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WW HMI SCADA-11 System Platform Best Practices 1: Engineering Efficiencies

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/ Wonderware

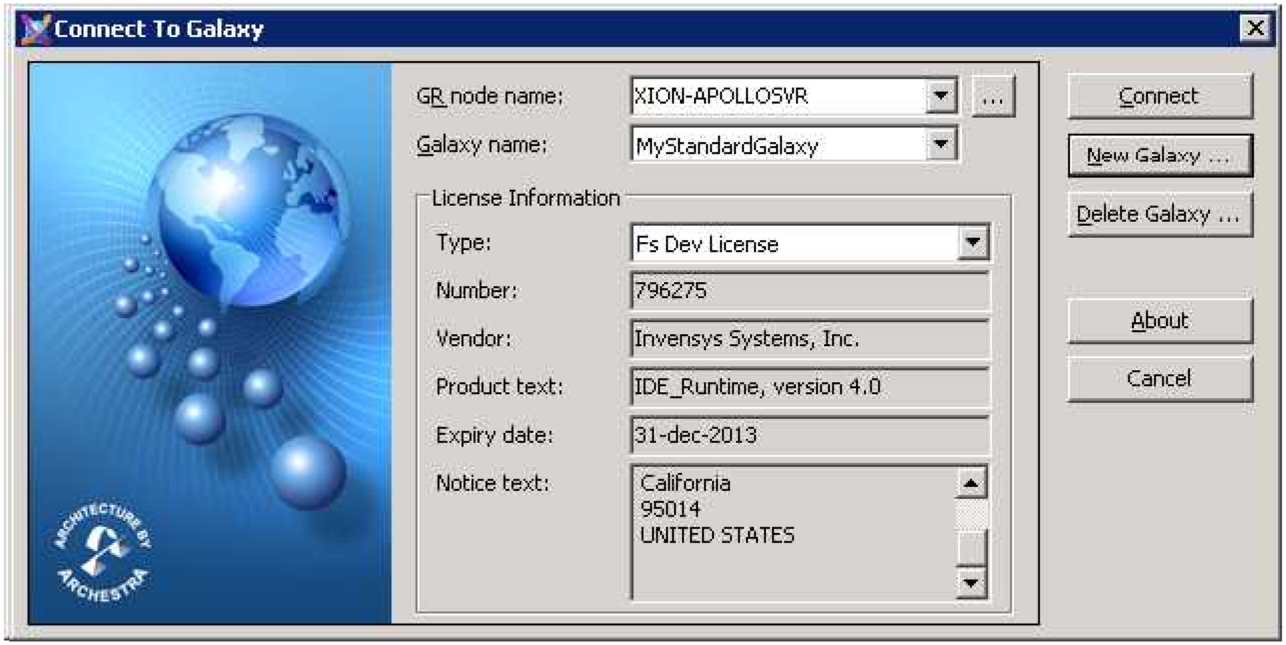
/ company / Wonderware

Topics to be Covered

- Building a Reusable Galaxy Template
- Multi-User Development
- Modeling and Template Organization
- Efficient Scripting
- Database Integration
- System Sizing Guidelines
- Model Based Device Integration

Configuring a Template Galaxy

- Create a Base Application Server Galaxy
- Connect to the Newly Created Galaxy


Connect To Galaxy

GR node name: XION-APOLLOSVR

Galaxy name: MyStandardGalaxy

License Information

Type: Fs Dev License

Number: 796275

Vendor: Invensys Systems, Inc.

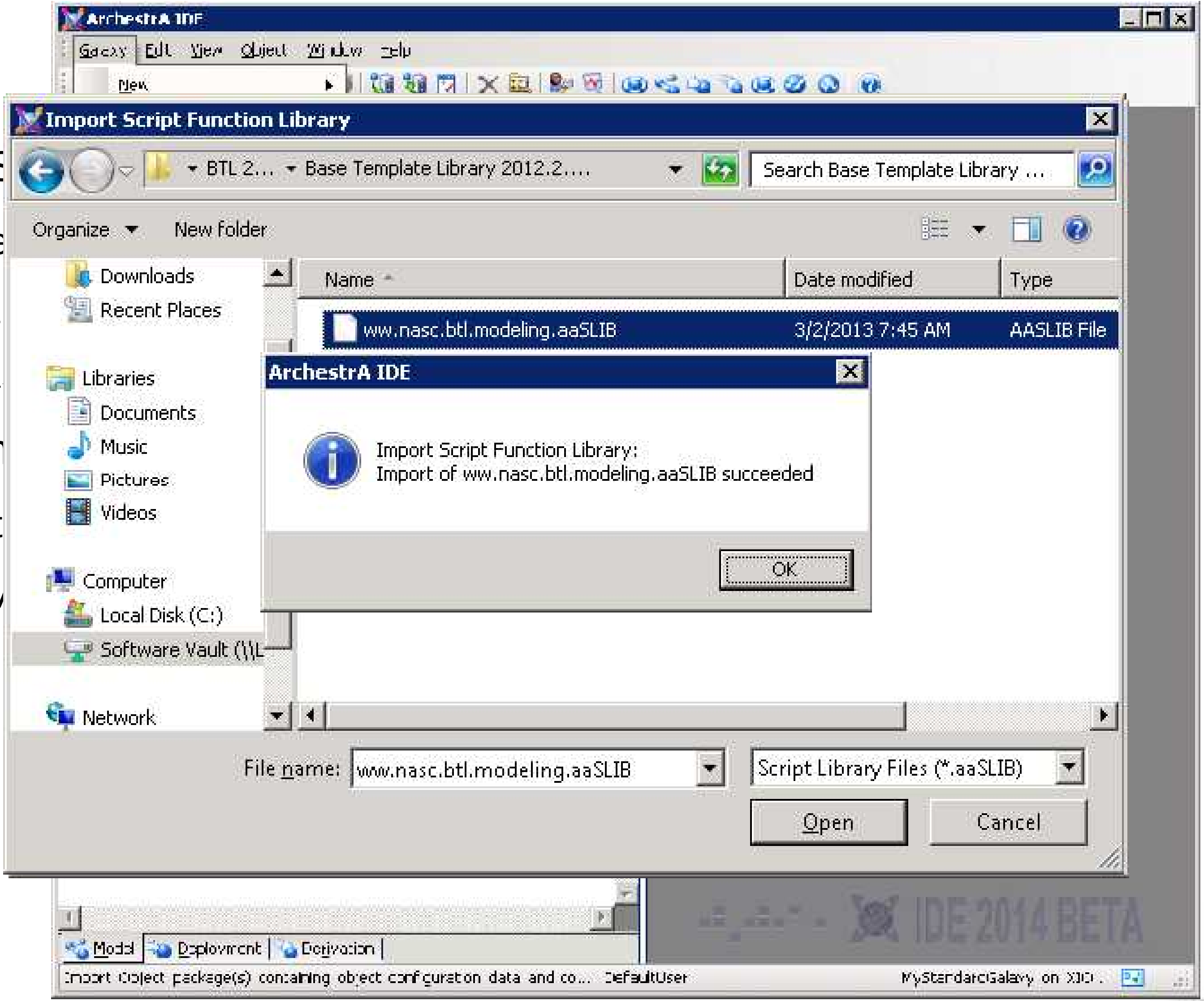
Product text: IDE_Runtime, version 4.0

Expiry date: 31-dec-2013

Notice text: California
95014
UNITED STATES

Load Script Libraries

- Import S
  - Base Te
    - Object
    - ww.na
- Importin
  - Prevent
  - Fixing V



Name	Date modified	Type
ww.nasc.btl.modeling.aaSLIB	3/2/2013 7:45 AM	AASLIB File

File name: ww.nasc.btl.modeling.aaSLIB

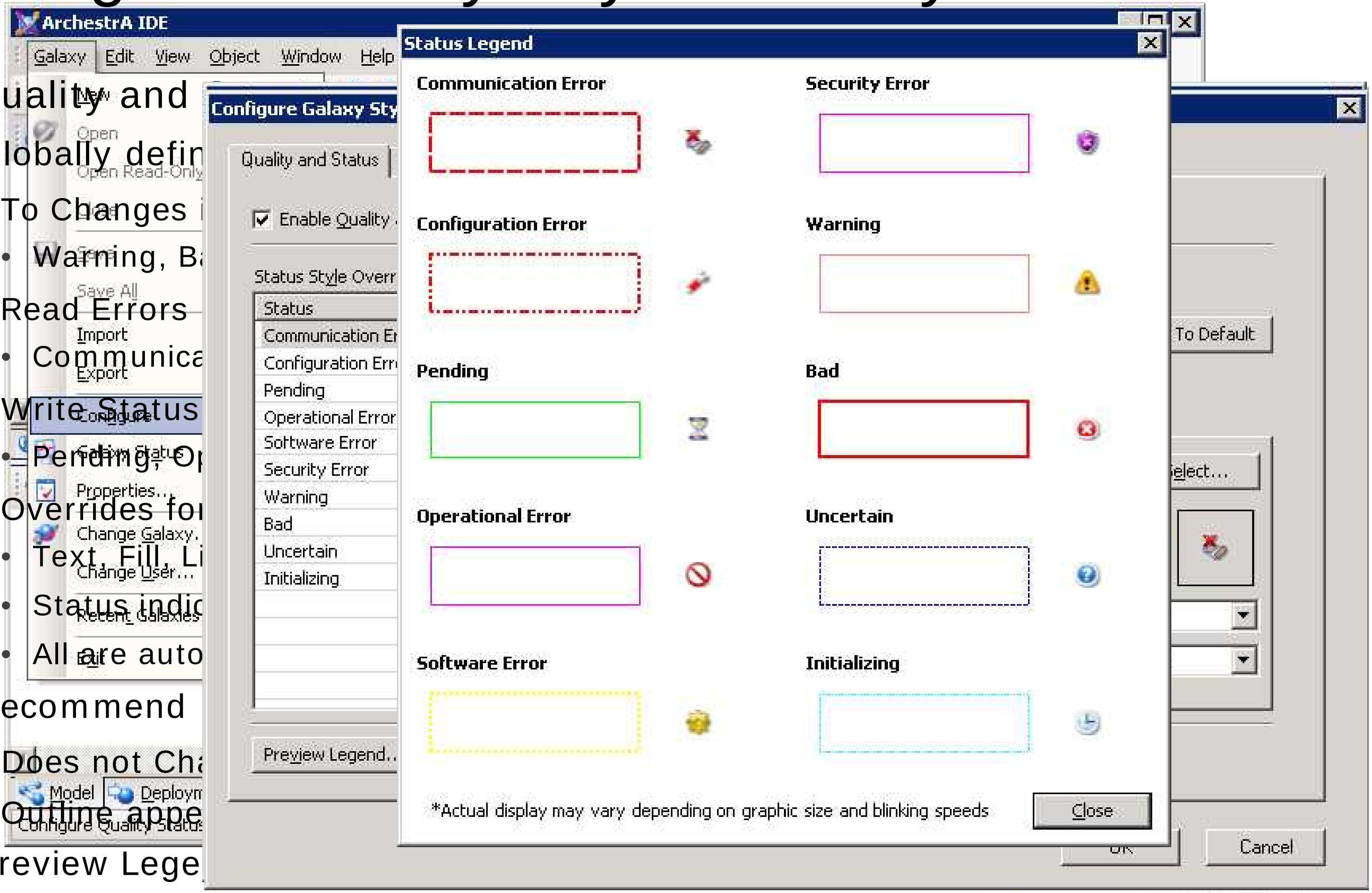
Script Library Files (*.aaSLIB)

Import Script Function Library:
Import of ww.nasc.btl.modeling.aaSLIB succeeded

Import object package(s) containing object configuration data and co... DefaultUser MyStandardGalaxy on XXX

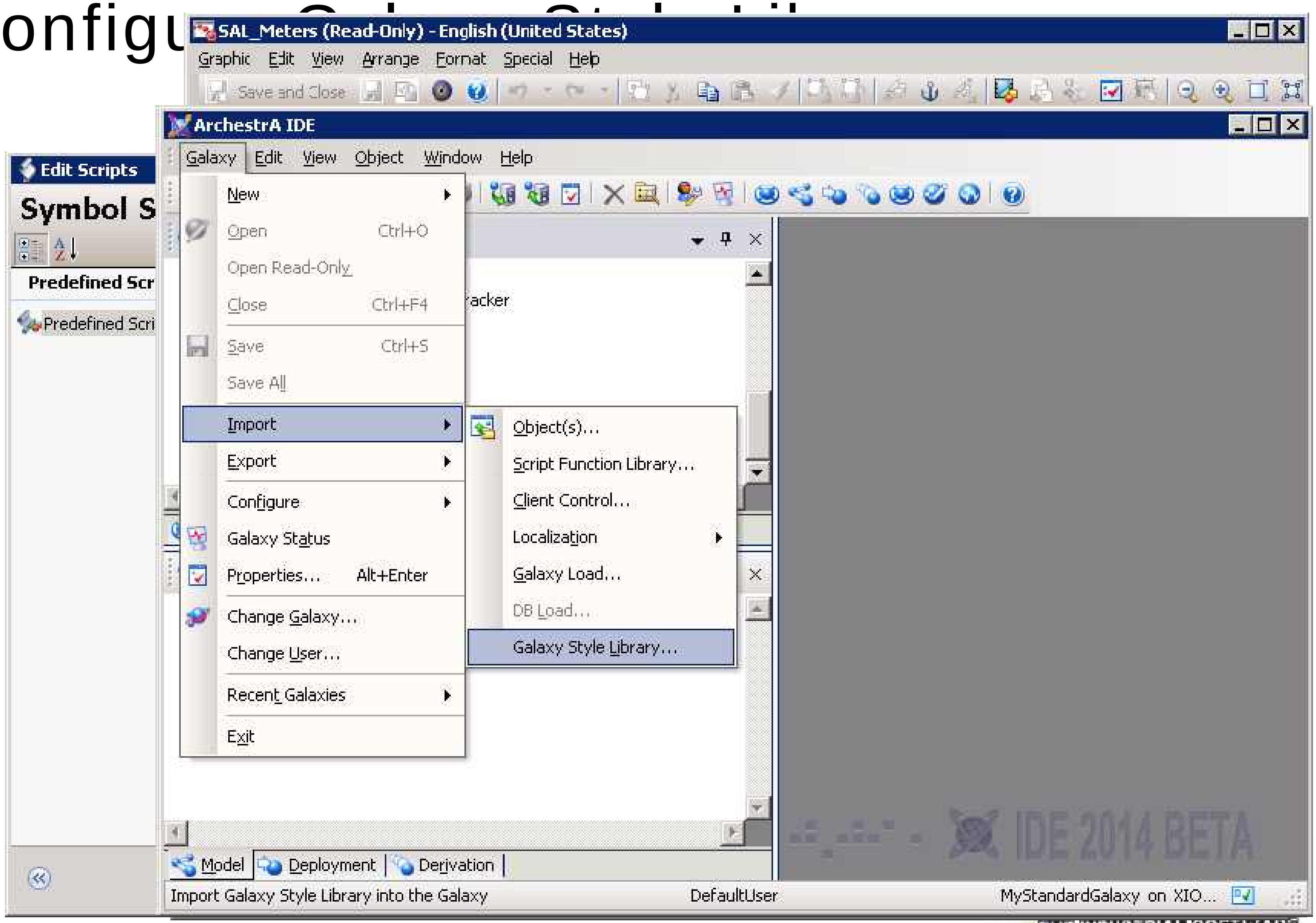
Configure Galaxy Style Library

- Quality and
  - Globally defin
    - To Changes i
      - Warning, Ba
    - Read Errors
      - Communica
    - Write Status
      - Pending, Op
    - Overrides for
      - Text, Fill, Li
      - Status indic
      - All are auto
  - Recommend
    - Does not Cha
    - Outline appe
  - Preview Lege



*Actual display may vary depending on graphic size and blinking speeds

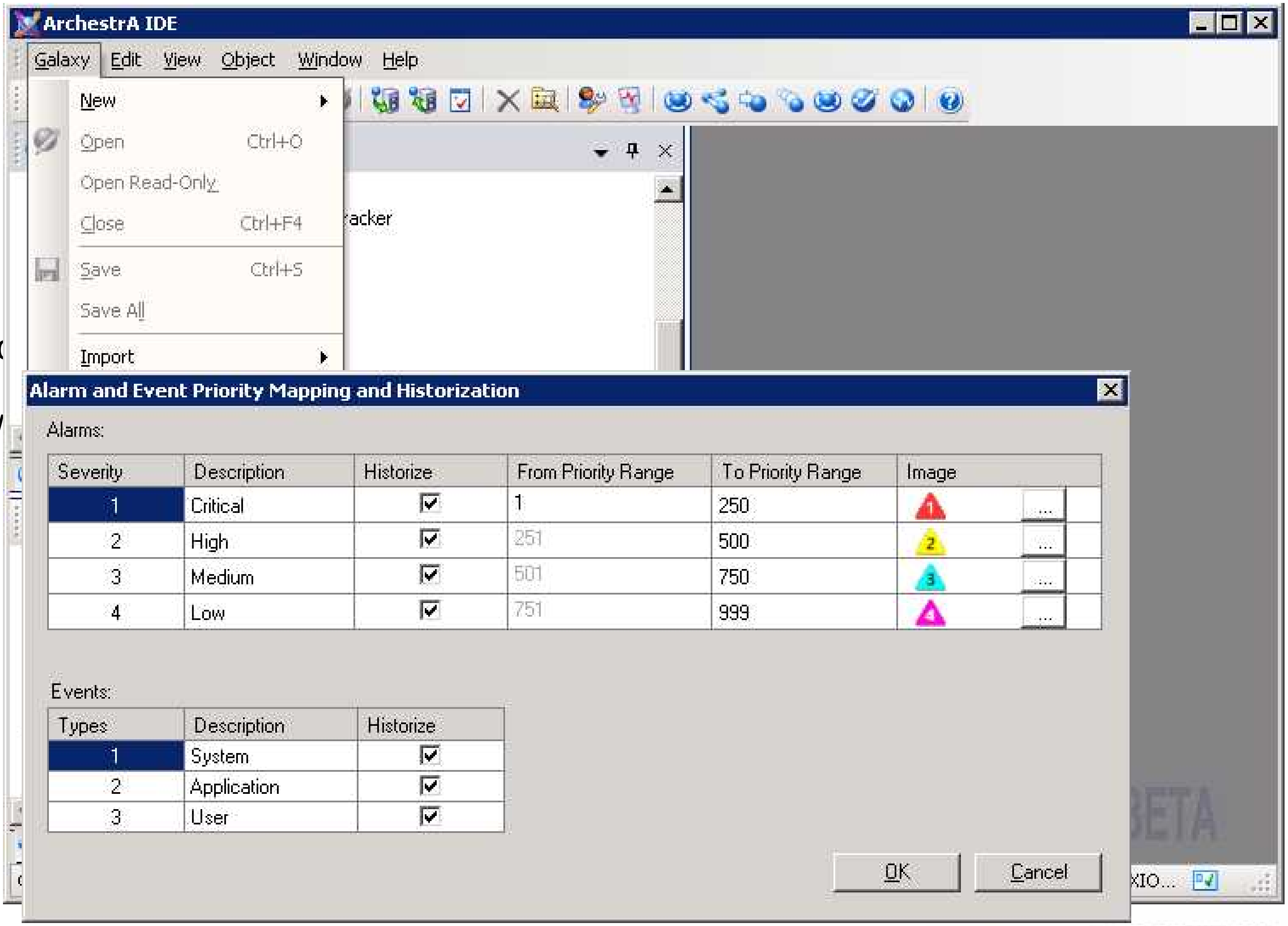
Configu



Import Galaxy Style Library into the Galaxy

Configure Alarm Priority Mapping

- Defines
  - Critical.
  - Which A
  - Image t
- Defines w



Alarm and Event Priority Mapping and Historization

Alarms:

Severity	Description	Historize	From Priority Range	To Priority Range	Image
1	Critical	☑	1	250	1 ...
2	High	☑	251	500	2 ...
3	Medium	☑	501	750	3 ...
4	Low	☑	751	999	4 ...

Events:

Types	Description	Historize
1	System	☑
2	Application	☑
3	User	☑

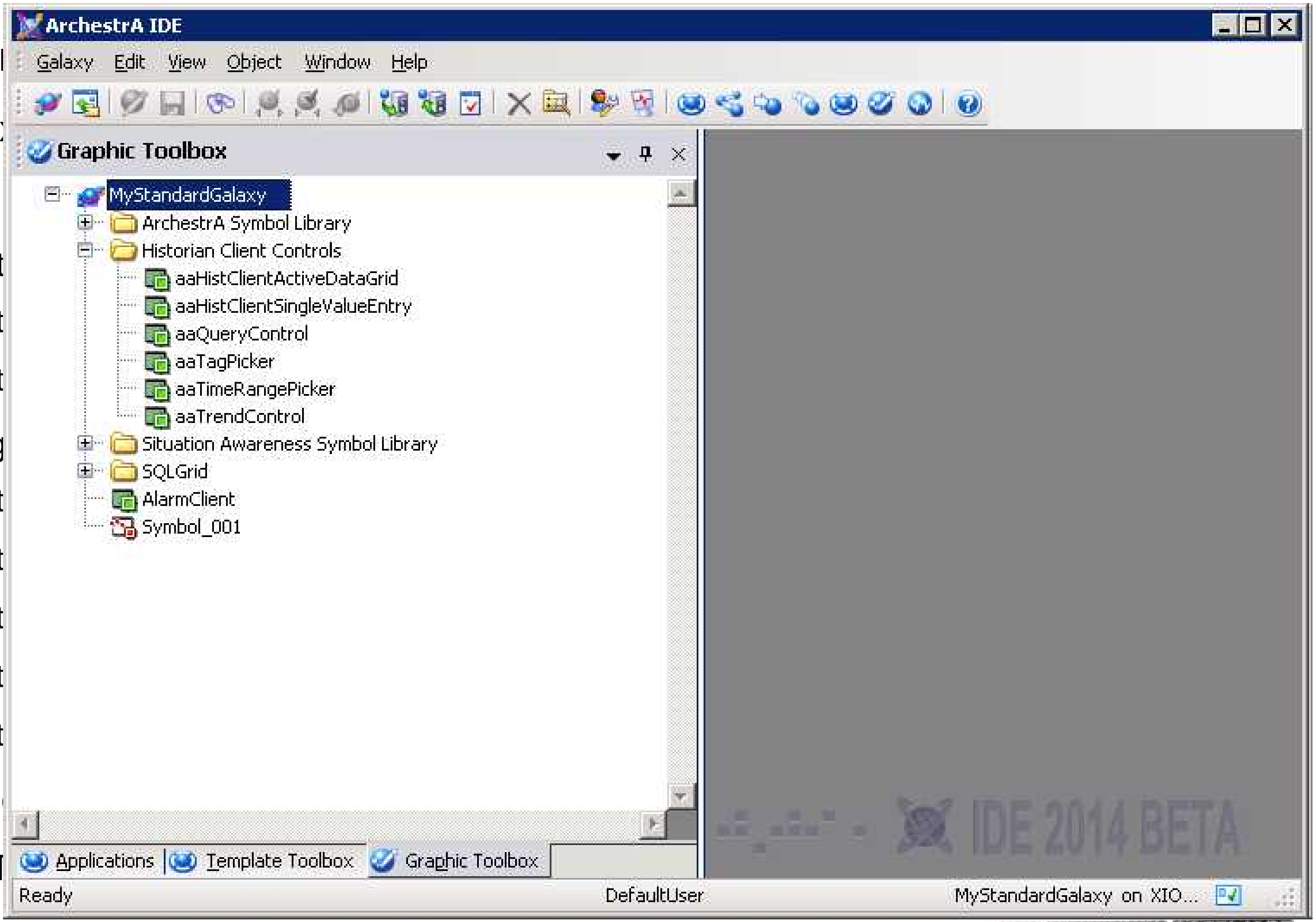
OK Cancel

Import Library of Templates

- North American System Consultants: Base Template Library
  - Excellent starting point for your own Library
  - Good example of scripting techniques
  - Contains
    - Application Object Templates
    - Quick Client
    - Model and Graphic Toolset Navigation
    - Will be discussed in Detail Later in this Presentation and Following Presentations

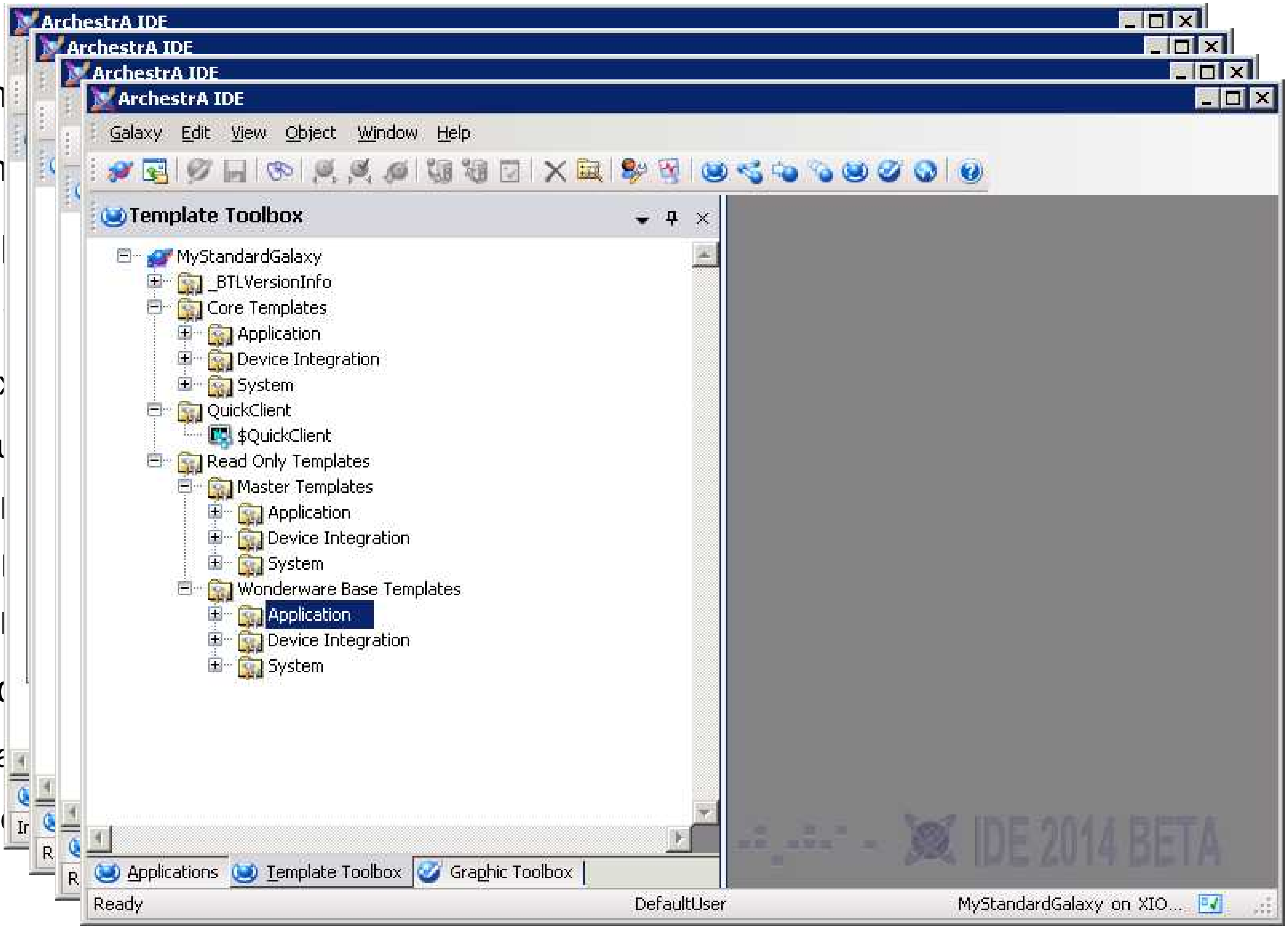
Import Client Controls

- Historiai
  - A little ex
  - C:\Progr
    - Applicat
      - aaHist
      - aaHist
    - Building
      - aaHist
      - aaHist
      - aaHist
      - aaHist
      - aaHist
  - Put in th
  - Put the T



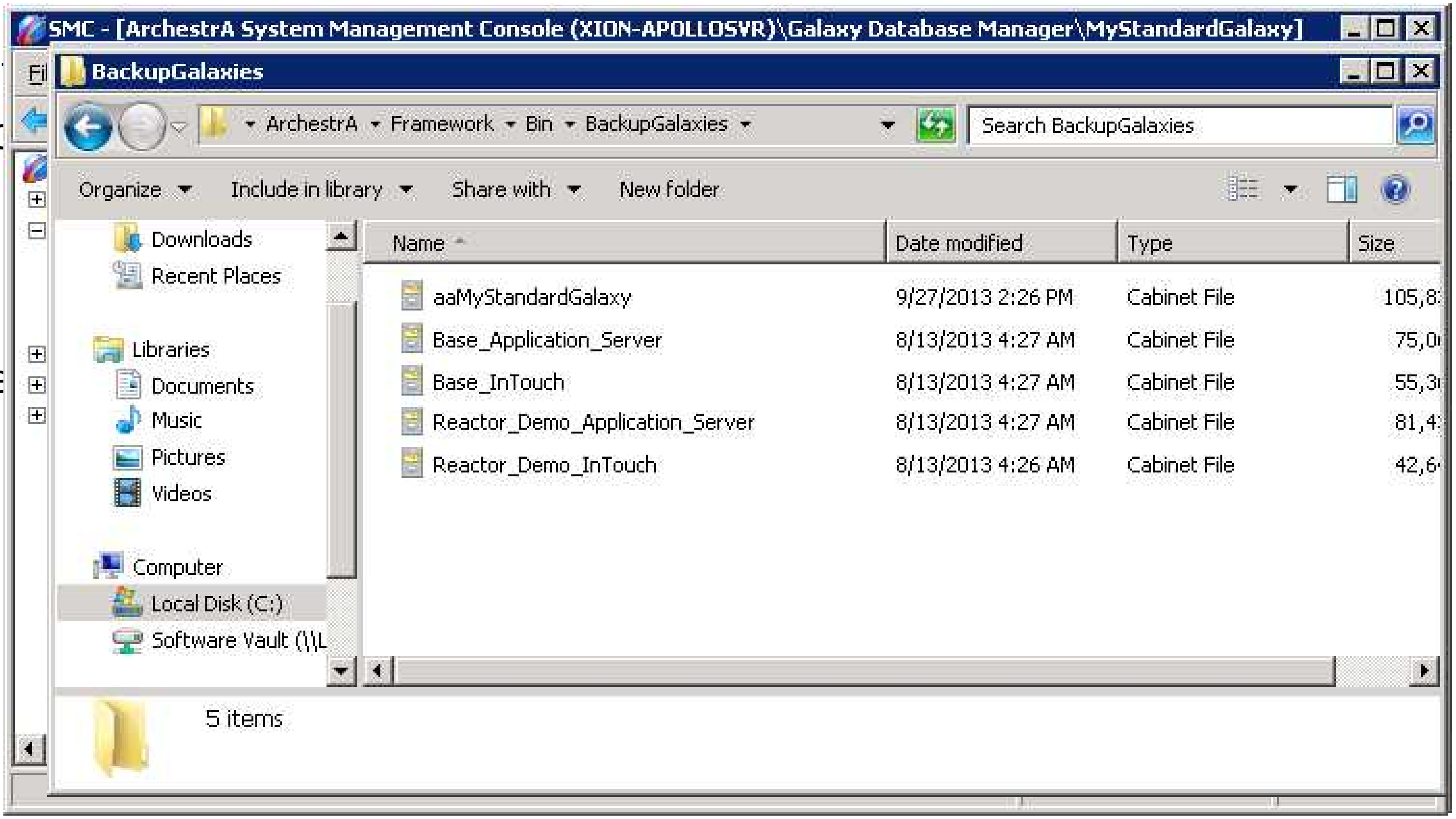
Import Base Template Library

- In
- In
- O
- O
  - Ex
  - Fu
    - I
    - I
    - I
- Add
  - La
  - Co



Save the Galaxy as a Template

- Launch
  Reposit
- Expand
  - Right-Cli
  - Place the
    C:\Progr
  - Repeat t



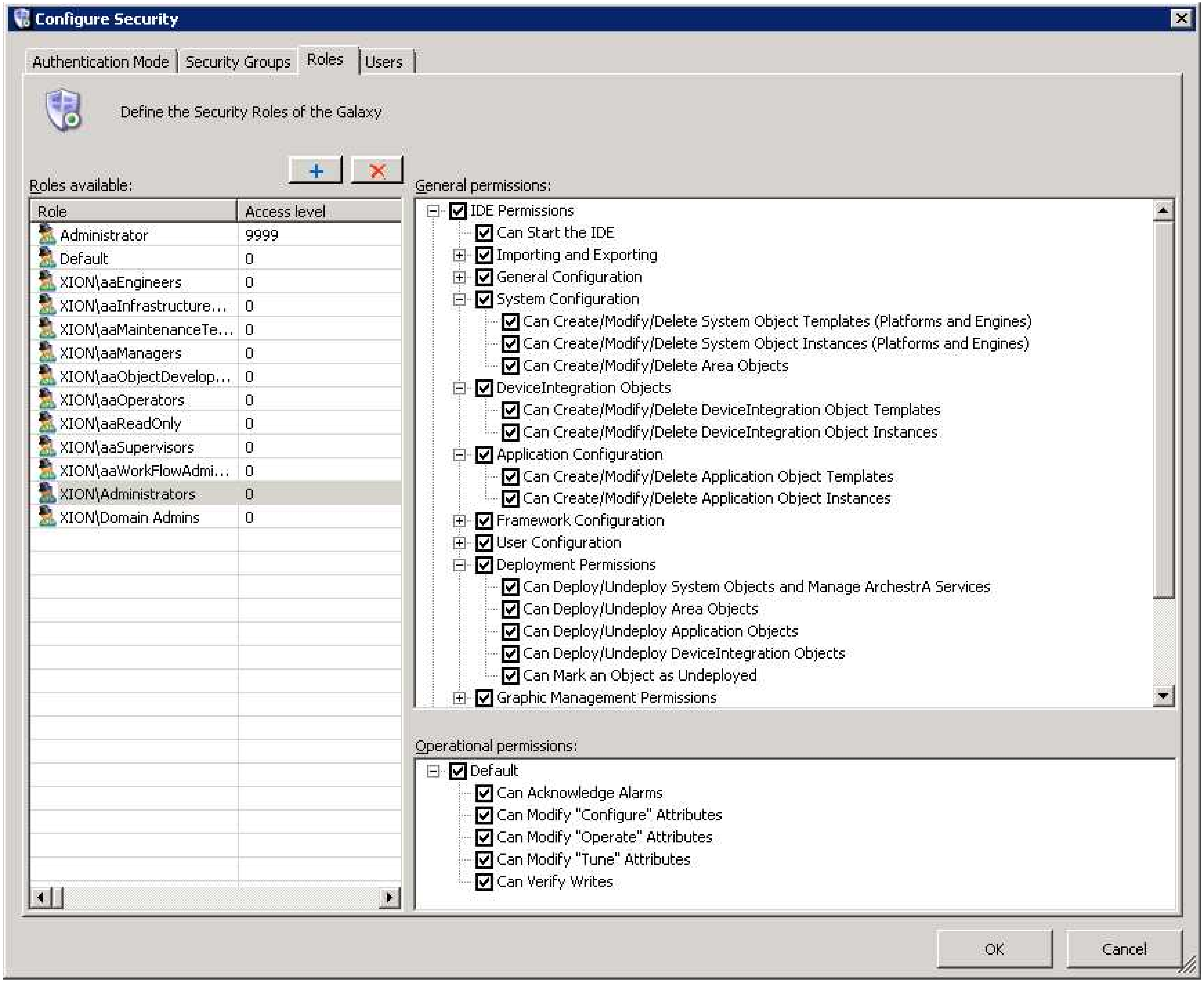
SMC - [ArchestrA System Management Console (XION-APOLLOSVR)\Galaxy Database Manager\MyStandardGalaxy]

BackupGalaxies

ArchestrA ▸ Framework ▸ Bin ▸ BackupGalaxies

Name	Date modified	Type	Size
aaMyStandardGalaxy	9/27/2013 2:26 PM	Cabinet File	105,8
Base_Application_Server	8/13/2013 4:27 AM	Cabinet File	75,0
Base_InTouch	8/13/2013 4:27 AM	Cabinet File	55,3
Reactor_Demo_Application_Server	8/13/2013 4:27 AM	Cabinet File	81,4
Reactor_Demo_InTouch	8/13/2013 4:26 AM	Cabinet File	42,6

5 items



Define the Security Roles of the Galaxy

Roles available:

Role	Access level
Administrator	9999
Default	0
XION\aaEngineers	0
XION\aaInfrastructure...	0
XION\aaMaintenanceTe...	0
XION\aaManagers	0
XION\aaObjectDevelop...	0
XION\aaOperators	0
XION\aaReadOnly	0
XION\aaSupervisors	0
XION\aaWorkFlowAdmi...	0
XION\Administrators	0
XION\Domain Admins	0

General permissions:

- ☑ IDE Permissions
  - ☑ Can Start the IDE
  - ☑ Importing and Exporting
  - ☑ General Configuration
  - ☑ System Configuration
    - ☑ Can Create/Modify/Delete System Object Templates (Platforms and Engines)
    - ☑ Can Create/Modify/Delete System Object Instances (Platforms and Engines)
    - ☑ Can Create/Modify/Delete Area Objects
  - ☑ DeviceIntegration Objects
    - ☑ Can Create/Modify/Delete DeviceIntegration Object Templates
    - ☑ Can Create/Modify/Delete DeviceIntegration Object Instances
  - ☑ Application Configuration
    - ☑ Can Create/Modify/Delete Application Object Templates
    - ☑ Can Create/Modify/Delete Application Object Instances
  - ☑ Framework Configuration
  - ☑ User Configuration
  - ☑ Deployment Permissions
    - ☑ Can Deploy/Undeploy System Objects and Manage ArchestrA Services
    - ☑ Can Deploy/Undeploy Area Objects
    - ☑ Can Deploy/Undeploy Application Objects
    - ☑ Can Deploy/Undeploy DeviceIntegration Objects
    - ☑ Can Mark an Object as Undeployed
  - ☑ Graphic Management Permissions

Operational permissions:

- ☑ Default
  - ☑ Can Acknowledge Alarms
  - ☑ Can Modify "Configure" Attributes
  - ☑ Can Modify "Operate" Attributes
  - ☑ Can Modify "Tune" Attributes
  - ☑ Can Verify Writes

Different Classes of Objects

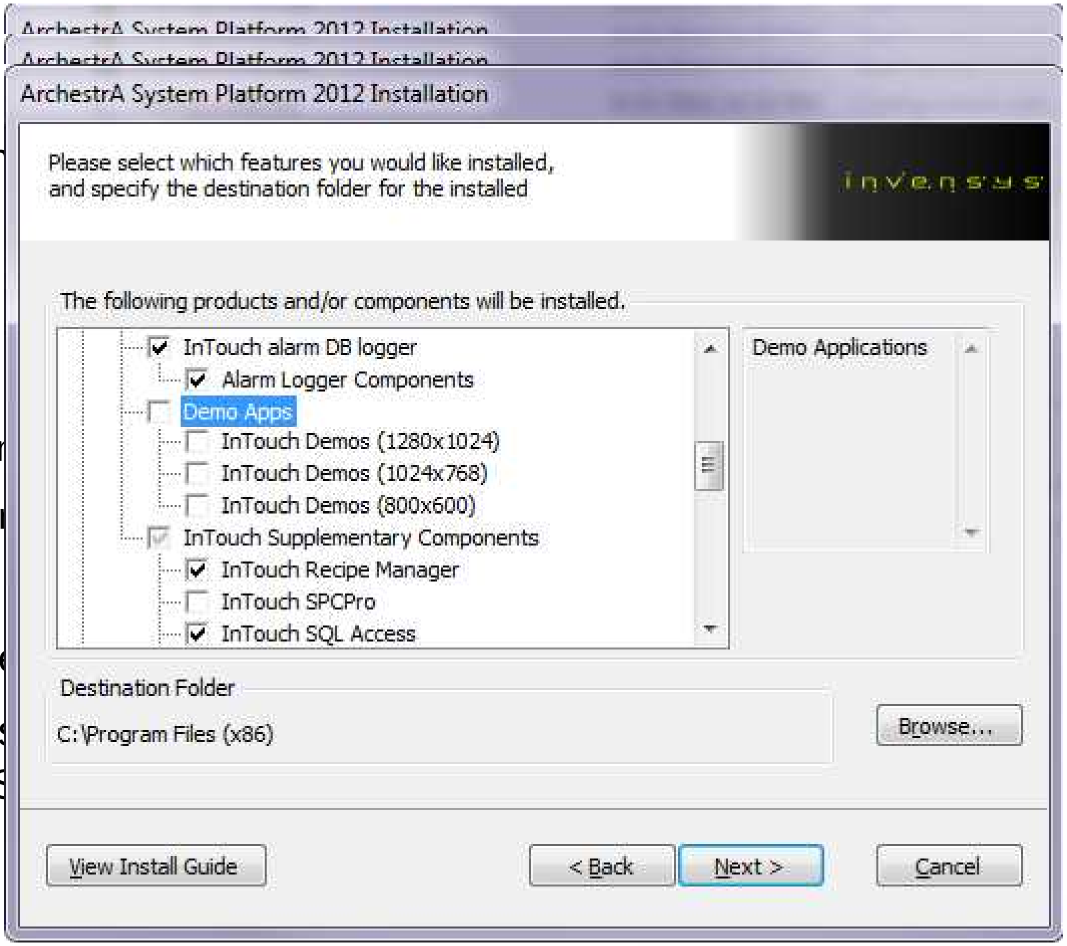
- Infrastructure Objects
  - Objects which define the Infrastructure of the Running Galaxy
    - Node Name Specific properties Typically
    - Platforms ($WinPlatform)
      - Node Name of the Operating System to Deploy to on the Network
      - Node Name of Historian to Configure and Send Data To
        - Alarms and Events
        - Platform Attributes to be Historized
    - Application Engines ($AppEngine)
      - Node Name of Historian to Configure and Send Data To
    - Dedicated Device Integration ($OPCClient/$DDESuiteLinkClient)
      - Point to a Specific Node Name for the DAServer
    - Wonderware WorkFlow Gateway ($WorkFlowGateway)
  - Infrastructure Objects are Dedicated to a Specific Galaxy’s Network
    - Should not be routinely transferred between Galaxies
    - Accidental Deployment will cause undesired results

Different Classes of Objects

- Project Specific Objects
  - Object specific to the Project/Application being created
    - Areas ($Area)
    - Application
      - Equipment, Calculation, Utility ($UserDefined)
      - AnalogDevice ($Analog Device)
      - DiscreteDevice ($DiscreteDevice) Etc...
    - RedundantDeviceIntegration ($RedundantDIObject)
    - InTouch View Engine ($ViewEngine)
    - InTouch Applications ($InTouchViewApp)
    - ArchestrA Graphics
  - These object can be Transferred Safely between Galaxies
    - Properly designed they adapt to the Infrastructure of the Target Galaxy
    - Little or no editing should be required when transferred

Multi-User Development

- Developer Workstation
  - Operating System can be Wir
  - Installation
    - System Platform DVD Install
      - System Platform Developmen
        - Remove the InTouch Der
      - Historian Server Node (Role Ir
        - Testing of Object history
    - Applicable DA Servers if neede
  - This provides for a complete s capabilities covered by Dev. S



ArchestrA System Platform 2012 Installation

Please select which features you would like installed, and specify the destination folder for the installed

The following products and/or components will be installed.

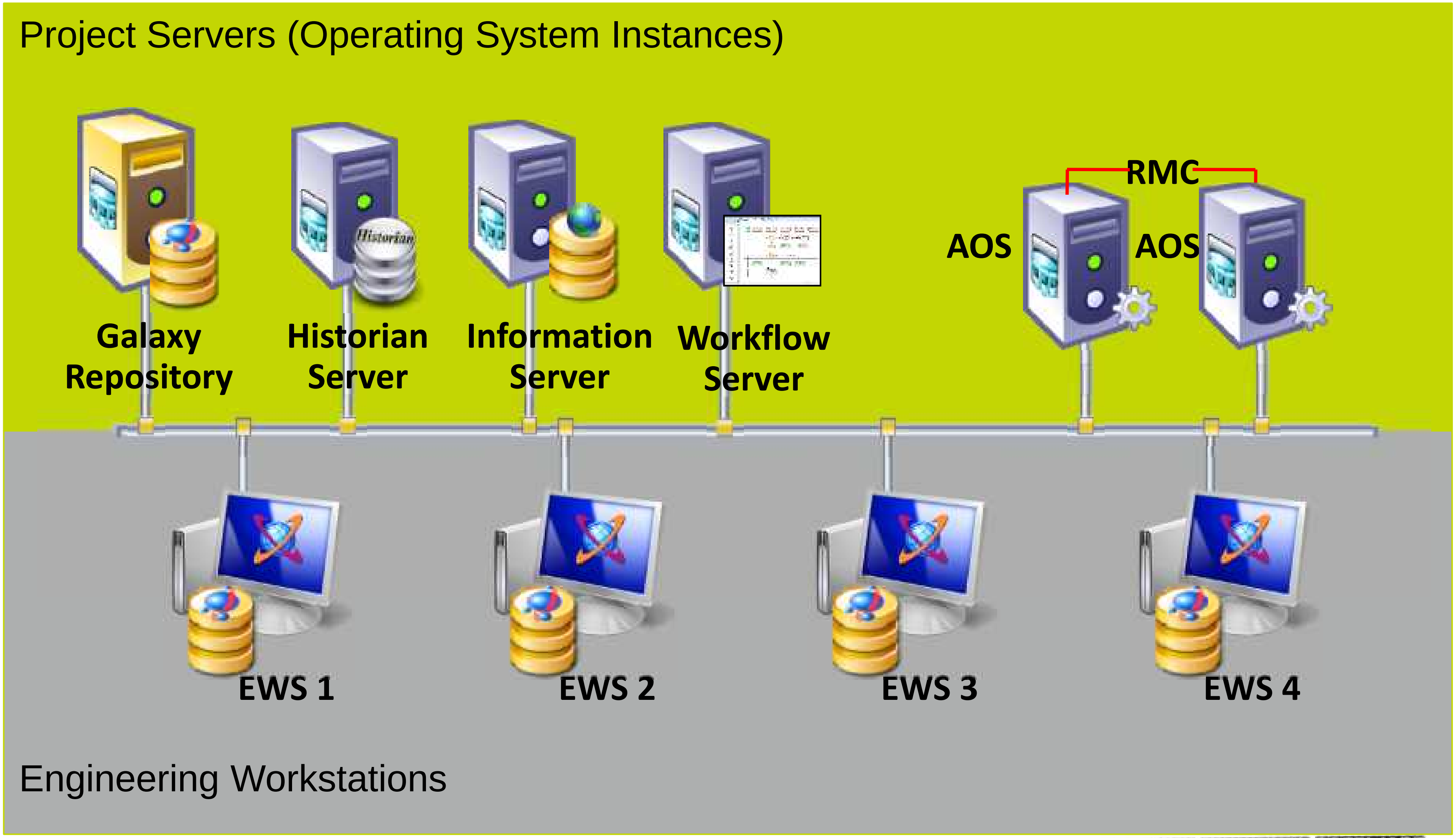
- ☑ InTouch alarm DB logger
  - ☑ Alarm Logger Components
- ☐ Demo Apps
  - ☐ InTouch Demos (1280x1024)
  - ☐ InTouch Demos (1024x768)
  - ☐ InTouch Demos (800x600)
- ☑ InTouch Supplementary Components
  - ☑ InTouch Recipe Manager
  - ☐ InTouch SPCPro
  - ☑ InTouch SQL Access

Demo Applications

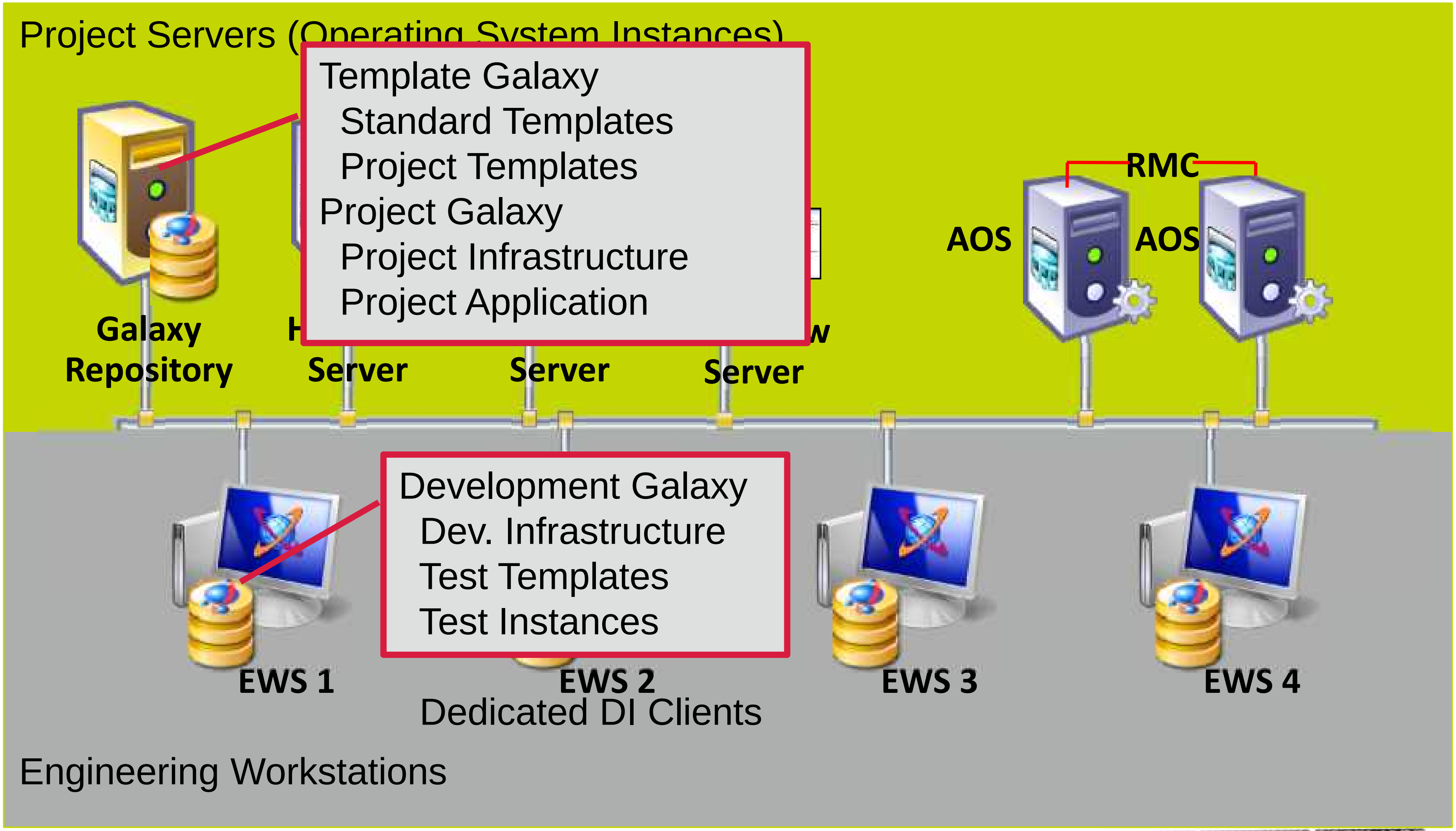
Destination Folder

C:\Program Files (x86)

Project Infrastructure



Project Infrastructure



Project Servers (Operating System Instances)

Template Galaxy
- Standard Templates
- Project Templates

Project Galaxy
- Project Infrastructure
- Project Application

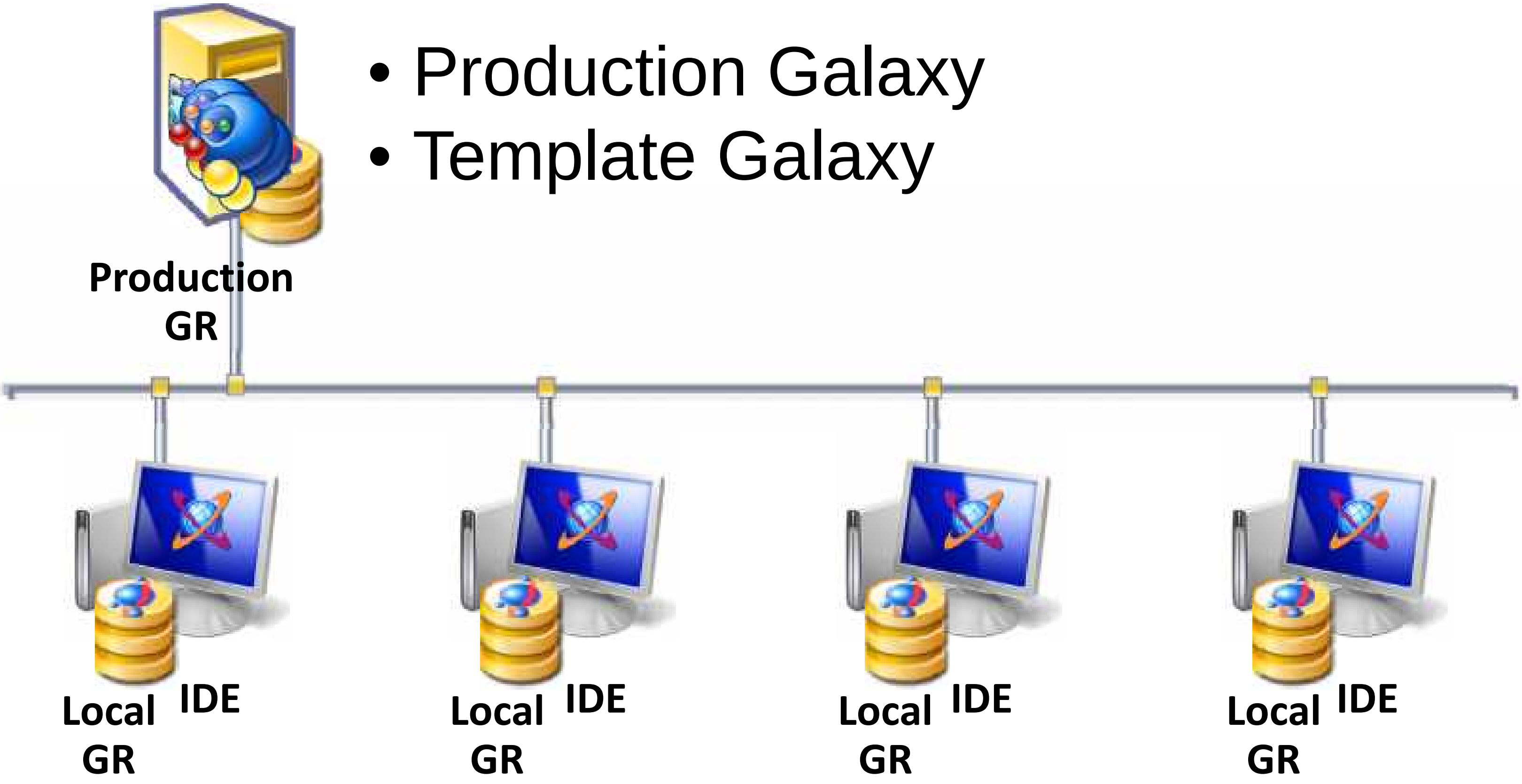
Development Galaxy
- Dev. Infrastructure
- Test Templates
- Test Instances

Dedicated DI Clients

Engineering Workstations

Multiple Developers in one Galaxy

- Production Galaxy
- Template Galaxy

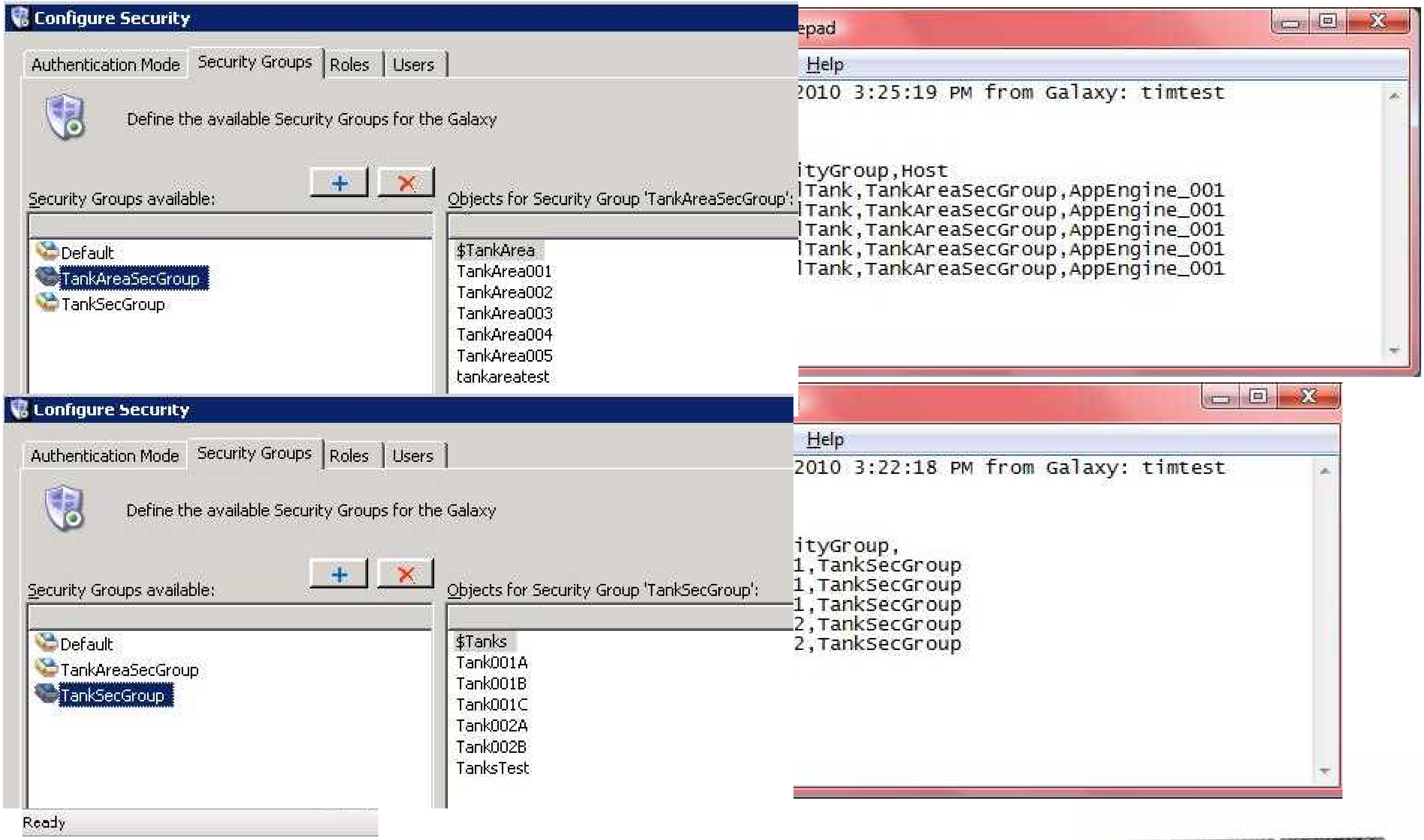


Each Development Workstation has a Local Development and Test Galaxy

Scaling out Production w/Galaxy Load

- Good Tool for scaling out the Production Galaxy
- Allows Speadsheet definition of Instances
- Can also Manipulate Existing Instances
  - Change Areas
  - Attribute Values
- Only Attributes to be Changed are Required
  - Tagname is the Key (Always Required)
  - Tagname and SecurityGroup (Required for new Instances)
- Format is Simple
  - Even the Cancel Button works ☺
- Can Create “Templates” of Non-Templateable Objects
  - DI Networks and Devices
  - Areas and Contained Objects
  - Engine Layouts for Platforms

Galaxy Load to Create Instances



Define the available Security Groups for the Galaxy

Security Groups available:

- Default
- TankAreaSecGroup
- TankSecGroup

Objects for Security Group 'TankAreaSecGroup':

- $TankArea
- TankArea001
- TankArea002
- TankArea003
- TankArea004
- TankArea005
- tankareatest

```
2010 3:25:19 PM from Galaxy: timtest


ityGroup,Host
lTank,TankAreaSecGroup,AppEngine_001
lTank,TankAreaSecGroup,AppEngine_001
lTank,TankAreaSecGroup,AppEngine_001
lTank,TankAreaSecGroup,AppEngine_001
lTank,TankAreaSecGroup,AppEngine_001
```

Define the available Security Groups for the Galaxy

Security Groups available:

- Default
- TankAreaSecGroup
- TankSecGroup

Objects for Security Group 'TankSecGroup':

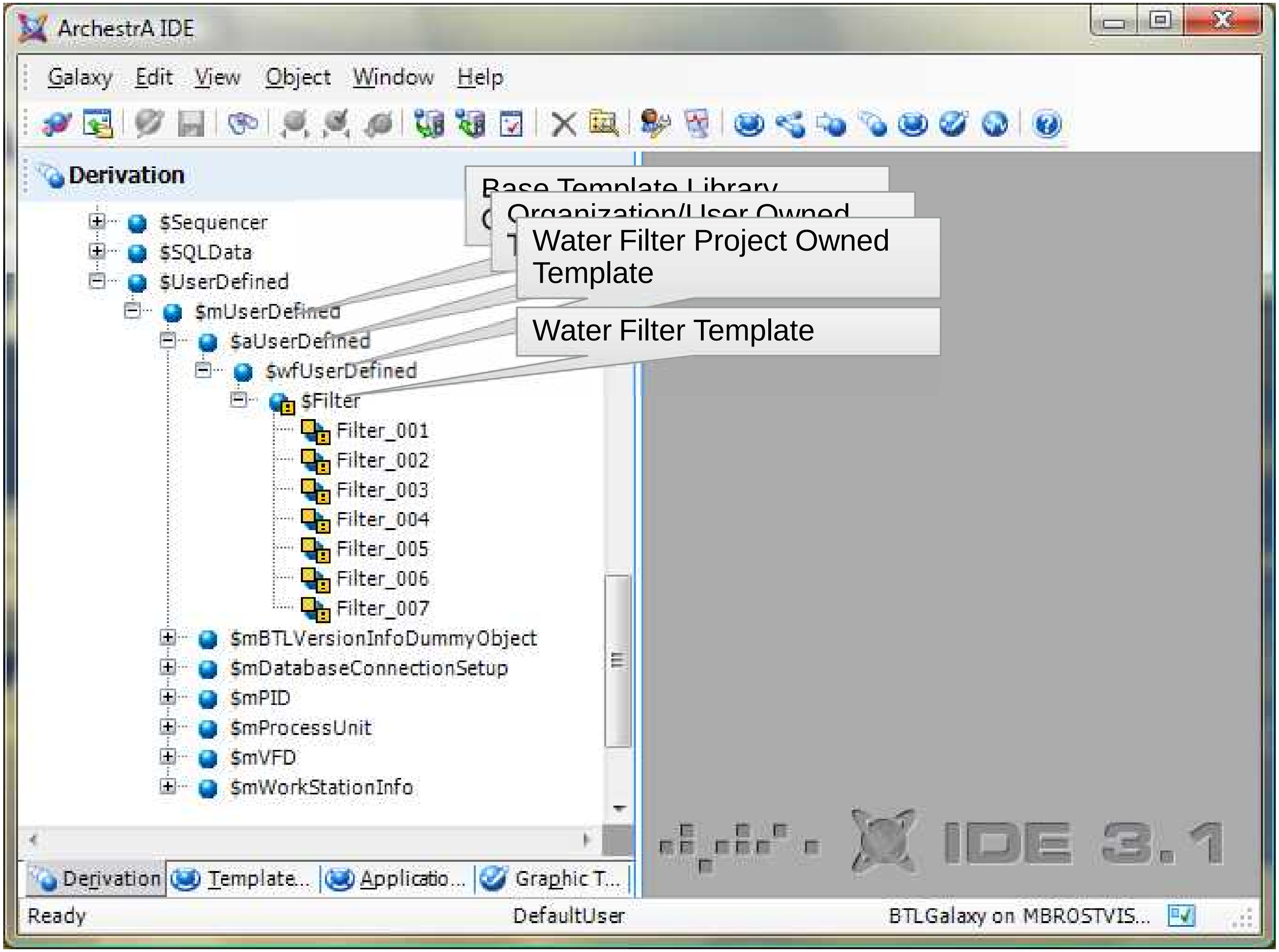
- $Tanks
- Tank001A
- Tank001B
- Tank001C
- Tank002A
- Tank002B
- TanksTest

```
2010 3:22:18 PM from Galaxy: timtest


ityGroup,
1,TankSecGroup
1,TankSecGroup
1,TankSecGroup
2,TankSecGroup
2,TankSecGroup
```

Organize your Templates

- Create a Template Storage Galaxy
  - Maintains current Templates
  - Distribute via Packages
  - Control distribution of updates
  - Should always have Security Enabled
- Levels in hierarchy dictate Ownership within Team/Organization
- Very Few Instances should exist in this Galaxy
  - Necessary for placing template Graphics on InTouch Windows



Base Template Library

Organization/User Owned T

Water Filter Project Owned Template

Water Filter Template

- $Sequencer
- $SQLData
- $UserDefined
  - $mUserDefined
    - $aUserDefined
      - $wfUserDefined
        - $Filter
          - Filter_001
          - Filter_002
          - Filter_003
          - Filter_004
          - Filter_005
          - Filter_006
          - Filter_007
    - $mBTLVersionInfoDummyObject
    - $mDatabaseConnectionSetup
    - $mPID
    - $mProcessUnit
    - $mVFD
    - $mWorkStationInfo

Ready DefaultUser BTLGalaxy on MBROSTVIS...

Galaxy Design Guidelines (Estimates?)

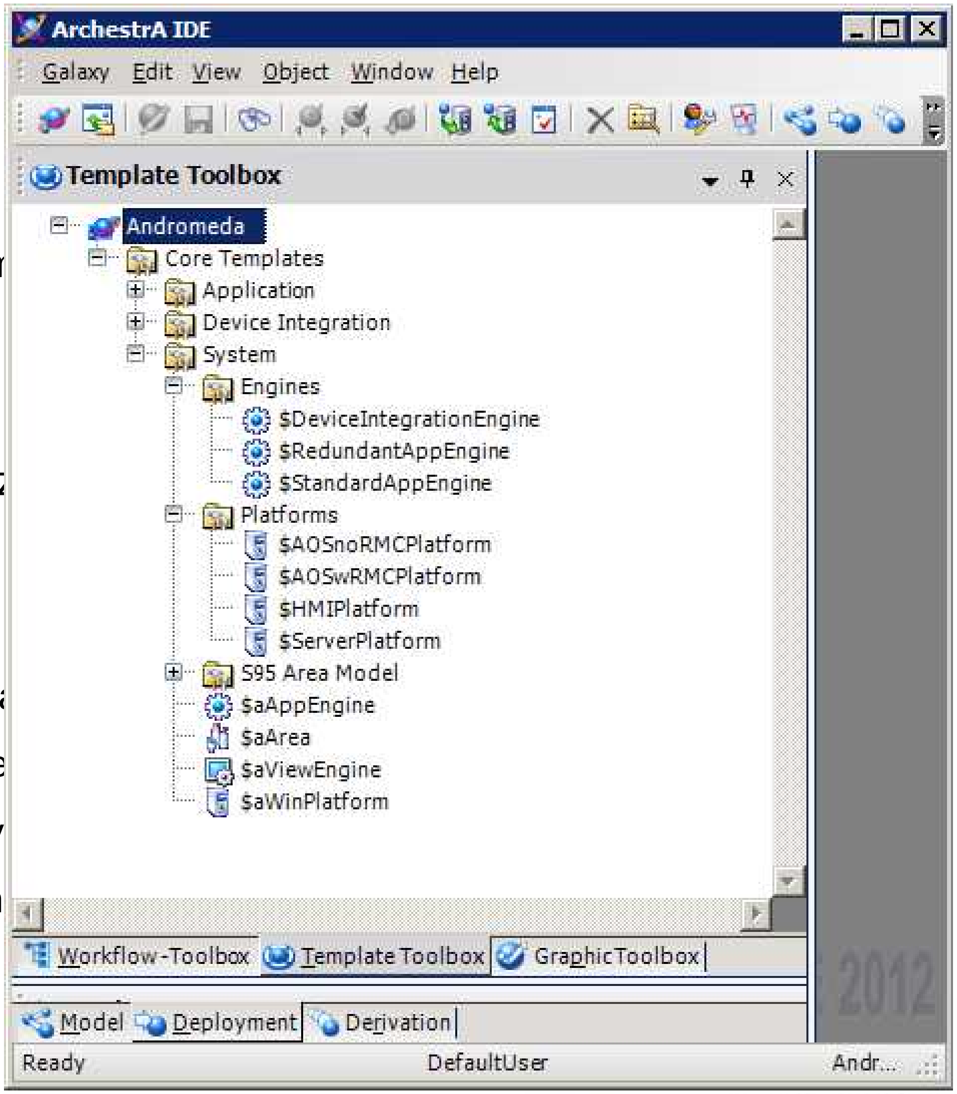
- Platforms
  - Multiple AOS Platforms reduce deployment times
- Application Engines (Galaxy Work Horse)
  - 1 Active Engine / Core / 1-2 GB
  - 5-10,000 IO / Engine
  - 2,000 Objects / Engine
  - Standard Engines can Handle a Heavier Load than Redundant Engines
- View Engines
  - Can host multiple InTouch App Instances
  - Can serve as an Active Engine in Runtime
    - Template for Configuration Settings
    - Holder of ArchestrA Graphics as Windows
  - Multiple View Engines Can be Used on same Platform (Have a good reason for THIS)

Galaxy Design Guidelines (Estimates?)

- Areas
  - Provides for Object Distribution across Engines
  - Hierarchical Model
    - Alarming and Events
    - Historical Data (If Enabled to 1st Tier Historian)
  - Areas are Sisters in Execution Not Hierarchical
  - Must have Multiple Areas to support Multiple Engines
  - Rollup of Alarm Counts / Enable / Silence / Disable
  - Limit of 500 Objects / Area is a good rule of thumb

Galaxy Infrastructure

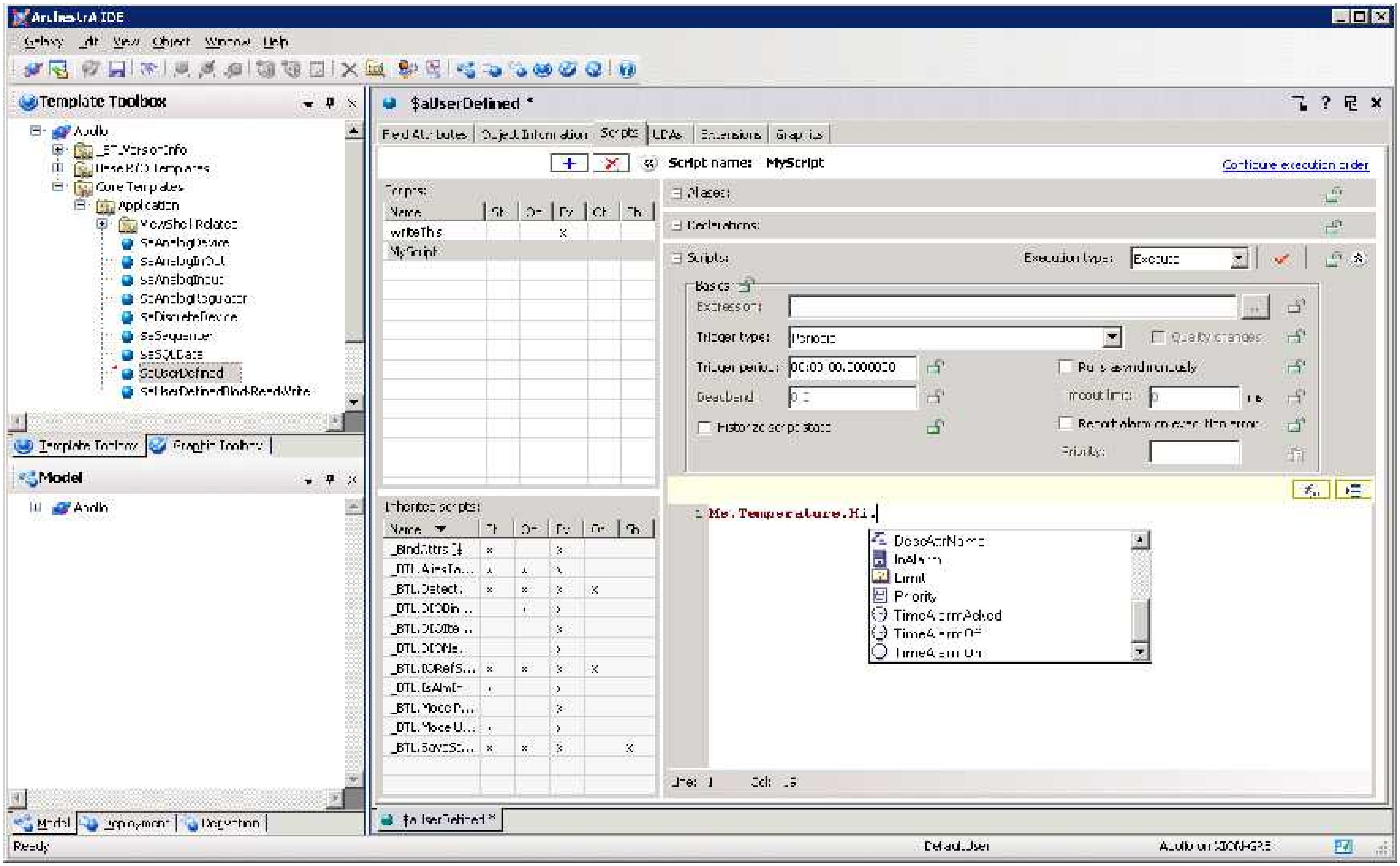
- Create Templates for Standards
  - Lockable Read Only Attributes
    - Will not be Dumped via Galaxy Dum
    - Propagation will be guaranteed
    - Slightly better performance
  - Writable Attributes needing Initializ
    - Locking cannot be used
    - Utilize an OnStartup script to set th
      - Script can be locked to ensure propa
      - Attribute values will remain writable
      - Use Read-only Security for IDE only
      - Protects against Upload Runtime Ch



Andromeda
Core Templates
Application
Device Integration
System
Engines
$DeviceIntegrationEngine
$RedundantAppEngine
$StandardAppEngine
Platforms
$AOSnoRMCPlatform
$AOSwRMCPlatform
$HMIPlatform
$ServerPlatform
S95 Area Model
$aAppEngine
$aArea
$aViewEngine
$aWinPlatform

Ready DefaultUser Andr...

Auto Complete Script Editor



Script name: MyScript

Name	St	On	Ex	Of	Sh
writeThis			x		
MyScript					

Execution type: Execute

Trigger type: Periodic

Trigger period: 00:00:00.0000000

Deadband: 0.0

Timeout limit: 0 ms

```
Me.Temperature.Hi.
```

- DescAttrName
- InAlarm
- Limit
- Priority
- TimeAlarmAcked
- TimeAlarmOff
- TimeAlarmOn

Line: 1 Col: 19

Database Integration

- aaDBIntegration Script Library
  - Loaded by default into every Galaxy since v3.0(?)
  - Script Safe .net class library for database tasks
    - Object Classes
      - aaDBClient
        - aaDBCommand
        - aaDBConnection
        - aaDBRow
        - aaDBTransaction

Database Integration

- Enumerations
  - aaDBCommandState
  - aaDBCommandType
  - aaDBConnectionState
  - aaDBConnectionType
  - aaDBParameterDirection
  - aaDBTransactionState

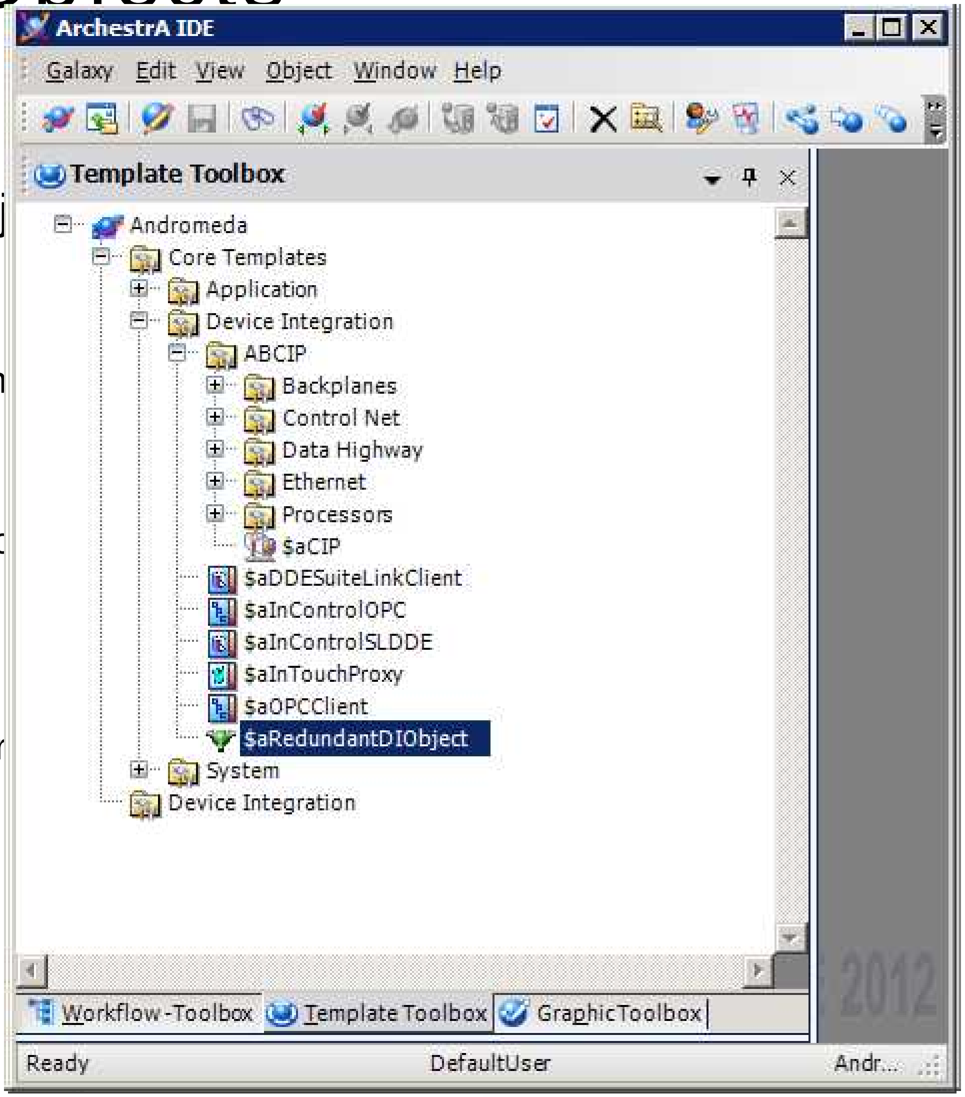
Database Integration

- Connection pooling
- Results Sharing
- Synchronous Transactions
- Asynchronous Transactions
- Engine Safe
- Object Safe

Device Integration Objects

Four types of Device Integration obj

- Di Client Objects
  - Connect to externally installed and con
- Di Network Objects
  - Contain DA Servers in the Runtime Pac Platform
- Di Device Objects
  - Configure the Di Network device hierar component in the hierarchy of devices
- Redundant Di Objects
  - Choose between two DI Client objects Objects

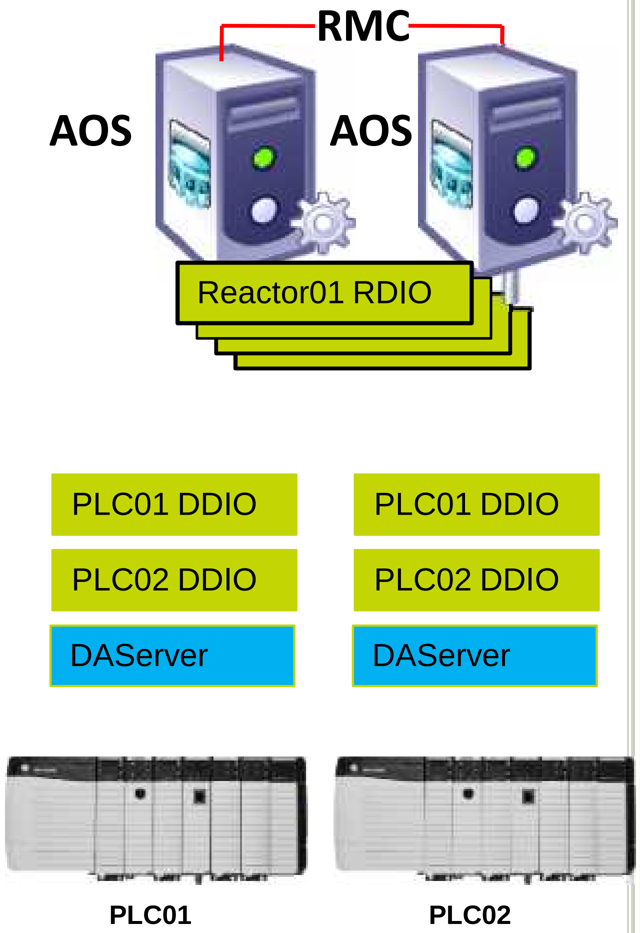


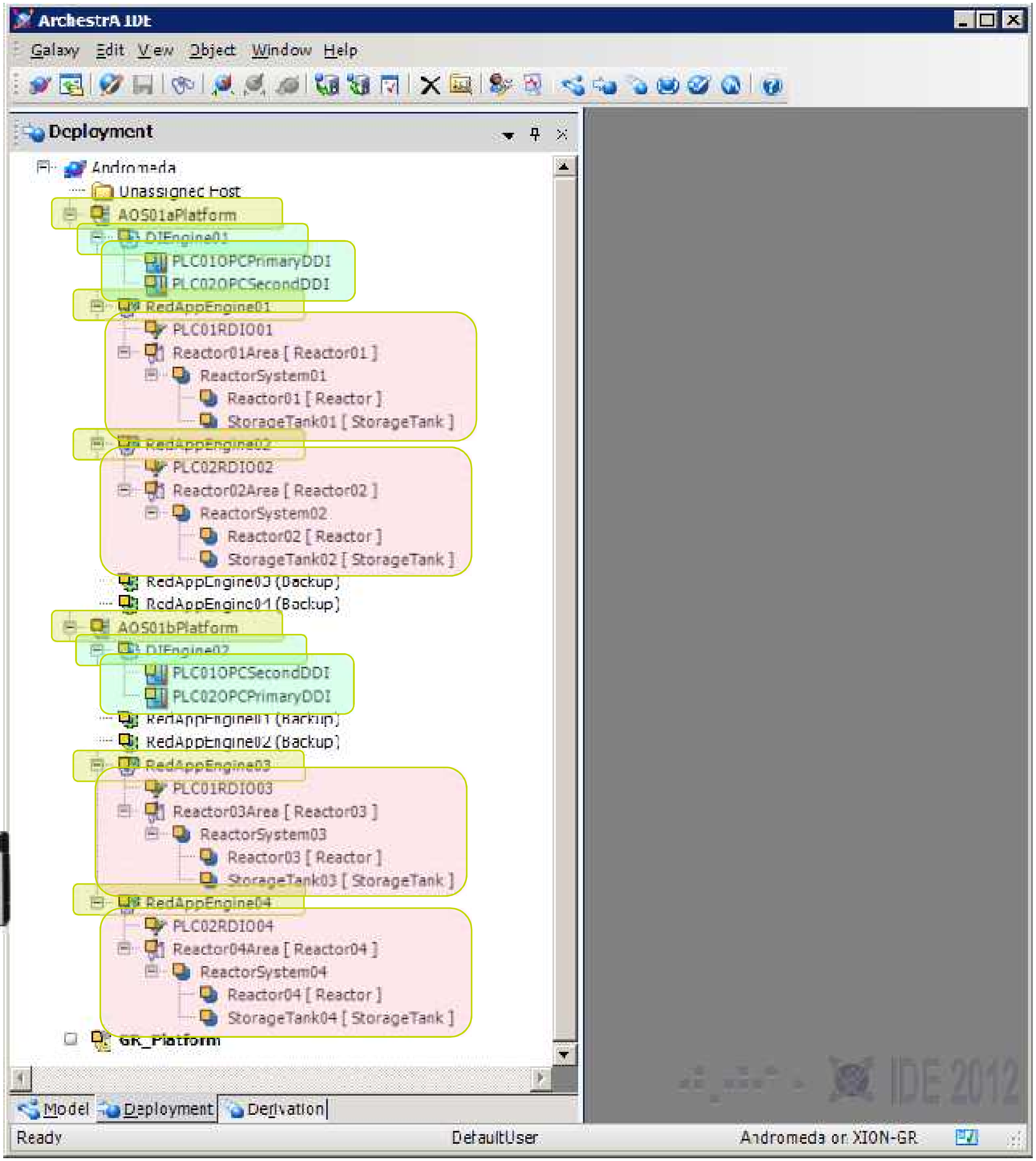
Redundancy

Treat Redundancy as an Insurance Policy Understand what it covers and what it does not.

- Device Communication
  - Selects Between Two Dedicated Communication Paths to a Device
  - Failover Less Than 5 Seconds
- Application Engine Redundancy
  - Preserves the aaEngine as a Service
  - Executes a state-full restart of the Engine Service on another Platform
  - Failover Less Than 1 Minute
- Operating System Redundancy
  - Managed by Hyper-V, V Motion, or Hardware
  - GR, WIS, RDS, Historian, Workflow
  - Executes a state-full restart of the OS
  - Failover Less Than 10 Minutes (Typically)

Redundancy





```
Andromeda
  Unassigned Host
  AOS01aPlatform
    DIEngine01
      PLC01OPCPrimaryDDI
      PLC02OPCSecondDDI
    RedAppEngine01
      PLC01RDIO01
      Reactor01Area [ Reactor01 ]
        ReactorSystem01
          Reactor01 [ Reactor ]
          StorageTank01 [ StorageTank ]
    RedAppEngine02
      PLC02RDIO02
      Reactor02Area [ Reactor02 ]
        ReactorSystem02
          Reactor02 [ Reactor ]
          StorageTank02 [ StorageTank ]
    RedAppEngine03 (Backup)
    RedAppEngine04 (Backup)
  AOS01bPlatform
    DIEngine02
      PLC01OPCSecondDDI
      PLC02OPCPrimaryDDI
    RedAppEngine01 (Backup)
    RedAppEngine02 (Backup)
    RedAppEngine03
      PLC01RDIO03
      Reactor03Area [ Reactor03 ]
        ReactorSystem03
          Reactor03 [ Reactor ]
          StorageTank03 [ StorageTank ]
    RedAppEngine04
      PLC02RDIO04
      Reactor04Area [ Reactor04 ]
        ReactorSystem04
          Reactor04 [ Reactor ]
          StorageTank04 [ StorageTank ]
  GR_Platform
```

Ready   DefaultUser   Andromeda on XION-GR

Sizing Guidelines

- Operating System Sizing
  - GR
    - Windows 2008 R2, 4 Cores, 4-8GB Memory
    - Recommended to be Virtualized
    - Only way to recover a GR without a Required Deployment
  - AOS
    - Windows 7, 4 Cores, 4GB Memory
    - Virtualize Larger Hardware into Blocks this Size
    - Improves Deployment Speed
    - Failover Performance
    - Upgrade with Minimum Downtime (Following Section)
    - 25,000 IO Per Standard AOS or Redundant AOS Pair (YMMV)
    - Ideally DA Servers are Local

Sizing Guidelines

- Operating System Sizing
  - InTouch Workstation
    - Windows 7, Dual Core, 4GB Memory
    - High clock speed better than more cores
    - Fast Disks or Solid State (Loading windows from disk)
  - InTouch RDS Server
    - Windows 2008 R2
    - Lots of Cores (16), Lots of Memory (48GB)
    - Solid State Disks
    - 25 - 75 Sessions per Server (YMMV)