PI Developer Community

Presented by Ahmad Fattahi
Group Leader, Technology Enablement, OSIsoft
WELCOME TO THE GEEK SIDE
Welcome to TechCon!
PI Developers Club

Community of PI System Builders

Developer Technologies

Data Science

Innovation
Interested in Hackathon as a Service? Talk to us!
Upcoming Enhancements

- Trial Subscription
- Self-service Account Management
- Enhanced User Experience
GitHub

- 23 repositories
- Collaboration
- White papers, UC labs
- Wishing for Open Source? Talk to us!
Learn how to add a custom symbol, created with JavaScript and HTML, to PI Vision 3.

Add topics

Community Samples
- Updated the readme for the FFT symbol
- update product name
- Update copyright year
- fixed link to the documentation

OSIsoft on GitHub

github.com/osisoft

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github.com/osisoft
TechCon

Thursday all-day

18 hands-on labs
15 presentations

Partner and Product Expo

Closing Reception
Users Conference Hackathon

Data sponsor: Vitens

• Innovation for Better Drinking Water

7 Teams

• 24 Hackers
• 23 Hours
Team Living on the edge – 3rd Place
Rhys Kirk, Jason Sandy, Francis Agyei, Chris Cody

- OSIsoft Edge Historian that allows customers to send instant feedback and telemetry to Vitens
- Raspberry Pi 3 Retro Gaming Bundle
- One free subscription to PI DevClub
- Public recognition
- Presenting at the Pitch Panel
Team Diet Coke – 2\textsuperscript{nd} Place
Alexander Gleim, Achilleas Kasfikis, Albert Barstad, Christopher Schröpfer

- Monitoring water quality by combining multiple sensors to get robust anomaly indication
- Spatial density-adaptive anomaly detection to monitor water quality

- Ultimate 4tronix initio 4WD Robot Car Kit
- One half-priced registration to the UC over the coming year
- One free subscription to PI DevClub
- Public recognition
- Presenting at the Pitch Panel
Team connectPoint – 1st Place
Gregor Biering, Marek Zajac, Jakub Kowalski, Przemyslaw Kuczynski

- A connected system that combines real-time data, detects anomalies
- Provide the information to the right person to enable the right action

- Kuman Professional WiFi Smart Robot Car kit with Camera
- One free registration to the UC
- One free subscription to PI DevClub
- Public recognition
- Presenting at the Pitch Panel
Contact Information

Ahmad Fattahi
afattahi@osisoft.com
Group Leader, Technology Enablement
Roadmap for PI Developer Technologies

Presented by Ray Verhoeff, David Hearn, Mike Sloves, Bodo Bachmann
Custom Applications for Your Business

- Desktop applications
- Mobile applications
- Business system integration
- Web services:
  - Much like PI Web API but built by you based on your own service designs
  - Same requirements as us:
    - Performance, scalability
    - Security
    - Large number of users
PI Developer Technologies

- **PI AF SDK**: A single high-performance .NET Framework SDK that gives you to access all PI System data
- **PI Web API**: Modern REST-based web service standard, ideally suited for many platforms
- **PI SQL Products**: Use SQL client applications to access PI System Data
  - Integration with business systems
- **PI OPC Servers**: Enables access to PI from OPC client applications
  - Integration with industrial information systems
PI Developer Technologies

• **Overview on the Technical Support website**
• **Product Roadmap**
  – Look for the “Developer Technologies” group
• **PI Developers Club**
  – Part of **PI Square**
• Code samples on **GitHub**
  – See OSIsoft’s organization at [http://www.github.com/osisoft](http://www.github.com/osisoft)
Getting ideas from you!

- [https://feedback.osisoft.com/](https://feedback.osisoft.com/)
- Making it easier to send us suggestions
- Vote suggestions up or down
- Embedding UserVoice into our products
- *Problems should still go to Technical Support*
At the Conference

- Presentations
- Product Expo
- PI Geek Bar
- Learning Labs
Presentation

• “How to pick the right PI Developer Technology for your Project”
  – Today, 11:15 – 12:00
  – Arora 16

Hands-On Lab

• “Build Applications for the PI System: Learn Basics of Developer Technologies”
  – Today, 10:10 – 13:10
AF SDK: What’s new and what’s coming

- Notifications and Analytics
- Multicultural support:
  - UOM Group Mapping
  - Attribute Description Override
- Ongoing initiatives:
  - More context
  - Performance
  - Search, Aggregation
- Other Enhancements and New initiatives
Notifications and Asset Analytics

_How can I interact with PI System Services?_

• New architecture for Notifications – much more scalable (2016 R2)
  – Configure via AFNotificationRule (no more AN SDK)
  – Triggers on Event Frames matching search criteria
  – History stored on Event Frame

• Asset Analytics
  – Queue backfilling, auto-recalculation of analyses
  – Output to Event Frames created from Analyses
  – New analytic functions for linear regression, covariance
  – Derive Event Frame context from Start Time, End Time, and Duration
UOM Group Mapping

**How can I see values in my desired units?**

- Select desired UOM Group (e.g. Metric or US Customary)
- Clients automatically convert value to mapped UOM
Attribute Description Override

How can I specify region-specific names for an attribute?

- You can now override attribute descriptions defined by a template.
- Searches updated to support description overrides.

<table>
<thead>
<tr>
<th>Name</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area</td>
<td>200 ft²</td>
<td>Area</td>
</tr>
<tr>
<td>Cold Side Temperature Difference</td>
<td>110.37917327...</td>
<td>Diferencia de temperatura en la cara fría</td>
</tr>
<tr>
<td>Hot Side Temperature Difference</td>
<td>168.71165466...</td>
<td>Diferencia de temperatura en la cara caliente</td>
</tr>
</tbody>
</table>
Attribute Traits

*How can I know what to query without user input?*

- Automatically use relationships without configuration
  - Forecast, Limits, Analysis Triggers (2016)
  - Locations (2016 R2)
  - Reason (2017 R2)
- Evaluate limits for attribute
- Trend prediction with actual
- Relate asset to its location
- Identify reason for Event Frame
Performance and Efficiency

How can I get data in and out of PI System more efficiently?

- Asynchronous data read/write calls (2016)
- Replace values in bulk call (2016 R2)
How can I quickly get the data I need from the PI System?

• Filter-based searches - much more flexible (>40 filters)
• Many new fields to filter on
  "Template:‘Tank Event' Start:>=’*-3d' |Level:>=45.0”
• Server cache, full load of matches, client-side matching (2016)
• Light-weight search (2017)
  – No SDK object loaded
  – Only gets requested fields
• PI Point search by
  value/timestamp/status (2017)
• Search for attributes (2017 R2)

```csharp
class Dto
{
    public Guid ID;
    public DateTime StartTime;
    [AFSearch.ObjectField("|Level")]
    public AFValue Level;
}
IEnumerable<Dto> matches =
    search.FindObjectFields<Dto>();
```
Search Aggregates

How can I aggregate data efficiently?

• Search aggregates (2017)
  – Summaries (min, max, count average, total, etc.)
  – Grouping (discrete)
  – Binning (continuous)
  – Can be layered, done in bulk
  – Built on light-weight search

• Server-side support for aggregates (Future)

```javascript
// outage count by week
search.Histogram(
  field: "StartTime",
  bins: beginningOfWeeks);

// average duration by reason
search.GroupedSummary(
  groupedField: "|Reason",
  summaryField: "Duration",
  summaryTypes:
    AFSummaryTypes.Average);
```
Other Enhancements in 2017 R2

- Identify OSI provided UOMs
- Hierarchical enumeration sets
- No longer need to specify "AllowExtensions" to add categories to an element defined by a template.
- Element attribute value in naming pattern
- Various audit trail and viewer enhancements
Future Initiatives

What’s next?

• Data quality
  – Flag stale data
  – Propagate quality information
• Improved search capability and performance
• Display digits for Attributes
• Analytics 3rd party integration (e.g. MATLAB)
• Event frame scale-out
• .NET Standard (Core compatible) option
Also of interest for AF SDK developers

- Presentations
  - PI Server 2017 (11:15-12:00 – Arora 11)
  - Best Practices for Building AF SDK Applications (12:15-13:00 – Arora 16)
  - Best Practices for Implementing PI AF – Customer Testimonials (14:30-15:15 – Arora 11)

- Hands on Lab (requires pre-registration)
  - Getting Started with the AF SDK (14:30-17:30)
PI Web API
PI Web API 2017 R2

- Releasing November 2017
- Continued Performance Improvements
  - Overall query performance
  - Concurrent Users
- Support Mixed Authentication in Chrome
- StreamSetController streams results
- Batch calls in Read-only mode
- Point Counts & License Limits
- Swagger improvements
- Web ID 2.0
- New AF Search syntax support
- Federal Information Processing Standards (FIPS) Support in Indexed Search
- Bug Fixes
PI Web API 2018

- MORE performance improvements
- Support File Annotations
- Support Notifications
- Support PI System Health Services
- Services to find changes in the PI System
- Support NEW AF Search
Presentation

• “Build a Secure, Public-Facing PI Web API Environment”
  – Today, 15:25 – 16:10
  – Arora 16
PI SQL Family Evolution

PI ODBC

Client Application

ODBC Client

ODBC v2 API

PI API

PINet

SQL Queries

PI Data Archive
PI SQL Family Evolution

PI ODBC
- PI OLEDB Provider
- PI JDBC Driver

PI OLEDB Enterprise
- PI OLEDB Enterprise

PI ODBC Driver
- PI ODBC Driver

Middleware
- PI SQL Data Access Server
- PI Data Archive

Client Application
- Java Client Application
- ODBC Client
- PI ODBC Driver
- SQL Queries

ODBC v3 API
C++ Lib
net.tcp or https

ODBC

Integration
Query Engine

ODBC v3 API
C++ Lib
net.tcp or https

ODBC

ODBC v3 API
C++ Lib
net.tcp or https

ODBC

ODBC v3 API
C++ Lib
net.tcp or https

ODBC
PI SQL Family Evolution – in Development

**PI ODBC**
- **PI OLEDB Provider**
- **PI JDBC Driver**

**PI OLEDB Enterprise**
- **PI ODBC Driver**

**PI SQL Client OLEDB**
- **PI SQL Data Access Server**
- **PI AF Server**

**Java Client Application**
- **PI JDBC Driver**
  - Java
  - C++ Wrapper
  - https

**Client Application**
- **PI ODBC Driver**
- **ODBC v3 API**
- **ODBC**

**Client Application**
- **PI SQL Client OLEDB**
  - OLE DB API
  - C++ Lib
  - net.tcp or https

**Middleware**
- **PI OLEDB RTQP Engine**
- **Integrator Query Engine**
Goals

• Performance
• Scalability
• Simplify E-R Model

• Community Technology Preview (CTP) program under way
• Talk to Ray Verhoeff, Product Manager
PI SQL Family Evolution – in Development

• New Real-Time Query Processing Engine (RTQP Engine)
  – Redesign PI SQL access to AF

• New OLE DB Provider (PI SQL Client OLEDB)
  – Leverage new architecture (query execution close to data store)

• PI JDBC
  – Pure Java version
    (more platforms)
Hands-On Lab

• “Utilizing MS SQL Server Integration Services for Reporting PI Data via Email or Flat File”
  – Today, 10:10 – 13:10
  – Arora 16
PI SDK 2016

• Big Security Improvements
  – Transport Security (with PI Data Archive 3.4.395 or later)
  – Takes advantage of newer, more secure compiler
    • SafeSEH Exception Handling Protection
    • SEHOP
    • Heap Metadata Protection
    • Increased protection against buffer overrun exploits
    • Control Flow Guard
    • SDLC Checks
  – VB6 ActiveX components
    • Update to latest PI SDK to mitigate known security issues fixed by Microsoft
PI SDK 2018

• More improvements to security
  – Use of static analysis tools to find known problems
  – Removing of deprecated calls

• Bug Fixes
PI OPC DA/HDA Server
PI OPC DA/HDA Server
PI OPC HDA Server
PI OPC HDA Server 2016

• Bug Fixes
  – 2 Memory leaks addressed
    • TimeAverage reads
    • Repeated connection / disconnection
  – OPC HDA v1.2 compliance issue – PercentGood is now time-weighted
  – Misc Bug Fixes: Null pointers, empty strings, ItemHandle release
• End of support of Module Database
PI OPC DA Server
PI OPC DA Server 2015

• Uses AF SDK to access PI Data Archive
  – Eliminates server-crashing bug inherent to previous architecture / design
  – Improved security (vs. using PI SDK / PI API)

• Very long start-up time 😞
PI OPC DA Server 2017

- 50% faster initial startup time than 2015
- Namespace Data cached on shutdown leads to...
  - 95% faster startups!
PI OPC DA Server 2018

- Additional optimization to initial times
- Advise event when only the timestamp changes
- Future data support
- Whitelist/blacklist of PI Data Archives
- Bundle OPC Tools
Contact Information

Ray Verhoeuff
ray@osisoft.com
Product Manager

Mike Sloves
msloves@osisoft.com
Group Leader

David Hearn
dhearn@osisoft.com
Group Leader

Bodo Bachmann
bodo@osisoft.com
Engineering Manager
Thank You

Danke
Merci
Gracias
Obrigado
감사합니다
謝謝
ありがとう
Спасибо