

What is GIS (for Unidata)?



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Tracking as the Origin of Science



Louis Liebenberg, The Art of Tracking: The Origin of Science (Wired, June 2003)

World Wide Lab

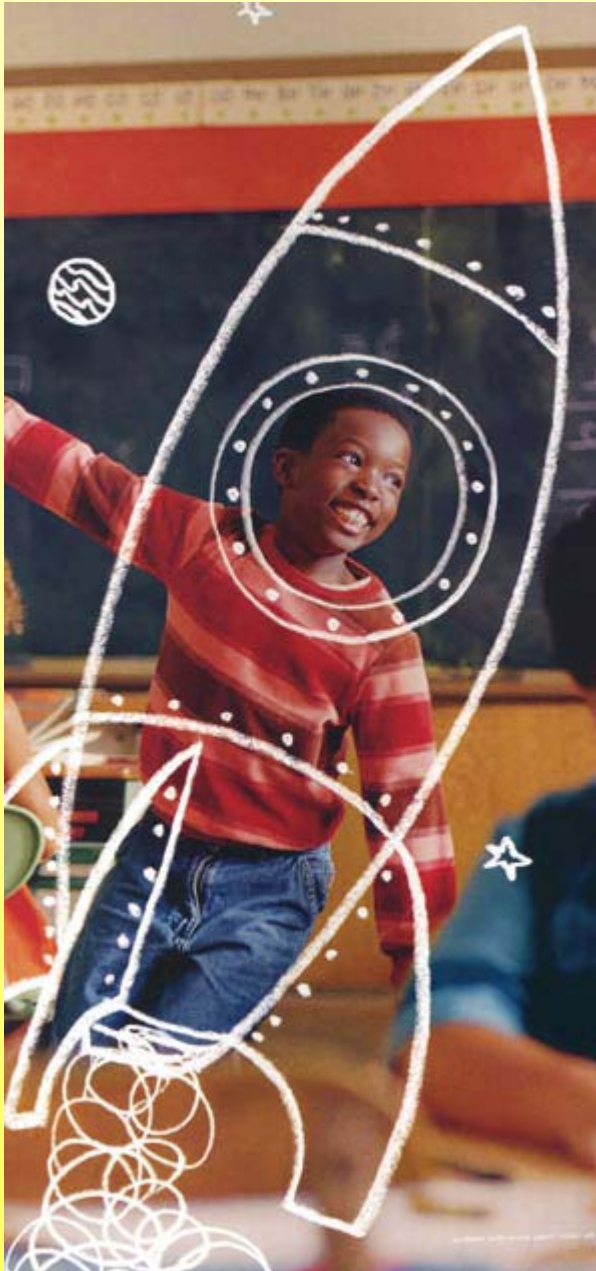
The 20th century was the golden age of the laboratory. Answers to the great research questions were sought within cloistered chambers, where small groups of specialized experts scaled down (or up) phenomena in blissful isolation... Knowledge emerged from a confined center of rational enlightenment, then slowly diffused out to the rest of society... Science was what was made inside the walls where white coats were at work.

Today, all this is changing. Indeed, it would be an understatement to say that soon nothing, absolutely nothing, will be left of this top-down model of scientific influence.

Bruno Latour, Center for the Sociology of Innovation, Ecole des Mines de Paris, Wired, June 2003

World Wide Lab II

1. The laboratory has extended its walls to the whole planet. Instruments are everywhere.
2. You no longer need a white coat or a PhD to research specific questions.
3. There is the question of scale. The size and complexity of scientific phenomena under scrutiny has grown to the point that scaling them down to fit in a laboratory is becoming increasingly difficult.



Microsoft sees a rocket scientist in the potential of this young man. The changing relationship between science and society proposed by Latour suggests that we are already there.

At the same time, we are challenged with science understanding and education in the United States:

The United States ranked 18 or 19 out of 38 countries that participated in the 1999 eighth grade Trends in International Mathematics and Science Study

Nine in 10 Americans (90%) state they are concerned that today's students may not have "the math and science skills necessary to produce the science excellence required for homeland security and economic leadership in the 21st century."
Bayer Facts of Science Education IX, 2003

Andy Grove: Communication Overcomes Computing

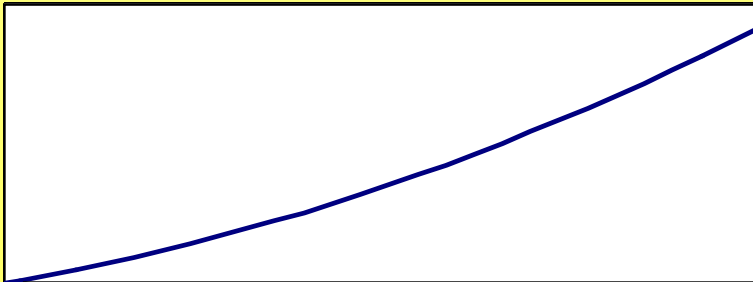
The framework is changing now. The Internet is redefining software. The Internet is redefining the role of computing and communication and their interaction with each other. I still don't understand the framework. I don't think any of us really do. But some aspects of it are pretty clear. It's proven not to be computing based but **communications** based. In it computing is going to be subordinated to the communications task.

"Decisions Don't Wait", Harvard Management Update.

Infrastructural Technologies

IT is, first of all, a transport mechanism - it carries digital information just as railroads carry goods and power grids carry electricity. And like any infrastructural technology, it is far more valuable when shared than when used in isolation. The history of IT in business has been a history of increased interconnectivity and interoperability, from mainframe time-sharing to minicomputer-based local area networks to broader Ethernet networks and on to the Internet. Each stage in that progression has involved **greater standardization of the technology** and, at least recently, greater homogenization of its functionality. For most business applications today, the benefits of customization would be overwhelmed by the costs of isolation.

Nicholas G. Carr, Harvard Business Review, May, 2003



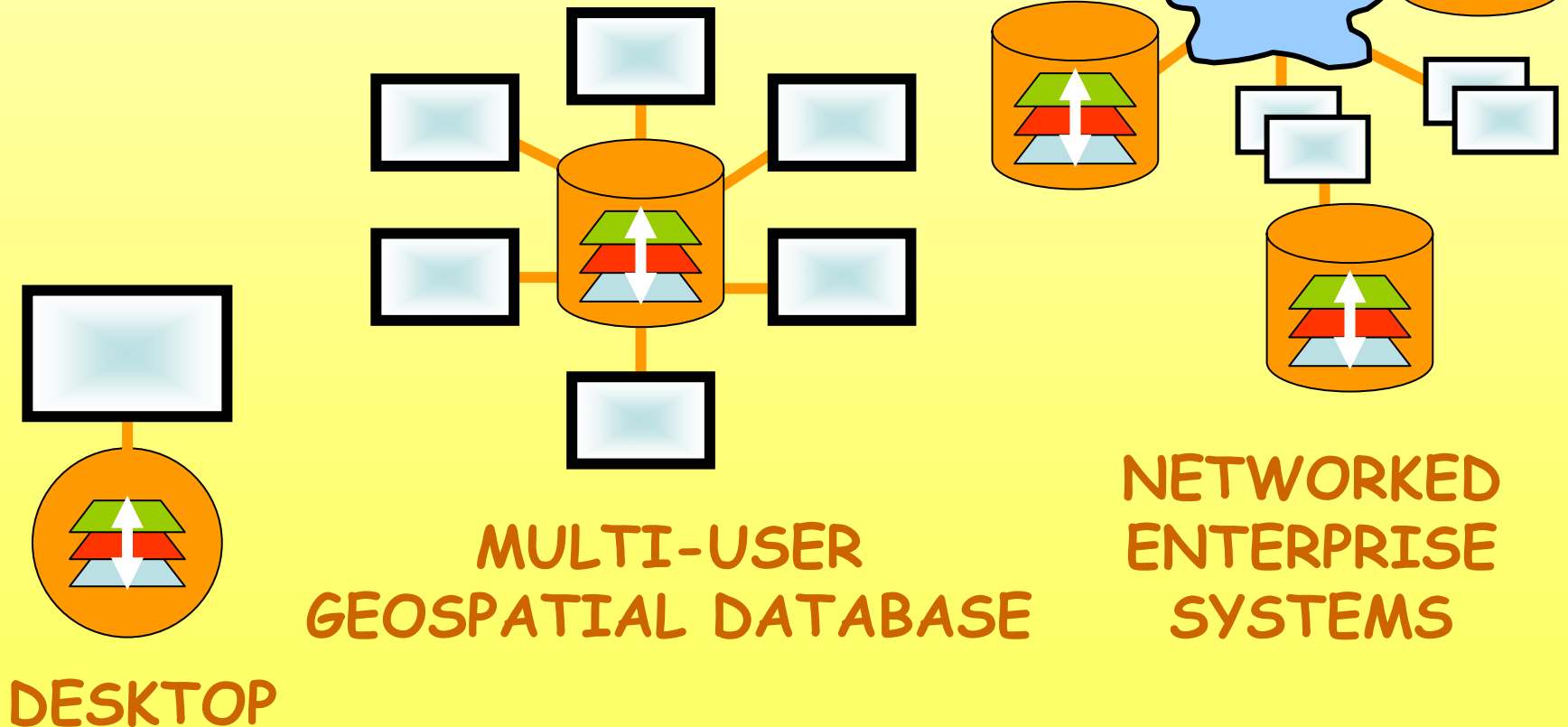
Corollary to Metcalf's Law: the cost of non-compliance goes up as the square of the number of members of the network.

GIS is Changing

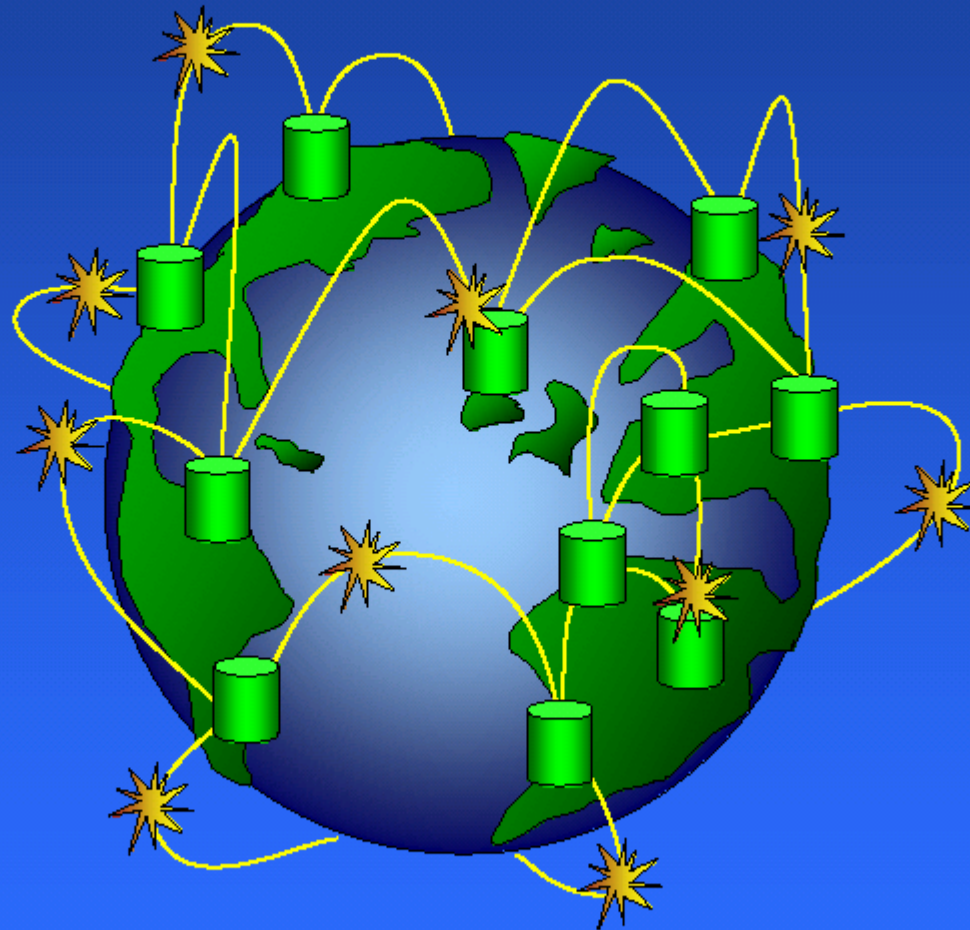
Geographic Information Systems

+ Relational Databases

+ World Wide Web



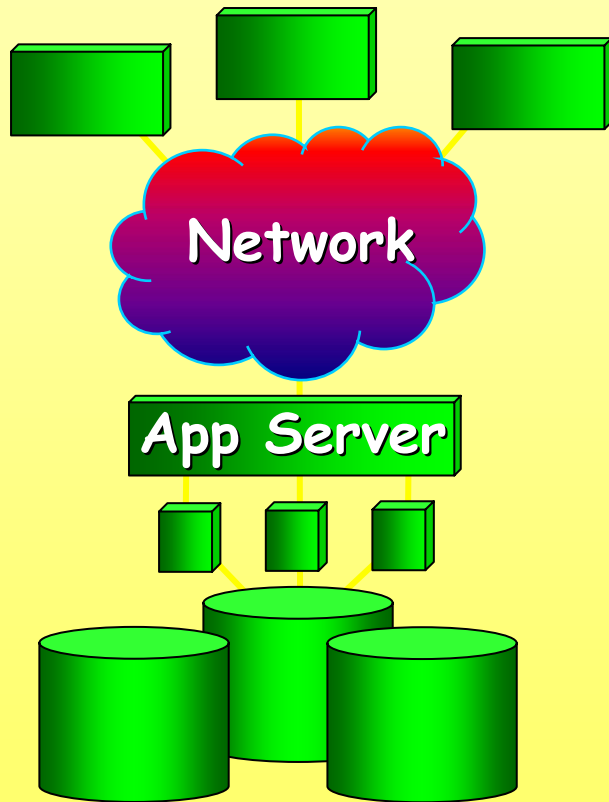
Creating a Digital Earth



... A Nervous System for Spaceship Earth

Geospatial Information System

Many Clients



Geospatial Database

Frameworks for Data

Dissemination & Use

Update and Maintenance

Workflows / Process

QA/QC

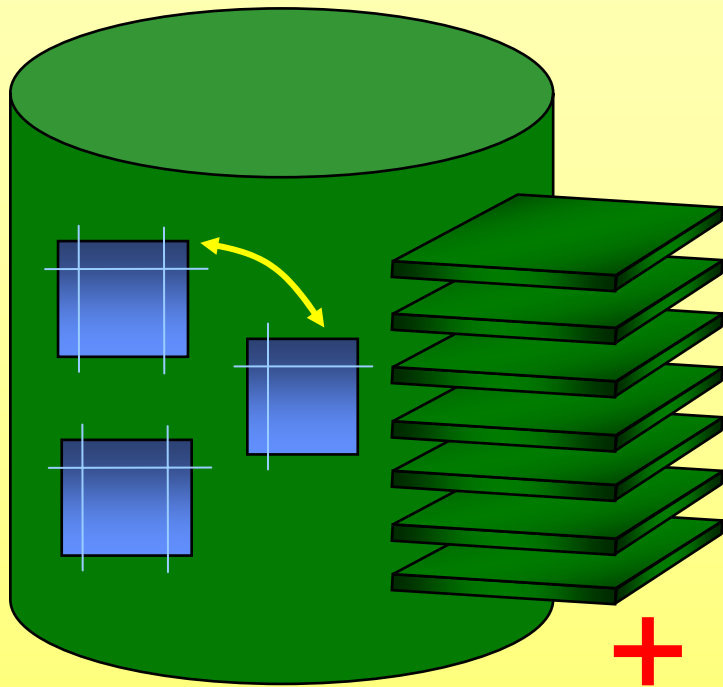
Validation and Integrity

Documentation

Policies for Data

Management, Sharing,
and Use

Geospatial Database?



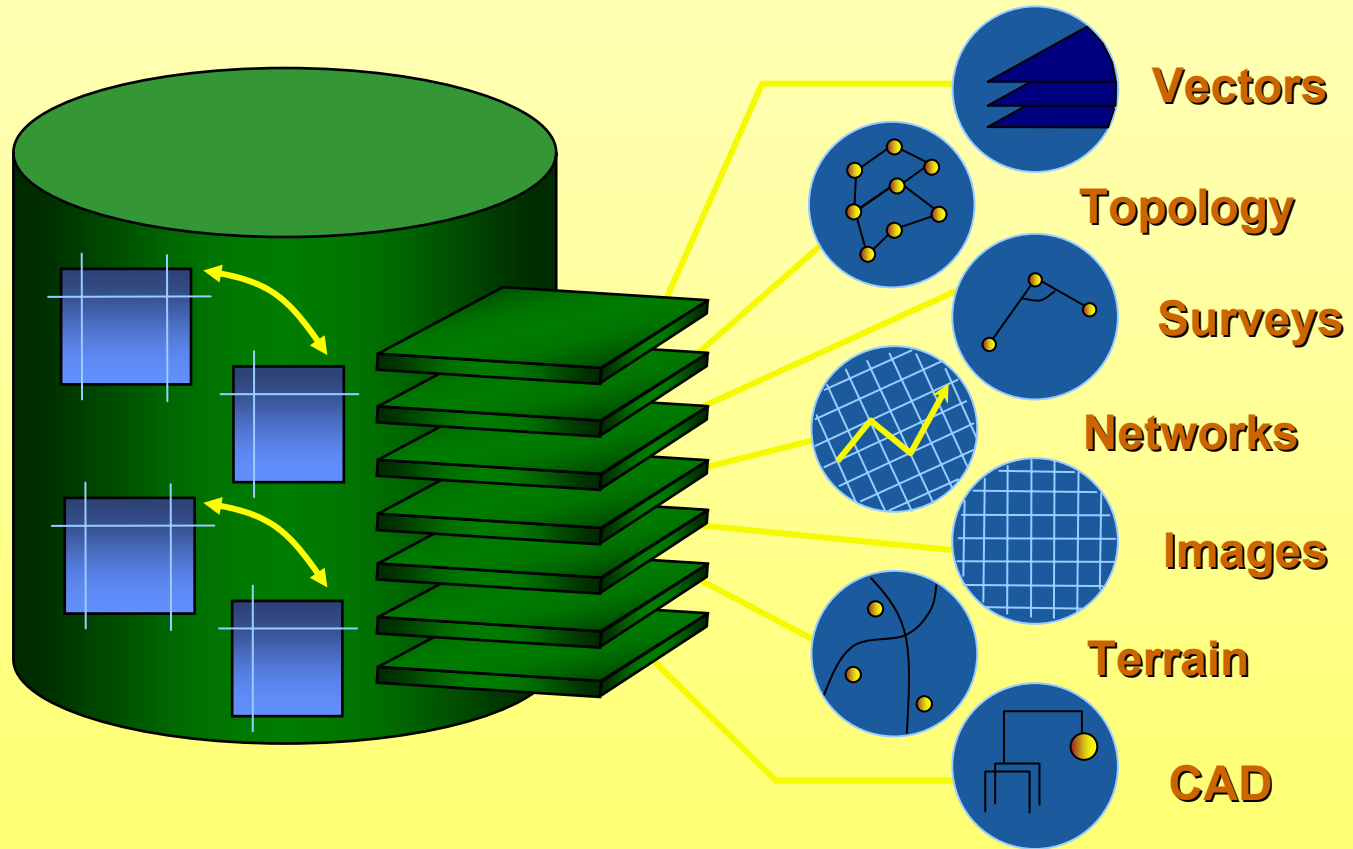
Standard
Relational Database

+ Geospatial
Data Types

+ Geospatial Functions
/ Operators

= Geospatial Database

Many Data Types / Relationships



. . . Using Standard RDBMS Technology

What is GIS...

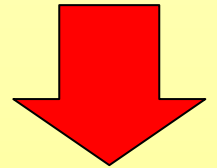


A global system
(built on computers,
networks,
standards, and
geospatial
databases) for
communicating data
and information
about the
environment and
society

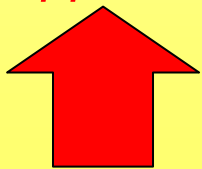
(for Unidata)?

Unidata Objectives (1998):

Sustaining Innovation



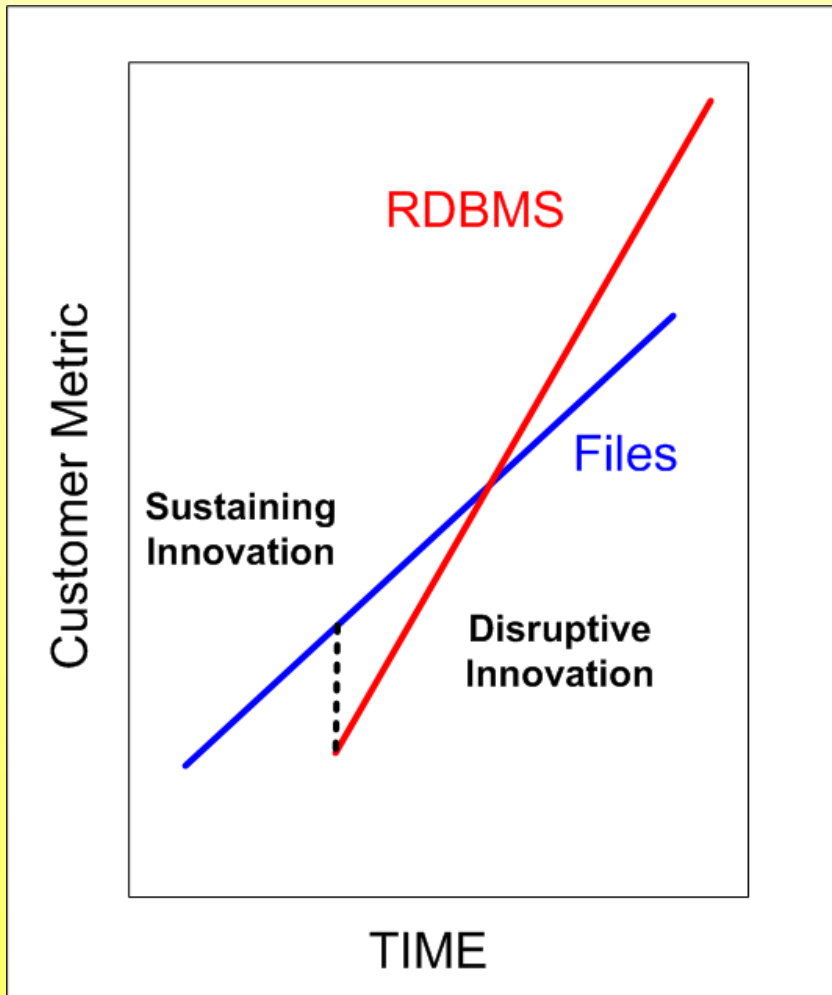
“These objectives either *respond* to users' current needs or *advance* Unidata toward meeting future needs effectively. Most of the "responsive" items are continuations of current Unidata objectives, and their importance is well established. *But only by looking beyond present needs to anticipate future ones, and by pursuing the most promising technical advances, can Unidata remain effective. This is true even though some of these advances involve uncertainties, and the demand for them may not be apparent as yet*”. Unidata, 2003 Proposal.



Disruptive Innovation

Clayton Christensen, *The Innovator's Dilemma*

Organizational Challenge

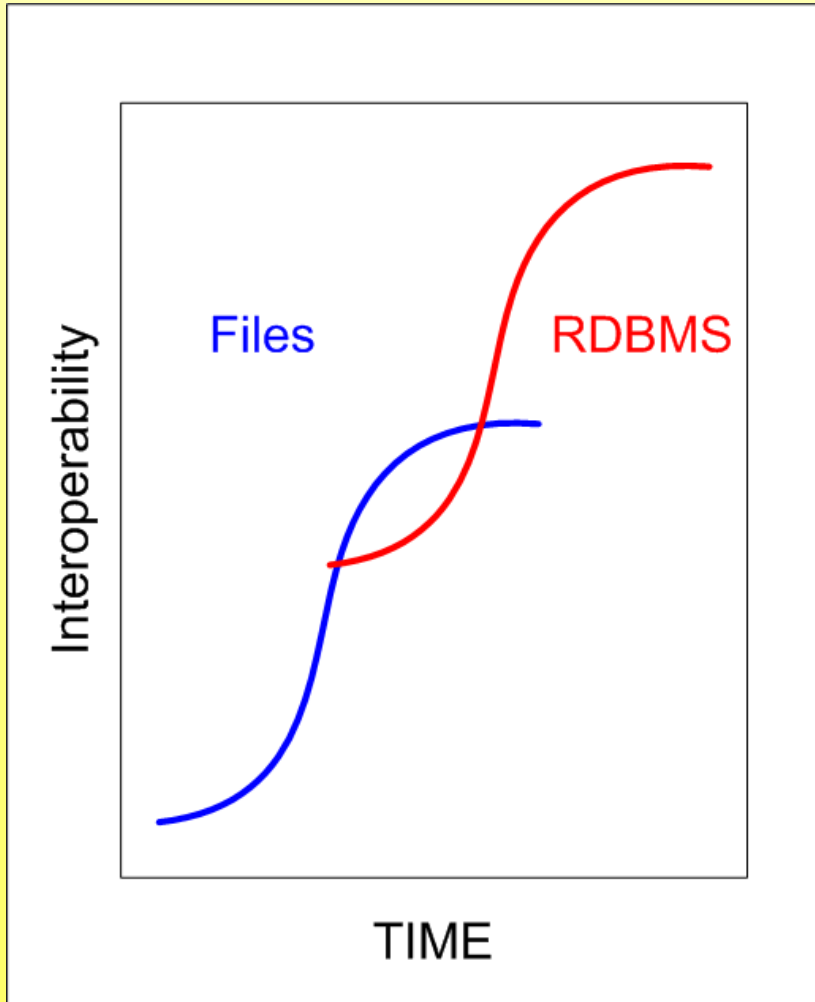


Sustaining Innovation: serves existing customers and organizational values.

Disruptive innovation: serves unknown new customers, requires new processes and organizational values.

Innovator's Dilemma, Clayton Christensen

Organizational Challenge



Technology S Curve: the time to begin development of new technology is when existing technology is doing well.

Does Unidata have the capability (as an organization) to do GIS?

Organizational capabilities		
Resources	Processes	Values
Easy	Change	Hard

Unidata and the GIS Community already share values. The hard work is done.

Parallels

Unidata

IDV, Ferret, GMT, IDL

OPeNDAP

COARDS / CF

NetCDF Library

NetCDF Data



GIS

ArcMap, ArcIMS,
WMS, WFS, WCS

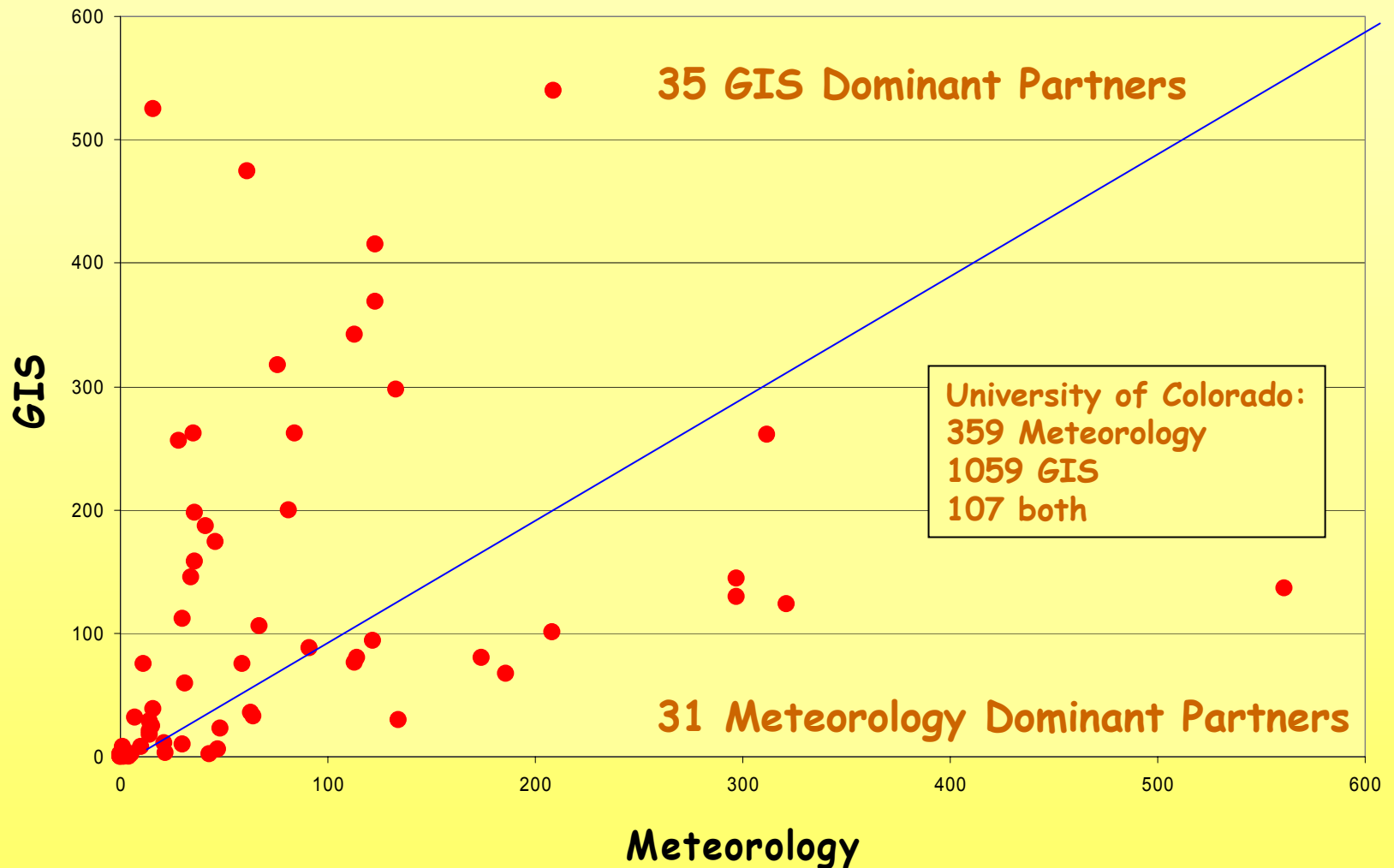
AXL, GML

Community Data Models,
Open GIS Specifications

SQL

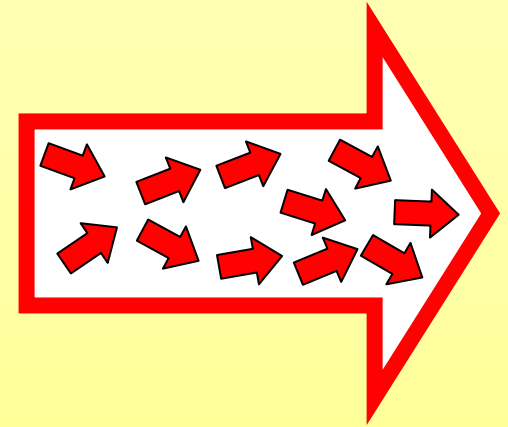
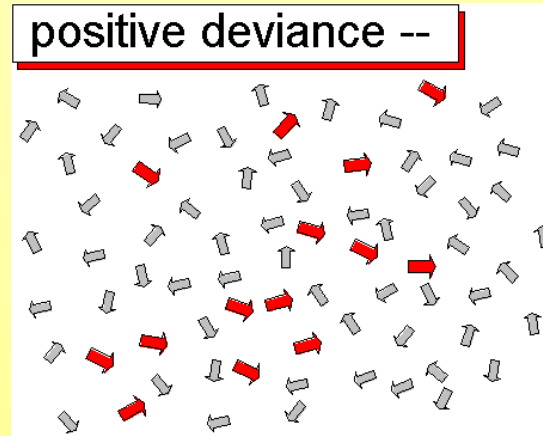
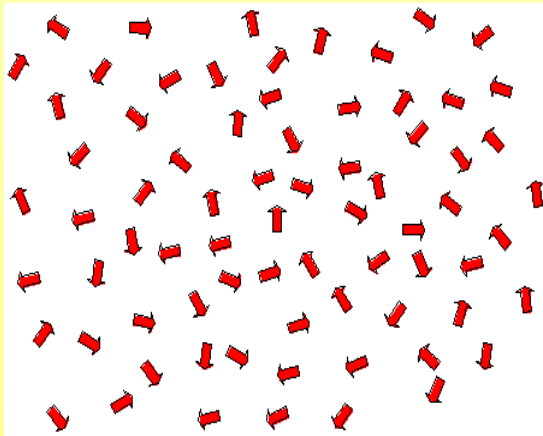
Geospatial Database

Existing Resources / Processes



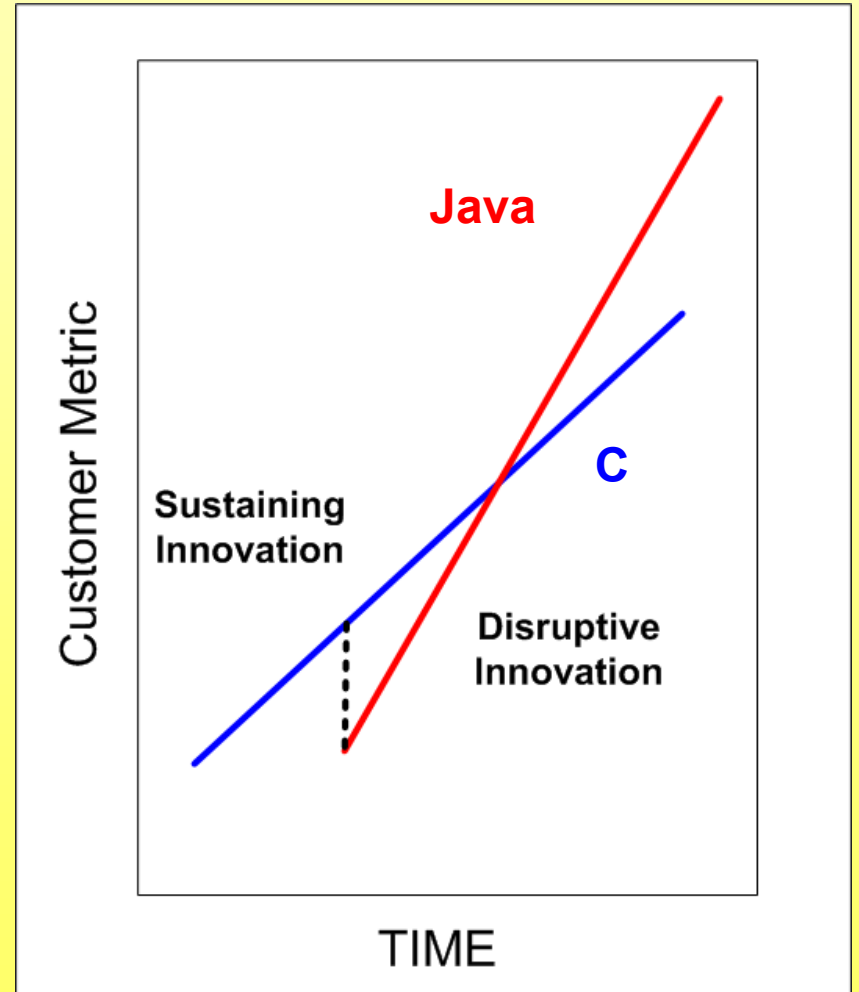
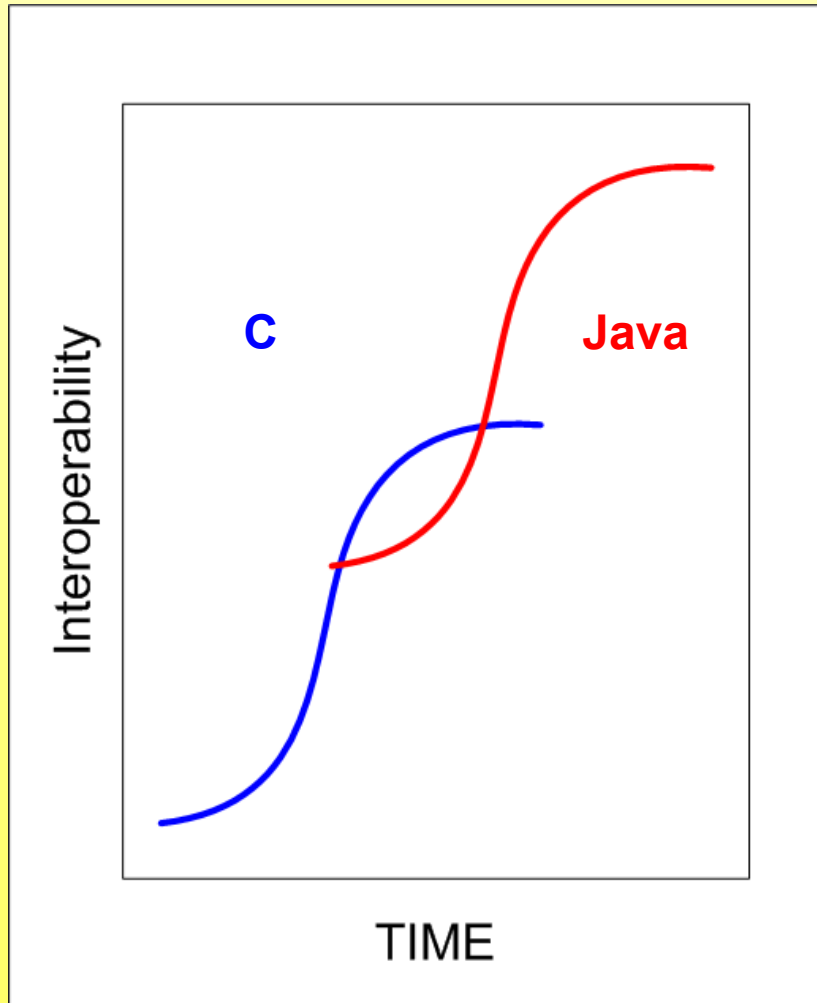
Number of Google hits for "meteorology" and "GIS"
"Meteorology" & "GIS" up to 8% of Meteorology + GIS

Leadership Model: Positive Deviance



Positive deviance says that if you want to create change, you must scale it down to the lowest level of granularity and look for people within the social system who are already manifesting the desired future state. Take only the arrows that are already pointing toward the way you want to go, and ignore the others. Identify and differentiate those people who are headed in the right direction. Give them visibility and resources. Bring them together. Aggregate them. Barbara Waugh

Been There...Done That!



What is GIS for Unidata?



An opportunity to develop *data, tools, and community leadership for enhanced Earth-system education and research*, that is consistent with Unidata's organizational history and **values** and that builds on existing capabilities in the Unidata community!



THE
NEXT
BIG
THING!