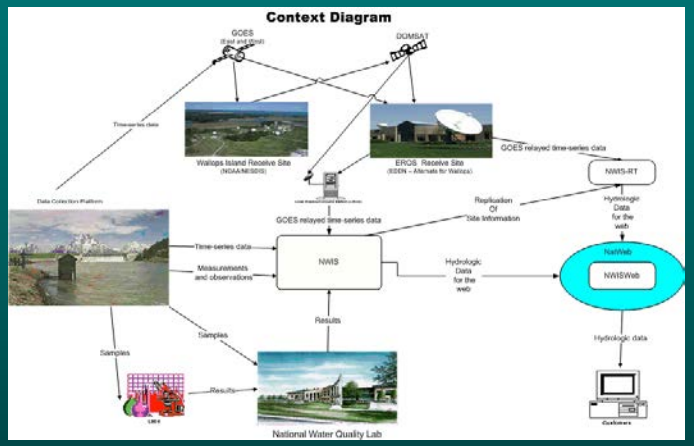
USGS Water Data Management

I. Infrastructure, Security and Maintenance
II. NWIS and NWISWeb
III. Modern Delivery Services



Prepared by Susan Trapanese

For the ACWI Monitoring Challenges Workgroup
February 25, 2013

USGS

IT Infrastructure - DOI

Enterprise Infrastructure

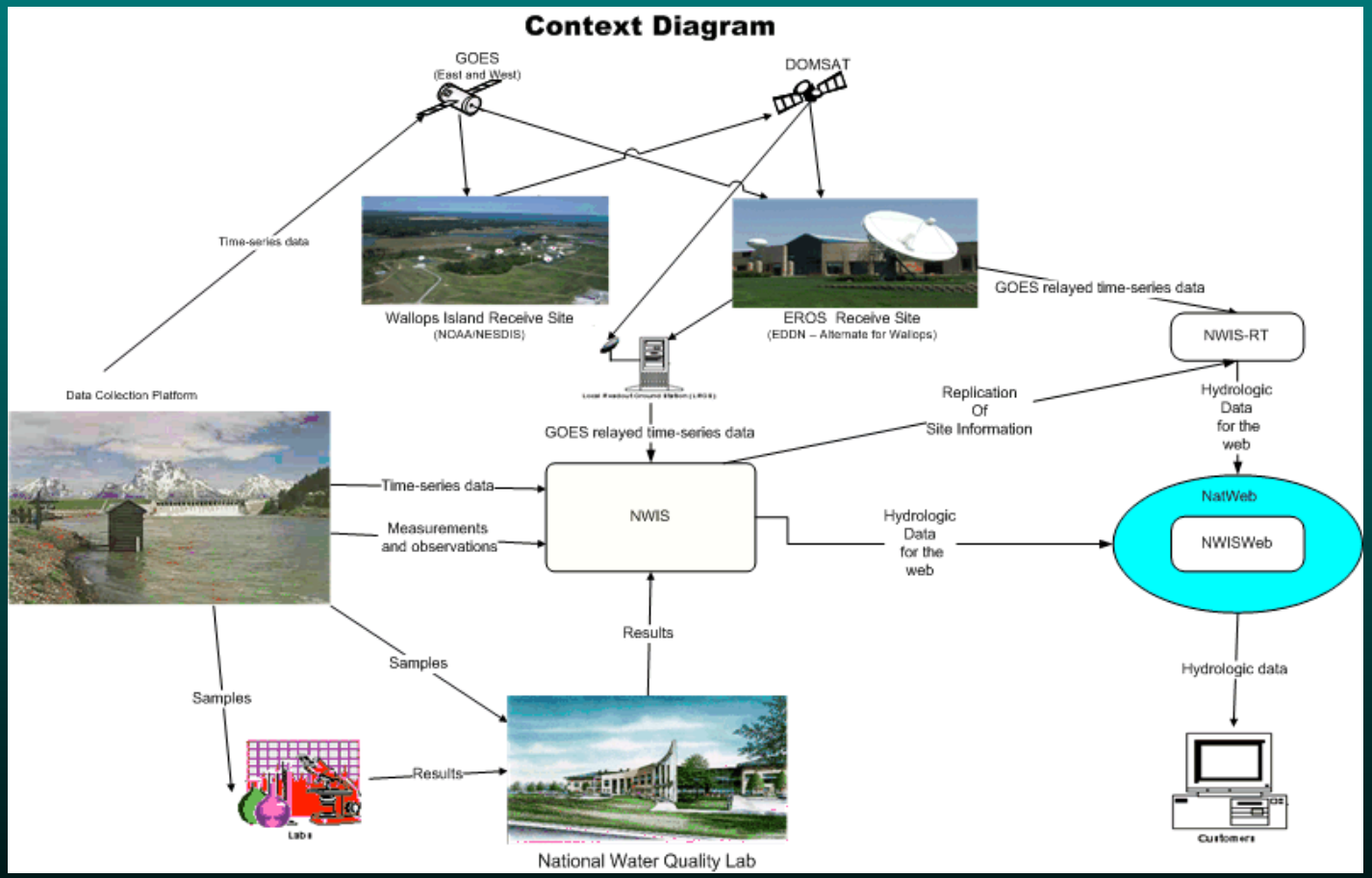
- Unified Messaging
  - Email and Collaboration
- Telecommunications/Network
- End-user device/software support (desktops, laptops and mobile phones)
- Data Center and Hosting Services
- Compliance and Support
  - Security
  - Records Management
  - IT Capital Planning and Investment Control

Mission Specific Infrastructure

- Software development, testing, and maintenance for mission applications or systems
- National Critical Infrastructure
- Applications and systems not connected to the DOI network

USGS

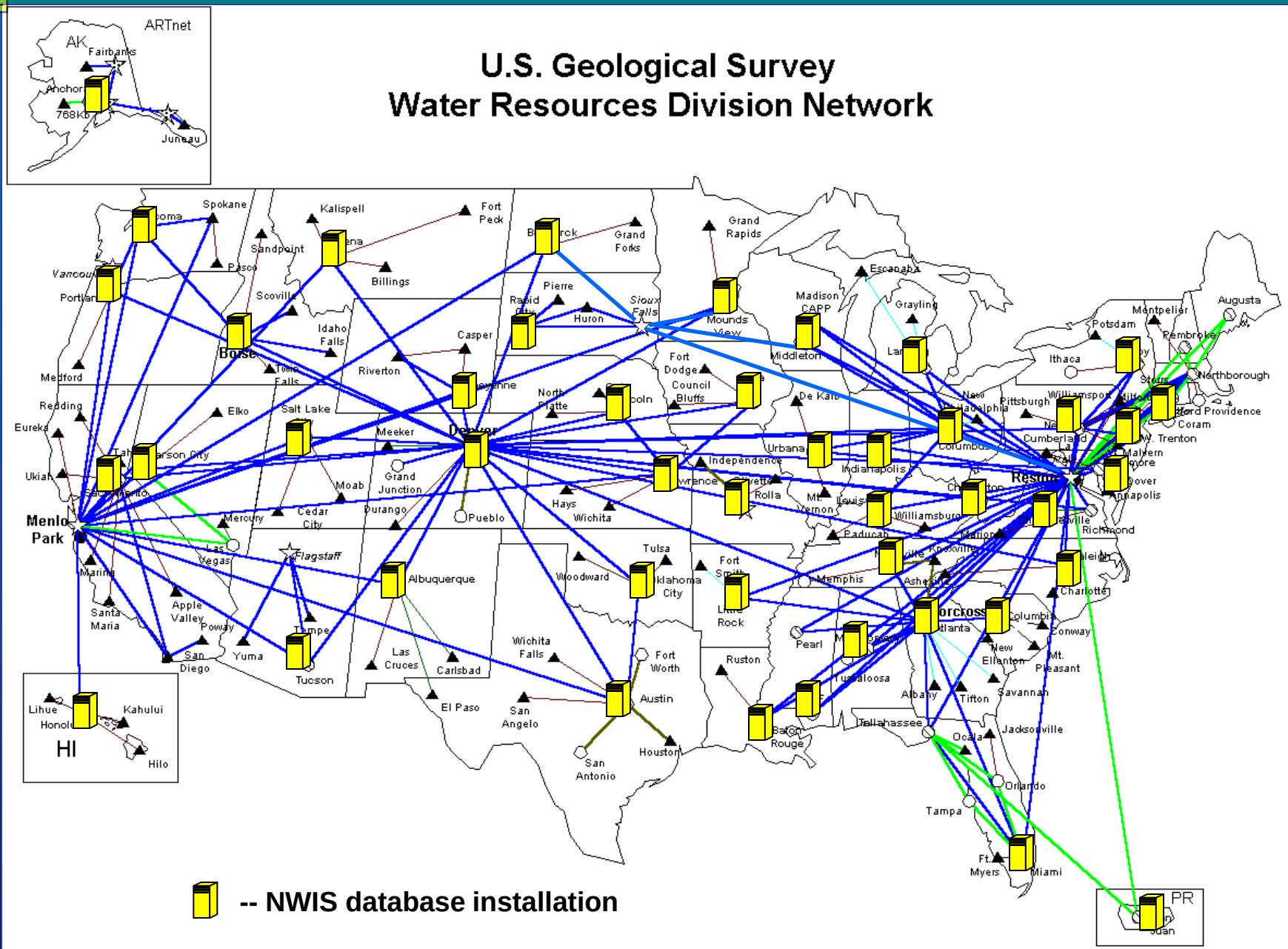
Water Data Infrastructure



Core-NWIS:

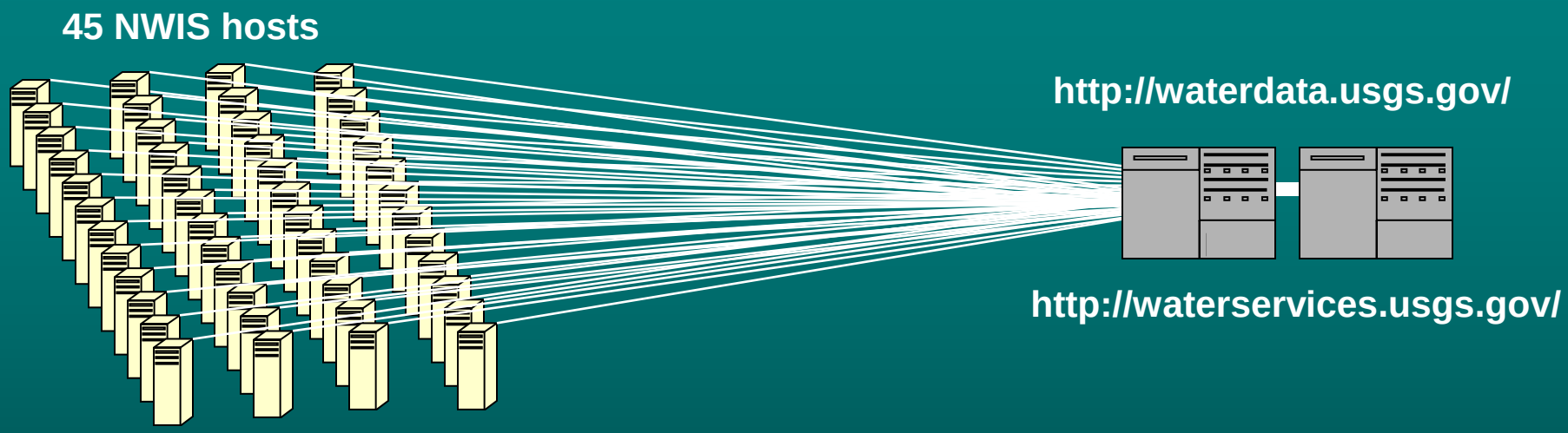
- Uses a data model optimized for its prime functions -- the acquisition, processing, and long-term archiving of data.
- Data processing (computation of derivatives, review, qualification, and approval) is highly interactive favoring local access to server.
- core-NWIS has internal services and interfaces that enable desktop-processing tools to access the databases.

U.S. Geological Survey
Water Resources Division Network



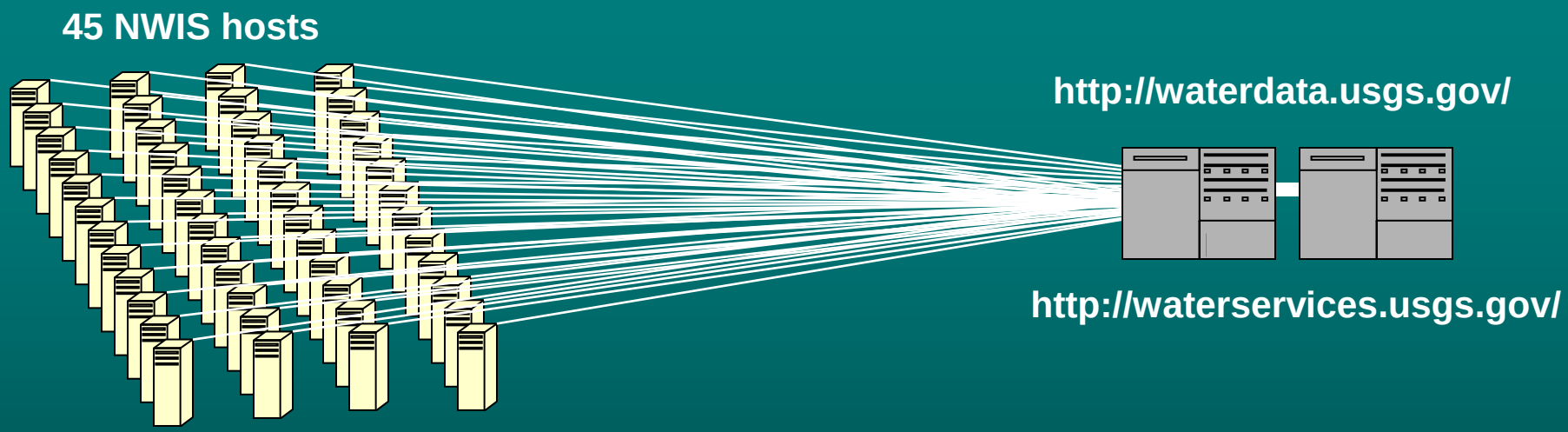
-- NWIS database installation

Secure Repository → Public "View"



USGS

Secure Repository → Public "View"

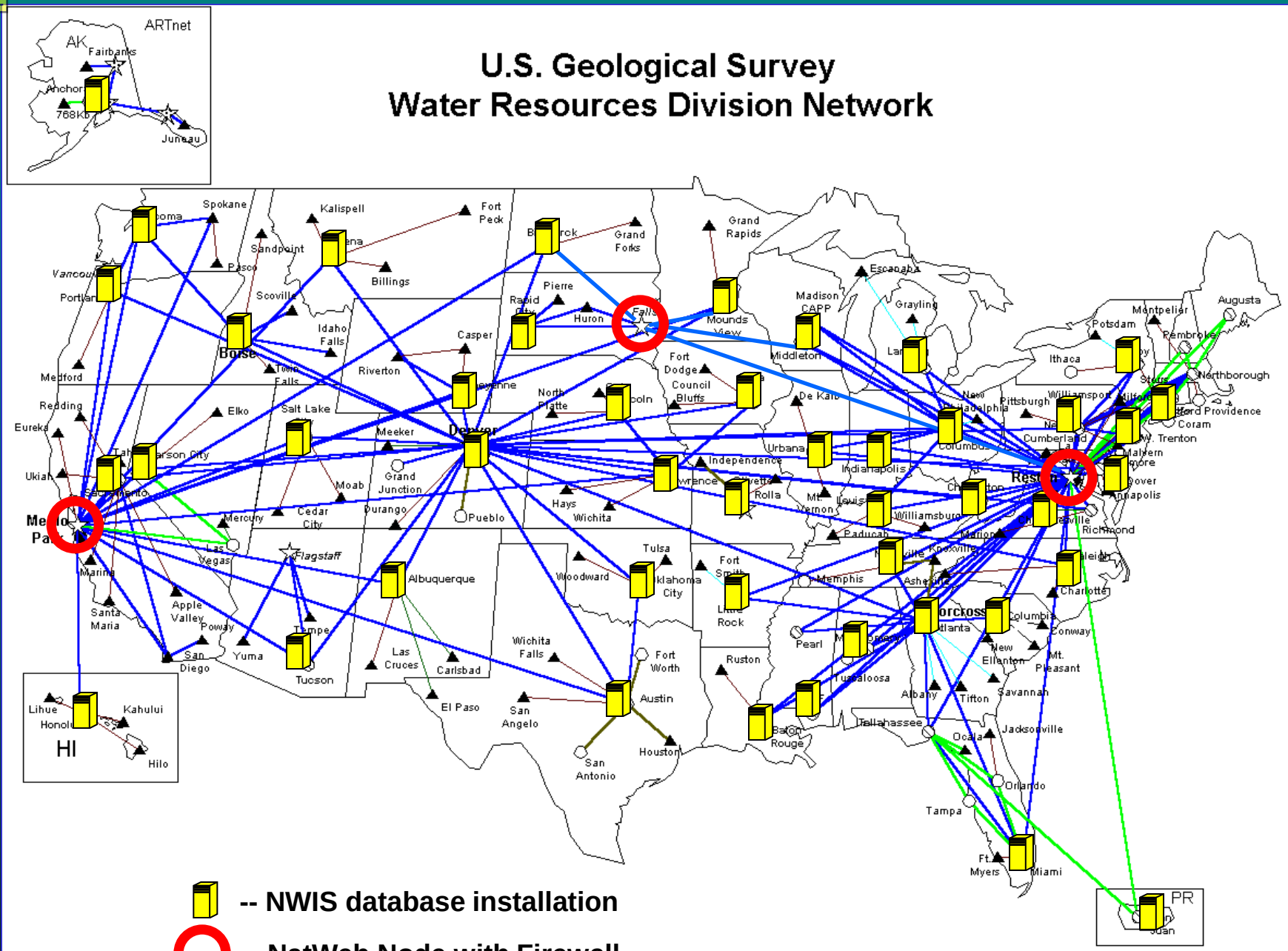


National Aggregate Dataset

Total sites	1.57 Million
Real-time sites	12,705
Daily values	344 Million
Ground-water levels	8.83 Million
QW samples	5.12 Million
QW values	96 Million
Peaks	728,798

USGS

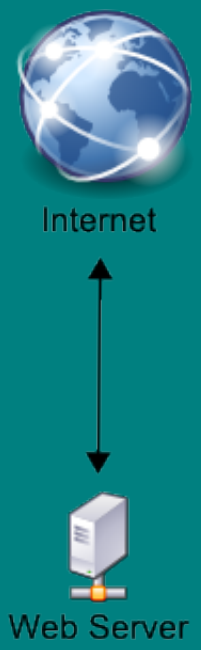
U.S. Geological Survey
Water Resources Division Network



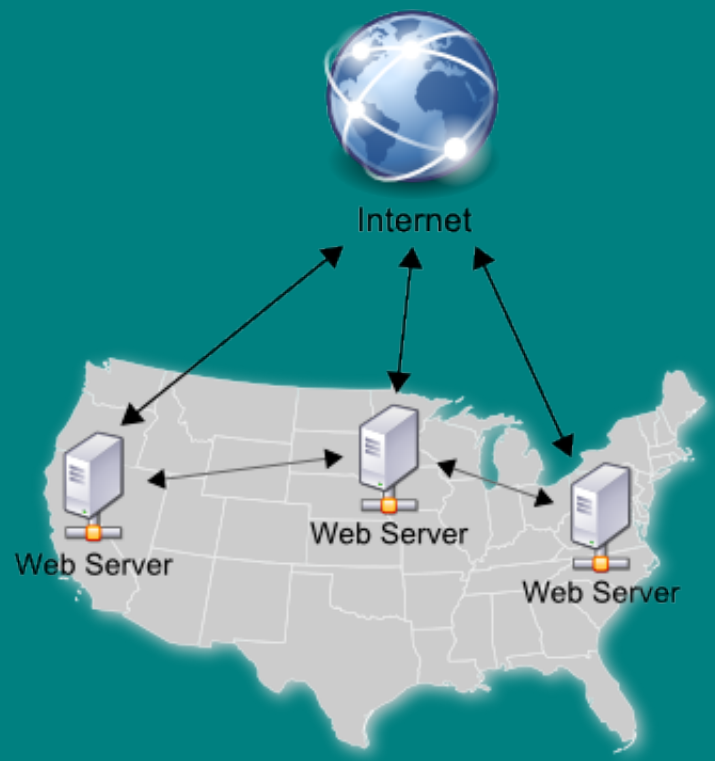
-- NWIS database installation

-- NatWeb Node with Firewall

Reliability in NatWeb

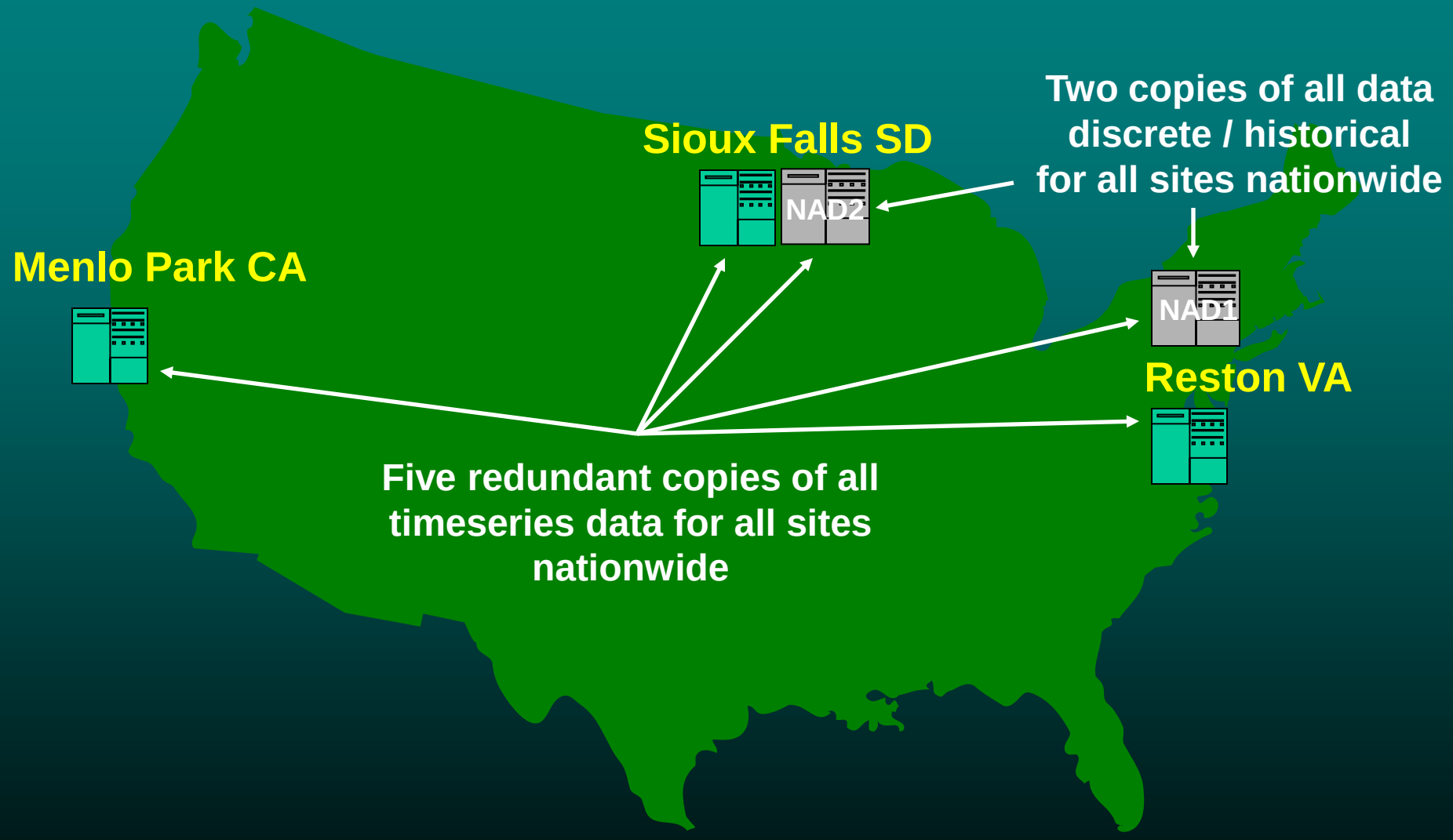


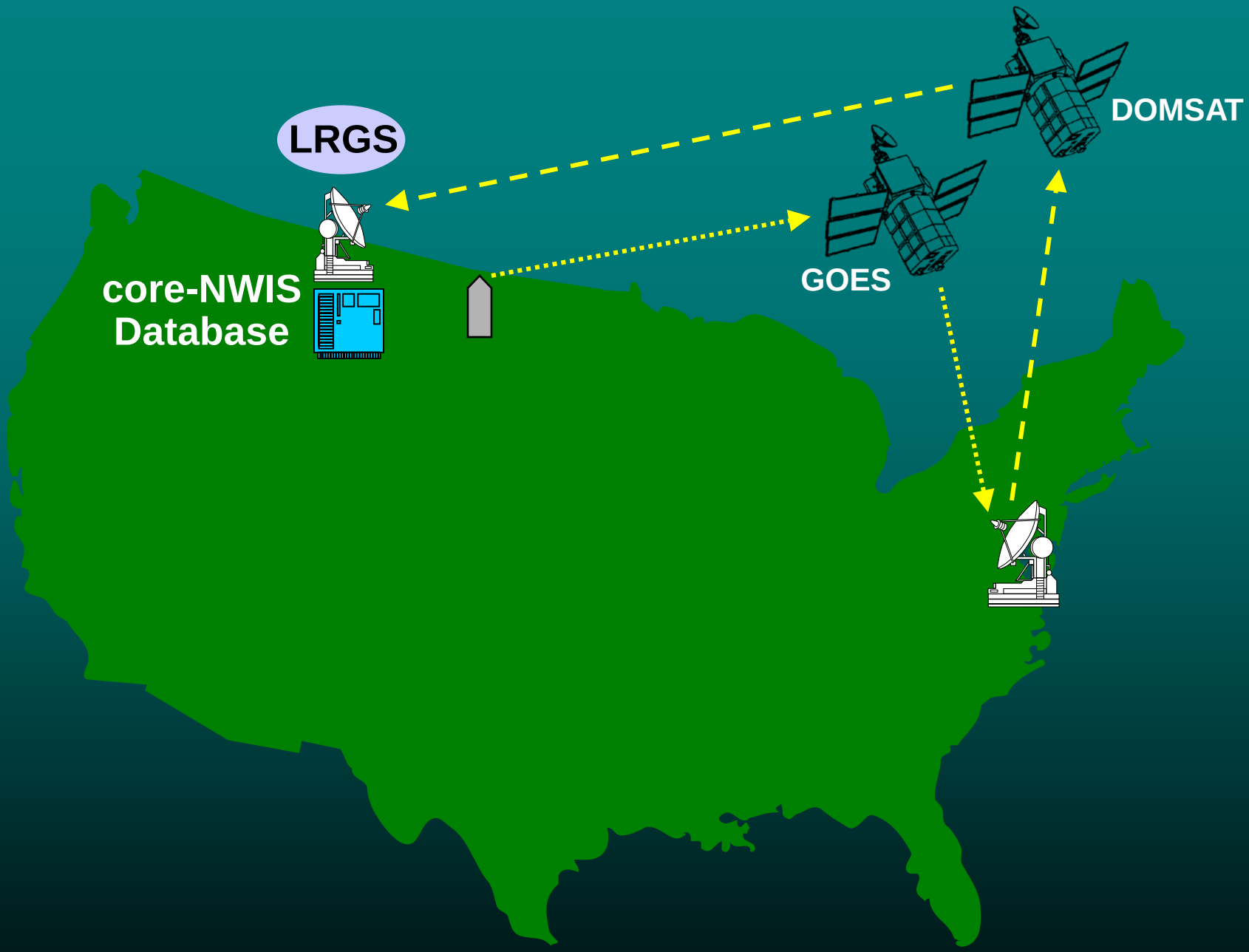
Typical Web Server



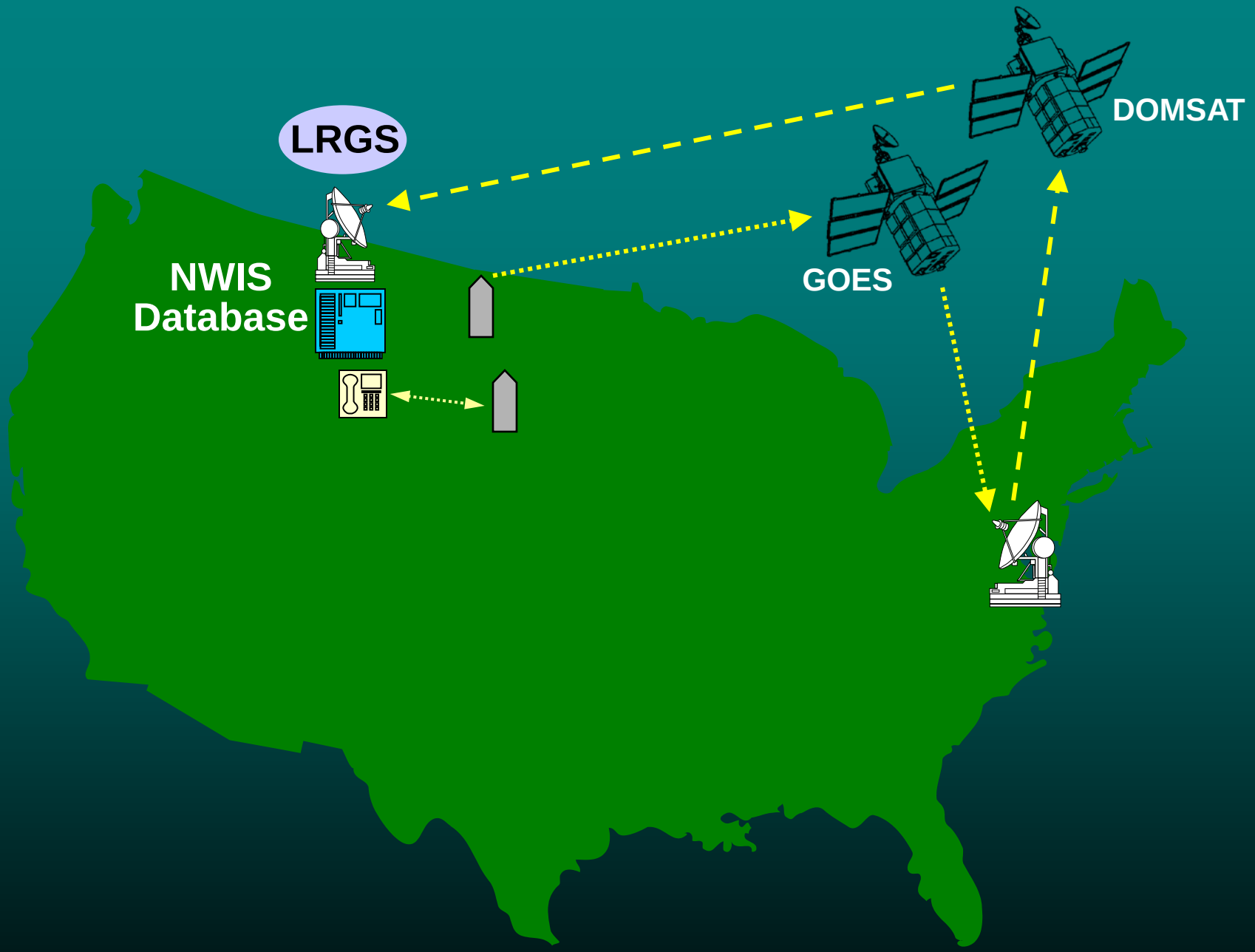
NatWeb System

NWISWeb Data Delivery



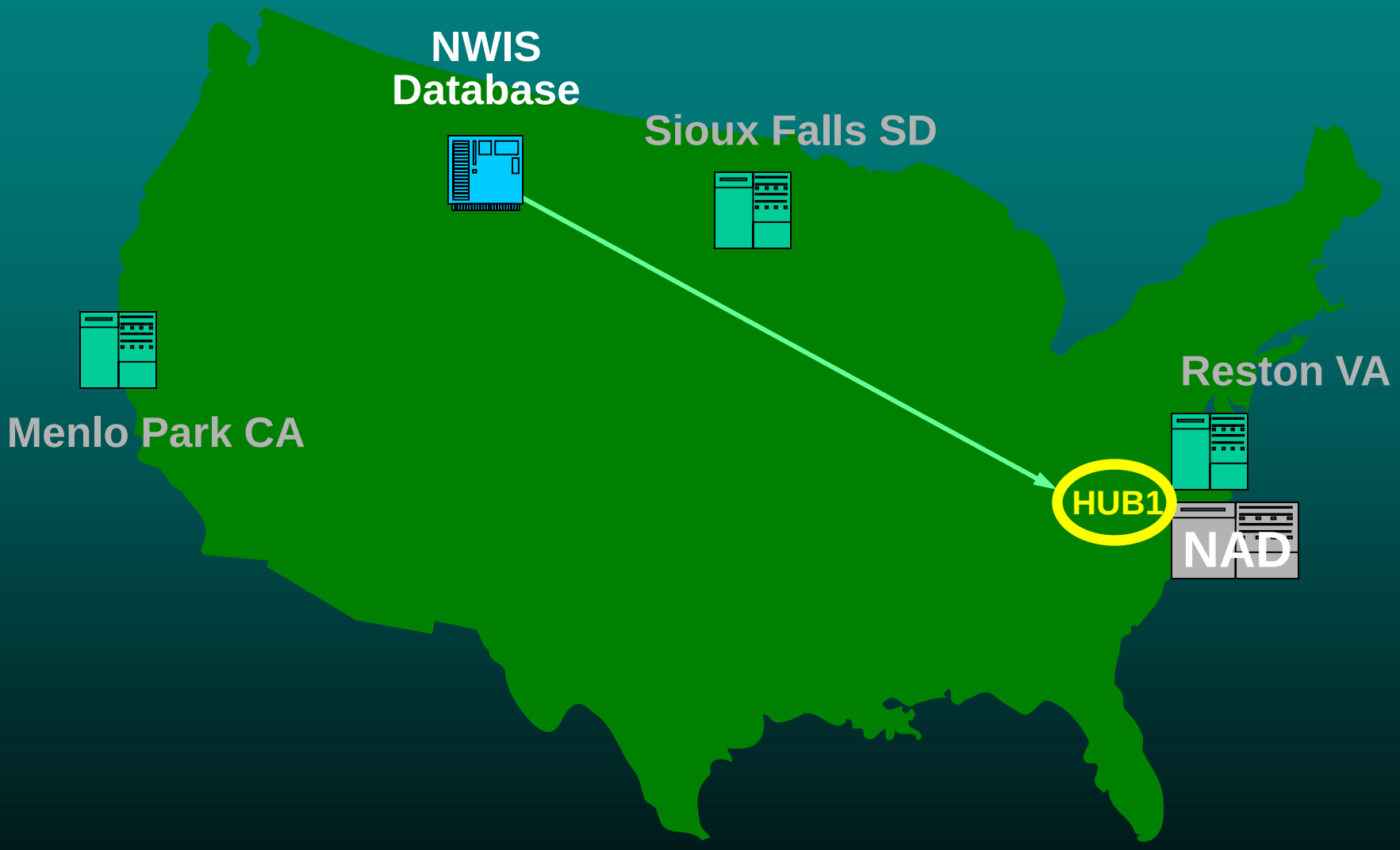


USGS



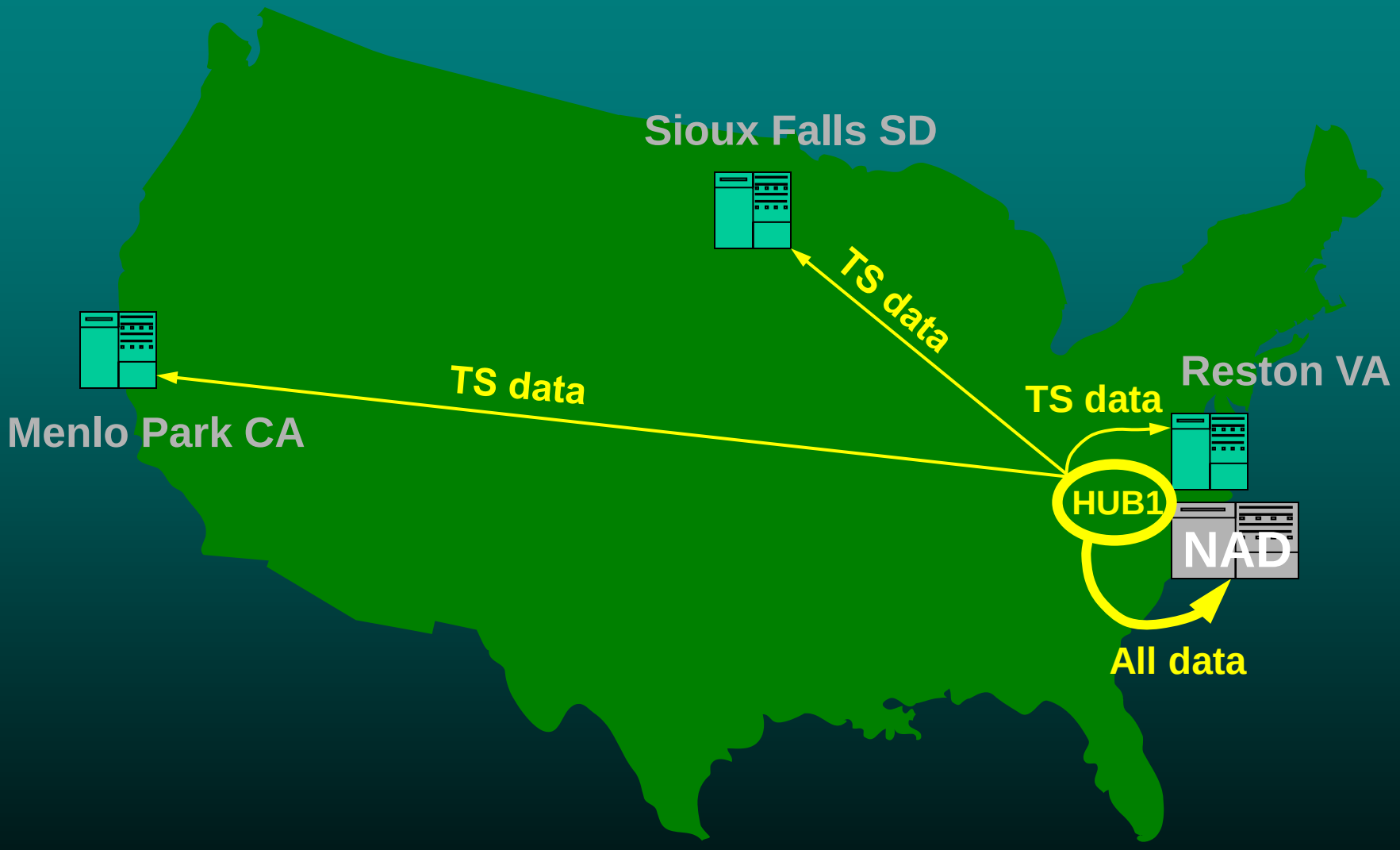
USGS

NWISWeb Data Transfer



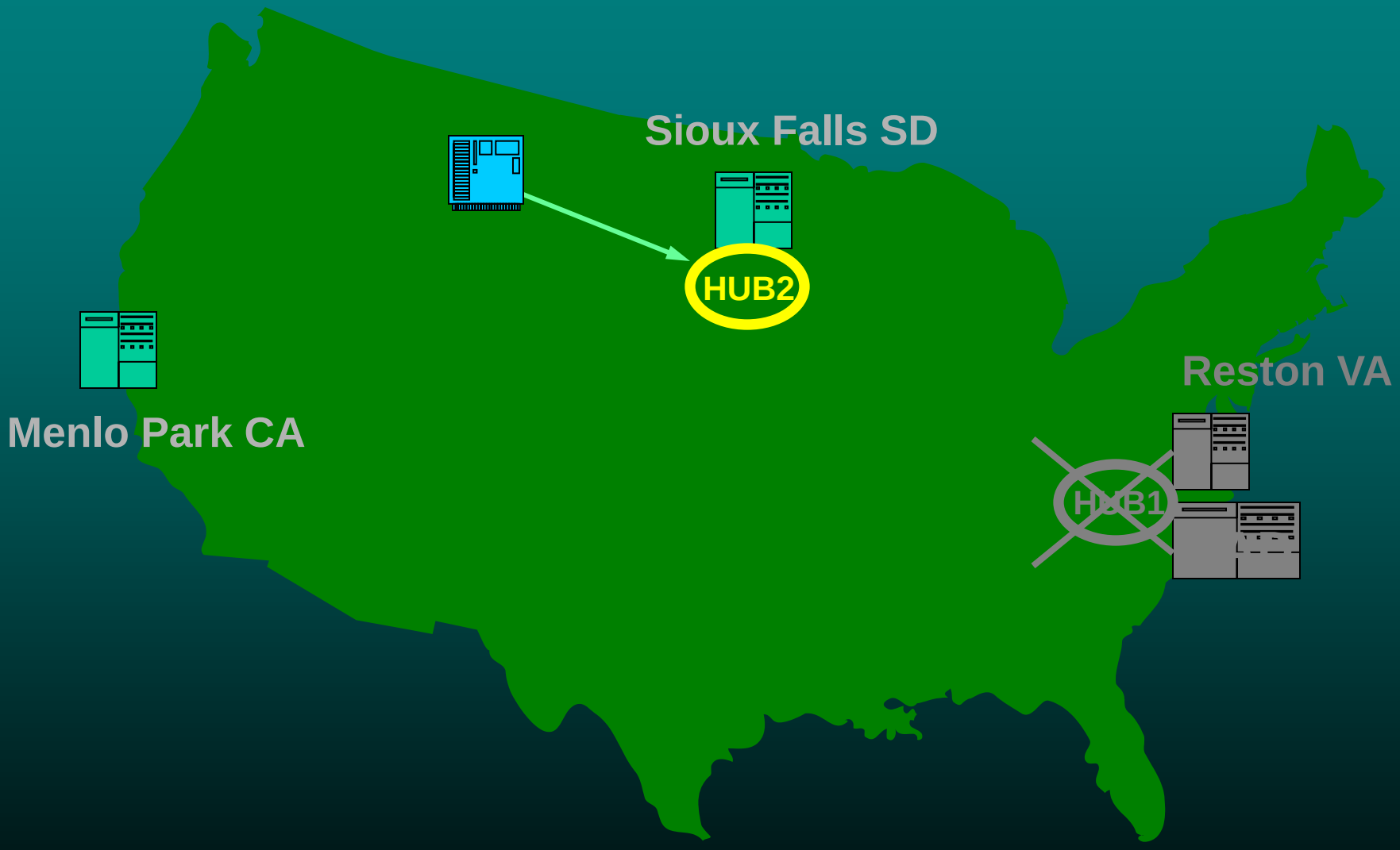
USGS

NWISWeb Data Transfer



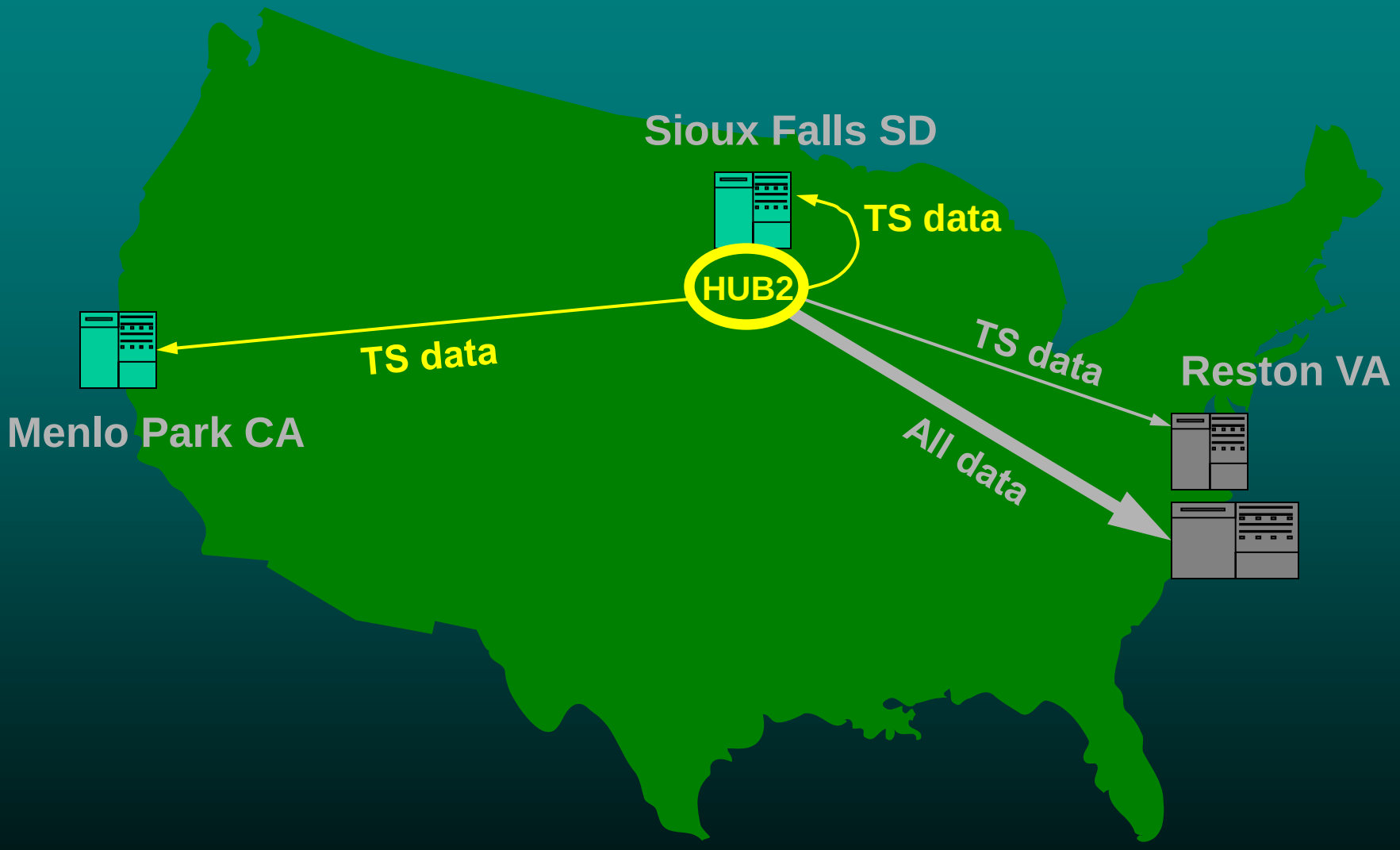
USGS

NWISWeb Data Transfer



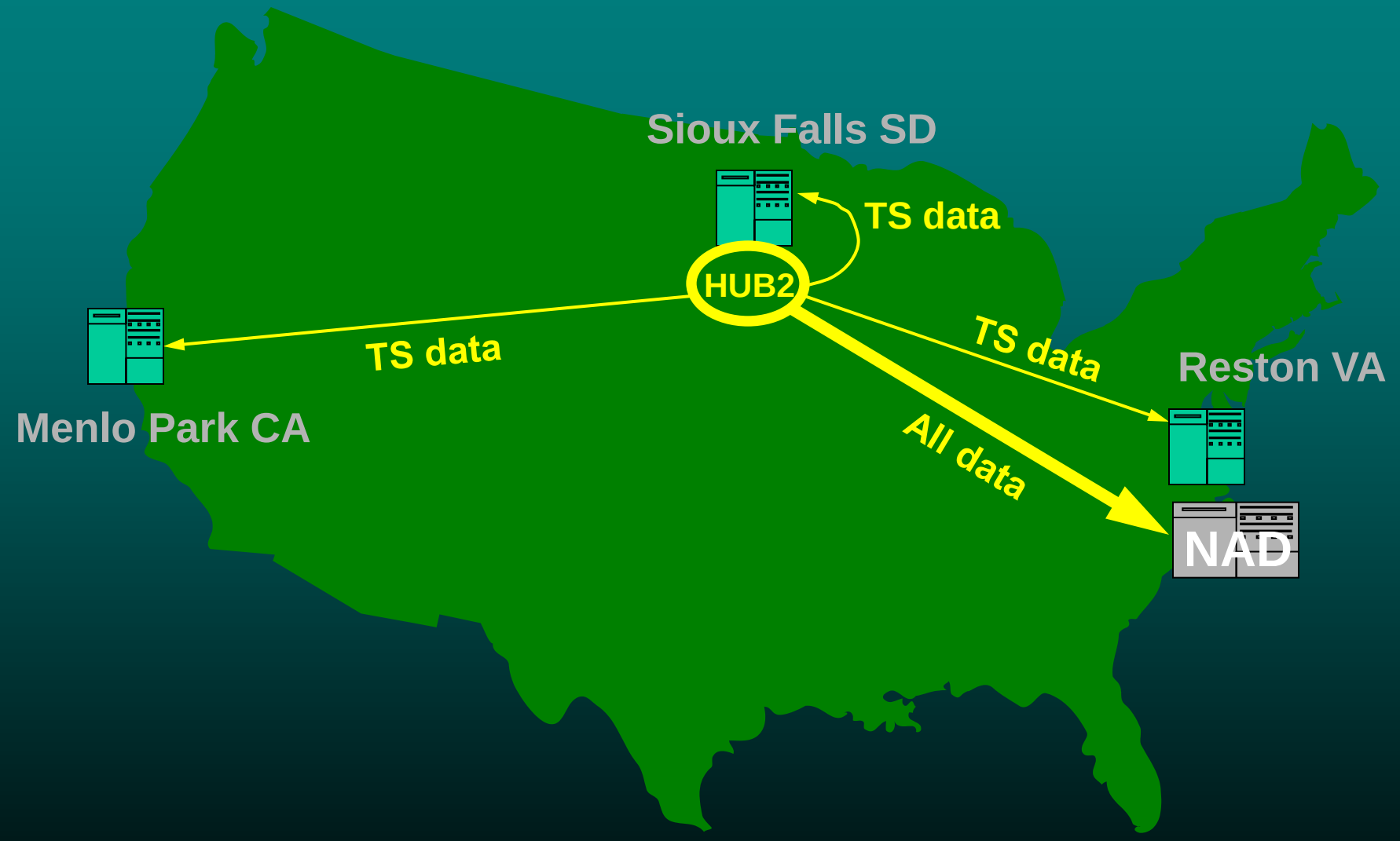
USGS

NWISWeb Data Transfer



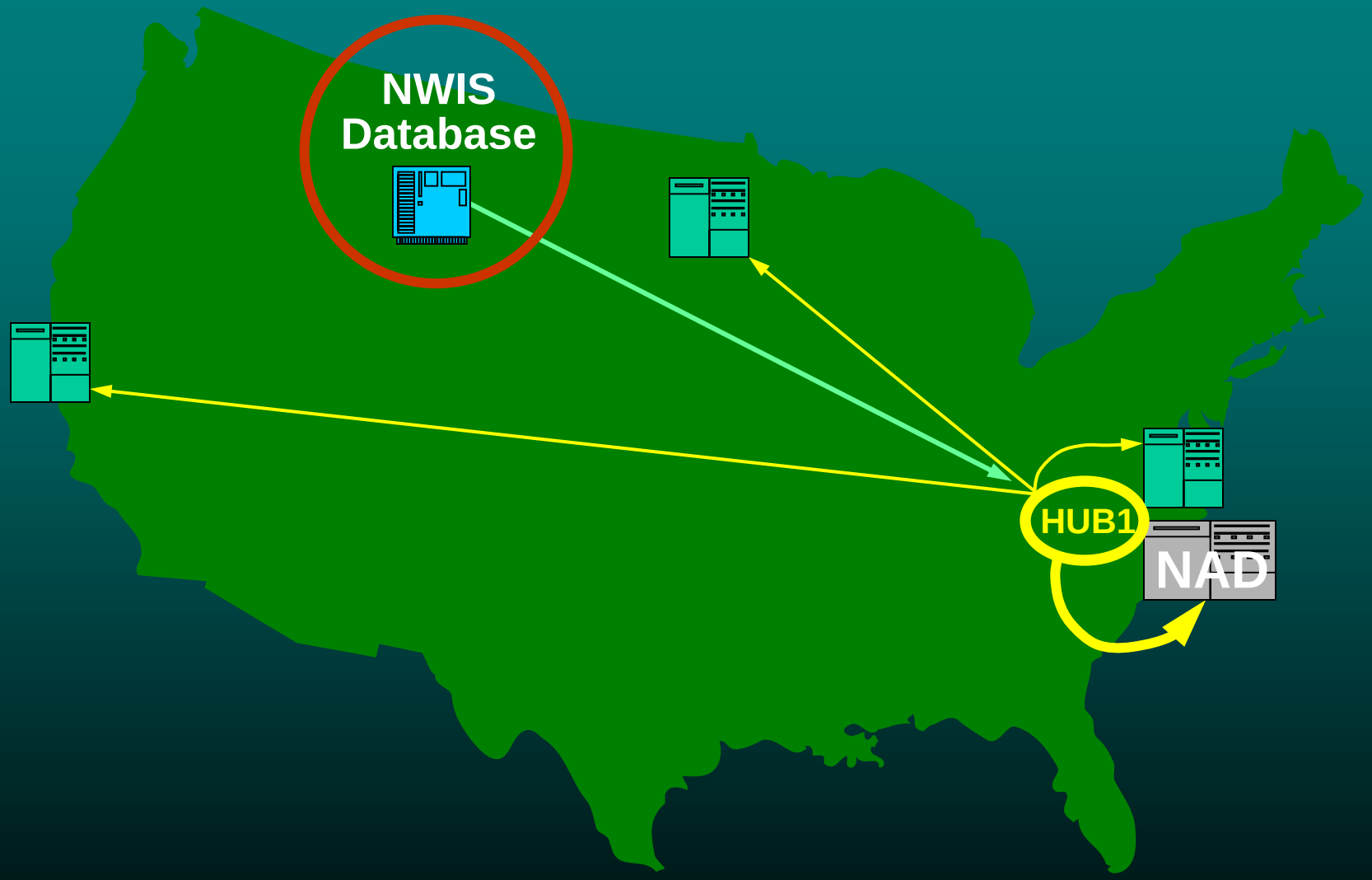
USGS

NWISWeb Data Transfer

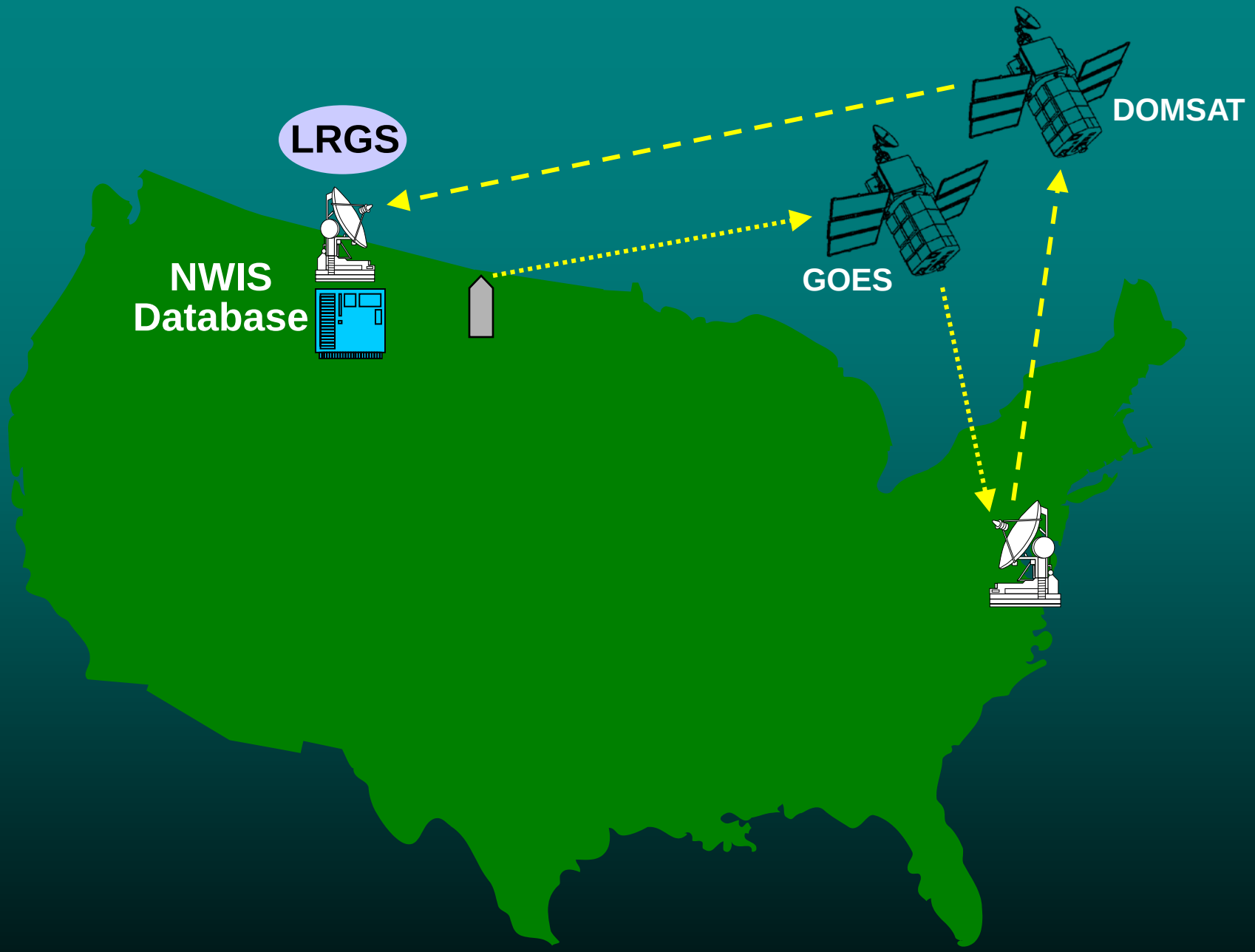


USGS

NWIS Database is single point of failure

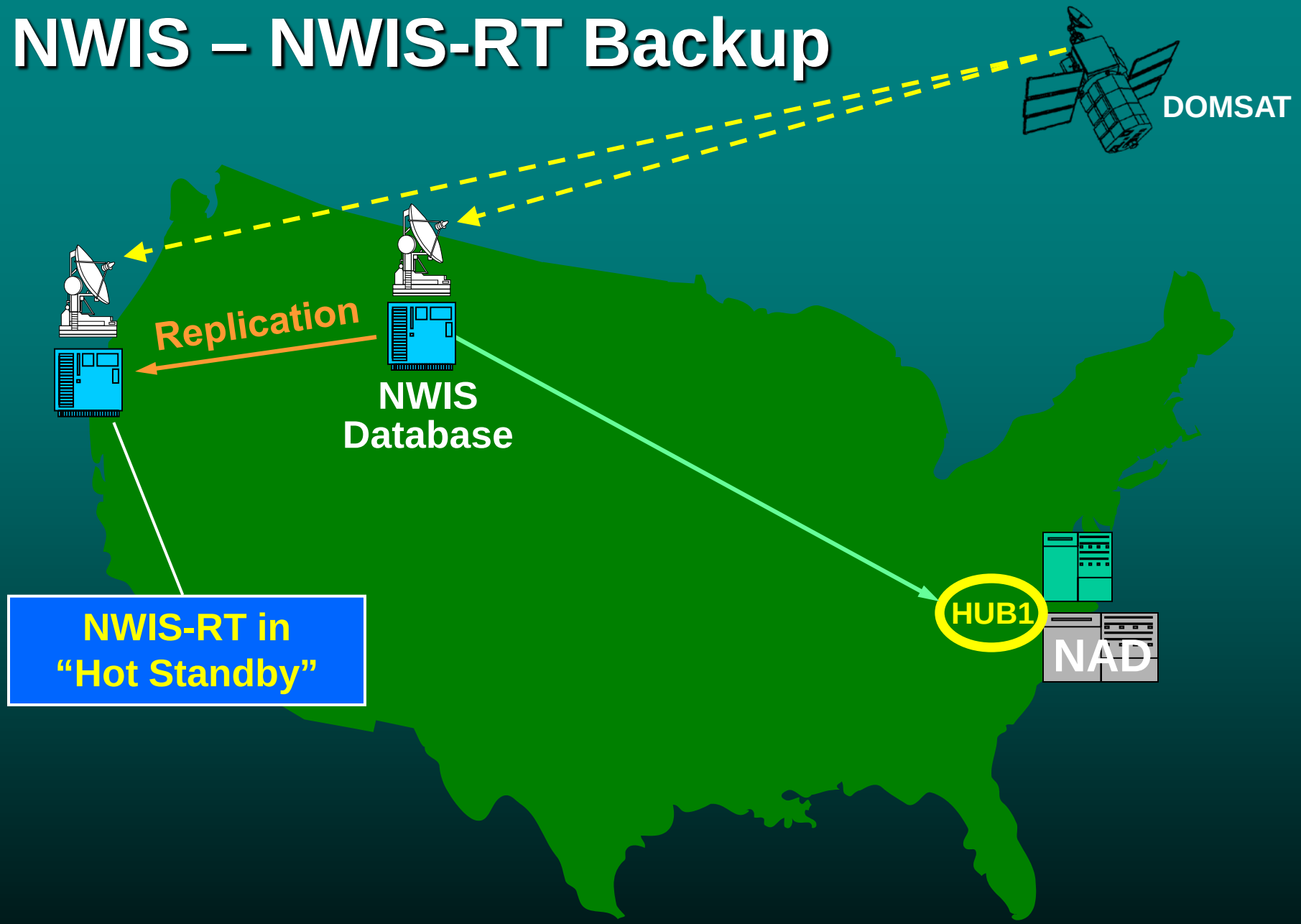


USGS



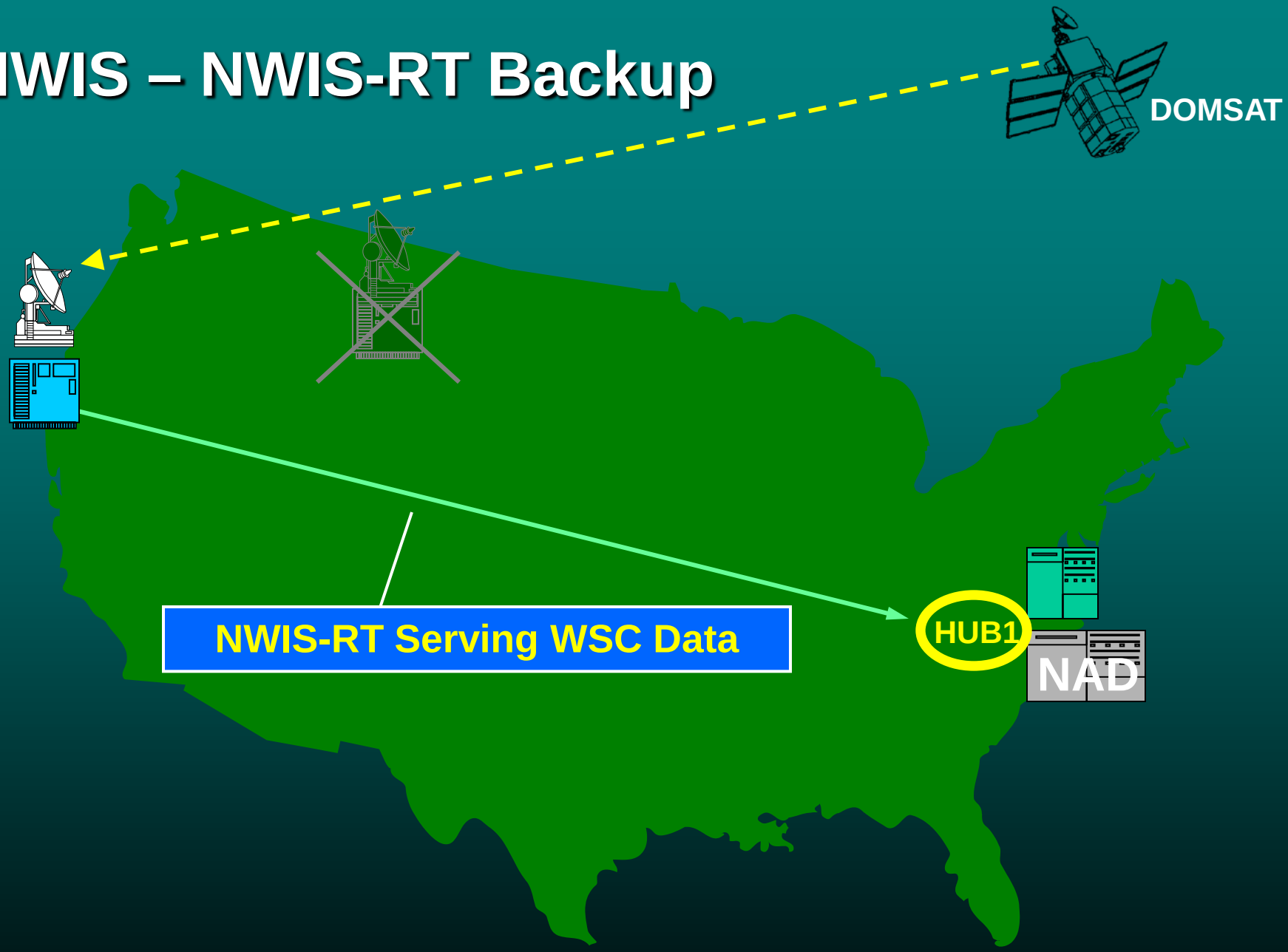
USGS

NWIS – NWIS-RT Backup



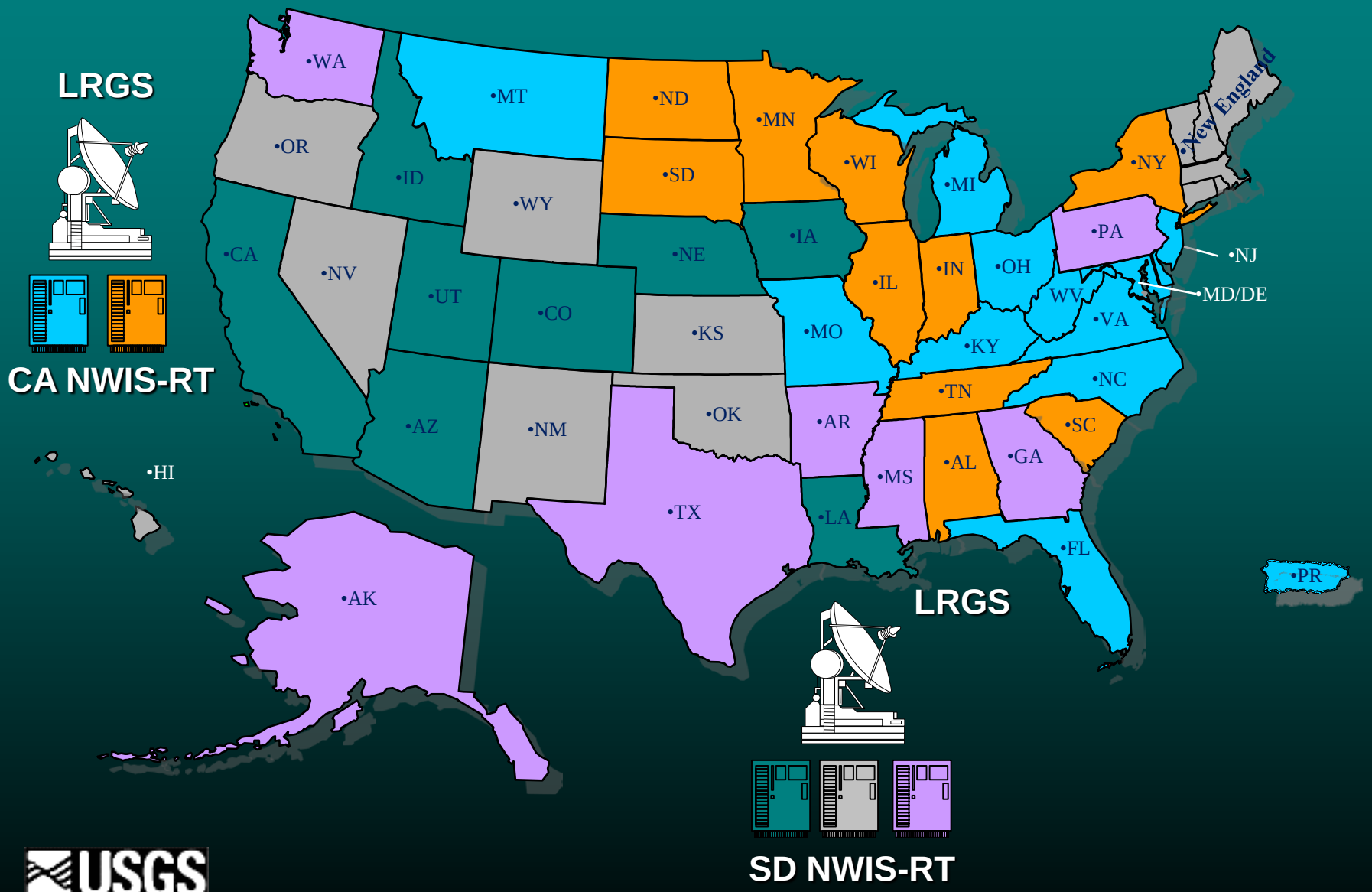
USGS

NWIS – NWIS-RT Backup

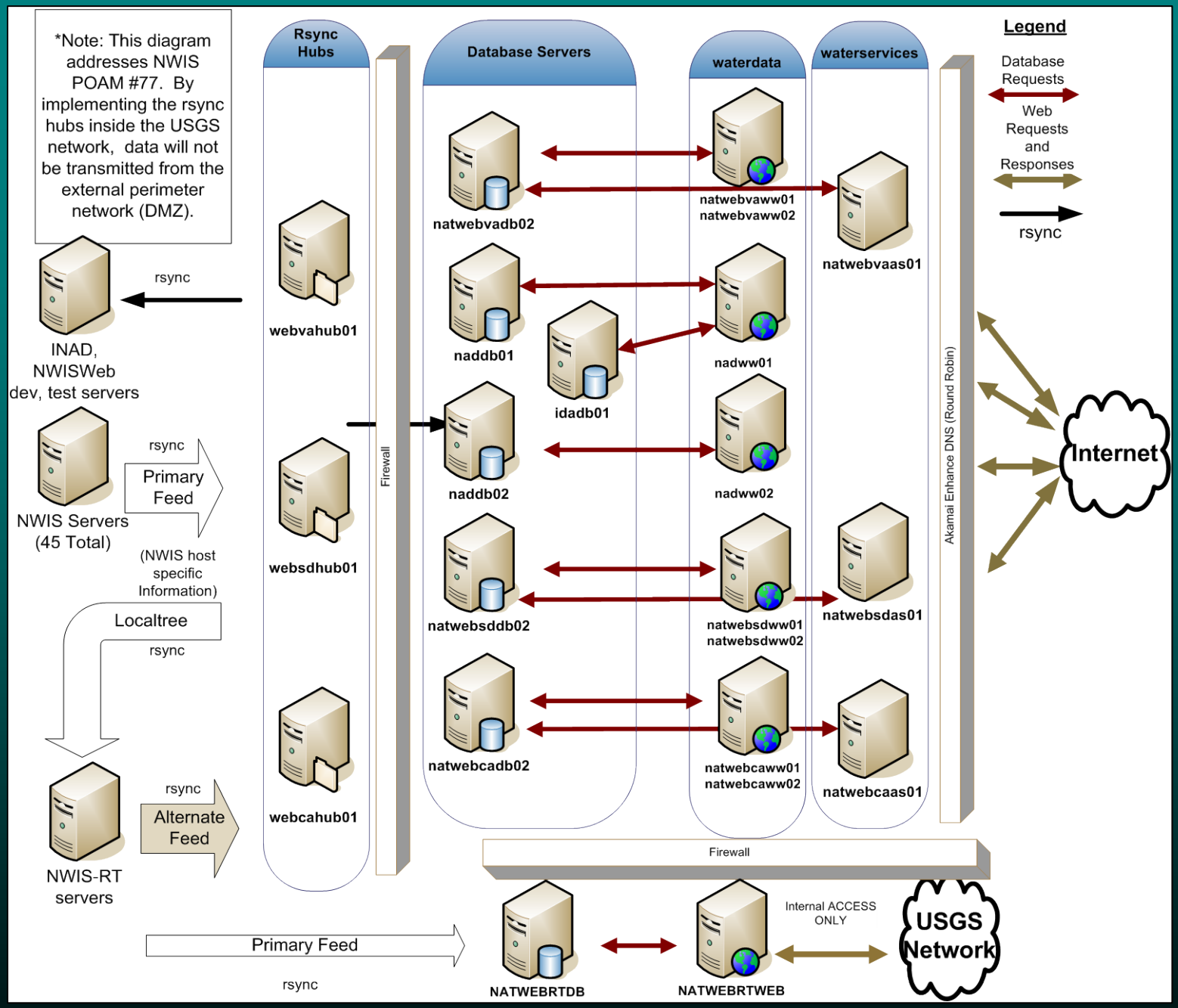


USGS

NWIS to NWIS-RT Replication



USGS


*Note: This diagram addresses NWIS POAM #77. By implementing the rsync hubs inside the USGS network, data will not be transmitted from the external perimeter network (DMZ).
Rsync Hubs
Database Servers
waterdata
waterservices
Legend
Database Requests
Web Requests and Responses
rsync
INAD, NWISWeb dev, test servers
rsync
webvahub01
natwebvadb02
natwebvaww01
natwebvaww02
natwebvaas01
naddb01
idadb01
nadww01
NWIS Servers (45 Total)
rsync
Primary Feed
(NWIS host specific Information)
Firewall
naddb02
nadww02
Akamai Enhance DNS (Round Robin)
Internet
websdhub01
natwebsddb02
natwebsdww01
natwebsdww02
natwebsdas01
Localtree
rsync
webcahub01
natwebcadb02
natwebcaww01
natwebcaww02
natwebcaas01
NWIS-RT servers
rsync
Alternate Feed
Firewall
Primary Feed
rsync
NATWEBRTDB
NATWEBRTWEB
Internal ACCESS ONLY
USGS Network

Security

- NWIS Security Classification - Moderate
  - NWIS, Earthquakes, Landsat and National Map are mission critical major system
  - Rigorous IT practices, controls and accountability
- DOI Enterprise
  - Network scans and firewalls
  - Secure desktop systems and enterprise services

USGS

Data Protection and Continuity of Operations (COO)

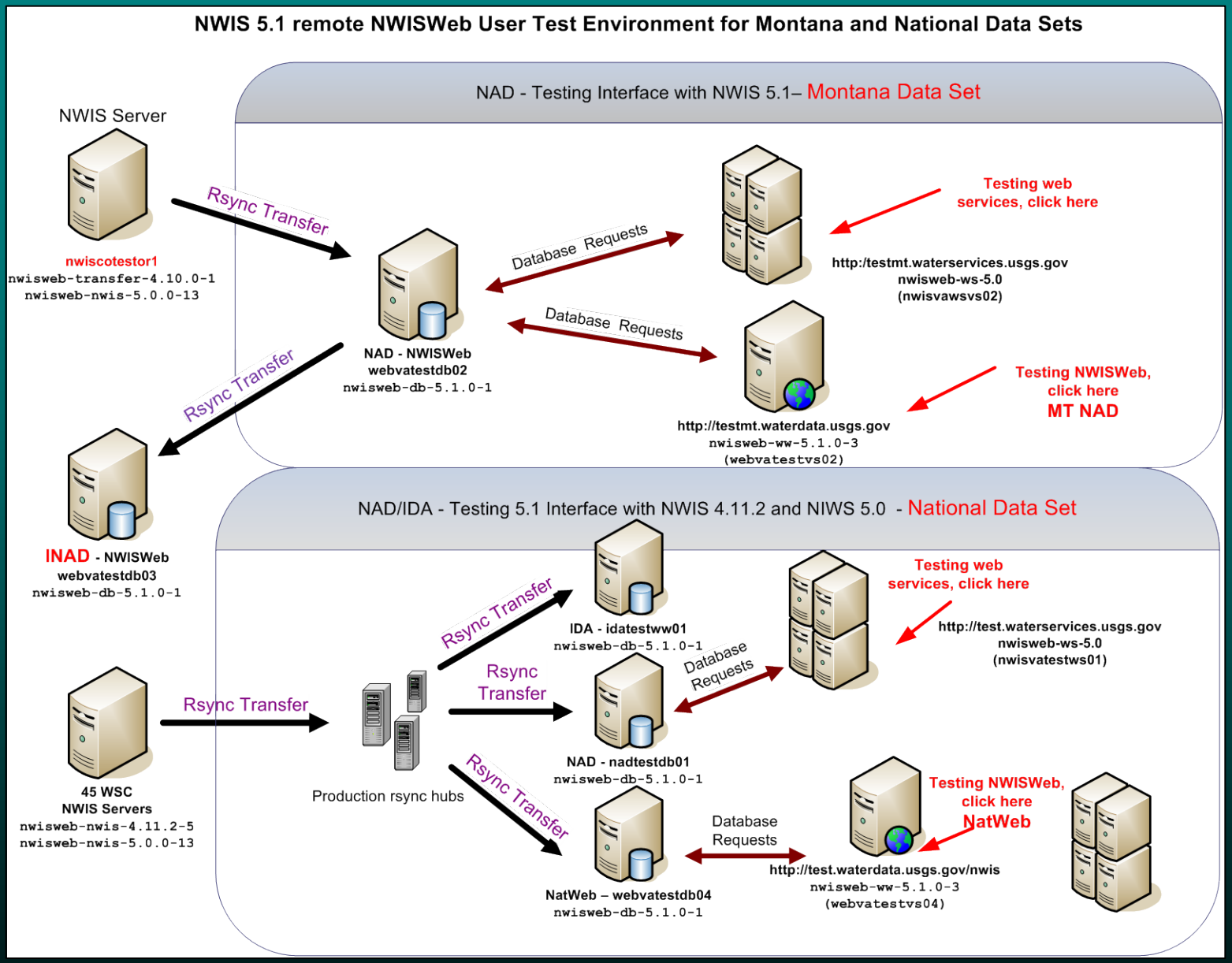
- Regular system and database backups
  - Database management system's recovery logs
  - Daily incremental and weekly full backups
  - Checksums and verifications
  - Encrypted and copies taken offsite
- COO
  - Redundant systems for real-time data
  - NWIS Buddy-sites
    - uses a WSC in a different "weather pattern"
    - weekly data transfers, verification and annual testing

USGS

Maintenance/Operations

- NWIS follows formal documented processes .
  - User support is provided by funded support teams.
  - Formal configuration management and testing practices are followed.
  - Critical patches follow a strict documented assessment before release.
  - User Groups perform formal reviews and testing of NWIS before each release.
- NWIS performs IT Security Control Reviews (4 per year), and has a permanent security manager and field-based technical advisory team.
- NWIS teams maintain web-pages of best practices, check-scripts and automated monitoring processes - and a 7x24 real-time data support-hotline.
- Specialized training is regularly provided to system and database administrators.

USGS


NWIS 5.1 remote NWISWeb User Test Environment for Montana and National Data Sets
NAD - Testing Interface with NWIS 5.1– Montana Data Set
NWIS Server
nwiscotestor1
nwisweb-transfer-4.10.0-1
nwisweb-nwis-5.0.0-13
Rsync Transfer
NAD - NWISWeb
webvatestdb02
nwisweb-db-5.1.0-1
Database Requests
Database Requests
http:/testmt.waterservices.usgs.gov
nwisweb-ws-5.0
(nwisvawsvs02)
Testing web services, click here
http://testmt.waterdata.usgs.gov
nwisweb-ww-5.1.0-3
(webvatestvs02)
Testing NWISWeb, click here
MT NAD
Rsync Transfer
INAD - NWISWeb
webvatestdb03
nwisweb-db-5.1.0-1
NAD/IDA - Testing 5.1 Interface with NWIS 4.11.2 and NIWS 5.0 - National Data Set
Rsync Transfer
IDA - idatestww01
nwisweb-db-5.1.0-1
Testing web services, click here
http://test.waterservices.usgs.gov
nwisweb-ws-5.0
(nwisvatestws01)
Rsync Transfer
Rsync Transfer
Database Requests
45 WSC
NWIS Servers
nwisweb-nwis-4.11.2-5
nwisweb-nwis-5.0.0-13
Production rsync hubs
NAD - nadtestdb01
nwisweb-db-5.1.0-1
Rsync Transfer
Database Requests
Testing NWISWeb, click here
NatWeb
NatWeb – webvatestdb04
nwisweb-db-5.1.0-1
http://test.waterdata.usgs.gov/nwis
nwisweb-ww-5.1.0-3
(webvatestvs04)

red : Big Brother Professional Edition - Status @ Mon Feb 11 11:53:15 EST 2013 - Windows Internet Explorer

http://nwisvabb01.er.usgs.gov/bb/

File Edit View Favorites Tools Help

Favorites | Suggested Sites | Web Slice Gallery

ACWI/Monitoring Challen... | Home - NWIS | red : Big Brother Profes...

big brother PROFESSIONAL EDITION

last update
Mon Feb 11 11:53:15 EST 2013

NWIS Eastern Region Servers

	conn	cpu	disk	hdwr	mnt	msgs	NTP	ora	page	procs	satin	ver
nwisal.er.usgs.gov												
nwisfl.er.usgs.gov												
nwisga.er.usgs.gov												
nwisil.er.usgs.gov												
nwisin.er.usgs.gov												
nwisky.er.usgs.gov												
nwisla.er.usgs.gov												
nwisma.er.usgs.gov												
nwismd.er.usgs.gov												
nwismi.er.usgs.gov												
nwismo.er.usgs.gov												
nwisms.er.usgs.gov												
nwisnc.er.usgs.gov												
nwisnj.er.usgs.gov												
nwisny.er.usgs.gov												
nwisoh.er.usgs.gov												
nwispa.er.usgs.gov												
nwispr.er.usgs.gov												
nwissc.er.usgs.gov												
nwistn.er.usgs.gov												
nwisva.er.usgs.gov												
nwiswi.er.usgs.gov												
nwiswv.er.usgs.gov												

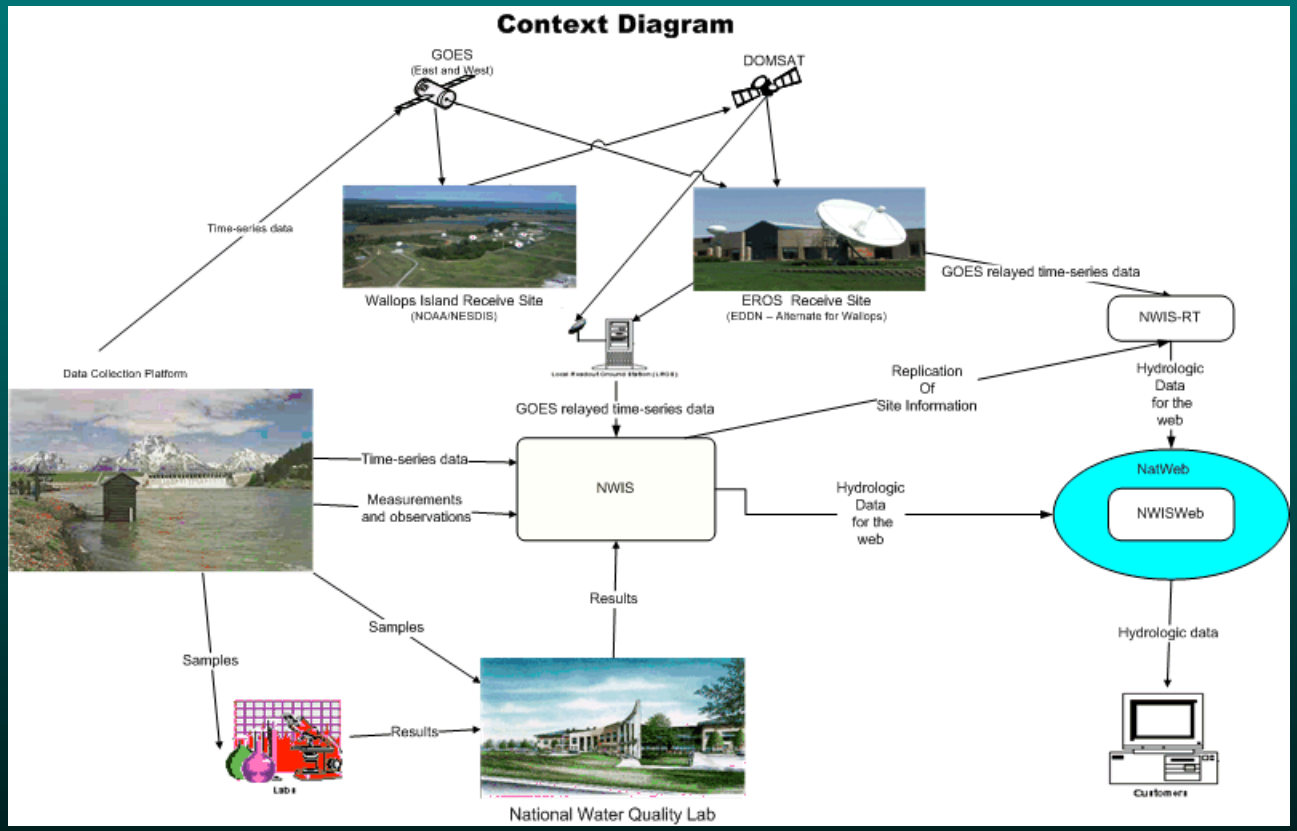
NWIS Central Region Servers

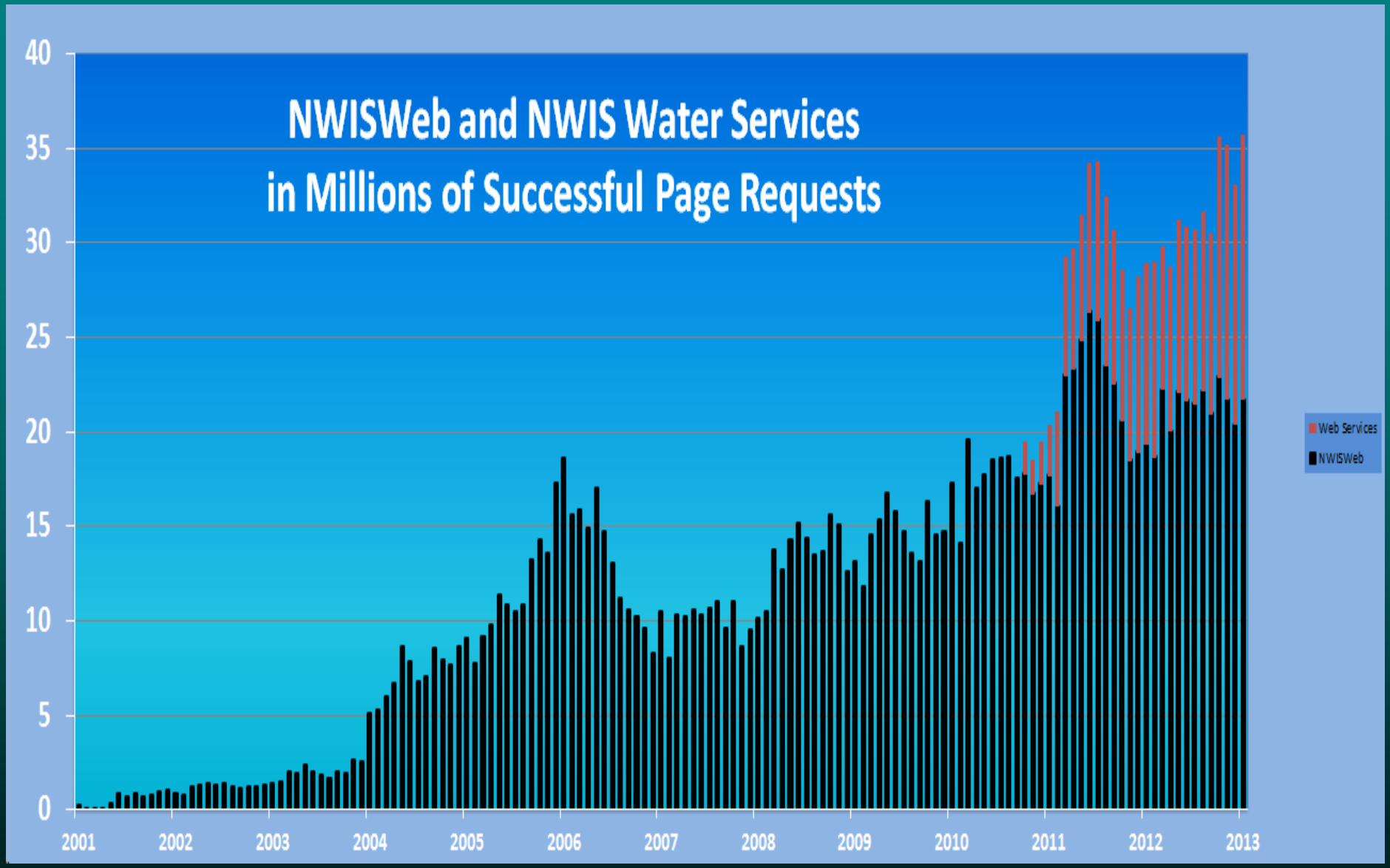
conn cpu disk hdwr ingres mnt msgs NTP ora page procs satin ver

Done | Local intranet | Protected Mode: Off | 100%

USGS

Data Flow: Acquisition to Dissemination





•Through January 2013

USGS

Software Development

- User driven
  - Users define priorities
  - Users develop requirements
  - Users test and accept software
- Formal Users Groups
  - Authority
  - Responsibility
  - Partnership with development staff
- Multifaceted
  - Official NWIS software development
  - Commercial software
  - Locally written/nationally recognized products

USGS

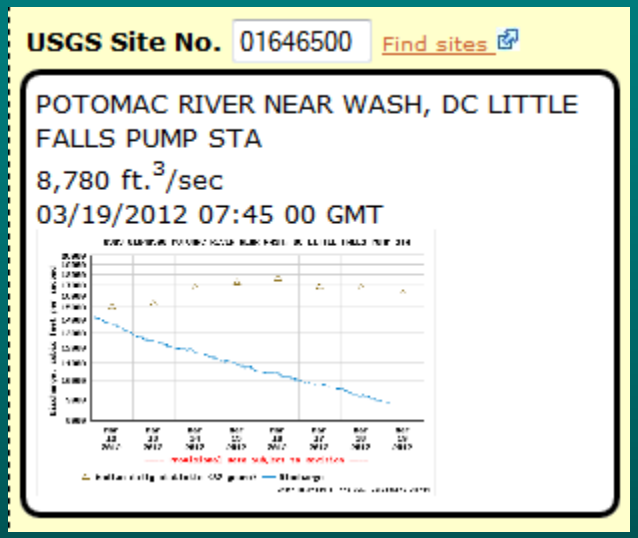
Modern Delivery Services

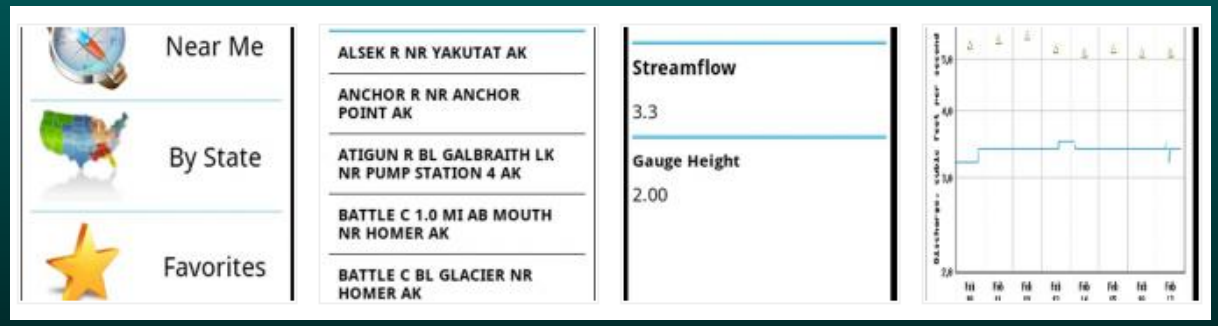
Mobile Strategy

- NWISWeb web services provide customer-facing services to high-value data
  - Consumed by USGS, Federal partners, and others (in their websites, data-portals and mobile applications)
  - USGS WaterAlert, WaterNow and WaterWatch depend on NWISWeb data services
- A mobile friendly version of the NWISWeb Real-time data web-interface will be made available in late 2013

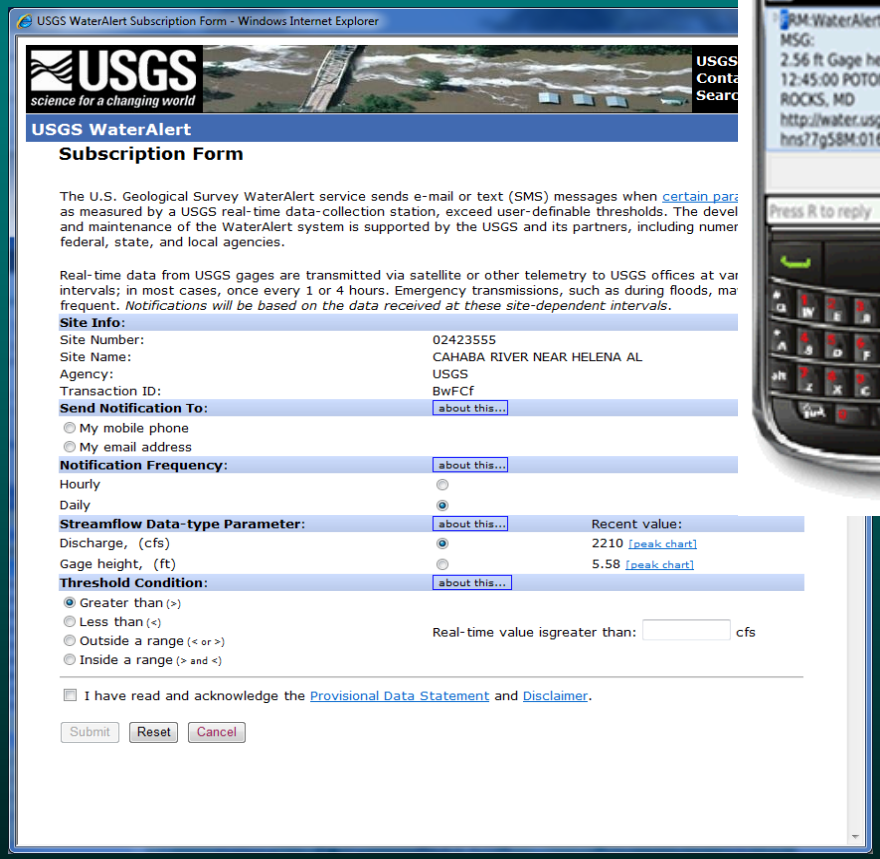
USGS

IV Service Apps and Integrations





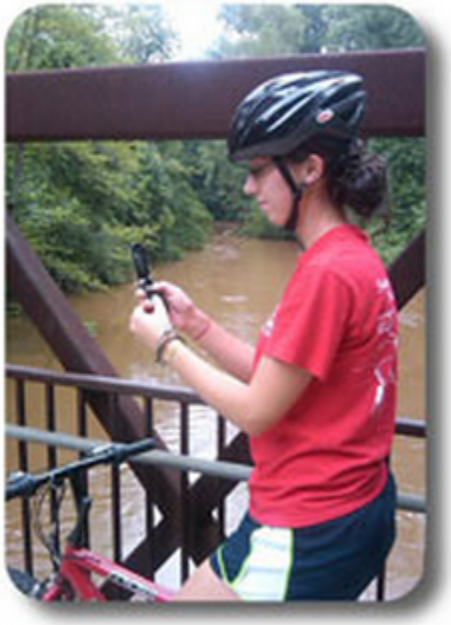
WaterAlert



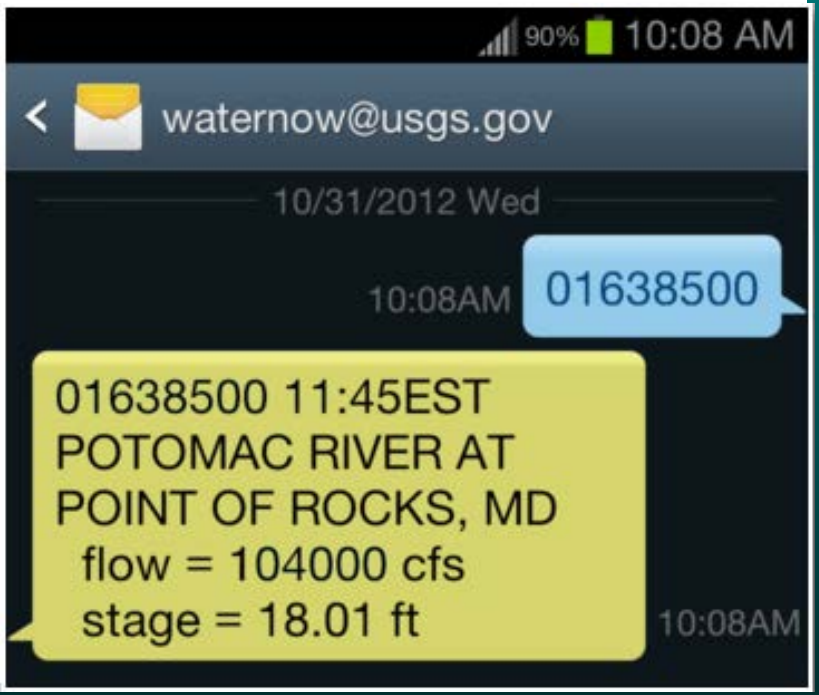
- Sends emails/texts based upon user pre-set thresholds
- Almost all real-time parameters
- Hourly or daily intervals
- Thresholds:
  - greater than
  - less than
  - between a range
  - outside a range
- Sends notifications when NWISWeb flags are turned on/off

WaterNow

USGS WaterNow – On-demand, current conditions for water data directly to your mobile phone or email



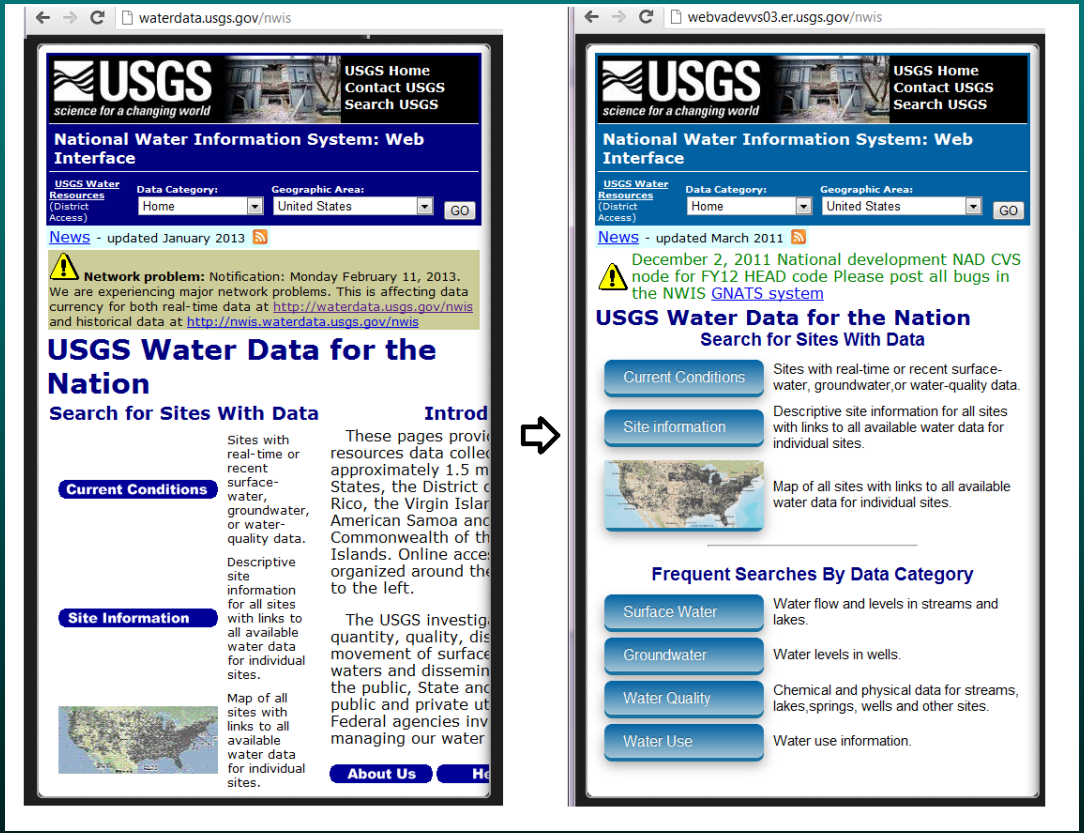
Send an email or text message containing a USGS current-conditions gaging site number and quickly receive a reply with its most recent observation(s).



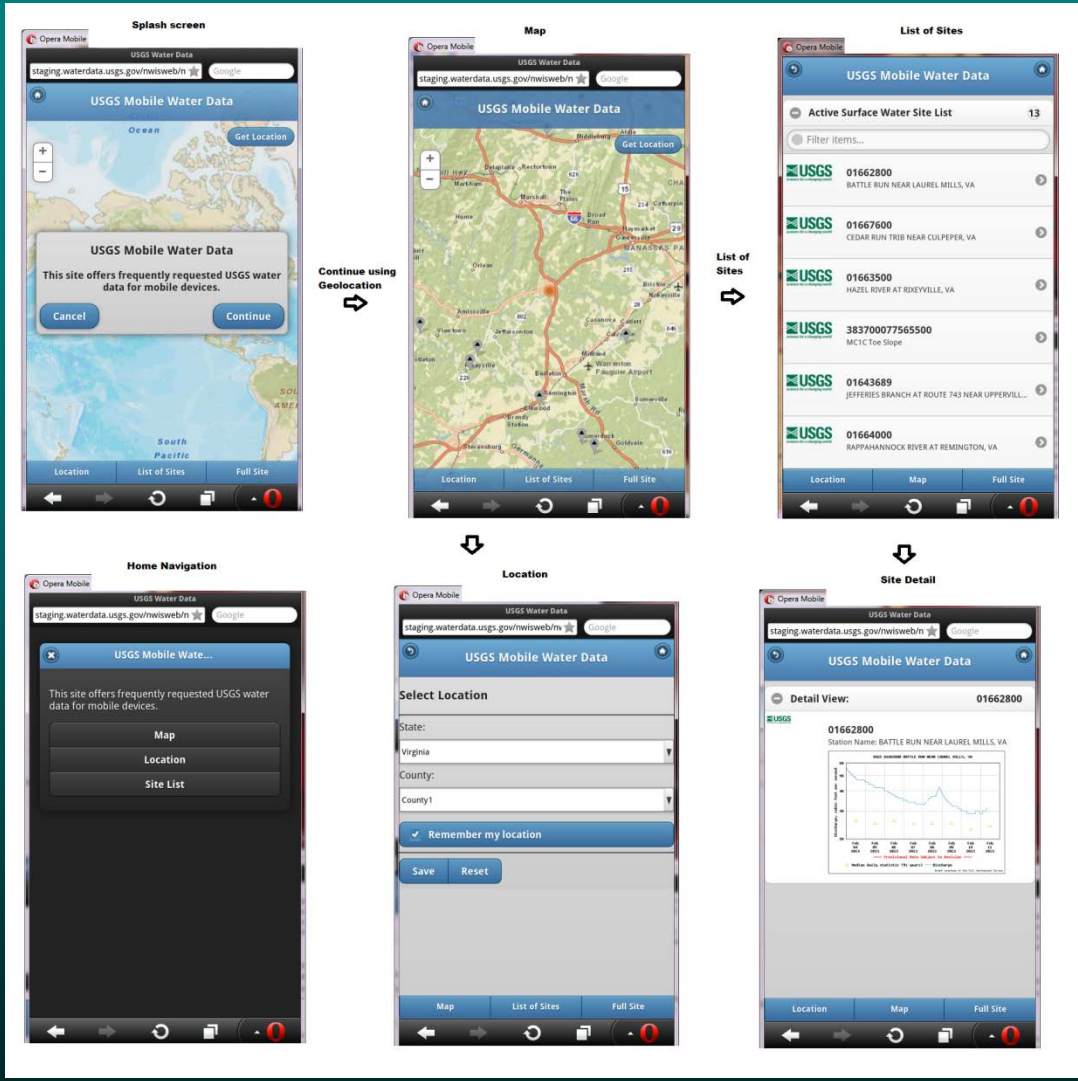
USGS

Coming Soon - NWISWeb Mobile Friendly Displays

NWIS Web Main Page - Before and After



Coming Soon - Mobile Aware Current Data Display



Can use GPS to locate and display current data for sites near user, or use other options

Data Integration / Interoperability

- The USGS Office of Water Information (OWI) and the Center for Integration and Data Analytics (CIDA) are collaborating with OGC including working on OGC "Interoperability experiments" with international partners and actively contributing to standards and protocol development.
- NWISWeb is providing the data/web services and revising them based on latest OGC protocols (WaterML 2, WFS, SOS) but will likely need to support other protocols as well.
- CIDA developed the USGS/EPA Water Quality web services portal and is actively involved in other ACWI sponsored portal development efforts.
- OWI is active contributor to the USGS Community for Data Integration (sponsored by the USGS Core Science Systems mission area)

USGS

Questions?