Developing Analytics with Microsoft StreamInsight & PI for StreamInsight

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Microsoft StreamInsight

in



PI for StreamInsight

PI Server 2010



- Increasing amount of data
- Integration of data for analysis
- Data quality management
- Finding better ways to analyze data

Microsoft StreamInsight

- In-memory data processing engine
- Event driven, incremental computations
- .NET and LINQ programming environment
- Correlate multiple, heterogeneous data sources
- Modular design engine and adapters



- Input and Output adapters for StreamInsight
- Analytics using Microsoft StreamInsight





• Stream is a series of events











var query = from e1 in stream1 join e2 in stream2 on e1.i equals e2.i select new { e1.i, e1.j, e2.j };

Typical StreamInsight Queries

- "Give me the Top 3 values every 10 minutes"
- "Filter out sensor readings when the device was in a maintenance period"
- "Tell me when an event A was followed by an event B within 3 minutes"



- Event detection
 - Vibration analysis & meter data outage management
- Cleanse and monitor sensor data
 - Inform users of data issues
- Other Industry examples
 - Clickstream analysis for user behavior
 - Risk analysis for business activity monitoring

Cleanse and monitor sensor data

- Outside acceptable limits or invalid
- Monitor 1000-10,000s of data points
- Support data bursts upward of 10,000 events/second
- External meta-data for validation rules
- Call 3rd party or custom library for validation

Cleanse and monitor sensor data



Vibration Event detection & Analysis

PI System 1 StreamInsight Server PI System 1 PI System 2

- Requirement
 - Detect limit exceedance for 12,000 data streams and events/sec
 - Replicate a data window of 60 minutes to the second PI System on event detection
- Benefit
 - Enable failure analysis with data from each event



Meter reporting validation – traditional method

public List<DateTime> MissingIntervals(DateTime start, DateTime end, TimeSpan interval, String serverName, String tagName)

```
List<bool> foundIntervals = new List<bool>();
```

```
for (DateTime intervalStart = start; intervalStart - interval < end; intervalStart += interval)
```

```
foundIntervals.Add(false);
```

```
PISDK.PISDK sdk = new PISDK.PISDK();
```

```
PISDK.Server server = sdk.Servers[serverName];
```

```
PISDK.PIPoint pipoint = server.PIPoints[tagName];
```

```
PISDK.PIValues pivalues = pipoint.Data.RecordedValues(start, end,
```

```
BoundaryTypeConstants.btOutside, string.Empty, FilteredViewConstants.fvShowFilteredState, null);
```

```
foreach (PISDK.PIValue pivalue in pivalues)
```

```
long intervalOffset = ((long)(pivalue.TimeStamp.UTCSeconds * TimeSpan.TicksPerSecond) + interval.Ticks / 2 - start.Ticks) / interval.Ticks;
if (intervalOffset >= 0 && intervalOffset < foundIntervals.Count)
foundIntervals[(int)intervalOffset] = true;
```

```
List<DateTime> missing = new List<DateTime>();
```

```
for (long intervalOffset = 0; intervalOffset < foundIntervals.Count; intervalOffset++)
```

```
if (!foundIntervals[(int)intervalOffset])
```

missing.Add(start + TimeSpan.FromTicks(intervalOffset * interval.Ticks));

```
return missing;
```

Where does StreamInsight fit within the PI System?

PI Analytics		
Configuration	Programming	
Performance Equations	PI Advanced Computing Engine (PI ACE)	
Totalizers	Microsoft StreamInsight & PI for StreamInsight	
Statistical Quality Control		
PI AF formula data reference	PI AF custom data reference	

PI ACE and PI for StreamInsight features

Features and Capabilities	PI ACE	PI for StreamInsight
PI Server Collective and PI Server buffering support	\checkmark	×
Scheduler or can run as a Windows Service	\checkmark	\checkmark
Recalculation	\checkmark	×
Wizard and Manager	\checkmark	×
High level query language LINQ ("SQL Like")	×	\checkmark
Performance events/sec	1000's*	> 10,000's*

How does StreamInsight work?





StreamInsight Features

Benefit	StreamInsight Features
Simple configuration for PI Tags	PI Adapters support tag searches
Support complex payloads	Event types are .NET structures
Process high data rates	Low latency and in excess of 10,000 events/sec*
Minimize load on server	In-memory storage and processing of data
Query across different data sources	Normalized events, join streams
Don't need to know about PI SDKs	.NET, LINQ and PI Configuration for adapters only

StreamInsight Environment

- Modular Queries and collaboration
- Multiple clients sharing a single StreamInsight server
- Trace the event flow of queries
- Prototype queries in a sandbox



StreamInsight Software

- Microsoft SQL Server 2008 R2
 - StreamInsight inside
 - Standard (single processor) with Standard, Web, or Enterprise version of SQL Server
 - Premium (multi-processor) with DataCenter version of SQL Server
- PI for StreamInsight
 - PI Adapters
 - Stream events as they arrive at the PI Data Archive
 - Write events to PI System
 - Part of PI Server 2010

More Information

- OSIsoft Virtual Campus
 - OSIsoft vCampus Live 2010 presentation
 - Download version for development
 - Forums
- Microsoft StreamInsight blogs, forums
 - Hitchhiker's Guide to StreamInsight



Thank you

