Common Ground in Geocollaboration

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Project Objectives

- Investigate a collaborative workspace that provides:
  - multiple role-specific views and team view
  - geo-spatial planning task

- Integrate research from Information Visualization and Computer-Supported Cooperative Work
- Prototype for geo-collaborative tactical operations planning; use our open-source collaborative infrastructure
- Define measures for evaluating common ground in experimental settings
- Articulate relationships between common ground and other computer-supported collaboration constructs

- How can collaborative construction of a geo-spatial plan visualization ameliorate problems of too much and too little common ground?

- Approach:
    - Obtain and edit real/realistic map content
    - Design and implement experimental task
    - Implement collaborative map interactions

Outcomes

- Convertino, G., Ganoe, C.H., Schafer, W.A., Yost, B. & Carroll, J.M. 2005. A Multiple View Approach to Support Common Ground in Distributed and Synchronous Geo-Collaboration. In Proceedings of the *Third International Conference on Coordinated & Multiple Views in Exploratory Visualization (CMV 2005)*, July 5th 2005, London, UK.

- Carroll, J.M., Rosson, M.B., Convertino, G & Ganoe, C. 2006. Awareness and teamwork in computer-supported collaborations. *Interacting with Computers*.

- Schafer, W., Carroll, J.M. & Haynes, S. submitted. Emergency management as collaborative community work.
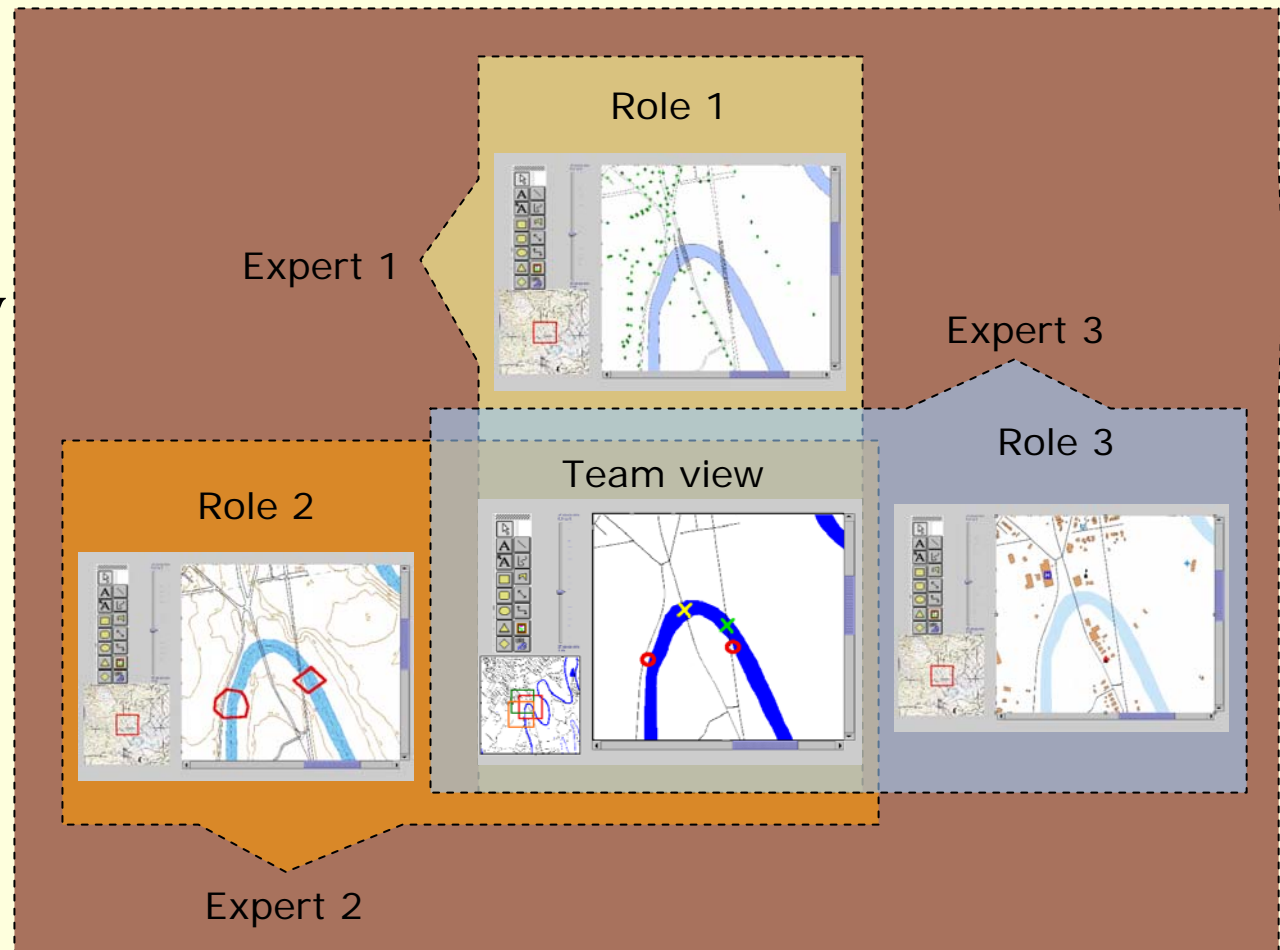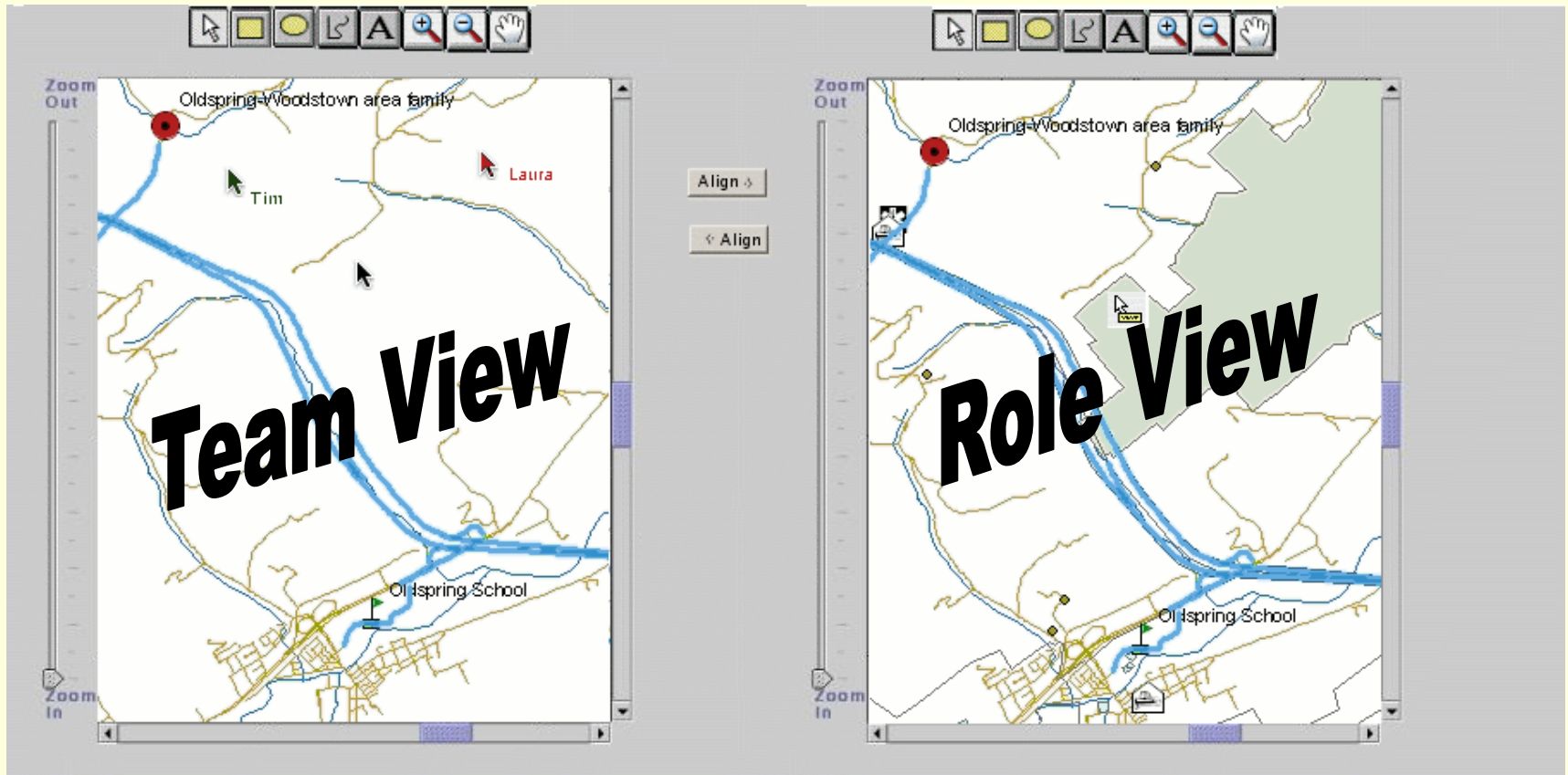
Common Ground Experiment

Role-specific map-views

Complementary knowledge

Team view is constructed jointly

Multiple views design

- Three users, each with specific role
- Each user sits at a separate computer

Multiple View Issues

- How do users share information using maps?

- How do they stay aware of others' actions and references?

- What features are available with each view? (navigation, query, annotation)
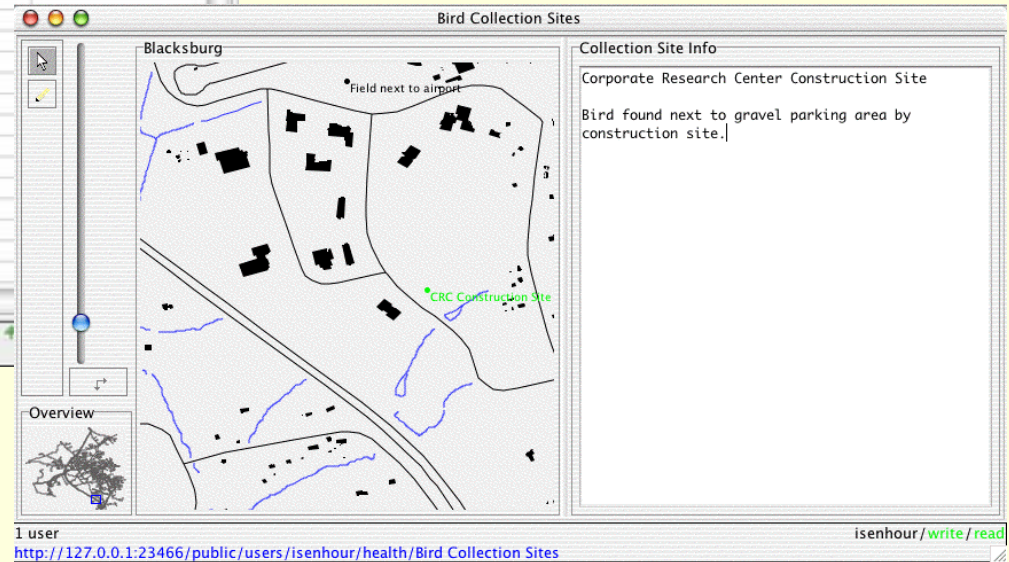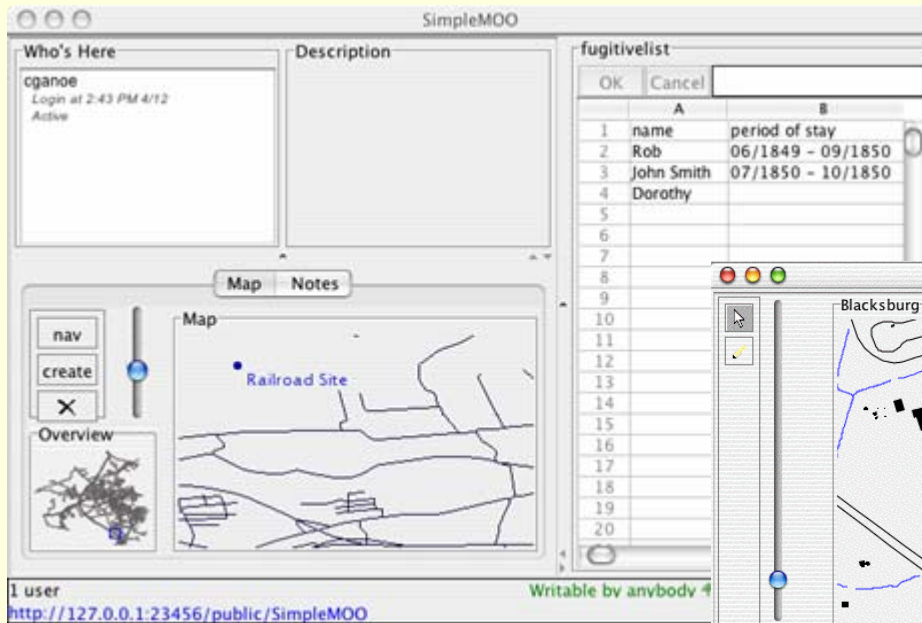
- How do you coordinate actions across views?

Geocollaboration

- Geocollaboration: How can people collaborate with map software?

- Numerous design decisions

- Existing software tools make different choices
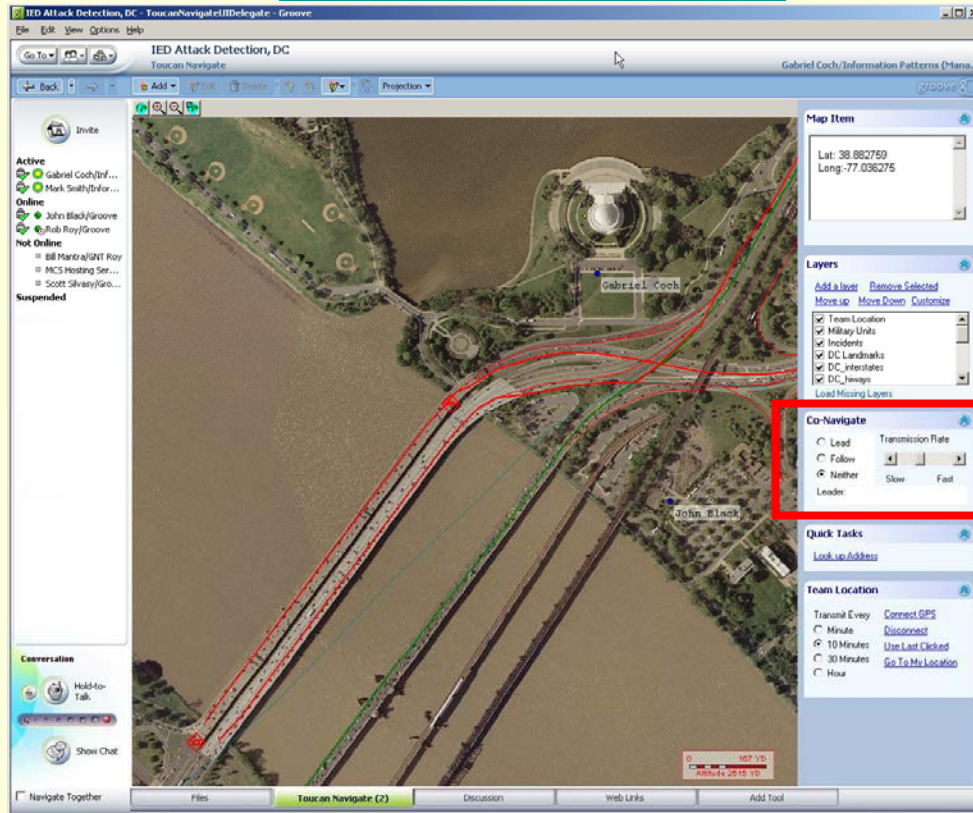
BRIDGE Collaborative Map

- Users add spots to map and link to other content

Toucan Navigate

(www.infopatterns.net)

- Navigation controls for working alone, following, or leading

Geocollaboration Architecture

- Geocollaboration Software Architecture
  - Based on a survey of existing map tools
  - Supports a variety of geocollaboration features
- Software offers:
  - Toolkit for developing geocollaboration applications
  - Support for using multiple features in combination
  - Sandbox for developing new features

Architecture Development

- Open-source development project

- Integrates two existing software toolkits:
  - CORK: collaborative infrastructure, replicated objects
  - GeoTools: GIS toolkit, standards compliant

- Focus on reusable and extensible objects

Geocollaborative SW architecture

Geocollaborative BRIDGE Tools			
Shared User Activity			Shared Geographic Map
Shared History (BRIDGE)	Shared Cursors	Shared Viewpoints	Shared Geospatial Data: Shapefiles, User-Created Data, Styles
Collaborative Infrastructure (CORK)			GIS Tookit (GeoTools)

- Same map data is useful for multiple applications
  - Centre county roads, rivers, and buildings:
    - Emergency management software
    - Underground Railroad research
- Applications require different rendering techniques
  - EM: different road types and lane markings
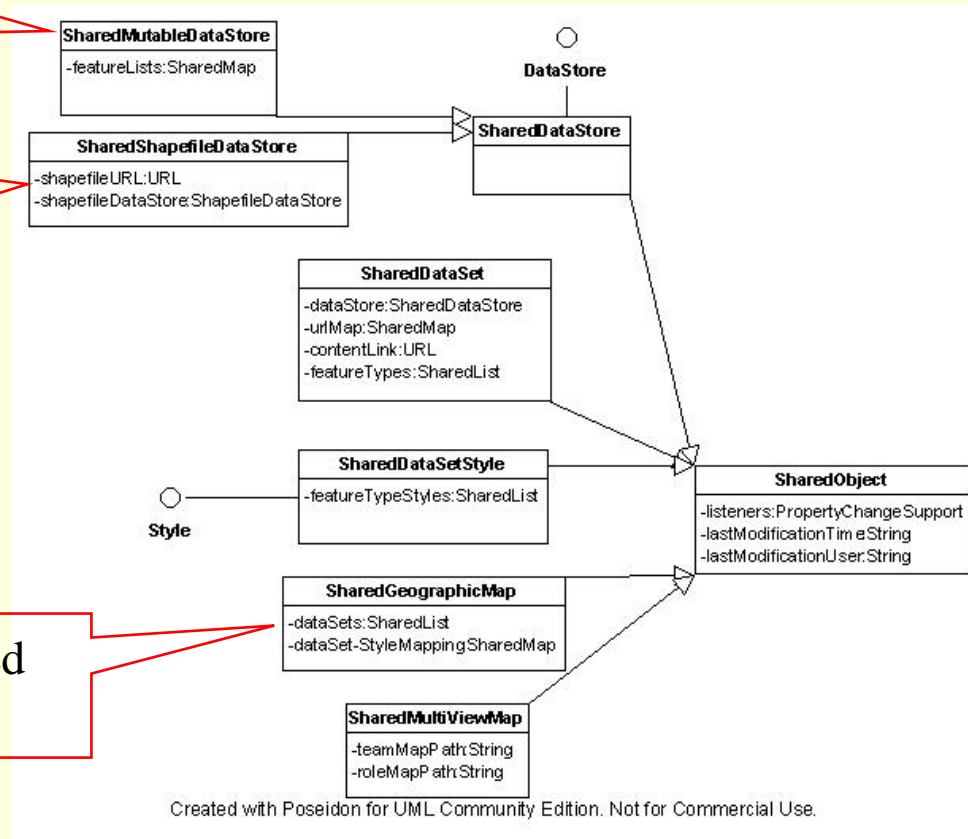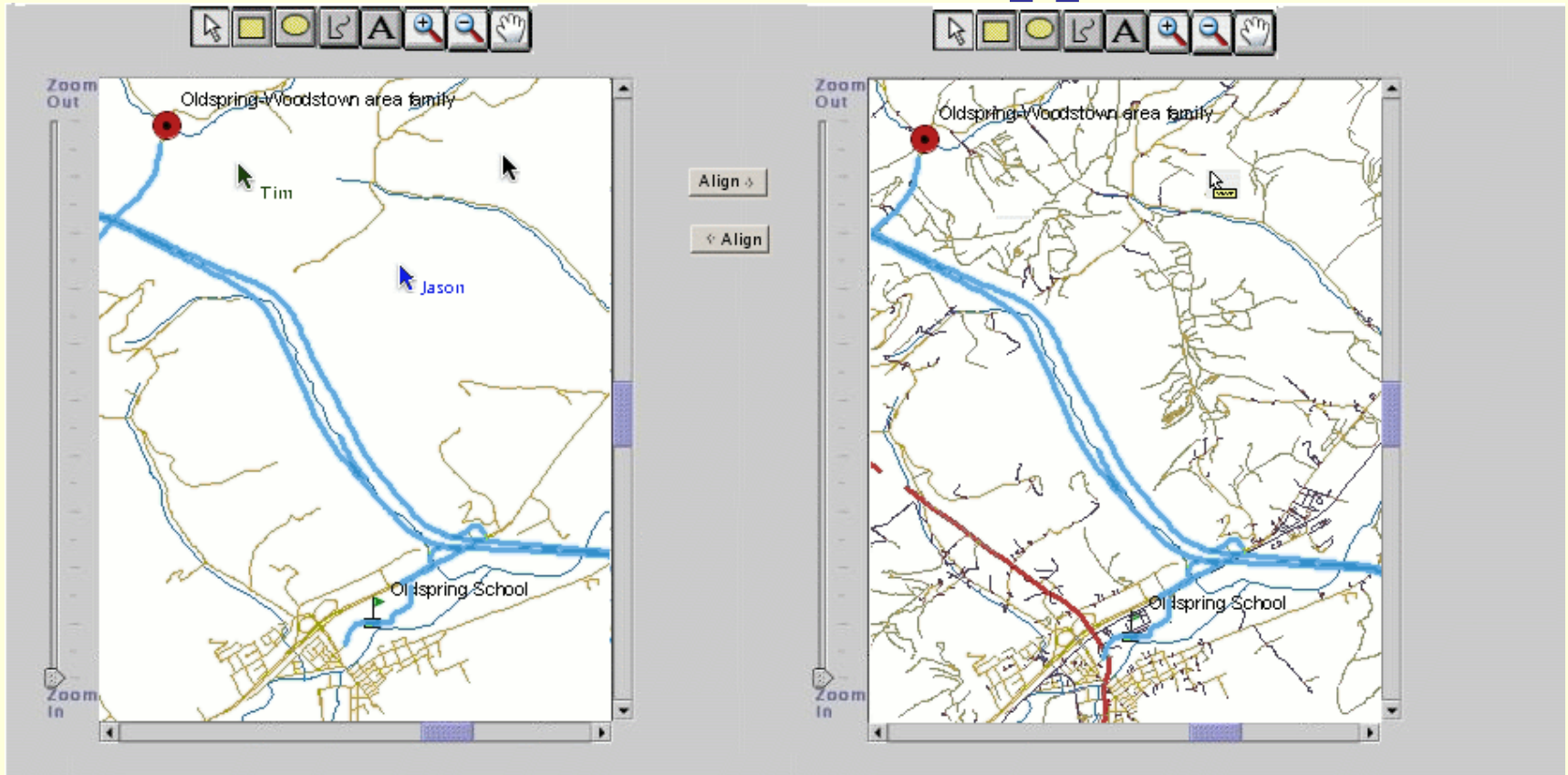 - UGRR: major roads, historic building sites

User-created content

Standard map data format

Map data paired with styles

SharedMutableDataStore
-featureLists:SharedMap

○ **DataStore**

SharedDataStore

SharedShapefileDataStore
-shapefileURL:URL
-shapefileDataStore:ShapefileDataStore

SharedDataSet
-dataStore:SharedDataStore
-urlMap:SharedMap
-contentLink:URL
-featureTypes:SharedList

SharedDataSetStyle
-featureTypeStyles:SharedList

○ **Style**

SharedObject
-listeners:PropertyChangeSupport
-lastModificationTimeString
-lastModificationUser:String

SharedGeographicMap
-dataSets:SharedList
-dataSet-StyleMappingSharedMap

SharedMultiViewMap
-teamMapPath:String
-roleMapPath:String

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Multiple Views Application

- Build views from existing map objects
- Share mouse cursors across maps

- Emergency task: plan a rescue for a family stranded by flood

- Three, interdependent *roles*
  - *Public works* (utilities and roadway infrastructure)
  - *Environment* (floodplains and weather)
  - *Mass care* (shelters/rescuees' needs and vehicles)

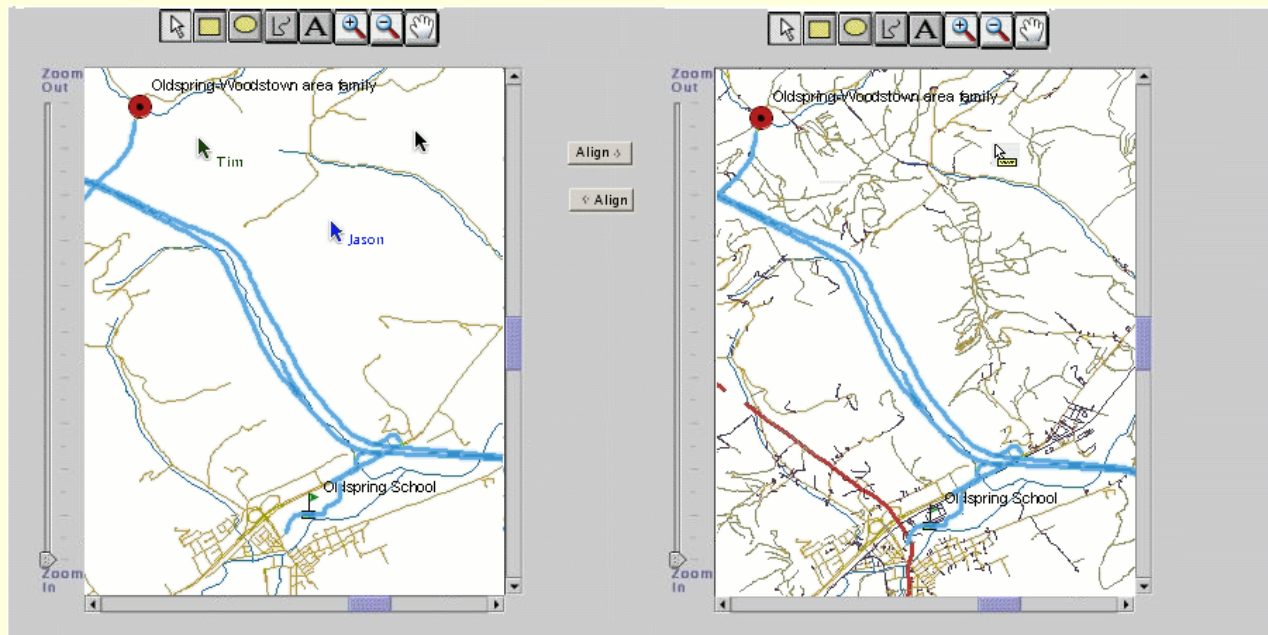- Roles based on an emergency operations center

Demonstration

Other Features

- Draw annotations, pass across views
- Align viewports
- Synchronize team view navigation

Comments, Questions, Suggestions?   Thanks!