



New York State Department of Health Spatial Data Warehouse: A Case Study of Enterprise Geographic Information System for Public Health Information Network

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Vision of an Enterprise GIS for PHIN

- ▶ Comprehensive and integrated platform for spatial data creation, management, integration and analysis in a distributed computing environment to meet the needs of growing and changing public health information needs.
- ▶ Standards-based, integrated and open architecture.
- ▶ Consistent and compatible with PHIN Functions and Specifications as well as federal and industry standards
- ▶ Taking advantage of existing public health information technology infrastructure.



Enterprise GIS Principles in NYSDOH

- ▶ Use CDC PHIN Standards and Specifications v1.2
- ▶ Integrate with and take advantage of current NYSDOH Information System Infrastructure
- ▶ Collect, Process, Manage and Distribute information securely and efficiently
- ▶ Ensure and improve data accuracy and availability
- ▶ Provide the robust but scalable platform for distributing GIS, mapping and spatial services to a range of users



Goals

- ▶ Allow NYSDOH Program Areas and its partners to validate, analyze and visualize the contents of the NYSDOH integrated data repository through streamlined and centralized GIS services
- ▶ Support of epidemiological surveillance and research, enhanced development of health policy, and more effective public health practice and program management by storing and analyzing the spatial component of public health data.
- ▶ Facilitate data sharing so that GIS data and services can be used more efficiently and more effectively to reduce production of redundant, inconsistent, and conflicting data layers



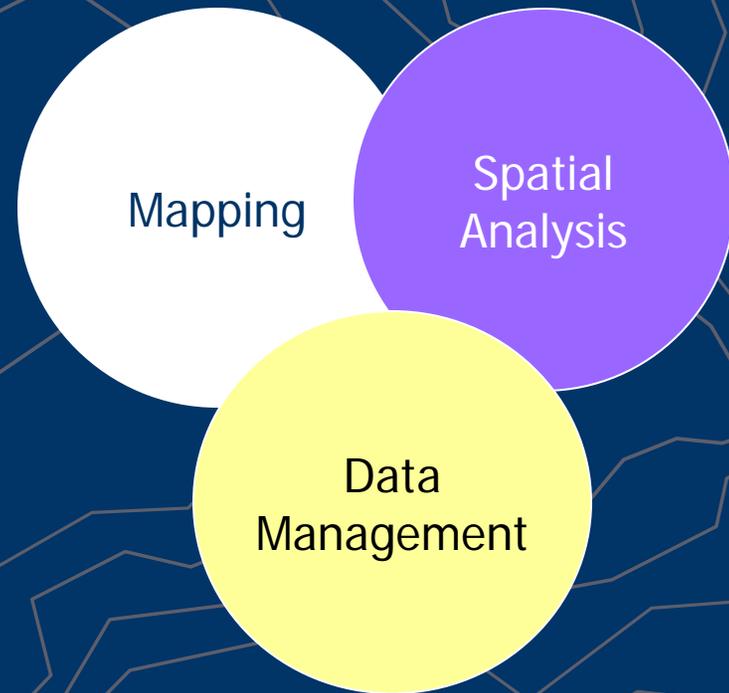
System Architecture

- ▶ Requirements of key user roles
- ▶ Complete geospatial data cycle
- ▶ Spatial data warehouse concept
- ▶ Federal and industry including PHIN v1.2, Geographic metadata standards, Web standards (XML), Networking standards (TCP/IP), and OpenGIS Consortium (OGC)



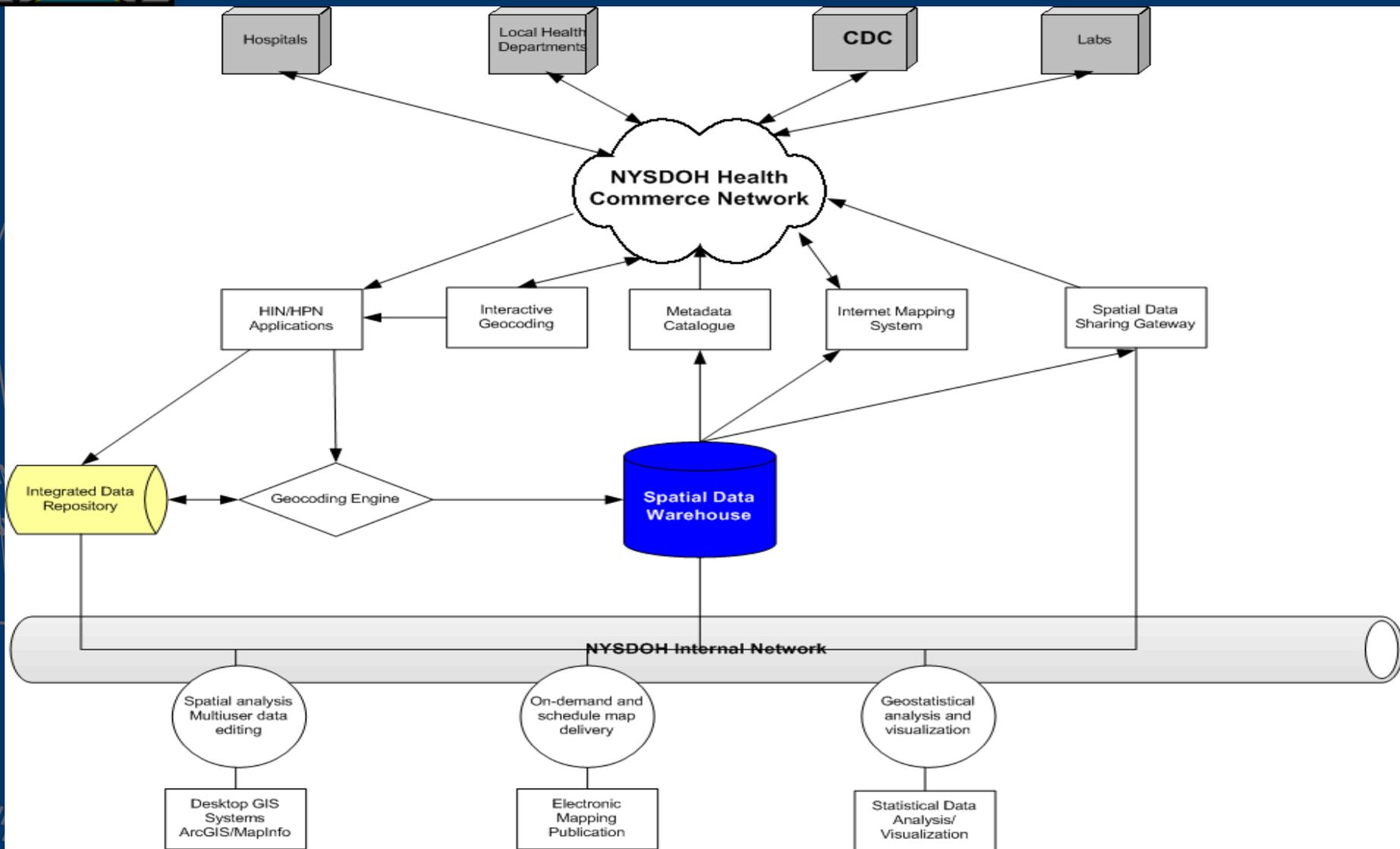
Subsystems

- ▶ Mapping: Visualization of geographic information
- ▶ Spatial Analysis: Geographic analysis as well as data conversion
- ▶ Data Management: Single, centralized data repository for data sharing and multiuser editing





System Design





Components

- ▶ At the core of the NYSDOH Enterprise GIS is a spatial data warehouse includes three main components of data flow: collection, management, and distribution
- ▶ Secure Internet mapping and visualization system
- ▶ Enterprise Geocoding system for both batch and interactive geocoding (including real-time geocoding while new records are added)
- ▶ ETL (Extract, Transform, Load) Spatial Data Engine that support more than 100 data formats including MapInfo, ESRI, Autodesk and thousands of coordinate systems.
- ▶ SAS Bridge to exchange spatial and attribute data with SAS software for statistical analysis.



Spatial Data Warehouse Concepts

- ▶ Support standard relational database
- ▶ Subject oriented
- ▶ Integrate spatial data with attribute data
- ▶ Open and scalable architecture
- ▶ Secure and flexible design



Spatial Data Warehouse Functions

- ▶ Collection: receive, manipulate and transform data
- ▶ Management: manage, store data and ensure that critical datasets are not lost, destroyed or corrupted
- ▶ Distribution: securely deliver data to various types of users by a broad range of tools

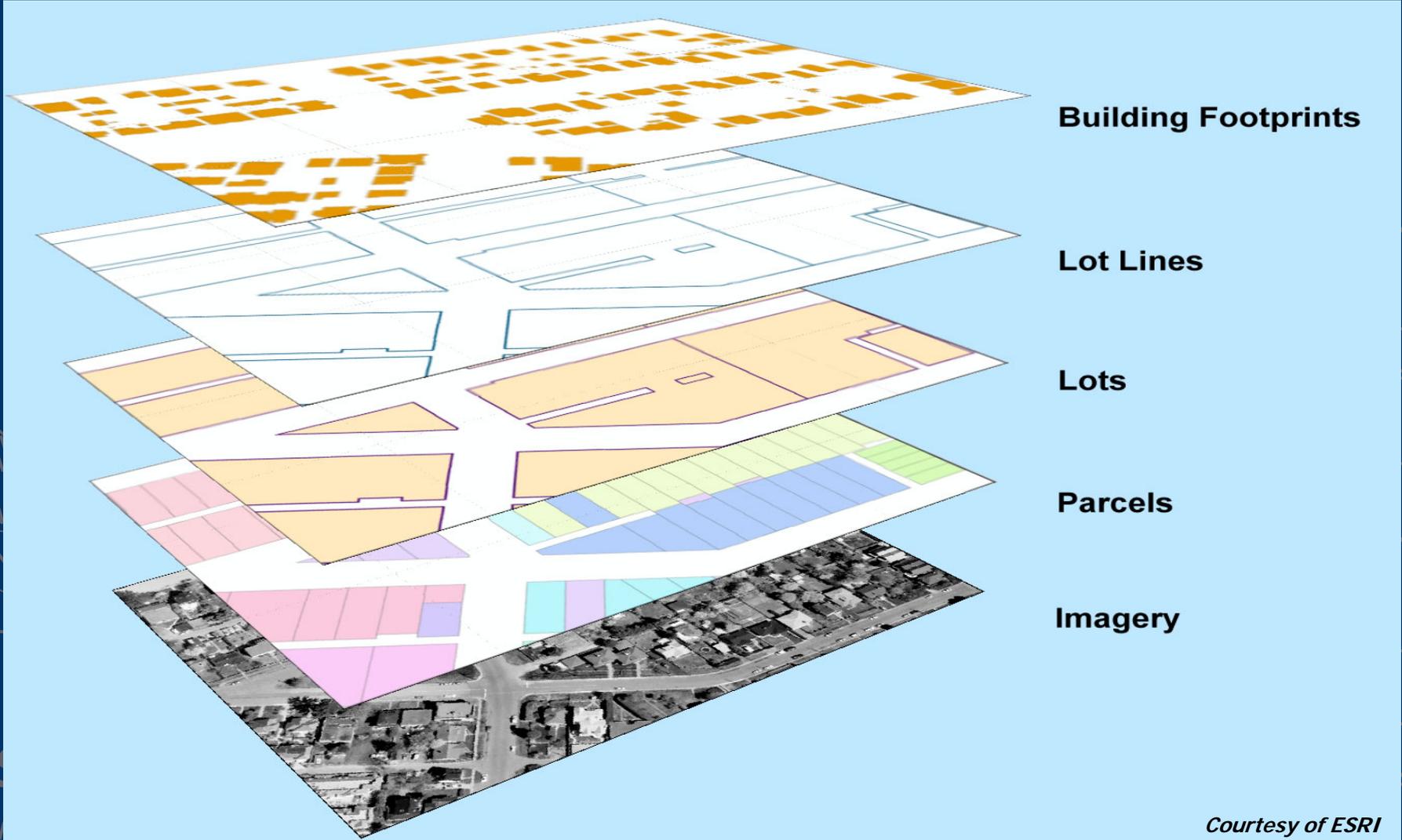


Advantages of NYSDOH Spatial Data Warehouse

- ▶ Centralized data access control under integrated data management policy of NYSDOH
- ▶ All data is stored together in a commercial off-the-shelf DBMS
- ▶ Allow multiuser access and editing
- ▶ Cost saving for commercially acquired datasets
- ▶ Supports advanced capabilities such as geometric and logical networks, true curves, complex polylines, and raster images (orthophotos, satellite images)
- ▶ Provide access via commonly accepted industry-standard APIs
- ▶ Support interoperability GIS standards



Sample Geodatabase





PHIN v1.2 with Spatial Data Warehouse in NYSDOH

- ▶ Use functions 1, 3 for data collection
- ▶ Use spatial components of clinical data from function 2 and lab data from function 4
- ▶ Manage spatial data from function 5
- ▶ Provide mapping and visualization capacity for function 6
- ▶ Control access and support authentication by directory of public health participants (function 7)
- ▶ Provide capacity to geographically select recipients of health alerts (function 8)
- ▶ Fully compatible to technical specifications of function 9 for security and disaster recovery



History of Development

- ▶ First Internet Mapping application for Emergency Response in July 2002.
- ▶ Fully integrated GIS application for the Hospital Emergency Response Data System (HERDS) in September 2002.
- ▶ Prototype of spatial data warehouse in December 2002
- ▶ Architecture and technical specifications of spatial data warehouse reviewed and approved by NYSDOH security in February 2003
- ▶ Spatial Data Warehouse in use in first project (EPHT) June 2003 and second project (WNV) November 2003



Current Status

- ▶ Secure Internet Mapping System is currently being used for Emergency Response applications including HERDS and other public health surveillance system including Air Monitoring and WNV Predictive Analysis using satellite images.
- ▶ Spatial Data Warehouse is being used by various program areas for base data sets that are available to NYSDOH program area at no cost such as street, highway network, MCD, Zip Code, County boundaries as well as user-defined GIS datasets such as hospital, nursing homes, air monitoring stations.



Future Plans

- ▶ The secure Internet Mapping System and Geocoding Engine will be used for West Niles Virus Surveillance and Childhood Asthma and Air Pollution Surveillance System in 2004, and will include new functionality, usability enhancements, architectural improvements and better security for user access control.
- ▶ The spatial data warehouse will be updated with more update and accurate spatial data from both commercial vendors (GDT, ESRI) and integrated with additional socio-demographic data such as Census, Claritas. The NYS Orthophotos will be fully loaded and become available for use by program areas.
- ▶ Training and support for GIS users in NYSDOH will be provided including possible development of an user-friendly interface to the spatial data warehouse for GIS desktop software.



Conclusions

- ▶ Enterprise GIS is a logical result of the growing use of spatial data for public health information needs
- ▶ Spatial data warehouse is the central component of Enterprise GIS for PHIN
- ▶ PHIN Functions and Specifications need to be updated with new standards and incorporated into design and development of Enterprise GIS