

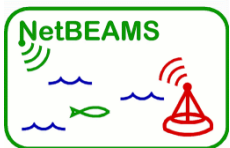
NetBEAMS

A System Overview

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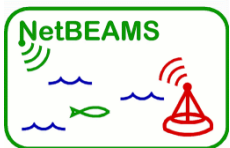


Department of Computer Science



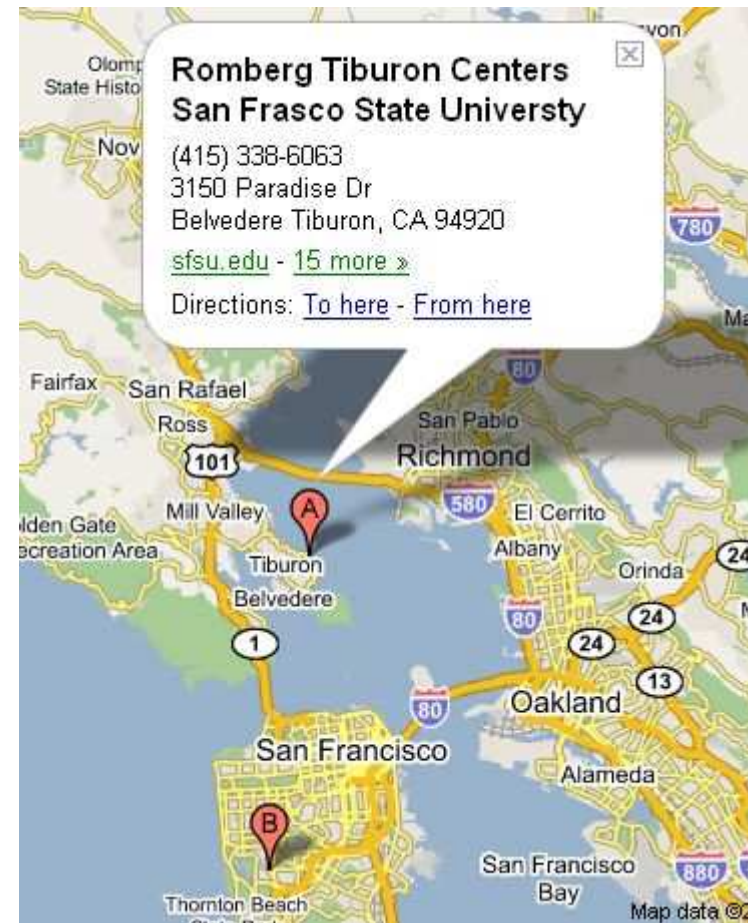
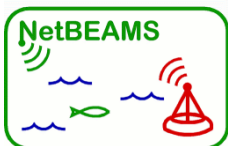
Outline

- Introduction
 - What NetBEAMS is
- Components
 - What NetBEAMS is comprised of
- Examples
 - What NetBEAMS is providing right now
- Future
 - Where is NetBEAMS headed



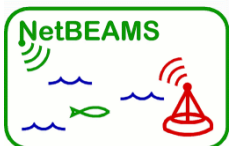
What is NetBEAMS?

- NetBEAMS –
Networked Bay
Environmental Asset
Monitoring System
- A distributed system
of water sensors
around the San
Francisco Bay Area
for SFSU's Romberg
Tiburon Center

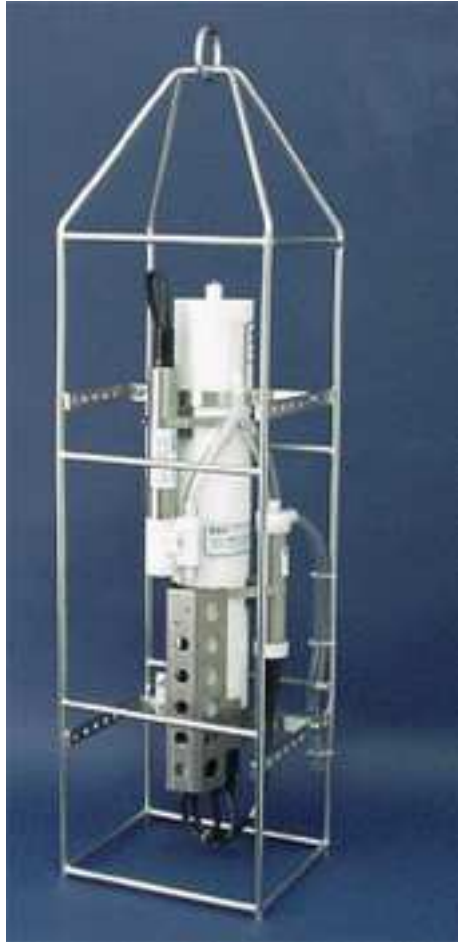


Before NetBEAMS

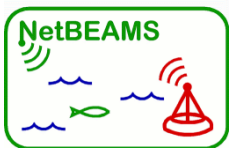
- Sensors made measurements and stored data in internal memory
- Data needed to be manually downloaded and analyzed
- Issues with this method
 - Not real time
 - Not easily shared
 - Not really persistent



Seabird Sensor

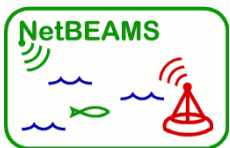


- Mfg: Seabird Electronics
- Directly measures
 - Temperature
 - Pressure
 - Conductivity
 - Photosynthetically available radiation
 - Transmittance
- Calculates
 - Salinity



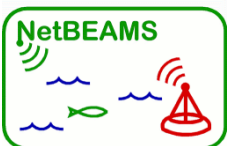
JDDAC

- Data acquisition framework from Agilent Technologies
- Provides measurement descriptions and transport to the JDDAC measurement server
- Runs on J2EE, J2SE* and J2ME
- NetBEAMS is ultimately a J2ME application
- *Note - Nice to have J2SE for debugging!



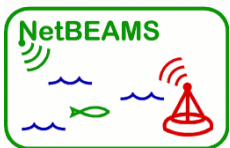
Phone/Controller

- Motorola i730 cellular phone with Nextel service running J2ME
- Phone is used as a controller for the sensor
- Communication is via RS-232
- Benefits
 - Existing reliable network
 - Relatively easy to program using JDDAC
 - Built-in GPS
 - Same code base, build script determines J2SE or J2ME



Measurement Cycle

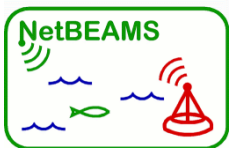
- Configure our JDDAC application to run every six minutes
- Commands are then sent to the sensor
 - Wake up
 - Take measurement
 - Go to sleep
- Parse the measurement string, update variables
- JDDAC sends measurements off to the server



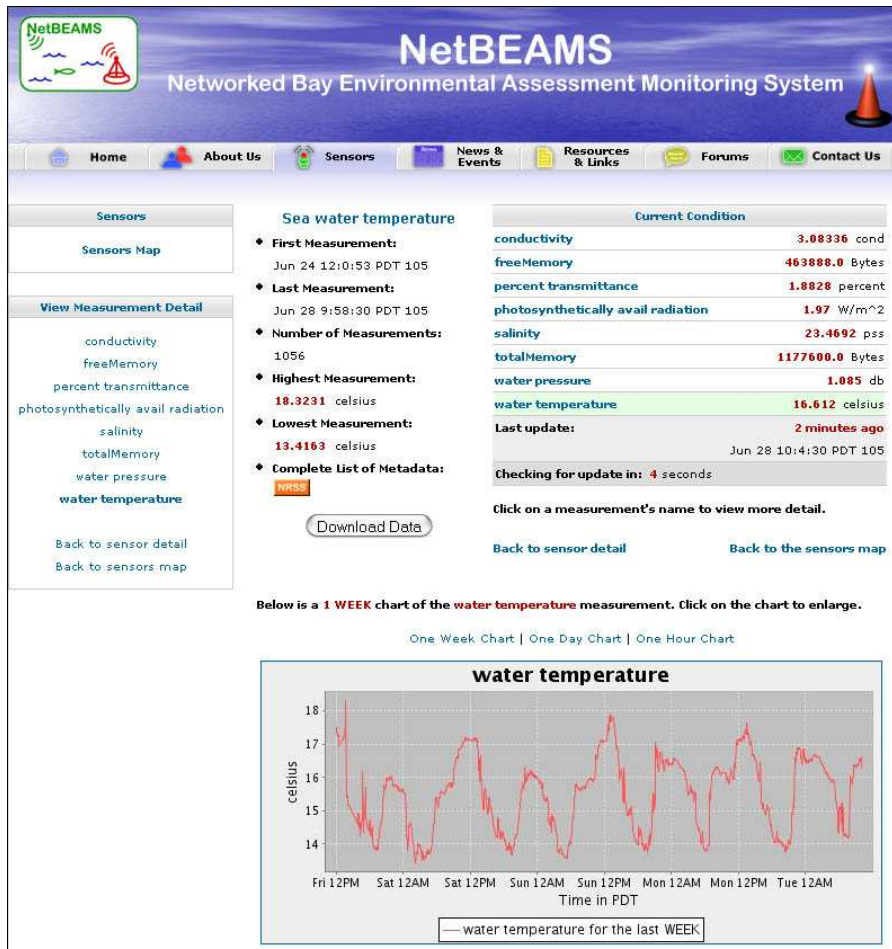
Data Dissemination via NRSS

- NRSS – Numeric RSS
- NRSS is a superset of RSS
- Adds metadata and numeric data to fully describe measurements

```
<description>
  <nrss:metadata>
    <nrss:arg n="name">water temperature</nrss:arg>
    <nrss:arg n="category">Seabird</nrss:arg>
    <nrss:arg n="upperLimit">+35</nrss:arg>
    <nrss:arg n="mid">246</nrss:arg>
    <nrss:arg n="units">celsius</nrss:arg>
    <nrss:arg n="mfg">Sea-Bird Electronics</nrss:arg>
    <nrss:arg n="dataType">Float64</nrss:arg>
    <nrss:arg n="mid">BZ1tl51234GL3vZrrR4/Og:2</nrss:arg>
    <nrss:arg n="description">Sea water temperature</nrss:arg>
```



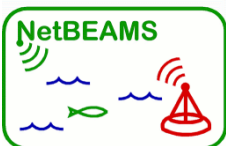
NetBEAMS.org



Available channels:
Water temperature,
pressure, salinity, etc.

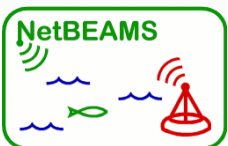
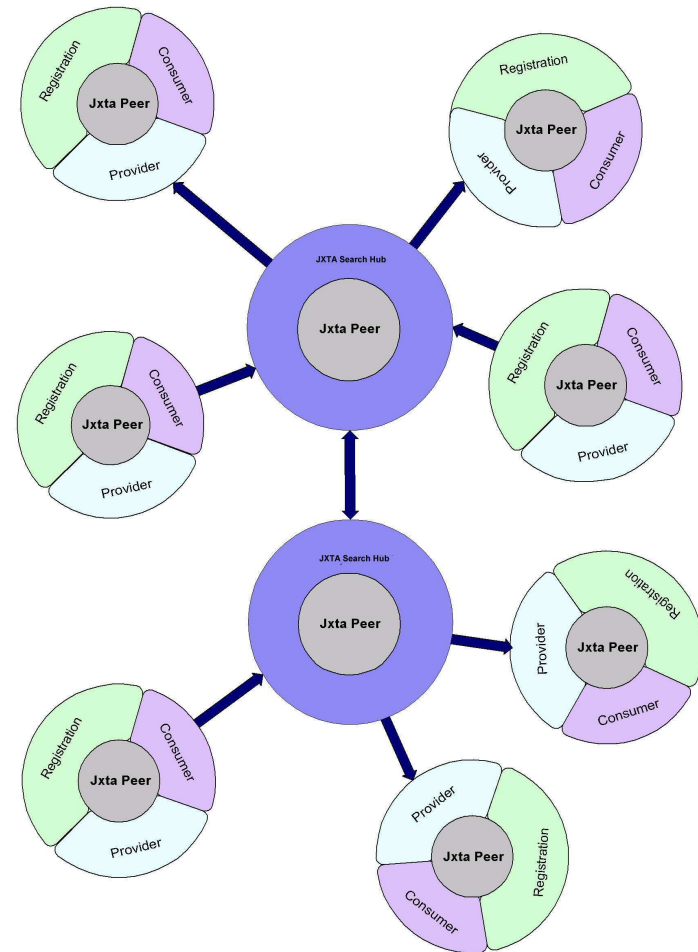
Hourly/daily/weekly
plots for each channel

Updated dynamically
as new data arrives

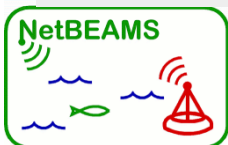
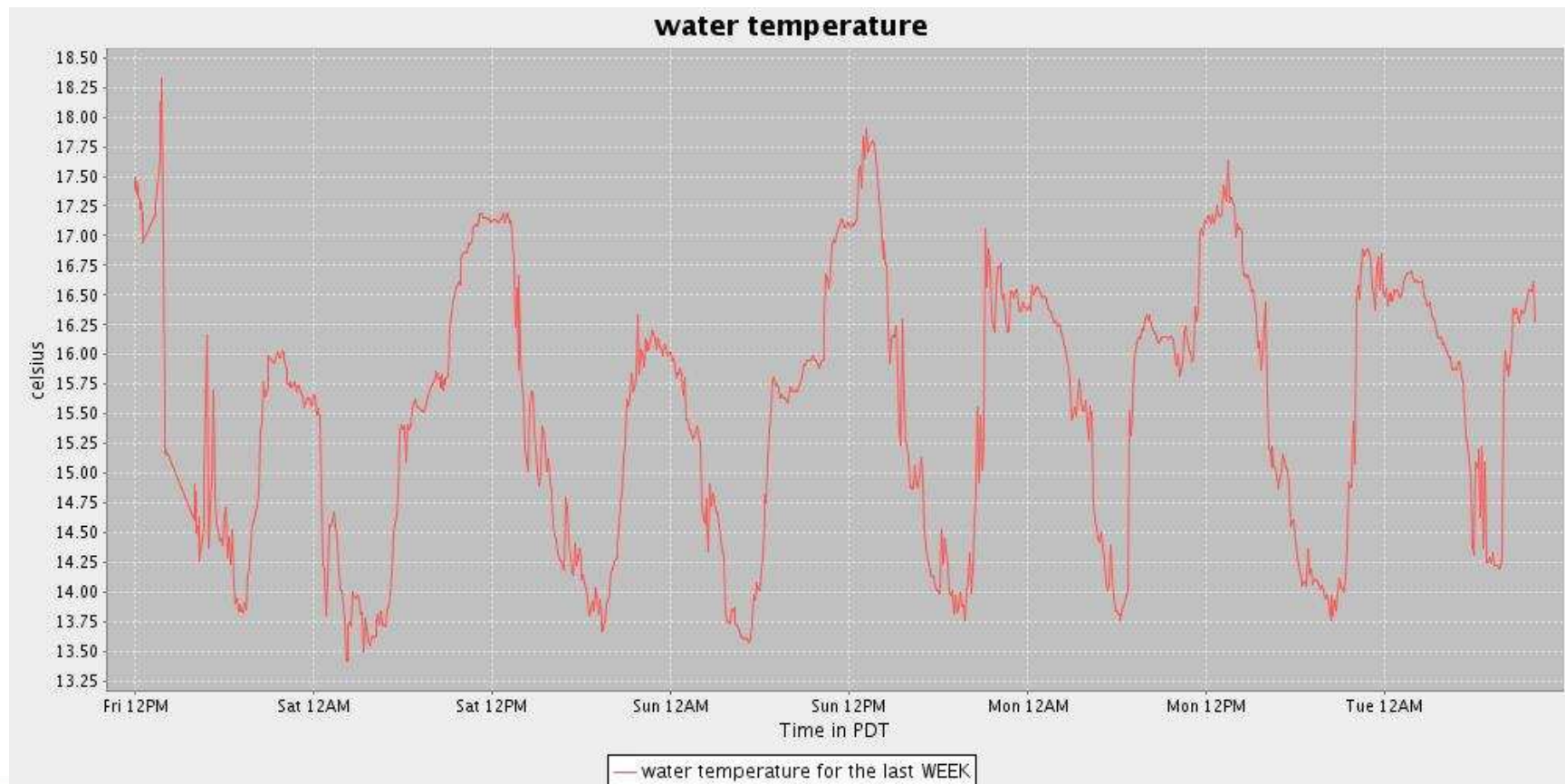


JXTA

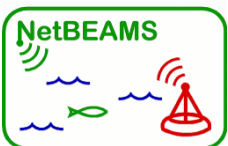
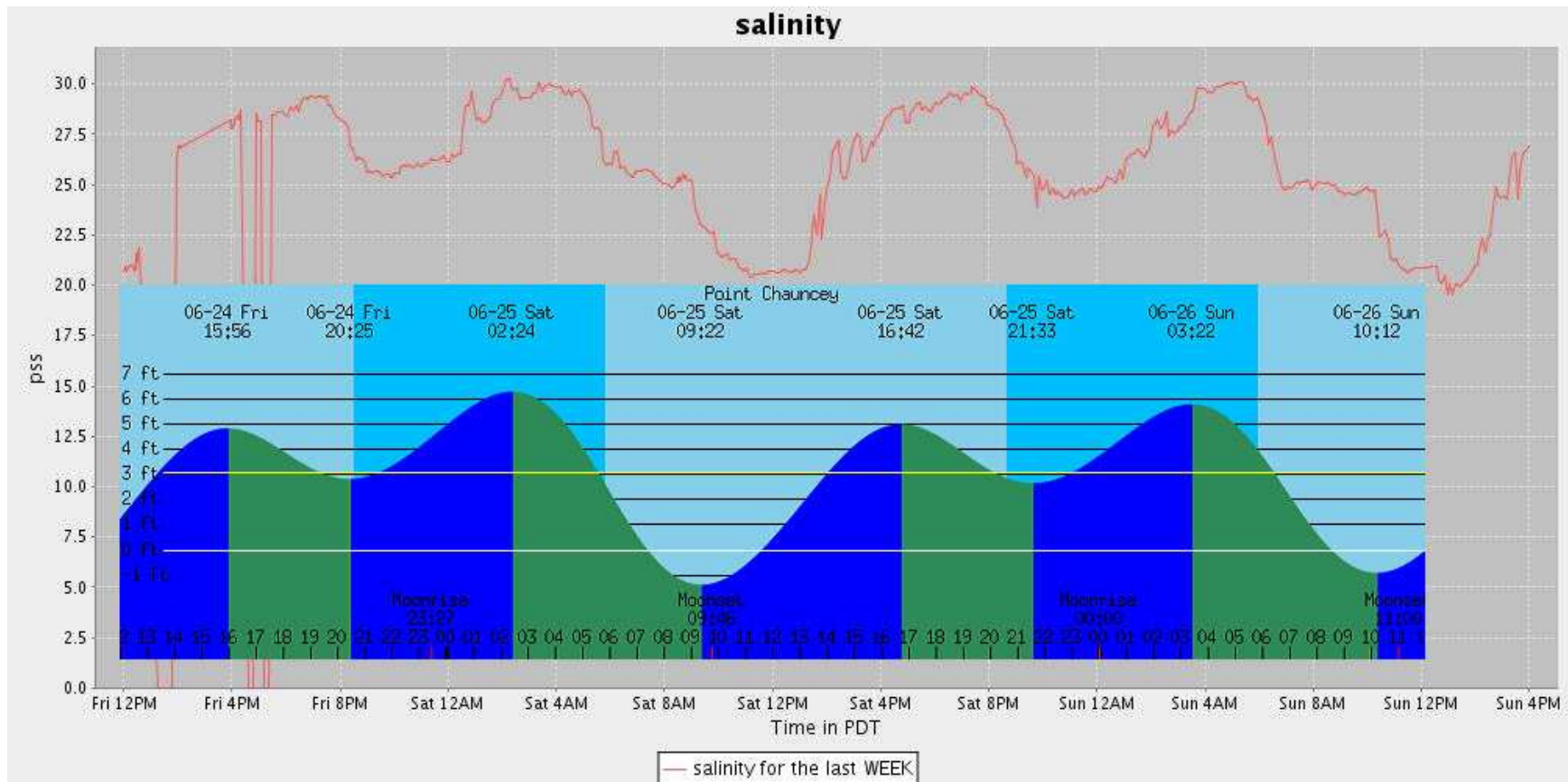
- The same data that is available to netbeams.org can be shared among peers using JXTA (peer-to-peer)
- Able to pull in measurements from various data feed



Up and Running at RTC

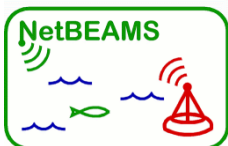
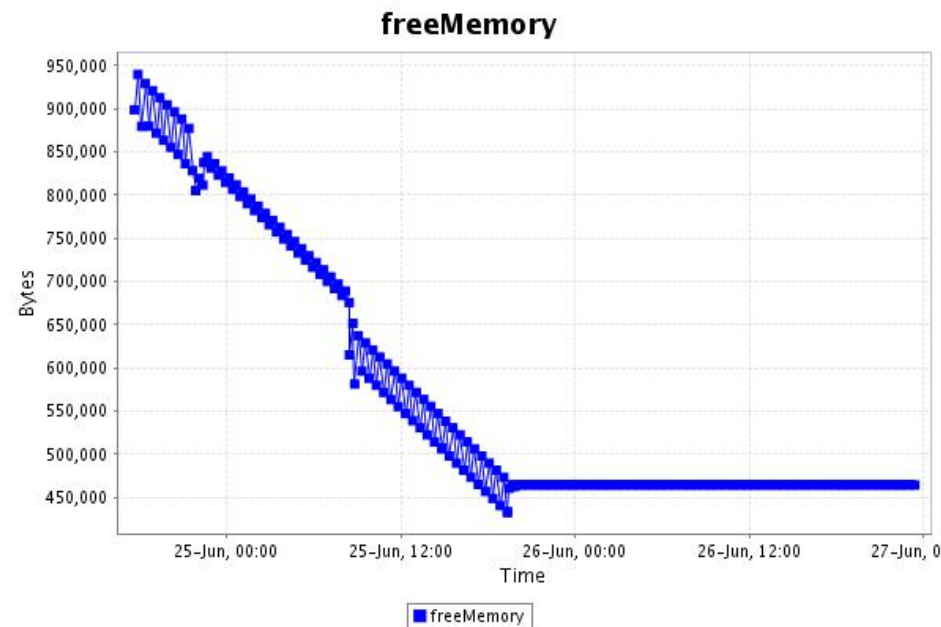


Data Example



Flexibility of JDDAC

- Our phone in Tiburon was running out of memory due to echos to stdout
- Solution: Turn it off remotely using JDDAC!



Future

- Deploy more sensors for Romburg Tiburon Center
- Dynamically supply GPS
- Bluetooth multiplexer to control multiple sensors with one phone

