



SCS 2.0 and IPAR 1.0
External Events and Data Copy
Expert User Guide

FOR RESEARCH ONLY

This publication and its contents are proprietary to Illumina, Inc., and are intended solely for the contractual use of its customers and for no other purpose than to operate the system described herein. This publication and its contents shall not be used or distributed for any other purpose and/or otherwise communicated, disclosed, or reproduced in any way whatsoever without the prior written consent of Illumina, Inc.

For the proper operation of this system and/or all parts thereof, the instructions in this guide must be strictly and explicitly followed by experienced personnel. All of the contents of this guide must be fully read and understood prior to operating the system or any of the parts thereof.

FAILURE TO COMPLETELY READ AND FULLY UNDERSTAND AND FOLLOW ALL OF THE CONTENTS OF THIS GUIDE PRIOR TO OPERATING THIS SYSTEM, OR PARTS THEREOF, MAY RESULT IN DAMAGE TO THE EQUIPMENT, OR PARTS THEREOF, AND INJURY TO ANY PERSONS OPERATING THE SAME.

Illumina, Inc. does not assume any liability arising out of the application or use of any products, component parts, or software described herein. Illumina, Inc. further does not convey any license under its patent, trademark, copyright, or common-law rights nor the similar rights of others. Illumina, Inc. further reserves the right to make any changes in any processes, products, or parts thereof, described herein without notice. While every effort has been made to make this guide as complete and accurate as possible as of the publication date, no warranty or fitness is implied, nor does Illumina accept any liability for damages resulting from the information contained in this guide.

© 2008 Illumina, Inc. All rights reserved. **Illumina, Solexa, Making Sense Out of Life, Oligator, Sentrix, GoldenGate, DASL, BeadArray, Array of Arrays, Infinium, BeadXpress, VeraCode, IntelliHyb, iSelect, CPro, iScan, and GenomeStudio** are registered trademarks or trademarks of Illumina. All other brands and names contained herein are the property of their respective owners.

Table of Contents

1	Scope and Purpose	4
2	Overview	4
3	Data Collection Events	4
3.1	Pre-Defined Events in RunConfig.xml	4
3.2	Event Bindings in RunConfig.xml	6
3.3	User Defined Events in Recipe.xml Protocol Files	7
4	Data Analysis Events	7
4.1	Pre-Defined Events in StargazerShell.xml	7
4.2	Event Bindings in StargazerShell.xml	8
5	Illumina Event Script Configuration	9
5.1	Purpose of the Illumina Event Scripts	9
5.2	Mechanics of the Illumina Event Scripts	10
5.3	GalaxyRunConfig Settings	11
5.4	Network Copy Overview	14
6	Network Copy for Standalone GA Instruments	14
6.1	Run Start	14
6.2	Cycle Complete	14
6.3	Run Complete	14
6.4	Other Events	15
7	Network Copy for Instruments with IPAR	15
7.1	Network Copy Options	15
7.2	Run Start	16
7.3	Cycle Complete	16
7.4	Run Complete	17
7.5	Analysis Error	17

1 Scope and Purpose

This document explains the implementation of external event scripts for both the instrument control computer (SCS) software and the IPAR software.

There are two main topics covered:

1. The first topic is the meaning and usage of external events in the GA and IPAR computers. It is a general explanation of the mechanics of the feature. This topic comprises the chapters *Overview* (page 4), *Data Collection Events* (page 4), *Data Analysis Events* (page 7), and *Illumina Event Script Configuration* (page 9).
2. The second topic covers how our default scripts coordinate a run with other applications (RunBrowser, GoldCrest, NetCopy). This section describes how SCS 2.01 and IPAR 1.01 deploy event scripts, and what those event scripts will do for managing network data copy of results and images. This topic comprises the chapters *Network Copy for Standalone GA Instruments* (page 14), and *Network Copy for Instruments with IPAR* (page 15).



NOTE

This document is written for the **expert user**, who has an advanced understanding of the instrument control and IPAR software.

2 Overview

The Data Collection software (a.k.a. SCS) on the instrument control computer is able to signal various events that occur during a run. Similarly, the IPAR software on the IPAR server also signals the same events during analysis of a run. There is a small set of predefined events, and there are user-defined events that can be set up in the run protocol (recipe).

Each event requires an event handler, which is a user defined program or script which will be automatically run as an external process when the corresponding event is triggered. There is a default set of event scripts that are part of the software installation which are used to copy results and (optionally) images to the network file server for offline analysis. These default event scripts also launch ancillary programs such as the RunBrowser.

Event handlers must be connected to their events in configuration files. For SCS, this is in the DataCollection \ bin \ Config folder, in the RunConfig.xml file. For IPAR, it is in the DataAnalysis \ bin \ Config \ StargazerShell.xml file. These bindings must be in place before the SCS or IPAR software is launched in order for them to be used.

3 Data Collection Events

3.1 Pre-Defined Events in RunConfig.xml

On the Data Collection (SCS) side the events listed below are pre-defined. They are bound to event handlers via RunConfig.xml. When the Data Collection software (SCS) calls an event handler it passes in some important parameters. The parameters vary according to the type of event. The table below explains the purpose and meaning of the events, and shows the parameters passed in to the handlers.

Event	Description
Run Start	The OnRunStart event is triggered once as soon as the run begins. This event occurs after the run folder has been entered, after the sample sheet (optional) info has been entered, after the focus

	<p>calibration model has been accepted, and in IPAR based systems after communication with IPAR has been successfully initiated.</p> <p>The only parameter to the run start event is the local run folder, fully qualified path and file name:</p> <pre>OnRunStart "runfolder"</pre>
Run Complete	<p>The OnRunComplete event is triggered once for each run, after the last step of the protocol has finished execution.</p> <p>The only parameter to the run complete event is the local run folder, fully qualified path and file name:</p> <pre>OnRunComplete "runfolder"</pre>
Cycle Start	<p>The OnCycleStart event is triggered once at the beginning of every imaging cycle. There are three possible types of imaging cycles: Incorporation, Cleavage and ReadPrep. Chemistry cycles do not have any events associated with them.</p> <p>There are three parameters to the cycle start event. The local run folder is the first parameter. The cycle type can be one of three values – Incorporation, Cleavage, or ReadPrep. The cycle number is zero based, so it is one less the actual cycle nbr (when running cycle 1, the cycle number parameter will be zero).</p> <pre>OnCycleStart "runfolder" "cycle_type" "cycle_nbr"</pre>
Cycle Complete	<p>The OnCycleComplete event is triggered after the last tile has been processed. In IPAR systems the event is fired only after the results for the last tile have been sent from the IPAR server. Just as for cycle start events, the cycle complete event applies to all imaging cycles – Incorporation, Cleavage and ReadPrep.</p> <p>There are three parameters to the cycle start event, as described above for the cycle start event.</p> <pre>OnCycleComplete "runfolder" "cycle_type" "cycle_nbr"</pre>
Run Stopped	<p>The OnStop event is triggered when the operator clicks the Stop button to stop or pause the run.</p> <pre>OnStop "runfolder"</pre>
Run Resumed	<p>The OnRunResume event is triggered when the operator clicks the Resume button.</p> <pre>OnResume "runfolder"</pre>
Run Error	<p>The OnError event is triggered when any error occurs in the Data Collection (SCS) that causes the run to stop. This can be a system error (e.g. failed communications with a device) or a software error (e.g. out of memory).</p> <p>There are two parameters to the run error event. First is the error message itself and second is the run folder.</p> <pre>OnError "error_message" "runfolder"</pre>
IPAR Error	<p>The OnAnalysisStop event is triggered when any error occurs on the IPAR server that causes IPAR analysis to stop for the run. This error informs the Data Collection (SCS) software that analysis is no longer available, so no more images will be sent and no more results received or displayed.</p> <p>Note that some software errors may not be caught by the IPAR software exception handling routines. There is a class of serious system errors that can cause the IPAR software to be halted and shut down by Windows, so that it cannot send any error message over to SCS. In this case SCS will time out trying to communicate with IPAR.</p> <p>If IPAR can send the error message to SCS, then the analysis stopped event is triggered. There are two parameters, as for the run error event described above.</p> <pre>OnAnalysisStopped "error_message" "runfolder"</pre>

3.2 Event Bindings in RunConfig.xml

For the GA instrument control computer, the UserProgram section of RunConfig.xml is where the event handlers are bound to their associated events. Here is the way the XML is set up for this binding. The pre-defined events sub-elements of the UserProgram element. All events have the Path and Shell attributes, but only some have the Wait attribute, depending on whether the run is continuing after the event.

In order to disable an event handler, you only have to set the Path attribute to a null string "" as in OnCycleStart below.

```

<UserProgram Minimized="true">
  <OnCycleStart Path="" Shell="true" Wait="false" />
  <OnCycleComplete Path="..\..\..\EventScripts\CycleComplete.bat"
    Shell="true" Wait="false" />
  <OnRunStart Path="..\..\..\EventScripts\RunStart.bat"
    Shell="true" Wait="false" />
  <OnRunResume Path="..\..\..\EventScripts\RunResume.bat"
    Shell="true" Wait="false" />
  <OnRunComplete Path="..\..\..\EventScripts\RunComplete.bat"
    Shell="true" />
  <OnStop Path="..\..\..\EventScripts\RunStop.bat"
    Shell="true" />
  <OnError Path="" Shell="true" />
  <OnAnalysisStop Path="..\..\..\EventScripts\AnalysisError.bat"
    Shell="true" />
</UserProgram>
    
```

The attributes are described in the table below.

Event	Description
Minimized Attribute	The UserProgram element has a global Minimized attribute which applies to all the pre-defined events. If this flag is set to "true" then all the event handlers will be run with their windows minimized to the task bar. If this flag is set to "false" the event handler windows will pop up on the desktop and be visible to the user.
Path Attribute	Each event element has a Path attribute which defines the full path and program name of the event handler. The DataCollection software checks these paths when it starts up and will report an error if the program is not found. The DataCollection software will not run if these event handler paths aren't valid.
Shell Attribute	Each event element has a Shell attribute which defines the type of executable program for the event handler. If the handler is command line or console application, then Shell is set to "true". This includes .bat, .cmd and .exe files that are built as console applications. For most interpreted scripts (Python, Perl, VBS) Shell is also set to "true". For event handlers that are windows programs that have a GUI, the Shell attribute should be set to "false".
Wait Attribute	Each event element has a Wait attribute which controls how the event handler program is launched. If Wait is set to "true" then the Data Collection software will stop executing the recipe until the event handler is finished, and will wait to see what the return value is from the handler. If the event handler sets its program return value to zero (no errors) the Data Collection software continues with the recipe. But if the event handler returns a non-zero value that means an error has occurred, and the recipe will be stopped with an error message indicating which event caused the run to be aborted.

3.3 User Defined Events in Recipe.xml Protocol Files

A recipe can now have the same UserProgram element as the configuration file RunConfig.xml. This is a powerful feature that enables users to configure any external program to run at any step of the protocol.



CAUTION

Please use this feature sparingly and with caution. Indiscriminate usage can block a run indefinitely and yield degraded data.

These programs or scripts can be used to enable, disable or synchronize continued execution of the recipe. There is no limit to the number of these UserProgram elements that can be inserted into a recipe. But please don't overuse the feature or you can degrade instrument performance. Use this feature when it is necessary to coordinate with laboratory work flow or LIMS. Programs that send emails, instant messages, or even call pagers are examples of how this feature could be used.

The syntax for an user-defined event in a recipe is as follows:

```
<UserProgram Path="C:\MyFolder\MyEventHandler.cmd"
             Minimized="false" Shell="true" Wait="false">
```

The attributes are described in the table below.

Event	Description
Minimized Attribute	The Minimized attributes is as described in 3.2 <i>Event Bindings in RunConfig.xml</i> above. It controls whether the event handler window will pop up and be displayed on the desktop ("false"), or minimized to an icon on the task bar ("true").
Path Attribute	The Path attribute is the same as described in 3.2 <i>Event Bindings in RunConfig.xml</i> above. It is simply the fully qualified path and executable program name that is going to be the handler for this event.
Shell Attribute	The Shell attribute is as defined in section 3.2 <i>Event Bindings in RunConfig.xml</i> above. It is set "true" for command line applications, such as bat and cmd files. It is set "false" for programs that have a windows GUI.
Wait Attribute	The Wait attribute of the UserProgram command functions the same way as for all other events described in Section 3.2 <i>Event Bindings in RunConfig.xml</i> above. The Data Collection software (SCS) is blocked until the external program finishes execution. If the Wait attribute is "true" then SCS checks the result code. Zero meaning "no errors, continue" and non-zero meaning "stop the run".

4 Data Analysis Events

4.1 Pre-Defined Events in StargazerShell.xml

Events described in this section are pre-defined on the Data Analysis side (IPAR). They are bound to event handlers via StargazerShell.xml exactly the same way the SCS events are bound in RunConfig.xml (see Section 3.2 above).

When IPAR calls an event handler it passes in some important parameters. The parameters vary according to the type of event. The table below explains the purpose and meaning of the events, and shows the parameters passed in to the handlers.

There are three standard parameters passed to most of the IPAR events:

- Local run folder full path
- Archiving flag (when "true" it means IPAR will archive images to the archive folder)

- Archive root folder, which is the full path to specified network run folder where images, data and logs will be copied.

There is no concept of the cycle type in IPAR, as there is for the GA events. Cleavage images are not sent to IPAR, only Incorporation and ReadPrep cycle images, which are treated the same by IPAR.

Event	Description
Run Start	<p>The OnRunStart event is triggered once as soon as the run begins. This event occurs after the first image has been received from SCS.</p> <p>The standard parameters for IPAR events are passed to the run start event.</p> <pre>OnRunStart "runFolder" "archivingFlag" "archiveRootFolder"</pre>
Run Complete	<p>The OnRunComplete event is triggered once for each run, after the last step of the protocol has finished execution.</p> <p>The parameters to the run complete event are the standard three parameters for IPAR events:</p> <pre>OnRunComplete "runfolder" "archivingFlag" "archiveRootFolder"</pre>
Cycle Start	<p>The OnCycleStart event is triggered once at the beginning of every imaging cycle.</p> <p>There are four parameters to the cycle start event. The local run folder is the first parameter. The cycle number is zero based, so it is one less the actual cycle nbr (when running cycle 1, the cycle number parameter will be zero). The archiving flag and archiving folder are passed in as the last two parameters.</p> <pre>OnCycleStart "runfolder" "cycle_nbr" "archivingFlag" "archiveRootFolder"</pre>
Cycle Complete	<p>The OnCycleComplete event is triggered after the last tile has been processed.</p> <p>There are four parameters to the cycle start event, as described above for the cycle start event.</p> <pre>OnCycleComplete "runfolder" "cycle_nbr" "archivingFlag" "archiveRootFolder"</pre>
Run Stopped	<p>The OnStop event is triggered when the operator clicks the Stop button to stop or pause the run.</p> <pre>OnStop "runFolder" "archivingFlag" "archiveRootFolder"</pre>
Run Resumed	<p>The OnRunResume event is triggered when the operator clicks the Resume button.</p> <pre>OnResume "runFolder" "archivingFlag" "archiveRootFolder"</pre>
Run Error	<p>The OnError event is triggered when any error occurs in the Data Analysis (IPAR) that causes the analysis to stop. This can be a system error such as file or network problems, or it can be a software error.</p> <p>There are four parameters to the run error event. The first three are the standard IPAR event parameters, and the fourth is the actual error message.</p> <pre>OnError "runFolder" "archivingFlag" "archiveRootFolder" "error_message"</pre>

4.2 Event Bindings in StargazerShell.xml

For the IPAR server, the UserProgram section of StargazerShell.xml is where the event handlers are bound to their associated events. The XML file is set up the same way as for the GA computer, as described above in Section 3.2 Event Bindings in RunConfig.xml.

```
<UserProgram Minimized="true">
```

```

<OnCycleStart      Path=" ..\..\..\EventScripts\IPAR_CycleStart.bat "
                   Shell="true" Wait="false" />

<OnCycleComplete  Path="..\..\..\EventScripts\IPAR_CycleComplete.bat "
                   Shell="true" Wait="false" />

<OnRunStart       Path="..\..\..\EventScripts\IPAR_RunStart.bat "
                   Shell="true" Wait="false" />

<OnRunResume      Path="..\..\..\EventScripts\IPAR_RunResume.bat "
                   Shell="true" Wait="false" />

<OnRunComplete    Path="..\..\..\EventScripts\IPAR_RunComplete.bat "
                   Shell="true" />

<OnStop           Path="..\..\..\EventScripts\IPAR_RunStop.bat "
                   Shell="true" />

<OnError          Path=" ..\..\..\EventScripts\IPAR_RunError.bat "
                   Shell="true" />

</UserProgram>
    
```

The attributes are described in the table below.

Event	Description
Minimized Attribute	Refer to Section 3.2 <i>Event Bindings in RunConfig.xml</i> above
Path Attribute	Refer to Section 3.2 <i>Event Bindings in RunConfig.xml</i> above
Shell Attribute	Refer to Section 3.2 <i>Event Bindings in RunConfig.xml</i> above
Wait Attribute	Refer to Section 3.2 <i>Event Bindings in RunConfig.xml</i> above

5 Illumina Event Script Configuration

This section describes the Illumina event scripts that are shipped as part of the SCS2.01/IPAR1.01 (and later) releases. Although these events are enabled by default, the end user must supply the path to the network folder where runs will be copied for further analysis.



NOTE

The user needs write permissions for the network folder where data will be transferred.

5.1 Purpose of the Illumina Event Scripts

- Copy run folder contents to the network
- Optionally copy raw data images to the network
- Launch Run Browser automatically to view run performance reports
- Launch GoldCrest (if IPAR is disabled) to provide input data to Run Browser.
- Delete raw images from the local run folders after they have been archived

5.2 Mechanics of the Illumina Event Scripts

This section describes how the Illumina event scripts are deployed, configured and enabled, as well as how to monitor their activities for performance and errors.

The Illumina event scripts are deployed in a dedicated folder in the C:\Illumina\SCSx.x folder on the GA computer, and in the C:\Illumina\IPARx.x folder on the IPAR server. The folder is named "EventScripts" for all officially released installations.

On the GA computer, the events are configured in GalaxyRunConfig.xml as described below. On the IPAR computer, there is no configuration file for events, but the behavior is controlled by the parameters passed in by the IPAR application. Those parameters are in turn controlled by configuring IPAR.

5.2.1 GalaxyRunConfig and SetRunConfig

These two files exist only on the GA instrument control computer. They do not exist in the IPAR server. In the C:\Illumina\SCSx.x root installation folder there are two files. GalaxyRunConfig.xml contains all the control settings for the event scripts. These are discussed in detail below in Section 5.3. The second file is SetRunConfig.exe which is required to process GalaxyRunConfig.xml.

The run start event script will invoke SetRunConfig using the relative path ..\..\SetRunConfig.exe. This is because the starting folder for all events is the DataCollection\bin\release folder.

The SetRunConfig.exe program checks the GalaxyRunConfig file for completeness and correctness (of expected elements). The EventScriptsRoot element is used to create a command file named SetScriptFolder.bat described below.

The SetRunConfig.exe program creates "tag" files in the Event Scripts folder for each option that has been enabled. Subsequent scripts can look in the script root folder to see if an option file exists. If the tag file for the option is present, then the option has been enabled at run start. If the tag file does not exist, the option is disabled. These options and their corresponding tag files are discussed in Section 5.3 below.

5.2.2 Script Root Folder

There are script root folders on both the GA computer and the IPAR server. On the GA, the script root folder is C:\Illumina\SCSx.x\EventScripts and on IPAR it is C:\Illumina\IPARx.x\EventScripts.

On the GA computer the SetScriptFolder.batch file is located in the root installation folder, C:\Illumina\SCSx.x which is accessible as the relative path "..\..\SetScriptFolder.bat" from an event script that has been invoked by the Data Collection software. On the GA computer, this batch file is created automatically at run start as explained in Section 5.2.1 above.

On the IPAR computer, the SetScriptFolder.batch file is located in the IPAR root installation folder C:\Illumina\IPARx.x which is accessible as the relative path "..\..\SetScriptFolder.bat" from event scripts launched by the Data Analysis software. Note that this batch file is not created every run like the GA version of this file. Instead, it is fixed during the IPAR installation and should not be changed or deleted.

5.2.3 Event Binding

Events are bound using the RunConfig.xml file for the GA and the StargazerShell.xml file for IPAR. These are just as described above in Section 3.2 and Section 4.2 respectively.

5.2.4 Event Log Files

The log files have changed in this release. Previously nfn.log and netcopy.log were created (overwritten) in the event scripts folder when a run started. The logs have been renamed; nfn.log is now named Events.log and netcopy.log is named Robocopy.log. These new logs are always put in the local run folder so they won't be overwritten. They are copied to the network run folder when network copying is enabled.

On the IPAR side, the same logs are created with a prefix to distinguish them from the GA logs. The IPAR_Events.log and IPAR_Robocopy.log files are created in the IPAR server run folder, and are also copied to the network run folder when network copy is enabled.

5.2.5 IPAR Event Script Configuration

As mentioned, there is no file in IPAR analogous to the GalaxyRunConfig.xml file on the GA computer. There is only one option that can be configured for the IPAR events, namely image archiving. This option is controlled via the Analysis.xml file located on the GA computer. This is an important distinction, since the IPAR bin\config folder may also have a copy of Analysis.xml. However it is the file on the GA computer that controls IPAR archiving. The GA passes this information to IPAR when a new analysis session begins (archiving for IPAR means that IPAR will save images in a dedicated network location.)

If the AutoArchive element is set to "true" in Analysis.xml, then IPAR will archive images and the IPAR side event scripts will participate in this archiving. Conversely, if AutoArchive is set to "false" then IPAR does not save images.

Note that there is a related attribute, ArchiveRoot, in Analysis.xml. This field is mandatory. It must have a valid network path, whether images are being archived or not. This network path is required by IPAR to put the analysis results and other contents of the run folder.

5.3 GalaxyRunConfig Settings

GalaxyRunConfig.xml and SetRunConfig.exe must both be located in the root SCSx.x folder, e.g. for release 2.01 it must be in the folder C:\Illumina\SCS2.01. This section discusses in detail the elements in GalaxyRunConfig and their attributes, and how they control the event script behavior.

The GalaxyRunConfig config file is organized into sections covering the different tasks required of the event scripts. The sections are:

- **EventScripts** – organization of the event scripts themselves
- **RoboCopy** – available data copy options implemented with Robocopy.
- **RoboMirror** – mirroring options for GoldCrest base calling
- **GoldCrest** – options for the GoldCrest run QC application.
- **RunBrowser** – options for the RunBrowser application for reviewing run performance
- **PerfMonitor** – optional low level performance monitoring

5.3.1 EventScripts

The element in the section EventScripts is described below.

Element	Description
EventScriptsRoot	<p>The EventScriptsRoot is a critical element for proper deployment of event scripts. It must contain the fully specified path to the event scripts folder, e.g. "C:\Illumina\SCS2.01\EventScripts". This field will be processed by the SetRunConfig program which is executed at the run start event.</p> <p>SetRunConfig.exe will copy the path from the EventScriptsRoot element of GalaxyRunConfig.xml to a special command file "C:\Illumina\SCS2.01\SetScriptFolder.bat" which subsequent event scripts can find with the relative path "..\..\SetScriptFolder.bat".</p>



CAUTION

The EventScriptsRoot field is fixed for each release, and should not be modified by the end users.

5.3.2 Robocopy

The elements in the section Robocopy are described below.

Element	Description
EnableNetworkCopy	This element is either "true" or "false" to control whether the GA computer will do any network copying. Normally, this flag is always set to "true" to enable the GA computer to upload the run performance data and (optionally) images to a network file system. If it is set to "false" there is no network copy at all from the GA.
NetworkCopyRootFolder	<p>This element contains a fully specified network folder location which the GA will use as the root folder for creating and storing the actual run folders. Note that this is the only place that controls where the GA will store run data and images. IPAR has its own place to specify the network run folder.</p> <p>Full specified means it starts with the network computer name and defines the public path to the desired root folder, for example \\myserver\shared\GA_runs.</p>
CopyImageFiles	This element is either "true" or "false" to control whether SCS will copy the raw image data up to the network run folder. As long as the EnableNetworkCopy element is true, the GA software will always copy the results and run performance data to the network. In order to copy images, this field must be set to "true" also. Note that when CopyImageFiles is "true" the EnableNetworkCopy must also be "true" and NetworkCopyRootFolder must have a valid network path.
YYMMSupport	This element controls whether the string "YYMM" in the NetworkCopyRootFolder element will be automatically translated into a 2-digit year and 2-digit month string. This allows runs from different months to be saved in different folders. When set to "true" the YYMMSupport element causes SetRunConfig.exe to do the automatic substitution of YYMM for the current year and month, for example 0804 for April, 2008.
DeleteFilesAfterNetCopy	This element controls whether images will be removed from the local run folder after they have been successfully copied. This is normally "true" because deleting old images is required in order to have sufficient space for the long runs and paired end runs that are enabled with SCS2.0.
CleavageImages	<p>Older protocols separated the cleavage (deblock) chemistry from the subsequent incorporation chemistry, putting a cleavage imaging cycle as a QC check. The idea was to make sure that the cleavage was effective by checking that the images are blank.</p> <p>In these older recipes, the event scripts split the network copy between the cleavage chemistry and the incorporation chemistry, moving 4 lanes during each. Although this is rarely done any more, the support is still available in this release.</p> <p>The CleavageImages attribute is set to "true" for recipes that do cleavage cycle imaging, and is set "false" otherwise and by default.</p>
CopyGoldCrestRunbrowserData	This element enables copying the RunBrowser data to the network run folder. The RunBrowser data is created either by feedback from the IPAR server, or by running the external GoldCrest application in parallel with data acquisition. The value can be either "true" or "false" and is "true" by default.

5.3.3 GoldCrest

The elements in the section GoldCrest are described below.

Element	Description
GoldCrestExe	This element defines the fully specified path to invoke the GoldCrest.exe application which is used to produce run quality data for review by the RunBrowser.
EnableServiceRecipeGoldCrest	This element is always set to "false" for IPAR based systems. For older GA systems, this element controls whether GoldCrest is automatically launched in parallel with recipes that have the "type = Service" attribute set. The first base incorporation QC recipe is a service recipe and needs to have GoldCrest running in order to get the QC data for the flow cell.
EnableNormalRecipeGoldCrest	This element controls whether the string "YYMM" in the NetworkCopyRootFolder element will be automatically translated into a 2-digit year and 2-digit month string. This allows runs from different months to be saved in different folders. When set to "true" the YMMMSupport element causes SetRunConfig.exe to do the automatic substitution of YYMM for the current year and month, for example 0804 for April, 2008.

5.3.4 RunBrowser

The elements in the section RunBrowser are described below.

Element	Description
RunBrowserExe	This element defines the fully specified path to invoke the RunBrowser.exe application.
EnableRunBrowserAutoLaunch	This element enables the RunBrowser to be automatically launched at the end of a run, and at the end of a first base incorporation QC step. It is "true" by default.

5.3.5 Robomirror

The elements in the section Robomirror are described below.

Element	Description
CopyGCBCFiles	This option is a deprecated option for internal R&D that is seldom used anymore. This feature will not be supported in any future release. It was used for GoldCrest base calling.
GCBCExcludeDir	This option is a deprecated option for internal R&D that is seldom used anymore. This feature will not be supported in any future release. It was used for GoldCrest base calling.

5.3.6 PerfMonitor

The element in the section PerfMonitor is described below.

Element	Description
EnablePerfMonitor	This element is for internal R&C engineering use, to monitor the various subsystems for performance analysis tuning.

5.4 Network Copy Overview

Network copy is required to move results, raw data and run information to a dedicated network location. The event scripts are the default mechanism provided by Illumina to accomplish network copy. In IPAR based systems, both the GA computer and the IPAR server participate in copying results and logs up to the network run folder. In standalone (non-IPAR) systems, the GA computer is solely responsible for copying everything to the network run folder.

Details of network copy functionality for standalone and IPAR systems are covered in Sections 6 and 7 below.

6 Network Copy for Standalone GA Instruments

The new event scripts provide essentially identical network copy functionality for the standalone GA instrument as in previous SCS1.0 release. The `GalaxyRunConfig.xml` file, located in the `C:\Illumina\SCS2.x` folder is used to set up and control network data copy behavior. For details, refer to Section 5.2 *Mechanics of the Illumina Event Scripts*, and Section 5.3 *GalaxyRunConfig Settings*.

One change from the previous SCS1.0 release is that the event script log file is named `Events.log` and is kept in the run folder, instead of the event scripts folder. This prevents it from being overwritten for each run. Similarly, the Robocopy log is named `Robocopy.log` and is also maintained in the run folder.

Another change from previous releases is the creation of a special tag file in the network run folder, `GA_Netcopy_Complete.txt`, which indicates that all data copy and image copy has completed at the end of the run. This allows server side scripts to know when the pipeline can be started.

6.1 Run Start

At the run start event, the network path in `GalaxyRunConfig` is tested. The run folder and the `Config` subfolder are created, and the `PermissionsTest.txt` file is copied. These operations verify that we have the required permissions on the network file system. Any errors cause an interactive dialog with the operator to try to correct the problem by entering a new network path.

6.2 Cycle Complete

On the imaging cycle completion events, the log files are copied to the network run folder. At the end of the first imaging cycle, all files in the local run folder, along with the `Config` and `Calibration` sub-folders are copied to the network run folder. From cycle 2 onwards, the images from the preceding cycle are moved to the network run folder. Two special files are updated to the network run folder at the end of each cycle – namely the `commandIndex.bin` file which marks the progress in the protocol (so that we can open the protocol from the run folder and continue) and the `.params` file used by the analysis pipeline. Finally, the `GoldCrest` files are copied to the network run folder each cycle, for use by the run browser.

6.3 Run Complete

The run completion event is signaled when the last operation in the protocol has completed. The images from the final imaging cycle are moved to the network run folder. The entire images folder is checked and any images not moved in previous cycle completion events are moved now.

If `GoldCrest` has been running, we will wait for `GoldCrest` to create the “process.completed” file to indicate that all Run Browser data has been written. Then we will move the `GoldCrest` data up to the network run folder, including `GoldCrest` logs, csv files, xml files and the `.params` file.

All the logs and other files in the top of the run folder are copied and the GA_Netcopy_Complete.txt is created to indicate that the network run folder is up to date and all copy operations are complete.

6.4 Other Events

In this release, all events have associated scripts. In previous releases, there were no scripts associated with the run error event, the run stop event or the run resume event. The default event scripts in this release cover those three events even though there is no network copy function associated with them. The run stop, run resume and run error events only put entries in the events log with time stamps.

7 Network Copy for Instruments with IPAR

With IPAR based systems there are now two computers copying (moving) information to the network run folder. The IPAR server has the primary responsibility for moving images to the network run folder (this is the IPAR "archiving" feature discussed earlier.) The GA computer is configured to run as a failsafe in case the IPAR server has a problem. Since the GA event scripts move images for the previous cycle, there is normally no actual copying from the GA computer, since the IPAR server has already copied them to the network run folder at the end of the current cycle. But if IPAR stops functioning, the GA computer will move all images so that at the end of the run, all required files are available for the analysis pipeline.

IPAR creates the image processing results in the same way as the first stage of the analysis pipeline (a.k.a. Firecrest). There are two types of IPAR results files – compressed and uncompressed. The compressed (.gz) files contain the intensity data. These files are copied at the end of the run. All other analysis files (e.g. the .clu files) are uncompressed, they contain auxiliary image analysis information and are copied to the network location after each cycle.

7.1 Network Copy Options

There are 3 supported scenarios for IPAR data and results management. They are discussed below. The preferred option for the SCS2.01/IPAR1.01 release is listed first (IPAR save images with the GA acting as a failsafe in case of errors on the analysis server). The configuration file settings for the three options are listed in the table below.

7.1.1 IPAR Saves and Transfers Images to the Network Run Folder in Addition to its Results Files and Logs

The GA computer will also save images, but one cycle later, as a backup in case IPAR stops. Images and results need to be the same network destination in this case.

7.1.2 IPAR Will Save and Move Results Only, Images Are Not Saved on the Network

Only results get saved. All analysis logs, runbrowser data and IPAR results go to same network folder.

7.1.3 GA Instrument Computer Moves Images to the Network Run Folder

Images, Analysis logs and RunBrowser data *may* go to a separate network location from the IPAR results.

Configuration File Settings for Data and Results Copying

	Enable Network Copy (GRC)	SCS Save Cluster Images (IP)	Copy Image Files (GRC)	Delete Files After NetCopy (GRC)	Copy GoldCrest Runbro Data (GRC)	IPAR Enabled (RC)	IPAR Save Images (SGS)	IPAR Image Archive (An)	IPAR Archive Root (An)
[7.1.1]	True	True	True	True	True	True	True	True	Valid path
[7.1.2]	True	False	False	False	True	True	False	False	Valid path
[7.1.3]	True	True	True	True	True	True	False	False	Valid path

Key: GRC- GalaxyRunConfig.xml RC- RunConfig.xml IP- ImagePath.xml SGS- StargazerShell.xml An- Analysis.xml

7.2 Run Start

7.2.1 GA Run Start Event

On the GA computer, the Run Start event function is the same as previously described in Section 6.1

7.2.2 IPAR Run Start Event

At the run start event, the network path is tested to verify that we have the required permissions on the network file system. Unlike the GA script, which reads the network path from GalaxyRunConfig.xml, the IPAR script receives the network path as a parameter. This path is originally defined by the AnalysisRoot attribute in the GA configuration file Analysis.xml. When a run is started, the GA software begins a new IPAR analysis session, and passes this information to the IPAR software. The IPAR software then passes this network path to the event scripts.

To test the validity of the network path, the Run Start script creates the run folder and creates one sub-folder IPAR_Config. Then it creates a file named IPAR_PermissionTest.txt. If these operations are successful, the access to the network is verified, and IPAR network copy is enabled. If there are any errors a message is displayed to the operator, the script returns an error status, and the run is stopped. In order for IPAR to run there must be a valid network run folder for transferring results.

7.3 Cycle Complete

7.3.1 GA Cycle Complete Event

On the GA computer, the Cycle Complete event function is the same as previously described in Section 6.2

7.3.2 IPAR Cycle Complete Event

Only images are copied from IPAR when processing the cycle complete events. There are two settings required for IPAR image copying. In the Analysis.xml file on the GA computer the AutoArchive attribute must be set to "true". In the StargazerShell.xml file on the IPAR computer, the Images attribute must be set to "true" in the Save element.

When IPAR is performing image analysis during an imaging cycle, it will attempt to archive (move to dedicated network location) as many image files as possible before the end of the cycle. When the last tile of the cycle has been processed it will stop archiving for that cycle. When IPAR archives an image file, it resets the archive ('a') property of the file. It may not be able to archive all images during the cycle. The cycle complete event script will pick up where IPAR left off and finish transferring all images for the cycle

that has just completed. It will only transfer image files which still have the 'a' archive property set. Then the script will delete all images for that cycle in the local run folder.

7.4 Run Complete

7.4.1 GA Run Complete Event

On the GA computer, the Run Complete event function is the same as previously described in Section 6.3

7.4.2 IPAR Run Complete Event

The IPAR run complete event is responsible for copying all image processing results to the network run folder. These results cannot be sent during the cycle completion events while the run is going on because the results files are not complete until the last cycle has been processed.

The IPAR run complete event will pause at the outset to allow the cycle complete event script to finish processing the last imaging cycle. Then it copies all the results from the Data subfolder, which includes the zipped intensity files and the Firecrest subfolder files. This results data is approximately 100 gigabytes for a 36 cycle run.

The run complete event will also check the Images folder to make sure that all images were transferred successfully to the network server. And finally it moves all the logs from the root of the run folder to the network run folder.

7.5 Analysis Error

This event only occurs on the GA computer. If an error happens during analysis, the error report is sent to the GA and the Analysis Error event is triggered. The error is logged in the events log and then image copy is automatically enabled for the GA events. Since the IPAR analysis software is stopped, we need to make sure that the GA side copies all the images up to the network run folder so we can do offline analysis. The Run Start event script will be called if necessary from the Analysis Error script, in order to make sure all required information is available for the Cycle Complete scripts to copy the images.