Spatial Data Infrastructure
- a new approach -
But when I say “SDI”

You will know what I mean
What might be new?

- Wrong problem space
  
  - Wrong technologies & standards
  
  - Let’s rethink BOTH!!
SDI – Let’s focus on urban environments !!
The built environment is heating up!
Built Infrastructure a major pollution source
SDI – National and Regional Security
Future water security?
SDI – Smart Energy Management

Powering the Geo-Web
SDI – as Collaboration

- Architects, Engineers, Construction …

- Notion of Projects

- Share data, plans, objectives, costing information etc ….

- Foundation of unified urban support system.

- Real time!!
Spatial Data Infrastructure

Technology Trends and Open Standards
Technology Trends and Open Standards

- Databases and Spatial Servers
- Web Services, web-based user interfaces, SaaS.
- W3C, OASIS, IETF, ISO, OGC.
- SDI Organizations – e.g. INSPIRE etc.
- Location Based Services
- Available Content (Vector, Raster, 3D)
- Building Information Models (BIM)
- Cloud computing.
Key Standards Bodies

- ISO TC/211
  - Data Models
  - e.g. XML, WSDL, SOAP

- W3C
  - Data transport, Web Services
  - e.g. http, ftp

- IETF
  - e.g. http, ftp

- OASIS
  - Metadata, Data Security
  - Geospatial Web Services & Encodings
  - e.g. cityGML, IFC

- Open Geospatial Consortium
  - Interoperability
  - e.g. XML, WSDL, SOAP

- Smart Building Alliance
  - International Content Bodies
  - e.g. IHO, ICAO

- Many Others
  - e.g. http, ftp

- National Bodies
  - e.g. Dutch Cadastre (Top10NL)
Commercial Data Aggregators & Government

- Navteq, TeleAtlas etc.
- Google Earth/Maps.
- Microsoft Virtual Earth.
- Yahoo.

Different objectives.

Utility or Threat? – Use to best advantage.

While they provide key data and tools – they WILL NOT address the need for Collaboration Infrastructures!
Spatial Data Infrastructure

A Strategic Imperative?
SDI – Foundation for Business Process Integration

- Urban Planning & Design
- Infrastructure Construction
- Urban Infrastructure Management
- Environmental Security
- National & Regional Security
- Energy Management

Spatial Data Infrastructure

- Databases & GIS
- Internet & WWW
Government Role in Collaborative Infrastructures

- Public Access to Government
- Business Access to Government
- Government Agencies are Heterogeneous
- Transparency
- Accuracy
- Security
- Timeliness
- Productivity

Governments need to make major strategic investments in Information Technology!
e-Government and SDI

- e-Government is NOT a department.
- SDI means spatially enable e-Government.
- All levels of Government & Private Sector!
- e-Government to e-Society.
Collaboration in the Urban Environment

• Urban Planning – Managing Urban Growth
• More efficient Design & Construction
• Remediation – the green agenda
• Emergency Planning and Crisis Management
• Environmental Analysis and Assessment
• Security and Public Safety
• Provision of Social Services
Example 1: Land Subdivision

Planning

Deciding

All levels of government
- government corporations
- private sector
-- NGO

Notification & Distribution
Example 2: Property Assessment

- Aggregation & Integration
- Assessor
- Notification & Distribution
- Municipal
- Band Office
- Real Estate
- Elections
- Citizen
- Adjustment
- Land Classes
  - Residential
  - Split
  - Utilities
  - Major Industry
  - Business - Other
  - Light Industry
  - Supportive Housing
  - Farm Land
- Citizen
Example 3: Evacuation Management

Explosion Event Detected by Police

Event reported to Police HQ

Event transmitted to Emergency Control Center – scale/time/impact

Fire Department Notified

Request for traffic model sent to Traffic Control Center

Traffic Control Initiates Evacuation Plan

Evacuation Plan Sent to ECON & Police

Evacuation Plan Initiated

2nd Explosion Event (Fire Department)

Re-run traffic model to revise evacuation plan

Updated plan to ECON
Key Points

• Need to share data, not just pictures/maps

• Need to share data in context. Provenance & Business Process are as important as the data.

• Need to automate the process of sharing – not just ETL or ad hoc methods.

• Need to validate data as it is shared

• Must handle different data models transparently.

• Spatial is necessary but not sufficient!
Business Process Integration is the real issue

Spatially enabling e-Government
SDI – Foundation for Business Process Integration

- Urban Planning & Design
- Infrastructure Construction
- Urban Infrastructure Management
- Environmental Security
- National & Regional Security
- Energy Management

Spatial Data Infrastructure
Traditional View of SDI

• Focuses on services, people, technologies to access geographic information.

• Mainly a “library model” with a primary focus on discovery and visual presentation of maps.

• Provides a portal controlling access to discovery and visualization resources.

This is useful but we believe SDI technology MUST do much more
SDI as Urban Support System

- Our SDI concept focuses on supporting built infrastructure.
- Covers entire life cycle of the infrastructure – i.e. planning, design, construction, and operation.
- Contributes to the development of public policy.
- Integrates design (AEC) and geographic information.
- Supports collaborative projects integrating stakeholders in the private sector & government.
- Leverages public portals like Google Earth.
- Extension of e-Government to incorporate private sector.
- Ensures operational data (e.g. for traffic management, public safety, etc. is tied to changes in the physical infrastructure)
SDI as Urban Support System

- Architects
- Municipal Staff
- Developers
- Engineers
- Project Managers
- Land Survey
- Fire/Ambulance & Emergency Services
- Police
- Maintenance
- Maritime Survey
SDI as Urban Support System

- Support wide variety of stakeholders – public & private
- Data sourced from professional “custodians”
- Data sourced from private citizens.
- Data sourced from public business processes (e.g. land tenures, cadastre, building permits, zoning etc).

Over Complete Life Cycle of Urban Infrastructure

- Investors
- Urban Planners
- Architects
- Developers
- Engineers
- Contractors
- Police & Security
- Fire & Ambulance
- Traffic Management
- Operations
- Planning
- Design
- Construction
SDI - Technology Objectives

• Facilitate **transparent** information sharing at all levels and for all stakeholders.

• Support concrete “**development**” activities like engineering design – not just maps.

• Support government business processes – fully **integrate with e-Government**.

• Support broad spectrum of vertical applications (security, urban planning etc)
SDI - Technology Objectives

- Pragmatically leverage **open standards** to enable non-intrusive integration of stakeholder systems.

- **Synchronize** information views across multiple stakeholders.

- Each stakeholder has own view – but all views are **consistent** with one another.
SDI - Technology Objectives

- **Not about GIS** – uses many types of information – geographic information, design (CAD/BIM), engineering, sensor, costs, energy etc.

- **2D/3D** data and **temporal** evolution.

- **Protect** data assets – Data Security

- Support project **collaboration**.
Spatial Data Infrastructure

Galdos Approach
Vertical Solutions on SDI Foundation

- Emergency Response
- Construction Management
- Urban Planning & Design
- Energy Management
- Land Management
- Assessment & Taxation

Spatial Data Infrastructure
Galdos SDI Framework

Internet (Physical and Logical)

Spatial & Other Data Stores
Technology Components - SDI Framework

GeoWeb Controller

Data flow is peer-to-peer

participant spatial database

e.g. ArcGIS Server

e.g. Oracle Spatial

Notification/Monitoring

= connector
Galdos SDI Architecture - SDI Framework

- Peer-to-Peer Architecture with Controller.
- Control Center to monitor & manage connections.
- Data flow can be push or pull.
- Data flow is connector to connector.
- Connectors for common/GIS spatial or other DBMS
  - Oracle Spatial
  - ArcSDE/ArcGIS Server
  - MS SQL Server
- No restrictions or changes for/on client applications.
- Connector or Controller – just Roles!
Technology Components - SDI Framework

- Framework for managing & automating data distribution
- Framework for managing & automating data aggregation
- Publication & Subscription
- Context
- Notification
Technology Components - SDI Framework

- Builds on standard spatial & non-spatial databases (e.g. ESRI, Oracle, MS).
  - Audit Trail & Monitoring
  - Unobtrusive
  - Secure
Technology Components - Web Registry Service

Critical component for data sharing

- Manages context for sharing. Data Communities.
- Manages Publications/Subscriptions.
- Manages identifiers (object names, ID’s)
- Based on open standards (ebRIM, GML, XML)
- Notification
- Spatial Data Support

A general artifact and digital content manager
Galdos Technology Components & Solutions

- Spatially enabling e-Government.

- INdicio Web Registry Service

- GeoWeb SDI Framework

- Automated quality assurance.

- Google Earth & ArcGIS Server
Summary

• Special position of government wrt collaborative information infrastructure.

• Start thinking business process integration.

• Evolution of standards & technology.

• Invest for change and flexibility.
Summary

• See SDI in a New Light!!

  – Focus on Urban Environments – build bottom up!

  – Support many data types

  – Real time – event driven

  – Collaboration framework
Vertical Solutions on SDI Foundation

SDI Framework supports
- peer to peer ED data transfer
- synch spatial & other DB
- integrate spatial applications
- publication/subscription
- audit trail
- security framework

Spatial Data Infrastructure
Galdos SDI Framework

Internet (Physical and Logical)

Spatial & Other Data Stores
Summary - Digital Nervous System for Earth

Local to Global!

New SDI Concept & Focus

Build the GeoWeb from the ground up!!
GeoWeb 2009 Conference

Vancouver, Canada
July 27-31, 2009

Urban Environments
3D Modeling
Student Contest
Discussion