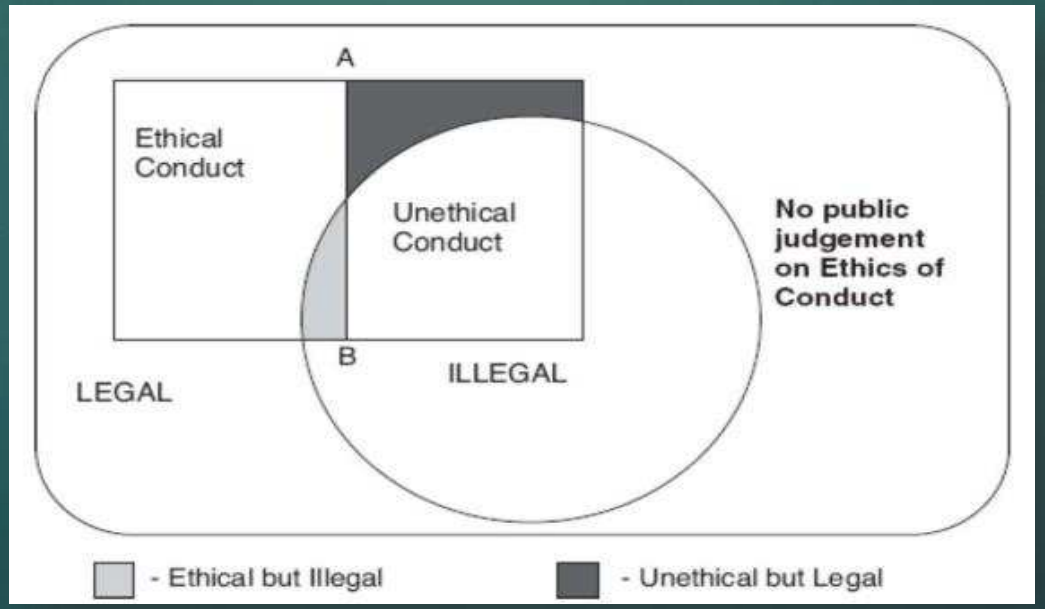
GNSS and High Resolution RS

- Growing importance of GNSS to their military operations
- Various civilian applications
- Growing investment in the global navigation infrastructure to develop their own independent systems

Technology	Coverage	Accuracy	Updates	Location Data
GPS	Earth	0.01m-100m	<1s	x, y, and z coordinates
Mobile phone (tower triangulation)	Populated areas	120m-30km	4.6ms-2hrs	x, y coordinates
CCTV	City centers	1m	1/30s	Camera location
RFID	Near readers	1m	Sporadic	Distance to reader
Credit card	Payment Kiosk	1m	Sporadic	Kiosk location

Legal and Ethical Issues - GIS

- **Legal versus Ethical Issues**
- Human conduct in society can be classified as legal or illegal
- A clear distinction can be made between legal & illegal and ethical and unethical conduct
- Violations of laws are subject to sanctions imposed by the judicial system
- Ethics refers to values that deal with human conduct or practices



Major Legal Issues

- Focused predominantly on tracking people and invasion of privacy
- GIS Technologies are broad and complex
- Legal issues related to applications of GIS technologies are concerned with
  - Collection, Ownership,
  - Access, Retention, use, and
  - Dissemination of georeferenced data at either individual or collective levels
- Major legal issues relating to geospatial technologies can be grouped into THREE categories
  - Privacy and data accessibility issues
  - Intellectual property, copyright, and data licensing issues; and
  - International law issues

Major Legal Issues – Category 1

- **Privacy and Data Accessibility Issues**
  - To track people and commodities in real time
  - Privacy changed from
    - ✓ Right to be left alone, to right to enjoy anonymity, to right to control information about oneself
  - Moved locational (spatial or geographical) privacy to the forefront of privacy concerns
  - Invasion of privacy due to use of geospatial technologies
  - Common law and state constitutions
  - Tort laws are often invoked
  - Wrongful act or damage for which a civil action can be brought
  - **FOUR** kinds of privacy Torts
    - ✓ **Misappropriation of one's likeness**
    - ✓ **Intrusion upon a person's seclusion**
    - ✓ **Public disclosure of embarrassing private facts**
    - ✓ **Publicity in false light**

Major Legal Issues – Category 1

- **Misappropriation of one's likeness**
  - Use of a person's name, likeness, or identity for trade or advertising purposes without consent
- **Intrusion upon a person's seclusion**
  - Physical, electronic, or mechanical intrusion into someone's private space
- **Public disclosure of embarrassing private facts**
  - Publication of non-newsworthy, private facts about an individual
- **Publicity in false light**
  - Publication of false, highly offensive information about an individual

Major Legal Issues – Category 1

- **Summary**
  - legal protection for location privacy is inconsistent and sectoral
  - Coverage only under certain situations and for specific technologies
  - Legal public privacy issues and the further development of geospatial technologies
  - Conflicting rules exist, such as the need to obtain a warrant for police to start tracking
  - somebody, despite the lack of legal protection for privacy in public.

Major Legal Issues – Category 2

- **Intellectual Property, Copyright, and Data Licensing Issues**
  - Challenging issues related to copyright, liability, and intellectual property rights on diverse GIS info
  - Licensing of geographic data and works has increasingly become a common practice
  - Limited protection by copyright and other intellectual property in the digital environment
  - License or licensing of GIS data means a transaction or arrangement
  - Data providers have turned to technological means to control access and copying
  - Courts have upheld contracts or licenses that limit the uses that a licensee can make of data
  - Federal agencies always distribute geographic data at or below marginal cost of Distribution
  - Many state and local governments have experimented with the distribution of data using licenses to generate revenue
  - Many of these entities have concluded that fee programs,
    - ✓ Cannot recover a significant fraction of government data budgets,
    - ✓ Seldom cover operating expenses, and
    - ✓ Act as a drag on private-sector investments that would otherwise add to the tax base and help grow the economy

Major Legal Issues – Category 2

- GIS data are difficult to protect through copyright alone
- Growing concerns over potential liability and a desire to limit liability through explicit license language
- Sharing costs through various data maintenance partnerships has also become common practice
- Geospatial community has recognized the difficulty of designing licenses that can,
  - ✓ Track the legal, economic, and public interest concerns of different levels, and
  - ✓ Accommodate all sectors of the geographic data community
- No effective license tracking and enforcement mechanisms
- Wikification of GIS raised important legal issue on who is qualified to create GIS data
- Management Association for Private Photogrammetric Surveyors (MAPPS)
- MAPPS filed a lawsuit seeking to limit competition for GIS services

Major Legal Issues – Category 2

- Innovations in technologies have drastically flattened the learning curve for geospatial and mapping technologies
- Development of,
  - Google Maps TM /Google Earth TM and
  - Microsoft Virtual Earth®, along with their precursors
  - MapQuest,
  - Yahoo Maps,
  - Multimap,
  - StreetMap, have democratized the application of massive online GIS information
- New wave of technological innovations has even democratized the production of maps and online GIS information
- Liability of GIS is related either to contract liabilities (warranties/implied vs. defined) versus Tort liabilities (negligence, fraud, and product liability)

International Dimension-Category 3

- Concern of international community since early days of remote sensing technology (1960s)
- Geospatial technologies have always played an important role in international affairs
- Basic legal framework for all space activities provided by 1967 Outer Space Treaty
- Freedom of exploration, use of outer space by all states, including satellite remote sensing
- Treaty provides for application of general international law to outer space
- Establishing general principles such as freedom of information gathering from outer space
- Key principles deal with the issue of access to data gathered by remote sensing activities for land-use purposes
- Principle IV "sensed states."
- Principle V calls for offering opportunities of cooperation to sensed states, and
- Principle VII requires "sensing states" to make technical assistance available to other interested states on mutually agreed terms
- Principle XII provides "on a non-discriminatory basis and on reasonable cost terms."

International Dimension-Category 3

- Principle X regarding threats to "Earth's natural environment" to other states; and
- Principle XI calls upon states of relevant information regarding natural disasters
- Principle VIII "shall promote international cooperation, including technical assistance and coordination in the area of remote sensing."
- Liability stemming from geospatial data is concerned
- International liabilities regarding geospatial data are most likely handled by General Agreement on Tariffs and Trade (GATT) developed by the World Trade Organization (WTO)
- Geospatial data may also be addressed by various existing and proposed EU laws regarding electronic databases, or other bi-lateral/multi-lateral agreements
- Dominant concern is military/national security instead of commercial goals
- Rights of developing countries are not properly respected according to the international rule of law

Ethical Issues

- Discussions on ethics can be conducted at THREE levels:
  - ✓ Normative,
  - ✓ Meta-, and
  - ✓ Descriptive/ Applied
- *Normative ethics* deals with issues related to right or wrong behavior/ practices in society,
- *Meta-ethics* is ontological foundation and justification for the normative practices.
- Descriptive/applied ethics concentrates on what specific actions we should take under specific circumstances
- Yet to define what actions are acceptable and under what circumstances our use of geospatial technologies is ethical and moral
- Another ethical issue is related to first law of geographic information "information is often the most scarce when it is needed the most"
- On-going war on terrorism raises another ethical dilemma

Ethical Issues (Cont..)

- High-resolution satellite images are used by terrorists to plan attacks on allied troops
- Availability of online GIS databases has made sensitive information lot easier to access
- More geospatial information available online, inadvertently created an infrastructure
- Can be used counter productively by terrorists to plan and launch attacks against us
- Somberly warned
  - ✓ "Ruin is the destination toward which all men rush, each pursuing his own best interest in a society that believes in the freedom of the commons. Freedom in a commons brings ruin to all."
- This raises the question, should society impose certain limits and guidelines in terms of who can collect, access, use, retain, and disseminate geospatial data?

Seeking Remedies

- Developments in GIS technologies and their wide-ranging applications raised a series of challenging legal and ethical issues.
- Existing laws and regulations can be applied to some limited extent
- Need a combination of legal, ethical, and technical approaches in order to address these issues effectively
- **New Legislation**
- **New Ethics**

Seeking Remedies

- **New Legislation**
- Most legal issues regarding the use of GIS technologies include:
  - (1) Data collection
  - (2) Data retention
  - (3) Data access
  - (4) Data use and integration with other information
  - (5) Data dissemination and
  - (6) Data ownership and licensing
- Comprehensive legislation needed to address these issues at local, national, and international levels

Seeking Remedies

- **New Ethics**
- Development of new ethics rules and social norms at both the individual and societal levels
- New ethics and moral practices are perhaps more effective
- New ethics of forgetting, which clearly articulates a new set of rules on "how" and "when" to "forget," and even "delete,"
- New cyber-infrastructure for socio-spatial archives that can document every action, every event, every conversation, and every material expression of an individual's life
- New ethics of forgetting developed and built into development of life-logging technologies
- New ethics of forgetting could be an emancipatory process that will free pervasive computing from burdensome and pernicious effects

Seeking Remedies

- **New Ethics: Asimov's Laws of Robotics**

First Law of Robotics:
A robot may not injure a human being, or, through inaction, allow a human being to come to harm
Second Law of Robotics:
A robot must obey orders given to it by human beings, except where such orders would conflict with the First Law.
Third Law of Robotics:
A robot must protect its own existence as long as such protection does not conflict with the First or Second Law

- **New Ethics: Durocher's Laws of Location Based Services (LBS)**

First Law of LBS:
Location, through its availability or non-availability, must not allow a human being to come to harm.
Second Law of LBS:
Availability of one's location must be in one's complete control, except where such control would conflict with First Law.
Third Law of LBS:
The providers of location-based services must be allowed to create a profitable business from these services as long as such business does not conflict with the First or Second Law.

Technical Solutions

- Legal and ethical strategies for remedying the problems brought about by geospatial technologies are trust- based mechanisms
- Trust can be breached, making sensitive information still vulnerable to unintentional and intentional disclosure.
- location privacy has addressed the issue of adapting the level of spatial detail in location information as needed to protect an individual's location privacy
- This concept is termed in the literature as
  - ✓ "spatial cloaking"
  - ✓ "obfuscation"
  - ✓ "need-to-know principle", and
  - ✓ "principle of minimal asymmetry"

Technical Solutions

- Surveillance Scenarios and Laws of LBS

Scenarios	Examples	Legal/Ethical Issues	Laws of LBS
They didn't know where you were	Normal life for ordinary citizens	Personal privacy/ ethics of forgetting	Obeyed (violated if the person is suicidal?)
They know and you want them to	On call, emergency, alibi	Consent	Obeyed
They don't know but you thought they did	Faulty signal, signal blocked, physical density	Ignorance	Violated
They know and we wanted them to	Criminal activity, unethical conduct	Public interest	Ambiguous
They know and you didn't want them to	Nuisance calls, stalking, monitoring	Geo-identity Theft	Violated
They know and we thought we wanted them to	Abusers, hostage takers	Coercion	Violated
They know and can physically keep you there	Forced labor or domestic abuse	Geo-slavery	Violated

Summary and Conclusion

- New technological cornucopia tends to erode privacy, create new forms of inequality, and diminish the mechanisms of accountability
- Technological advances provide us with hope for trustworthy computing that is capable of giving users more secure control of their own personal information
- Technical remedies are not sufficient for the legal and ethical challenges
- Need broader legal and ethical frameworks that can effectively deal with issues at individual, institutional, and international levels
- Widespread applications of GIS technologies in society and our individual lives have opened new avenues for intellectual inquiries that will have far-reaching impacts
- GIS scientists need to work closely with other geographers and scholars in other disciplines facing similar legal and moral concerns in order to address many of challenging issues

Legal Issues regarding Spatial data

- Main legal issues regarding the spatial data, information and GIS technology supported databases in general are related to **THREE** prevailing problem domains:
  - Intellectual Property Rights and GIS technology - copyright issues on spatial data sets, topographic and thematic maps, GIS databases, GIS software and applications etc.,
  - Privacy Protection and GIS technology - confidentiality protection in GIS databases versus enabling public access to spatial data, personal integrity data and political sensitive data, policy for restrictive disposal and limited access to spatial data etc.,
  - Liability and GIS technology - warranty and (legal) responsibility for specified spatial data quality, liability contract problems, negligence, torts and damages, limited recovery strategies for spatial data etc.

GEO ICT STANDARDS

Geo ICT Standards - Introduction

- Open Geospatial Consortium (OGC) or International Standards Organization (ISO)
- Used to characterize a common role between end users and developers as well as policy-makers and clients involved in specific domain of technology
- Provide the level of details, quality, security, and environmental impact as well as the value of security
- Encourage information and product exchange; internationally
- Encourages the dissemination of creative new thoughts and cutting-edge innovations
- Create an environment for mutual communication among involved parties and allow the dissemination of technology

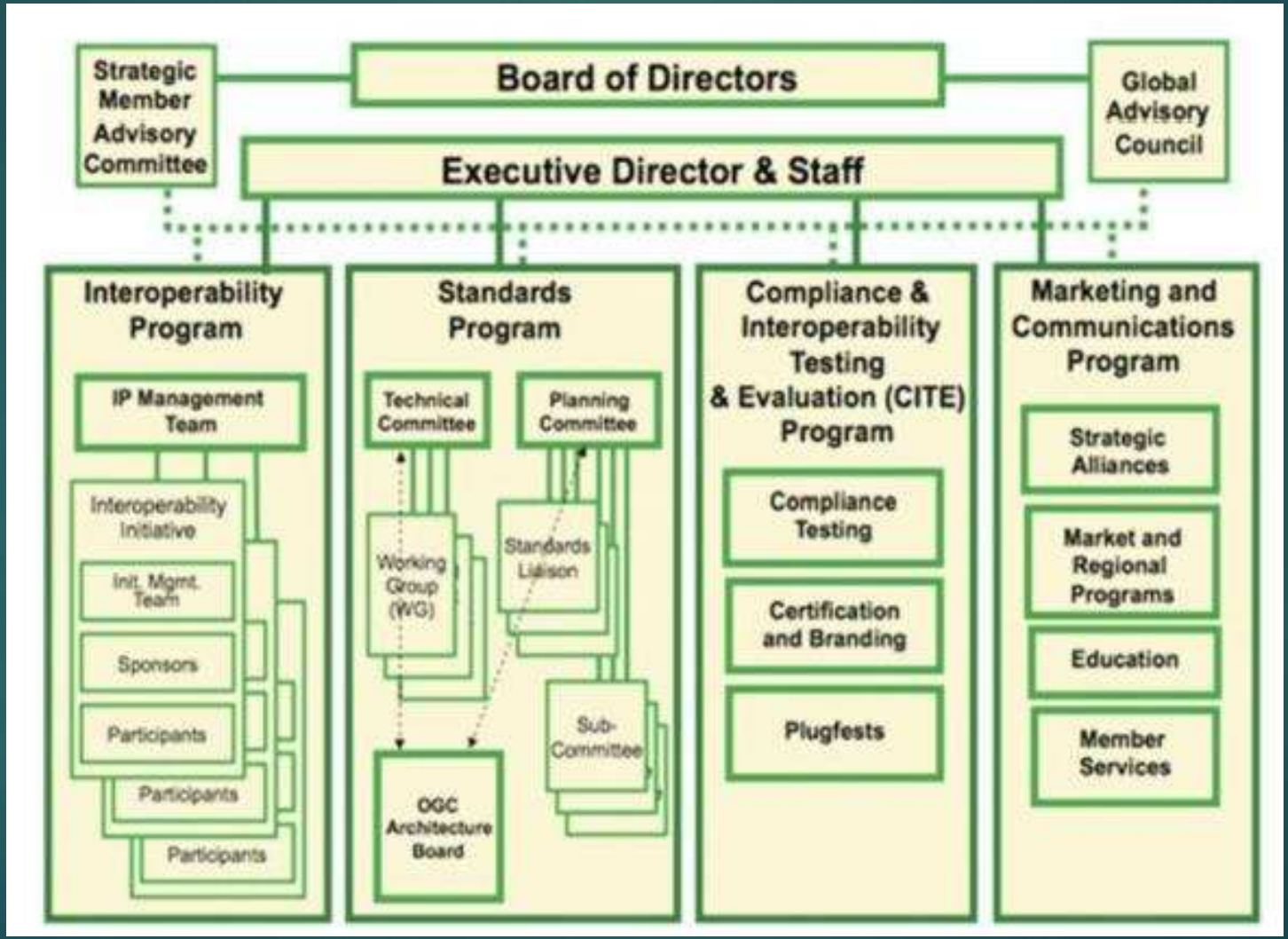
Standardization Initiatives

- Three major international initiatives:
  - Open Geospatial Consortium (OGC)
  - International Standards Organization (ISO), and
  - International Hydrographic Organization (IHO)
- Three institutions provide guidance and direction in developing standards related to geospatial information technology (GeoICT) from a data perspective
- There are other initiatives, such as the IEEE and W3 initiatives, which address the technology-related side of interoperability in terms of systems and platforms

Open Geospatial Consortium (OGC)

- Industry consortium aimed at supporting the development and adoption of interoperability standards for technologies
- Involve Spatial information and location
- Aims at creating a world of Geospatial Information Community
- Common acquisition and sharing of Geographic Information and Services
- Benefit of whole user community whether in the form of applications or platforms
- To support the creation of spatial interface specifications that are openly available for the wider global user community

Structure of the OGC



Courtesy of Open Geospatial Consortium

OGC Standards

- OGC WEB SERVICES (OWS) are OGC standards provided through Web services
- Involves allowing servers to dynamically query, access, process, and combine diverse types of spatial information over the web
- OWS standards:
  - Web Map Services (WMS)
  - Web Coverage Service (WCS)
  - Web Feature Service (WFS)
  - Web Processing Services (WPS)
  - Catalogue Service for the Web (CS-W)
  - Styled Layer Descriptor (SLD)
  - Web Map Tile Service (WMTS)

Web Map Service (WMS)

- Produces maps of spatially referenced information from geographic data
- Characterizes three operations:
  - 1: Returns service-level metadata;
  - 2: Returns a map whose geographic and dimensional parameters are characterized
  - 3: Returns data about specific components appearing on a map.
- WMS operations can be invoked as Uniform Resource Locators (URLs)
- URLs relies on which operation is queried.
- Specifically, while asking for a map, the URL shows:
  - What data are to appear on the map
  - What part of the Earth is to be mapped
  - Suitable coordinate system
  - Produced image width and height

Web Coverage Service (WCS)

- WCS gives access to coverage data in structures that are valuable for client-side rendering, as data input into scientific models, and for different clients
- WCS permits clients to choose segments of a server ' s information property
- Gives accessible data together with their point-by-point descriptions
- Returns coverages communicating to space/time-differing phenomena that relate a spatio-temporal area
- Concentrates on coverages as a particular class of features and, correspondingly, characterizes streamlined utility
- WCS 2.0 uses the scope model of the Geography Markup Language (GML) Application Schema for Coverages

Web Feature Service (WFS)

- Allows a client to retrieve and update geospatial data coded in GML from numerous WFSs
- Needs for a WFS include:
  - The essential interfaces must be well-defined in XML
  - GML must be used to prompt features within the interface
  - Capable to present features using GML
  - The predicate or filter language will be defined in XML and be derived from CQL
  - There must be use of a subset of XPath expressions for referencing properties

Catalogue Service for Web (CS-W)

- "Catalog" is about original service interfaces that supports organizing, discovery, access of geospatial information associated with geospatial details
- Catalog services help end-users or application software packages
- To discover information that exists within a distributed computing setting
- Usually realized as a dedicated database associated with details about geospatial properties
- Required to obtain the OGC feature, feature allocation, catalog, as well as metadata interfaces

Styled Layer Descriptor (SLD)

- layered descriptor specifies how a WMS could be worked out to allow user-defined tailoring.
- Value of the aesthetic portrayal associated with geographic data cannot be overstated in the SLD
- Recognized as seeing what exactly turns location facts directly into an explanatory or decision-support tool.
- Identify elementary styling options through visual portrayals for each and every accessible data set
- Styling language that client & Server can identify is “Symbology Encoding” (SE)
- Enables the user to employ the output of Web Map Servers, Web Feature Servers, and Web Coverage Servers.

Web Map Tile Service (WMTS)

- Delivers an explanation to serve digital maps using predefined image tiles
- Describes the tiles obtainable
- in each layer (i.e., each type of content)
  - in each graphical demonstration style
  - in each format
  - in each reference coordinate system
  - at each scale, and
  - over each geographic portion of the total enclosed area
- Clients can read the Service Metadata file to request exact titles
- WMS client can demand map by covering a subjective number of map layers
- Client can demand map layers extracted by means of server-promoted style

Other OGC Standards

- These standards are not dependent on the Web for execution.
  - Keyhole Markup Language (KML)
  - Geographic Markup Language (GML)
  - Sensor Model Language (SensorML)
  - Location Service (OpenLS)
  - Open GeoSMS
  - GeoAPI

Keyhole Markup Language (KML)

- Google developed KML, and it was adopted by the OCG as a data standard
- Encodes what is to be shown in an Earth browser and how to show it
- Uses a tag-based structure with nested elements and attributes
- Based on the XML standard
- Encode and transport representations of geographic data for display
- KML can be used to do the following:
  - Annotate the Earth, specify icons and labels to identify locations
  - Create different camera positions to define unique views for KML features
  - Define image overlays to attach to the ground or screen
  - Define styles to specify KML feature appearance
  - Write HTML descriptions of KML features including hyperlinks
  - Organize KML features into hierarchies, locate and update KML documents

Geographic Markup Language (GML)

- Form of XML encoding for the transport and capacity of geographic data
- Uses the OGC Abstract Specification geometry model
- GML was intended to do the following:
  - Give a method for encoding spatial data
  - Adequately extensible to bolster a wide assortment of spatial errands
  - Set up the establishment for an Internet GIS
  - Give straightforward encodings of spatial data and spatial connections
  - Have the capacity to separate spatial and non-spatial substance
  - License the smooth incorporation of spatial and non-spatial information
  - Interface promptly spatial components to other spatial or non-spatial components
  - Provide an arrangement of basic geographic display items

Sensor Model Language (SML)

- Places more emphasis on the procedure of measurement and observation
- Themes of Sensor ML are as follows:
  - Provide representations of sensors and sensor frameworks
  - Provide sensor and procedure data in the backing of benefit and support
  - support processing and analysis of the sensor observations
  - support the geolocation of observed values (measured data);
  - Provide execution and general description of attributes
  - Provide general portrayals of parts
  - provide a machine-interpretable portrayal of the interfaces and information streams
  - Provide an unequivocal depiction of the procedure
  - Provide a total executable strategy for determining new data products of interest

Location Service (OpenLS)

- Also known as the GeoMobility Server (GMS)
- Open platform for location-based application services
- Online directory to discover adjacent or specific places, products, or services
- OpenLS application find the location, product, or service they pursue
- A location must also be accompanied in the request when the subscriber is looking for the adjacent location, product or service
- Two basic ways to determine a specific point of interest
  - (1) By some assets of the point of interest (e.g., unique identifier, name, description,…)
  - (2) By its position in terms of some other point of interest

Open GeoSMS

- Short Message Service (SMS) is correspondence administration part of telephone, Web or portable correspondence frameworks
- Any application or service can essentially influence an expanded SMS message using the Open GeoSMS group
- Open GeoSMS characterizes a developed organization of SMS with basic area content for accomplishing interoperable interchanges while maintaining human comprehensibility
- Any application or service can essentially send an augmented SMS message using the Open GeoSMS position
- The target client device receives this area-empowered SMS message

GeoAPI

- GeoAPI library contains a progression of interfaces and classes in Java language characterized in a few bundles
- Library incorporates broad Javadoc code documentation, which supplements the directives of the ISO/OGC details
- The standard does not yet propose a complete arrangement of interfaces covering the whole conceptual standard of the ISO/OGC
- Concentrates on a beginning gathering of interfaces only
- Covers theoretical model to allow the meaning of a geospatial coordinate system
- Geodetic anchoring points focuses as well as empower the change of coordinate tuples between distinctive reference systems

Emerging Trends in GeoICT Standardization

- The ISO Standardization Efforts for Big Data
- The IHO Standardization Efforts for Hydrographic Data
- The IEEE Standardization Efforts for Networks and Hardware Technology
- W2 and W3 Standardization Efforts on Web Services
- Web 3D Standardization Efforts

Case Studies

- Supreme Court Interventions
- US Court Cases

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Policies/Acts of Government

- National Security Act 1980
- Aerial Photographic Survey Aircraft-borne Remote Sensing 2006
- The National Map Policy (NMP) – 2005
- The Civil Aviation Requirement (CAR), 2012 & 2018.
- The Remote Sensing Data Policy (RSDP) – 2001 & 2011
- The National Data Sharing and Accessibility Policy (NDSAP) – 2012
- Section 5 of the Official Secret Act of 1921: Wrongful Communication Of Information, etc.,
- The Criminal Law Amendment (Amending) Act 1990
- Customs Act 1962, Notification No. 118, 1963 & 1980
- Information Technology Act 2000
- Guidelines Issued by DST Feb 2021 and NGP 2022

National Geospatial Policy 2019 (Draft)

- **Open Access**

  Access to geospatial data be easy and user-friendly such as web or mobile platforms.

- **Registered Access**

  Geospatial data will be provided as per the prescribed protocols defined by data and service providing agencies. The user will be required to register through the web or mobile. Requisite fee, if any, needs to be paid through the paymentgateways.

- **Restricted Access**

  Access to restricted data will be as per the policies in vogue from data generating agencies from time to time.

Guidelines Issued by DST Feb 2021

- There shall be no requirement for prior approval, security clearance, license or any other restrictions on the collection, generation, preparation, dissemination, storage, publication, updating and/or digitization of Geospatial Data and Maps within the territory of India. Individuals, companies, organizations, and Government agencies, shall be free to process the acquired Geospatial Data, build applications and develop solutions in relation to such data and use such data products, applications, solutions, etc by way of selling, distributing, sharing, swapping, disseminating, publishing, deprecating and destructing.
- Self-certification will be used to convey adherence to these guidelines

Guidelines Issued by DST Feb 2021

The threshold values are:

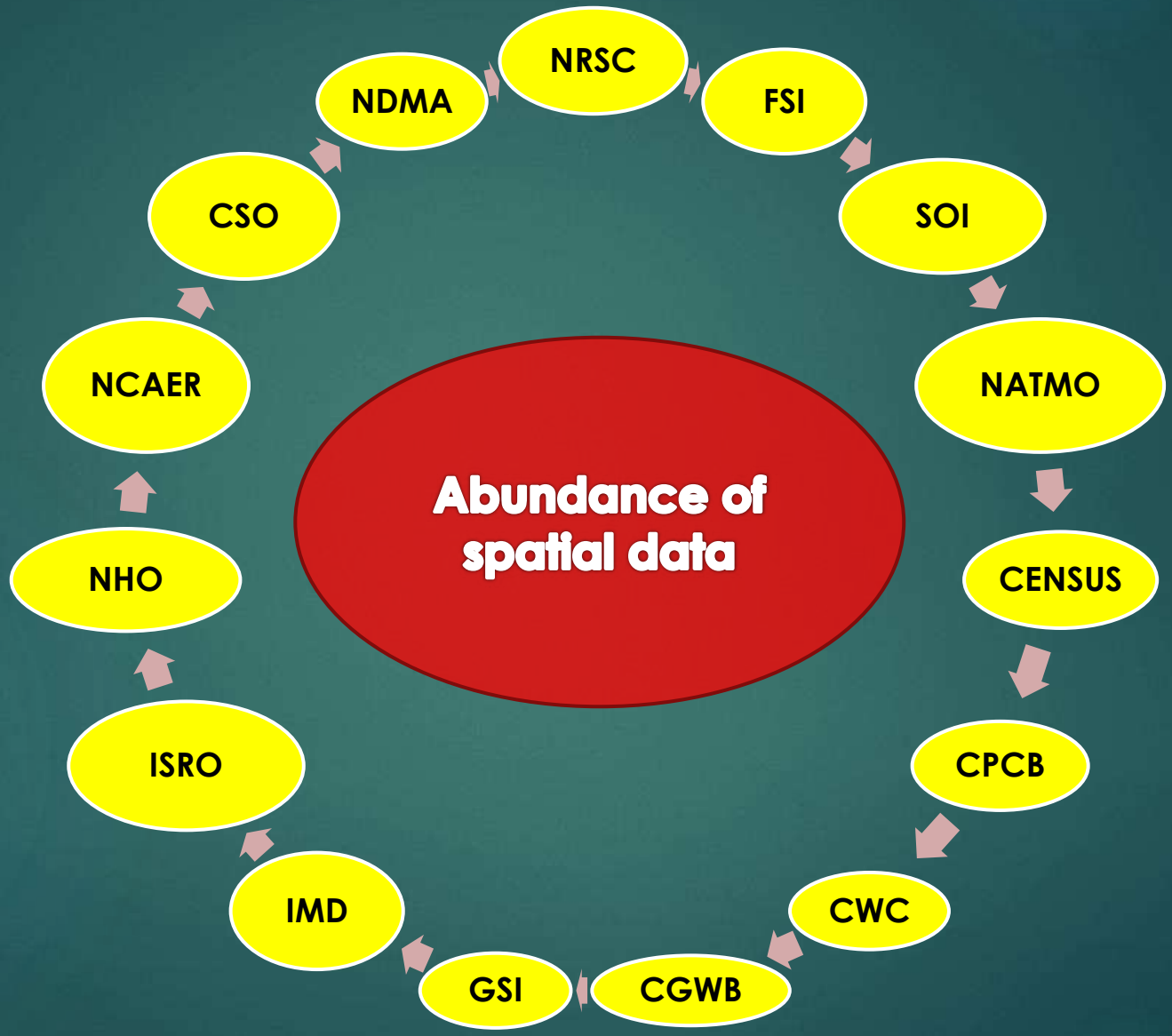
- On-site spatial accuracy shall be one meter for horizontal or Planimetry and three meters for vertical or Elevation.
- Gravity anomaly shall be 1 milli-gal
- Vertical accuracy of Bathymetric data in Territorial Waters shall be 10 meters for up to 500 meters from the shore-line and 100 meters beyond that.

SPATIAL DATA INFRASTRUCTURE (SDI)

Spatial Data Infrastructure

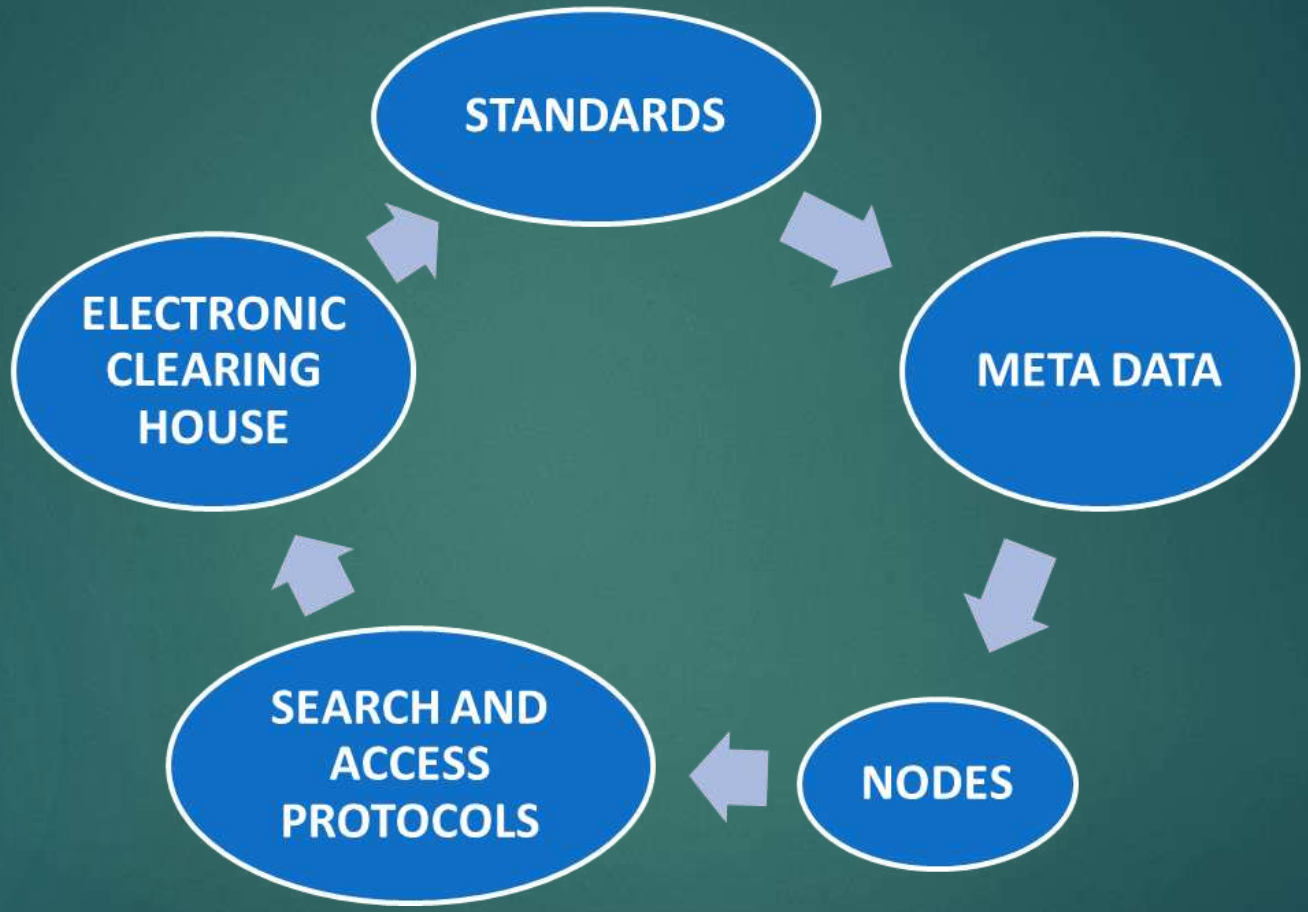
- GSDI/UN GGIM
- NSDI
- State SDI
- District SDI

www.nsdi.gov.in


Abundance of spatial data
NRSC
FSI
SOI
NATMO
CENSUS
CPCB
CWC
CGWB
GSI
IMD
ISRO
NHO
NCAER
CSO
NDMA

Why are we not able to use and add value to rich geospatial data assets?

- Lack of Metadata
- Data in analogue form
- Reluctance to share the data
- Not interoperable
- Policy


STANDARDS
META DATA
NODES
SEARCH AND ACCESS PROTOCOLS
ELECTRONIC CLEARING HOUSE

Web Map Service from SOI OSM Maps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SEARCH
nsdi
National Spatial Data Infrastructure
NSDI-11 Annual Event to be held at Bengaluru from 21st Dec to 23rd Dec 2011 has been postponed.
NSDI
Downloads
Organization
RTI
PhotoGallery
GSDI/State SDIs
NSDI Annual Events
» Welcome to NSDI
India is fast moving into being an information and knowledge society - especially with the emphasis on Information Technology and 'transparent' e-governance. Know More..
» NSDI VISION
1. National Infrastructure for the availability and access to organised spatial data.
2. Use of the infrastructure at Community, Local, State, Regional and National Levels for sustained economic growth.
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NSDI Aspiration docume
6th NSDI-EC meeting


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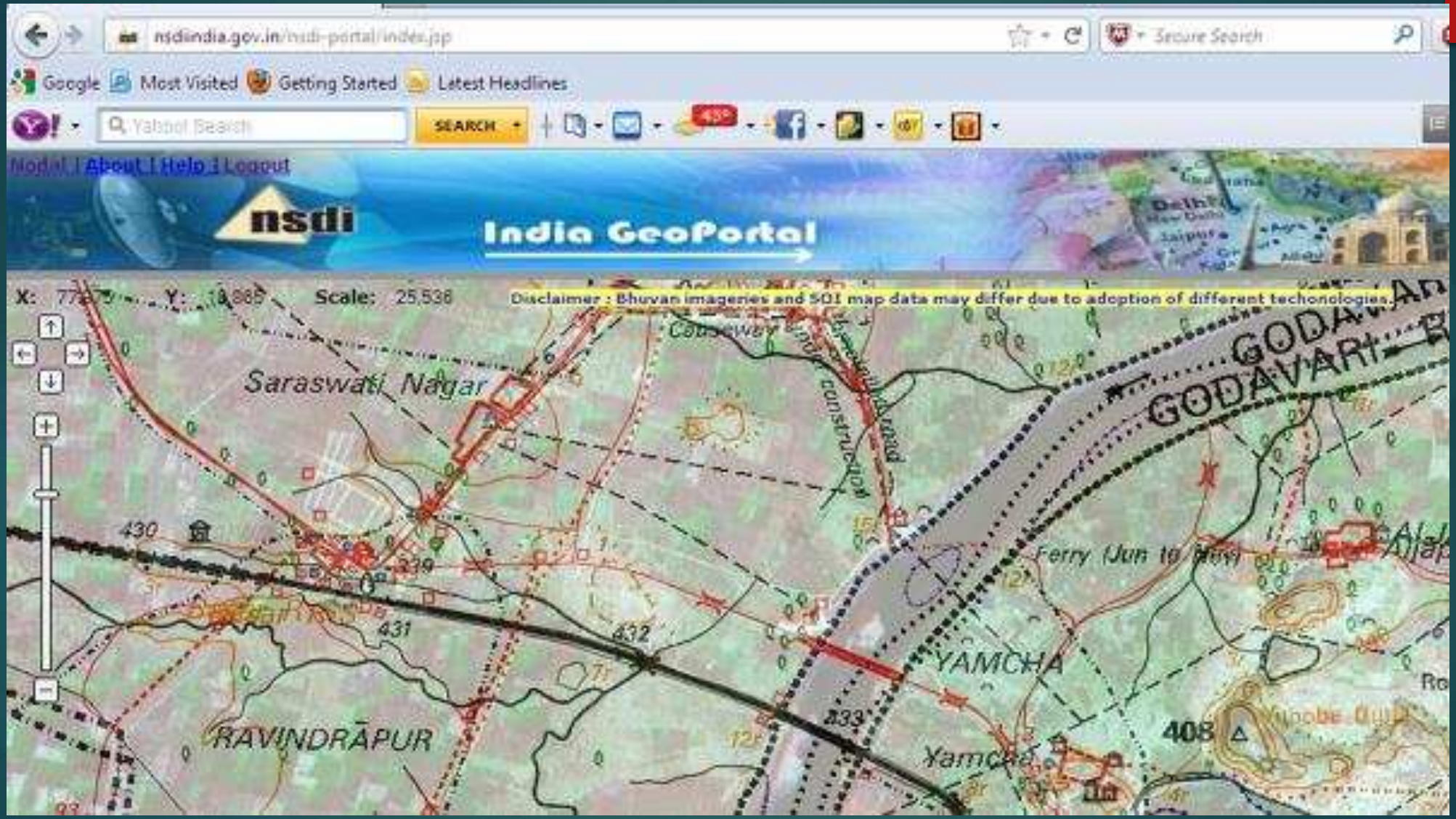
India GeoPortal
Disclaimer : Bhuvan imageries and SOI map data may differ due to adoption of different technologies
Scale: 25,536
Saraswati Nagar
Causeway
GODAVARI
Ferry (Jun to Nov)
430
431
432
433
YAMCHA
RAVINDRĀPUR
408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India GeoPortal
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Disclaimer : Bhuvan imageries and SOI map data may differ due to adoption of different technologies.
Saraswati Nagar
Causeway
construction
road
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430
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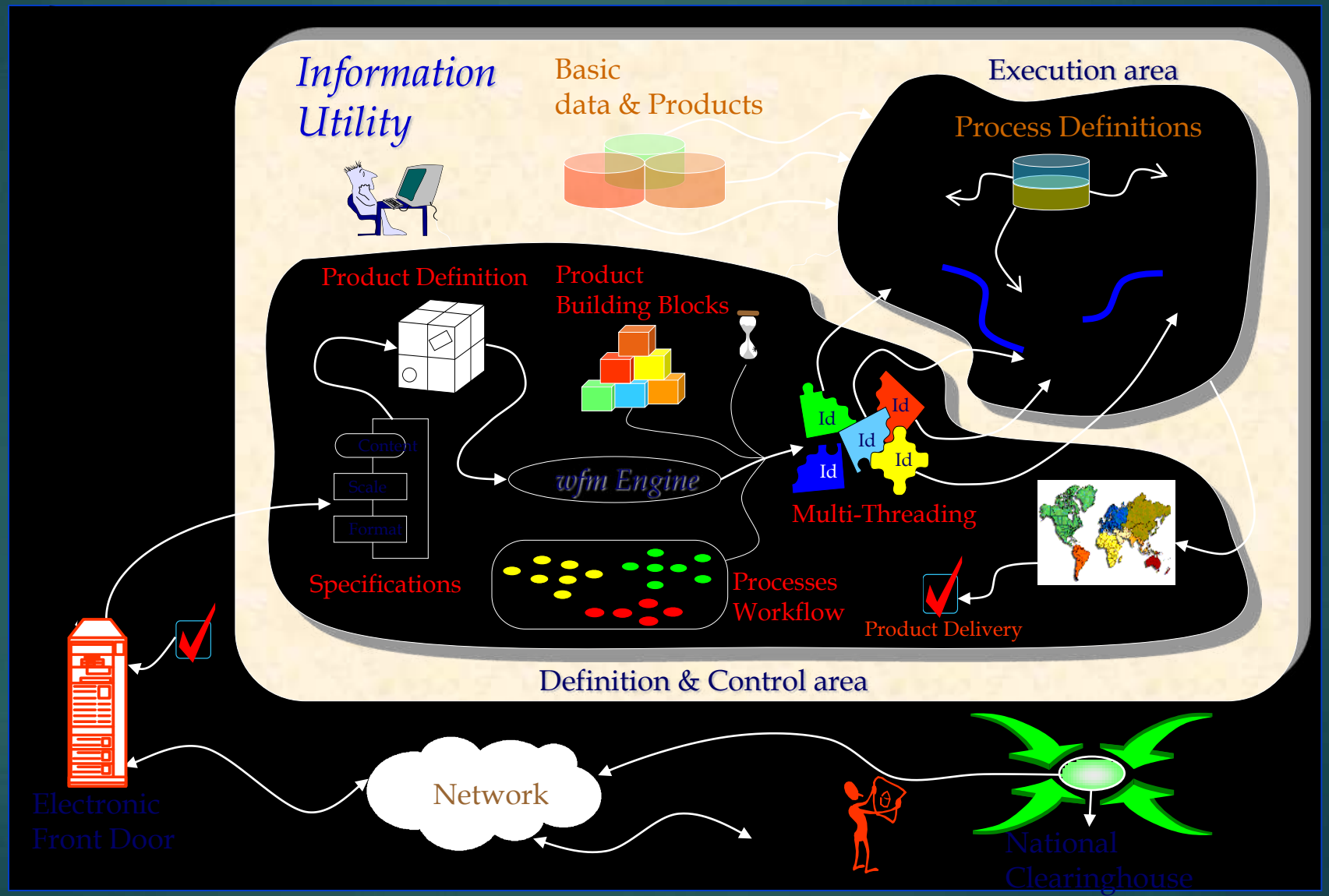
408

Spatial Information Processing



Geospatial Activity	Survey/ Mapping/ Trained skill-workforce	Trained workforce for Survey/Mappin, Geo-database and GIS Apps	Educated professionals for Survey/Mappin, Geo-database and GIS Apps	Trained users development who would be users	School-level awareness
Present Availability Estimate	~15000-20,000	~6000-10000	~800-1200	**~25000-50000**	**NA**
Estimated Additional need by end of 2015	~20000 @4000-5000 per year	~15000 @~2000-3000 per year	~5000-8000 @ ~1000-1500 per year	**~500,000** @ ~50-100K per year	Estimated in phased manner thru NCERT/State School Boards
Knowledge/ Skill-interventions required	**Industrial Training in specific Geospatial Operations (2-4 weeks)**	**In-depth specialised training in operations/ managing (3-12 months)**	**4-Year Graduate/ 2-Post-Graduate/PhD in Geospatial Technology thru University**	**User Training on specific GIS apps operations (1-2 week orientation)**	**Basic chapters in 9-12 science curriculum; Additional GIS Kit knowledge exercises**
Min Qual for knowledge/ skill interventions	10th OR 12th Grade school	Graduate in Science/Arts Or Diploma in Comp Apps	12th Grade leading to BTech/ BTech leading to MTech/PhD	Basically a Geospatial technology user in Central/State governments	School at 6-8 AND 9-12 Grade
Knowledge Credits	Professional Certificate	PG Diploma	BTech OR MTech OR PhD	Applied Certificates	Proficiency Certificate

Thanks

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