"where PI geeks meet"

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What's New with the SDKs?

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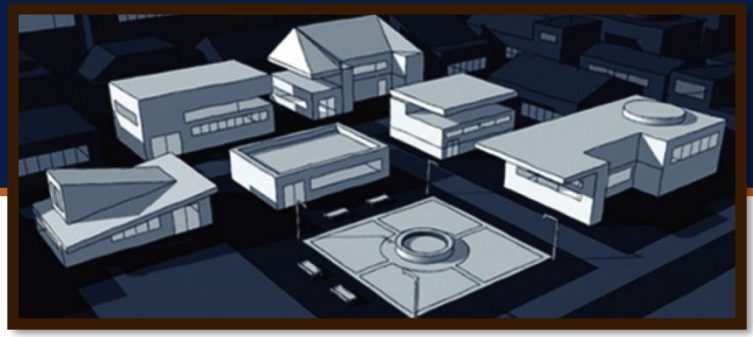
Agenda

- OSIsoft SDKs overview
- The PI SDK
- The AF SDK
  - Demo
- The Notification SDK
- Questions

The OSIsoft SDKs

- PI SDK
  - PI Points, PI Message Log, PI Internal Databases
- AF SDK
  - Databases, Elements, Attributes, Tables
  - Data References (DRs, Notification Config. And delivery)
- AN SDK (a.k.a. Notifications SDK)
  - Notifications Instances (history)
- Event Frames SDK (a.k.a. EF SDK)
  - Part of the AF SDK (more this week)



The PI SDK

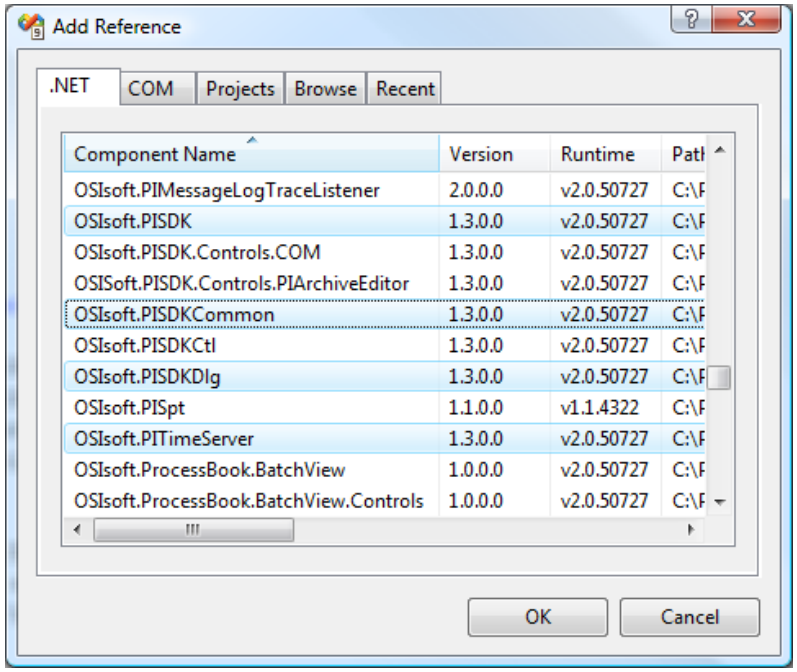
PI SDK charter

PI SDK development targets

- Support all Windows platforms
- Support COM & .NET programming
- Support rapid development and ease of use
- Maintain compatibility for existing programs
- Continuous enhancements, sometimes without code changes

Programming With PI SDK

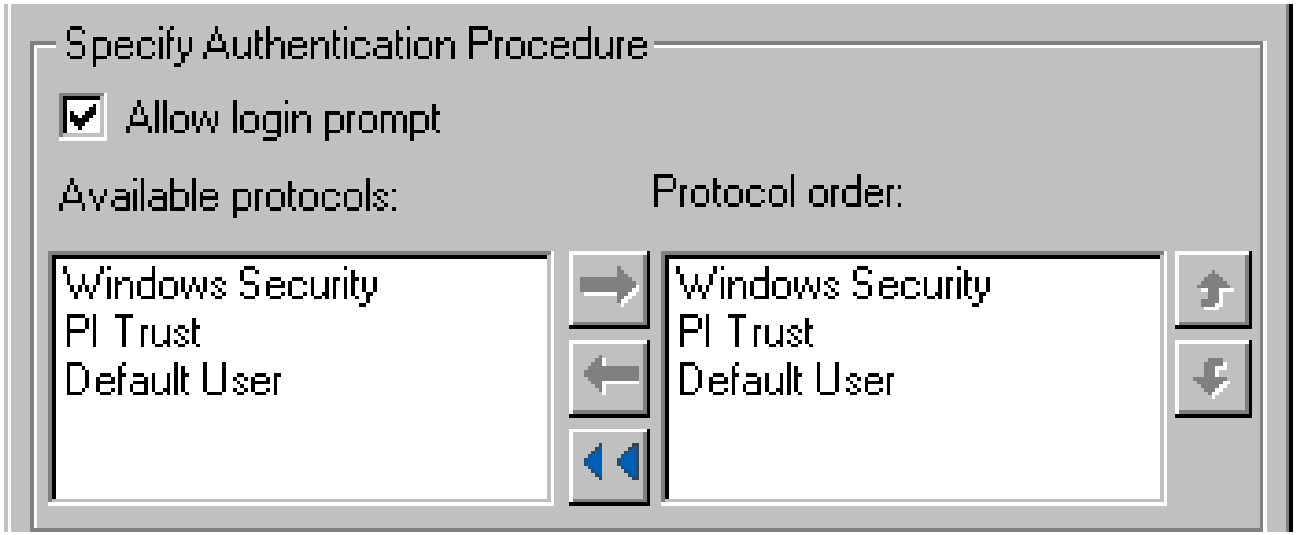
- Assemblies
  - OSIsoft.PISDK
  - OSIsoft.PISDKCommon
  - OSIsoft.PISDKDlg
  - OSIsoft.PITimeServer
- Help File: \PIPC\Help\PISDK.CHM



- Manage/Find PI Points
- Read/Write Data
- Perform Calculations
- Invoke Common Dialog Windows
- …

New Authentication (WIS)

- Authentication options in PI SDK 1.3.6
  - Connection manager configures types and order



- Client and/or Server configurable with PI 3.4.380

The 64-bit Release

- Programmatic Interfaces are identical
- Side by Side installation
  - Separate install paths for 64/32-bit
    PIHOME=(64) ? PISystem registry : pipc.ini;
  - Environment variables: PIHOME, PIHOME64
    - Include paths for projects and command files
- Shared resources
  - Server table operations affect both
  - PI Networking System (PINS) serves both

PI Message Log Files

Message logging goals in PI

- Consolidate messages to a single log
- Consolidate repetitive text, and provide more context
- Enable easier analysis and searching

PI Message Log Files

Message log changes

- Message ID specifies text, severity, subsecond timestamps
- Expandable collection of predefined messages
- Shortcut implementation with ID 1-5 (Critical, Error, Warning, Informational, Debug)
- Search for ID using MessageLog2.List2 (e.g. ID 7076 provides login node, user, trust)
- See list of current ID's at: PIHOME\help\en\PIMessageDefinitions.htm

HA discussion

Use the Behaviors collections!

- PI Server & Collective behavior equivalence
- PI SDK automatically detects server capabilities
  - Finds the correct node, but no unnecessary switching
  - Switching nodes consumes resources (connect with SERVERROLE=Any, load balancing ready)
- Detect Behavior types per server
  - Batch read/write, Data write, Configuration write

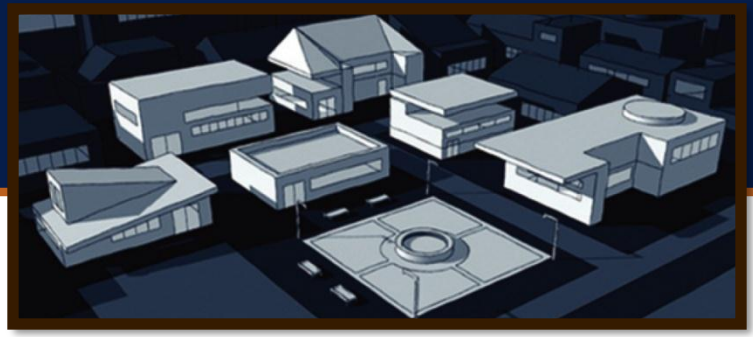
Coming next: Data Buffering

- Buffering PI SDK data with PIBufSS:
  - Transparent to the PI SDK program – no changes
  - Data fanning to collectives
  - Detection of buffering on/off
- Identity preservation for secure writes
- Supported servers in PIBufSS : PI 3.4.375+
- Detect if Server Side Buffering (SSB) is available
  - Prefer server side replication over fanning

Coming next: Server Table

Client server table central management

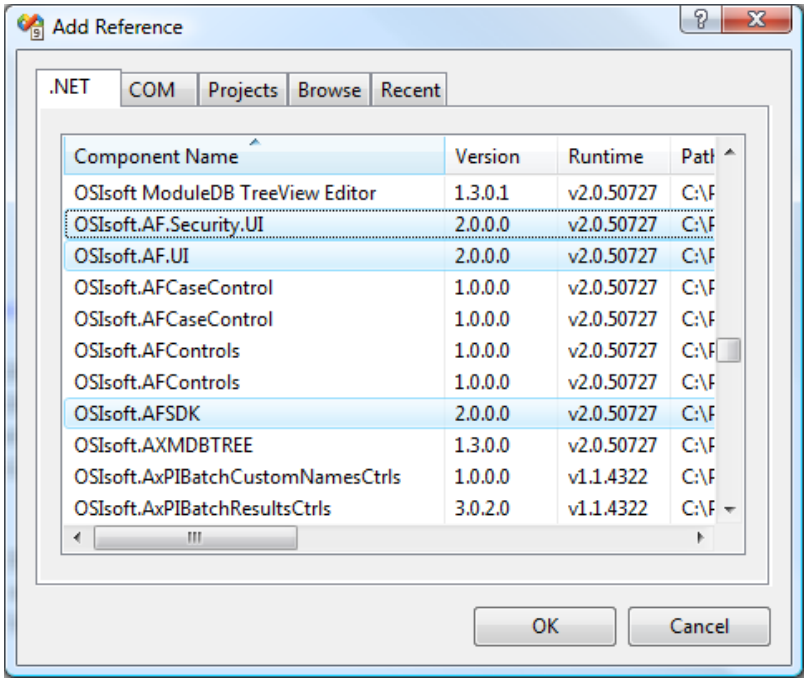
- Collective auto config, then auto-add servers
- Central client management
  - PI System store required for PI server and AF server configuration
  - User or node based listings
  - Store domain specific information
  - Collective priorities



The AF SDK

Programming With AF SDK

- Assemblies
  - OSIsoft.AFSDK
  - OSIsoft.AF.UI
  - OSIsoft.AF.Security.UI
- Help File: \PIPC\Help\AFSDK.CHM

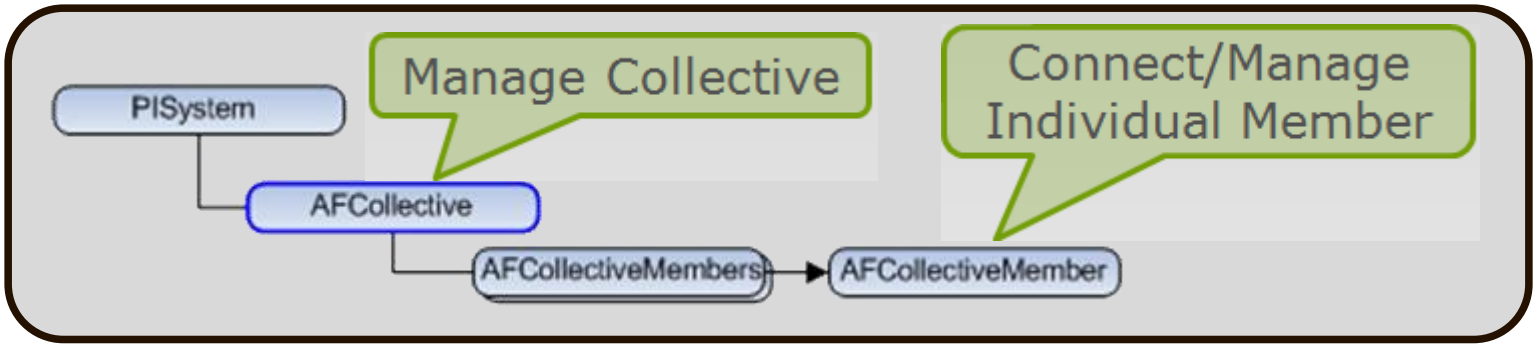


- Manage/Find Assets
  - Databases, Elements, Attributes
- Manage Library
  - Templates, Tables, Contacts
- Configure Notifications
- Invoke Common Dialog Windows
- …

What's new since AF 2.0?

- Support for High Availability
- Integration of PI SDK 64 bits
- Check-in & Multi-Threading
- Bulk operations
- Improved searches
- Documented UI controls
- Support for Notification Templates
- Event Frames preview

High Availability in the AF SDK

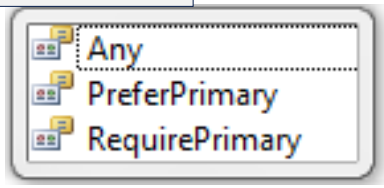


- Programming Model very similar to PI SDK for HA
- AF SDK will automatically
  - Failover on connection loss
  - Connect to Primary as necessary for writes
- Monitor for connection changes using **`PISystem.ConnectionChanged`** event

AF-HA – How to Connect?

- Method1: Provide AFConnectionPreference during Connect

```
myPISystem.Connect(true, null, AFConnectionPreference.RequirePrimary);
```



- Method 2: Configure default Connection Preference

```
myPISystem.ConnectionInfo.Preference = AFConnectionPreference.Any;
```

- Method 3: Connect directly to member

```
AFCollectiveMember memberOfCollective = myPISystem.Collective.Members["AFPhoenix"];
memberOfCollective.Connect();
```

- Use **`AFCollectiveMember.Priority`** to set local connection priority for member

64-bit Support

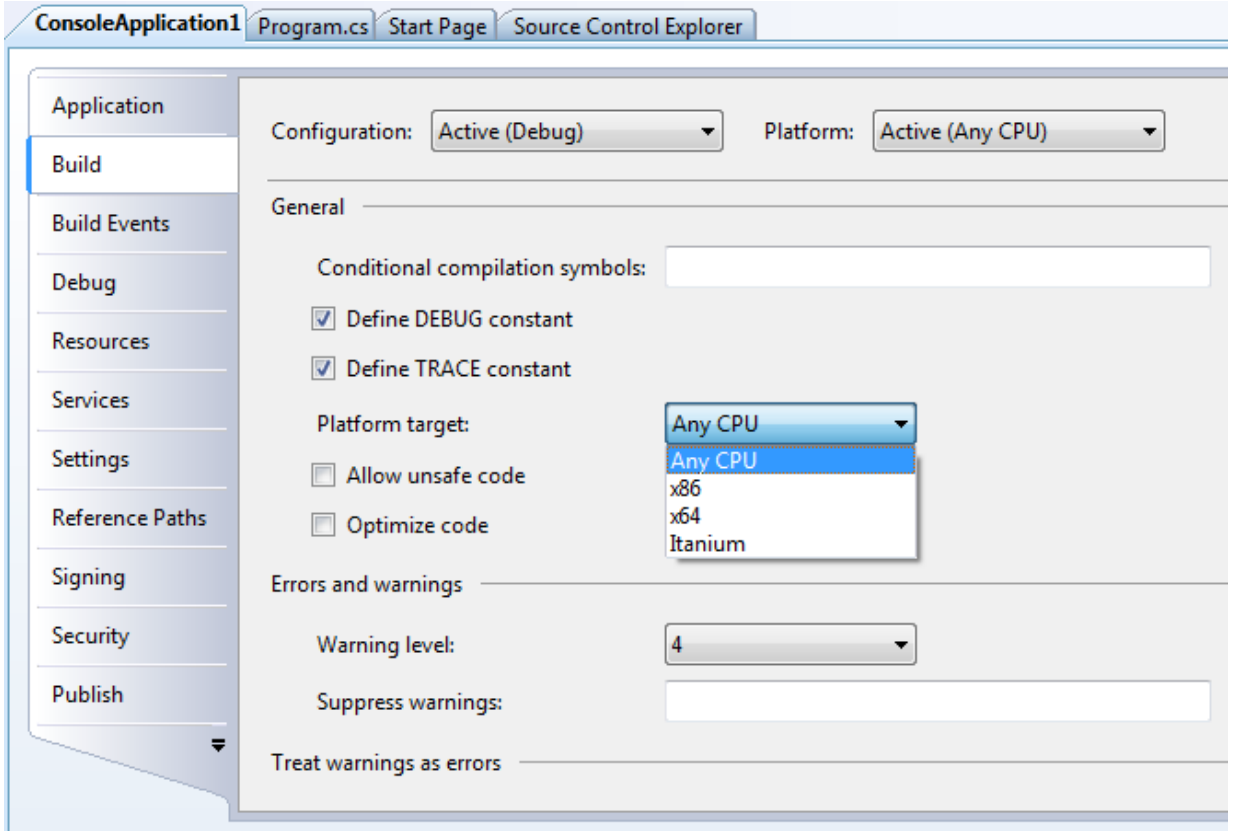
- AF SDK is 64-bit compatible (MSIL)
  - Requires 64-bit PI SDK
    (installed with AF 2.1 client, but not with PB)

- Not all functionality may be available under 64-bits
  - Use of PI SDK functions like Tag Search
  - Use of Plug-Ins using PI API

- AF Server and SQL Server support both 32- and 64-bit
  - You can mix and match

64-bit Support

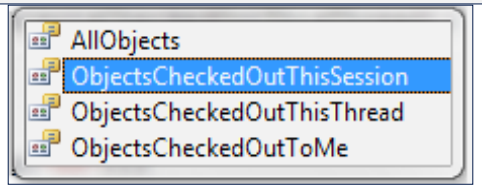
- Hosting Application controls whether AF SDK run as 64-bit or 32-bit
- Itanium is not supported



Check-In Changes

- Control scope of database *CheckIn* and *ApplyChanges* with *AFCheckedOutMode* to prevent conflict

```
myDatabase.ApplyChanges(AFCheckedOutMode.ObjectsCheckedOutThisSession);
myDatabase.CheckIn(AFCheckedOutMode.ObjectsCheckedOutThisThread);
```

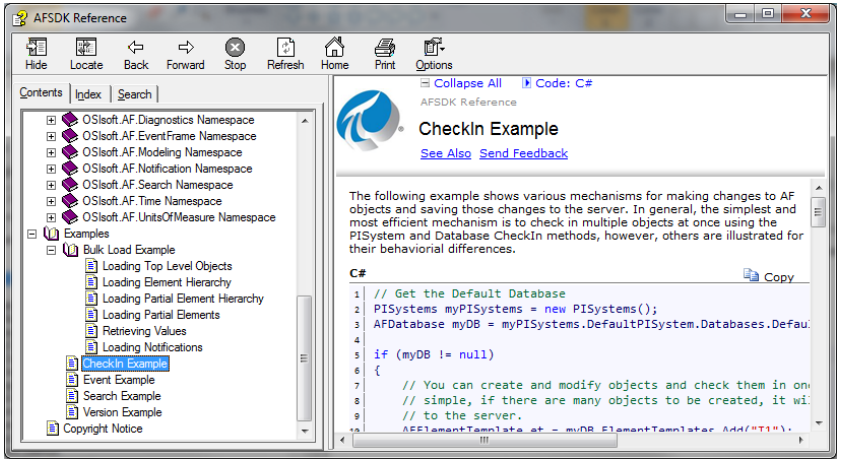


- Alternatively, specify list of objects using

```
PISystem.CheckIn(Ilist<IAFTransactable> objList)
```

- Reduce Server Rounds-Trips

- See *CheckIn* examples in AF SDK Reference



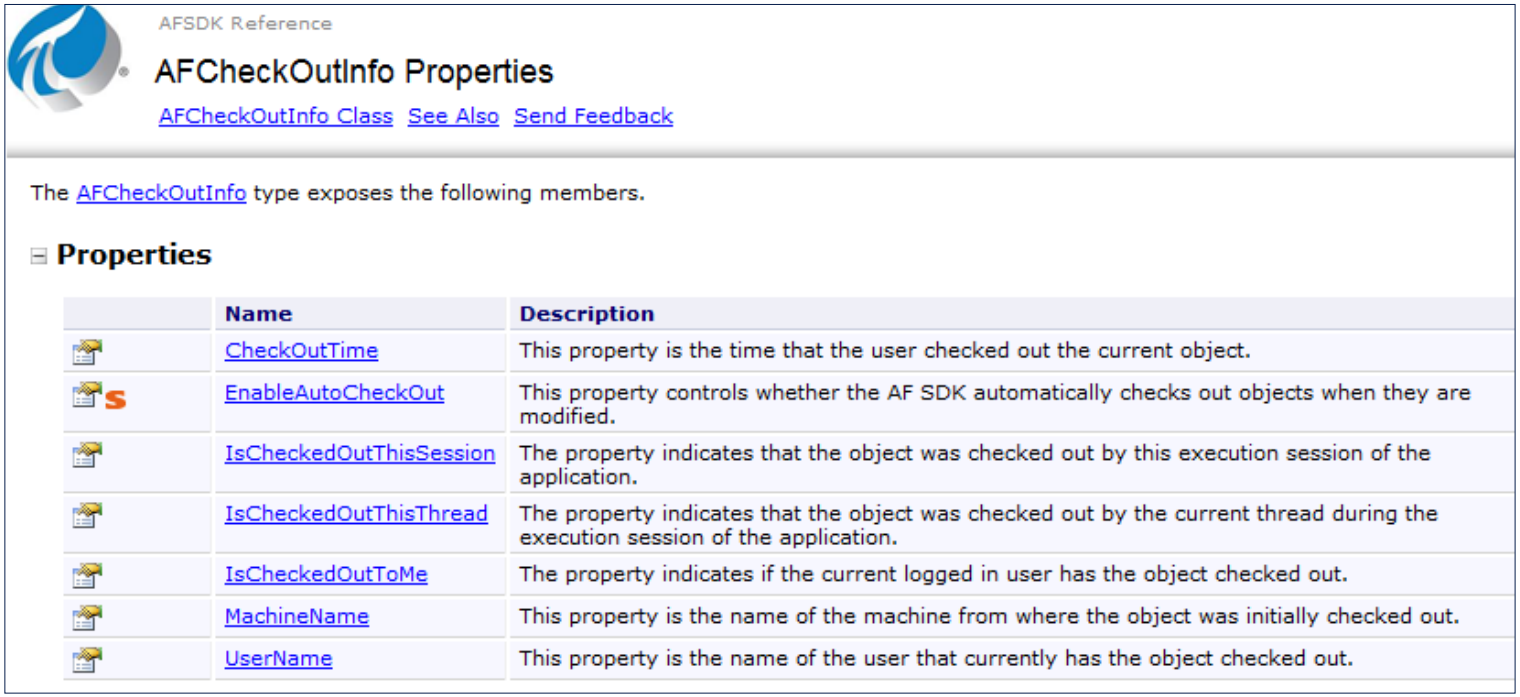
Check-In Changes

- Determine **when** a Checkout occurred

```
if (myElement.CheckOutInfo.CheckOutTime < new AFTime("Y"))
```

- Determine **where** a CheckOut occurred

```
if (!myElement.CheckOutInfo.IsCheckedOutThisThread)
```



AFSDK Reference

AFCheckOutInfo Properties

AFCheckOutInfo Class | See Also | Send Feedback

The AFCheckOutInfo type exposes the following members.

Properties

	Name	Description
	CheckOutTime	This property is the time that the user checked out the current object.
S	EnableAutoCheckOut	This property controls whether the AF SDK automatically checks out objects when they are modified.
	IsCheckedOutThisSession	The property indicates that the object was checked out by this execution session of the application.
	IsCheckedOutThisThread	The property indicates that the object was checked out by the current thread during the execution session of the application.
	IsCheckedOutToMe	The property indicates if the current logged in user has the object checked out.
	MachineName	This property is the name of the machine from where the object was initially checked out.
	UserName	This property is the name of the user that currently has the object checked out.

Multi-Threading

- If multiple threads within one application might modify the same AF object, then lock

OR

```
lock (myElement)
{
    myElement.Description = "Change";
    myElement.CheckIn();
}
```

- Use different AF SDK memory pool

```
PISystems mySystems = new PISystems(true);
```

- Microsoft Threading Design Guidelines

  http://msdn2.microsoft.com/en-us/library/f857xew0(VS.71).aspx

  Performance and Deadlock prevention

Finding Changes to AFDB and PISystem

- New method for greater accuracy

```
public IList<AFChangeInfo> FindChangedItems(AFIdentity identity,
                                            bool searchSandbox,int maxCount,
                                            Object cookie, out Object nextCookie)
```

- First call: pass a DateTime for the cookie
  - Subsequent calls: use the returned cookie
- More accurate the previous call which used a time
- AFChangeInfo now contains
  - ChangeTime, ID of object changed
- Database.Refresh internally uses this call

Reducing Round Trips to Server

- The programmer has the largest effect on performance
  - Easiest way is not always the most efficient
- Load* Methods (all transactable objects)
  - AFElement.LoadElements(IList<AFElement>)
  - AFNotification.LoadNotifications(IList<AFNotifications>, bool loadAnalyses);
- Specialized methods
  - AFElement.LoadElementsToDepth(…, int depth, …)
  - AFElement.LoadElementReferences(…)
  - AFElement.LoadParents(…, int maxLevels, bool fullLoad)
  - AFElement.LoadAttributes(…, IList<AFAttributeTemplates>)
  - AFAnalysis.LoadTargets(…)
  - …

AF Attribute Value Search

- Searches on attributes with a Data Reference are executed on the client
- Indexing Attributes:

```
myAttributeTemplate = myTemplate.AttributeTemplates.Add("ID");
myAttributeTemplate.Type = typeof(int);
myAttributeTemplate.IsConfigurationItem = true;
myAttributeTemplate.IsIndexed = true;
```

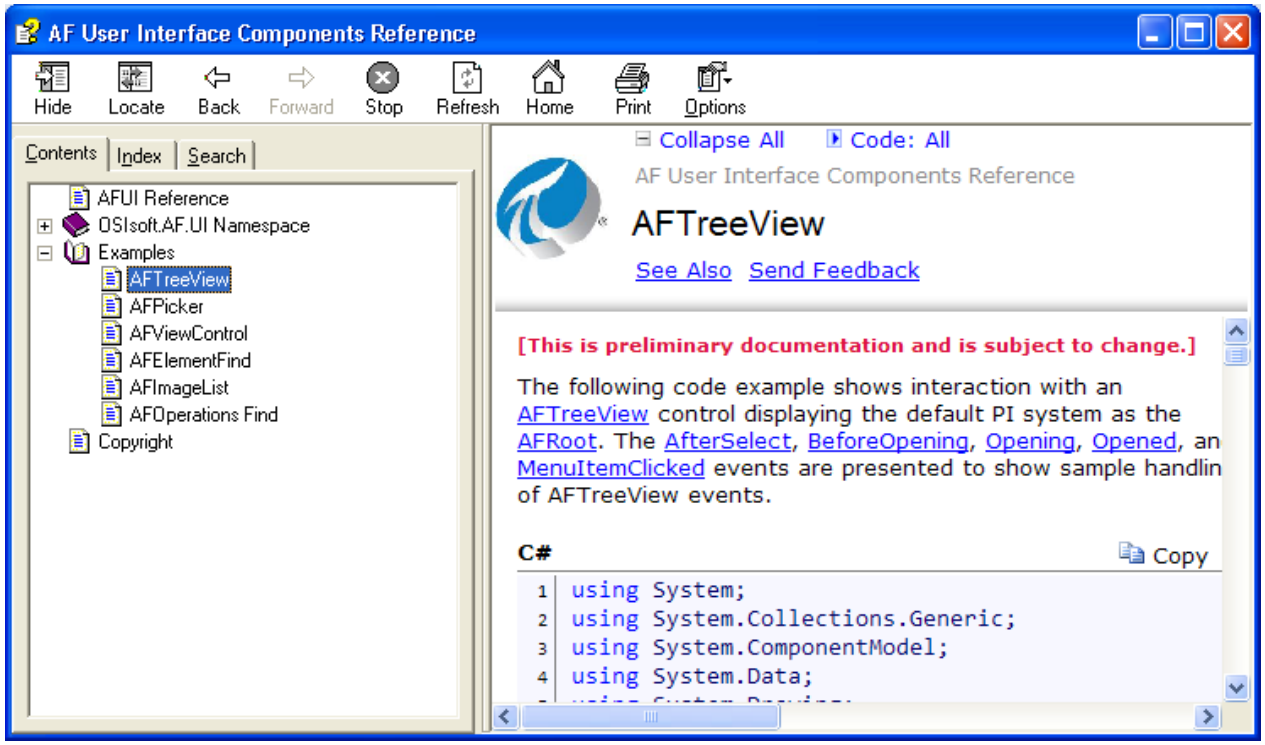
- Finding Elements by Attribute Value:

```
AFAttributeTemplate myAttributeTemplate = myTemplate.AttributeTemplates["ID"];
AFAttributeValueQuery[] afvaluequeries = new AFAttributeValueQuery[1];
AFAttributeValueQuery afvaluequery = new AFAttributeValueQuery();
afvaluequery.AttributeTemplate = myAttributeTemplate;
afvaluequery.Operator = AFSearchOperator.Equal;
afvaluequery.AttributeValue = "11481";
afvaluequeries[0] = afvaluequery;

AFNamedCollectionList<AFElement> list =
    AFElement.FindElementsByAttribute(null, "", afvaluequeries, false,
    AFSortField.Name, AFSortOrder.Ascending, 10);
```

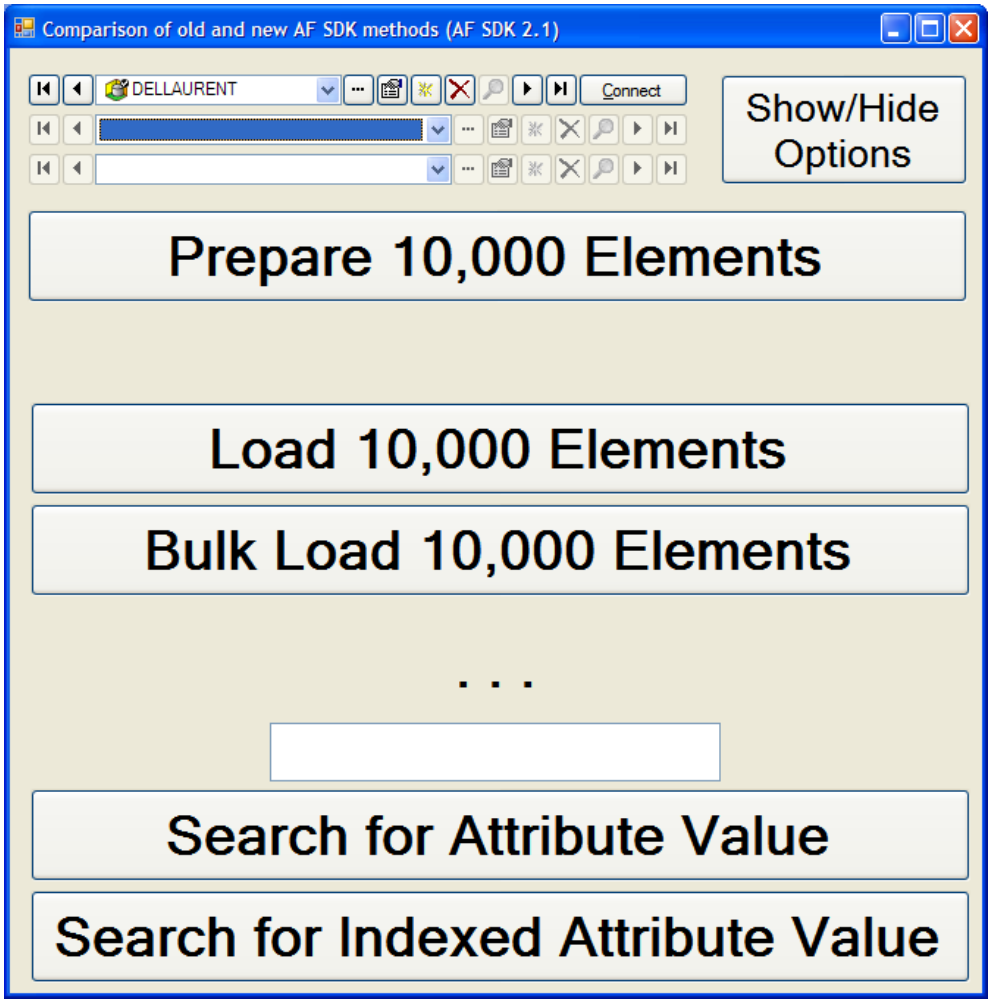
OSIsoft.AF.UI Namespace

- Exposes several controls and dialog windows
- Help and examples
  - AF User Interface Components Reference



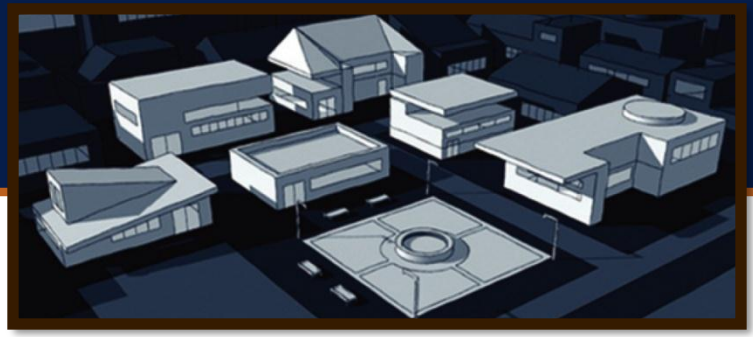
AF SDK 2.1 Demo

- Standard load vs Bulk load
- Standard attribute search vs Indexed attribute search
- AF UI Controls integration



Coming next with AF

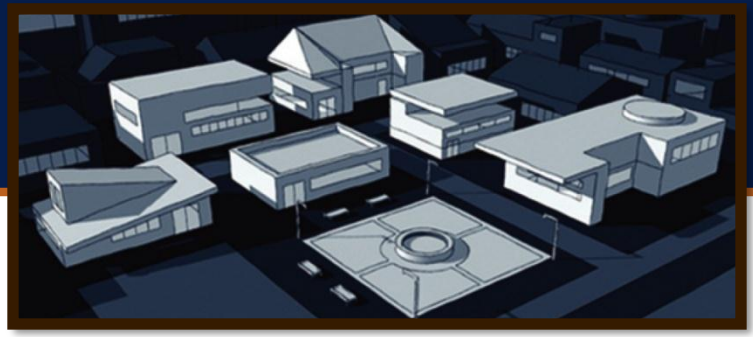
- AF 2.2
  - Faster insert
  - Large element collections
  - Server side paging of Element collections and searches
- AF 2.3
  - Improved Searching
  - Analytics



The Notification SDK

What's new since Notification 1.0?

- Performance improvements
- Support Notifications templates
- Ability to link delivery channels to Active Directory contacts
- New OCS delivery channel



Questions ?

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THANK YOU.