



**N S D L**

THE NATIONAL SCIENCE DIGITAL LIBRARY

# *Technical Network Services*



# Role of Technical Network Services

## From the Solicitation...

- Maintain and upgrade NSDL infrastructure and NSDL.org (with RC)
- Provide technical support for NSDL tools, services, and collections accessioning
- Support *Pathways, Integrated Services*, and other projects to contribute
- Facilitate discussions to identify priorities for new services
- Marshal “collective intelligence” of larger community
- Develop business model to sustain infrastructure after grant ends

# PI Team

- Carl Lagoze (PI, Cornell): Digital library architectures, eScience repositories, interoperability protocols
- Michael Wright (UCAR): Led technical development and operations for DLESE and strategic initiatives for NCAR Library
- Tamara Sumner (U of Colorado): Educational technology, cognitive and learning science, user-centered design

# First 6 Months Accomplishments

- Ramp up new TNS organization (contracts and people) – *still underway*
- Understand existing infrastructure and processes – Technical Audit, TNS All Hands Retreat (with RC), Collections Audit
- Initiate strategic planning with RC
- Initiate technical services to be provided

# Big Picture for TNS

- New organization, new circumstances
- Now
  - Streamlining operations
  - Ramping up community services and collaborative development processes
- Next
  - Enhanced educational services driven by grantees, RC, exemplars

# Strategies & Resource Alignments

Project management and administration	1.5 FTEs
<b>1) Maintain and operate the technical infrastructure</b>	<b>4.7 FTEs</b>
<b>2) Mobilize the community</b>	<b>3.5 FTEs</b>
<b>3) Support educational exemplars</b>	<b>2 FTEs</b>
4) Improve NSDL.org user experience	0.5 FTE
5) Evaluation	0.3 FTE
6) Extend strategic partnerships	As needed

# 1) Technical Infrastructure Operations

- What is the “data center” infrastructure?
  - HW/SW Stack underpinning NSDL.org and hosted community services
  - Technical components of collection accessioning, aggregation, and curation
- Objectives
  - Lower operating costs
  - Improve maintainability and scalability

# Operations: Action items

## Simplification, streamlining, virtualization

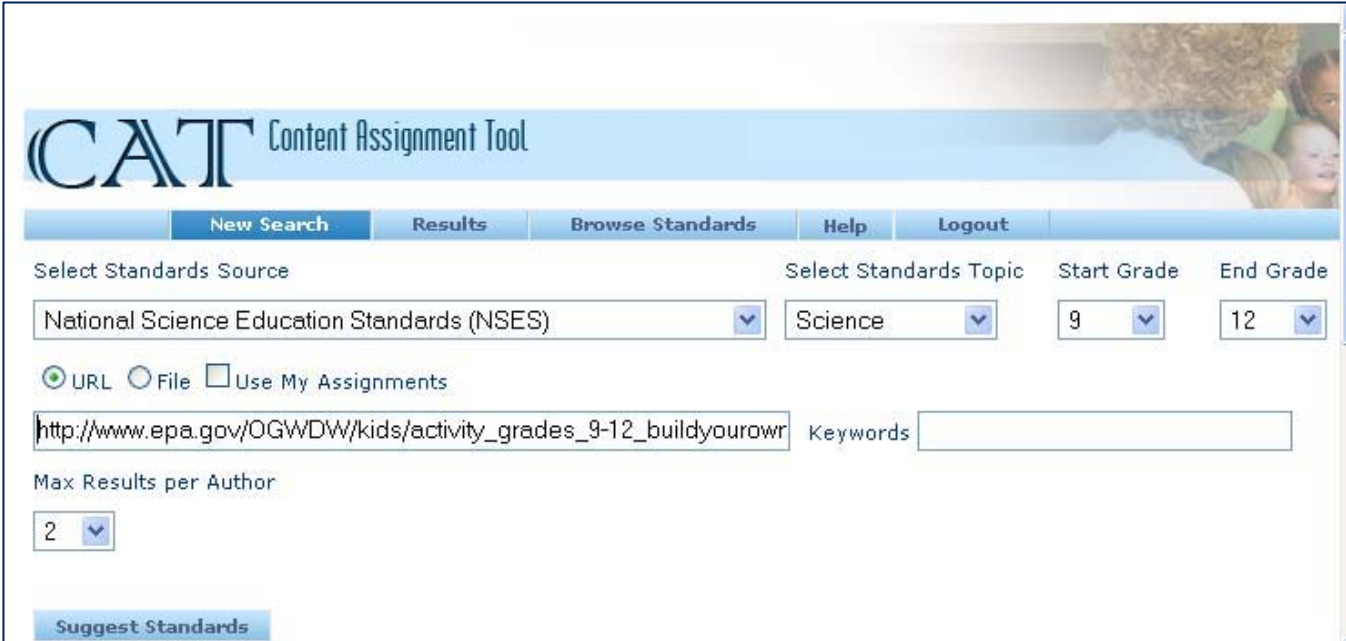
- From 20+ servers down to 6 or 7
- Reduce supported software components
  - Shibboleth single sign-on to be phased out
- Refocus collections aggregated for NSDL.org
  - Current: 165 collections with 2.1 million items
  - Proposed: 96 collections with 100,000 items
- “Spin up the cloud” for hosting services
  - Instructional Architect, Strand Map Service, CAT
  - MSP2, SMILE



# Operations: Action items continued

Rethink the current “handover” model for supporting community developed software

- Code
- License
- Training
- Updates
- Strategic Alignment



The screenshot shows the CAT Content Assignment Tool interface. At the top, there is a navigation bar with the following tabs: **New Search**, **Results**, **Browse Standards**, **Help**, and **Logout**. Below the navigation bar, the interface is divided into several sections:

- Select Standards Source:** A dropdown menu currently set to "National Science Education Standards (NSES)".
- Select Standards Topic:** A dropdown menu currently set to "Science".
- Start Grade:** A dropdown menu currently set to "9".
- End Grade:** A dropdown menu currently set to "12".
- Search Method:** Three radio buttons:  URL,  File, and  Use My Assignments.
- URL:** A text input field containing the URL "http://www.epa.gov/OGWDW/kids/activity\_grades\_9-12\_buildyourowr".
- Keywords:** An empty text input field.
- Max Results per Author:** A dropdown menu currently set to "2".
- Buttons:** A blue button labeled "Suggest Standards" is located at the bottom left of the form.

## 2) Mobilize the Community

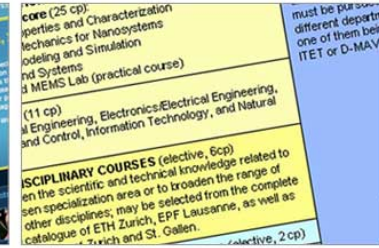
- Who is the TNS community?
  - New NSDL Grantees; the Resource Center
  - Legacy Pathways and other NSDL projects
  - Other NSF grantees such as CCLI, ATE
  - Other: Fedora, larger ed tech community
- Objectives
  - Support cyberlearning platform vision
  - Build active developer and prosumer community

**Example: NSDL.org**

**Example: Beyond Penguins & Polar Bears**

**Example: Curriculum Customization Service**

User services and applications



- Strand Maps
- NSDL Search  
• Digital Discovery Service
- NSDL Collection System
- OnRamp Content Management and Distribution System
- NSDL Media Wiki
- Expert Voices Word Press Multi-user Blogging system



- TNS services:
- share a common service layer
  - feature open APIs
  - are highly customizable
  - are scalable

Community content and collections



# A platform comparison

## Cyberlearning Report

- Centralized cloud
- Open APIs
- Gold-standard open source components
- Vibrant developer community
- Robust data mining services
- Well-defined standards for plugging data into apps

## NSDL Platform

- Distributed
- Open APIs
- Gold-standard open source components
- Emerging developer community
- Data mining research beginning to take off
- Scientific data plug-n-play research in Pathways

# Mobilizing: Action Items

- Training Program – Use cases and individual platform components
- Open Solution Community approach – Invest *all* TNS platform development resource in a collaborative, co-development model
- Partner with Fedora Commons – Leverage their community and open source knowledge and cache

# Co-Development Example with SMILE

## NCS Metadata Editor

▼ coordinates remove  
best practices

**Bounding box tool**

<i>westCoord</i>	-107.14
<i>eastCoord</i>	-104.86
<i>northCoord</i>	40.26
<i>southCoord</i>	39.03


**Widget**  
activates  
boundingBox Tool

## BoundingBox Tool

**Geocoder**

Min Latitude: Minimum Latitude  
Max Latitude: Maximum Latitude  
Min Longitude: Minimum Longitude  
Max Longitude: Maximum Longitude

Add Bounding Box



Map data ©2009 Tom Albin, Curious Technologies

**Callback**  
inserts values from  
BoundingBox tool  
into metadata

# Open Solution Community

- Roadmap Process – collaborative development of priorities and collective resource allocation
  - Nucleate around *core* capabilities
  - EduPak released with Fedora Commons
  - Series of mini-Technical Summits to engage NSDL developers
- Contributor Process – mechanisms for integrating community-developed software into codebase

# Emerging Roadmap Areas

- **Phase 1 priorities (2009):** NCS hosting and customization; custom framework consulting; custom metadata in NDR; configuring search services; web feed ingest; automated collection monitoring and reporting
- **Phase 2 topics (09/10):** Extensions to Strand Map Service to support state standards, annotations, and custom maps; widgets/tools to enable faculty to create and share instructional activities; interoperability via OAI-ORE or SIF; state standards mappings and standards interoperability



# 3) Support Educational Exemplars

- Objectives
  - Use NSDL infrastructure and collections to create and evaluate a small number of exemplars
  - Support NSDL grantees, NSF grantees, and other community members in this endeavor
- Criteria for selecting exemplars
  - Potential for increasing usage and/or demonstrating impact

## Unit 2: Earth's Dynamic Geosphere

### Plate Tectonics

Plate Tectonics is the result of matter and energy flow in the Earth which causes specific topography.

Volcanoes Plate Tectonics Earthquakes

Units of Study » Unit 2: Earth's Dynamic Geosphere: Plate Tectonics » Interactions of Plates

#### Key Concepts

- a. GPS Technology
- b. Modern Theory
- c. Plate Boundaries
- d. Earth's Layers
- e. Plate Motion
- f. Interactions of Plates**
- g. Physical Evidence

#### Interactions of Plates

EarthComm Activities Interactive Resources Education Standards My Stuff (1)

##### Activity 4

#### Plate Tectonics: Activity 4: Effects of Plate Tectonics

[http://ccs.dls.ucar.edu/protected/iat/earth\\_dynamic\\_geosphere/chap02/e...](http://ccs.dls.ucar.edu/protected/iat/earth_dynamic_geosphere/chap02/e...)

Page: G 95

Number of periods: 2.0

Classroom activity

This activity uses maps to discover the relationship among plate tectonics and earthquakes and volcanoes. Students will model: 1) the rise of magma through the Earth using honey and vegetable oil, 2) subduction and accretion using cream cheese and cheese.



Keywords: Sea-floor spreading, Mountains at plate boundaries  
From: EarthComm Activities

- My Stuff for this Activity (2)
- Key Concepts for this Activity (1)
- Instructional Support Materials (4)
- Teaching Tips (5)
- Student Conceptions (1)
- Embedded Assessments (4)

## Unit 2: Earth's Dynamic Geosphere

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Units of Study » Unit 2: Earth's Dynamic Geosphere: Plate Tectonics » Interactions of Plates

#### Key Concepts

- a. GPS Technology
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- e. Plate Motion
- f. Interactions of Plates**
- g. Physical Evidence

The interactions of plates at their boundaries create specific landforms such as trenches, mountains, volcanoes, island arcs, rift valleys, and mid-ocean ridges and explains the global pattern of earthquakes.

#### Interactions of Plates

EarthComm Activities Interactive Resources Education Standards My Stuff (0)

Top Picks (6) Images / Visuals Animations Working With Data

#### Plate Boundaries

<http://scign.jpl.nasa.gov/learn/plate4.htm>

Save

Reference

Scientific illustration

This site provides information on plate boundaries, which are found at the edge of the lithospheric plates and are of three types: convergent, divergent and conservative. Wide zones of deformation are usually characteristic of plate boundaries because of the interaction between two plates. The three boundaries are characterized by their distinct motions which are described in the text and depicted with block diagram illustrations, all of which are animated. There are also two maps that show the direction of motion of the plates. Active links lead to more information on plate tectonics.

From: DLESE Community Collection (DCC)

#### Plate Tectonics II: Plates, plate boundaries, and driving forces

[http://www.visionlearning.com/library/module\\_viewer.php?mid=66](http://www.visionlearning.com/library/module_viewer.php?mid=66)

Save

Module or unit

The distribution of earthquakes and volcanoes around the world confirmed the theory of plate tectonics first proposed by Wegener. These phenomena also help categorize plate boundaries into three different types: convergent, divergent, and transform.

Keywords: earthquakes, volcanoes, subduction, convection, hot spot

From: DLESE, Visionlearning Collection

# Curriculum Customization with Denver Public Schools

# Created with EduPak

# What will success look like for TNS?

- Contribute to shared NSDL goals
  - Technical advances and operations to increase usage and demonstrate impact
- TNS-specific goals
  - **NSDL infrastructure and collections used in new teaching and learning experiences**
  - Vibrant community of co-developers and contributors
  - Business model to sustain “data center” technical operations

# Several Major Challenges

- Shifting from an R&D shop to a technical service provider organization
- Streamlining the organizational footprint for sustainability
- Rethinking the current “handover” model
- Balancing short-term community service efforts with long-term strategic goals

# Discussion

# 4) Improve NSDL.org User Experience

- Who is the user?
  - Still very broad

*“a unique educational and scholarly resource for innovative STEM learning materials and research on STEM learning”*

- Objectives
  - Refocus NSDL.org collections and interfaces to increase educative value
  - Instrument NSDL.org to characterize usage and provide rich behavioral data
  - Preserve (?), feature, and disseminate STEM learning products from NSF funding

## 5) Evaluation

- Two modest strands of effort
  - Supporting Resource Center through infrastructure instrumentation
  - Community satisfaction measures around technical customer support, technical operations, and roadmap processes and outcomes

## 6) Extend Strategic Partnerships

- Mostly purview of Resource Center
- Two exceptions
  - Project 2061/AAAS -> Co-leads on Strand Map Service, Owners of content IP
  - Fedora Commons -> Critical partnership for jumpstarting and extending the proposed Open Solution Community approach