Web Mapping Metro Rail Services in Los Angeles County

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**Map**

- **Map**
  - A visual representation of an area
  - A symbolic depiction of the relationships between elements of space
  - Significant contributions and visual communication in transportation

- **Paper Mapping**
  - Traditional way of mapping
  - Disadvantages
    - Time consuming
    - Difficulty making changes
Web Mapping

» The process of designing, implementing, generating and delivering maps of the World Wide Web (www) and its products.

» Advantages
  • Delivering information easily
  • Updating information easily
  • Resource interactivity

Web Mapping Experience

» Google Map
Objective

- Building a Web Mapping Application of Metro Rail Services in Los Angeles County
- Allowing clients using and interacting with the resources
Workflows

GIS Server

Objects
GIS Services
Server Object Manager (SOM)

GIS Services
Server Object Container (SOC)

Web Application
Web Services
API

Flex
Amazon EC2

Web Server

GIS Server

ArcGIS Server (Serve)

GIS Resources (Author)

Map
Geodata
Geoprocessing
Geocode
Network Analysis
Other Objects

Clients (Use)

ArcGIS Desktop

Web Browser

Mobile

Workflows
GIS Resources

- ArcGIS for Desktop (Author)
  - A software that allows the user to analyze data and author geographic knowledge
    - Examining relationships
    - Testing predictions
    - Making better decisions

- Components
  - Map
  - Geodata
  - Geoprocessing
  - Geocode
  - Network Analysis
  - Other Objects
GIS Resources Components

Map

Basemap

» Locational reference
» Framework foundation
  • Overlaying and mashuping operational layers
  • Performing tasks
  • Visualizing geographic information

Map Layer

» Background layer
  • Reference purpose
  • Overlaid by operational layer

» Static layer
  • Data does not or rarely changes
GIS Resources Components

- Map Components
  - Vector datasets
    - Road
      - Streets
      - Freeways
    - Parcels
    - Building footprints
  - Raster Datasets
    - Aerial photos
    - Satellite imagery
    - Topography
      - Hillshade
      - Elevation – graduate colors
  - Labels and annotations
GIS Resources Components

Geodata

- Geographic data
  - Geographic: Spatial analysis
  - Data: values of qualitative or quantitative variables
- Producing electronic map

Geodatabase (Geographic data)

- Data storage and management framework
- Combination
  - Geo (spatial data)
  - Database (data repository)
    - Creating a central data repository
GIS Resources Components

- Geoprocessing

- Purpose
  - Automating GIS task

- Function
  - A workflow as methods to automate, document, and share multiple-step procedures
  - A framework of data transportation

- Geoprocessing tool
  - Performing an operation on an ArcGIS dataset
  - Producing a new dataset as the result of the tool
Geocode

- Coding the Earth-providing geographic reference information
- The process of assigning a location in the form of coordinated values
  - Latitude
  - Longitude
GIS Resources Components

Network Analyst

- Network-based spatial analysis
- Calculating and determining the relationship and locations of network facilities
- Transportation analysis
  - Routing
  - Closest Facility
  - Service Area
  - Location – Allocation
  - Vehicle Routing Problem
  - Origin – Destination Cost Matrix
GIS Resources Components

Network Analysis

- Network Geodatabase
  - Source Feature
    - Road
    - Rail
    - Station
    - Demographic Parcel
    - Others
  - Network Dataset
    - Road
ArcGIS Server

ArcGIS Server (Serve)

» Providing the platform for sharing GIS Resources

» Allowing client applications to use and interact with resources

» Ability to create, manage, and distribute GIS services over the Web to support desktop, mobile and web mapping applications

  • Services: a method of communication between two electronic devices over the web

  • Application: a computer software designed to help the user to perform specific tasks
ArcGIS Server

Components

» GIS Server
  • Host and Run Services
    » GIS Services: automated geographic information services that are published and accessed over the Web using standard technologies and protocols

» Web Server
  • Host Web applications and Web services that use the objects running in the GIS Server
    » Web application: an application is accessed over a network
    » Web services: a representation of a GIS resources (objects) that a server is making available to other computers on a network
GIS Server

Components

» Server Object Manager (SOM)
  • Managing a set of server objects distributed across one or more SOC machines
  • Publishing new services
  • Managing hosted services

» Server Object Containers (SOC)
  • Hosting the server objects managed by the SOM
  • Hosting the published services

Categories of GIS Service

» Mapping
» Geocode
» Geodata
» Geoprocessing

» Globe
» Image
» Network Analysis
» Geometry
Web Server

» Hosting server applications and Web services by using ArcGIS Server API.
  • API (Application programming Interface)
    ✤ A set of rules, routines, protocols, tools, or specifications for building software application

» These server applications use the ArcGIS Server API to connect to a SOM, make use of services, and create other ArcObjects for use in their applications

Web Service

» Architecture styles
  • SOAP: Simple Object Access Protocol
  • REST: Representative State Transfer
ArcGIS API for Flex

- Creating applications with intuitive, visually rich and responsive user interface
- Powerful Advantage of ArcGIS Services
  - Mapping
  - Geocoding
  - Geoprocessing
- Widget
  - Small application that can be installed and executed within a web page by an end user
- Adobe Flash Builder
  - An integrated development environment to build and deploy Web applications and Web services for Flex
Cloud

- Cloud Computing is the delivery of computing and storage capacity as a service to a heterogeneous community of end-recipients.

ArcGIS and the Cloud

- Retrieving ready-to-use maps
- Accessing task services
- Amazon EC2
  - A web services that provides resizable compute capacity in the cloud
Clients

- Clients (Use)

- Components
  - Web browsers
    - Performing GIS tasks with a web browser and Internet connection
  - ArcGIS Desktop
    - Connecting to ArcGIS server using ArcGIS Desktop applications to make use of services
  - Mobile
    - Using mobile device to access GIS capabilities and data
Web Mapping Metro Rail Service

- Web Mapping Service Application
  - Station Information
  - Transit Load Factor
  - Finding Nearby Metro Stations
  - Census Chart
  - Metro Services Area
  - Others
Conclusion

Significances of Web Mapping
- Providing the most up-to-date information
- Interacting with clients
- Without program experiences for users

Transportation Contribution
- Transit forecasting
- Service planning
Acknowledgement

- LAC MTA
- ESRI

Thanks to everyone who contributed on the websites