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Advancing Sustainability with Geospatial
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Sustainable Development (Rio+20): Global geospatial experts recommendations

- Geospatial information infrastructure at all levels (local, national, regional, global)

- Use of geographic data on a common framework for sustainable development applications

- Identification of new and emerging technologies to support sustainable development

- Consideration of legal and ethical issues

- Better use of spatial standards to facilitate data sharing

Effective Sustainable Development Requires:

- Ability to Absorb and Process Diverse Types of data
  - Sensors; LIDAR; Imagery; Video – UAVs; Social Media
- Ability to Process Large Amounts of Rapidly Arriving Data
  - Cloud Computing (Lower Energy costs)
  - Big Data Processing Techniques (Real Time Monitoring & Analysis)
- Ability to Transform Information into Actionable Knowledge
  - Semantics – Linked Open Data – Ontologies
  - Security, Privacy of Information
  - NSDIs, Standards
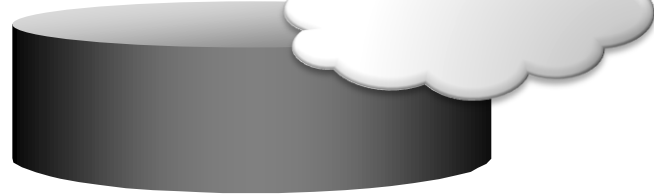
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Geographic Information Evolution and Migration
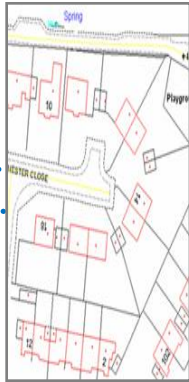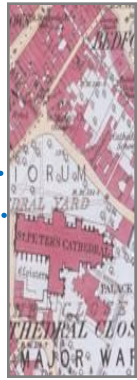
Mapping

Digital data file

Geographic Information Systems

Spatial Information Technology

Integrated Geospatial Information

Centralize Business and Location-Based Asset Information

Attribute Data

Vector Data

Imagery

Spatial Relationships
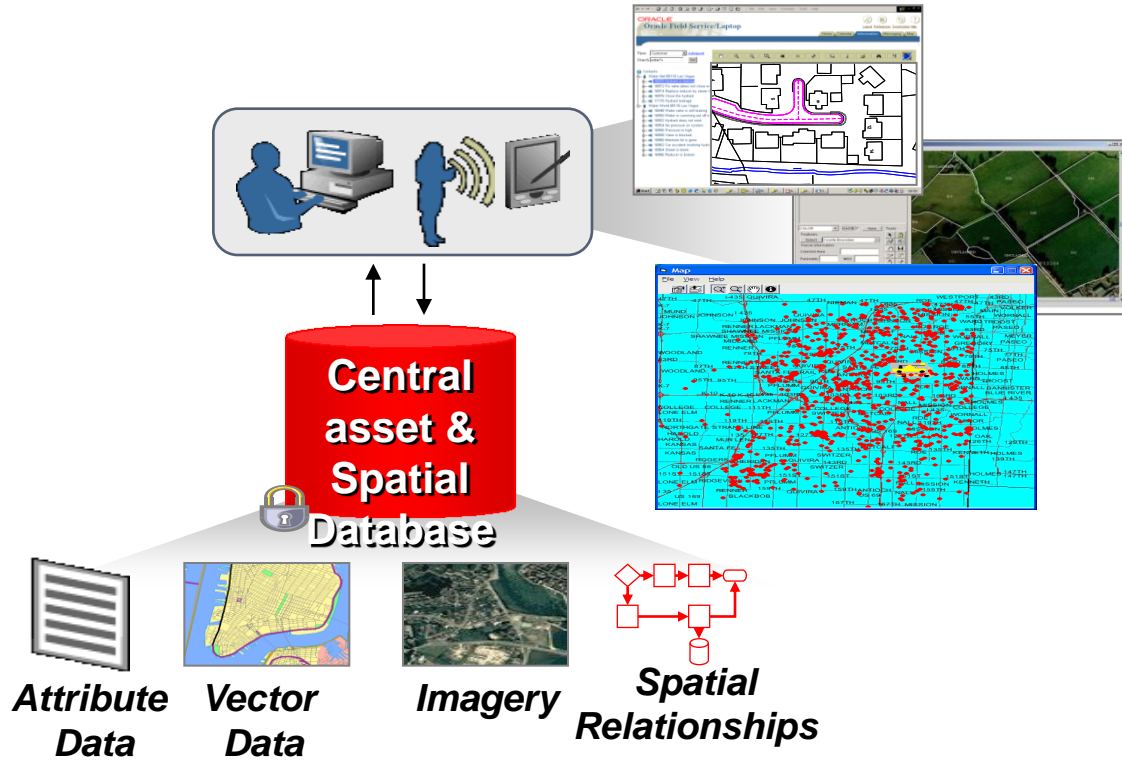
- **Data Integrity**
  - Data protected at the database
- **Ease of Integration**
  - Direct to the database
- **Ease of Maintenance**
  - Common repository
  - No proprietary interfaces
- **Enterprise Quality of times**
- **Service**
  - Transactional integrity
  - Security
  - Scalability
  - **Captured once, used and updated many**

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Geospatial Data for Sustainable Development
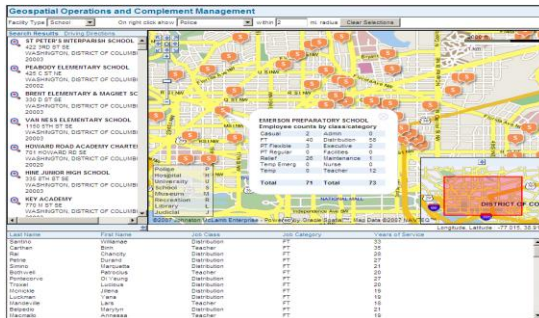
Crime Monitoring
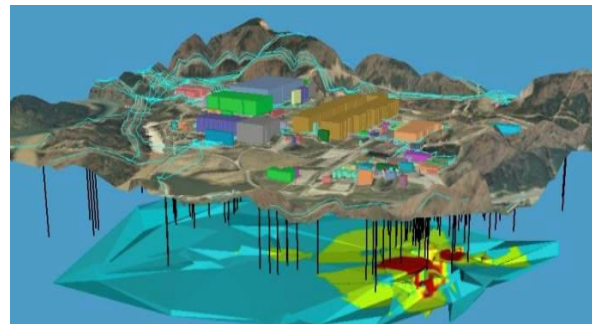
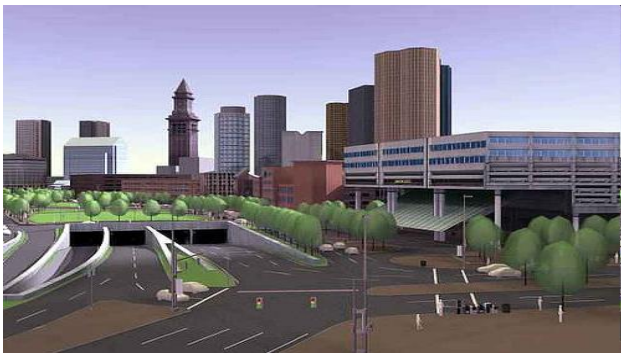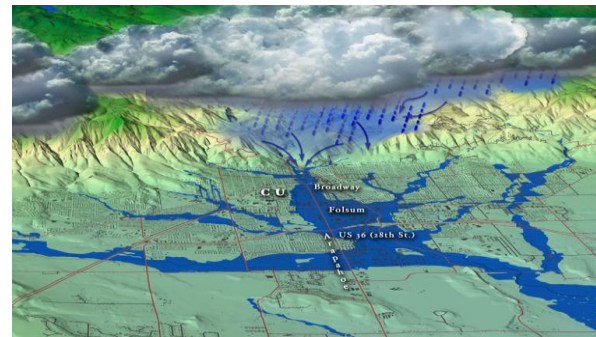Environmental Monitoring

Urban Modeling & Simulation

Predictive Hazards Planning

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Sustainability: Geospatial at Core

Automatic Responses and Publishing

Real-time Data Streams

External Data Sources

Transactional & Operational Systems
Contents Repository
Databases
Web resources
Blogs, Mails, news

Financial Data

Telephone Records

Internet Traffic

Search, Presentation, Report, Visualization, Query

Text Files • Binary Images • XML • HTML • PDF • Excel • Map Files • Shape Files • User Sessions

Tables | Relationships | Charts | Timelines | Geospatial

SMS | Console Alerts

EV Grid Management

Workflow Initiation

Real-time Dashboards

Enterprise Data Management Infrastructure

Secured

GeoSpatial

Documents

POIs
Historical **Demographics**
Records **Customer Data**
Call Records

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Spatially-aware
Real Time Stream / Event processing

Track Moving Objects
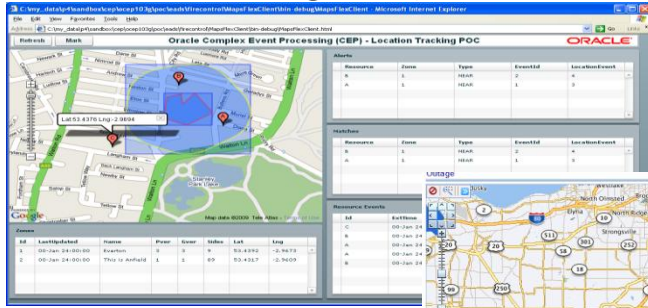
Real-Time Business Intelligence
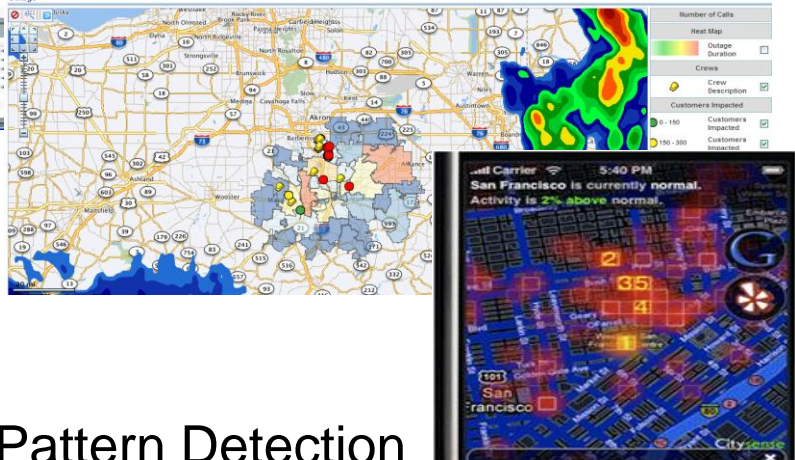
Real-Time Pattern Detection

– Ultra-high throughput (1 million/sec++) and microsecond latency

– Detect patterns in the flow of events and message payloads

– Filtering, correlation, and aggregation across event sources

–

Business Intelligence in Real Time

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NIST Definition of Cloud Computing

Cloud computing is a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.

5 Essential Characteristics
- **On-demand self-service**
- **Resource pooling**
- **Rapid elasticity**
- **Measured service**
- **Broad network access**

Source: NIST Definition of Cloud Computing v15

3 Service Models
- **SaaS**
- **PaaS**
- **IaaS**

4 Deployment Models
- **Public Cloud**
- **Private Cloud**
- **Community Cloud**
- **Hybrid Cloud**

Sustainability: Oracle Offers Cloud Choice

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ON DEMAND

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APPLICATIONS

Cloud Services

Run on private shared platform or public SaaS model

Public Clouds

Private Cloud

SaaS

PaaS

IaaS

INTERNET

Apps

PaaS

IaaS

INTRANET

Users

Oracle Technology in public clouds

- Enterprise deployment option

- Power 3rd party public clouds

Oracle Private
Cloud Platform

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Sustainability = Complete Platform Technologies

Real-time Event & Stream Processing

Evaluate and Process Real-time Data Feeds

Big Data Technologies

Batch Process, Filter, Integrate and Ingest External Data Sources

Load Processed Results for Analysis and Decision Making

Orchestration, Analytics and Visualization

Analyze and make decisions based on information from Authoritative Databases and external sources

Automatic Responses and Publishing

Publish and Disseminate actionable information

Secured

Enterprise Data Management Infrastructure

Authoritative Databases of Geospatial Related information

Manage and evaluate large scale data sets

Perform complex analysis and computation

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Ontology-driven Geospatial Applications - Actionable Knowledge

Application Ontologies

National Map Core Datasets

Geographic Names

Spatial Data

Raster Data
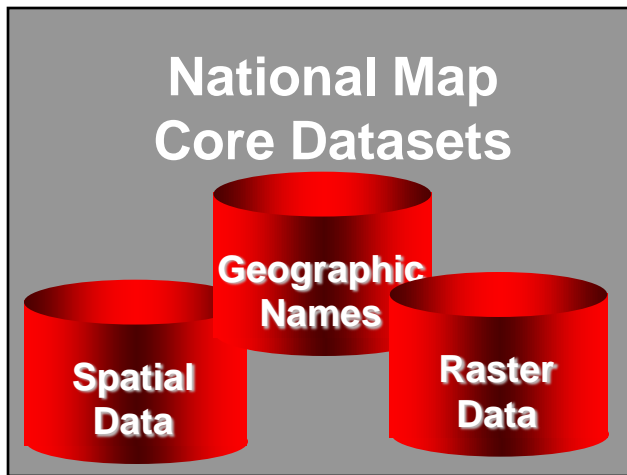
- Simple Features
- GeoRaster
- Topology
- Networks
- Gazetteers

RDF & OWL Data
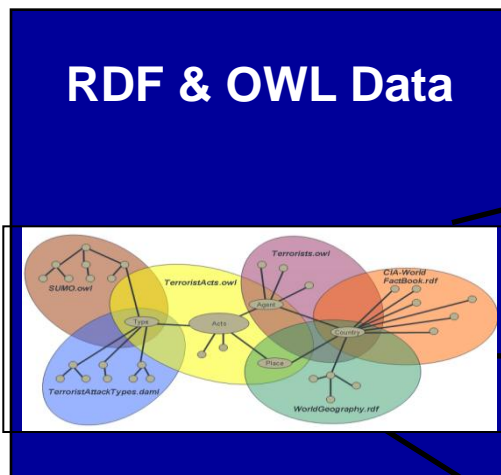
- Data Integration
- National Map schemas
- Geographic names
- Temporal
- Naïve Geography

Situational Awareness

Theater

Targeting

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Sustainability Data Collection must Respect
Information Security and Privacy

Oracle Database

Encryption & Masking

Access Control

Monitoring

Blocking & Logging
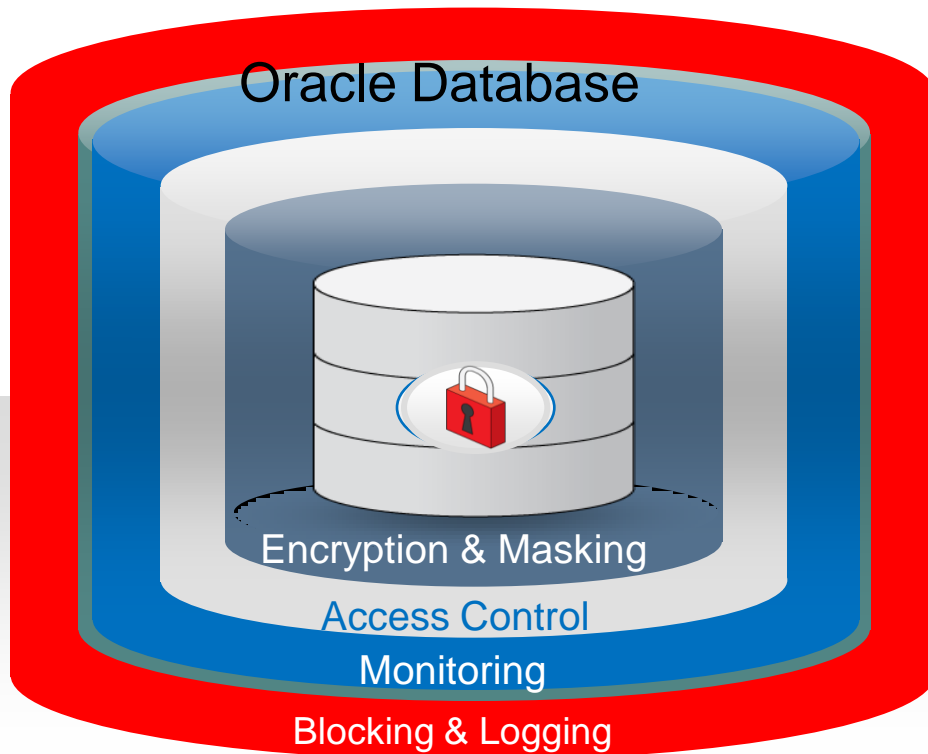
Monitoring
- Configuration Management
- Audit Vault
- Total Recall

Access Control
- Database Vault
- Label Security

Encryption & Masking
- Advanced Security
- Secure Backup
- Data Masking

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Seeking Order through Standards

"We intend to complete development for a new suite of tools for developing the next generation of applications. And there are several interesting things with the next generation of tools, but perhaps the single most interesting thing about them is that for the first time a major application company is going to commit to an absolute standards-based development environment."
– Larry Ellison

- **ISO**
    - **TC 211**
    - **TC 204**
- **Open Geospatial Consortium**
    - **Simple Features**
    - **GML**
    - **Web Services**
- **De-facto Standards**
    - **SHP, MGE, DXF, KML**
- **Professional Standards**
    - **ISPRS, FIG, WMO**
- **Java, .NET, Flash**

SQL3/MM Spatial

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Sustainability = Location-Enabled Applications

Emergency Response

Adjudication & Settlement

Cadastral / Land Use Information Management

Agricultural Management

Environmental Management

Survey Dept

Core Spatial & Business Data Repository

Transportation Infrastructure

Min of Lands

Enterprise Data Management Infrastructure
GeoSpatial   **Documents**

Crime Monitoring

Citizen Portal

Secured

POIs
Historical   **Demographics**
Records   **Customer Data**
                      Tax Records

Planning Applications

Homeland Security

Health & Social Services

Criminal Justice

Utility Asset Maintenance & Regulatory Reporting

Disaster Management

Min of Housing

Semantic Mapping

Resource Planning

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Technology Trends for Sustainable Development

- – Consolidating data management:
  - -- Store once, use many times
  - -- Minimize IT costs; Focus on public service delivery
- – Spatial data as part of information infrastructure
  - -- Fact-based environmental monitoring
  - -- Repurpose investments in data gathering
  - -- Coordinate with departments, agencies, and public
- – Location-enable Enterprise Business Applications
  - -- Urban Planning, Citizen Web Services,
  - -- Public Safety, Emergency Response
  - -- Land Management, Environmental monitoring
  - -- Business Intelligence

Sustainability Requires Complete Platforms
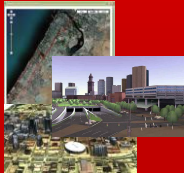
Big Data

Volunteered Geographic Information

Sensors Streaming Data

Geo-referenced Video, 3D, LiDAR

Simplified Spatial IT

Support for Open Standards

Spatial Database, Application Server, BI, tools

Support by Leading Partner solutions

Spatially-enabled Engineered Systems

Deep Analytics

Real-time Spatial Event Processing

Dense Visualization

Spatial Analysis

On Premise, On Cloud, Shared Services

Shared GeoSpatial Services Location Aware Everything

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Cloud Computing

Oracle Engineered Systems