THE LTER NETWORK INFORMATION SYSTEM: A FRAMEWORK FOR ECOLOGICAL INFORMATION MANAGEMENT

El Sistema de Informacion LTER Reda: Un Estructura para Manejo de Informacion Ecologica

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LTER


Arctic
Tundra
Bonanza
Creek
North
Temperate
Lakes
Andrews
Forest
Cedar
Creek
Hubbard
Brook
Plum Island Sound
Harvard
Forest
Shortgrass
Steppe
Niwot
Konza
Kellogg
Network
Office
Baltimore
Phoenix
Sevilleta
Coweeta
Virginia Coast
Jornada
Palmer
Station
Luquillo
McMurdo
Dry Valleys

CORE RESEARCH AREAS

- Pattern and control of primary production
- Spatial and temporal distribution of populations selected to represent trophic structure
- Pattern and control of organic matter accumulation in surface layers and sediments
- Patterns of inorganic inputs and movements of nutrients
- Patterns and frequency of site disturbances

Science drives the need for information management

- At the Sites
  - e.g., long-term studies depend on databases to retain project history
- for the Network
  - e.g., communication and integration of data for cross-site projects

“The Americans have need of the telephone, but we do not. We have plenty of messenger boys.”

-- Sir William Preece, chief engineer of the British Post Office, 1876.

LTER Network Information Management Milestones - 1988-1996

1988 Network Information Manager described

1989 Minimum Standard Installation (MSI) Defined

1990 Connectivity Committee formed

1991 Core Data set Catalog published

1992 Metadata content defined

1993 Site data sharing policy described

1994 LTER scientists demand on-line data

1995 Plan for a network information system drafted

1996 Working group for NIS created and charged

1997 First NIS prototype modules developed

LTER Information Managers Committee Goal:

- to promote ecological science by fostering the synergy of informatics and ecological research.

LTER Network Connectivity- 1988-1995

1988 BITNET email

1989 LTERnet Internet-based e-mail forwarding system

1990 Client/Server tools

1991 Gopher servers

1992 WAIS servers

1993 HTTP servers

1994 On-line Data

1995 Web to Database Connectivity

1996 Field site connectivity

1997 First sites connected vBNS (Internet II)

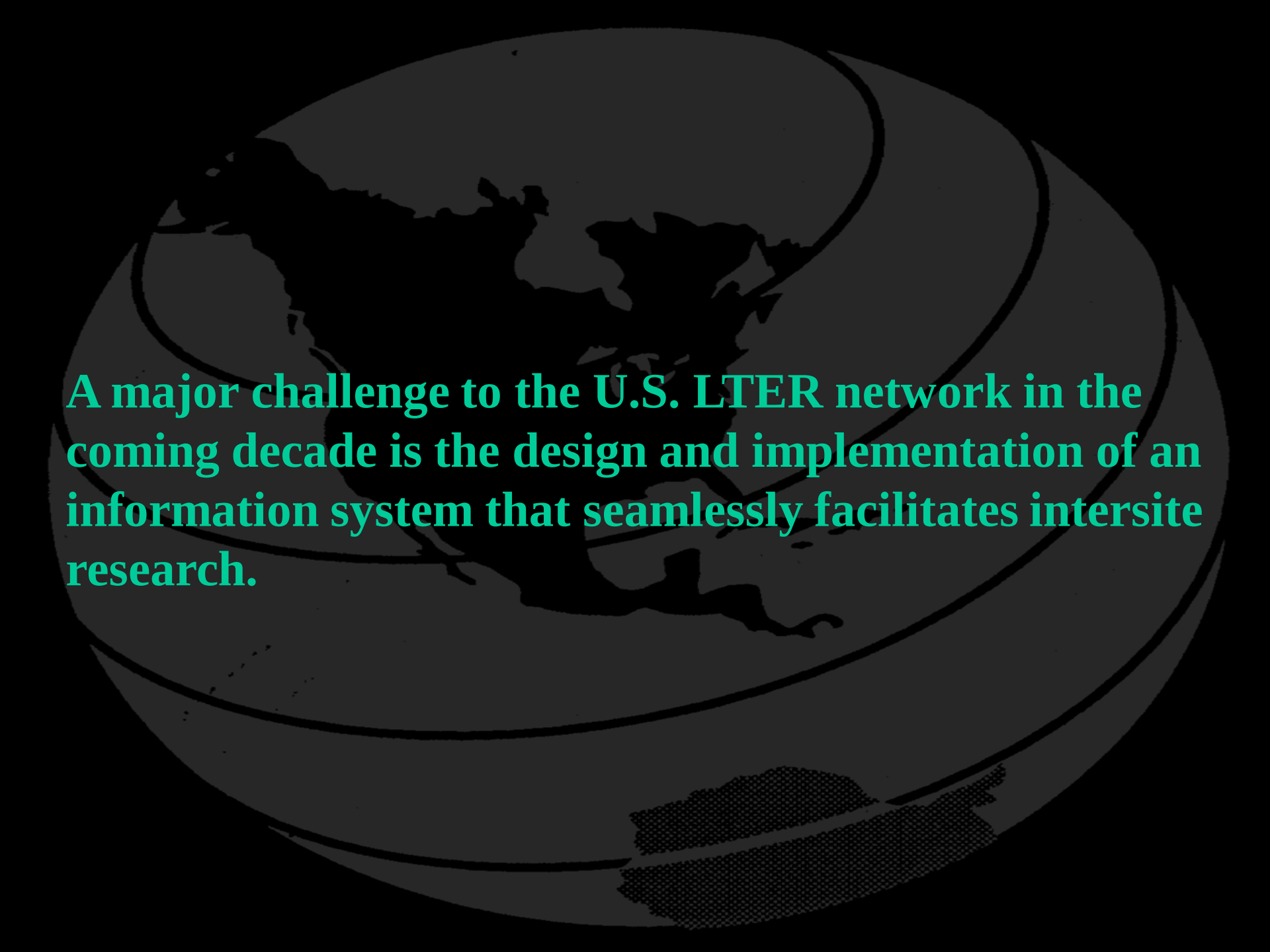
Why do we need a Network Information System?

- Modern Ecology requires increased access to data and metadata distributed across multiple sites for synthesis and integration across broad spatial and temporal scales.

LTER

Existing LTERnet System Functions

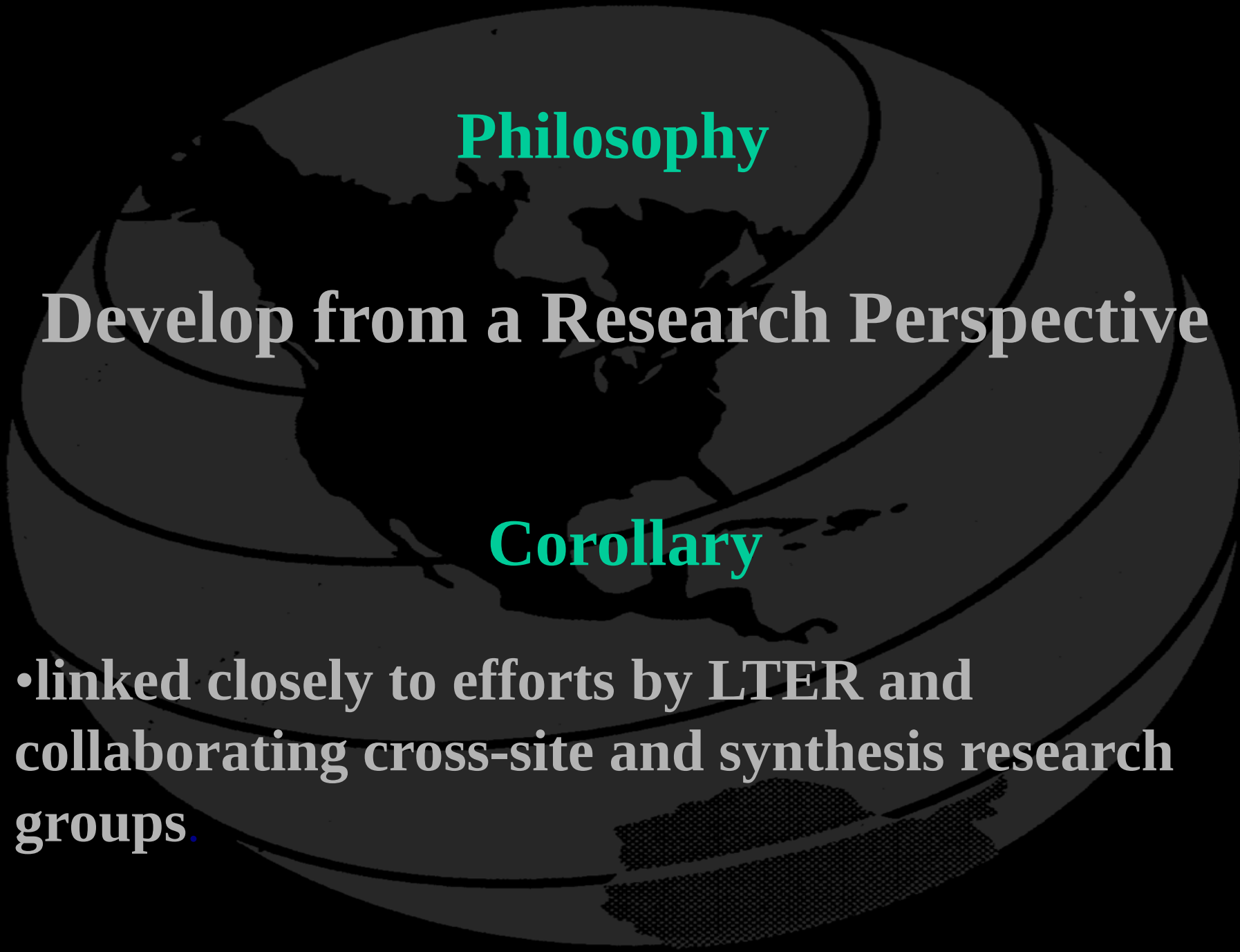
- Electronic mail forwarding system
- File transfer hub
- Hypertext (Web) server (WWW)
- Database server (ODBC compatible SQL Server)
- Data archive



A major challenge to the U.S. LTER network in the coming decade is the design and implementation of an information system that seamlessly facilitates intersite research.

The Ecological Informatics Challenge

- Can we make information available to ecologists:
  - in ways they can **locate** the information they need?
  - with information in forms they can readily use?

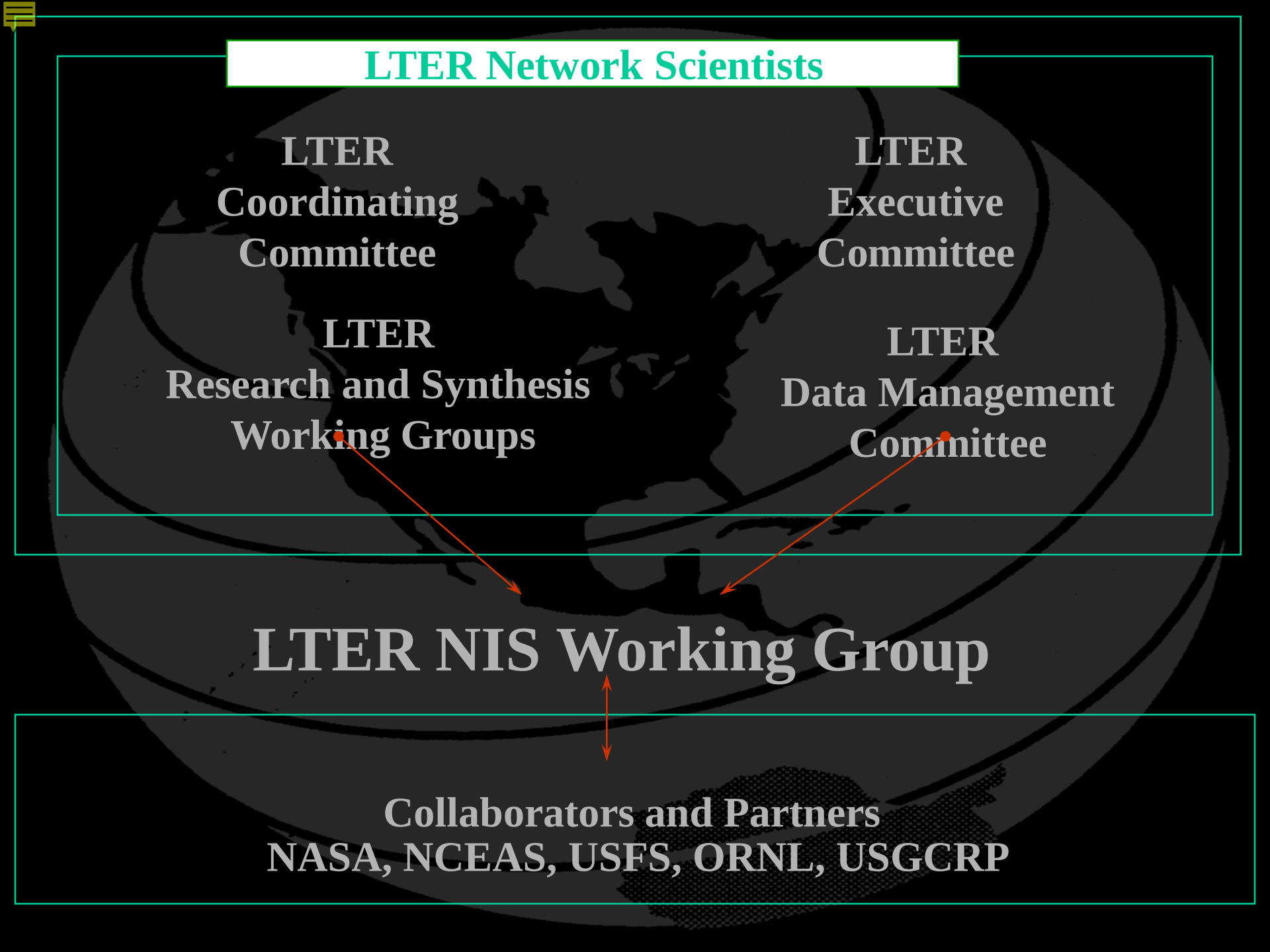


Philosophy

Develop from a Research Perspective

Corollary

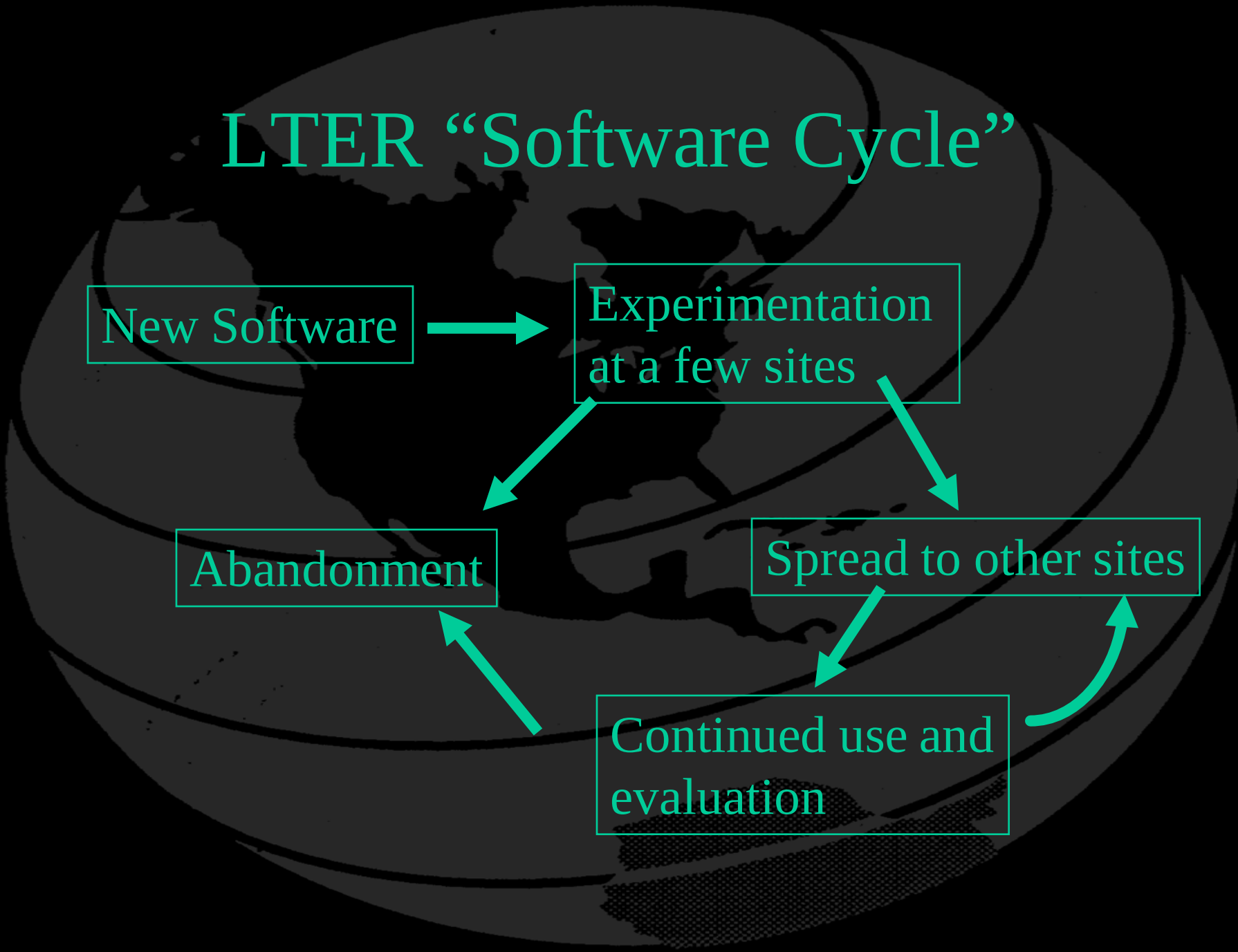
- linked closely to efforts by LTER and collaborating cross-site and synthesis research groups.


LTER Network Scientists
LTER Coordinating Committee
LTER Executive Committee
LTER Research and Synthesis Working Groups
LTER Data Management Committee
LTER NIS Working Group
Collaborators and Partners
NASA, NCEAS, USFS, ORNL, USGCRP

Goals of the LTER NIS Effort

- Increase Utility of Existing System
- Increase Access and Query Capabilities on Intersite Data
- Capitalize on Strength in Site Diversity

LTER “Software Cycle”



Desired Access and Query Capabilities

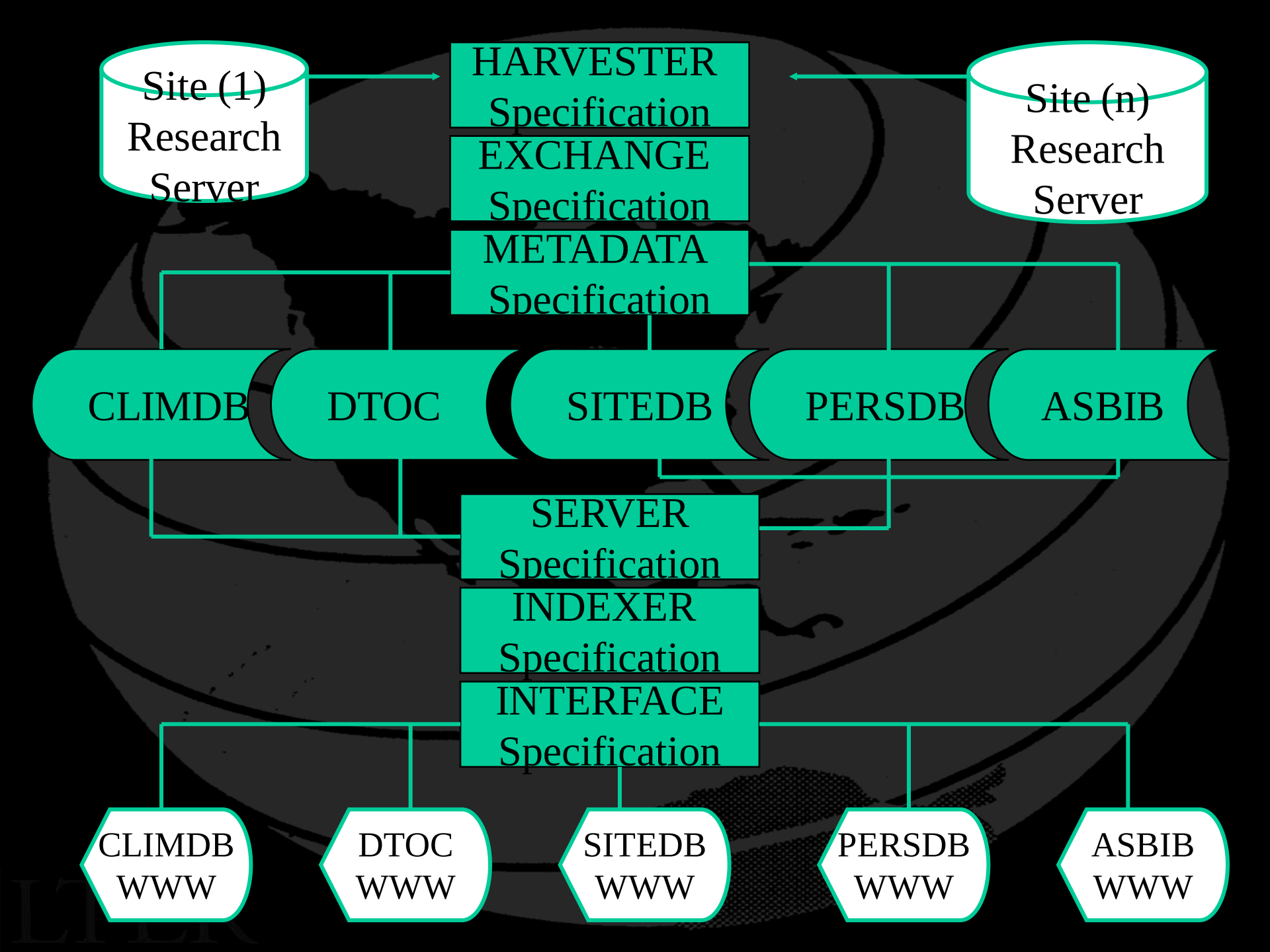
- Locate information anywhere in the network
- combine and analyze data from different sites
- answer standard information requests
- economically build query systems for special projects

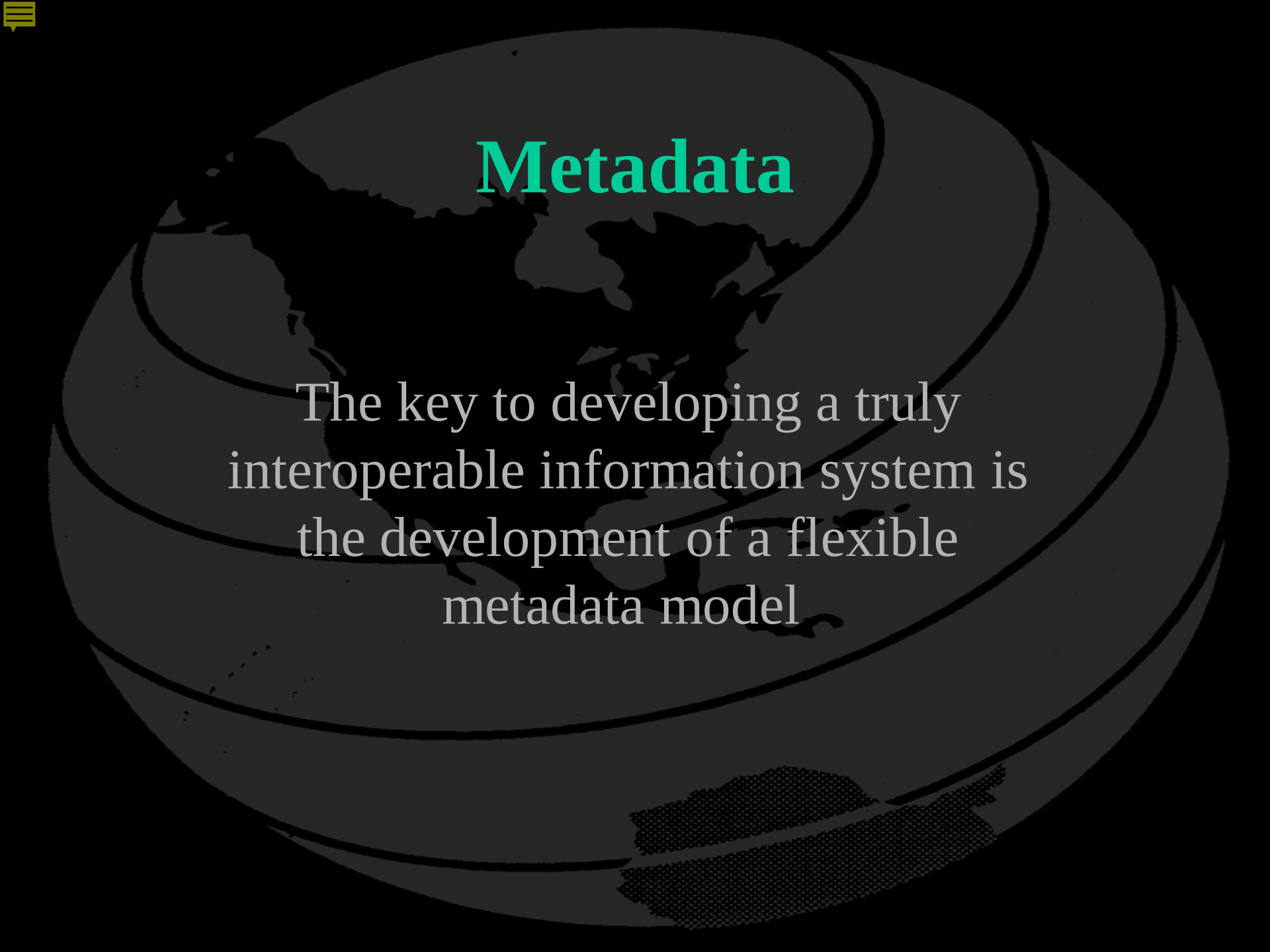
NIS Development Strategy

- Build prototypes using a variety of different technologies
- Evaluate prototypes for function and interoperability
- Design a modular framework from the results

What do we mean by "Framework"?

- A set of specifications to guide the NIS development that will assure modularity and interoperability through time.


Site (1) Research Server
HARVESTER Specification
EXCHANGE Specification
METADATA Specification
Site (n) Research Server
CLIMDB
DTOC
SITEDB
PERSDB
ASBIB
SERVER Specification
INDEXER Specification
INTERFACE Specification
CLIMDB WWW
DTOC WWW
SITEDB WWW
PERSDB WWW
ASBIB WWW



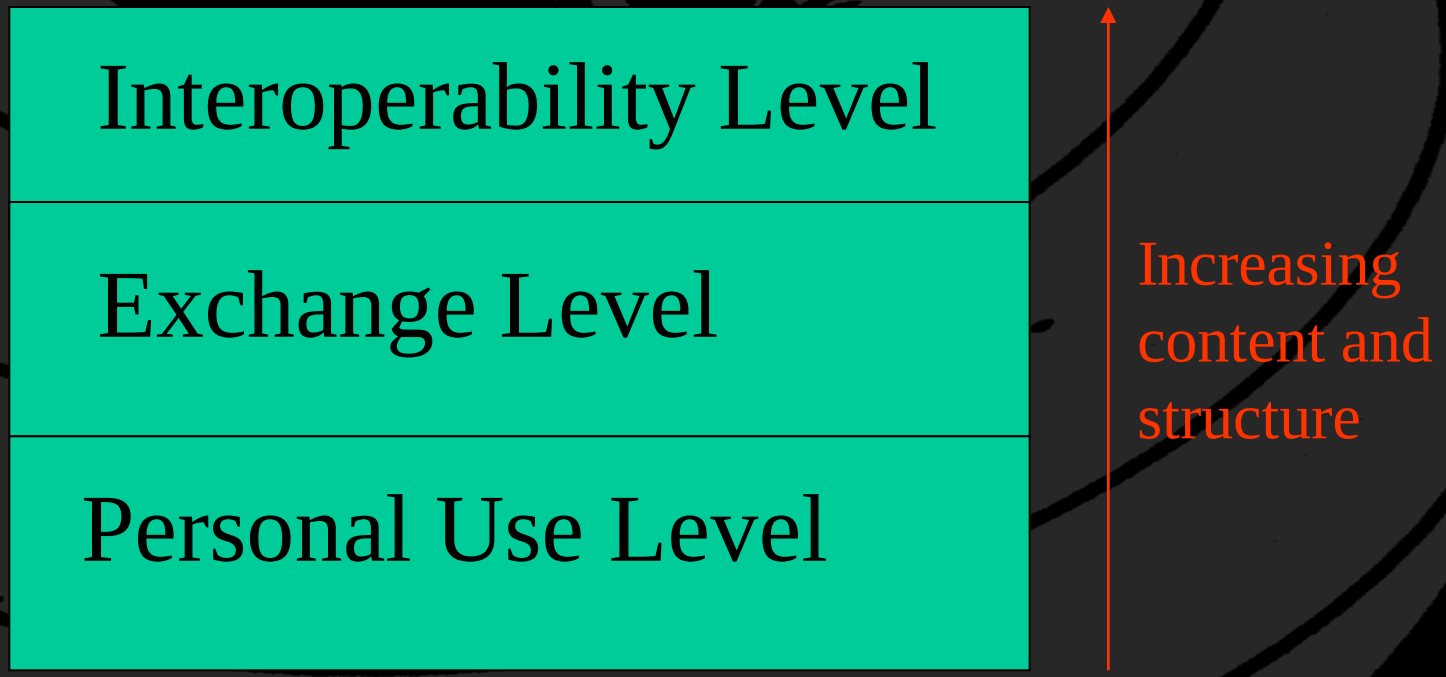
Metadata

The key to developing a truly interoperable information system is the development of a flexible metadata model

Metadata content and structure

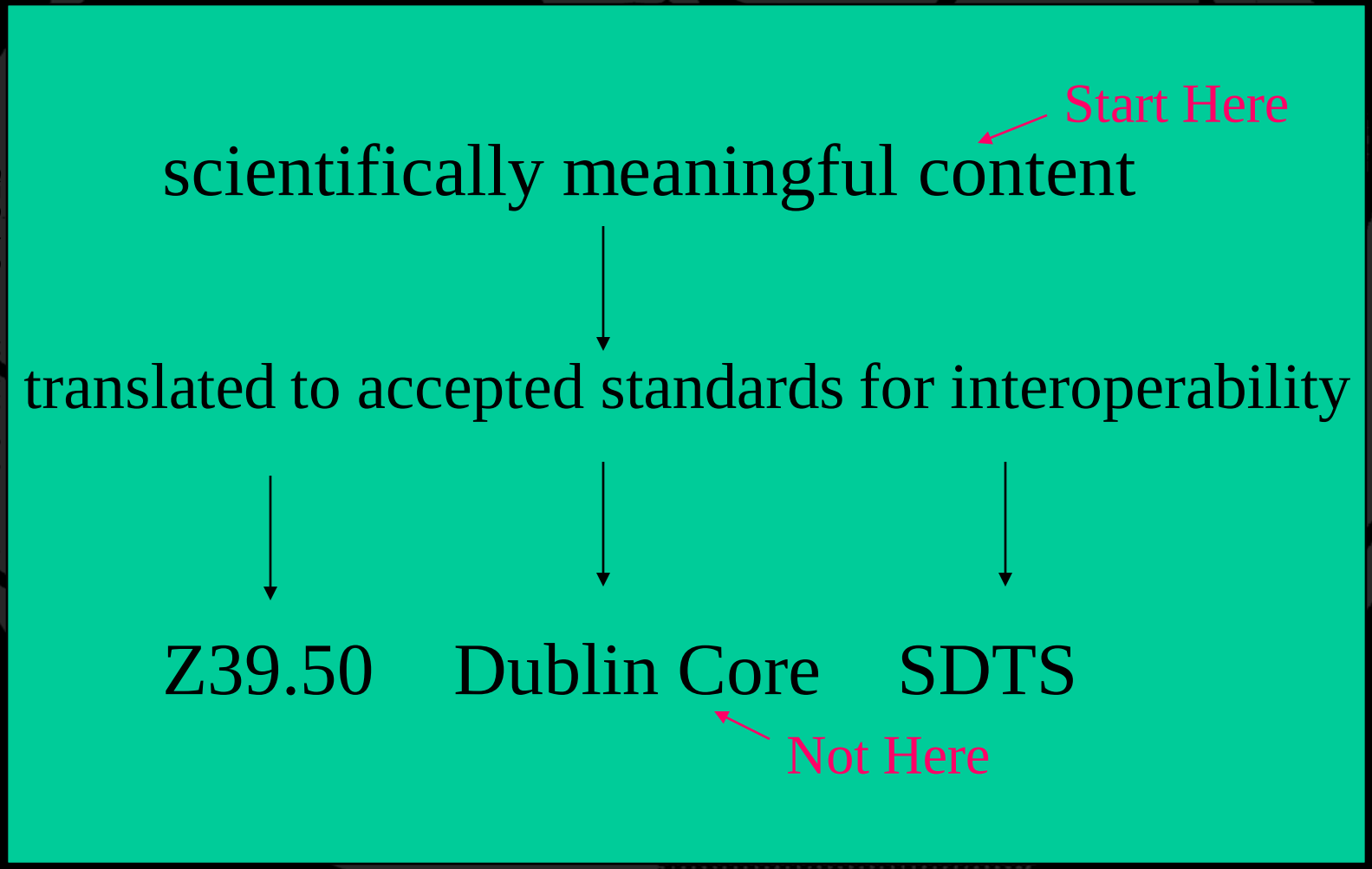
vs.

Level of Use

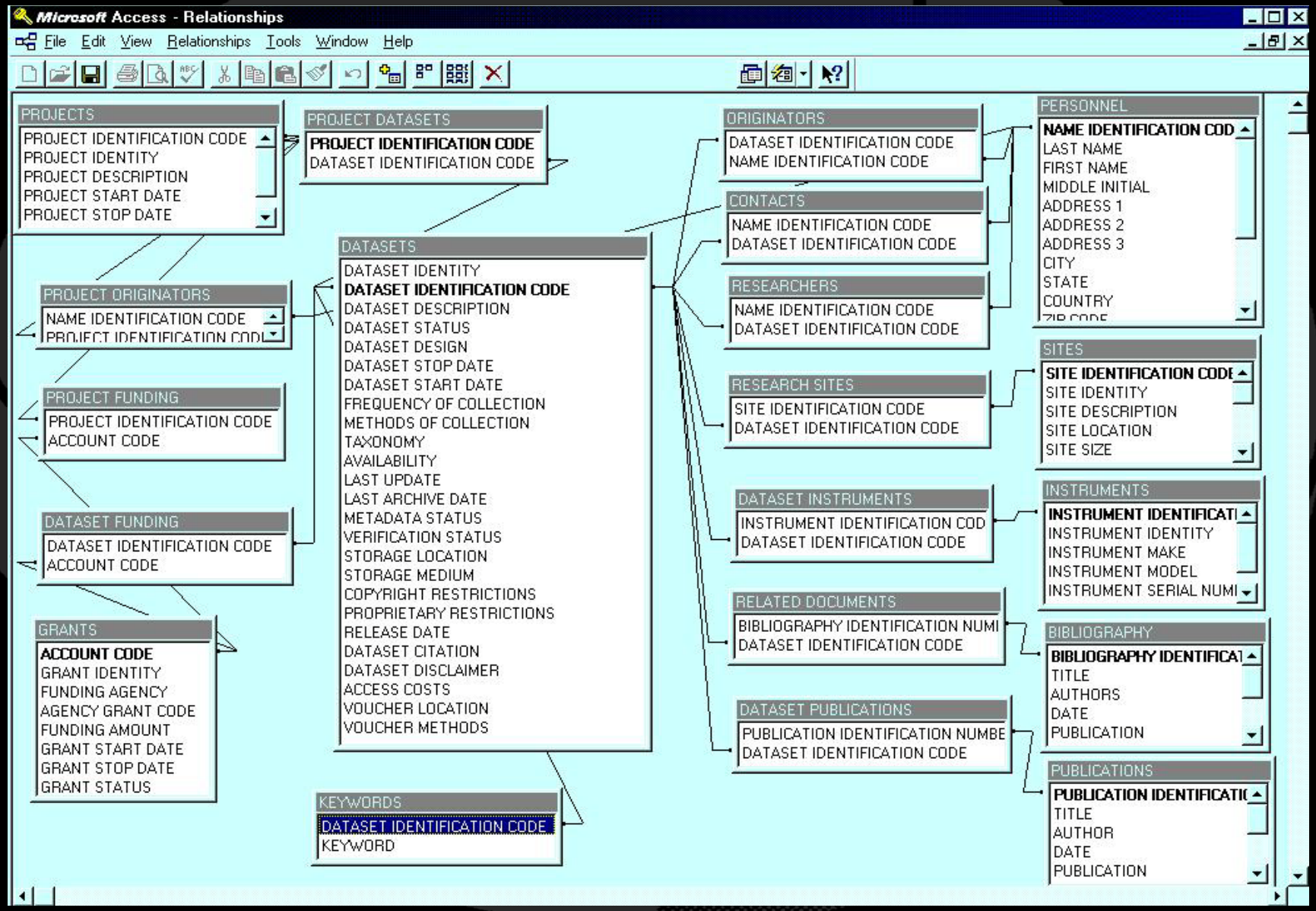


**following Michener et.al. 1997*

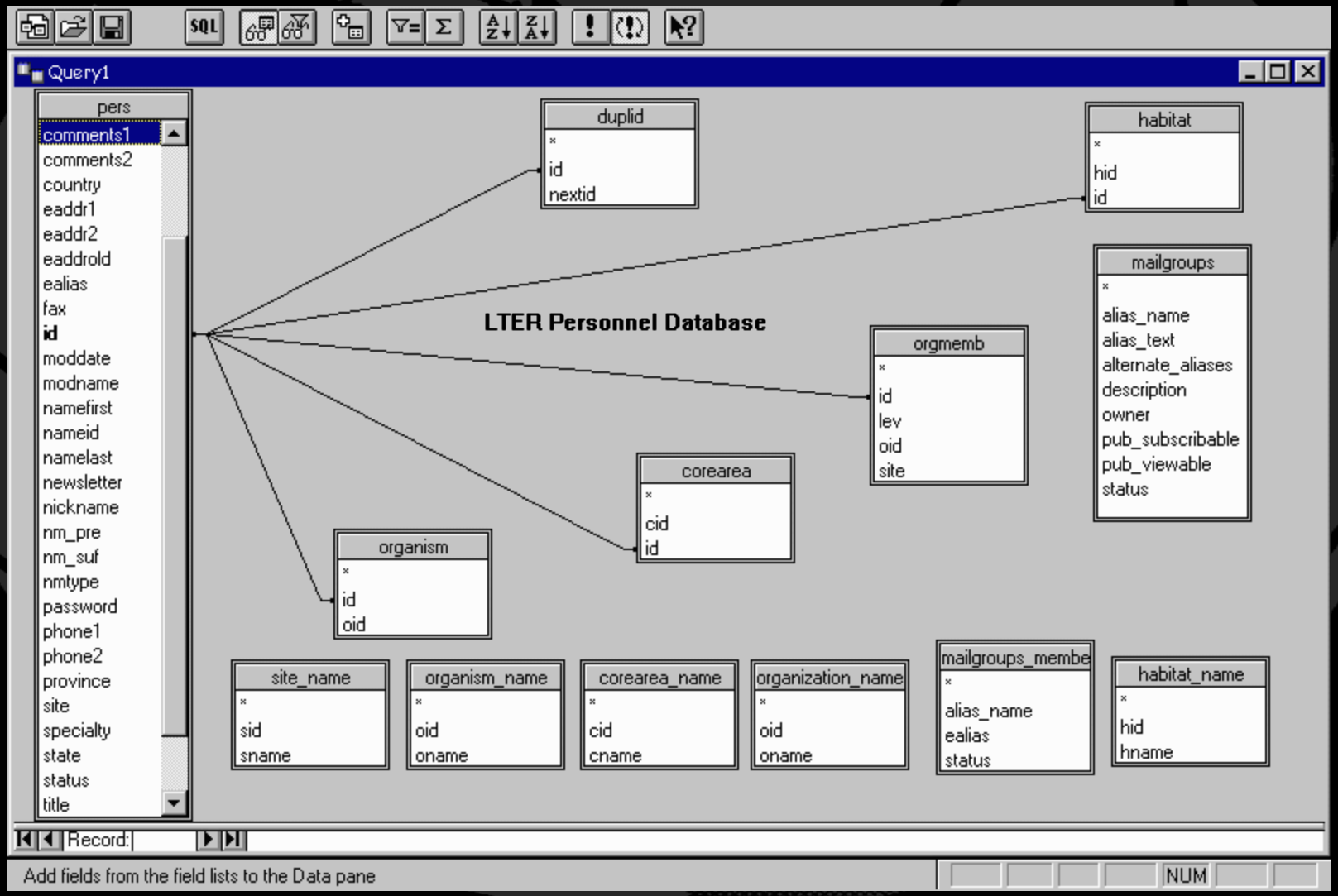
Metadata interoperability does not start with standards



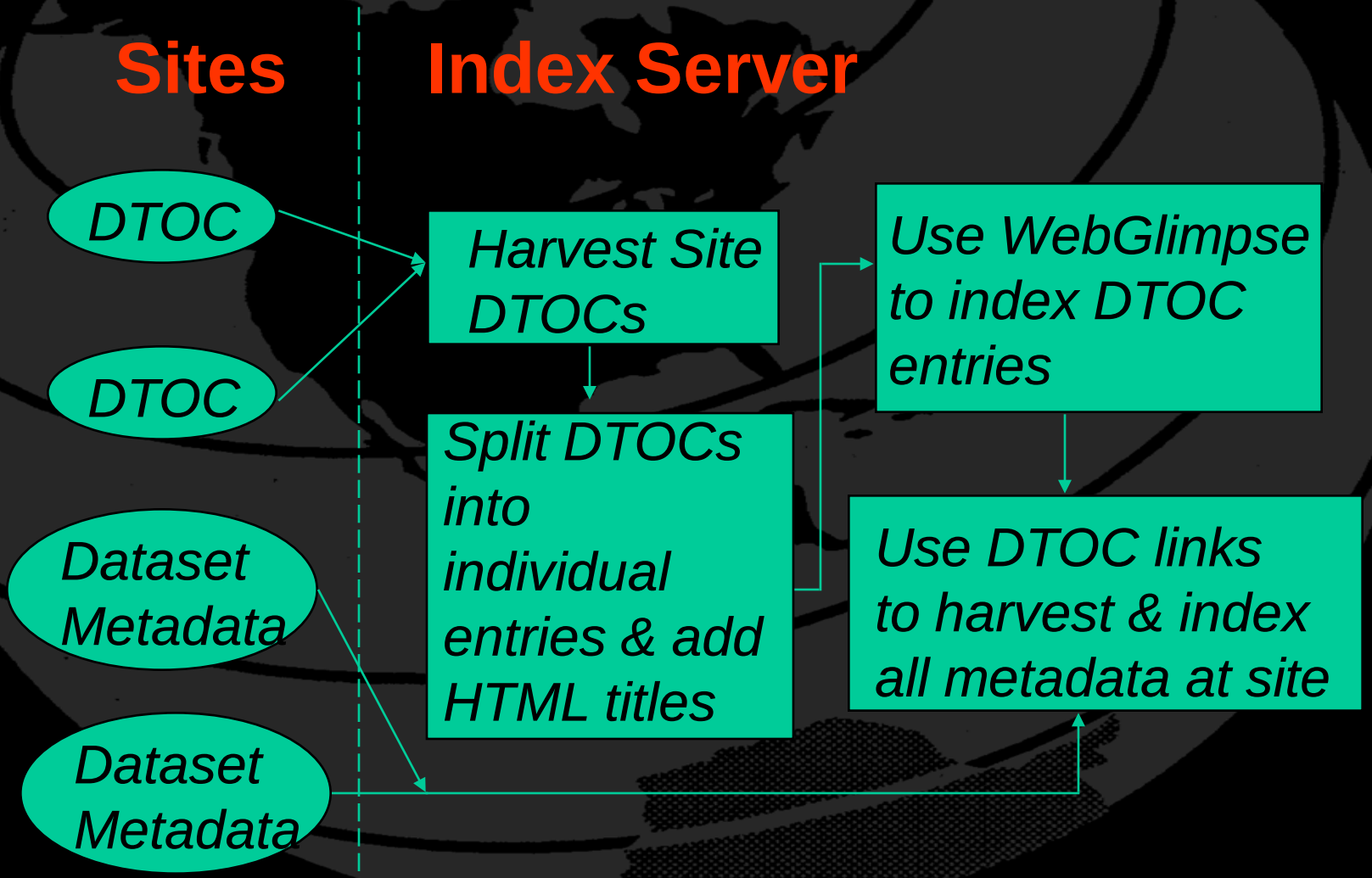
LTER METADATA MODEL V0.01



LTER Personnel Database



Preparation of DTOC Indices

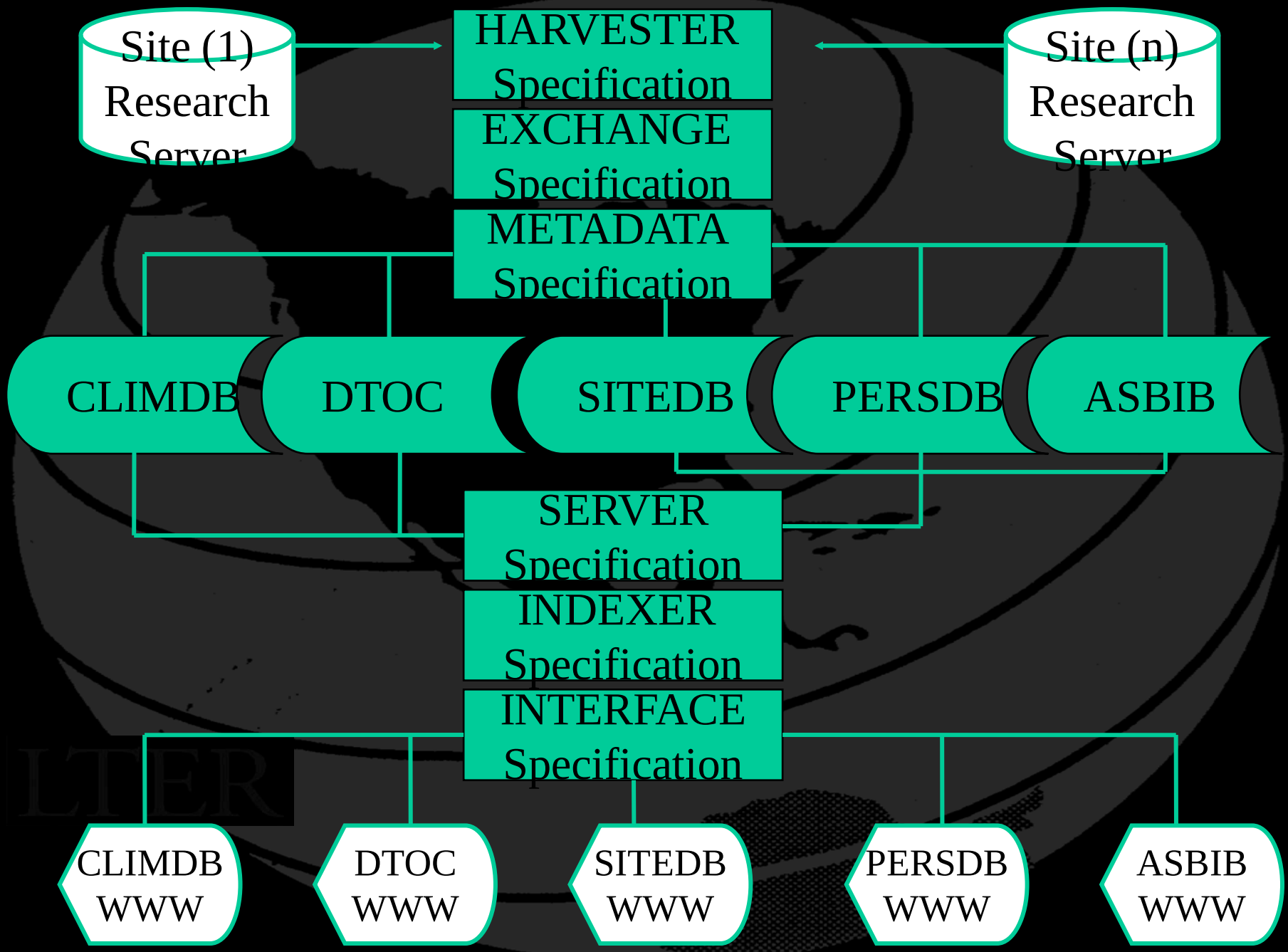


Data Table-of-Contents (DTOC)

- Each site created a simple Data Table of Contents containing their data sets
- Sample DTOC entry

•Bird Species List for the H.J.Andrews Experimental Forest and Upper McKenzie River Basin -- AND
--McKee, W. Arthur
-- biodiversity, bird, species list
--SA003

Colored letters have a WWW link back to site metadata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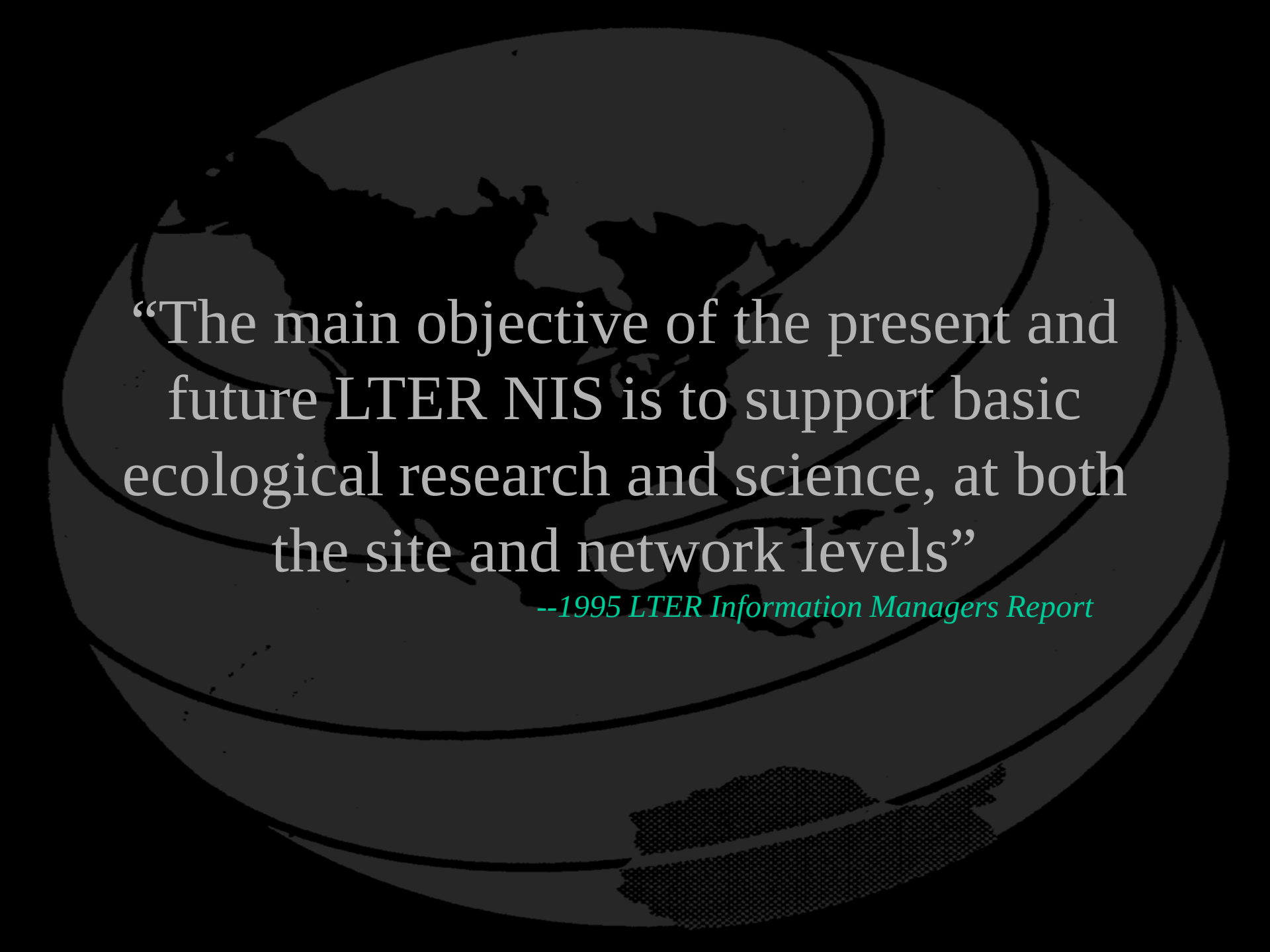
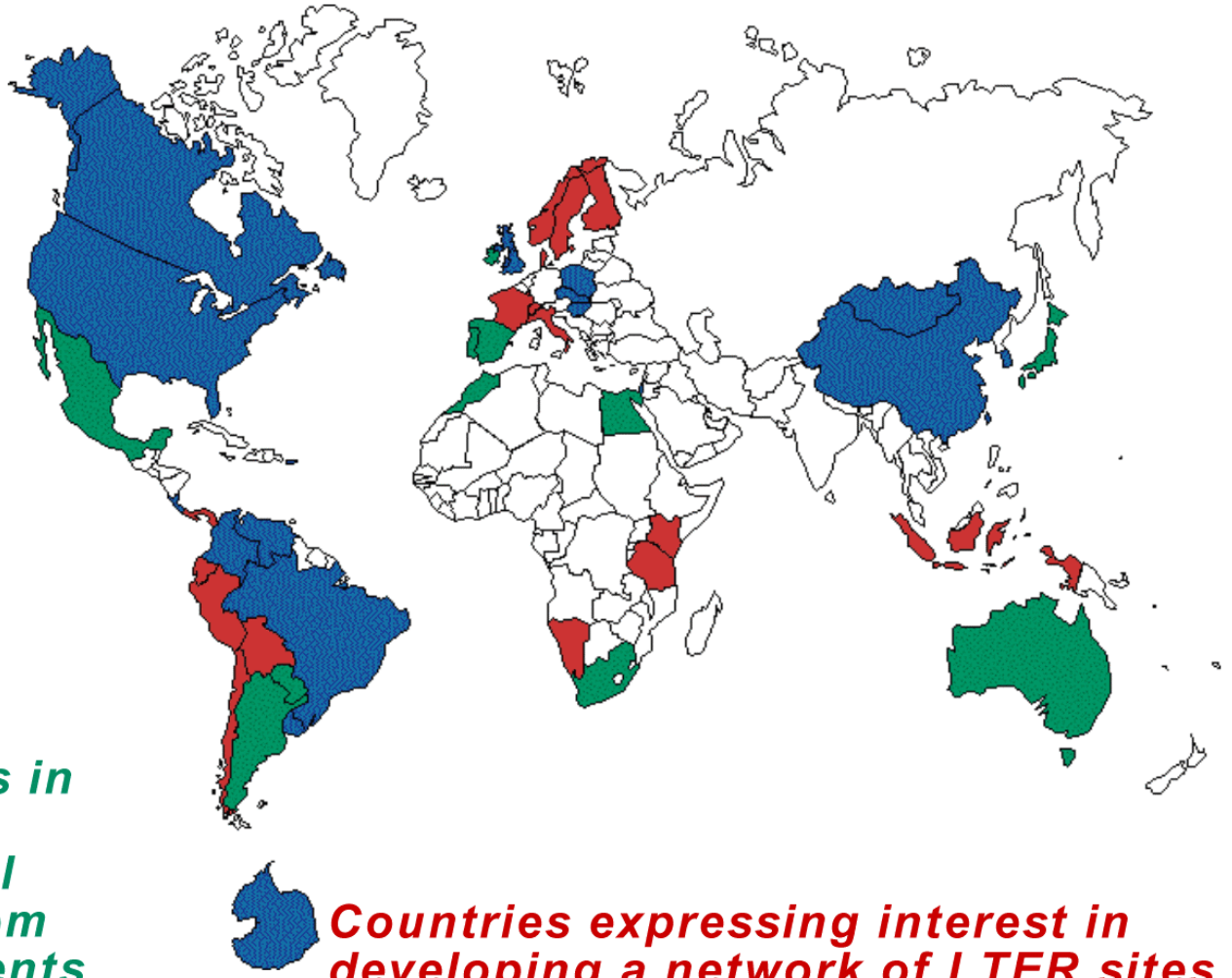


“The main objective of the present and future LTER NIS is to support basic ecological research and science, at both the site and network levels”

--1995 LTER Information Managers Report

Official ILTER Networks

- Brazil
- Canada
- China
- China–Taipei
- Colombia
- Costa Rica
- Czech Republic
- Hungary
- Israel
- Korea
- Mongolia
- Poland
- United Kingdom
- United States
- Uruguay
- Venezuela



LTER Networks in development, awaiting formal recognition from their governments

- Argentina
- Australia
- Egypt
- Ireland
- Japan
- Mexico
- Morocco
- Paraguay
- Portugal
- South Africa
- Spain

Countries expressing interest in developing a network of LTER sites

- Bolivia
- Chile
- Denmark
- Ecuador
- Finland
- France
- Indonesia
- Italy
- Kenya
- Namibia
- Norway
- Panama
- Peru
- Sweden
- Switzerland
- Tanzania

International LTER Network Information Management

Groundwork has been done, but there is a need for continued collaboration and cooperation among international information managers to establish international specifications for data exchange and information interoperability.


LTER