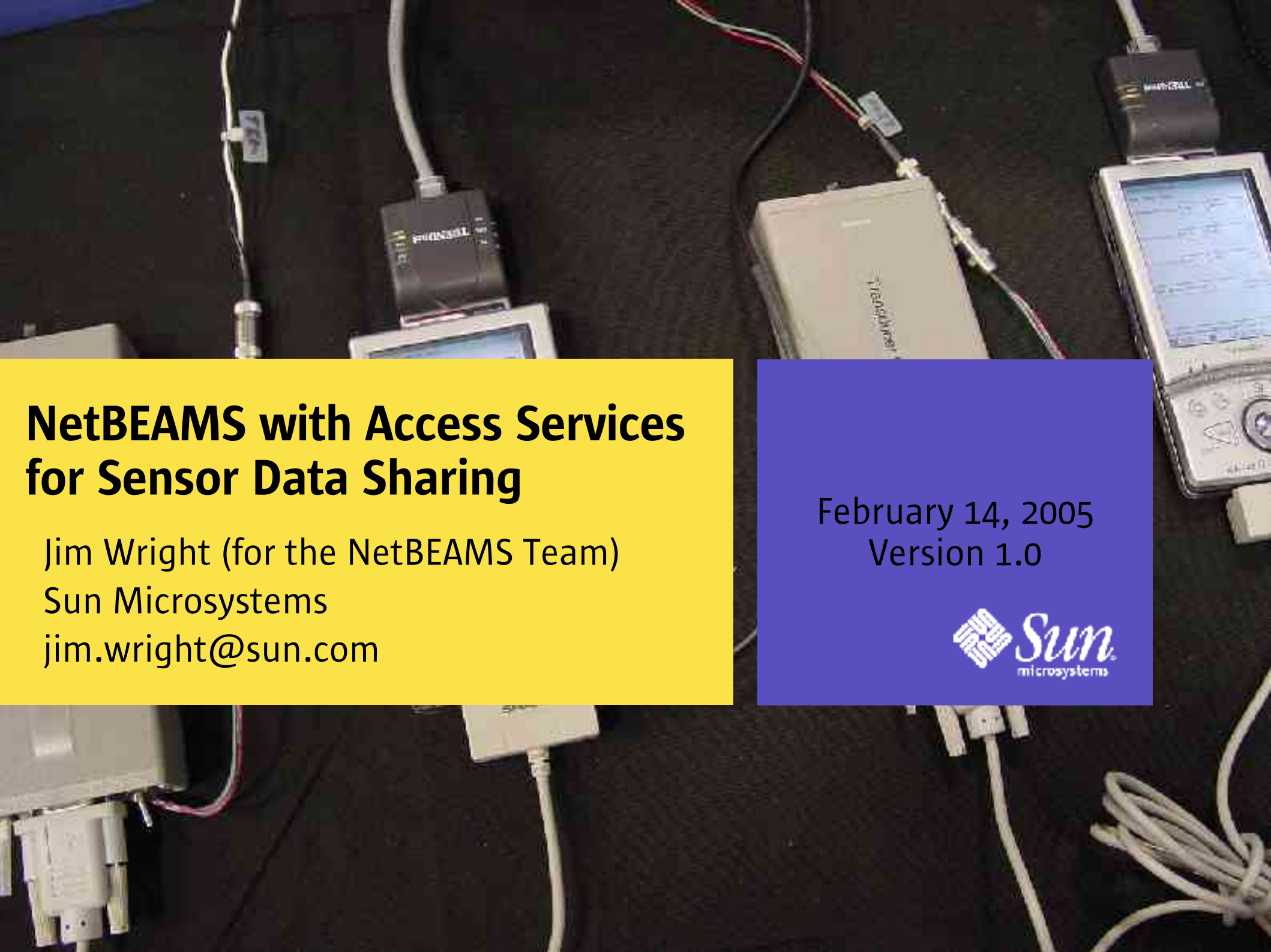

NetBEAMS with Access Services for Sensor Data Sharing

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Version 1.0

Sun microsystems

NetBEAMS - Networked Bay Environmental Assessment and Monitoring Stations

- Joint project between Sun, Agilent, SFSU, the Romberg Tiberon Institute and the JDDAC community
- Monitors SF Bay water quality


Romberg research vessel

Sensor array

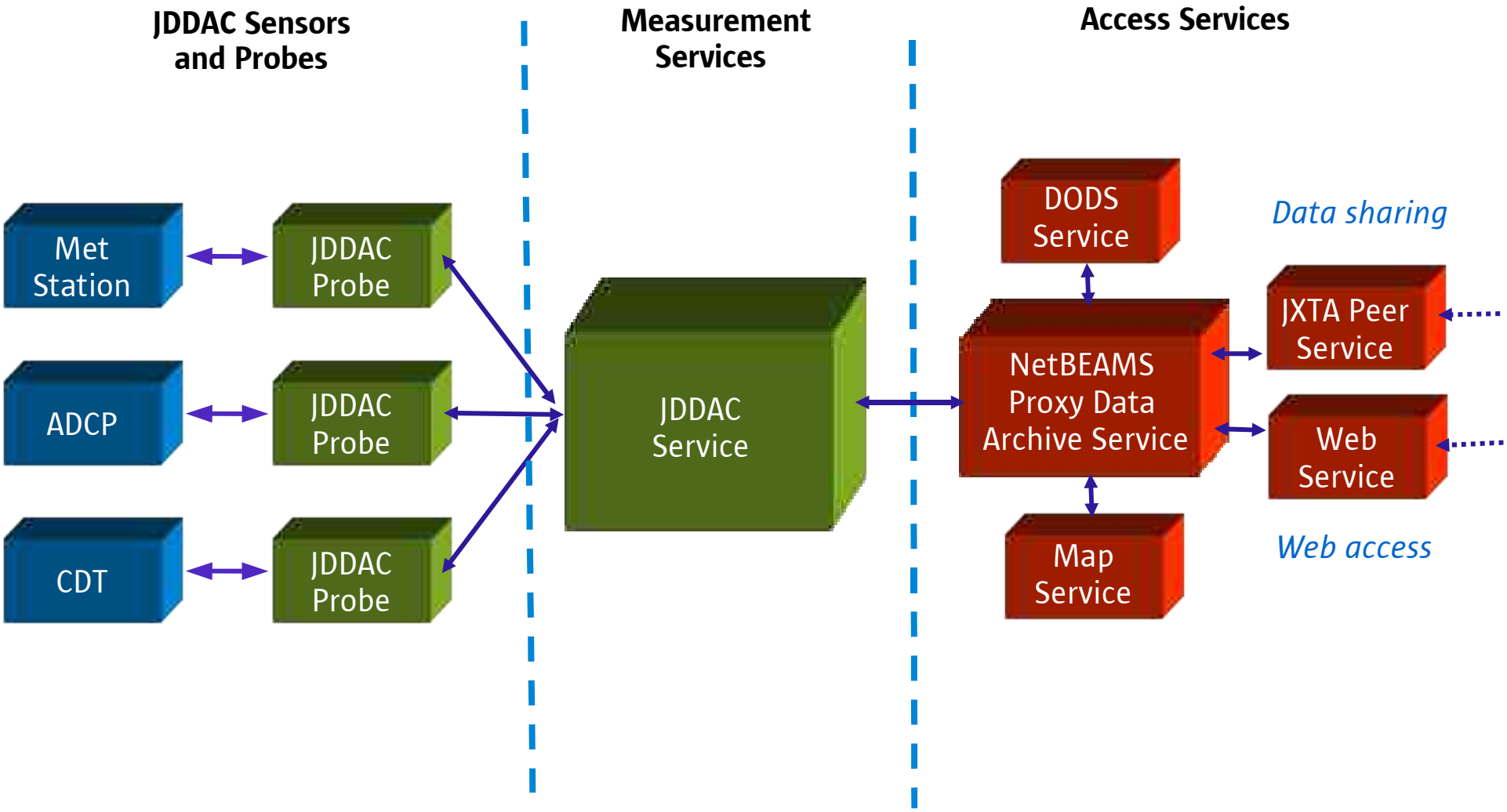
Contributes to the environmental monitoring capabilities of CICORE, the Center for Integrative Coastal Observation, Research and Education

NetBEAMS with Access Services

Access Services extends the Networked Bay Environmental Assessment and Monitoring Stations, NetBEAMS, to enable peer-to-peer data sharing for oceanographic, environmental and other kinds of research. Using applications linked by JXTA, individuals, teams and institutions can flexibly share data in a secure, network-transparent manner with automatic updating, data discovery and distribution.

NetBEAMS Architecture

With Access Services



JDDAC – Distributed Data Acquisition and Control for Java

- Open source Java sensor network software on java.net
  - Self-describing measurements
  - Plug 'n Play sensor integration
- Based on IEEE 1451 Standards
  - NIST-supported
- Brings real-world control to JES
  - Via TCP/IP, Cellular, …

JDDAC Board Members

Agilent Technologies

Sun microsystems

San Francisco State University

accenture

SYSTRONIX
Embedded Java Spoken Here

JDDAC Probe

- Acquires sensor data
- Performs local data manipulation and filtering
- Encodes and compresses data
- Stores sensor data locally
- Generates data self-description
- Performs sensor management
- Delivers data to requester

JDDAC Service

- Identifies, authenticates and configures probes
- Manages probe and measurement metadata
- Processes data for filtering and alarming
- Aggregates measurement values into data sets.
- Archives measurement data in a database.
- Advertises measurement data sets.
- Provides system administrative functions.
- J2EE

Measurement Data Available

JDDAC Service

Measurement Data

Value	Actual data value
Timestamp	Time when a measurement was made
Location	Location where a measurement was made
Quality	Measurement Source (measured, simulated, etc.)

Measurement Metadata

Unit	Measurement Unit
Uncertainty	Measurement Uncertainty
Owner	Measurement Owner

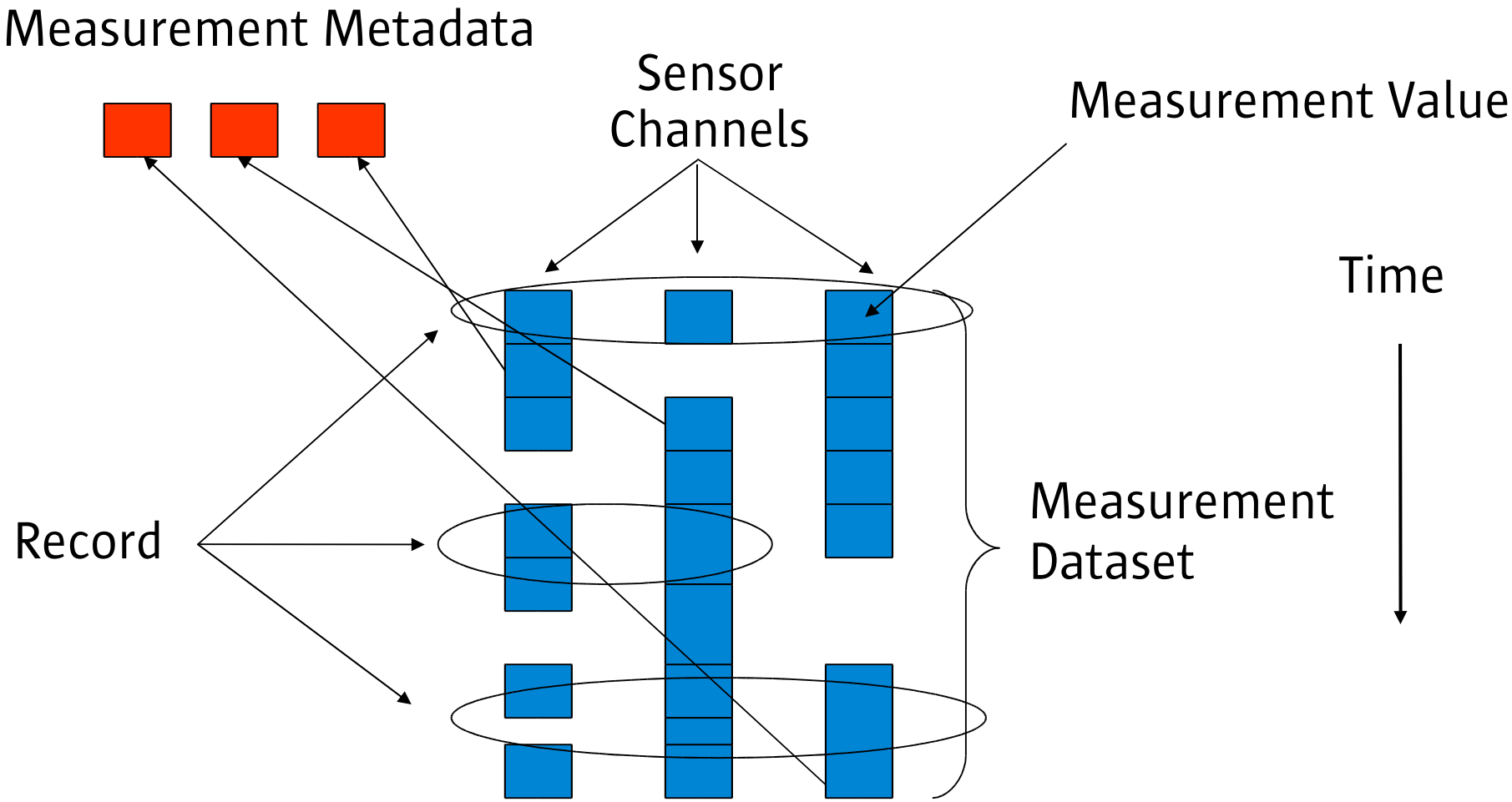
Measurement Data Model

JDDAC Service

- Based on IEEE 1451.1 Data Model
- Loosely typed, name/value pairs.
- Represents measurement data and metadata.
- Presented as ‘ArgArray’ class in Java programs.
- Client communication via XML

Measurement Dataset

JDDAC Service



JDDAC Service Interface

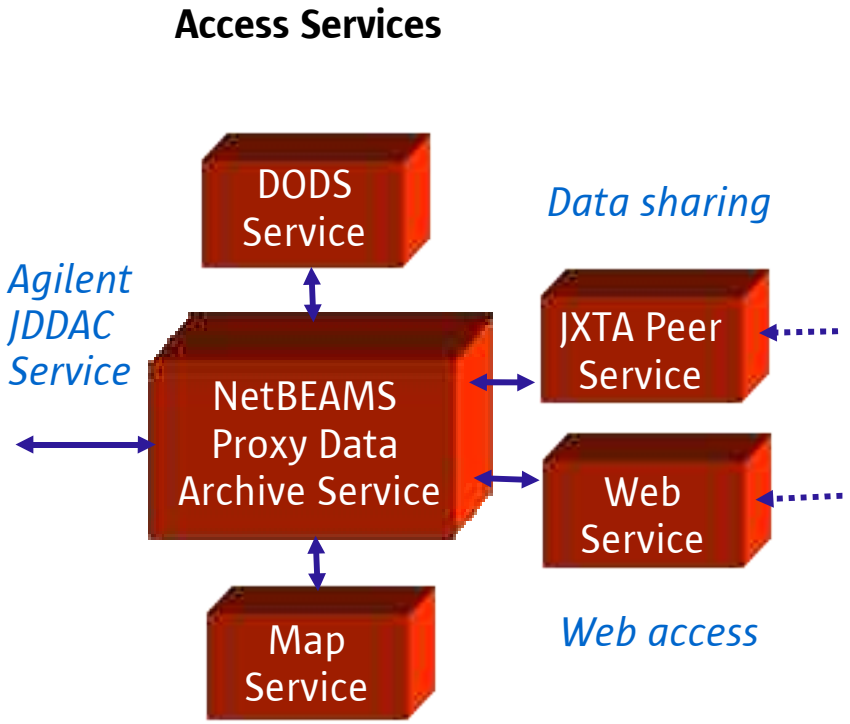
- HTTP GET parameters and XML via HTTP POST commands
- Authentication/Compression available for XML communications.
- Interface enables users to
  - Define measurement policies.
  - Manage probes.
  - Query measurement data and metadata.
  - Perform simple data filtering.

Access Services Capabilities

- Enables data sharing with JXTA applications
- Proxies data from multiple Agilent JDDAC Services
- Retains data in a data store suitable for searching, sorting and dataset creation
- Automatic data discovery via JXTA
- Group access and permissions via JXTA
- Secures data transfers via JXTA
- Network transparent access via JXTA

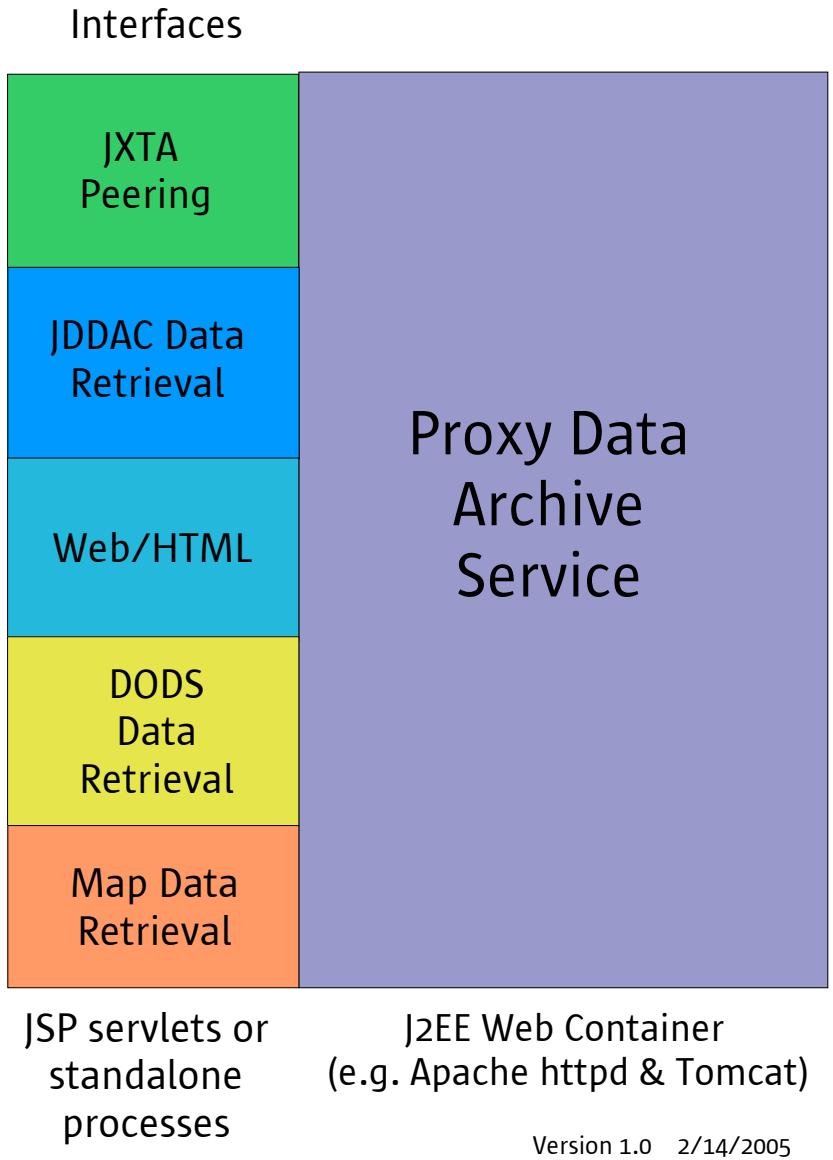
Access Services Elements

- Proxy Data Archive Service
  - Marshals and archives data
  - Searching, sorting, retrieval
- JXTA Peer Service
  - Data sharing, security
- DODS Service
  - Formats OPeNDAP datasets
- Map Service
  - Serves map data
- Web Service
  - DODS Web Access, JDDAC Mgt…



Proxy Data Archive Service Architecture

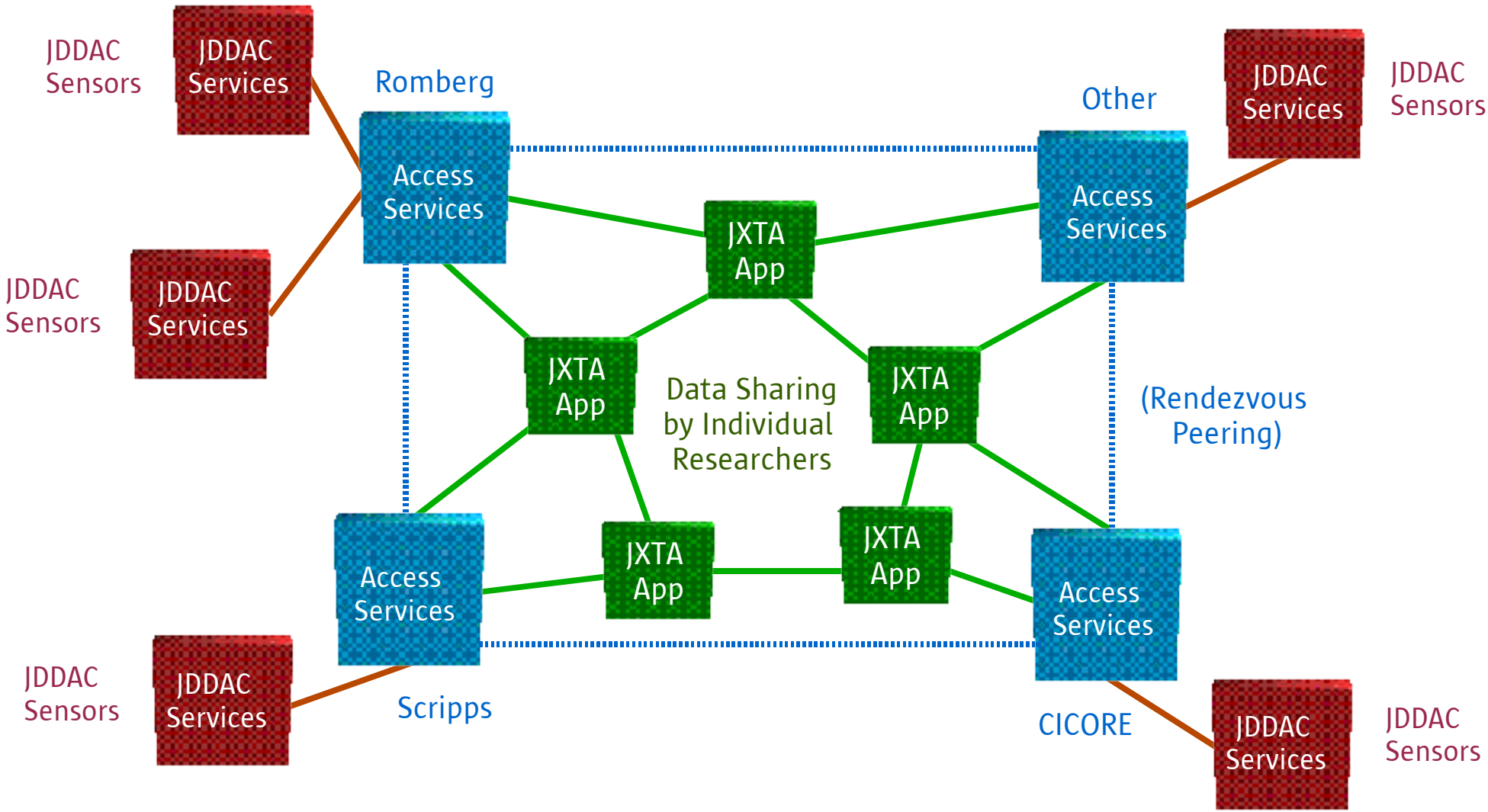
- Archival Data Store
- Sensor data updates
- JXTA shared data retrieval
- OPeNDAP data formatting
- Map data retrieval
- Web access to JDDAC Data Services mgt, DODS
- Framework for future service additions



JXTA Peer Service

- Implements a data sharing network for Access Services
- Supports P2P mechanisms including discovery, transport (including firewall handling), the peer creation, peer groups, directory and security
- Maintains a cache of advertisements for datasets both local and remote
- Forwards discovery requests for datasets to other Access Services (rendezvous peering)

NetBEAMS Data Sharing With JXTA Peer Service



NetBEAMS with Access Services for Sensor Data Sharing

DODS and Map Services

- DODS Service
  - Returns datasets in OPeNDAP format
  - URL style requests and CGI implementation
  - Java tools (Anagram, Java DAP) available
- Map Service
  - Serves maps for geographical sensor displays
  - MapServer from University of Minnesota
  - Implementation is CGI requests which fork processes
  - Needs caching or alternate implementation

References

- JDDAC java.net project
  - http://jddac.dev.java.net
- NetBEAMS java.net project
  - http://netbeams.dev.java.net
- JXTA java.net project
  - http://jxta.dev.java.net
- NetBEAMS Architecture
  - http://netbeams.dev.java.net (Documents & Files)

Acknowledgments to Sun, Agilent, SFSU and Romberg Tiberon Institute Teams