

# Stepwise Integration of Alaska's Highway Analysis System with GIS

*presented to*

**2004 GIS-T Symposium**

*presented by*

**John Sutton  
Cambridge Systematics, Inc.**

**Jack Stickel  
Alaska Department of Transportation  
and Public Facilities**

**March 2004**

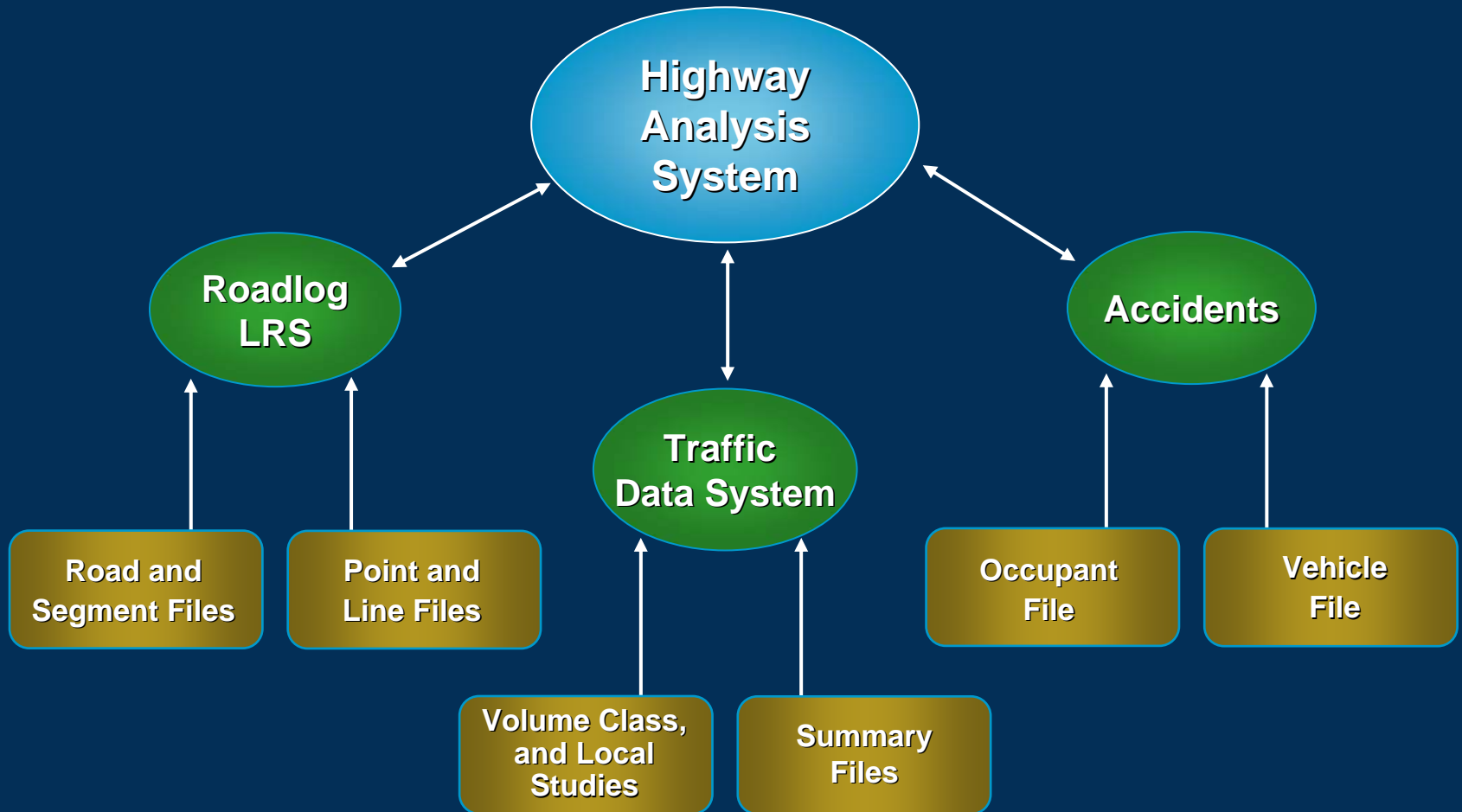
**Transportation leadership you can trust.**

# Highway Analysis System (HAS) As Designed

- Hierarchical mainframe database system designed to manage the State road network and features/incidents on or along the network
- Created by Boeing Computer Services in the mid-1980s
- Multi-component design (Roadlog, traffic, accidents, ...)
- Linear reference-based system (Roadlog)
- Contained a cartographic interface component (predecessor to today's GIS software)
- Development plans included extensive documentation defining the requisite data collection necessary to “fuel” the system



# Highway Analysis System



# Core Alaska Department of Transportation and Public Facilities' Business Need

Assess highway system performance

*which requires –*

Comprehensive inventory and monitoring of roadway and environmental features (pavement, bridges, traffic, etc.)

*which requires –*

Standard location reference objects (alignments, routes, mileposts, etc.)



# Highway Information Characteristics

- **Very heterogeneous in nature**
- **Distributed maintenance responsibility**
- **Many field collection methods and technologies**
- **Tied to centerline-based location references (i.e., Roadlog)**



# Roadway Data Issues

- **Accessibility** – Roadway information is difficult or impossible to find
- **Currency** – Roadway data is difficult to keep up to date
- **Discovery** – HAS is difficult for the casual user to use
- **Integrity** – Some data is incorrect or incomplete
- **Timeliness** – Data is late or out of date



# Roadway Data Issues (continued)

- **Availability** – Some required data are not available
- **Stewardship** – Some HAS data has unclear business meaning and purpose beyond the business area specifically involved with it
- **Cost** – Some data elements are very costly to collect or update



# Required HAS Enhancements

- **Improve data quality (completeness, accuracy, timeliness, accessibility, etc.)**
- **Improve data stewardship (management and administration)**
- **Integrate disparate data sets**
- **Visualize data values and relationships**
- **More efficient LRS management (multiple LRM support)**





# Strategic Alternatives

- Upgrade HAS by adding all required features, including visualization
- Build new integrated system using GIS technology
- Buy “off-the-shelf” system and customize it
- *Develop HAS-GIS interface*



# Why Choose the HAS-GIS Interface Strategy?

- **Most of the necessary data is already in either of the two systems; designing new data stores is not required to satisfy user needs**
- **Lowest cost, shortest time to implement, and greatest incremental user benefit of all alternatives**
- **Interface strategy allows HAS user community a choice of presentation (UI, reports, etc.) as well as tools supporting the application layer (highway data business rules)**



# HAS-GIS Interface Long-Term Vision



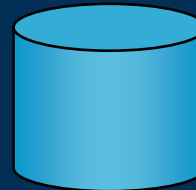
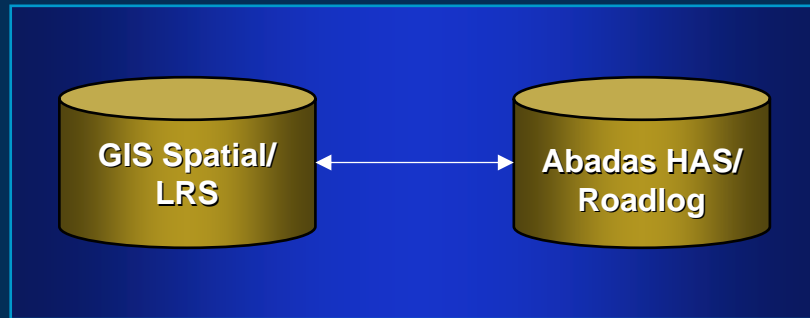
Applications



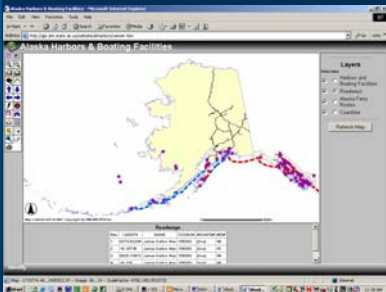
Wireless



Web Access



Database



Map Interface



PDA



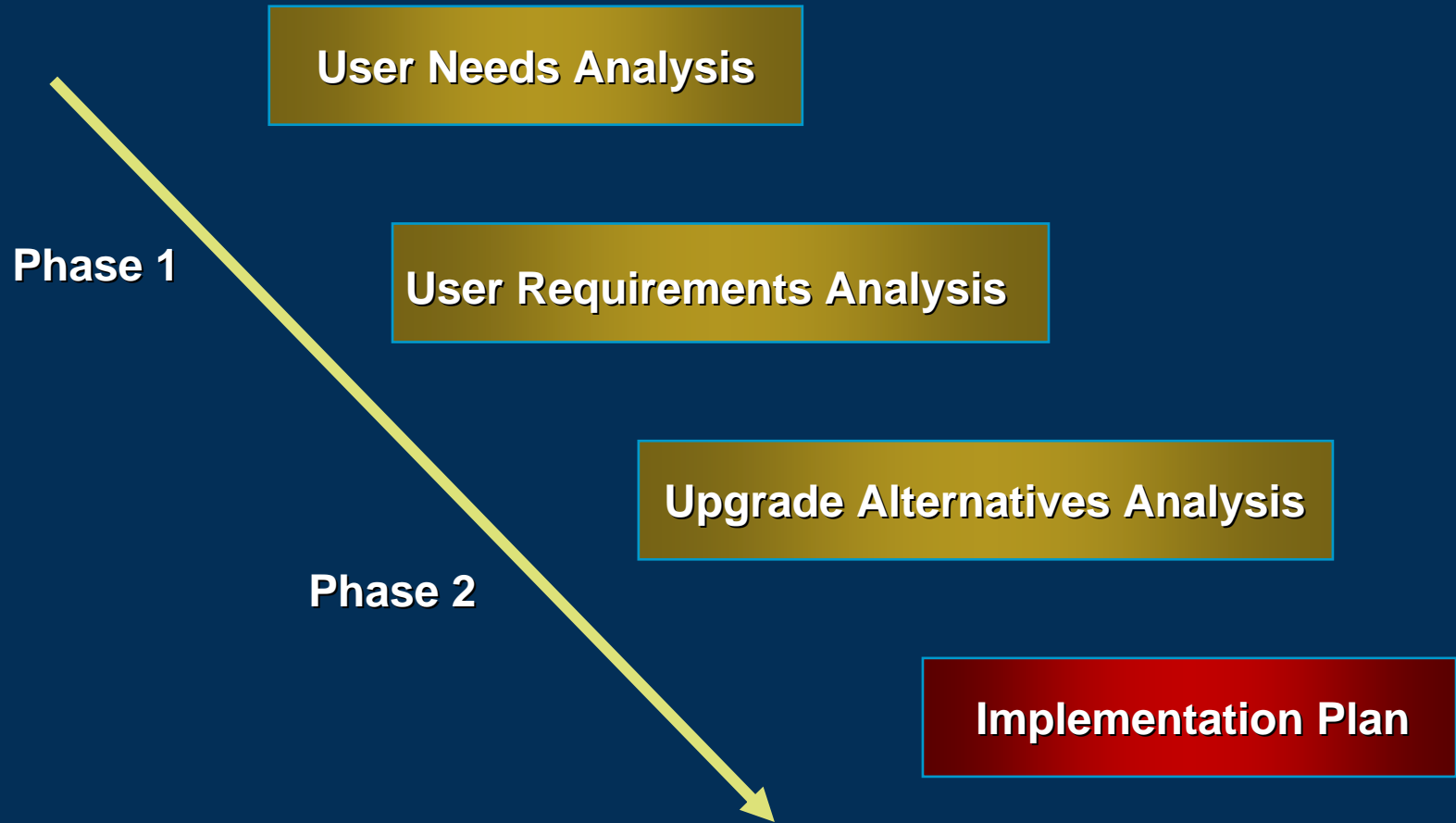
# Anticipated User Benefits

- **Improved access and ability to view business data relative to the road network**
- **Expanded capabilities and additional covered roads in the 511 Traveler Information System**
- **Integration tools to combine and display additional data sets relative to the road network**
  - **Environmental**
  - **Survey data**
  - **Traffic volumes (AADT or VMT)**



# HAS – GIS Interface Project

## Project Tasks



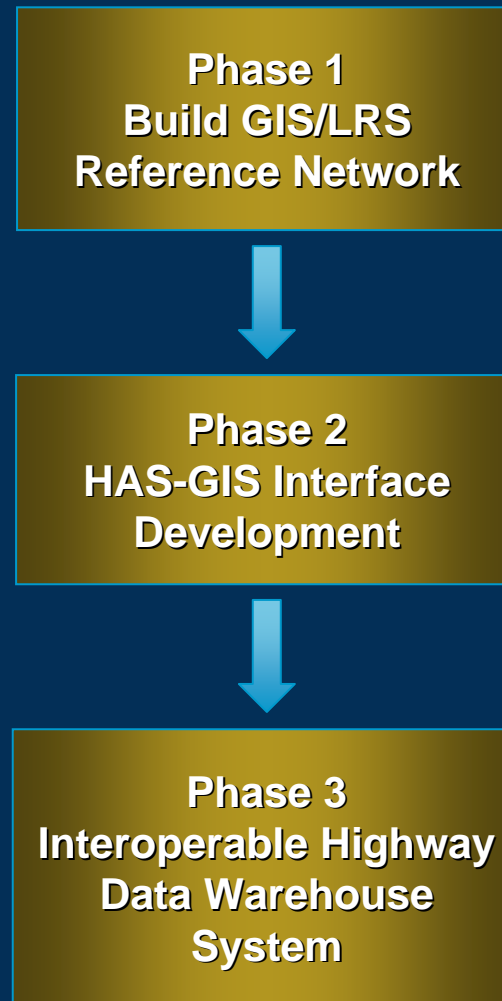
# Approach

- **Establish GIS as the environment to manage the LRS and road centerline data**
  - Integrate GPS centerline data collection and Roadlog updates
  - Synchronize GIS LRS and Roadlog/HAS
- **Create user friendly tools in GIS for data query, analysis, and display**
- **Develop a systems architecture to enable easier access to GIS, HAS, and other data sets in the Department**
  - AKNET
  - Internet



# HAS-GIS Interface

## Stepwise Development



# Phase 1

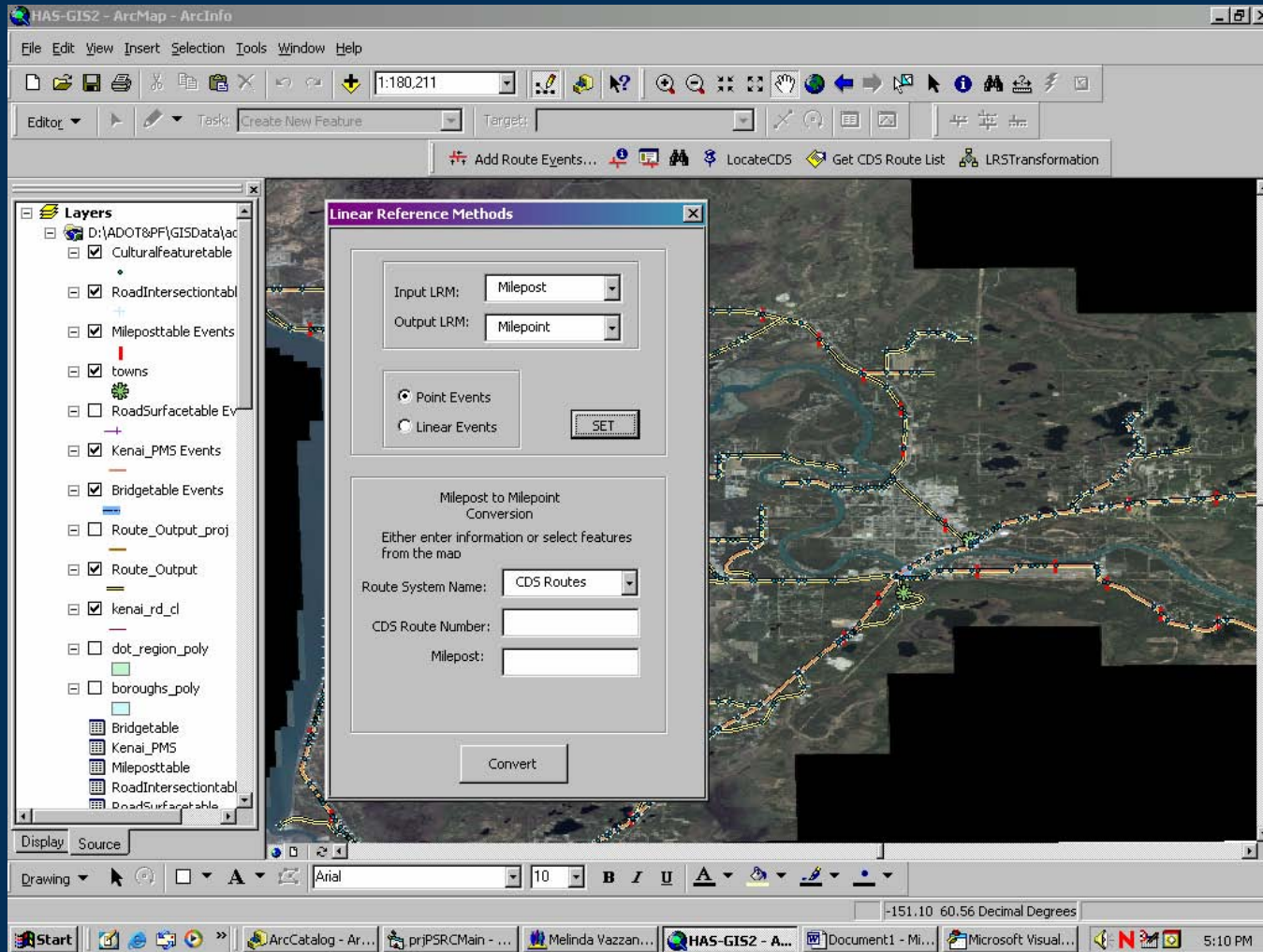
## Build GIS/LRS Reference Network

- Create reference network from GPS centerline data
- Develop Geodatabase to manage spatial data and LRS data
- LRS management tools
- Map-based query, analysis, and display tools
- Build on existing Department systems infrastructure



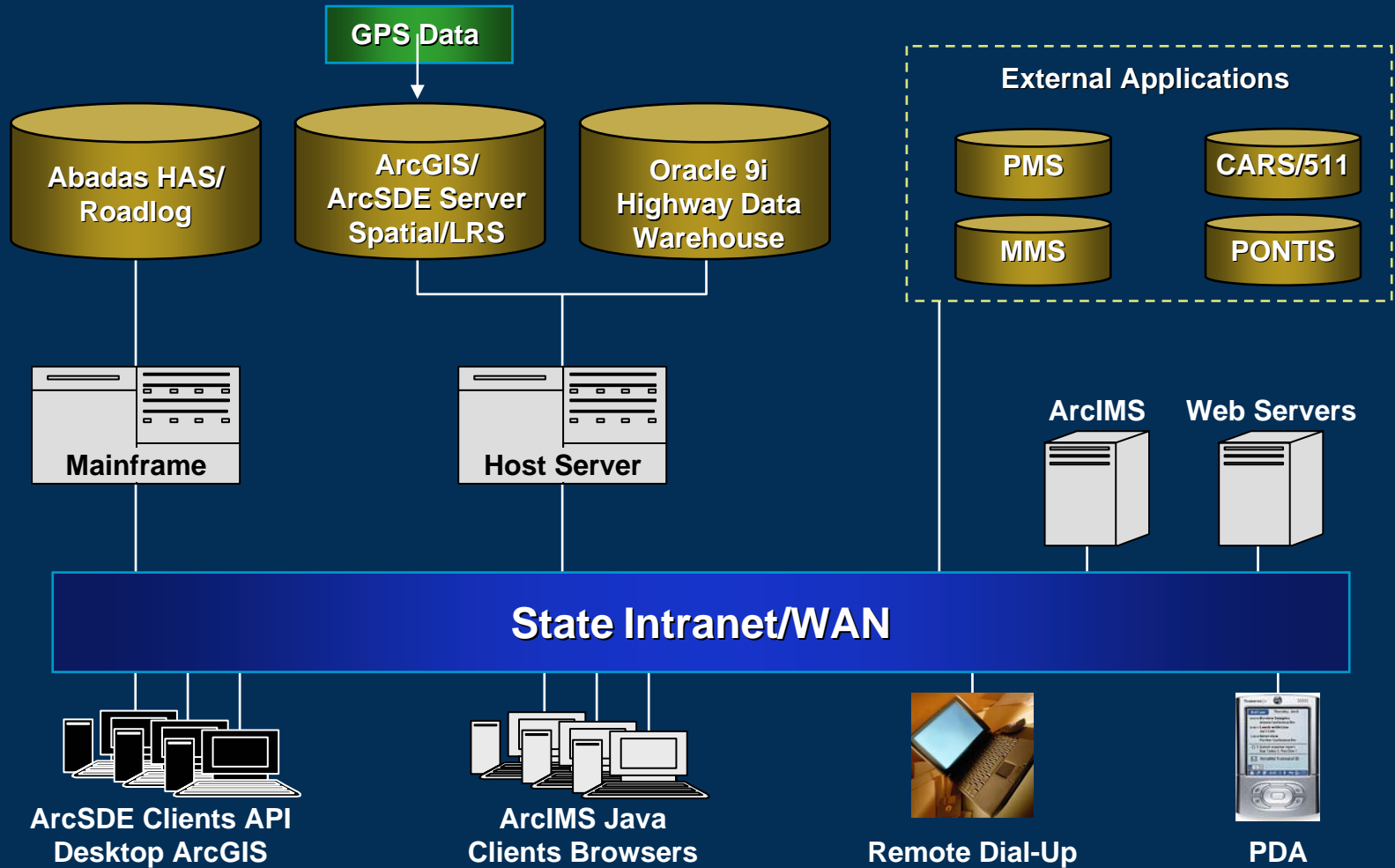


# Mapping HAS Data in GIS



# HAS-GIS

## Short-Term Concept Network Systems Design



# Phase 2

## HAS-GIS Interface Development

- **Create enterprise geodatabase**
  - **Enhanced Highway Data Warehouse**
- **Linkage to external systems**
- **Extend architecture to web-based services model**



# Phase 3

## Interoperable Highway Data Warehouse System

- **Migrate data and applications from HAS to Highway Data Warehouse System**
  - Highway data warehouse manages spatial data and LRS
  - Distributed databases link to HDW for mapping and spatial data services
- **Enterprise geodatabase and applications (e.g., HPMS, Accident Analysis)**
- **Web-based services architecture**



# Summary

## HAS – GIS Interface

- **Phased approach to HAS-GIS development**
  - **Priorities determined by user requirements**
  - **Achieve benefits at each phase**
  - **Develop capabilities within resources available**



# Questions?

