

# Broadening Web Service Access through REST and OData?

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# What is a web service?

“a software system to support interoperable machine-to-machine interaction over a network. It has an interface described in a machine-readable format (WSDL). Once published, a service can be located and used by other machines by its description using SOAP messages, usually conveyed using HTTP with an XML serialization in conjunction with other Web-related standards.”



<http://www.w3.org/TR/ws-gloss/>

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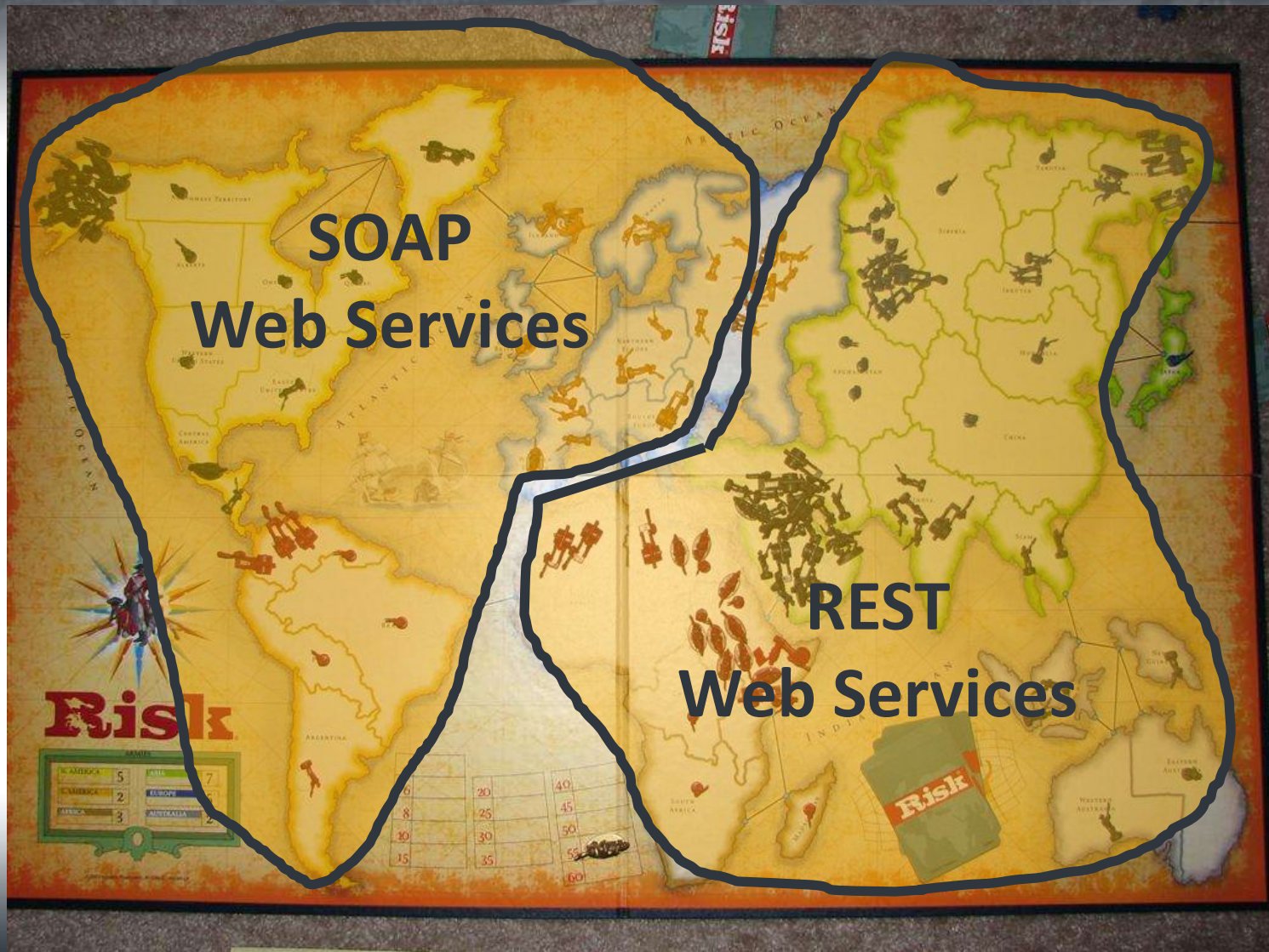
# What is a web service? (take 2)

today

The API of ~~the future~~ = Web API

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# Web Services Landscape





# By definition...

## SOAP

- Simple Object Access Protocol  
(protocol specification)

## REST

- Representational State Transfer  
(architectural style)

# In clear...

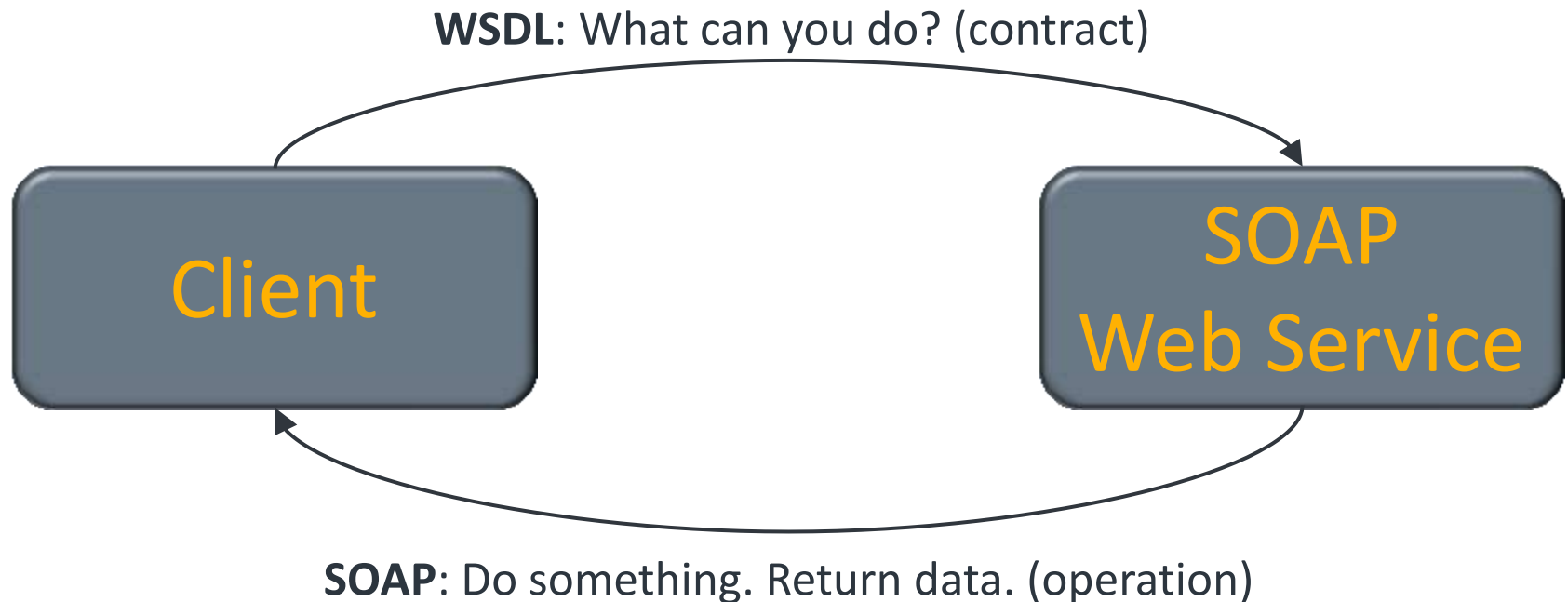
## SOAP

- Exposes methods with inputs and outputs (operation-centric)
- Well-defined, discoverable calling sequences
- Thought of as "official, serious, for large enterprises"

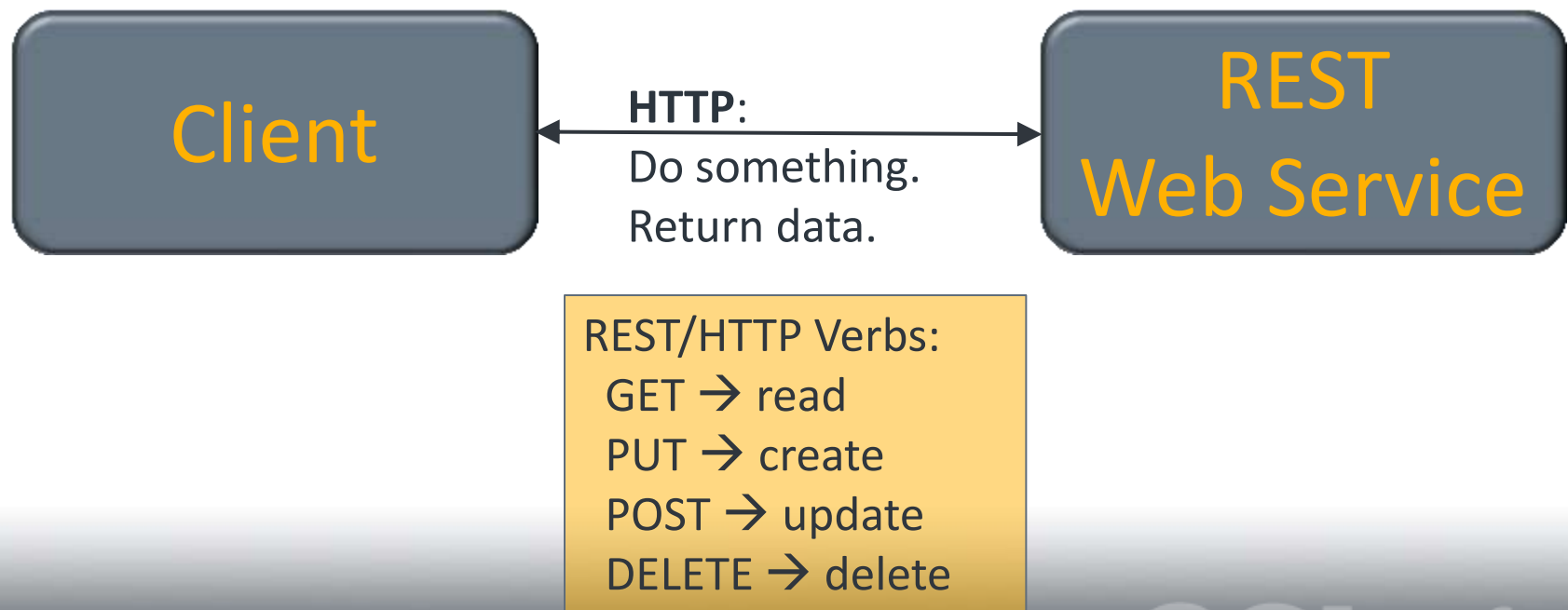
## REST

- Exposes resources, collections, relationships (data-centric)
- Open format (URI with verbs and nouns)
- Thought of as "easy, simple, free-form"

# SOAP Web Services (a.k.a. Big Web Services)



# REST Web Services (a.k.a. RESTful)



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# Representational State Transfer

Nouns

(Unconstrained)

e.g. `http://server.local/timeseries('sinusoid')?$filter=time gt '*-1h' and lt '*'`

Verbs

(Constrained)

e.g. GET

Content Types

(Constrained)

e.g. XML

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# At OSIsoft...



SOAP

PI Web Services 2010

REST

Open Data Protocol (OData)  
in PI Web Services ?

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# Web Feeds



RSS	Atom	AtomPub
<ul style="list-style-type: none"><li>• Really Simple Syndication</li><li>• Pseudo-XML syndication format</li></ul>	<ul style="list-style-type: none"><li>• More organized, extended RSS</li><li>• Fully-compliant XML format</li></ul>	<ul style="list-style-type: none"><li>• Atom publishing protocol</li><li>• Defines how to play with the data</li></ul>

\* JSON is another type of web feed format

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# Open Data Protocol (OData)

OData  
(protocol)



A RESTful Interface for Data



Open Data Protocol

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# URL Conventions

- Addressing entities and sets

Entity Set	/AFElements
Single Entity	/AFElements('Pump 123')
Member Access	/AFElements('Pump 123')/EffectiveDate
Link Traversal	/AFElements('Pump 123')/Attributes
Deep Access	/AFElements('Pump 123')/Attributes('Flow Rate')/Value

- Presentation Options

Sorting	/AFElements?\$orderby=Name
Filtering	/AFElements?\$filter=CreationDate gt '2007-05-07'
Paging	/AFElements?\$top=10&\$skip=30



# Why OData?

- No more silos of data...



Bus stops, facility buildings, schools



Census data, construction projects, gas stations, hotels, metro stations





# Why OData?

- Platform- and Language-Agnostic



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# Another example



- <http://www.osisoft.com> → <http://odata.osisoft.com/>
  - Events, Products, Partners, etc.
- <http://odata.osisoft.com/Events>
  - [/events?\\$filter=Type eq 'Regional Seminar'](#)
  - [/events?\\$filter=Location eq 'San Francisco'](#)
- OData for OSIssoft vCampus Live! 2010



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# In the Microsoft world...

## WCF Services

- SOAP
- WSDL
- WS-\*
- WS-Security

- Formerly 'ADO.NET Data Services' (codename 'Astoria')

## WCF Data Services

- REST
- Expose IQueryable collections as part of an OData Service
- HTTP
- AtomPub
  - Updatable for updates/deletes/inserts
- OData



# File > New > OData Service



- Create an "OData Service" for OSIssoft vCampus Live!

Microsoft SQL Server Management Studio

File

Edit

View

Project

Debug

Query Designer

Tools

Window

Community

Help

New Query

Change Type

Object Explorer

Connect

AdventureWorksDW

AdventureWorksDW2008

AdventureWorksLT

AdventureWorksLT2008

PIFD

ReportServer

ReportServerTempDB

vCampusLive2010

Database Diagrams

Tables

System Tables

dbo.Sessions

dbo.Speakers

Columns

Keys

Constraints

YUL-SPILON.vCamp...10 - dbo.Sessions

YUL-SPILON.vCamp...0 - dbo.Speakers

Title	ID	Day	Track	StartTime	EndTime	Abstract
Building a BI Infrastructure Part 2: Visualization, Analy...	7...	2	2	1:30pm	2:20pm	See how to create multi
You Knew The Job Was Dangerous When You Took It!...	b...	2	1	4:20pm	5:00pm	It's a process. It's technr
OSISO's SQL Data Access Family	...	0...	1	4:00pm	4:40pm	SQL-based standards (C
Integration with Enterprise Business Systems using PI ...	2...	1	2	2:40pm	3:30pm	This session will be pres
Broadening Web Service Access through REST and O...	5...	1	1	2:40pm	3:30pm	This session introduces
"Real-time Enabling" Your Enterprise Business Systems...	9...	2	1	2:30pm	3:20pm	This session presents di
PI Web Services Embraces New Technologies	...	d...	1	1:40pm	2:30pm	PI Web Services 2010 b
Integrating the PI System with Third-Party Analytics	...	1...	2	4:20pm	5:00pm	The PI System is the sta
Using PI Web Services and PI WebParts with Silverligh...	2...	2	1	3:30pm	4:10pm	As technology advances
PI Server 2010: AF Inside (Repeated)	...	d...	2	11:30am	12:20pm	PI Asset Framework (AF
Using Web Technologies To Connect and Enrich Data f...	f...	2	1	1:30pm	2:20pm	This session will present
PI System Security: Five Secrets You Should Know	...	f...	2	10:00am	10:50am	The PI System is charge
PI Server 2010: AF Inside	...	a...	1	10:30am	11:20am	PI Asset Framework (AF
PI System Virtualization & High Availability (HA) - Com...	1...	1	2	4:00pm	4:40pm	The PI System has beer
Complex Event Processing (CEP) with PI for StreamIn...	1...	2	1	10:00am	10:50am	StreamInsight is the nev
PI System Tuning and Optimization	...	9...	2	9:00am	9:50am	As customers' data need
Event Frames Driving Partners' Successes	...	0...	2	2:30pm	3:20pm	Using the Community Te
New to PI SDK and AF SDK 2010	...	e...	1	10:30am	11:20am	PI SDK 2010 provides su
NULL	N...	NULL	NULL	NULL	NULL	NULL

25

of 25

Output



# PI in WCF Data Services

- Remember... WCF Data Services expose IQueryable collections as part of an OData Service
- PI AF SDK exposes IQueryable collections (e.g. AFElements, AFAttributes)
- Difficult to achieve with PI SDK
- LinqToPI does this for PI data



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# LinqToPI??



# LinqToPI

- Empowers .NET developers to query the PI System using in-code, SQL-like queries
- Make PI "entities" IQueryable (and "OData ready")

```
var values =  
    from  
        arc  
    in  
        context.Archive.ArchiveData  
    where  
        arc.Tag == tagname &&  
        arc.Time.Between(startTime, endTime)  
    select arc;
```

# Where PI Data Meets OData



- Create a "PI OData Service"
  - Based on LinqToPI

# No More Silos of Data



- Query various OData feeds with a single client



# Thank You!

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