

## PANEL 2

### Geographic Information Systems, A Database Challenge for the 90's

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Geographic Information System (GIS) is a tool for modeling the world and simulating its geophysical phenomenon. Its domain of application spans every field, from business to space science and in particular the geosciences. It is a collection of software tools for the manipulation, analysis and visualization of spatial data. By spatial data we mean geophysical data (or geomatic data) including recorded facts about geophysical phenomena, and the rules and logic for simulating the occurrence of these events. The functionalities in a GIS require that we retain several distinct data classes: Spatial Data (e.g., vectorized map data), Attribute Data (e.g., structured data describing attributes of a specific geographic feature), Free Text Information (e.g., legal documents, descriptions of land parcels, etc.), Imagery (e.g., remote sensed images) and statistical data (e.g., census data).

The raw data resources required for integration into a GIS database are not only very large but also, come from diverse sources and agencies in geographically dispersed locations. The problem to be answered then is "How should the diverse data resources be modeled and integrated into a comprehensive and coherent GIS database that addresses all functionalities required in a geographic information system?" Current database technology is inadequate to handle efficiently all the complex requirements of geographic information systems.

Maintaining the various categories of data required in a GIS database poses a challenging database engineering question. The database issue is only one aspect of the problem. Given the very large volume of data involved and the distributed nature of the data sources, a distributed database management system must feature predominantly in its solution. This brings into play other dimensions of the problem. Namely issues of data communication, reliability and graphical workstation technology. While some of these issues are parallel to those in multimedia databases and have been addressed, there are still problems specific to GIS that need to be addressed. For example:

1. What is an appropriate data model?
2. What is an appropriate database architecture?
3. What minimum technological support is necessary to achieve remote display of graphics, images and video.

GIS is one arena where several disciplines of computer science: graphics, computational geometry, information retrieval, data communication, data and knowledge bases, etc., strongly interplay and poses a major challenge for very large scale database development.