IMS Synapse
Getting Started Guide

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Introduction

The Synapse Server is the new generation seismic server software developed by IMS. The server handles:

- Coordination of telemetry between devices in the seismic network. This includes:
  - All IMS hardware (e.g. netSP's, NetADC's and intelligent UPS's etc.).
  - ISSI GS-generation hardware.
  - Compatible 3rd party devices.
- Association of triggers into events.
- Prioritisation of seismic data for transmission.
- Automatic processing of events.

The Synapse GUI interface provides useful tools to monitor, control and configure the seismic system:

- **Monitor** displays provide the operator with a live view of the seismic system's status
- **System control** functions are available to interact with devices in the seismic network
- **Configuration** tools provide wizards to create and modify seismic system settings

All of the above are provided as user friendly, graphical interfaces.

For experienced technical users, Synapse can also be monitored from a web browser.

Installing Synapse Server

Download:

The Synapse server installers can be downloaded from:

http://software.imseismology.org/synapseserver/

Installers:

Linux 32 bit:	e.g. synapse_server_installer_linux_i386_2011-09-01.zip
Linux 64 bit:	e.g. synapse_server_installer_linux_amd64_2011-09-01.zip

Prior to installation:

Please have the following information ready before installing the Synapse Server:

1. The list of network id's that will be monitored by the Synapse Server, e.g. *23 24*
2. The root path where IMS databases will be stored (please note that this path does not include the database names). E.g. */data/ims*
3. An alternative port number (e.g. 8004) if the default port number (8001) is not allowed by the IT department of the mine.

Follow these steps to install the seismic server software:

1. Unzip the installer:

   unzip synapse_server_installer_linux_amd64_2011-09-01.zip

2. Install the Synapse Server:

   cd synapse_server_installer_linux_amd64_2011-09-01
   ./install_synapse_server

3. If the installation completed without any error messages, Synapse should now be running.

4. Inspect Synapse Server settings by viewing the following file:

   ~/.ims/synapse_server/settings.properties

5. Check if the Synapse Server is running:

   Point web browser to **http://localhost:8001/ims-synapse**

6. If no error messages are displayed in the browser, the server is up and running.

7. Add the keep_synapse_server_alive script to the cron. This script ensures that the Synapse Server is running and starts the server when the PC reboots.

crontab -e (and add the following two lines)

```
# Check that glassfish is alive.
*/5 * * * *  /home/ims/synapse_server/keep_synapse_server_alive
```

Licensing Synapse Server

Each Synapse server has to be licensed for the number of channels that will be sending data to the server, as well as for the writing of seismic data to disk.

The server does not have to be restarted when a new license is introduced.

1. Request a license file from IMS
2. Copy the license file to: ~/.ims/licenses

Updating Synapse Server

If the PC running the Synapse server can connect to the internet, new updates will be downloaded automatically. If not, a new update must be manually copied to the PC.

Update Synapse by following these steps:

1. Copy the new ims-synapse-server.war file to ~/synapse_server
    1. If the PC connects to the internet, copy ims-synapse-server.war from ~/.ims/synapse_server/updates/serverwar/
2. cd synapse_server
3. ./update_synapse_server_war

Synapse Server Scripts

The Synapse Server scripts resides in ~/synapse_server.

- Start the Synapse Server:

  ./start_synapse_server

- Stop the Synapse Server:

  ./stop_synapse_server

- Restart the Synapse Server:

  ./restart_synapse_server

- Update the Synapse Server:

  Copy the new ims-synapse-server.war file to ~/synapse_server
  ./update_synapse_server_war

Installing the Synapse Graphical Interface

Download:

The Synapse server installers can be downloaded from:

http://software.imseismology.org/synapse

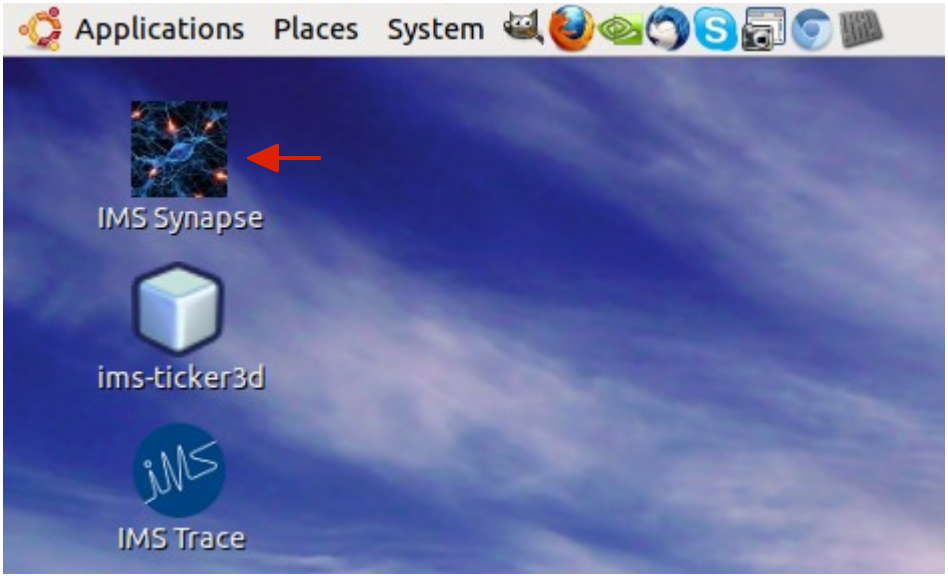
Installers:

Linux 32 bit:	e.g. ims_synapse-2012-05-08-linux-amd64.sh
Linux 64 bit:	e.g. ims_synapse-2012-05-08-linux-i386.sh
Windows 32 bit:	e.g. ims_synapse-2012-05-08-windows-i386.exe

Follow these steps to install Synapse:

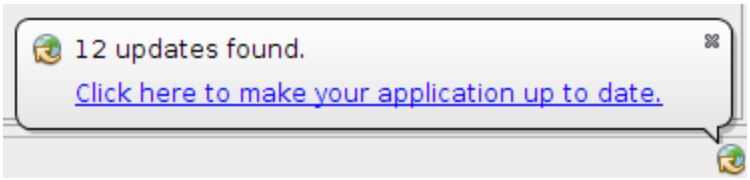
1. Install Synapse by running the installer

Synapse can now be launched from the IMS Synapse desktop icon.



Updating Synapse

On startup, a balloon will indicate if updates are available. Click on the link to update the application.



When the balloon disappears, it can be displayed by selecting the earth icon in the right hand corner. Please note that the latest Synapse updates should be installed when available.

Background Information

Databases and Network Id's

Each mine with a seismic network has a network id (in short netid) that uniquely identifies the mine. In the following examples, our fictional mine has a netid of 23.

Each Synapse PC also has two databases containing seismic data:

- A database with automatically processed data or data processed by the mine (fictional database tst).
- A database with data processed by IMS processing services (fictional database tstIMS).

Running Synapse for the First Time

User Management

Introduction

As mentioned in the introduction, Synapse provides tools to monitor, control and configure the seismic system. The **Synapse user manager** can be used to create and manage the users that will be administrating the Synapse seismic server. Various roles can be assigned to each user, allowing them to perform certain tasks. Currently the following roles can be assigned to each user:

1. **Admin:** An administrative user may perform any task in Synapse
2. **Controller:** The user may perform tasks related to the control of the system (e.g. sending test pulses to the sites and updating hardware modules)
3. **Configurator:** The user may configure the system

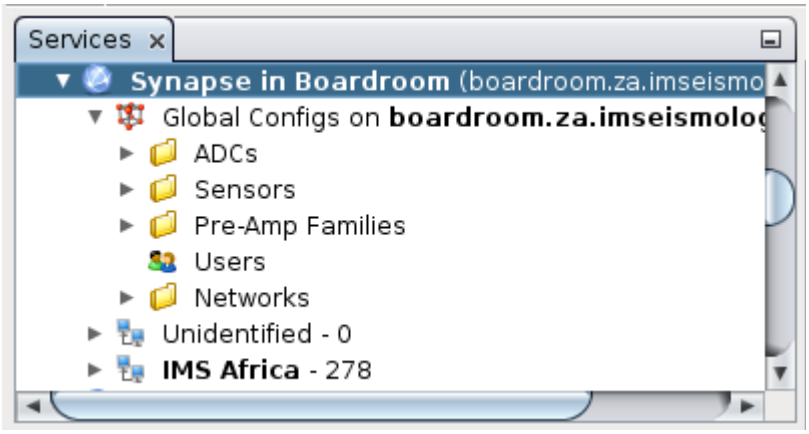
A Synapse user without any roles defined may view the seismic system, but cannot perform any tasks.

An **Admin** user is created by default and can be used to perform any task. Please note that the default password for the Admin user is: Admin. It is recommended that the password is updated, and individual users are created for administrating the Synapse system.

Creating New Users

To create new users on the Synapse **server**:

1. Log in as **Admin** user: **File** → **Login**
2. Expand the **Global Configs** node in the tree

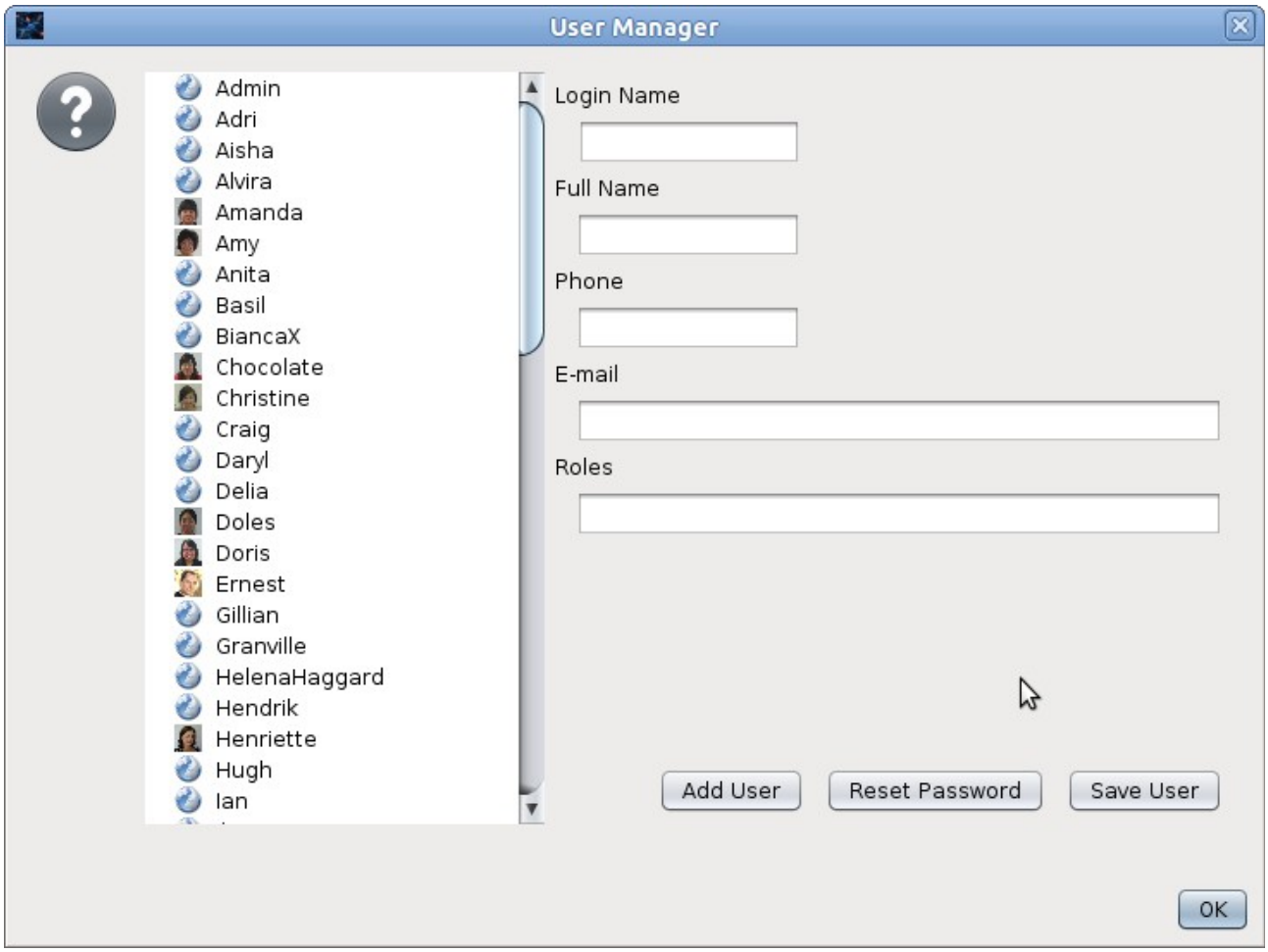


3. Right click on the **Users** node in the tree and select **Manager Users**. If this option is not available, please ensure that Advanced Config Editing is enabled:

1. Select **Tools** → **Options** from the menubar
2. Select the **Con Editor** tab
3. Enable: **Show advanced config editor options**
4. Restart Synapse

Please not this option will be disabled if a user without Admin rights has logged in.

4. The User Manager window will be displayed
5. Select **Add User**

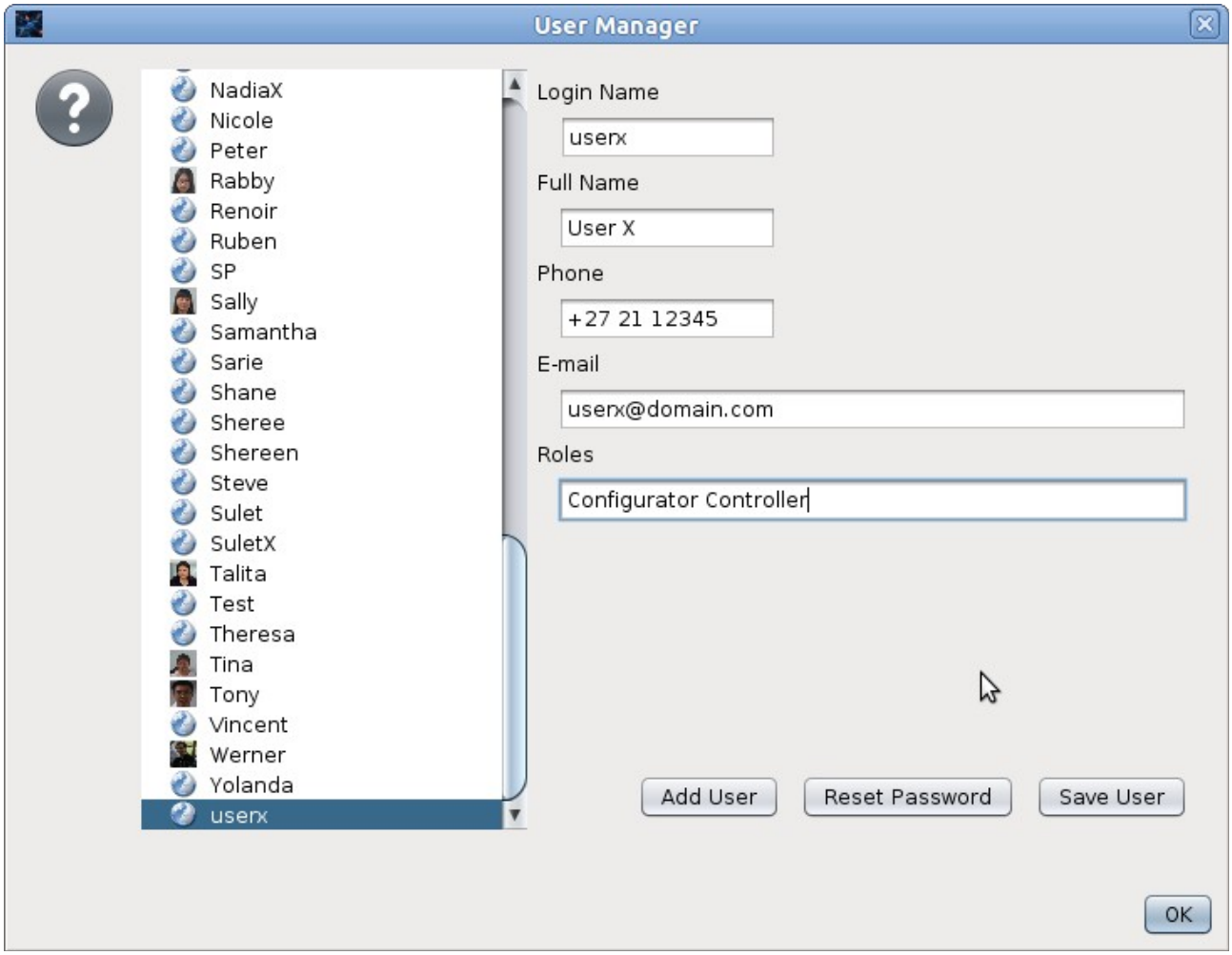


6. Enter the name of the user:

7. The user will be added to the list of available users
8. Select the user in the list on the left, and fill in the details and password of the new

user (demonstrated in example below)

1. Specify **Roles** by entering a space separated list. More than one may be specified
2. Click on **Reset Password** to enter a new password



9. Click on **Save User** and **OK**

Once all the users have been added to the Synapse server, the client configuration files have to be synchronised with those on the remote server. Please refer to *trace-remote-database-and-configs-TRACE-DOC-REMOTE-201210-GGv0.pdf* for more information.

Logging into Synapse

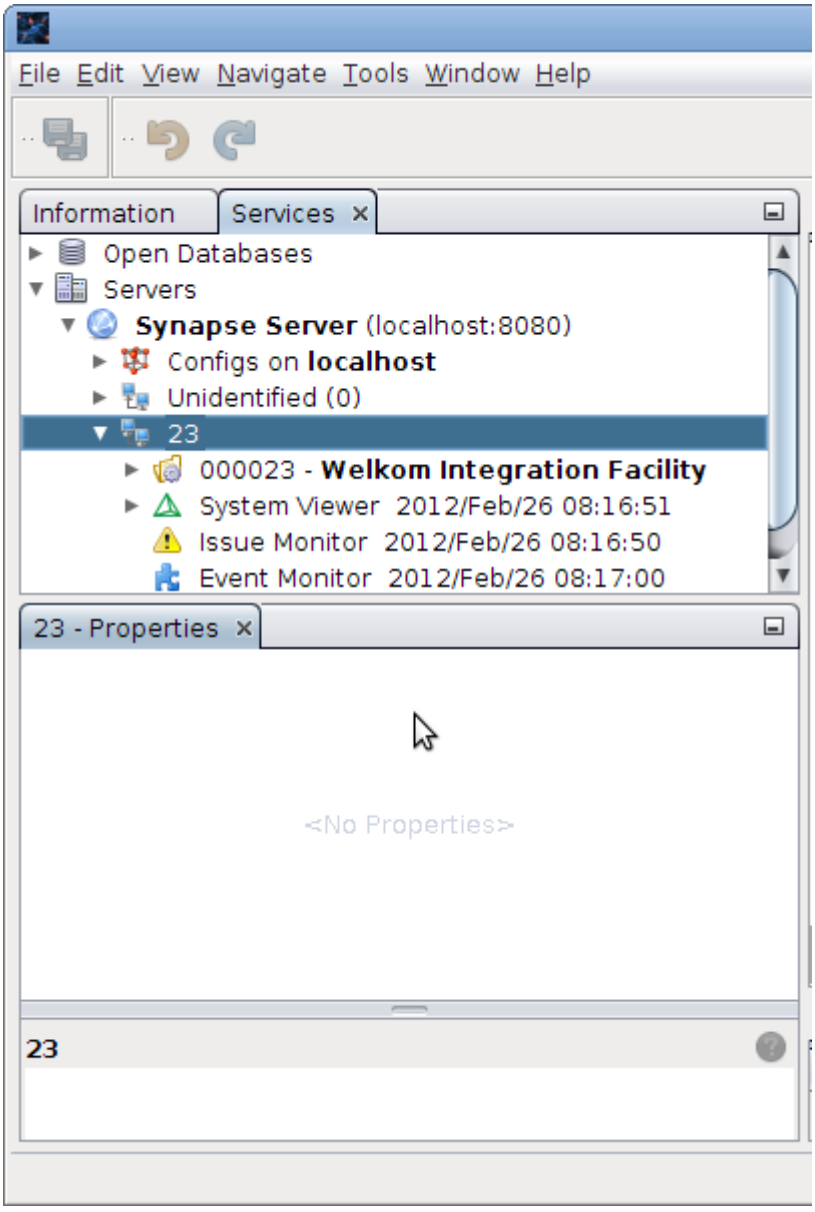
There are two ways for a user to log into Synapse:

1. If a control function is accessed and Synapse detects that a user is not logged in, a login dialog will be displayed prompting the user to log in
2. By accessing the **File** → **Login** menu option

Specifying a Synapse Server

Synapse allows one to monitor, control and configure a Synapse Server. Firstly, add a new Synapse Server (please note that this is a once-off procedure):

1. Select **Window → Services**
2. In the explorer window, right click on **Servers** and select **Add new IMS Synapse Server**
3. Enter the following:
    1. Description: Synapse
    2. Hostname: localhost (or the PC name / IP address of the Synapse Server)
    3. Port: 8001
4. Open the properties window by selecting **Window → Properties**. Move and dock the window in the left hand corner of the Synapse application.



Monitoring

While monitoring, we would like to see what is happening inside the seismic system. For example, which sites are triggering or are the system experiencing any problems.

System Viewer – Logical Layout

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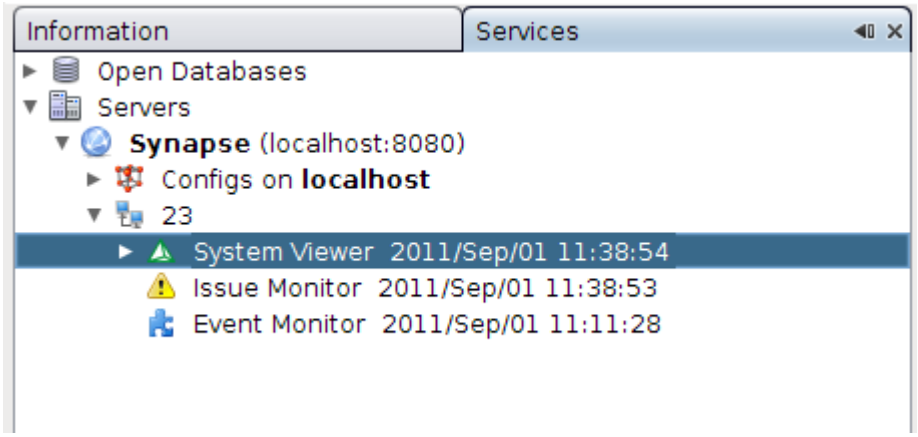
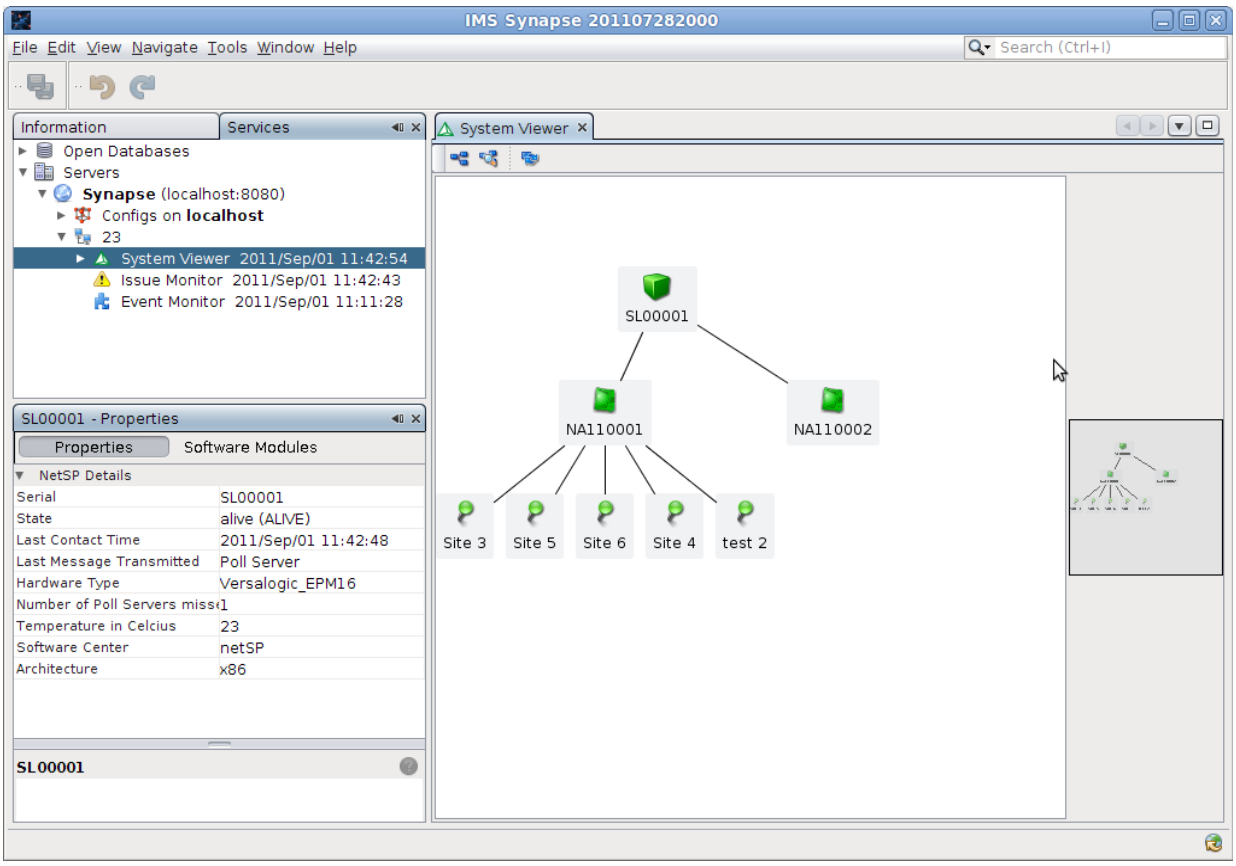
The System Viewer shows the logical layout of the seismic system and reports the connections between the netSP's, their netADC's and corresponding sites. To view the System Viewer:

1. Expand the nodes in the tree (under the network id) and double-click on **System Viewer**.



2. The logical layout should now be displayed in the graphical window.



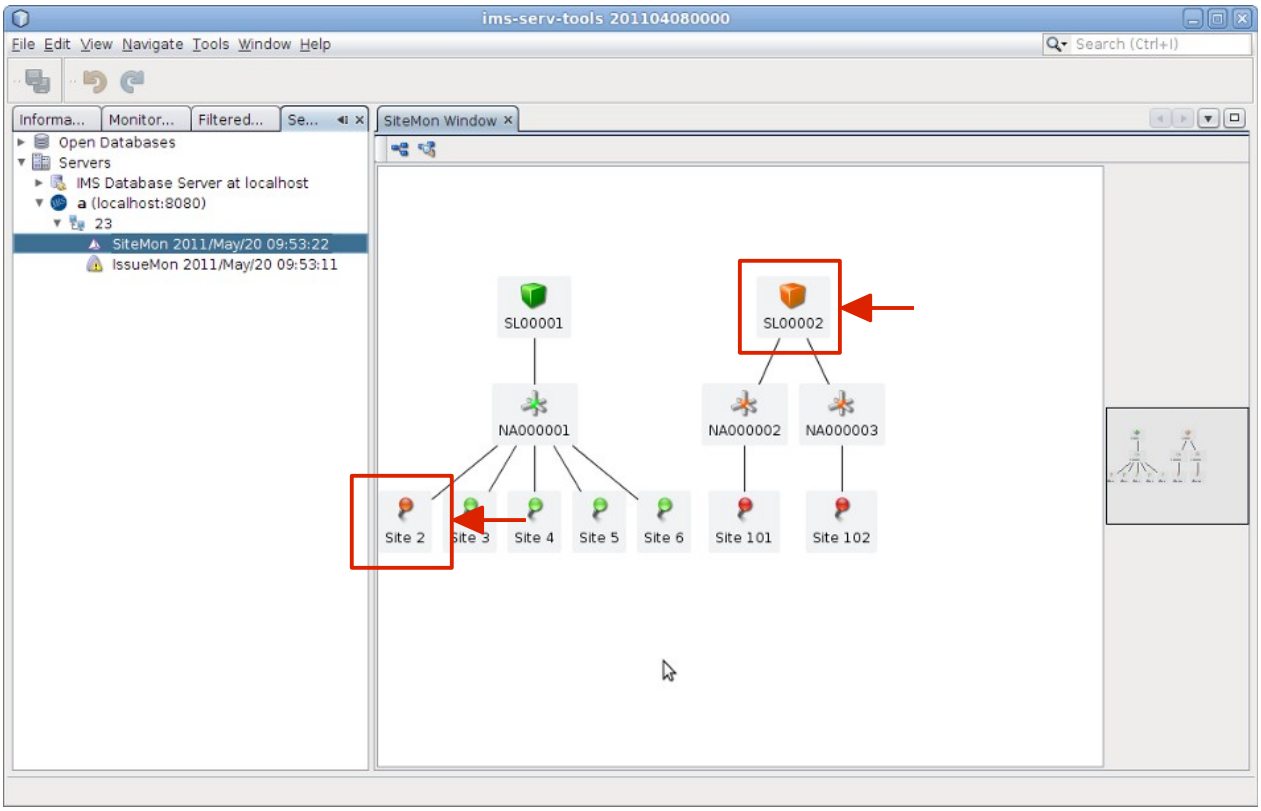
Colour is used to indicate the status of the devices:

1. **Red** indicates a critical problem.
2. **Orange** indicates a warning or intermediate state.
3. **Green** indicates a system that is working well!

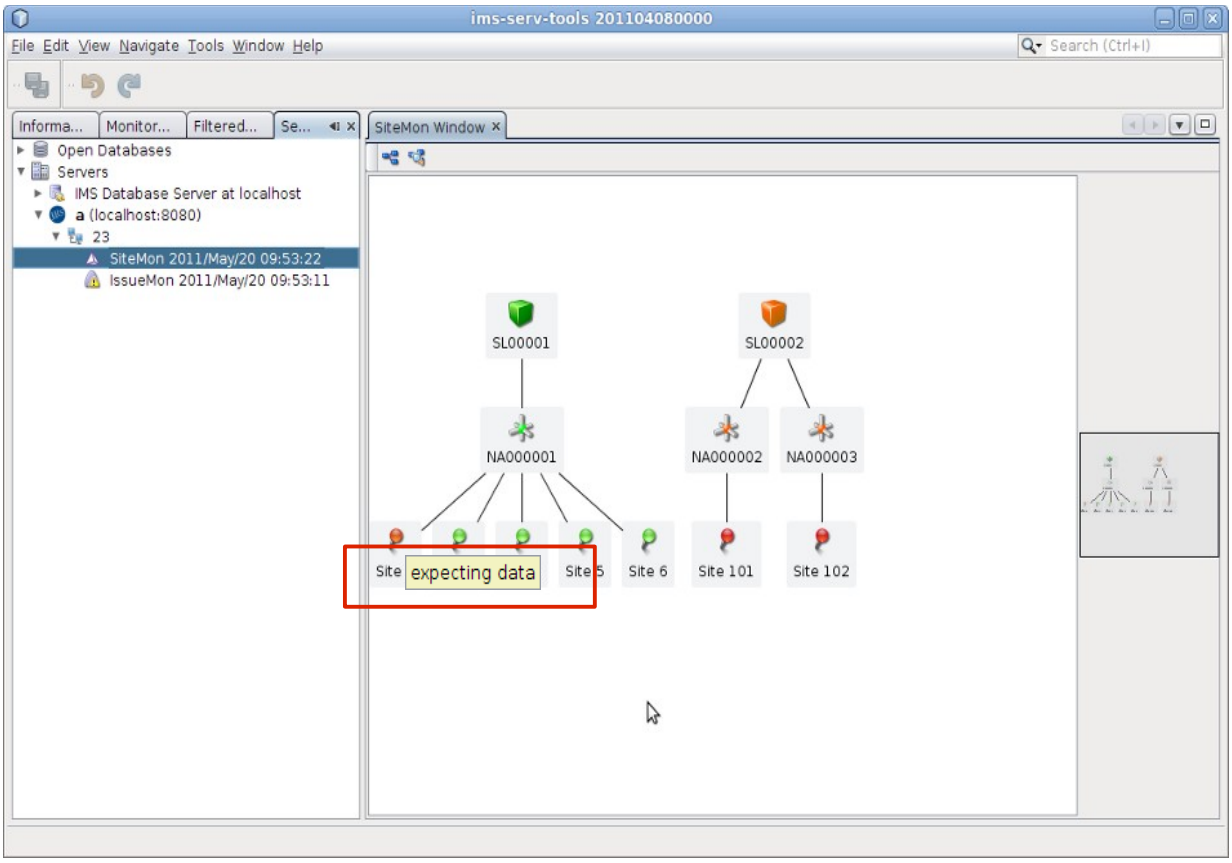
In the previous picture all the devices and sites are green which means that the system is in a good working condition.

Example:

In the next picture, the netSP with serial **SL00002** is orange - it is restarting for some reason. **Site 2** is also orange indicating that it is configured to send data, but has not yet started to transfer data to Synapse.



By hovering the mouse over the site (or device), the current state is reported.



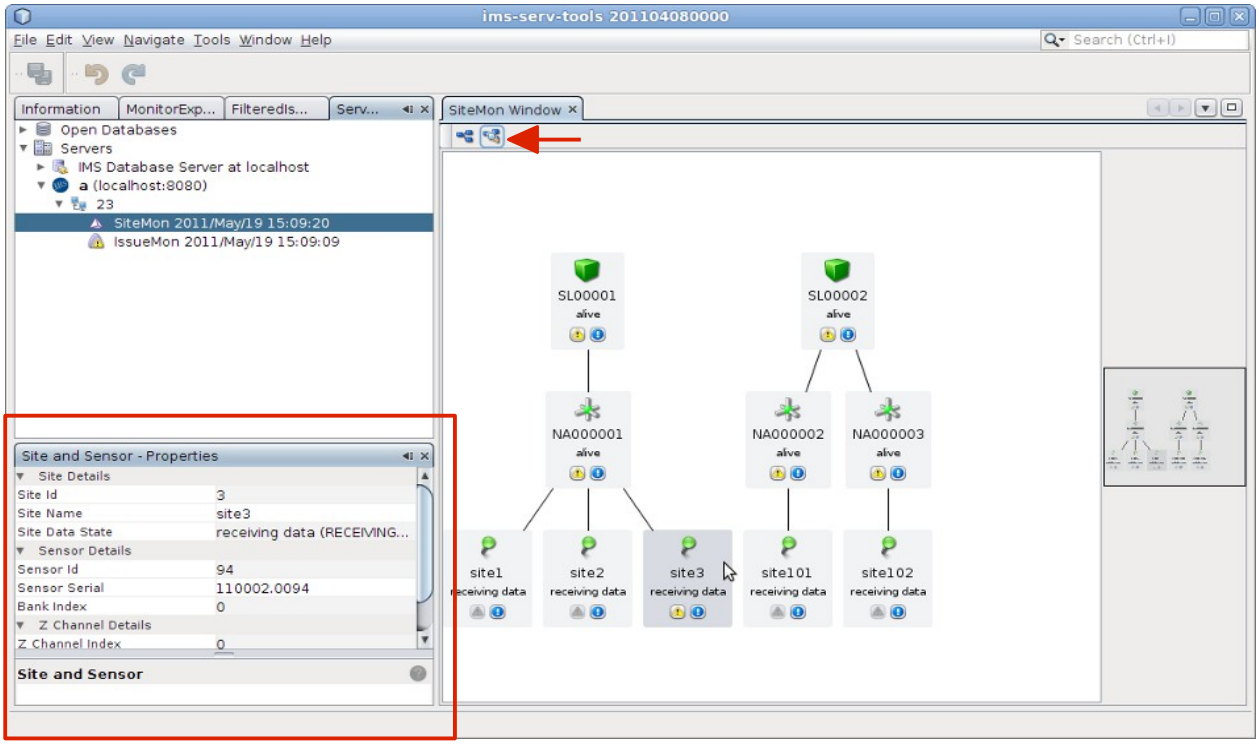
Detailed View

In detailed mode, more information is displayed in the graphical view.

1. Select **Display Detailed View** in the **System Viewer** window.
2. By selecting a node (by double clicking), the properties of the node is displayed.

Example:

In the next picture the properties of the site is displayed.



Issue Monitor

The Issue Monitor displays a list of issues currently experienced by the seismic system.

There are three issue levels:

Icon	Message Type	Description
	Information Messages	These are information messages reported by Synapse and does not have to be cleared
	Warning Messages	These are non-critical issues, but may indicate a problem with the system and should be investigated
	Error Messages	These are critical issues and *must* be resolved

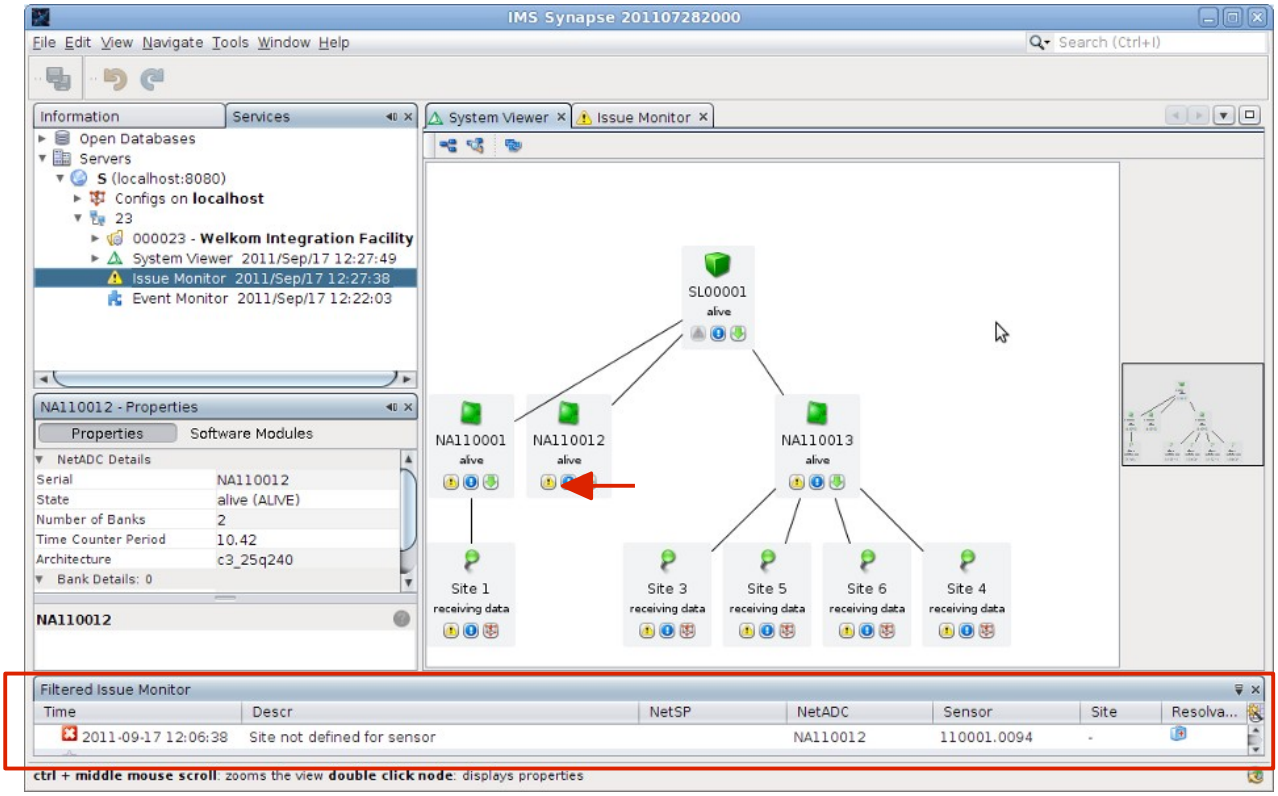
Important note: the aim is to clear all warning and error messages from the Issue Monitor.

Displaying Issues

The Issue Monitor can either display all issues reported by the system, or display a filtered list of issues that focusses on one device or site. Double click on the Issue Monitor node in the tree to display the monitor containing all issues. If a node (e.g. a site) has issues, an Issue button (yellow exclamation mark icon) will be appear in the corresponding node. Select this button to show a filtered set of issues.

Example:

In the next example, netADC NA110012 has an active issue button At the bottom of the viewer the filtered list of issues are displayed.



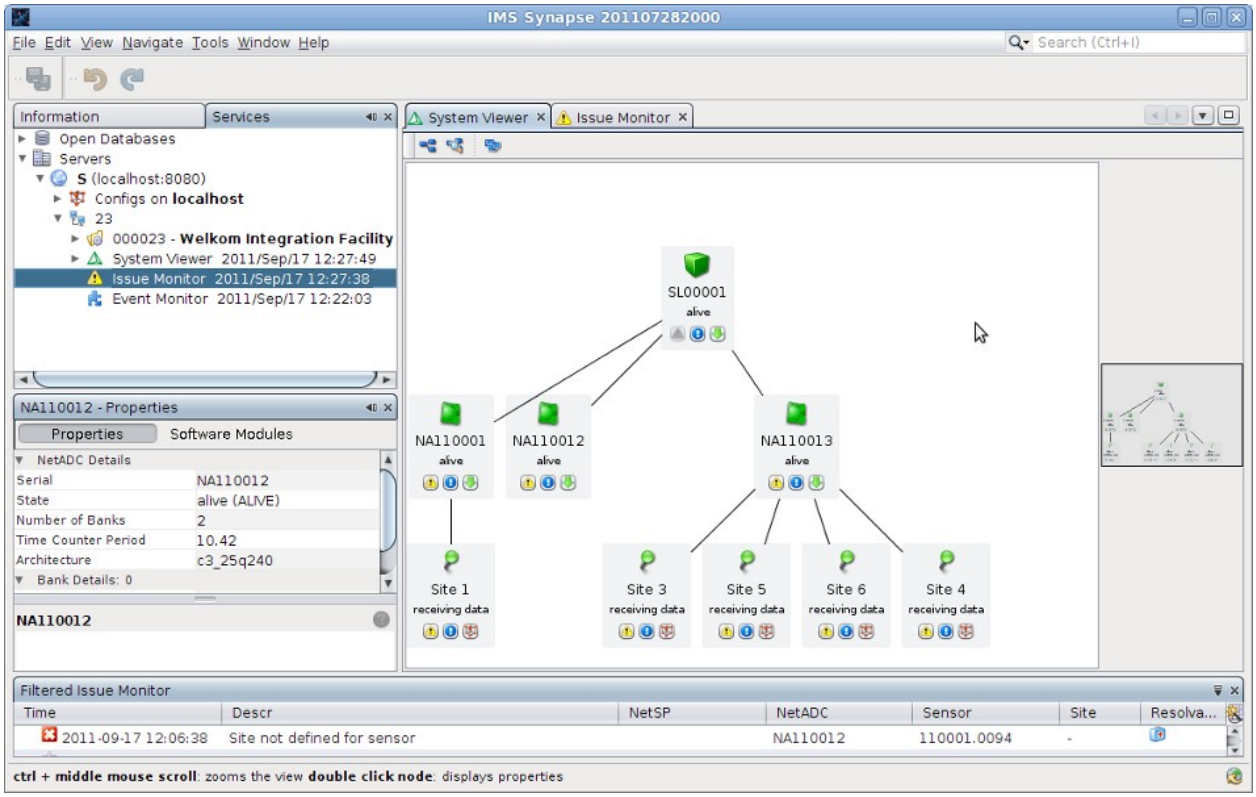
The filtered Issue Monitor reports that there is a sensor connected to the netADC that does not have a site defined.

Although the system is designed to be plug & play and runs with the minimum setup, one has to define sites as they specify the coordinates in the mine as well as triggering parameters.

Resolving Issues

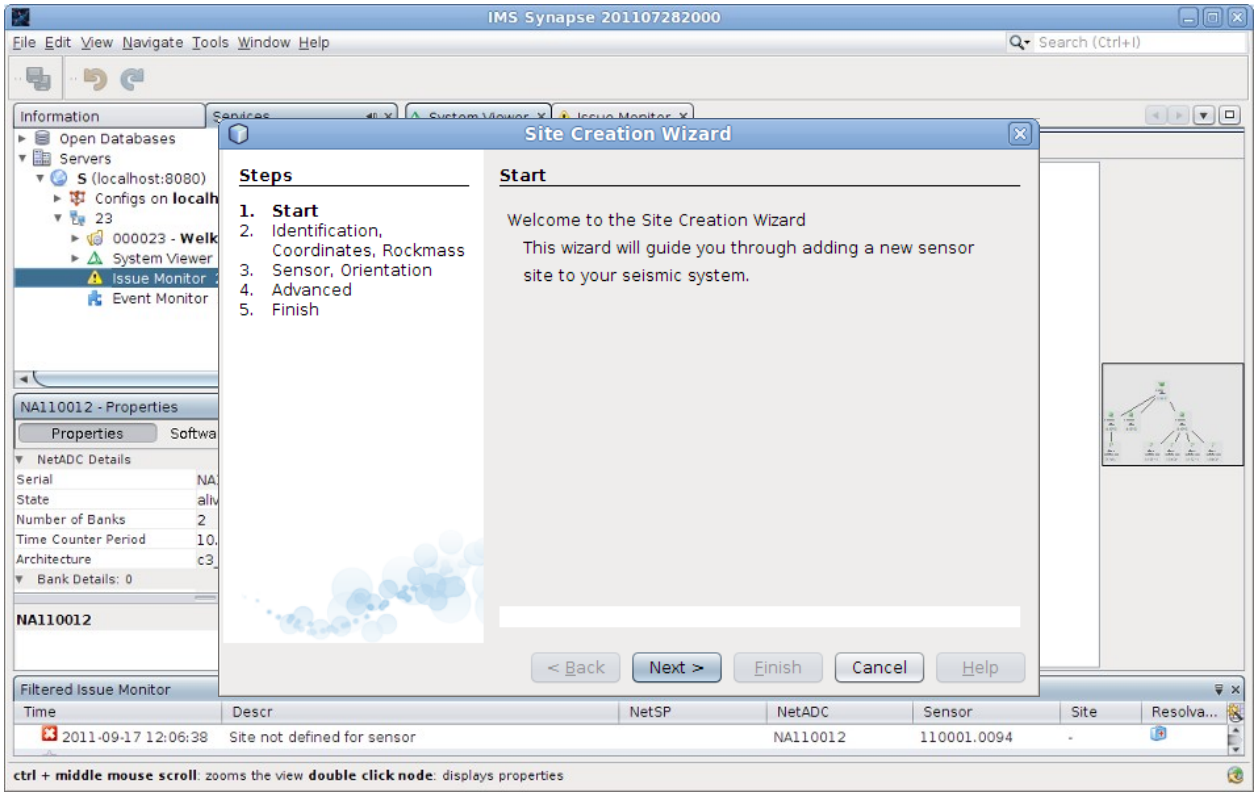
Issues with a tick mark next to the issue can be resolved with the help of a wizard.

1. Right click on the issue in the Issue Monitor
2. Select **Resolve Issue**
3. In this example the **Site Wizard** opens and guides us through the process of defining the missing site.

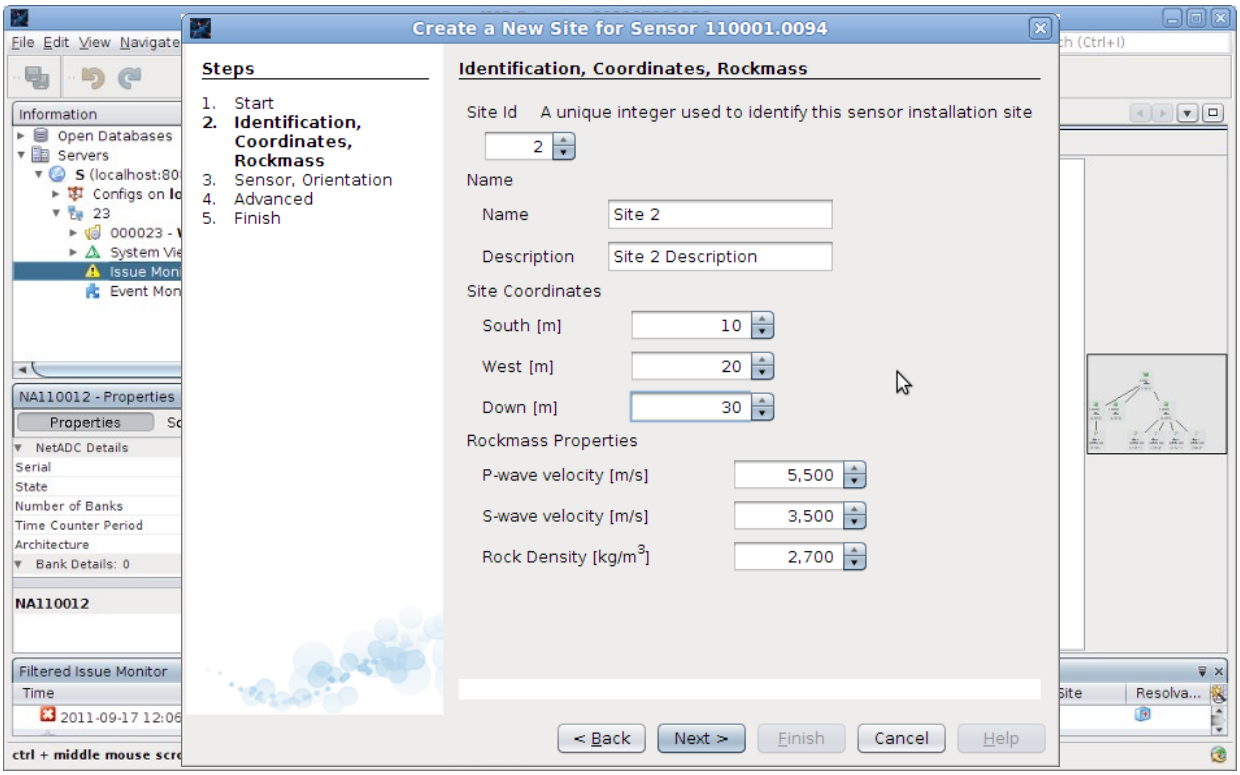


Site Wizard

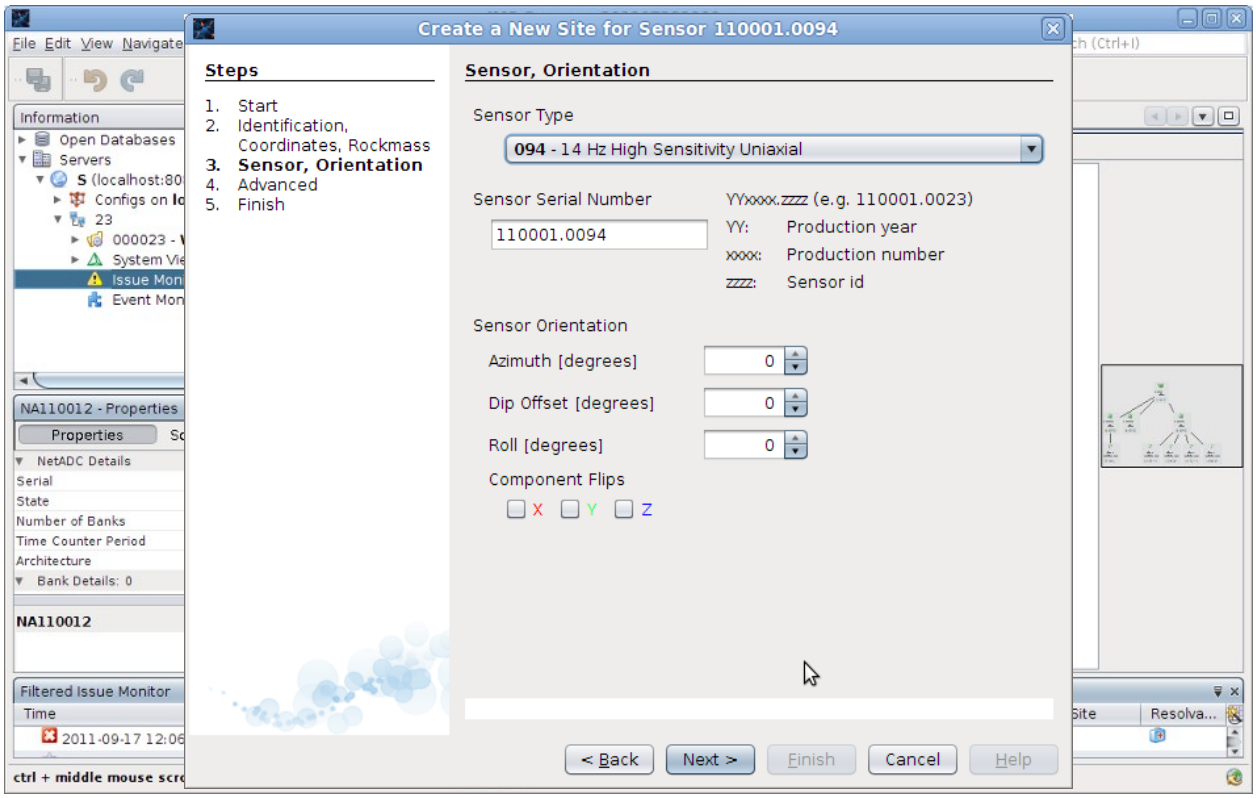
Step 1 – Start



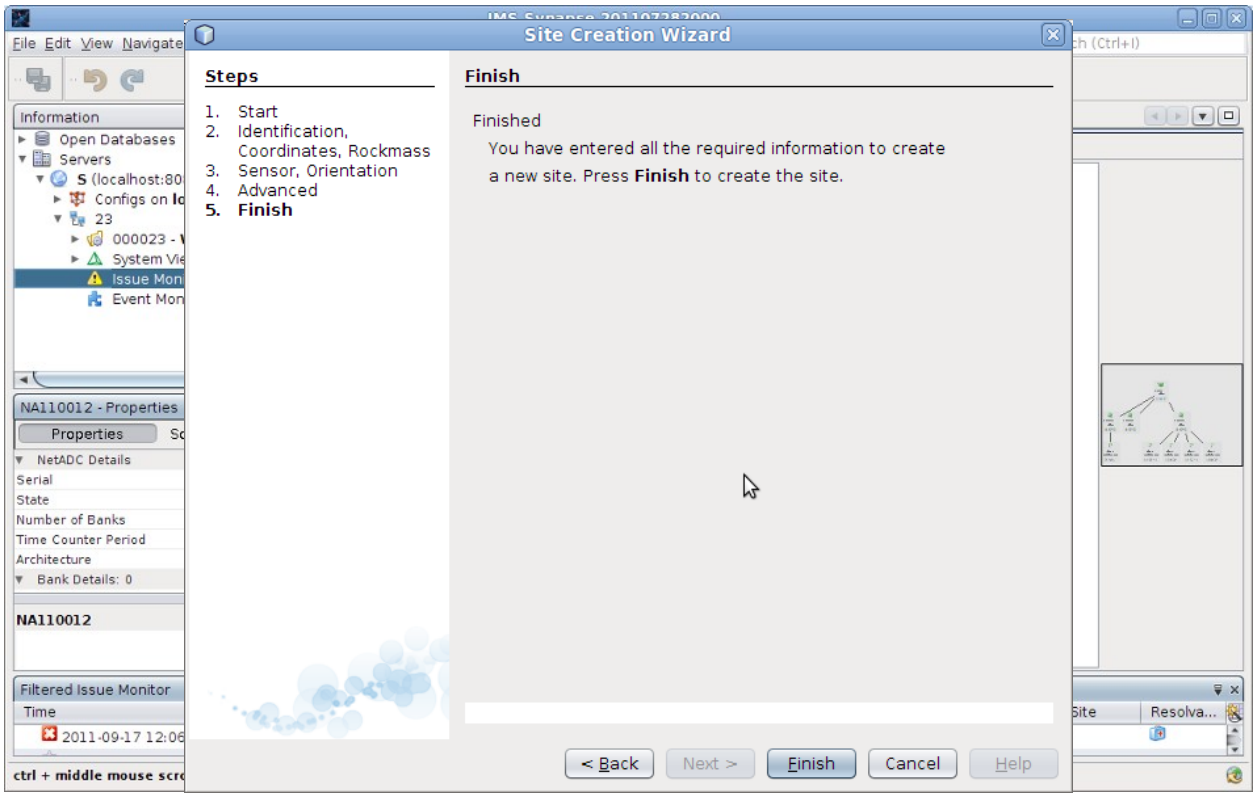
Step 2 – Name and site coordinates



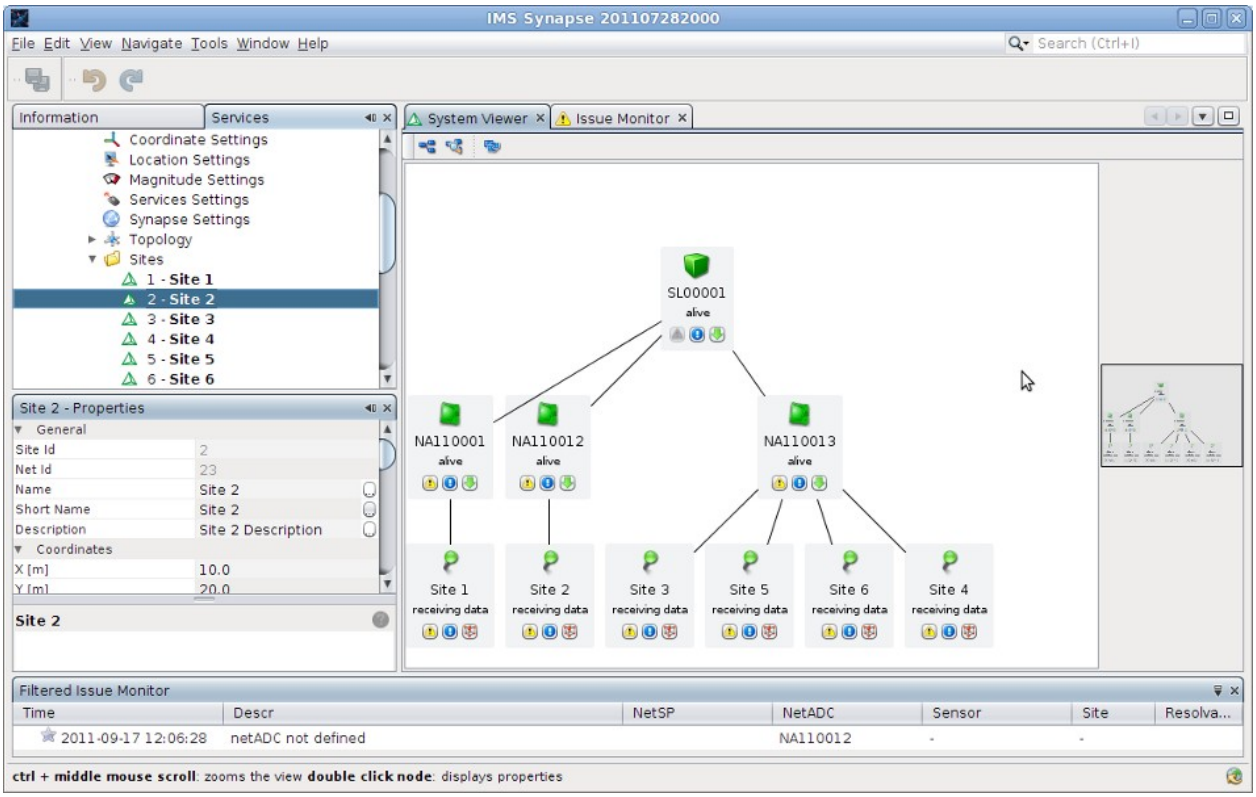
Step 3 – Sensor Information



Step 4 – Complete process

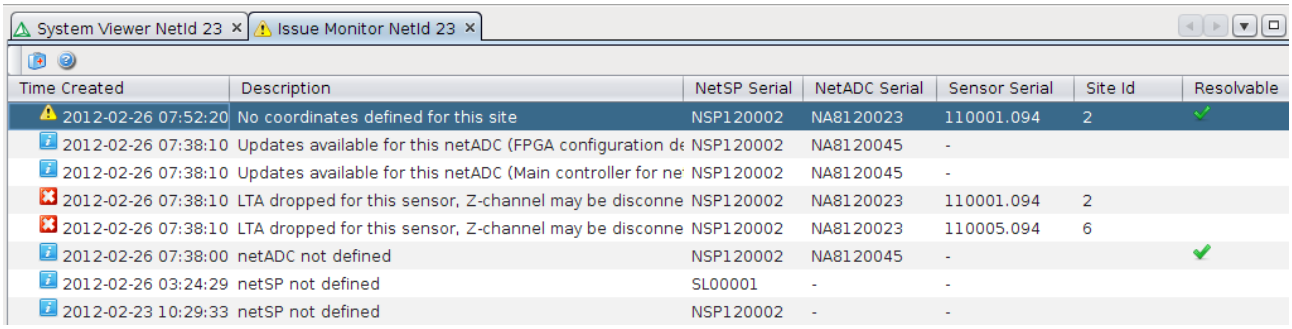


Step 5 – Site configured and displayed in System Viewer



Displaying All Issues Reported by the Synapse Server

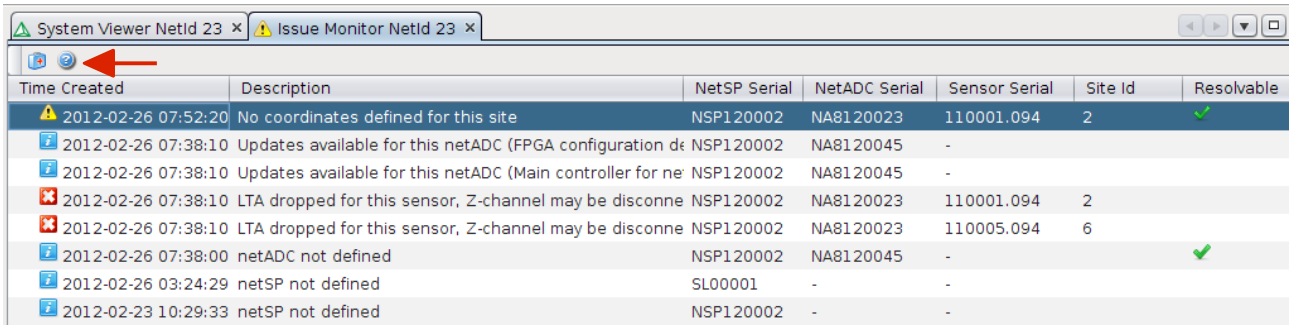
In the previous section, we have zoomed into issues found for a specific device (in this case a netADC with missing sites). The following view shows us a list of **all** issues found by Synapse. Some cannot be resolved automatically, but hints point us in the right direction in solving them.



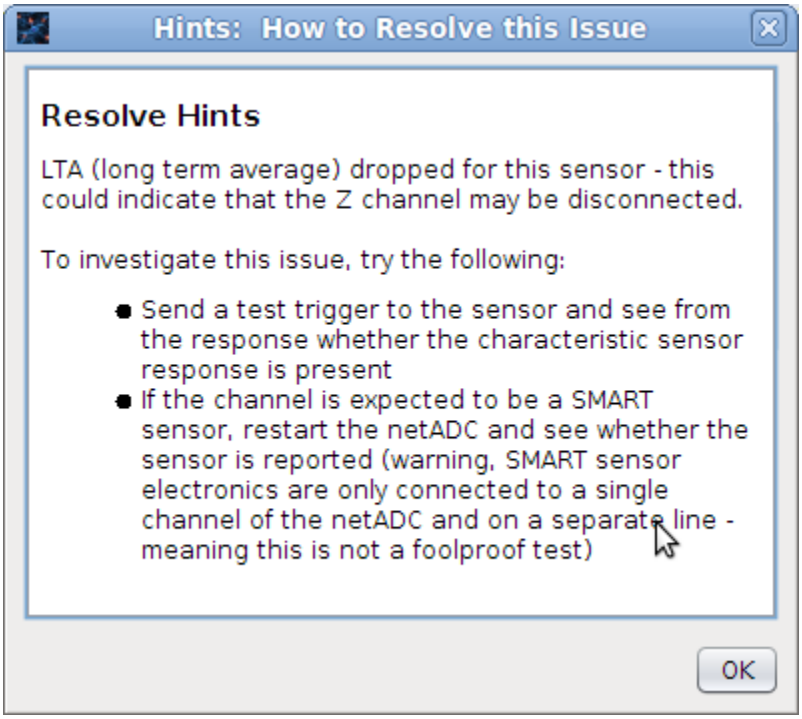
Time Created	Description	NetSP Serial	NetADC Serial	Sensor Serial	Site Id	Resolvable
2012-02-26 07:52:20	No coordinates defined for this site	NSP120002	NA8120023	110001.094	2	✓
2012-02-26 07:38:10	Updates available for this netADC (FPGA configuration de	NSP120002	NA8120045	-		
2012-02-26 07:38:10	Updates available for this netADC (Main controller for ne	NSP120002	NA8120045	-		
2012-02-26 07:38:10	LTA dropped for this sensor, Z-channel may be disconne	NSP120002	NA8120023	110001.094	2	
2012-02-26 07:38:10	LTA dropped for this sensor, Z-channel may be disconne	NSP120002	NA8120023	110005.094	6	
2012-02-26 07:38:00	netADC not defined	NSP120002	NA8120045	-		✓
2012-02-26 03:24:29	netSP not defined	SL00001	-	-		
2012-02-23 10:29:33	netSP not defined	NSP120002	-	-		

Hints and Tips

Select the help button for more information on how to resolve the issue.



Time Created	Description	NetSP Serial	NetADC Serial	Sensor Serial	Site Id	Resolvable
2012-02-26 07:52:20	No coordinates defined for this site	NSP120002	NA8120023	110001.094	2	✓
2012-02-26 07:38:10	Updates available for this netADC (FPGA configuration de	NSP120002	NA8120045	-		
2012-02-26 07:38:10	Updates available for this netADC (Main controller for ne	NSP120002	NA8120045	-		
2012-02-26 07:38:10	LTA dropped for this sensor, Z-channel may be disconne	NSP120002	NA8120023	110001.094	2	
2012-02-26 07:38:10	LTA dropped for this sensor, Z-channel may be disconne	NSP120002	NA8120023	110005.094	6	
2012-02-26 07:38:00	netADC not defined	NSP120002	NA8120045	-		✓
2012-02-26 03:24:29	netSP not defined	SL00001	-	-		
2012-02-23 10:29:33	netSP not defined	NSP120002	-	-		



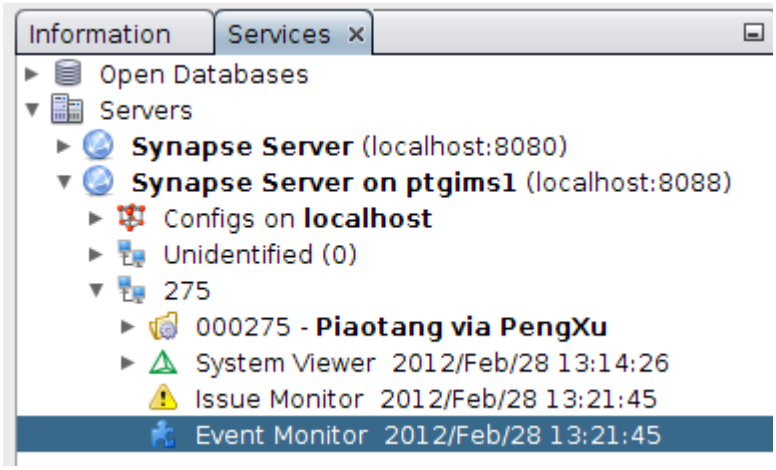
Event Builder Monitor

The Event Builder Monitor displays the live status of trigger association and event building, based on reported trigger times and received seismograms. During the event building process:

- STA/LTA trigger times of sites are reported
- Trigger times associate to form events
- The associated triggers are prioritised for transmission:
  - Associated, triggered seismograms sent first
  - Non-associated, triggered seismograms sent next
  - Un-triggered waveforms are sent last (bandwidth permitting)
- Events are available on disk as soon as seismograms arrive. Late seismograms are post-associated and merged with existing events

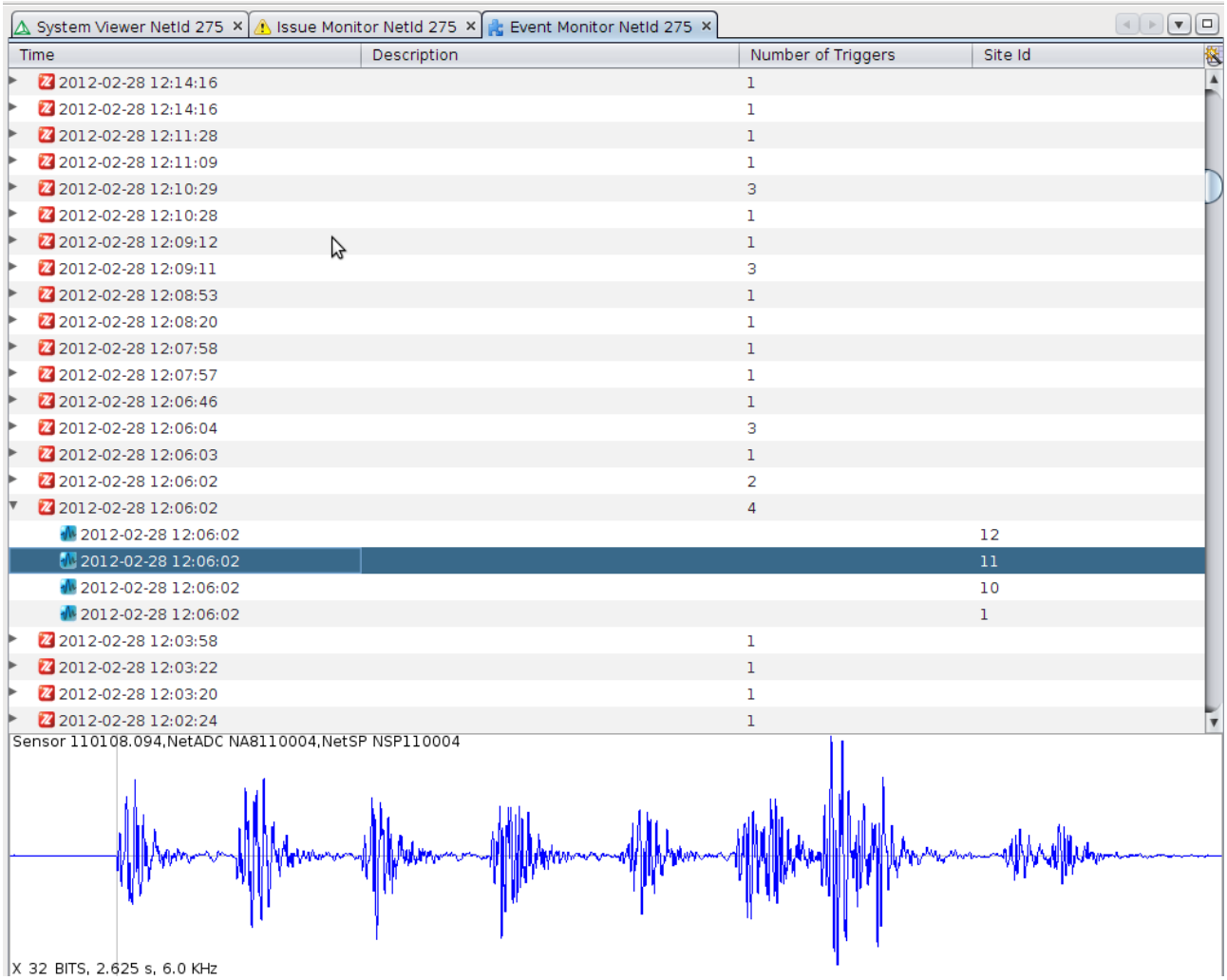
The Event Builder Monitor can be accessed by following these steps:

1. Double click on the Event Monitor in the tree



2. The Event Monitor will open and a list of events will be displayed
3. Expand an event to display the triggers associated with the event
4. Click on a trigger node to display the corresponding waveform for the trigger

In the next example, a trigger from a blast is displayed:

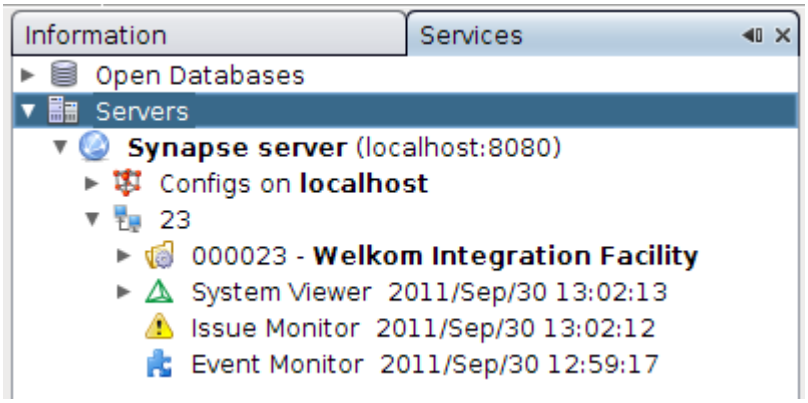

System Viewer NetId 275
Issue Monitor NetId 275
Event Monitor NetId 275
Time
Description
Number of Triggers
Site Id
2012-02-28 12:14:16 1
2012-02-28 12:14:16 1
2012-02-28 12:11:28 1
2012-02-28 12:11:09 1
2012-02-28 12:10:29 3
2012-02-28 12:10:28 1
2012-02-28 12:09:12 1
2012-02-28 12:09:11 3
2012-02-28 12:08:53 1
2012-02-28 12:08:20 1
2012-02-28 12:07:58 1
2012-02-28 12:07:57 1
2012-02-28 12:06:46 1
2012-02-28 12:06:04 3
2012-02-28 12:06:03 1
2012-02-28 12:06:02 2
2012-02-28 12:06:02 4
2012-02-28 12:06:02 12
2012-02-28 12:06:02 11
2012-02-28 12:06:02 10
2012-02-28 12:06:02 1
2012-02-28 12:03:58 1
2012-02-28 12:03:22 1
2012-02-28 12:03:20 1
2012-02-28 12:02:24 1
Sensor 110108.094,NetADC NA8110004,NetSP NSP110004
X 32 BITS, 2.625 s, 6.0 KHz

Configuration

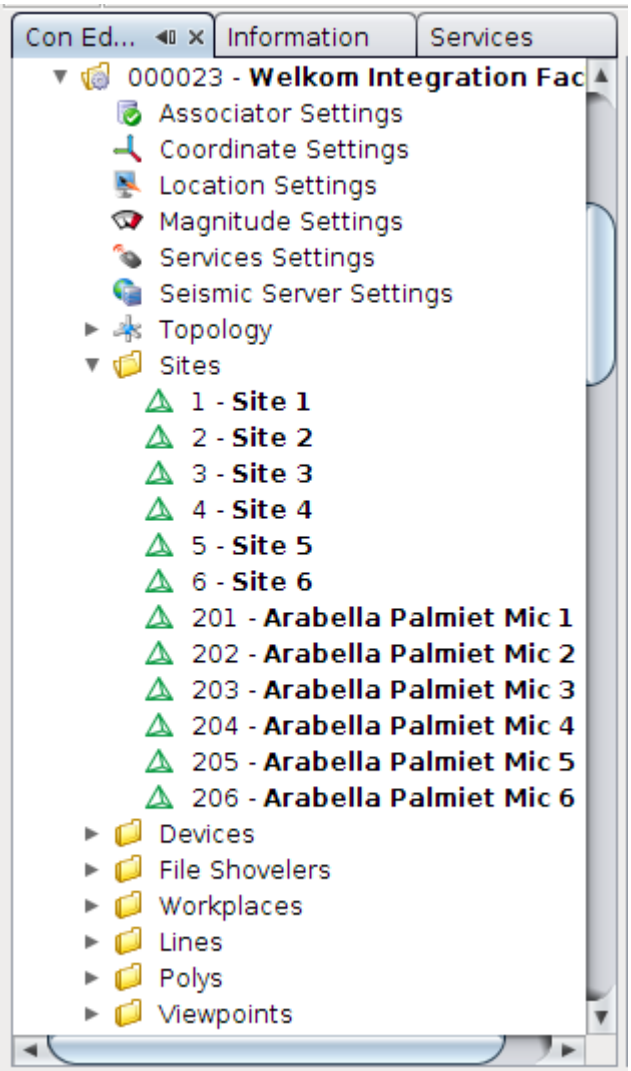
Editing configuration files on the Synapse Server

When running the Synapse Server and the Synapse graphical interface on more than one PC, a set of configuration files must be available on each PC. The configuration files are stored in ~/.ims/conf. To edit the configuration files on the Synapse Server (most likely **remote server**), follow these steps:

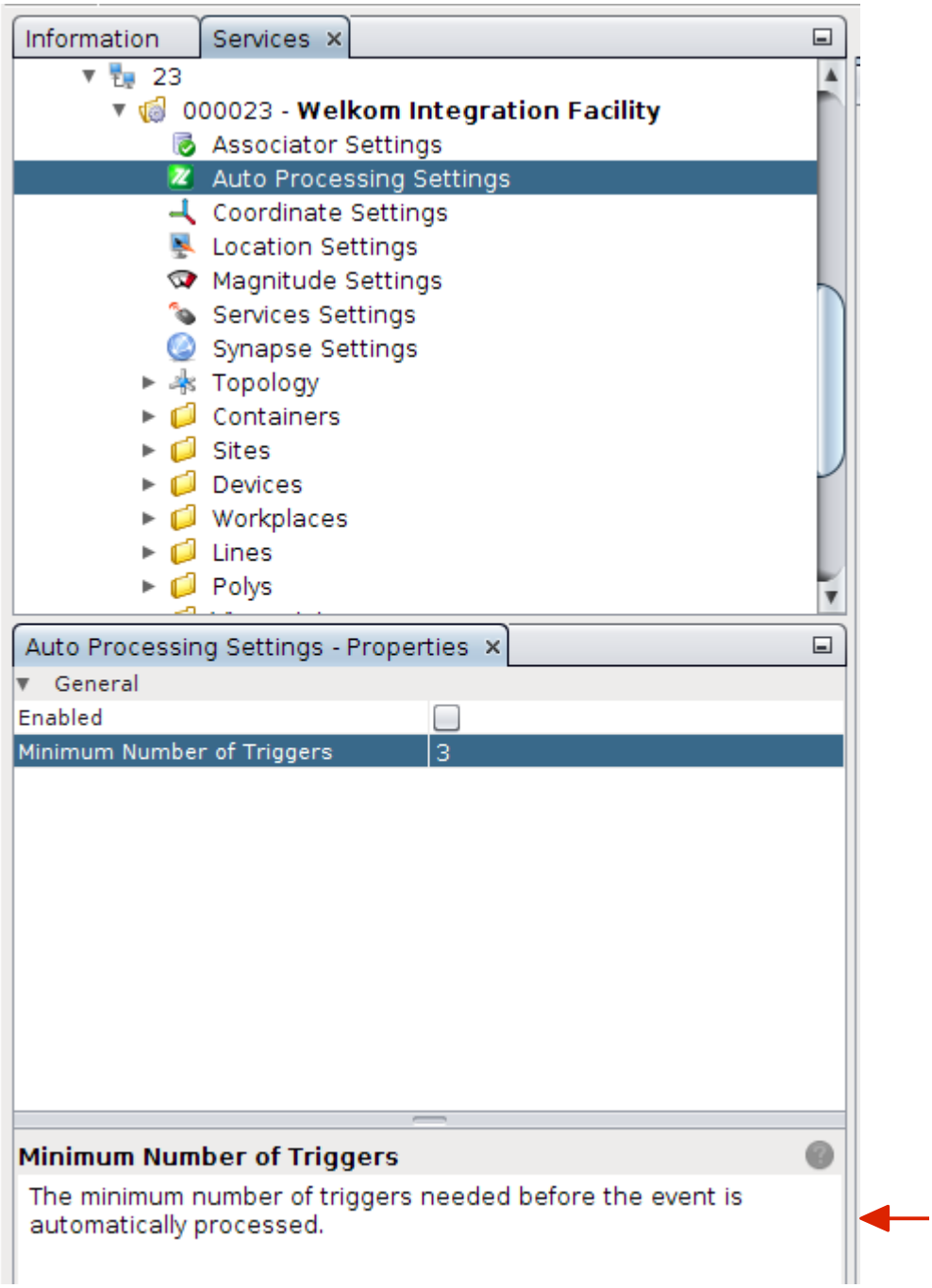
1. Expand the **Synapse** server node in the tree
2. Expand the Netid node (e.g. 23)



3. Expand the tree to display the property nodes for the specific network.



4. Edit properties by selecting the corresponding node. For example, to edit the settings for the Automatic Processing server, select the **Auto Processing Settings** node from the tree. If the properties are not displayed, ensure that the **Properties** window is open by going to **Window → Properties** and docking it into the bottom-left corner.

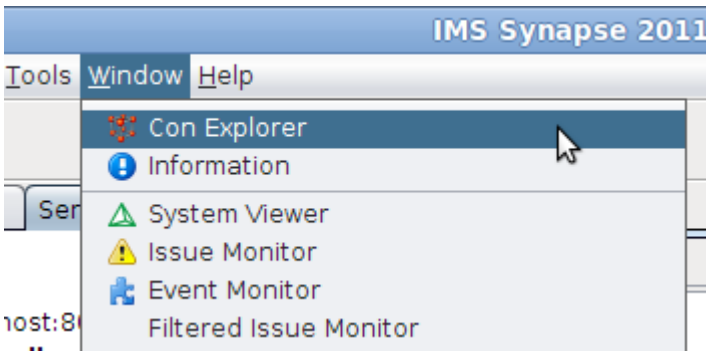


5. By selecting a field, in this example the **Minimum Number of Triggers** field, a short explanation is displayed at the bottom of the properties window.

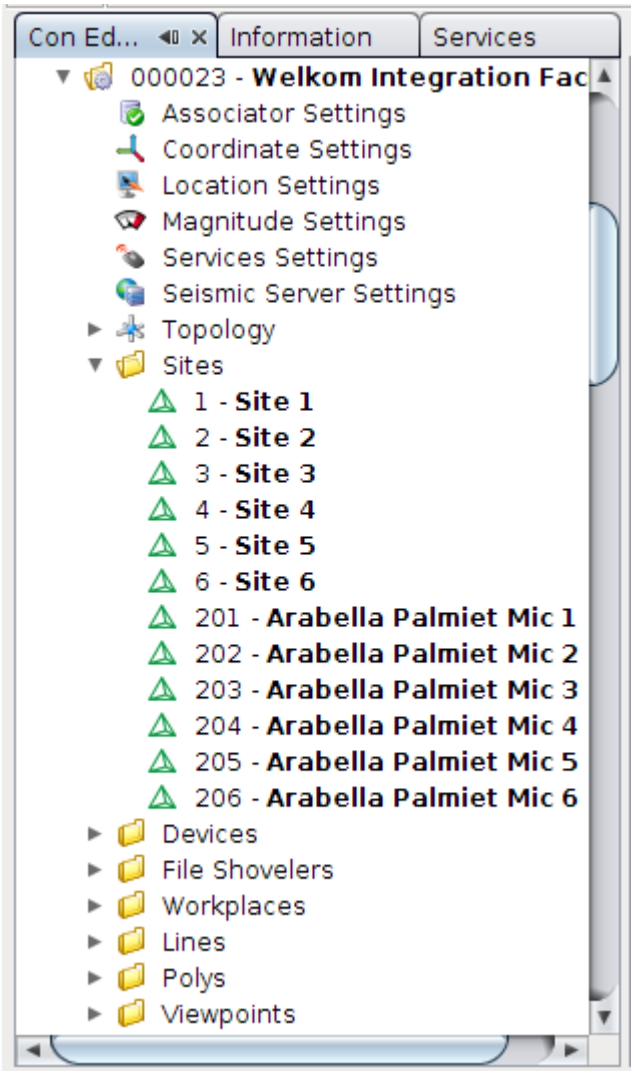
Opening the Con Explorer Window to edit the local configuration files

The Con Explorer Window also allows one to edit the configuration files on the **local PC**. Follow these steps to open the editor:

1. Select **Window → Con Explorer**



2. The Con Explorer window should now be displayed. Expand the tree to display the property nodes for the specific network.



System Control

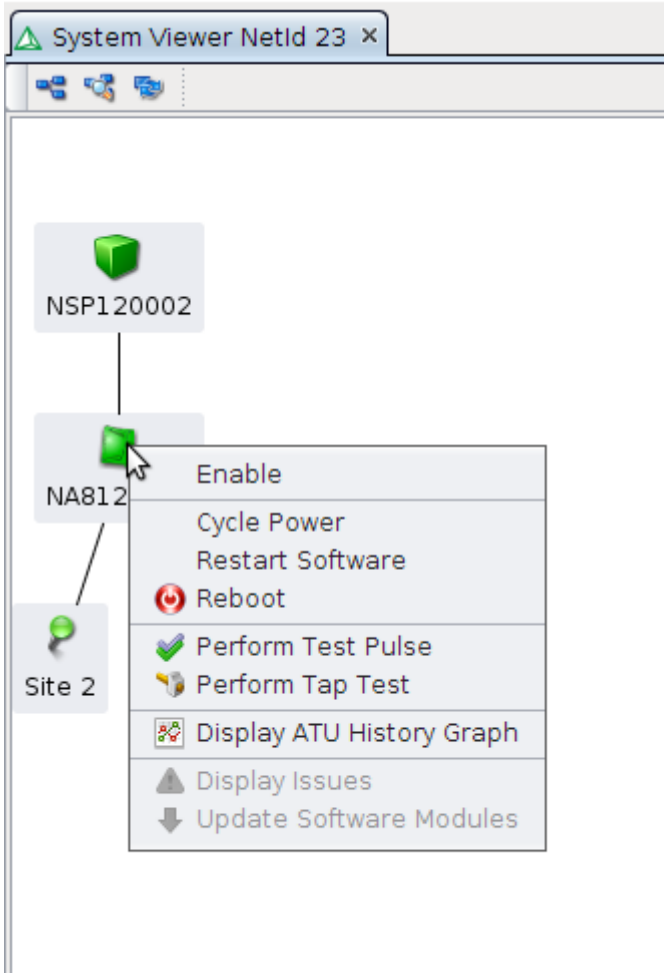
The main focus of System Control is to instruct the seismic system to perform various tasks. For example, to test the sensor, a test pulse can be sent to the netSP. All the sites connected to the netSP will respond by creating test pulses and sending it back to Synapse.

Please note that either an **Admin** user or a **Controller** must be logged in to perform system control functions. If a control function is accessed and Synapse detects that a user is not logged in, a login dialog will be displayed prompting the user to log in. Please refer to the **Running Synapse for the First Time → Creating Users** section for more information.

To access various system control functions:

1. Right click on a device or a site.
2. Select on option from the popup menu.

In the next example, the control functions for the netADC are displayed.



System Control Options

Restart Software

Restarts the software on the device.

Perform Tap Test

During a tap test, the netADC checks if the X, Y or Z polarity in the sensor has been flipped. If polarity is flipped, an issue will be raised and displayed in the Issue Monitor.

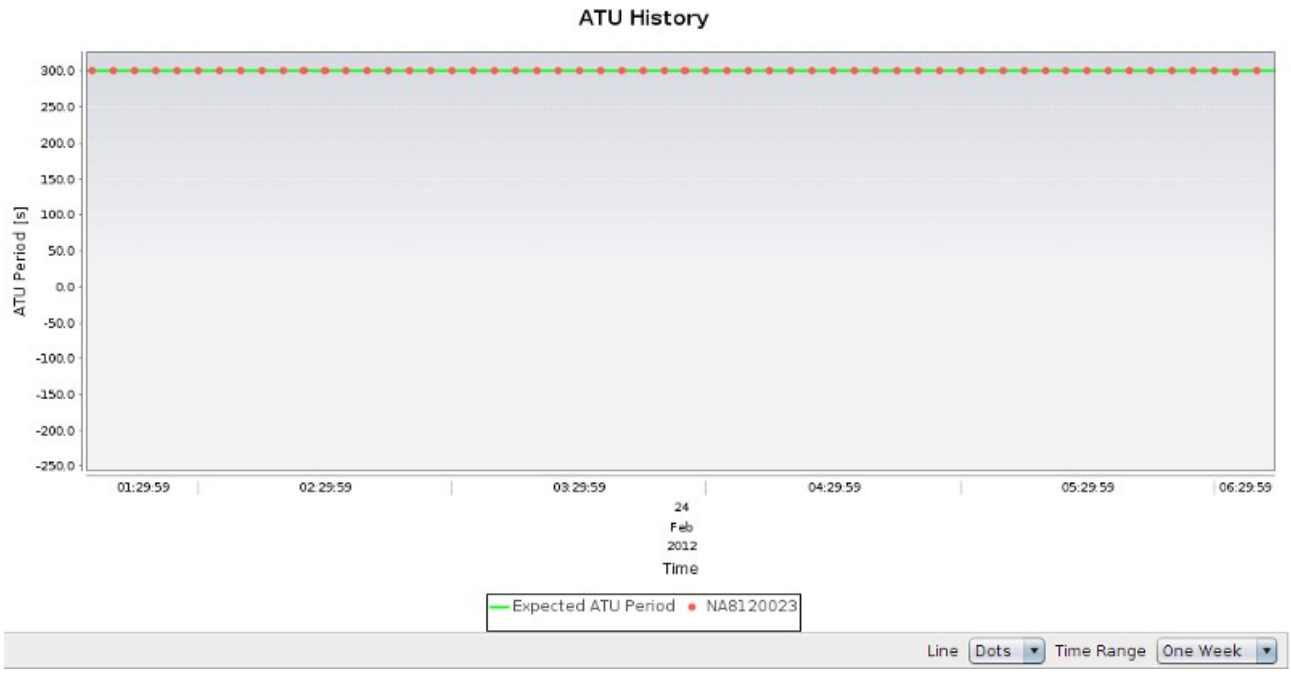
Display ATU History Graph

The ATU History Graph, plots the ATU period as received from the netADC's. The expected ATU period is plotted as 'n single green line, with the ATU period (in seconds) from the netADC's plotted as dots on the graph. There should be minimal deviation from the green line.

To display ATU graphs:

1. Right click on a netSP or netADC node in the **System Viewer**
2. Select **Display ATU History Graph**

The next example displays the ATU History for a single netADC.



What is ATU (Analogue Time Update)?

It is absolutely essential to have common time between the different IMS Stations to be able to establish where a seismic event occurred.

The IMS System makes use of a special break signal of specific length, to generate an ATU (Analog Time Update) signal that the IMS Stations will synchronize to.

The ATU has higher priority than other transmitted data, and the IMS Station's internal clock will be reset by the trailing edge of the ATU signal. Data exchange between the Synapse server and the individual IMS Stations, utilizes the TCP/IP protocol. ATU is injected to the DSLAM and is conveyed to the dsl modems at each IMS Station. The local dsl modem extracts this signal and passes it on to the IMS Station. Every IMS Station will therefore receive the ATU signal at exactly the same time, thereby resetting their internal clocks, resulting in common time between IMS Stations.

It is imperative that the seismic stations have common time within less than five milliseconds of one another (higher accuracy may be required for smaller systems).

The timing circuitry in the IMS Stations makes use of a crystal. This crystal can drift over time causing it to oscillate at a different frequency, resulting in the IMS Station's clock drifting. This can be compensated for by changing a software value (Time Counter Value). A marginal change in this value will rectify the drifting time of such an IMS Station. The clocks in the IMS Stations are reset every five minutes.

A problem with the ATU's usually indicate a communication issue.

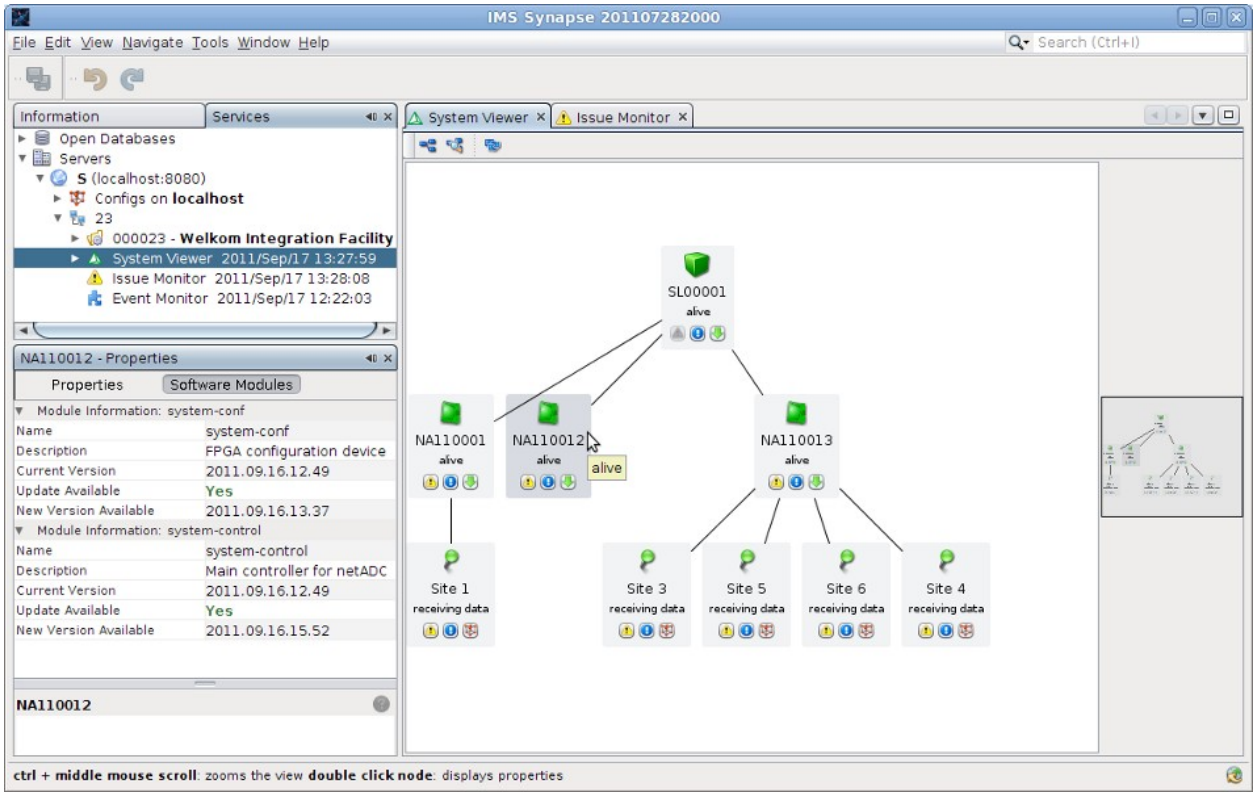
Display Issues

If the option is enabled, issues have been reported for the device or site. Select this option to display the filtered list of issues.

Update Software Modules

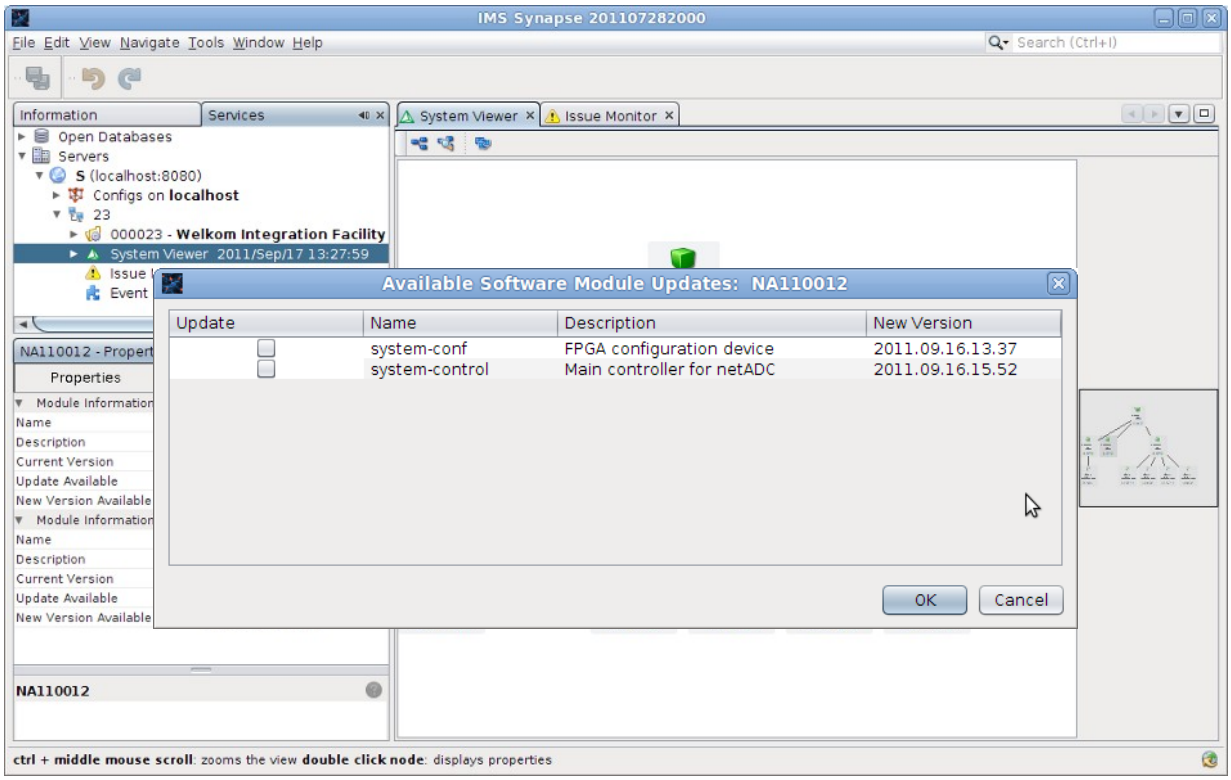
The software running on the device can be updated via Synapse. If a new update is available, a little green arrow will appear and the right click menu action will become active.

Step 1 – Look for updates marked with green arrows



Step 2 – Apply Updates

In this example, the netADC has two packages that may be updated. A package is selected and Synapse sends the new package with an update instruction to the netADC.



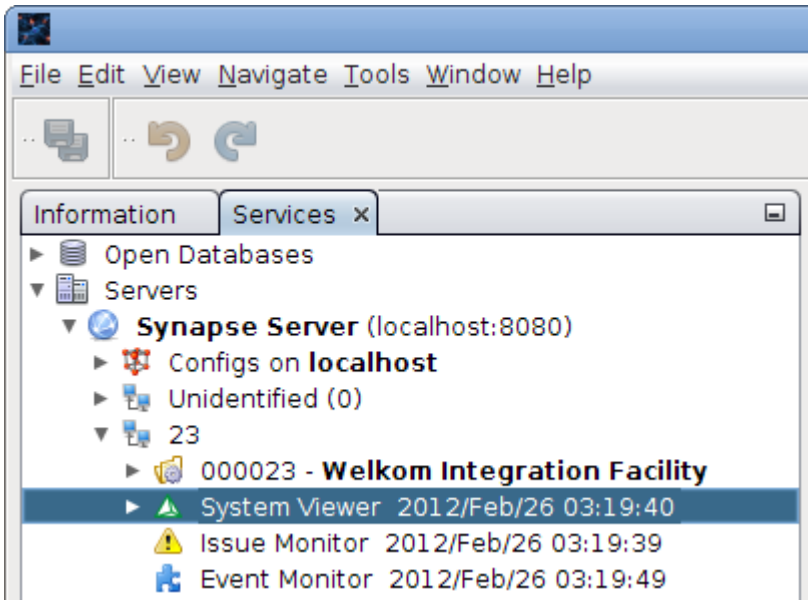
Daily Routines

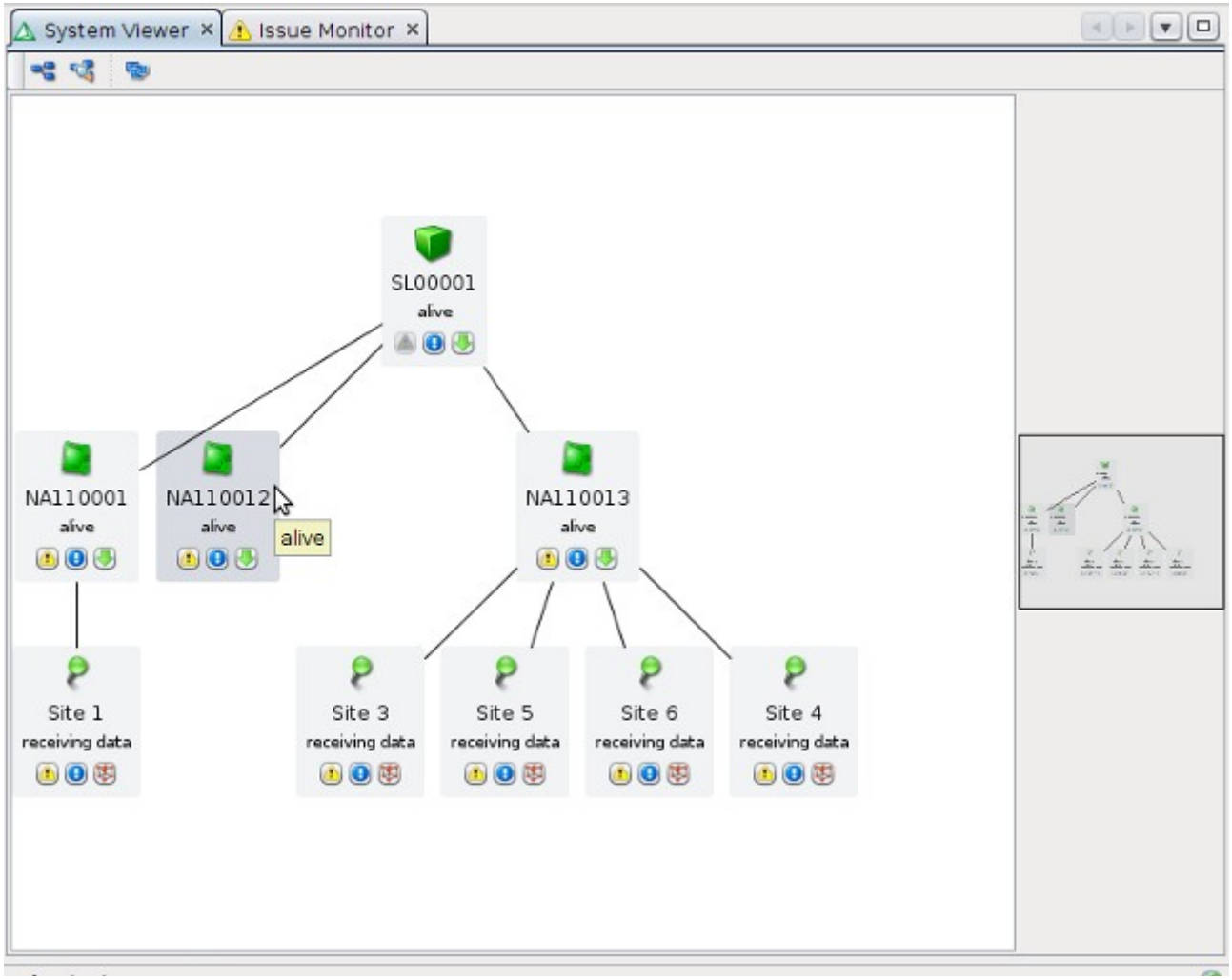
The sole purpose of these daily routines is to verify that the system is functioning to its full potential. A target of 100% uptime should be aimed for.

The following has to be checked:

1. System Viewer

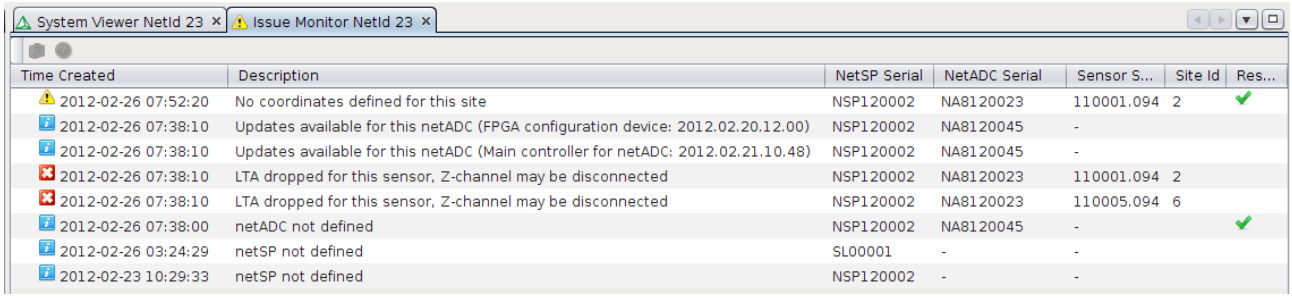
All devices and sites should be green. Any orange devices should be investigated for potential problems. Red devices have critical problems and must be attended to immediately.





2. Issue Monitor

All errors must be investigated and resolved. Warnings may indicate problems and could be resolved. Information messages does not have to be cleared.



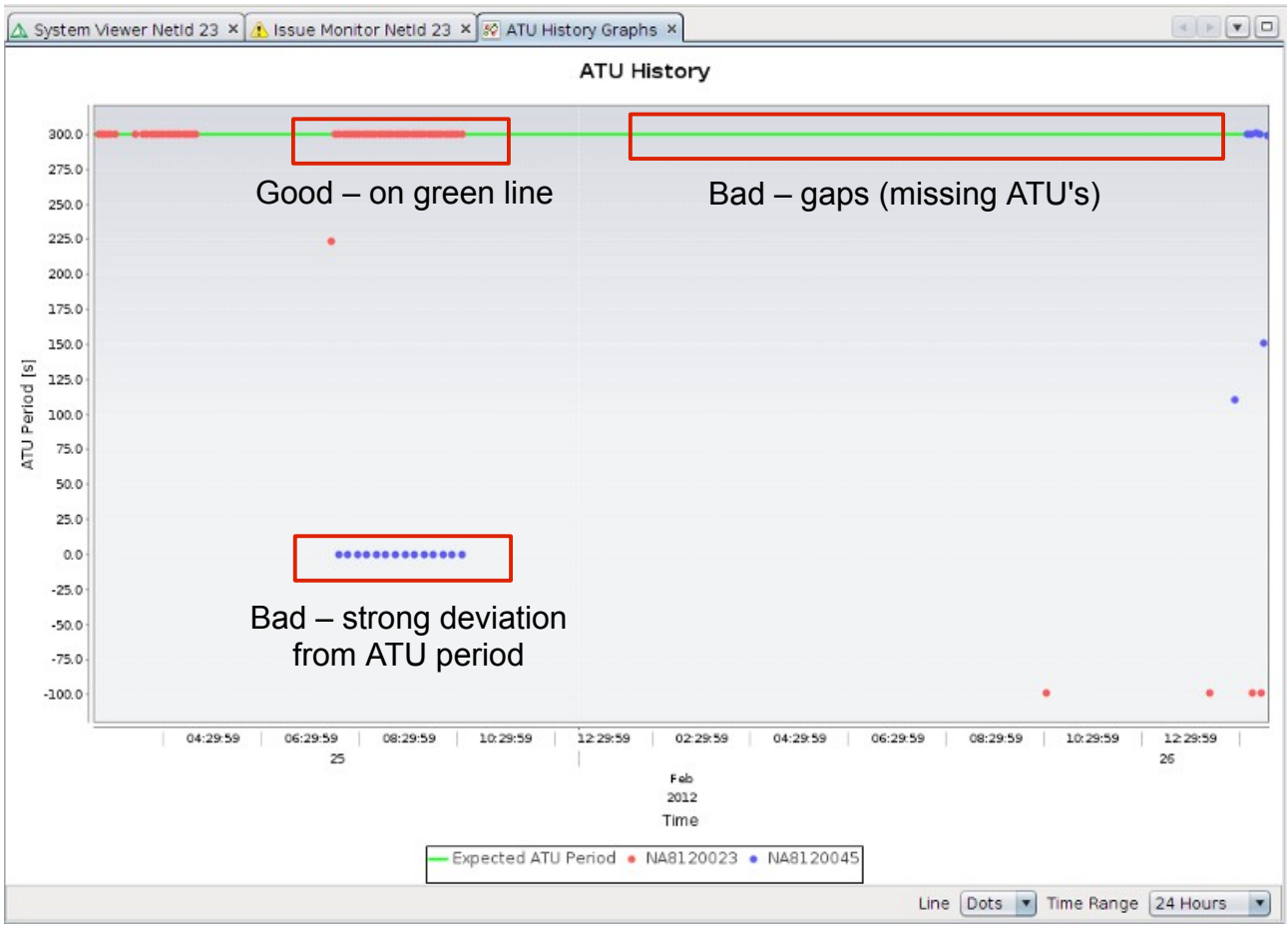
Time Created	Description	NetSP Serial	NetADC Serial	Sensor S...	Site Id	Res...
2012-02-26 07:52:20	No coordinates defined for this site	NSP120002	NA8120023	110001.094	2	✔
2012-02-26 07:38:10	Updates available for this netADC (FPGA configuration device: 2012.02.20.12.00)	NSP120002	NA8120045	-		
2012-02-26 07:38:10	Updates available for this netADC (Main controller for netADC: 2012.02.21.10.48)	NSP120002	NA8120045	-		
2012-02-26 07:38:10	LTA dropped for this sensor, Z-channel may be disconnected	NSP120002	NA8120023	110001.094	2	
2012-02-26 07:38:10	LTA dropped for this sensor, Z-channel may be disconnected	NSP120002	NA8120023	110005.094	6	
2012-02-26 07:38:00	netADC not defined	NSP120002	NA8120045	-		✔
2012-02-26 03:24:29	netSP not defined	SL00001	-	-		
2012-02-23 10:29:33	netSP not defined	NSP120002	-	-		

3. ATU History

Check the ATU History for each netSP on the network. To view the ATU History graph:

1. Right click on a netSP in the System Viewer
2. Select **Display ATU History Graph**
3. Repeat this for all netSP's in the viewer

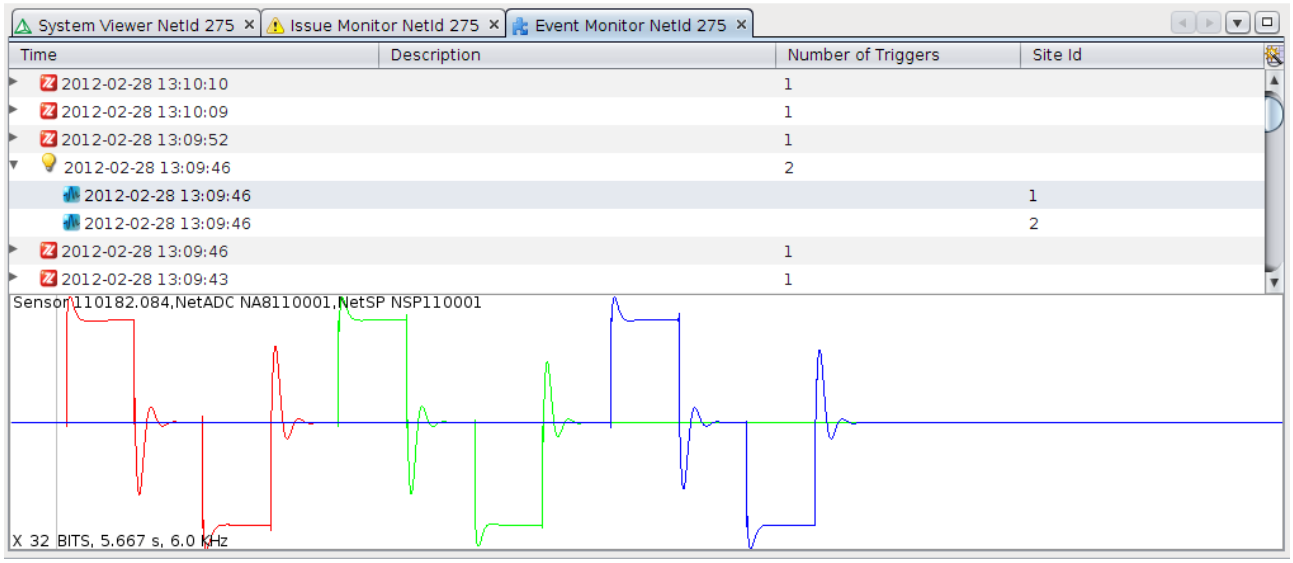
The ATU period for each netADC in the graph should not deviate from the green line indicating the expected ATU period. There should not be any gaps in the graph.



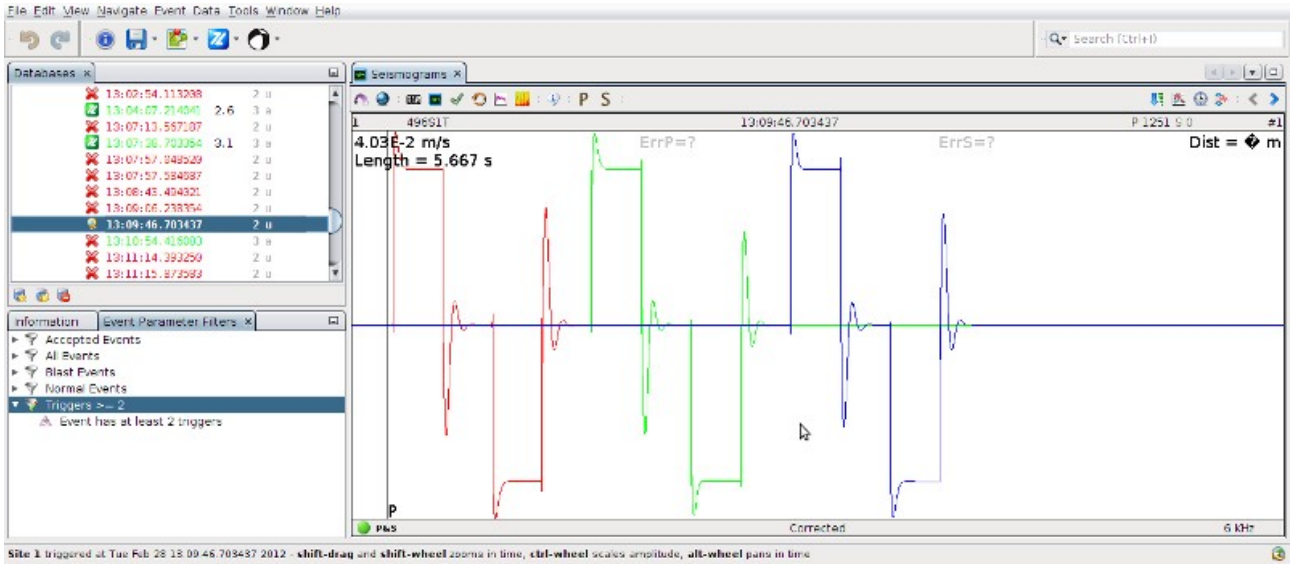
4. Test Pulses

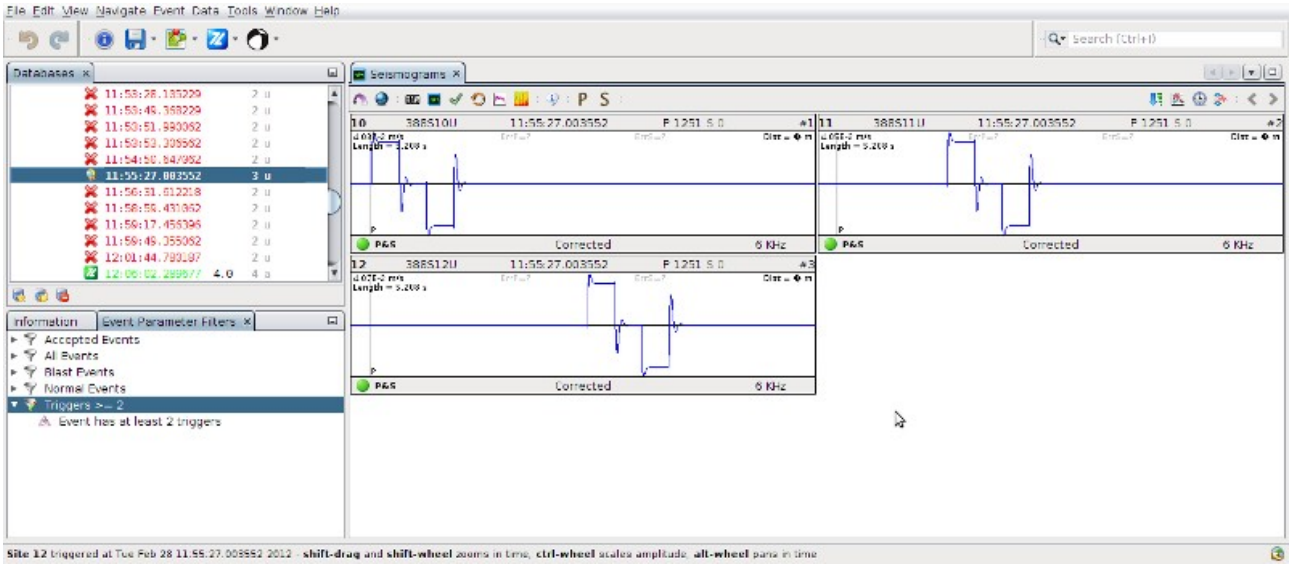
Test pulses are generated daily by the netADC's and are stored in the IMS database. Test pulses should be evaluated daily. Test pulses are marked with a yellow lightbulb in the **Event Monitor** window.

A test pulse for a triaxial geophone is displayed in the next picture:



Test pulses are best evaluated by viewing the data in Trace:





5. Hardware Updates

IMS will send a notification via e-mail when new updates are available for the netSP's and/or netADC's. The Issue Monitor will also report available updates for the hardware deveices. Apply the updates to the appropriate devices.