"where PI geeks meet"

OSIsoft®

vCAMPUS | LIVE! 2009

Palace Hotel, San Francisco, CA · Dec. 1-2, 2009

1001 Uses for PI Web Services

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Agenda

- Goals
- Our original design
- What's changed
- Demos
- Security
- Architecture
- Roadmap

Demos, Demos, Demos

- .NET coding in Visual Studio
- Silverlight-based web page
- Microsoft BizTalk
- Java coding in Eclipse*

Data Service Goals

- Expose what we are already doing
    - Create nothing new
- Supports clients that are:
    - Built with many development environments
    - On Windows and on other platforms
    - "Code-free"
- Synchronous and asynchronous
- Friendly to common IT architectures

Support our Value Themes

- System Scaling

- Security

- 64-bit support

- Asset-based PI

Many Development Environments…

- Microsoft Visual Studio

- Eclipse

- Netbeans

- Many others…

Data Service Design Pattern

- Simple. Declarative. Everything in one call.
  - **In:** "Query"
  - **Out:** Data

Original Design

- Path
  - PI tag, PE expression or AF Attribute
- Context
  - Time, Time Range, AF Element, Event Frame, …
- Manner
  - How to get the data
  - That is, Compressed, interpolated, aggregates, intervals, boundary behaviors, etc.

Feedback

- What if Path changes?
- We don't understand Context
- "Parallel-arrays" (or lack thereof) problem
- Calling sequence design problems
  - Not clear on how to get all required data in one call

New Proposal

- Array of Requests
  - Path
  - Constraint
  - Manner

Problem with the New Proposal

- Array of Requests
  - Path
  - Constraint
  - Manner

- Everything in red *should* be a parent class
  - **Constraint** is a parent to Time, Time Range, Element, etc.
  - **Manner** is a parent to PIArcRetrieval and PIAggregate Retrieval

Dreams are Shattered

- Microsoft InfoPath is confused by any parent class/sub class design

- Eclipse creates obscure proxy classes
  - WSDL as authoritative definition is our goal

New(er) Proposal for Archive Data

- Array of PIArcDataRequests
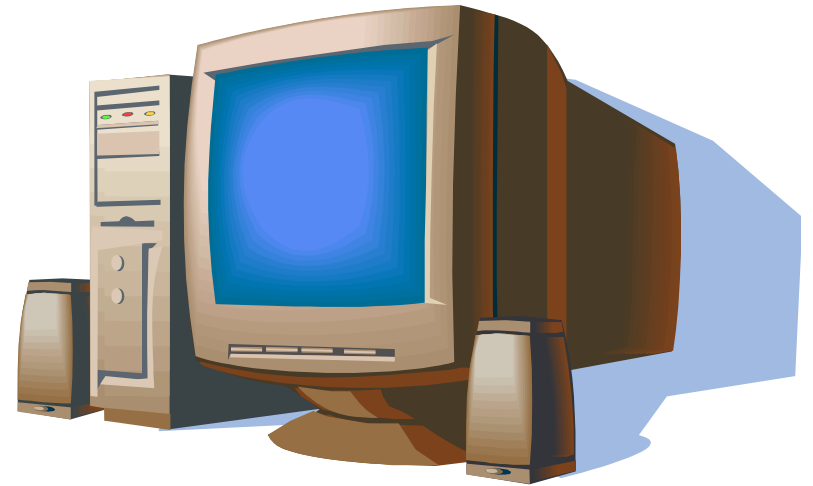 - Path
  - TimeRange
  - PIArcManner

New(er) Proposal for Aggregate Data

- Array of PIAggregateDataRequests
  - Path
  - TimeRange
  - PIAggregateManner

Demo

- .NET coding in Visual Studio
- Silverlight-based web page
- Microsoft BizTalk

Java Demo

- Eclipse development environment

- Create proxies from the web service WSDL

- Create calls to the web services in Java code

src - Java - PIDSClient/src/com/osisoft/xml/services/PIDataService/PIConstraint.java - Eclipse Platform

File Edit Source Refactor Navigate Search Project Run Field Assist Window Help
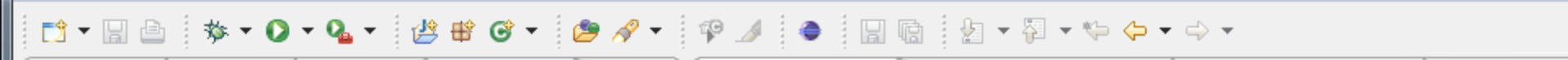
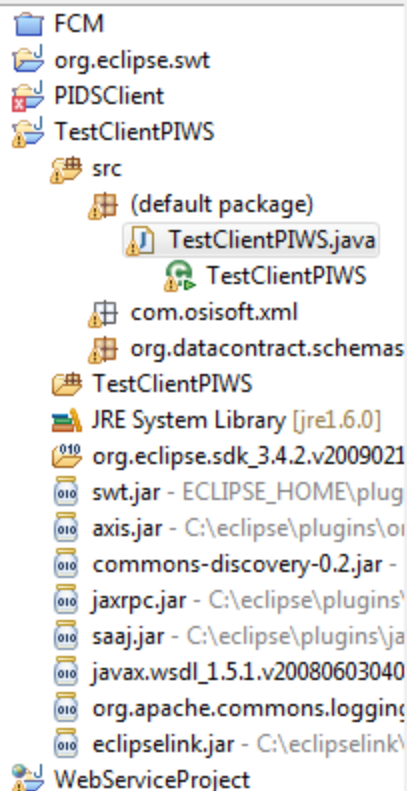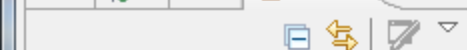Package E   Hierarchy   Navigator   Project Ex
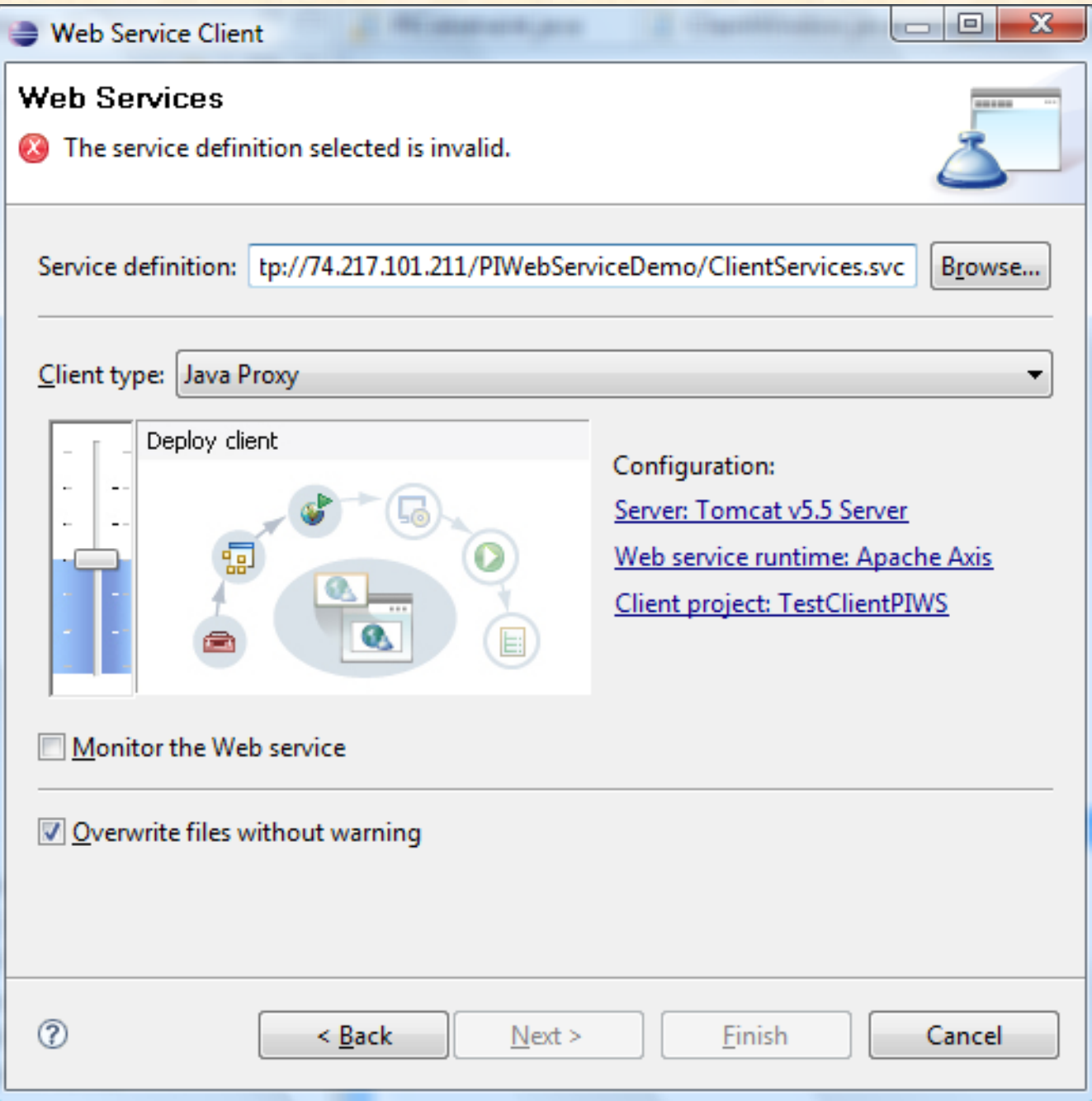
- FCM
- org.eclipse.swt
- PIDSClient
- TestClientPIWS
  - src
    - (default package)
    - com.osisoft.xml
      - COG.context
      - DOG.Data_specialized
      - services
    - org.datacontract.schemas._2004._07.PIWebService
      - BoundaryType.java
      - PIRetrievalManner.java
      - PIRetrievalType.java
      - RetrievalManner.java
      - SummaryType.java
    - TestClientPIWS
  - JRE System Library [jre1.6.0]
  - org.eclipse.sdk_3.4.2.v200902111700 - ECLIPSE_HOME\plugins - (
  - swt.jar - ECLIPSE_HOME\plugins\org.eclipse.swt.win32_3.4.2_win
  - axis.jar - C:\eclipse\plugins\org.apache.axis_1.4.0.v20080723060010
  - commons-discovery-0.2.jar - C:\eclipse\plugins\org.apache.com
  - jaxrpc.jar - C:\eclipse\plugins\javax.xml.rpc_1.1.0.v200806030420\
  - saaj.jar - C:\eclipse\plugins\javax.xml.soap_1.2.0.v200806030421\
  - javax.wsdl_1.5.1.v200806030408.jar - C:\eclipse\plugins
  - org.apache.commons.logging_1.0.4.v20080605-1930.jar - C:\eclip
  - eclipselink.jar - C:\eclipselink\jlib
- WebServiceProject

Classes generated from WSDL

PIConstraint.java   ClientWindow.java   TestClientPIWS.java   4

```java
public abstract class PIConstraint    implements java.io.Serializ
    public PIConstraint() {
    }

    private java.lang.Object __equalsCalc = null;
    public synchronized boolean equals(java.lang.Object obj) {
        if (!(obj instanceof PIConstraint)) return false;
        PIConstraint other = (PIConstraint) obj;
        if (obj == null) return false;
        if (this == obj) return true;
        if (__equalsCalc != null) {
            return (__equalsCalc == obj);
        }
        __equalsCalc = obj;
```

Problems   @ Javadoc   Declaration   Console

No consoles to display at this time.

File   Edit   Source   Refactor   Navigate   Search   Project   Run   Field Assist   Window   Help

PIConstraint.java   ClientWindow.java   PIDataServiceLocator   IPIDataServiceProxy.   TestClientPIWS.ja

FCM
org.eclipse.swt
PIDSClient
TestClientPIWS
  src
    (default package)
      TestClientPIWS.java
        TestClientPIWS
    com.osisoft.xml
    org.datacontract.schemas
  TestClientPIWS
  JRE System Library [jre1.6.0]
  org.eclipse.sdk_3.4.2.v2009021
  swt.jar - ECLIPSE_HOME\plug
  axis.jar - C:\eclipse\plugins\or
  commons-discovery-0.2.jar -
  jaxrpc.jar - C:\eclipse\plugins\
  saaj.jar - C:\eclipse\plugins\ja
  javax.wsdl_1.5.1.v20080603040
  org.apache.commons.logging
  eclipselink.jar - C:\eclipselink\
WebServiceProject

```java
        }

        @Override
        public void mouseUp(MouseEvent e)
        {
            // make the web service call and stuff things into the UI
            try
            {
                TimedValue[] values = ExecuteCall(path.getText(), "*");
                if (values.length > 0)
                {
                    TimedValue val = values[0];
                    if (val.getStatus().isEmpty())
                    {
                        if (!val.getValue().isEmpty())
                            value.setText(val.getValue());
                        if (!val.getUom().isEmpty())
                            uom.setText(val.getUom());
                    }
                    else
                        value.setText(val.getStatus());

                }
                else
                {
                    value.setText("No data returned");
                    uom.setText("");
                }
            }
            catch (Exception et)
            {
                et.printStackTrace();
```

Problems   @ Javadoc   Declaration   Console

No consoles to display at this time

File | Edit | Source | Refactor | Navigate | Search | Project | Run | Field Assist | Window | Help

Debug | Web

PIConstraint.java | ClientWindow.java | PIDataServiceLocator | IPIDataServiceProxy. | TestClientPIWS.java

TCP/IP Moni

Time of request:
Response Time:
Type:

```java
            display.dispose();
    }


    @SuppressWarnings("finally")
    public static TimedValue[] ExecuteCall(String path, String timeStr)
    {
        TimedValue[] values = null;
        try
        {
            ClientSvcEndpointStub proxy = new ClientSvcEndpointStub(new java.net.URL("http://74.217.101.211/PI

            String[] rPaths = new String[1];
            rPaths[0] = path;


            Time time = new Time();
            time.setInstant(timeStr);
            Time[] rTimes = new Time[1];
            rTimes[0] = time;

            PIRetrievalManner manner = new PIRetrievalManner(100,false,"1H", BoundaryType.Inside, PIRetrievalT
            PIRetrievalManner[] rManners = new PIRetrievalManner[1];

            rManners[0] = manner;

            String[] rColumns = new String[1];
            rColumns[0] = "Value";

            values = proxy.getValue(rPaths, rTimes, rManners, rColumns);
            return values;
        }
        catch(AxisFault fault)
```

Byte | Byte
Header: | Header:

Problems | @ Javadoc | Declaration | Console

No consoles to display at this time.

Writable | Smart Insert | 86 : 43 | Ctrl Contrib (Bottom)

Major OSIsoft Data Types

- Timeseries

- Event Frame series

- Table

- Hierarchy

- All of these *should* be a children of a "DataItem"

Preferred Web Method Pattern

- We would like methods that return data for Paths as their true data type

- We would like additional methods that return one specific data type:

  – For example, method to return only Time Series

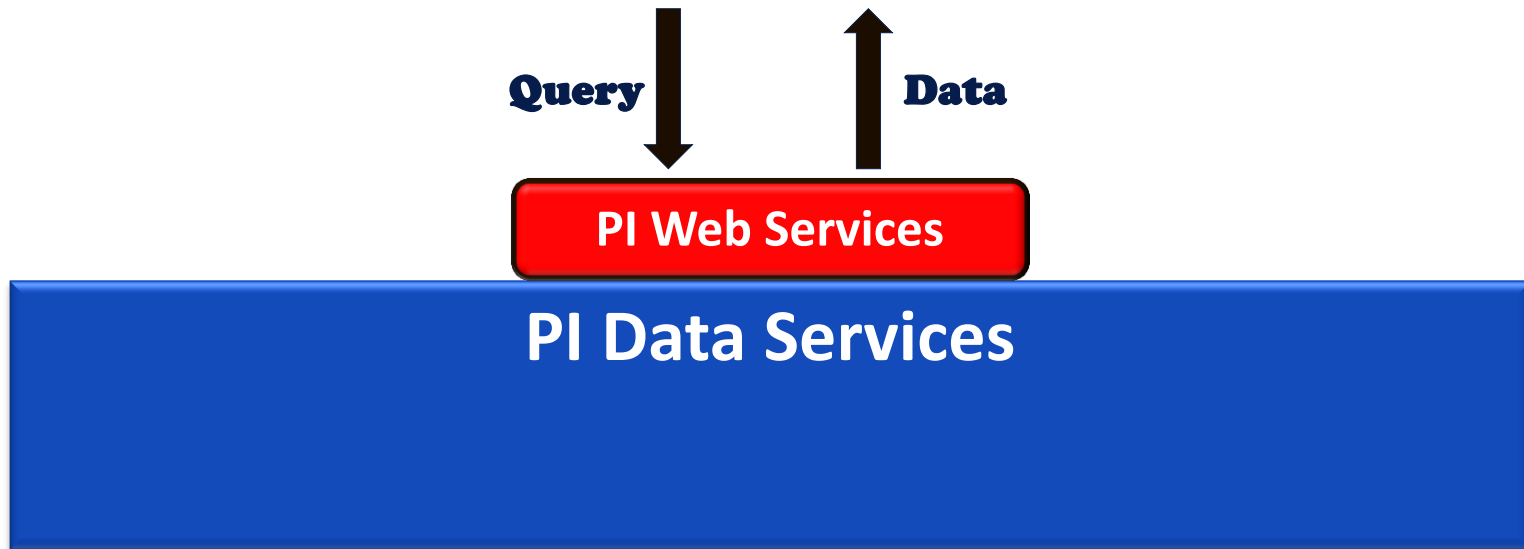 – Implementation would coerce if possible, error if not

25

What we have right now

- `GetPIArchiveData(PIArcDataRequests[])`
  - Path, Time Range, PIArcManner
- `GetPIAggregateData`
  `(PIAggregateDataRequest[])`
  - Path, Time Range, PIAggregateManner

- Both return TimeSeries[]
- This is already a coercion for Aggregates
  - These are really Event Frames

For those needing to write

- `InsertPIData(TimeSeries[])`

Security

Query from WCF Client (usually with Windows Identity)

Data to WCF Client

Internet Information Services (IIS)

(Process Identity)

PI Web Services
-impersonate caller

PI Data Services

PI Server and AF Data

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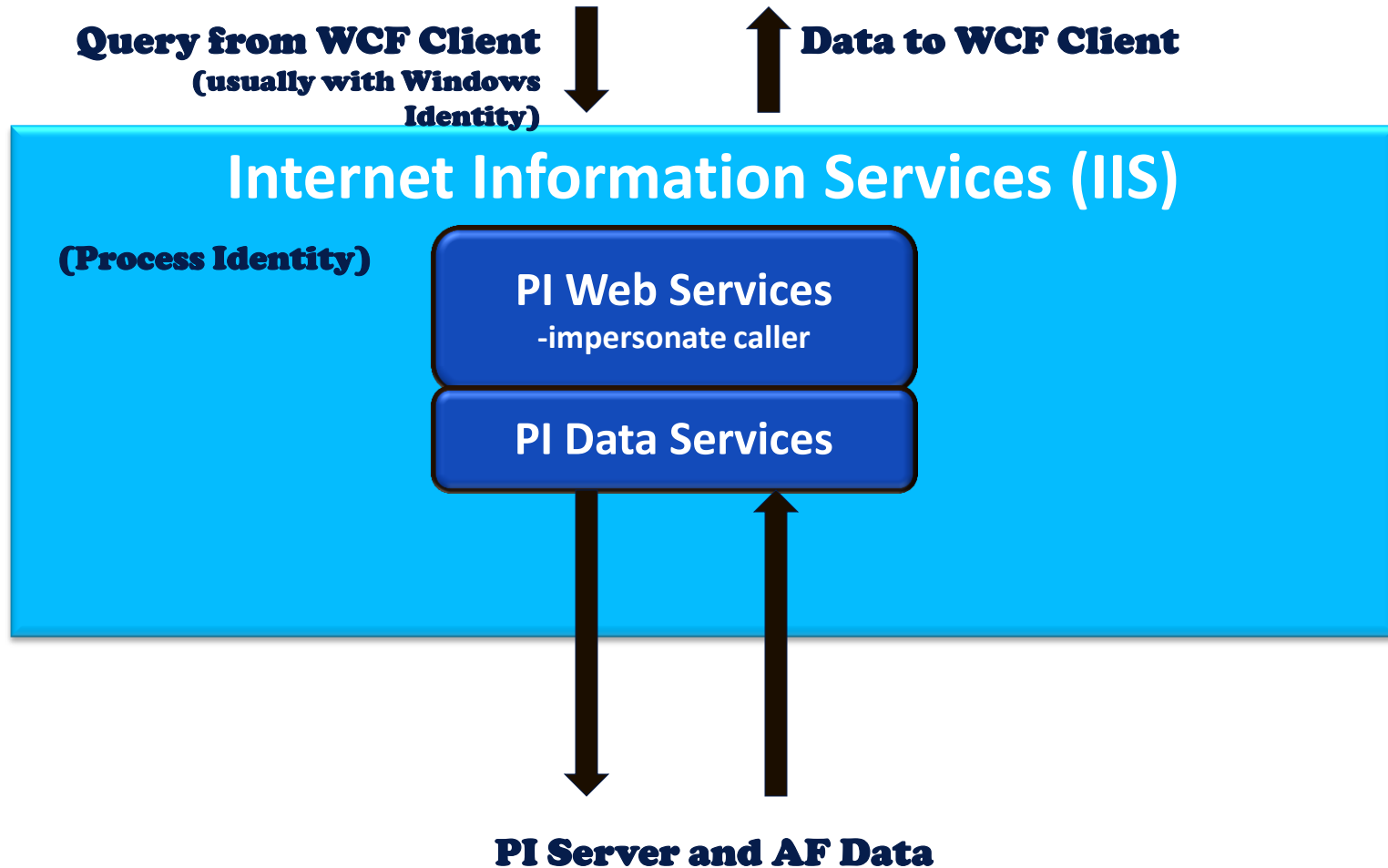
Supported Security Scenarios

- Intranet access

  - using PI Trust security

  - using Windows-based security

  - without a domain controller

  - with a non-Windows client

- Extranet access

  - using Windows-based security

  - anonymous access

Security

- Calculations and Data Entry can be turned off with web.config settings

- Methods marked with:
  - `[OperationBehavior (Impersonation = ImpersonationOption.Allowed)]`

- Compatible with PI 3.4.380 Security
  - Impersonate caller but fall back to Process Identity
  - PIIdentity or PI Trust

- Kerberos delegation

- What about WS-*?

Windows Communication Foundation
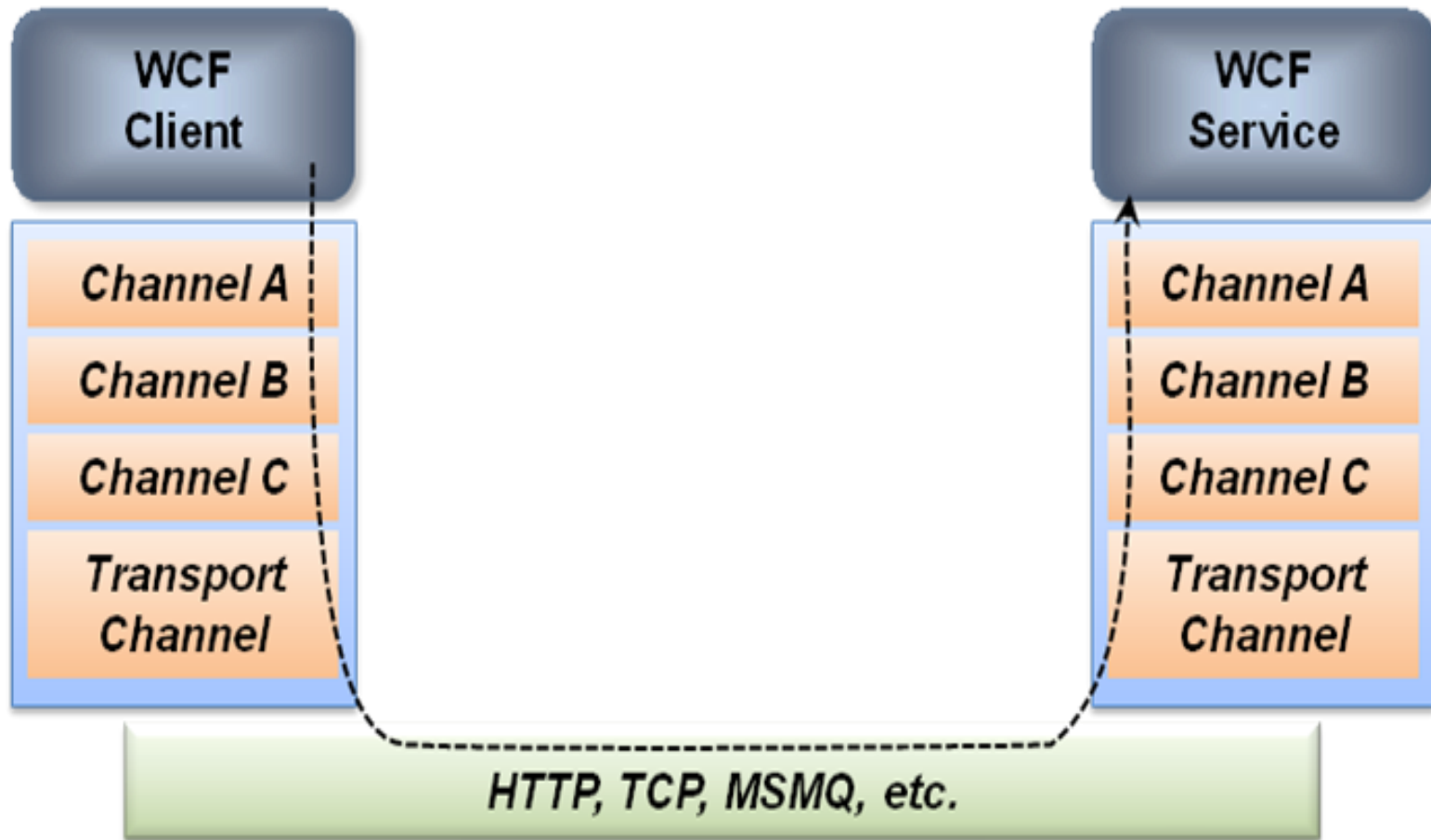
Windows Communication Foundation
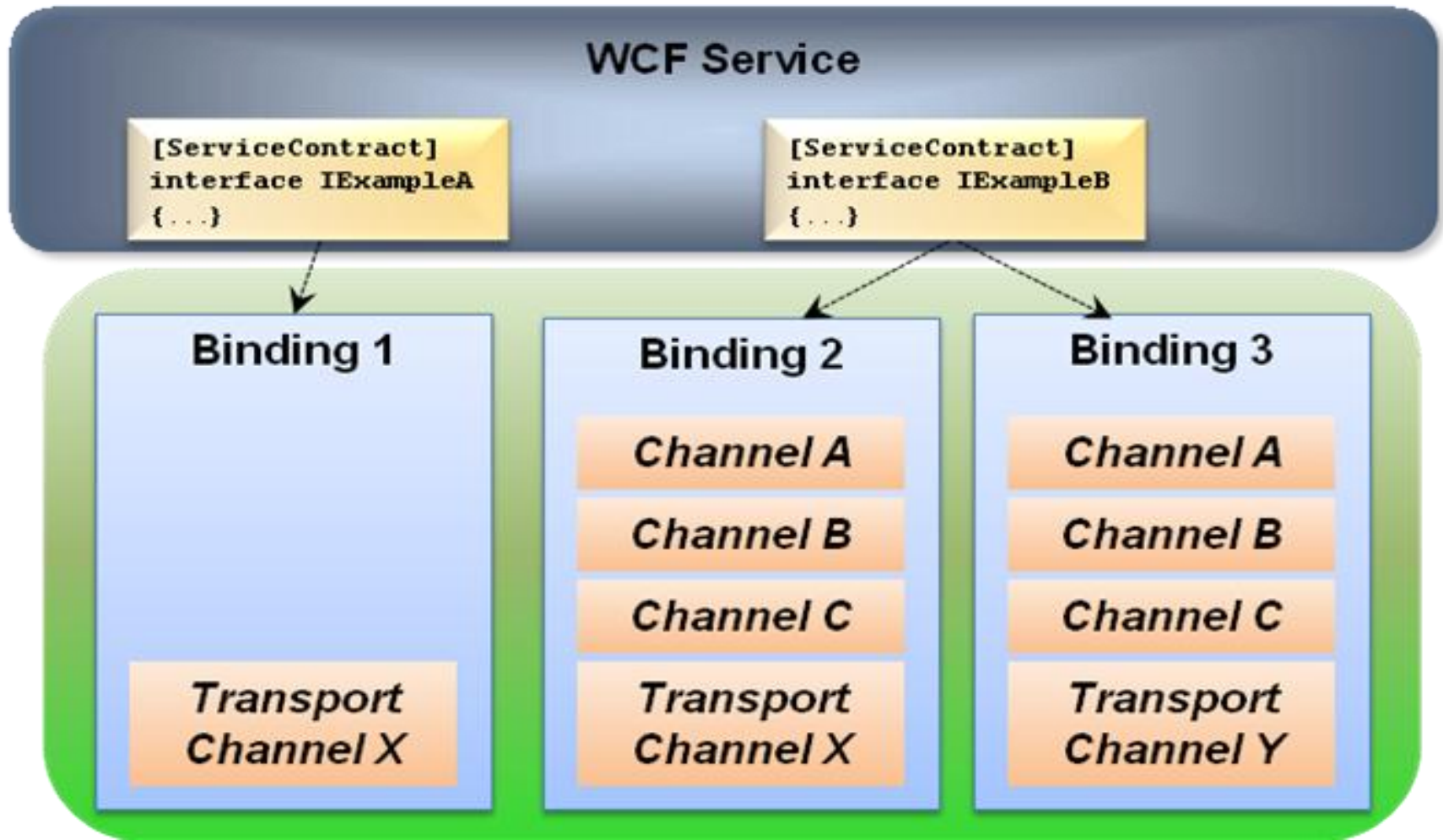
WCF Bindings

- We will test with other bindings:
  - netTCP
  - netNamedPipe
    - This is an option for service-based data access on the same box
    - Separates the application from data access activities like caching
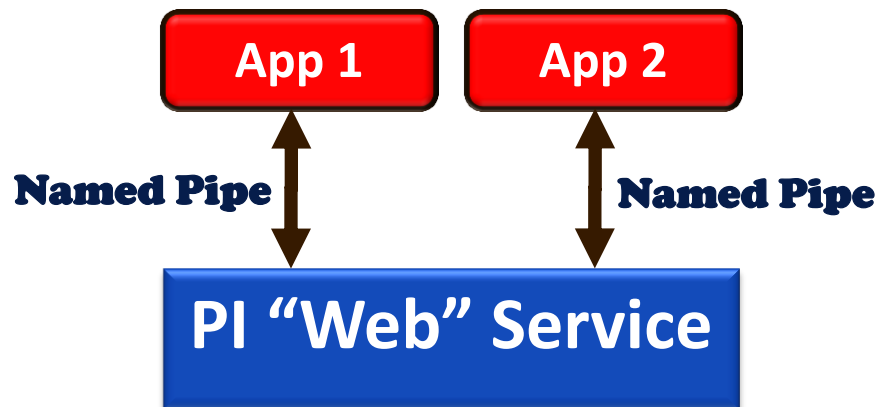
Asynchronous Calls

- Synchronous:
  - ```
    public System.Xml.XmlNode GetInfoByZIP(string USZip);
    ```

- Asynchronous:
  - ```
    public System.IAsyncResult BeginGetInfoByZIP(
    string USZip,
    System.AsyncCallback callback,
    object asyncState);
    ```

  - ```
    public System.Xml.XmlNode EndGetInfoByZIP(
    System.IAsyncResult asyncResult);
    ```

- Your callback:
  - ```
    void MyZIPCallback(IAsyncResult asyncResult);
    ```

Plan for First Release

- Timeseries Data Access
  - From PI tags **and** AF Element.Attributes
- Search
  - PI tags by point attributes
  - AF Element Attributes

Roadmap

- Data by Exception

- Non-timeseries data

- AF Manipulation
  - A.k.a. "CRUD" operations on AF
    - Create
    - Read
    - Update
    - Delete

Our Plan for vCampus Live

- Roundtable Sessions

- PI Web Service Learning Lab

- Feedback

- Feedback

- Feedback

- Did I mention feedback? Please send feedback to: **betapiwebservices@osisoft.com**