



Progress in Cyber-informatics for Integrated Watershed modeling

cf

“XYU]b['k]h 'hc c'a i W 'cZU[ccX'h]b[”

A]Yg' @c[gXcb

I b]j Yfg]hmicZK Ug\]b[hcb'

a `c[4 i 'k Ug\]b[hcb"YXi '

My goals are to:

- Talk fast
- Don't stay on any one slide too long
- Don't confuse people
- Make it interesting

- Two Main Points
 - Sharing is GOOD
 - Centralization is BAD
- Databases
 - Traditional designs can focus on accessibility
 - New “architectures” focus on integration





K \ Uh]g'jhH Uh]g'6 Y]b["G\ UfYX3"

- **Observations & Measurement:** cruise data, buoy and gauging stations, real-time instruments, and airborne and space based remote sensing.
- **Modelling:** Forecast, predictions, trends, correlations, covariance, description, characterizations;
- **Application:** decision support tools, public Information, education resources,

Let's take a look at a Traditional Database now with web delivery

File Edit View Favorites Tools Help

Back Forward Stop Home Search Favorites Media

Address http://www.psmem.org/data/lwhydrographicsurvey.html

Puget Sound Marine Environmental Modeling

PSMEM

About Projects Models Data Documents Users Links

Contact Us Search Site Map

National Oceanographic Partnership Program

Data Provided by PRISM Hydrographic Surveys

CROSS-SECTIONS

Main Basin Hood Canal Basin Whidbey Island Basin

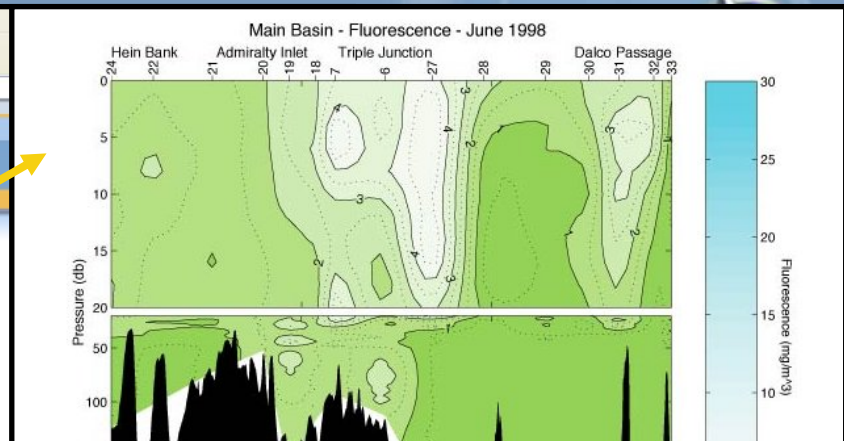
CRUISES

- Jun/98
- Dec/98
- Jun/99
- Dec/99
- Jun/00
- Dec/00
- Jun/02
- Jun/03
- Jul/03
- Aug/03

PROPERTIES

- Fluorescence
- Salinity
- Density
- Temperature
- Transmissivity
- Oxygen

GO



Clearinghouse Search Wizard

Select a Topic of Interest Help...

Select all topics or choose up to four topics of interest from the categories listed. This will help select appropriate Clearinghouse Servers to query.

Find servers that have data on: All topics Any one of up to four topics All of up to four topics

| | |
|---|--|
| <input checked="" type="checkbox"/> Administrative and Political Boundaries | <input type="checkbox"/> Facilities, Buildings and Structures |
| <input type="checkbox"/> Agriculture and Farming | <input type="checkbox"/> Geodetic Networks and Control Points |
| <input type="checkbox"/> Atmospheric and Climatic Data | <input type="checkbox"/> Geologic and Geophysical Information |
| <input type="checkbox"/> Base Maps, Scanned Maps, and Charts | <input type="checkbox"/> Human Health and Disease |
| <input type="checkbox"/> Biologic and Ecologic Information | <input type="checkbox"/> Imagery and Aerial Photographs |
| <input type="checkbox"/> Business and Economic Information | <input type="checkbox"/> Inland Water Resources and Characteristics |
| <input type="checkbox"/> Cadastral and Legal Land Descriptions | <input type="checkbox"/> Ocean and Estuarine Resources and Characteristics |
| <input type="checkbox"/> Earth Surface Characteristics & Land Cover | <input type="checkbox"/> Society, Cultural and Demographic Information |
| <input type="checkbox"/> Elevation and Derived Products | <input type="checkbox"/> Tourism and Recreation |
| <input type="checkbox"/> Environmental Monitoring and Modeling | <input type="checkbox"/> Transportation Networks and Models |
| | <input type="checkbox"/> Utility Distribution Networks |

Reset Next >>

Currently:

Data Clearinghouse
Data Library
Data Store



Look at What's new!

- Dynamic content
- User Profiles
- Reuse of content
- Single source > multiple use

At the UW our personal news service is powered by a stream of information



1 Content Evaluation

Editors find, evaluate, and select new sources based on the value they provide to our clients. Editors ensure we

- extract only content of value
- cover every page and part of the site that contains valuable content, and
- identify the parts of the site that change rapidly



3 Filters and Categorizes

Instantly categorizes content, adding structured metadata to filter information by any set of rules



2 Automatic Extraction

Continuously retrieves new information from thousands of qualified, hand-picked sources



4 Delivers

Delivers targeted news and information in real-time to any platform or business application



my UW

Top News Powered by Moreover Technologies

- [Progress made in Iran nuclear talks](#) - USA Today Nov 6 2004 10:53PM GMT
- [A Calm Vote in an Uncertain African Province Raises Hopes for Spring Elections](#) - New York Times Nov 6 2004 10:47PM GMT
- [Brazilian town attempts to lynch killer](#) - USA Today Nov 6 2004 10:36PM GMT
- [Levy Coast seizes after attack](#) - BBC Nov 6 2004 10:03PM GMT
- [Several' site in train derailment](#) - BBC Nov 6 2004 8:47PM GMT
- [Downs of Israelis dead in Somalia attacks](#) - CNN Nov 6 2004 8:12PM GMT
- [One person dead at train derail](#) - BBC Nov 6 2004 7:12PM GMT
- [France targets Iranian air force](#) - BBC Nov 6 2004 6:31PM GMT
- [State Department's counterterrorism chief, Cofer Black, quits](#) - USA Today Nov 6 2004 5:56PM GMT
- [French troops down Ivory Coast aircraft after deaths](#) - USA Today Nov 6 2004 5:25PM GMT

Microsoft

PressPass - Information for Journalists

Search: Microsoft.com, for: [Go]

PressPass Home | PR Contacts | Fast Facts About Microsoft | Site Map | Advanced Search

Top Stories

- November 5, 2004 10:00 a.m. PST
Q&A: Microsoft Outlines Strategy for Providing Full Range of Business Management Solutions for Companies As They Grow
New edition of Microsoft Office rounds out company's portfolio of business management applications that address the sales, service and financial processes of small and mid-size organizations and divisions of large enterprises.
- November 4, 2004 12:30 a.m. PST
Widespread ISV, OEM Involvement Shows Growing Momentum for ISA Server 2004
Three months after its release, Microsoft ISA Server 2004's advanced protection for Microsoft applications, ease of use and innovative approach to providing a platform for best-of-breed security solutions have made it a new favorite for small and enterprise businesses alike.

Of Note

- The View from the Top
- Games Are Landing in Stores With a Splash
- IT's Transformational Effect: The Real Point

Featured Links

- Microsoft Holiday Gift Guide
- Virtual Pressroom
- Microsoft Office System Newsroom
- Microsoft Business Solutions Newsroom
- Windows Server System Newsroom
- MSR Newsroom
- Security & Privacy Newsroom

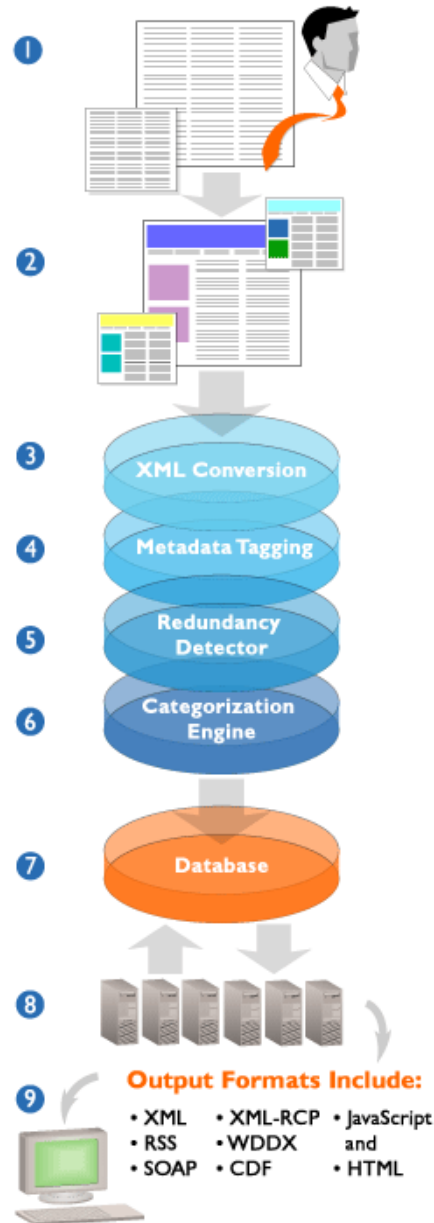
Press Releases

Holiday, November 5, 2004

moreover ● ● ●

Graphics provide by moreover.com

Moreover's Technology Architecture



1. Content Evaluation & Template Profiles

Editors find, evaluate, and select new sources based on the value they provide to our clients. Editors create customized template profiles for each site that ensure we:

- Extract only content of value
- Cover every page and part of the site that contains valuable content
- Identify the parts of the site that change rapidly

2. Dynamic Template Matching

Identifies and extracts new data from each site every 15 minutes via HTTP.

3. XML Conversion

Converts HTTP data into XML.

4. Metadata Tagging

XML code is enriched with valuable metadata to enable filtering by date, time, source name, type etc...

5. Redundancy Detection

Checks and eliminates identical sets of incoming data to prevent multiple postings and redundancy.

6. Categorization

Editors define content rules to filter incoming data topically.

7. Database Storage

New data is added to the database ready to be ad-hoc searched or presorted into XML differentiated sets.

8. Query Servers

Hosted servers process incoming query requests for updated data sets or ad-hoc searches of the database. The database creates and delivers the requested data set or query answer.

9. Output Engine

Translates outgoing data into the desired format to allow unique integration to client-side web site, intranet, extranet, desktop, or application.

What Lies Beneath? XML-metadata (extend markup language)

RAW XML METABASE

```

<?xml version="1.0" encoding="iso-8859-1"
<!DOCTYPE moreovercontentdump (View S
- <moreovercontentdump>
- <article id="58575892">
  <url>http://c.moreover.com/click/h
  <chtext_display>Waiting in the wings
  <source>Independent</source>
  <source_category>General</source_c
  <media_type>text</media_type>
  <tagline />
  <content>_</content>
  <docurl>http://news.independent.co
  <harvest_time>Jan 27 2003 12:53PM</
  <valid_time>Nov 18 2003 12:53PM</v
  <access_registration />
  <access_status />
  <source_rank>1</source_rank>
  <duplicate_group />
  <language>English</language>
- <location>
  <region>EUROPE</region>
  <country>UNITED KINGDOM</country>
  </location>
- <cluster>
  <<category>news: general</category>
  </cluster>
- <keywords_public>
  <keyword>News</keyword>
  </keywords_public>
  <keywords_code />
  <stock_ticker />
</article>
- <article id="58575881">
  <url>http://c.moreover.com
  <chtext_display>AOL's Parson
  
```

CUSTOM APPLICATIONS

REAL-TIME CONTENT

moreover ●●●

Graphics provide by moreover.com

If sharing is good, what's the Problem?

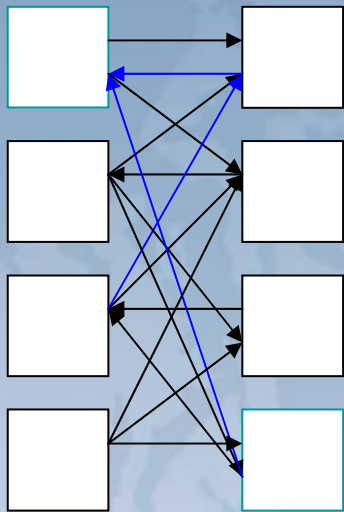


Frequently, efforts at collaboration between data providers and data users are frustrated by technical issues due to:

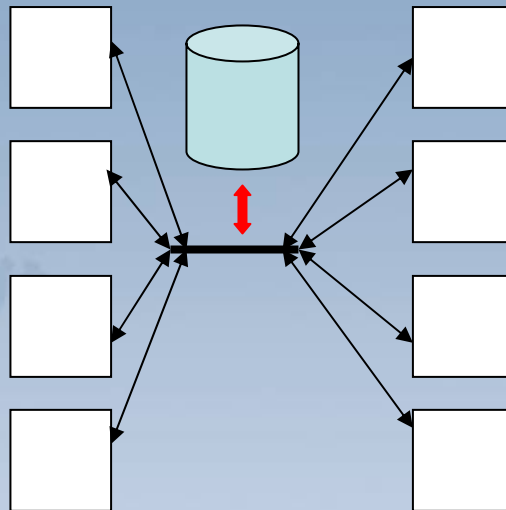
- **Network communication** problems;
 - Solution – a DataStream to uses existing protocols (HTML, XML, ESML) over the Internet
- Different groups use **different analysis packages**;
 - Solution – a DataStream that provides users with data formatted for their choice of software by identifying the underlying data structure and transforming the data format when the data arrives at the users' desktop.
- **Learning new software** wastes effort;
 - Solution – a DataStream to enable applications to “read” new data formats and thereby extending a well understood software application to new types of data.
- Centralized data repositories cannot support **works in progress**;
 - Solution – a DataStream to enable all users direct access to the most current version of all data in the DataStream. If a user cares to make data available, every other user knows of its availability instantly.
- It takes to long to **rewrite** an existing (in-house) application to accept new data structures;
 - Solutions - a DataStream to provide services which allow users to configure data to match existing code.



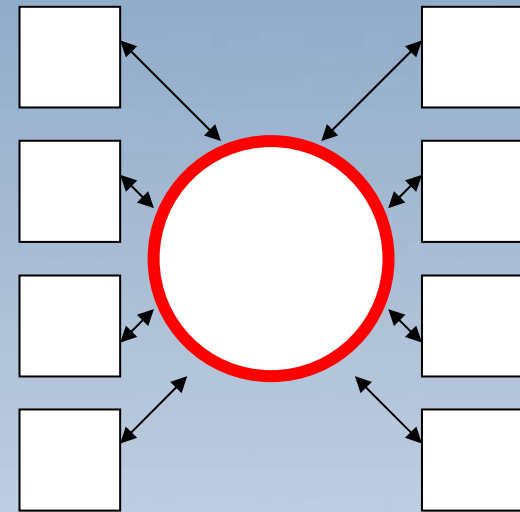
A gradient of architectures



Point-to-Point



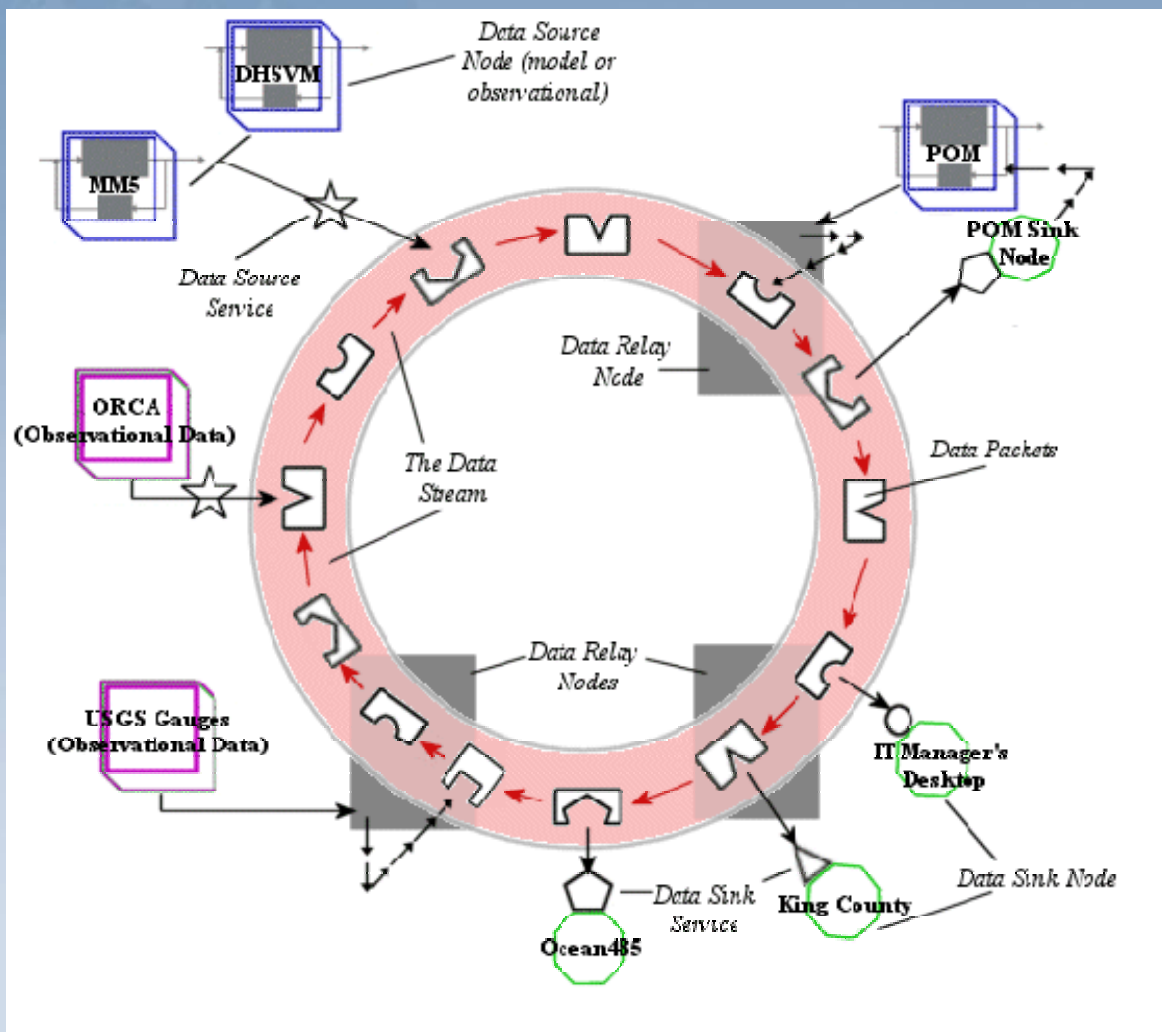
Data Warehouse



DataStream

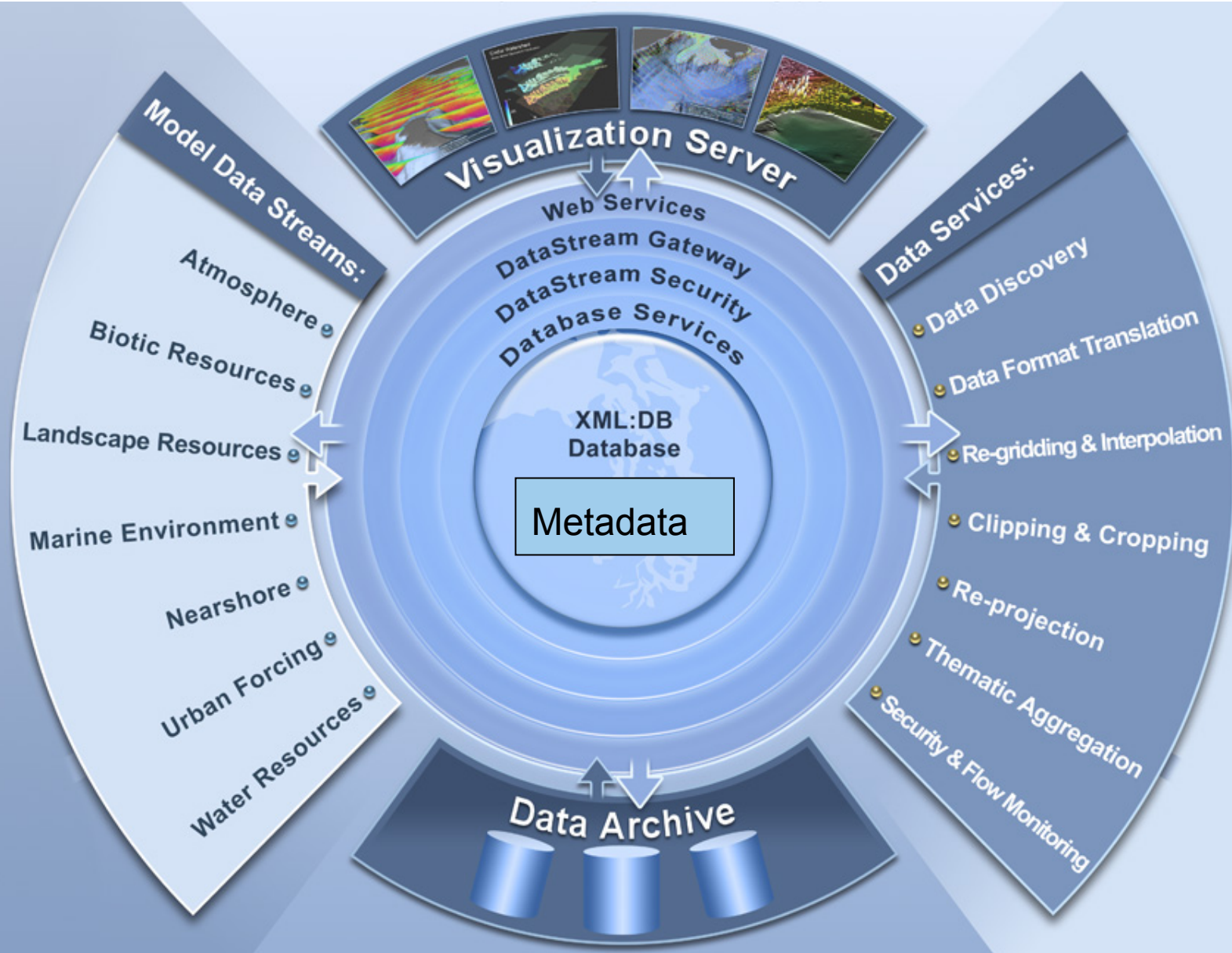
Information Integration System Architecture:

“the Datastream”



- Data Sinks
- Data Sources
- “Trigger” Technology
- Not an Archive
- Always Current
- Equal participation

Cyber-Infrastructure: a Collaborative for Land/Atmosphere/Marine Systems



Visualization Server

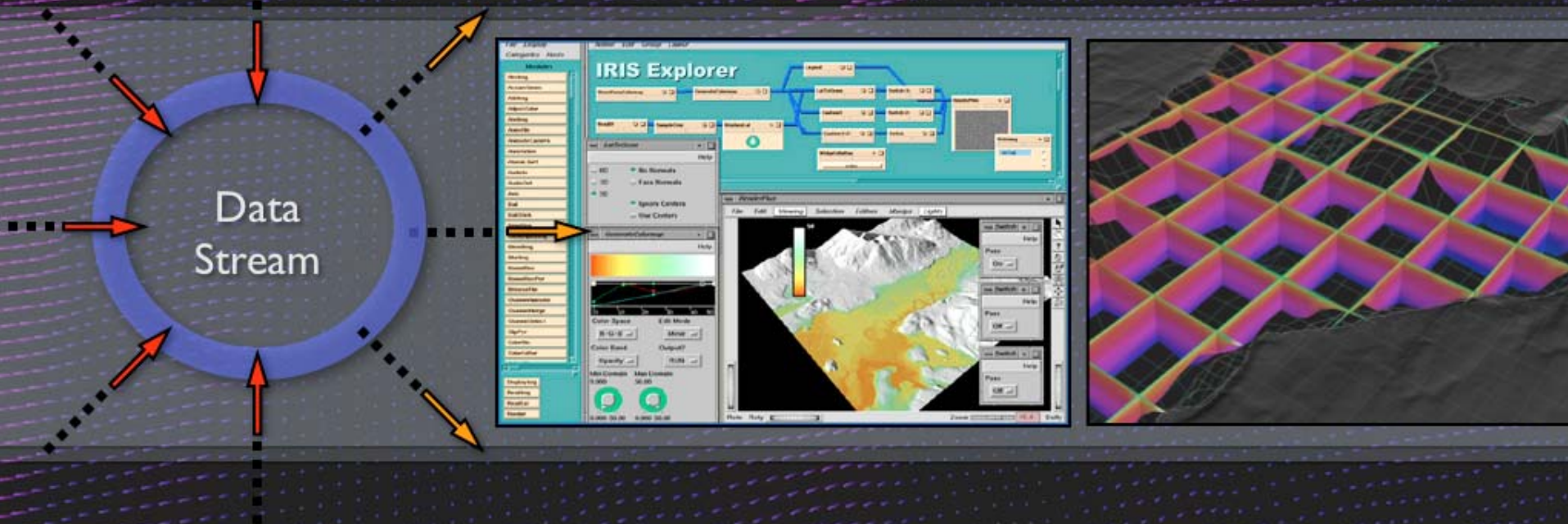
Data Streams
from Models



Scientific
Workflow



Visual Output
for the Web



Data Streams from Models:

MM5 4 km Surface Fields

- Temperature
- Precipitation
- Humidity
- Winds
- Short Wave Radiation
- Long Wave Radiation

Physical Template Model

- Bathymetry
- Topography
- Watershed Boundaries
- Classified Landcover
- Soil Layers
- SeaWiFS
- MODIS
- Landsat

DHSVM & VSB

- Hydrographs
- RunOff
- Soil Moisture Layers
- Snow Water Equivalent

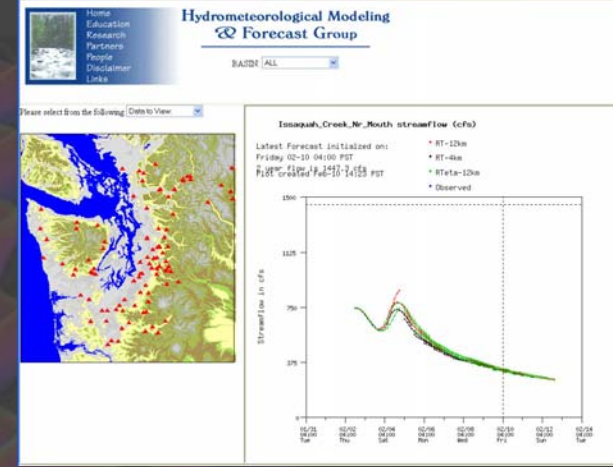
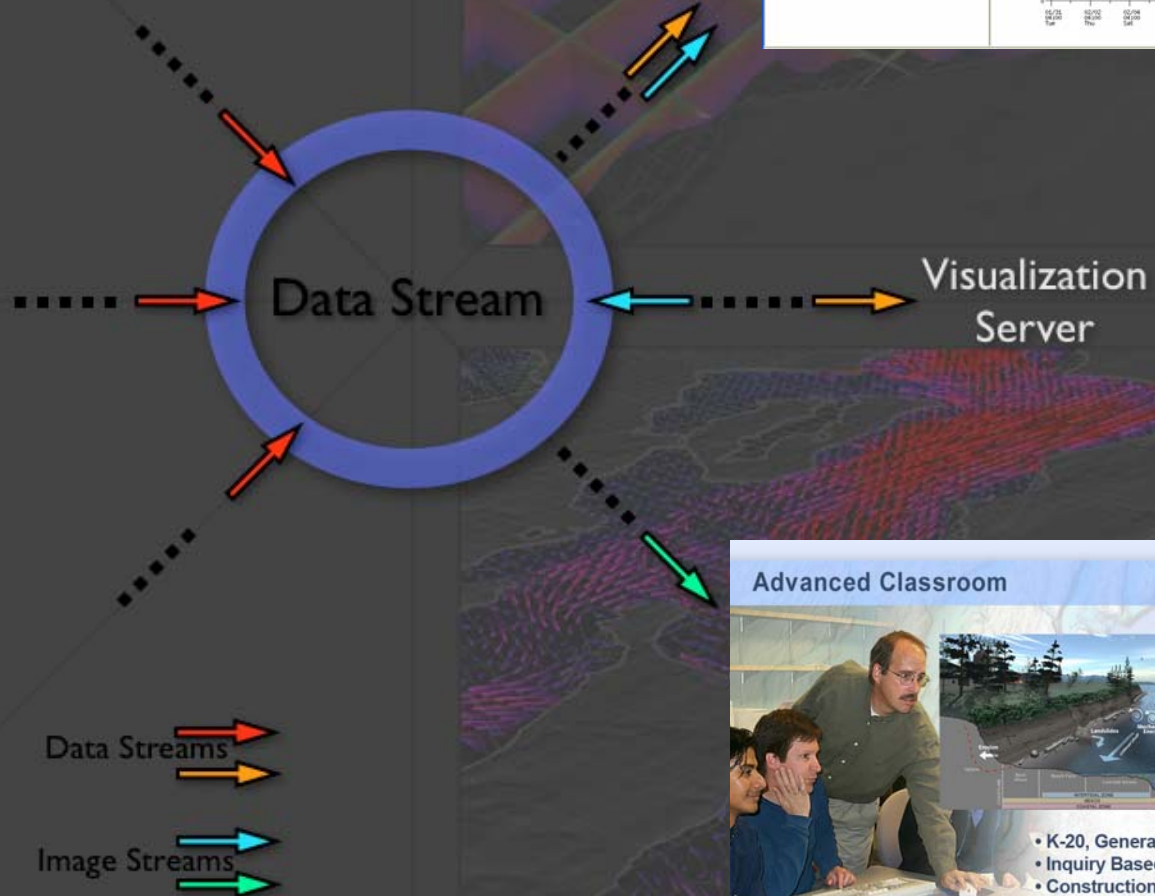
Princeton Oceanographic Model

- Currents
- Salinity
- Temperature

ABC Model

- Nutrients
- Plankton
- Organic Matter

Visualization Data Flow



Advanced Classroom

- K-20, General Public Audience
- Inquiry Based Curriculum
- Construction of Ecosystem Models
- Virtual Field Trips
- Current Access to Real-time Data
- Exploration Games

Search View

Search

Query: river
Field: Any

Scope

- All Metadata
- My Metadata
- Selected Peers



Change...

Date - YYYYMMDD

Start: 20040210
End: 20060210

Bounds

Link with Map

North 47.586715439092906
West -122.3162841796875
East -121.54861450195312
South 47.1682433385009

Submit Search

Data Discovery



Search Results

- Cedar Soil Depth
- PSMEM Test

Data Summary

[Download](#) [Details](#) [Edit](#) [Delete](#) [Permissions](#)

Title: Cedar Soil Depth
Abstract: Soil Depth for the Cedar River Basin just east of Puget Sound. 150m Resolution.
Purpose: To use in conjunction with hydrology and other modeling efforts
Date: 20040429-20040430

Desktop Toolkit

A Different Kind of Catalog: a "Window onto a Stream of Data"

Think of digital assets: Generated at a "sink" (which is listening to various "sources")






[Site Map](#)

[Search](#)

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Content Catalog Home










New Content:

| Type | Category | Title | Author | Size | Date |
|---|------------|--|------------------|--------|------------|
|  | HCDOP | HCSEG Monitoring Results 04-06-08-2004 | HCSEG | 21 kb | 2004-04-13 |
|  | Hood Canal | HCSEG Monitoring Results 03-31-04 | HCSEG | 24 kb | 2004-04-05 |
|  | Hood Canal | HCSEG Monitoring Results 03-22-23-04 | HCSEG | 18 kb | 2004-03-26 |
|  | PRISM | Modeling Puget Sound Circulation | Mitsuhiro Kawase | 612 kb | 2004-03-26 |
|  | PRISM | ORCA: An autonomous profiler monitoring water quality in south Puget Sound | Allan Devol | 3 mb | 2004-03-26 |

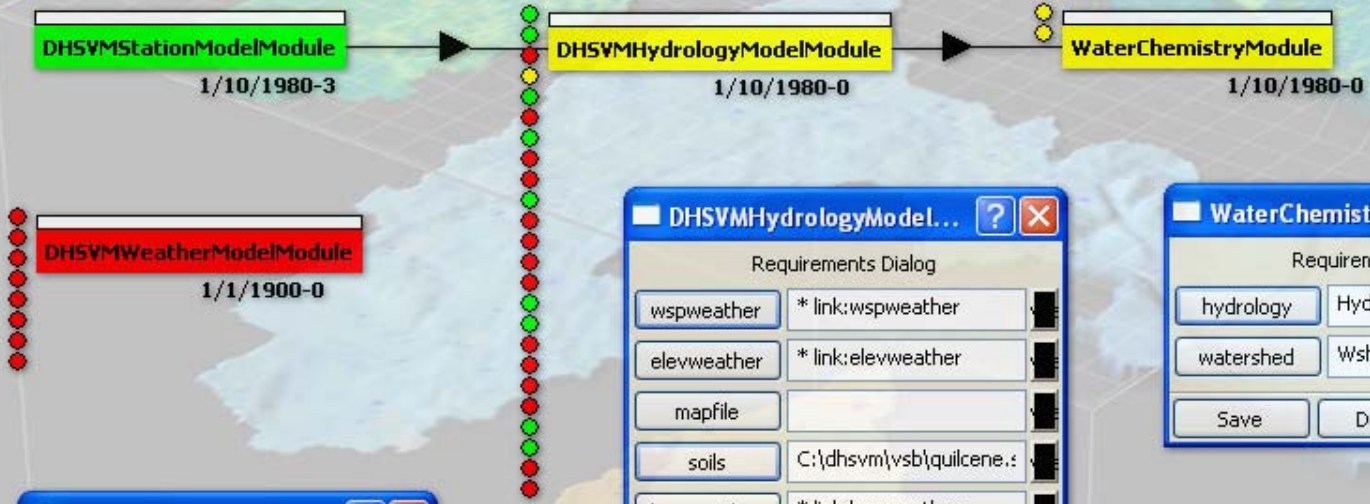
Search

All ▼

Icon Key

-  HTML
-  Text
-  PDF
-  Image
-  Presentation
-  Create Presentation
-  PowerPoint
-  Movie
-  QuickTime

Examples: Virtual Scaled Basins (DHSVM)



DHSVMHydrologyModel...

Requirements Dialog

| | | |
|-------------------|-------------------------|--|
| wspweather | * link:wspweather | |
| elevweather | * link:elevweather | |
| mapfile | | |
| soils | C:\dhsvm\vsb\quilcene.: | |
| lpseweather | * link:lpseweather | |
| soildepth | | |
| lwweather | * link:lwweather | |
| network | | |
| soilstate | | |
| precweather | * link:precweather | |
| channelstate | | |
| vegetation | | |
| elevation | | |
| interceptionstate | | |
| swweather | * link:swweather | |
| humweather | * link:humweather | |
| soiltable | | |
| snotelveg | | |
| shadows | | |

WaterChemistryModule

Requirements Dialog

| | | |
|-----------|----------------------|--|
| hydrology | HydroPixelOutput.csv | |
| watershed | WshedAttributes.csv | |

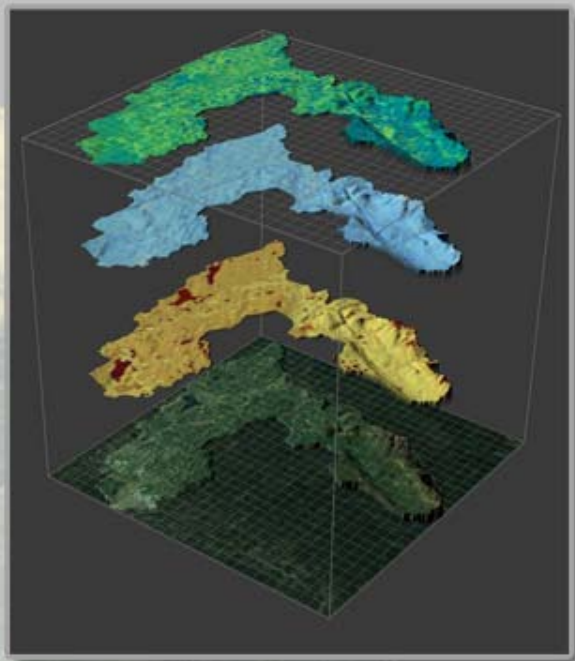
Save Delete OK

Link Details

Link Dialog

| | |
|--------------|-------------|
| wspweather: | wspweather |
| elevweather: | elevweather |
| swweather: | swweather |
| humweather: | humweather |
| precweather: | precweather |
| tempweather: | tempweather |
| lpseweather: | lpseweather |
| lwweather: | lwweather |

OK





Design Principle

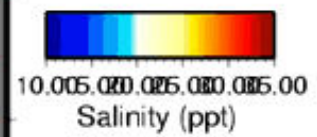
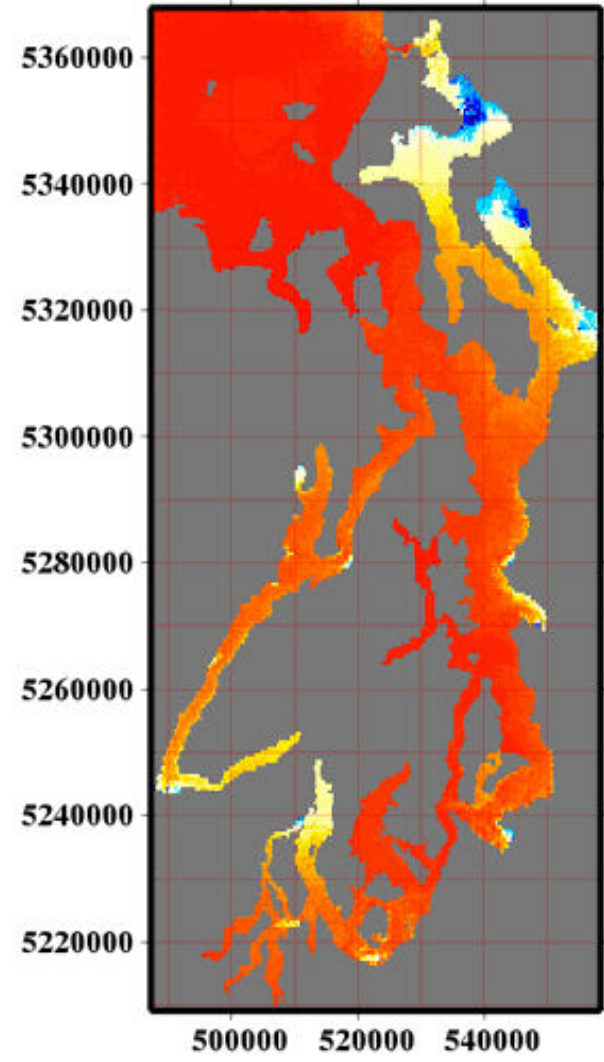
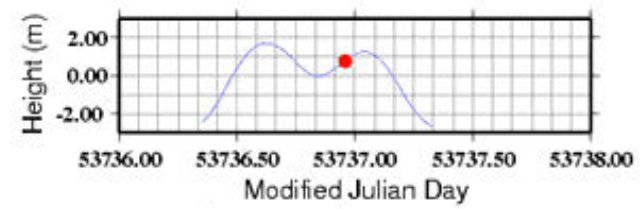
1. Data are most appropriately described updated and distributed by those that develop them;
2. Users desire access ready for their existing application/software;
3. It isn't the scientists job to responding to data request;
4. Users want access to data from anywhere that is served by a project regardless of its native format



Daily Hindcasts of Puget Sound Circulation, Temperature and Salinity

Ongoing calculations of the temperature and salinity are visualized at right. These visualizations are created using daily hindcast runs, and use atmospheric forcings from the UW Atmospheric Sciences [MM5](#) model. River inputs are from [USGS](#) gauging stations around the Sound. The oceanic boundary condition at the NW corner of the model is based upon a climatology from the Joint Effort to Monitor the Straits (JEMS) and is a crucial input. These visualizations are part of the [PSMEM](#) partnership, and are facilitated by technology developed by [PRISM](#) and the [INDIGO DataStream](#). For PowerPoint presentations about the model and our PSMEM partners, click [here](#).

[Download this movie as a FLI/FLC \(Quicktime compatible\) movie here](#)



**Puget Sound
POM output**
Date: 2006-01-01
Time: 15:00 PST
Sigma Level: 1


Example:
Puget Sound
Princeton Ocean
Circulation Model
(PSPOM)





Miles' Parting Shots

Remember:

- With changes in technology comes the opportunity to change metaphors:
 - Data Library  DataStream
- From a systems perspective, Think connectivity rather the collection.



Thanks!

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Mark Stoermer mmstorm@u.washington.edu