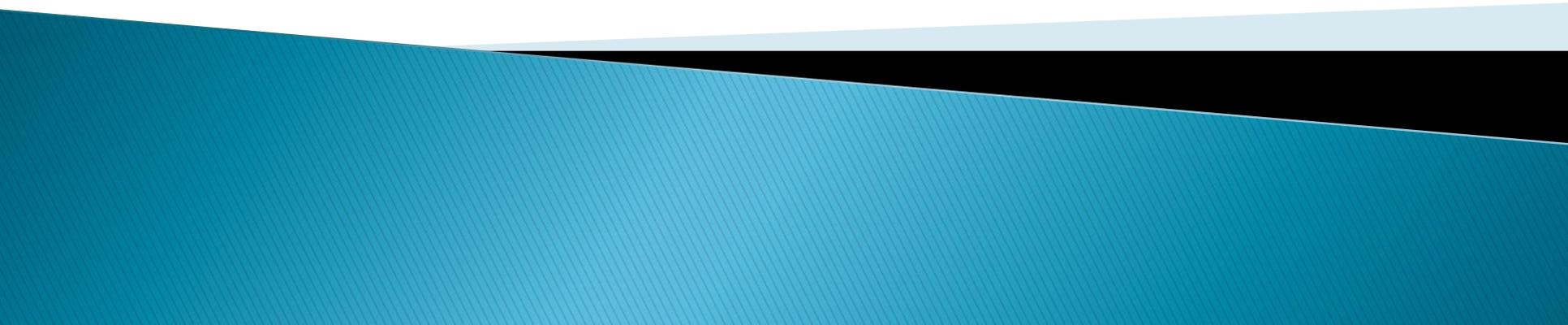


Enabling a National Sensor Data Sharing Network

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Outline

- ▶ Quick background on the WestFAST data workgroup.
- ▶ An EPA perspective on the current state of water quality monitoring data sharing.
- ▶ Existing approaches and standards for sharing sensor data.
- ▶ What would a national water data sharing network look like?
- ▶ What's needed to make it work?
- ▶ A path forward.

WestFAST Data Work Group

- ▶ WestFAST is a collaboration of 12 Federal agencies with water management responsibilities in the West
- ▶ Established a work group to begin cross-agency discussion on water data management and data sharing
- ▶ Some key drivers:
 - Western Governors' policy statements on water quantity and water quality
 - Open Data Policy calling for data to be made available in a machine readable format

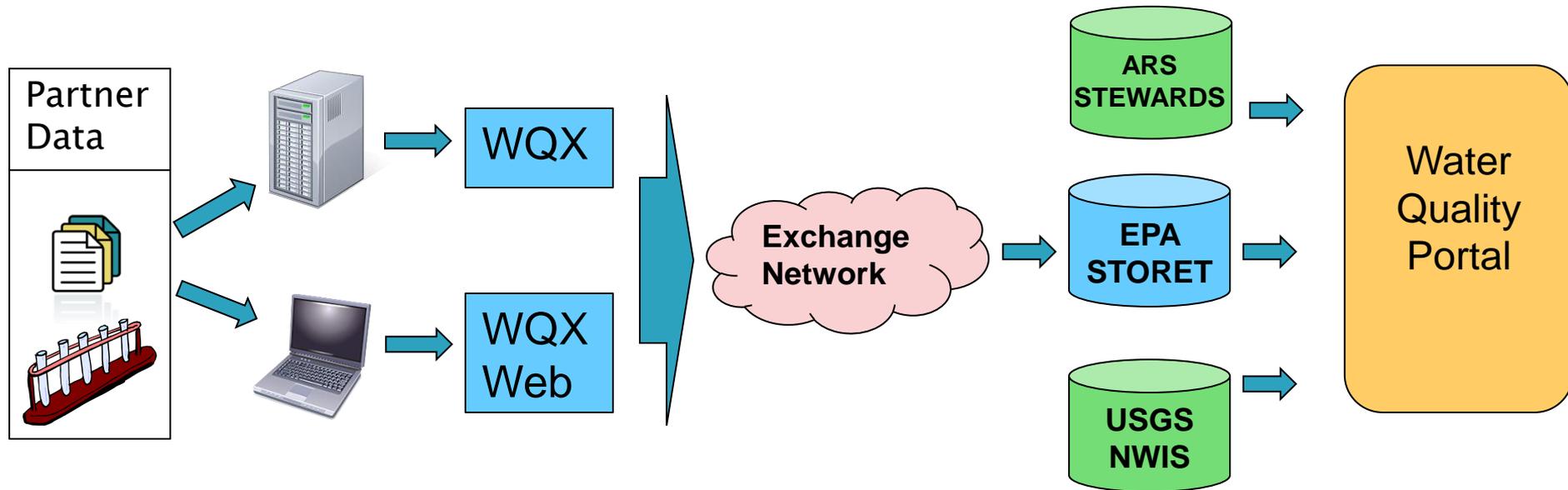
EPA Perspective: Water Quality Monitoring

- ▶ Two basic approaches for collecting water quality monitoring data
 - Discrete Data
 - Based on ‘Samples’ that are often sent back to a lab to be analyzed
 - Typically requires more metadata to describe how a result was measured
 - Examples include: Bacteria samples, metals samples, basic one-time field measurements (pH, DO, etc.), biological samples (number of fish, etc.), and habitat assessments
 - Sensor Data
 - Collected using a sensor that translates a reading into a measured value
 - Measurements are repeated at set increments (every 15 minutes)
 - Combining telemetry and sensors together allows data to be available ‘real-time’
 - Typically requires one set of metadata to describe the sensor and the QA/QC of the sensor
 - Examples include: basic continuous chemical sensors (pH, DO, Temperature), Nitrate sensors, wet-lab sensors, as well as a whole host of water quantity sensors (i.e. stream flow)

Water Quality Exchange (WQX)

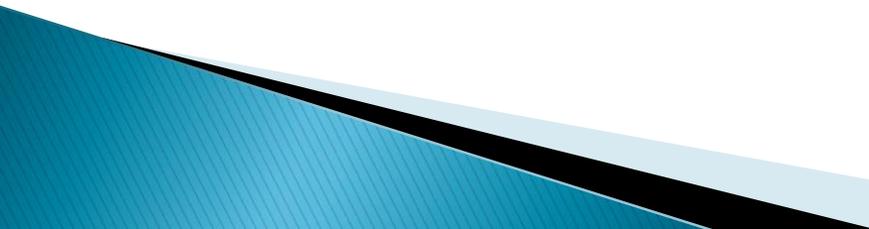
- ▶ Allows for the computer-to-computer exchange of water quality data
 - Designed for water quality samples (physical, chemical, microbiological, biological, and habitat)
 - Been available since 2007
- ▶ The schema was designed in partnership with the states and tribes
- ▶ The data exchange is used by EPA, other federal agencies, states, tribes, citizen groups, and local governments
- ▶ More information can be found at:
www.epa.gov/storet

The role of WQX in Data Sharing



- The water quality data portal (an EPA/USGS partnership) provides access to over 232 million water quality results
- These data are all available via web services which can be incorporated into any other third party application
- For more information on the portal see: www.waterqualitydata.us

What about Sensors and Continuous Data?

- ▶ EPA is starting to see an increased emphasis on sensors
 - ▶ New sensor technology, in addition to new telecommunication, and computing technology is opening an entire new world of possibilities
 - ▶ EPA is leading the Challenging Nutrients Sensor Challenge to accelerate affordable, reliable nutrient sensor development and use
 - ▶ At the 2014 National Water Quality Monitoring Conference, there was an entire track on sensors, and sensor data
 - ▶ EPA has also embraced a new 'Technology Blueprint' that seeks to promote the use of technology to improve how we do business
 - ▶ With this comes some new challenges, not the least of which is what to do with the data
- 

Metadata Needs May Change Based on Your Data

- ▶ In the water monitoring world, we can classify monitoring into two types:

Discrete Monitoring

- A **sample** is taken and sent to a lab for further analysis
- Typically a one-time event that can be repeated as needed



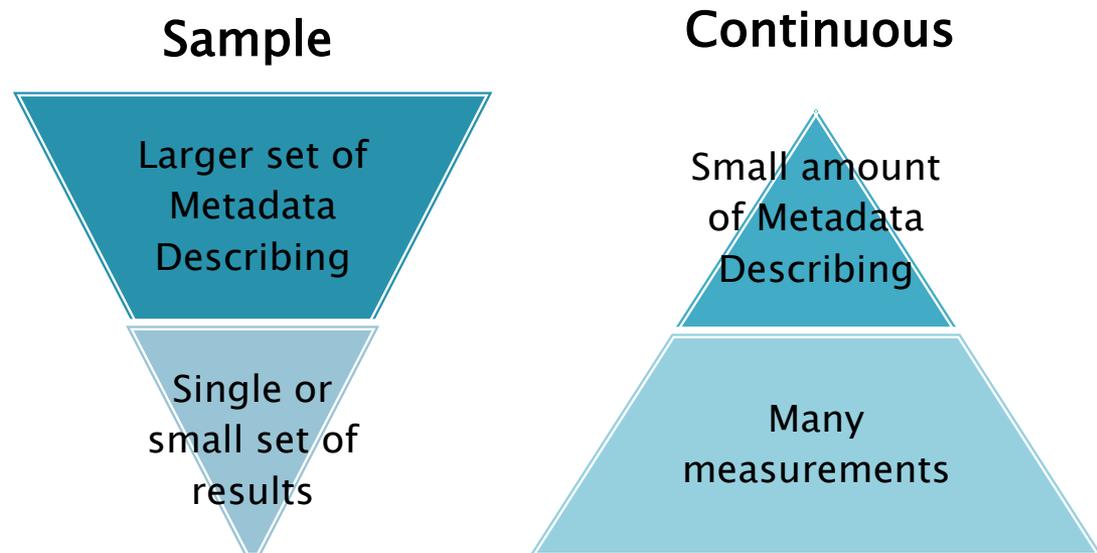
Continuous Monitoring

- A **sensor** is used to record a continuous stream of data about 1 particular analyte or a small set of analytes (i.e. flow, dissolved oxygen, pH, etc).
- Values are reported at set intervals (i.e. every 15 minutes, 1 hour, etc.)

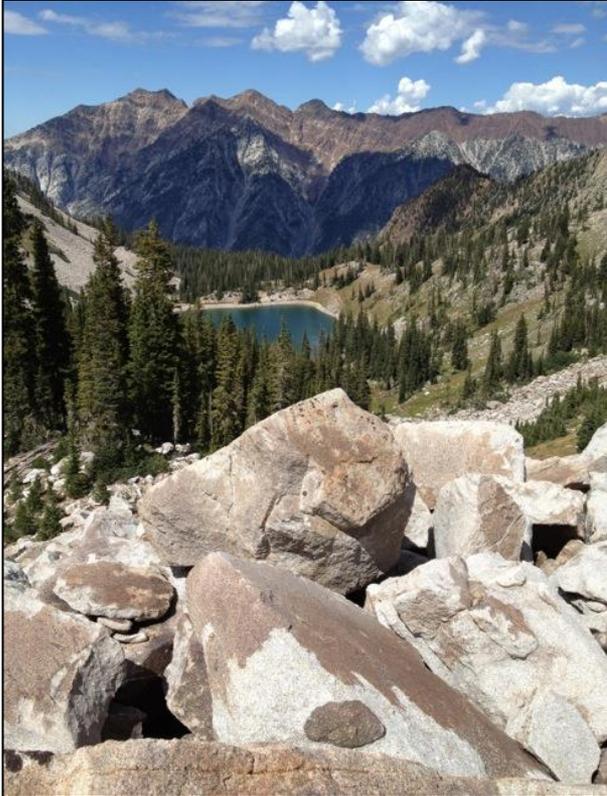


Continuous Monitoring Data

- ▶ The data model for continuous data is different from sample data
- ▶ EPA recognizes that WQX is probably not the model for this type of data
- ▶ EPA is beginning the process of looking at other approaches for continuous data (i.e. WaterML 2)



How to Share Sensor Data?



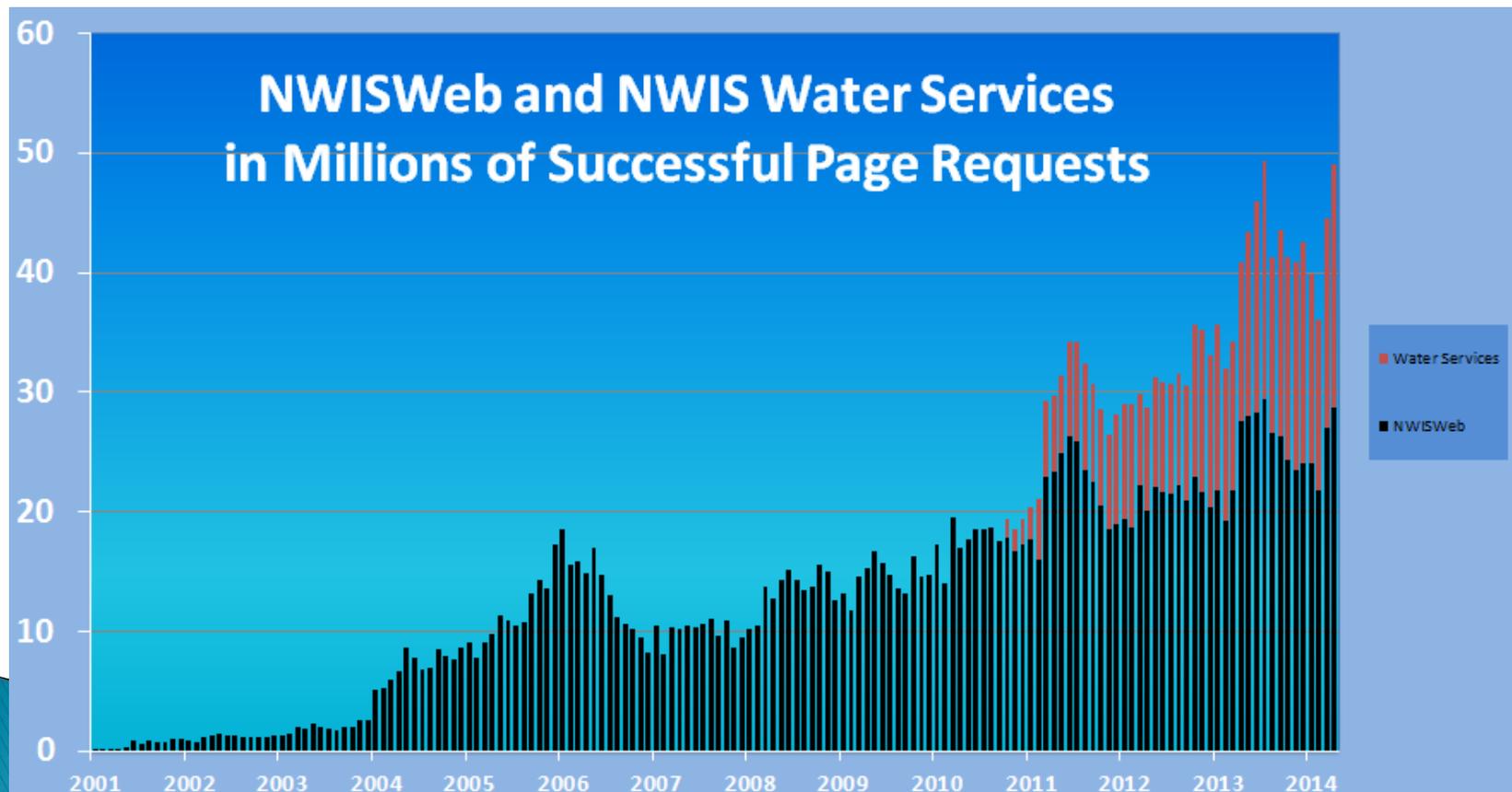
- ▶ Data standards exist
 - Sensor Observation Services (SOS)
 - Water Markup Language 2 (WaterML2) – (TimeSeriesML?)
- ▶ These Open Geospatial Consortium Standards hold a lot of promise as the means of communicating and sharing this information

SOS: <http://www.opengeospatial.org/standards/sos>

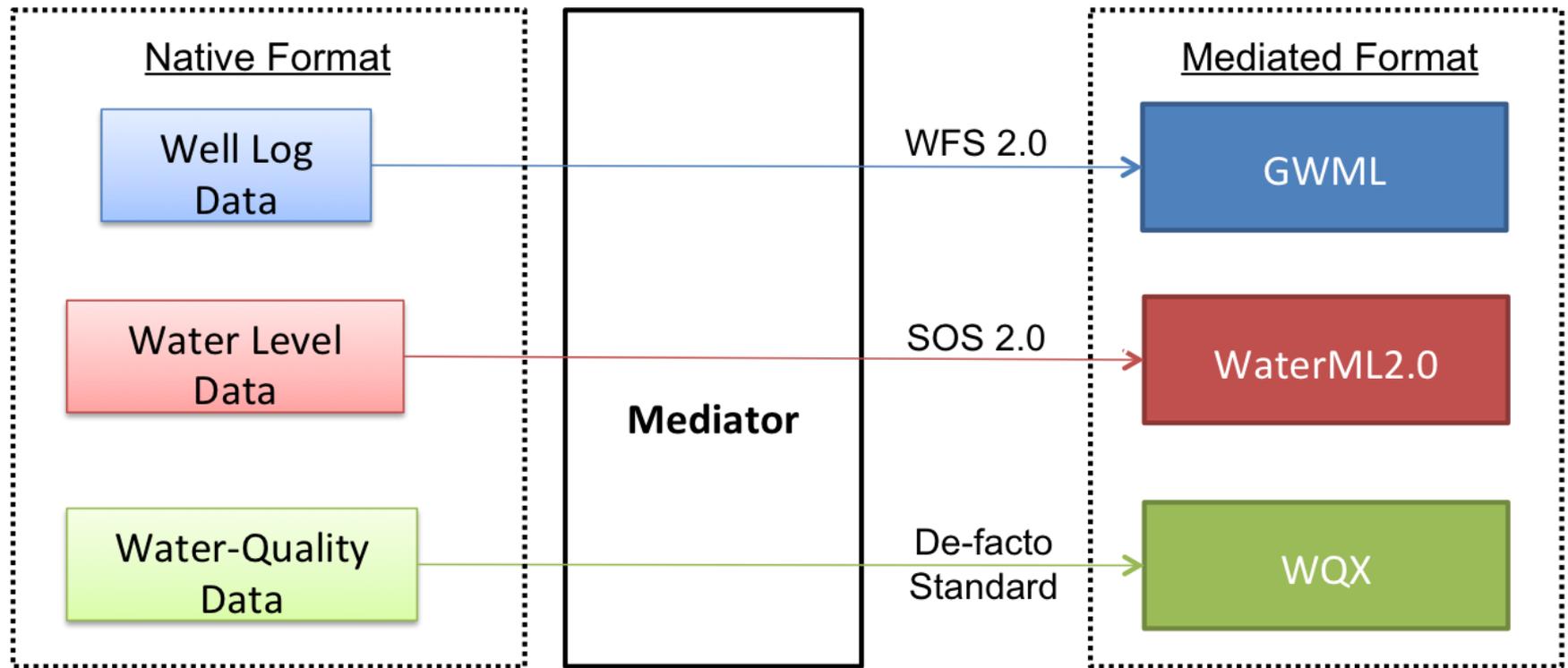
WaterML 2: <http://www.opengeospatial.org/standards/waterml>

Other Federal Agencies Are Already Moving in this Direction

- ▶ USGS is currently making data available via WaterML 2 using web services



Example: National Groundwater Monitoring Network

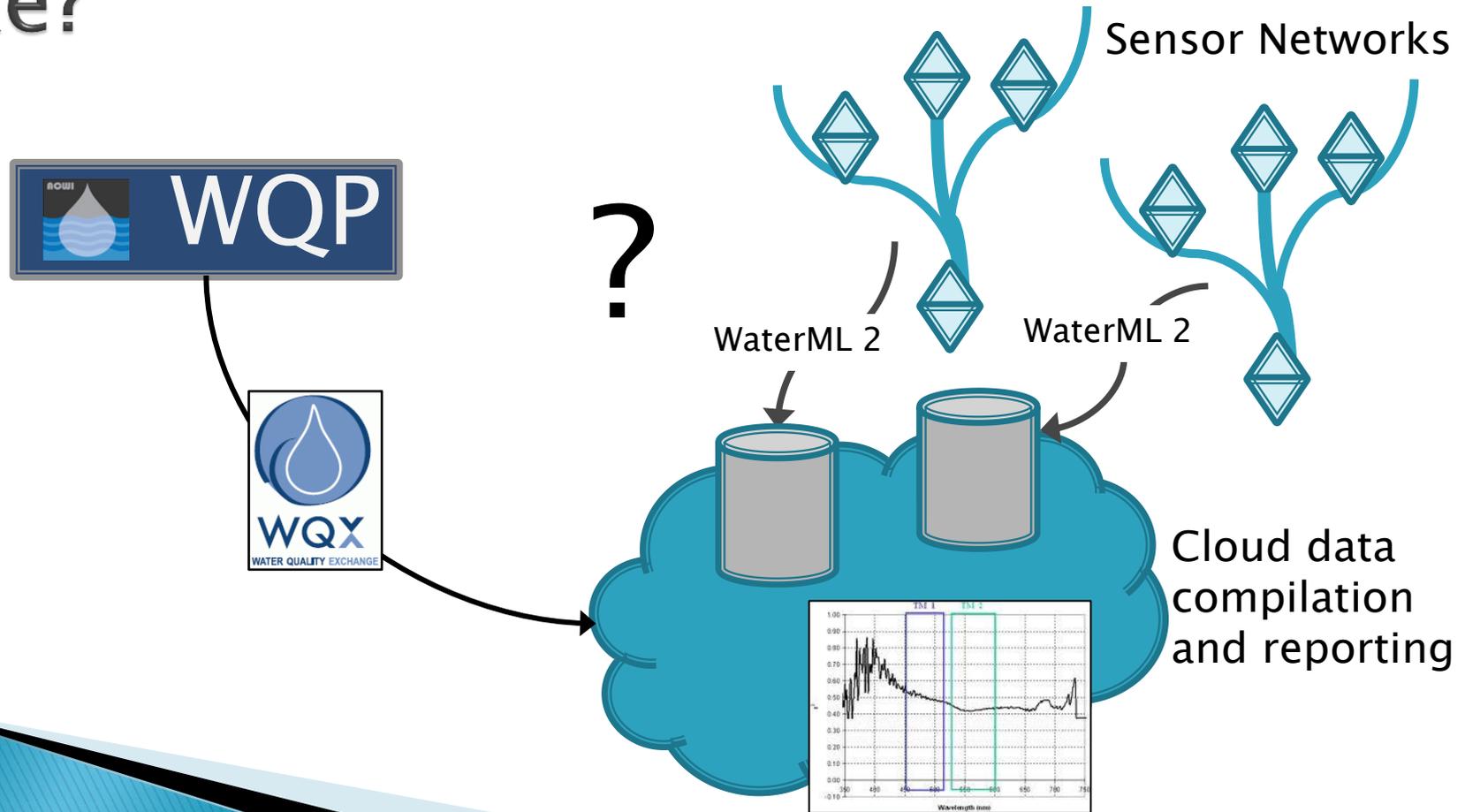


Other Glimmers of Possibility

- ▶ Improvements in telecommunications:
 - Improved cell networks
 - Low-frequency radio communication (zig-zag)
- ▶ Proliferation of cloud-storage options
- ▶ Remote sensor management, including remote QA/QC of sensor output
- ▶ New sensors coming to the market with the capability to measure new parameters



What would a national monitoring network that included both discrete and continuous data look like?



What We Need

- ▶ This effort is more than just a federal initiative
 - Needs state, tribal, local, academia, and private sector participation
- ▶ We should consider the adoption of open standards at all levels (SOS, WaterML 2)
- ▶ Demonstrate that the communication and exchange of data can work
- ▶ Set-up a cloud space and develop a plan for maintaining it
- ▶ We need to think about visualization, and how we make the data meaningful
- ▶ This effort should be bigger than just water quality data

A Path Forward



How do we
get there
from here?

*We could even think beyond water
data....*

“ If you can dream it,
you can do it. ”

Walt Disney



Have further questions, comments, or ideas contact:

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