Technical Note

E-Prime and The Observer XT

Noldus
Information Technology

Documentation: Fabrizio Grieco, Olga Krips, Viktor Kovacs.

March 2021

For The Observer XT version 16 and E-Prime Professional version 3.0

Noldus Information Technology bv

International headquarters

Wageningen, The Netherlands

Telephone: +31-317-473300

Fax: +31-317-424496

E-mail: info@ noldus.nl

For addresses of our other offices and support, please see our web site www.noldus.com.

Table of Contents

1. Introduction 4

ABOUT THIS TECHNICAL NOTE - 4

THE OBSERVER XT AND E-PRIME: WORKFLOW - 5

PREREQUISITES - 6

2. Install the software 8

ON THE OBSERVER XT PC - 8

ON THE E-PRIME PC - 8

3. Set up communication 9

THE OBSERVER XT PC - 9

THE E-PRIME PC - 11

4. Prepare the experiment in E-Studio 13

SPECIFY THE EVENTS TO IMPORT - 13

SPECIFY THE EVENT PROPERTIES TO IMPORT - 16

ENSURE HIGH SYNCHRONICITY BETWEEN THE OBSERVER XT AND E-PRIME - 23

5. Acquire data 28

6. Analyze data 34

HOW E-PRIME EVENTS ARE STORED IN THE OBSERVER XT - 34

SYNCHRONICITY BETWEEN E-PRIME AND THE OBSERVER XT DATA - 38

VISUALIZATION - 38

THE E-PRIME EVENTS IN THE CODING SCHEME - 40

ANALYSIS - 42

LAG SEQUENTIAL ANALYSIS - 50

7. Advanced settings 52

8. Troubleshooting 54

1 Introduction

ABOUT THIS TECHNICAL NOTE

In this Technical Note you find all information you need to establish communication between The Observer XT and the E-Prime software for stimulus presentation, run a test and analyze the data of E-Prime and The Observer XT as one data set.

Throughout this note we assume that you are familiar with the basic use of The Observer XT and E-Prime Professional 3.0, and that you have created an E-Prime experiment in E-Studio.

After reading this note you will be able to:

- Set up The Observer XT and E-Prime to communicate with each other.
- Start recording in E-Run through The Observer XT.
- Automatically Import the E-Prime data into The Observer XT.
- Analyze the E-Prime data in The Observer XT.

You can find this technical note in PDF format in the folder **C:\Program Files (x86)\Noldus\EPrime Server**.

NOTE The Observer XT 14.1 and later versions combined with E-Prime Client/Server 1.5 and later were not tested with E-Prime 2.x. If you have E-Prime 2.0, make sure that this combination works before running an experiment.

For more information

- For more information on The Observer XT, see The Observer XT Help. To open the Help, press **F1** in the program.
- For E-Prime, see the E-Prime Reference Manual.

THE OBSERVER XT AND E-PRIME: WORKFLOW

The workflow is generally as follows:

1. Make sure that the Observer XT and the E-Prime computers are connected to the local network.
2. In The Observer XT, open the project you require.
3. In E-Studio, open the E-Studio experiment that you require.
4. Prepare the test subject in front of the test monitor.
5. In The Observer XT, start an observation. This will send a start command to E-Run.
6. Let the E-Prime experiment run as usual.
7. When the E-Studio experiment has terminated, in The Observer XT stop the observation. The E-Prime experiment events are imported automatically into The Observer XT.

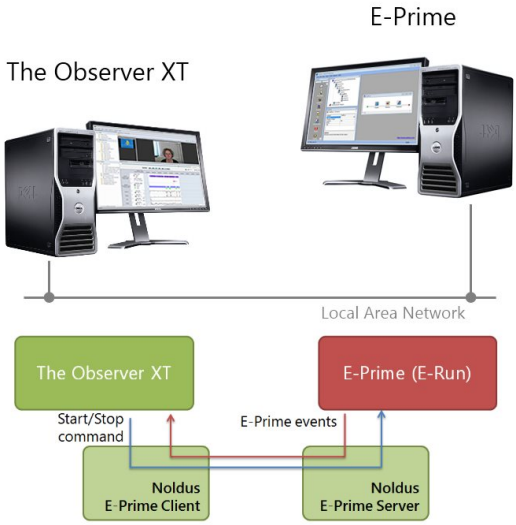


Figure 1 *Schematic representation of the physical connections and the software needed for communication between The Observer XT and E-Prime 3.0.*

TOOLS YOU NEED

In order for The Observer XT and E-Prime to communicate, you need additional software installed on your computers (Figure 1):

- **Noldus E-Prime Client 1.6**. Installed on the computer where The Observer XT is installed. See page 8.
- **Noldus E-Prime Server 1.5**. Installed on the computer where E-Studio is installed. See page 8.

  Noldus E-Prime Server also includes this technical note as documentation. You can find this technical note in PDF format in the folder **C:\Program Files (x86)\Noldus\EPrime Server**.

NOTE If you have E-Prime 3.0 and The Observer XT 14.0, update The Observer XT to 14.1 or later version. The Observer XT 14.0 only works with older versions of E-Prime Server and E-Prime Client made for E-Prime 2.x.

PREREQUISITES

Computer connection

The Observer XT and E-Prime must be installed on two separate computers, connected through a Local Area Network (LAN; Figure 1). Make sure that your connection is stable. If connection is lost once during an observation, it cannot be restored and most likely the data of that observation will be incomplete or invalid.

The Noldus E-Prime plug-in 1.5 was developed with The Observer XT 14.1, E-Prime 3.0.3.31 and E-Studio Professional version 3.0.3.18.

E-Prime add-on license

Your copy of The Observer XT can only work together with E-Prime if your Observer XT license includes the **E-Prime Tool**.

Operating system

The Noldus E-Prime Client and E-Prime Server software supports the 64 bit Professional editions of Microsoft Windows 10.

In case of complex setups

When The Observer XT and E-Prime are part of a more complex observational setup, including for example a physiological data acquisition system which uses a dedicated board on the E-Prime PC, or IP cameras, make sure that The Observer XT communicates directly with the E-Prime PC, using either a crossover cable or a dedicated network switch.

If you use a network switch to connect The Observer XT and the E-Prime computers (see Figure 2), it must have a fixed IP address with a range different from that of other switches, in order to prevent communication conflicts. For example: **192.168.0.101** for switch 1 and **192.168.1.xxx** for switch 2.

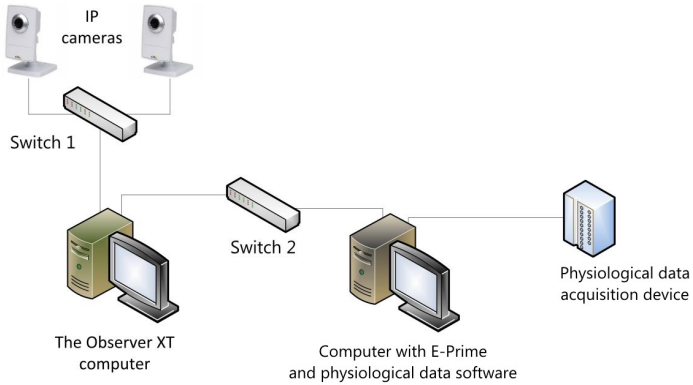


Figure 2 *Example of a complex observational system including The Observer XT, E-Prime, IP video cameras and a system for acquisition of physiological data. Make sure to connect The Observer XT computer and the E-Prime computer with a separate network switch, and the rest (IP cameras in this example) with another switch. You can also use a crossover cable to connect the two PCs instead of a network switch.*

2 Install the software

The E-Prime integration solution consists of two pieces of software:

- The E-Prime Client software, to be installed on the computer where The Observer XT is installed,
- The E-Prime Server software, to be installed on the E-Prime computer.

ON THE OBSERVER XT PC

1. Copy the file **E-Prime Client 1.6 Setup.exe** to The Observer XT computer.
2. Double-click this file and follow the instructions on your screen to install the E-Prime Client. Accept the terms in the License Agreement.

The software is installed on **C:\Program Files\Common Files\Noldus\The Observer\EPrime Client 1**.

Proceed with the next section.

ON THE E-PRIME PC

1. Copy the file **E-PrimeServer 1.5 Setup.exe** to the E-Prime computer.
2. Double-click this file and follow the instructions on your screen to install the E-Prime Server. Accept the terms in the License Agreement.

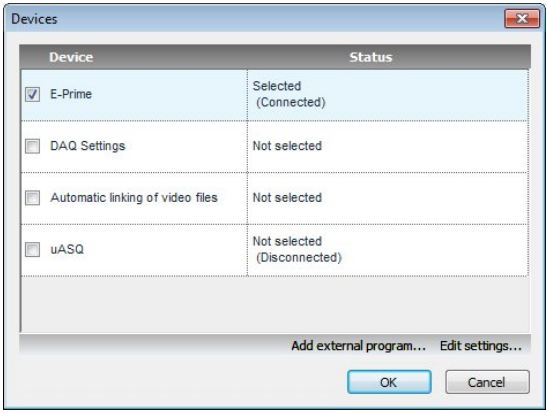
The software is installed on **C:\Program Files (x86)\Noldus\EPrime Server**. Proceed with the next section.

3 Set up communication

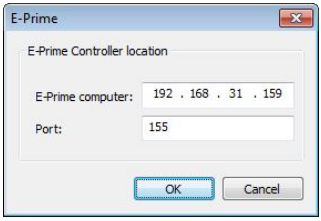
THE OBSERVER XT PC

Procedure

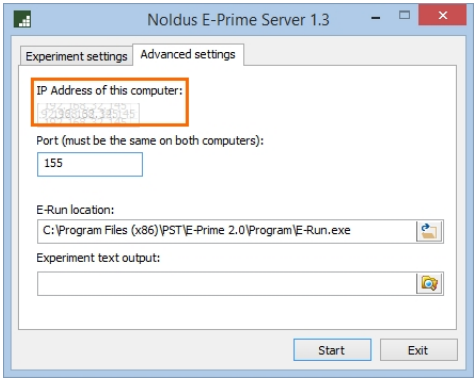
1. In The Observer XT, create a new project or open an existing one.
2. Click **Setup Project** in the main window. Under **Observation Source**, select **Live Observation**.
3. If the Devices window does not open, click **Devices** under **Live Observation**.



4. In the Devices window, select the option **E-Prime**, and double-click the cell under **Status**.
5. In the new window that appears, next to **E-Prime computer** enter the IP address of the E-Prime computer. Leave the **Port value** as **155**.



To obtain the IP address of the E-Prime computer:
On the E-Prime computer, start the **Noldus E-Prime Server**, then click the **Advanced settings** tab. The window that appears contains the E-Prime Controller IP address.



6. Click **OK**, then **OK** in the Devices window.
7. Proceed with the settings on the E-Prime PC (next section).

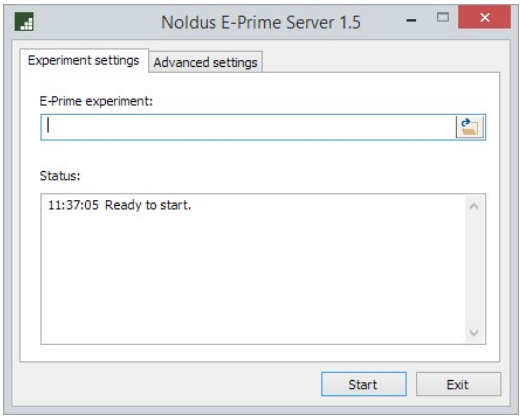
Notes

- You can also use a port number other than the default 155, but you must set it in both The Observer XT and in E-Prime Controller.
- If the E-Prime item does not appear in the Devices window, check that the E-Prime Client software is installed (page 8) and that your license includes the E-Prime add-on (page 6).
- Some Firewalls can block communication ports. If port 155 is blocked, ask your system administrator to find a free port that is

not blocked. Select this new port number in step 5 above and in the **Advanced settings** of the E-Prime Server (see page 52).
Alternatively, let your system administrator create an exception in Windows Firewall for port 155.

THE E-PRIME PC

1. On the E-Prime PC, start **Noldus EPrime Server**.



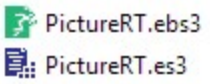
2. On the **Experiment Settings** tab, browse to the experiment file you want to use (***.ebs3**).

3. Click **Start** to activate Noldus E-Prime Server. From this moment on, it will accept messages from The Observer XT.

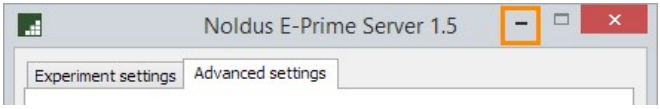
Notes

- For E-Prime 2.0, the file extension is ebs2. **NOTE** E-Prime 2.0 was not tested with The Observer XT 14.1 and later versions.
- Notice the difference between the file extensions: **.es3** is the extension of E-Studio files, which specify the experimental procedure. The extension **.ebs3** is of the E-Basic script file generated for that experiment. In order to have a **ebs3** file in your experiment

folder, generate it in E-Studio: choose **E-Run** > **Generate**. The experiment folder now also contains the ebs3 file.



- E-Prime Server can only be started once. If you start it multiple times, the **Noldus E-Prime Server** window comes on top of your screen.
- Do not click **Exit** until you are done with data recording. Instead, click the **Minimize** button or the Close (**X**) button.



- For the **Advanced settings** see page 52.

4 Prepare the experiment in E-Studio

SPECIFY THE EVENTS TO IMPORT

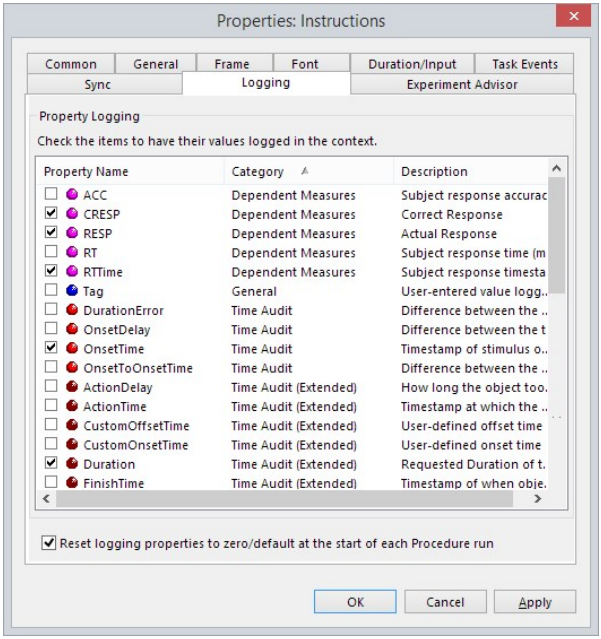
A typical E-Prime experiment consists of a number of E-objects (instructions, stimuli, feedbacks) organized in nested sequences called procedures. Follow this section to specify the E-objects that you want to import in The Observer XT, and their properties.

1. Start E-Studio and open your experiment.
2. In the Experiment Explorer window, double-click one of the E-objects in your procedure.
3. In the window that appears, click the **Properties** button (this is located just under the window's title bar).

4. Click the **Logging** tab. Follow all steps below.

Default parameters

5. Make sure that **OnsetTime** and **Duration** are selected. System events like the presentation of a stimulus will be imported in The Observer XT as state events for the subject **System** using these properties. See **HOW E-PRIME EVENTS ARE STORED IN THE OBSERVER XT** on page 34.



Properties for User responses

6. For the experiments in which a response is given by the test participant after presentation of a stimulus, make sure that the following items are selected:

- **CRESP** (Correct Response)
- **RESP** (Actual Response)
- **RTTime** (Subject response timestamp)

The participant responses will be imported in The Observer XT as point events for the subject “User” (see page 34).

7. Click **OK**.

Repeat the steps 2 to 7 for all the other objects you are interested in.

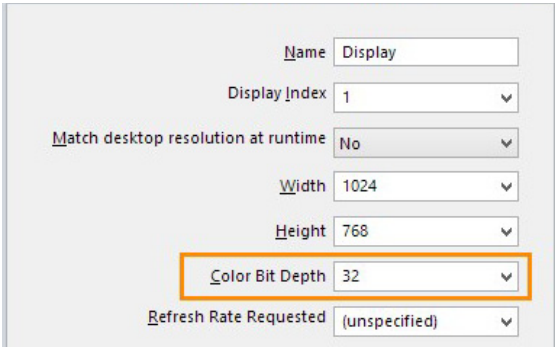
DISPLAY SETTINGS

E-Prime experiments in Windows 10

Windows 10 only supports 32 bit color depth. However, when an E-Prime experiment that was created in a prior version of E-Prime and with a bit depth lower than 32 is loaded into E-Prime 3.0, E-Prime keeps the originally-specified color depth setting. This may affect the E-Prime correct functioning.

To check that the Color bit depth is correct.

1. In E-Studio, choose **Edit** > **Experiment** (**Ctrl+E**).
2. Click the **Devices** tab, then double-click **Display**.
3. Next to **Color Bit Depth**, select **32** if not selected already.



IMPORTANT You must follow this procedure for any experiment that you open on that computer.

For a more general solution for Windows 8 and 10 computers, see the web page:

https://support.pstnet.com/hc/en-us/articles/115001493487-INFO-Windows-8-DirectX-11-or-greater-detected-23888-

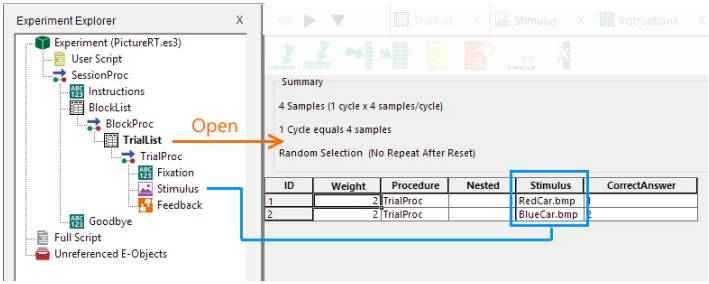
SPECIFY THE EVENT PROPERTIES TO IMPORT

For some events you may want to import additional information to The Observer XT, like the name of the picture used as a stimulus. This information can be imported as modifiers. See **HOW E-PRIME EVENTS ARE STORED IN THE OBSERVER XT** on page 34 for the way The Observer XT handles the E-prime data.

General rule

The Observer XT imports the object property that, in the Trial List, has the same name as the object. The values in the column cells are imported as modifiers.

In the example below, the object in the procedure is named **Stimulus**. Of this object, The Observer XT imports the values in the column **Stimulus** of the Trial List, **RedCar.bmp** and **BlueCar.bmp**. They are imported as modifiers of the behavior **Show Stimulus**.

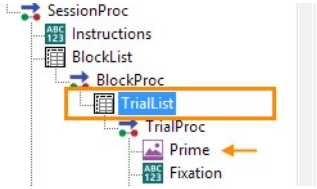


Example 1: To import stimulus file names

An image E-object has been inserted in a procedure, and named **Prime**. The trial list specifies that for **Prime** an image will be chosen randomly between the available image files, and displayed on the test participant monitor. The researcher requires that, for each instance of image presentation, the image file name is imported in The Observer XT as a modifier of the event “Show Prime”. For example, “Show Prime - Flower_12.bmp”.

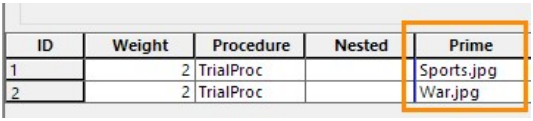
1. Open the experiment in E-Studio.

2. In the Experiment Explorer window, double-click the list in which the object is located.



3. In the list properties window, click the **Add attribute** button. Enter the name as the object (in this example, **Prime**).

4. Fill in the cells in the new column with the names you want to import (in this example, the name of the image files for Prime).

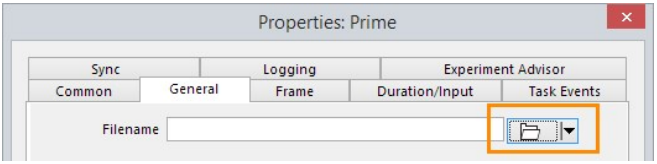


ID	Weight	Procedure	Nested	Prime
1	2	TrialProc		Sports.jpg
2	2	TrialProc		War.jpg

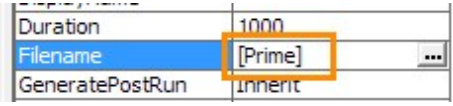
5. In the Experiment Explorer window, click the E-object again.

6. **IMPORTANT** If the attribute value is a file (image, video, etc):

   a In the **Properties** window locate the **Filename** item. In the field next to it, click the **Browse** button and select the folder that contains the stimulus files, then click **OK**.



   b In the field next to **Filename**, type in the object name in brackets [ ]. In this example: **[Prime]**.



7. Run the experiment in E-Studio (**E-Run** > **Run** or **F7**).

8. The experiment is ready to work with The Observer XT. The value of the attribute in a specific trial will be imported as a behavior modifier in the group **Media**. For example:

Time	Subject	Behavior	Modifier
86.330	System	Show Prime	Sports.jpg
88.330	System	Show Prime	Sports.jpg

Notes

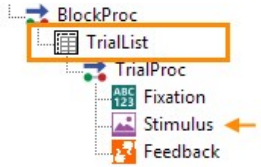
- For correct import into The Observer XT, the name of the attribute must be the same as the name of the object, including the case.
- It is not possible to import two or more attributes to the same object.

  For example, a stimulus object has two attributes, **File** (with the image file names as values) and **CorrectAnswer** (with values 1 or 2). For this object, you can import either the image file name or the correct response as a modifier, not both. In the first case you rename **File** as the object name, in the second you rename **CorrectAnswer** as the object name.
- It is not possible to change the name of the modifier group **Media** in The Observer XT.
- See also ***Example 3: To import responses as numerical modifiers*** on page 20.

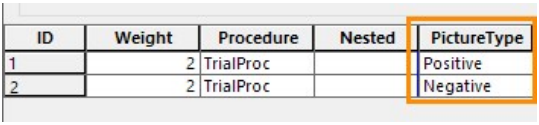
Example 2: To Import non-filenames

A stimulus has an attribute named **PictureType** with possible values **Positive** and **Negative** defined in the Trial List. For each stimulus event, the corresponding value must be imported in The Observer XT as modifier of the behavior **Show Stimulus**.

1. In E-Studio, open the experiment.
2. In the Experiment Explorer window, double-click the list in which the object is located.

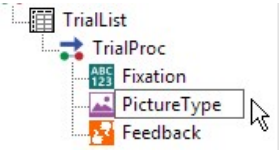


3. In the list properties window, take note of the attribute that contains the values to import (in this example, **PictureType**).



ID	Weight	Procedure	Nested	PictureType
1	2	TrialProc		Positive
2	2	TrialProc		Negative

4. Rename the object as the attribute.



5. Run the experiment in E-Studio (**E-Run** > **Run** or **F7**).

6. After that, the experiment is ready to work with The Observer XT. The value of the attribute in a specific trial will be imported as a behavior modifier in the group **Media**. For example:

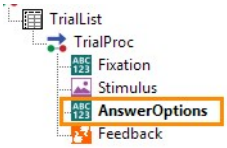
Time	Subject	Behavior	Modifier
89.414	System	Show PictureType	Positive
90.617	System	Show PictureType	Positive

Example 3: To import responses as numerical modifiers

Attributes that are imported as modifiers are by default nominal. This means that you can calculate durations and frequencies, but not average values or other numerical statistics. If this is what you want, for example to calculate the average rating for the pictures that are shown, you must specify additional settings for the attribute.

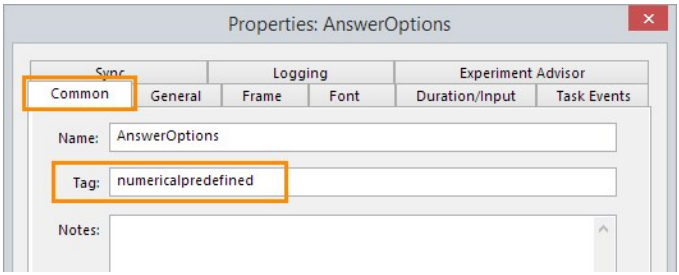
IMPORTANT If your E-Prime experiment includes the possibility to give numerical responses to a stimulus, these must be scored during the test. If you skip a numerical response, this will result in errors in the event log in The Observer XT.

1. Open the experiment in E-Studio.
2. In the Experiment Explorer window, double-click the element with the numerical response options.



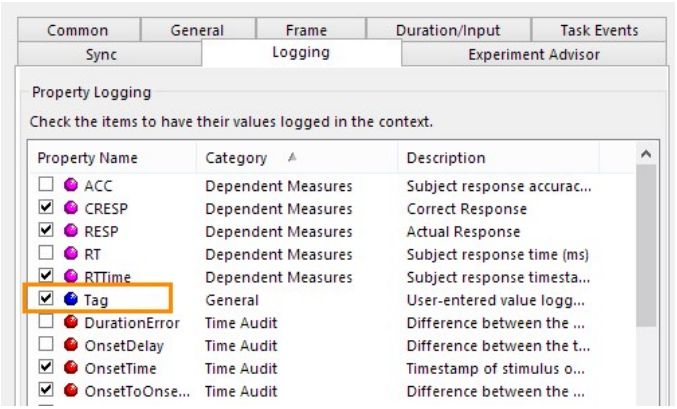
3. In the window that opens, double-click the **Properties** button.

4. Open the Common tab and in the **Tag** field enter the following:



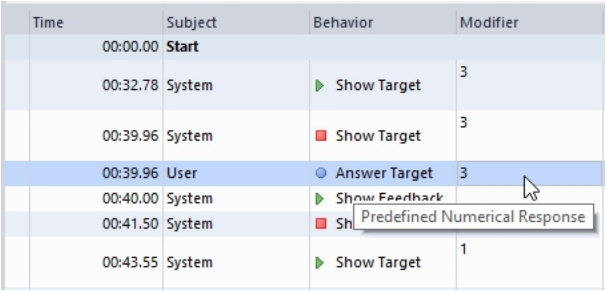
numericalpredefined for response options with predefined values.
numericalrange for response options within a range.

5. Click the Logging tab and select **Tag**.



6. Run the experiment in E-Studio.

7. After that, the experiment is ready to work with The Observer XT. The values of the attribute in a specific trial will be imported as numerical modifiers. For example:



Notes

- The tag you specified in step 4, is present in the log file of the E-run experiment, which is the text file present in the same folder as your experiment. See the picture below for an example.

```
AntwOptions.RT: 728
AntwOptions.RESP: 1
AntwOptions.CRESP:
AntwOptions.Tag: numericalpredefined
*** LogFrame End ***
```

- You can specify one response for each stimulus for import into The Observer XT. Multiple answers per stimulus is not supported.
- If you want to use numbers as responses, do not use an existing project created in The Observer XT 13 or earlier. Since this option did not exist in a previous version, it will result to errors in the Event log. Create a new project instead.

ENSURE HIGH SYNCHRONICITY BETWEEN THE OBSERVER XT AND E-PRIME

In order to ensure synchronicity with E-Run, The Observer XT needs to acquire the time information with the highest accuracy. To do so, it uses a **package** that runs in the E-Prime experiment. You must specify this package in all your experiments that work together with The Observer XT.

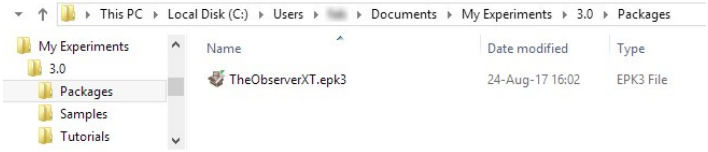
NOTE A package is a re-usable block of E-Basic script that you can add to E-Prime experiments via the **PackageCall** objects.

Procedure

1. With the File Explorer, make sure that the file **TheObserverXT.epk3** is present in the following two locations:

   C:\Users\[user name]\Documents**My Experiments\3.0\Packages**

   This is the default E-Prime search folder for packages.



   NOTE If you use E-Prime 2, the correct folder for this package is C:\Users\[user name]\Documents\My Experiments\Packages. The package file extension is epk2.

   The second location is C:\Program Files (x86)**Noldus\EPrime Server**.

   This is the installation folder of Noldus E-Prime Server. This package must be in that folder only if you installed Noldus E-Prime Server with a user account different from that you use when working with E-Prime. If the package file is not present, repeat installation of Noldus E-Prime Server.

   NOTE If you use E-Prime 2, the correct folder for this package is C:\Program Files (x86)\ Noldus\EPrime Server. The package file extension is epk2.

2. Specify the Packages Search Folders in E-Studio.

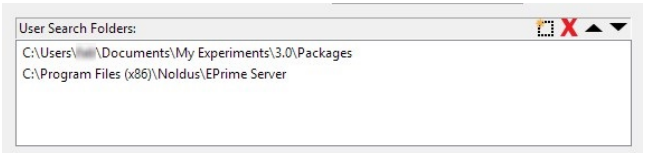
   a In E-Studio, choose **Tools** > **Options** > **Packages**.
   Under **User Search Folder** you should see the default folder
   C:\Users\[user name]\Documents\My Experiments\3.0\Packages

   NOTE For E-Prime 2.0, the folder is C:\Users\[user name]\Documents**My Experiments\Packages**.

   b Under **User Search Folder** you should see a second location (C:\Program Files (x86)\Noldus\EPrime Server). If that is not the case, click the **New** button.

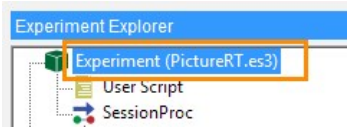
   Browse to **C:\Program Files (x86)\Noldus\EPrime Server**, then click **OK**.

   c Now the Packages tab in the Options window should look like this:

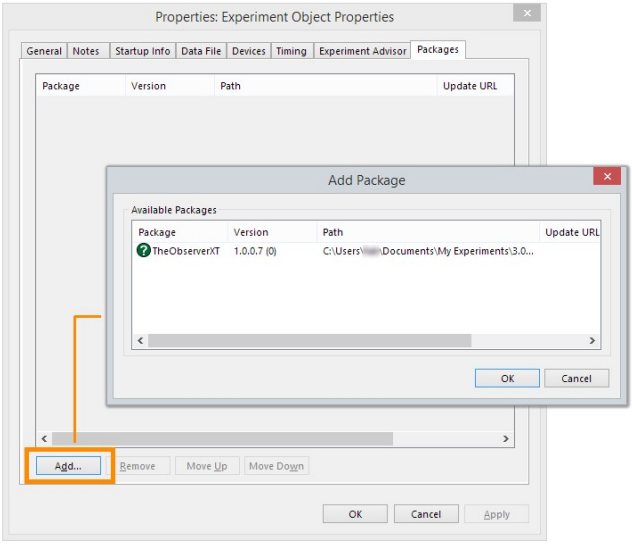


3. Specify the **TheObserverXT** package file in the E-Studio experiment.

   a In E-Studio, open the experiment, and in the Experiment Explorer window double-click the experiment name.

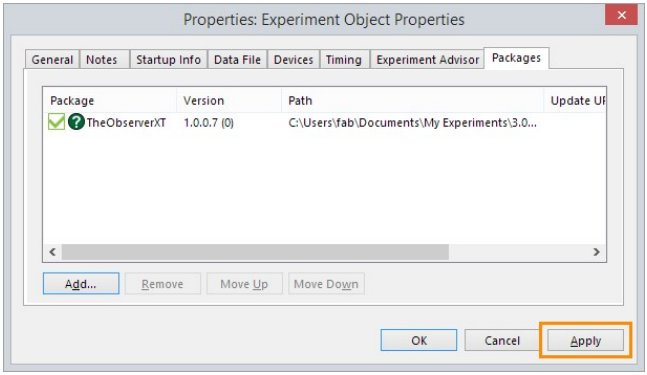


   b Click the **Packages** tab, then click the **Add** button.



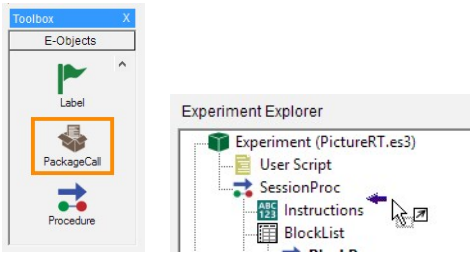
c Select **TheObserverXT**, click **OK**. If this package is not visible, restart E-Studio.

d Click **Apply**, then **OK**. The package can now be inserted in the experiment.

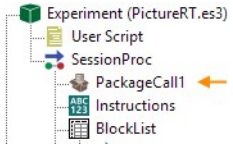


4. Insert the **PackageCall** in the E-Studio experiment.

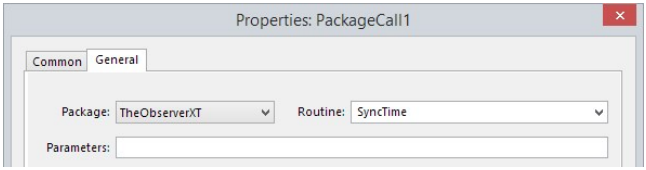
   a In the Toolbox window, locate **PackageCall**, and drag it to the beginning of the first procedure.



   b Result: An object named **PackageCall1** is inserted.



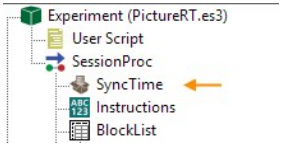
   c Double-click **PackageCall1**, click the General tab, and from the **Package** list select **TheObserverXT**. From the **Routine** list select **SyncTime**.



   d Click the **Common** tab. Ignore the warning and click **OK**.

   e Next to **Name**, rename **PackageCall1** to **SyncTime**, and click **OK**.

   f Result: In the **Structure** window, the **PackageCall** object is now named **SyncTime**.



5. Run the experiment once (**E-Run** > **Run**, or press **F7**) then save the experiment.

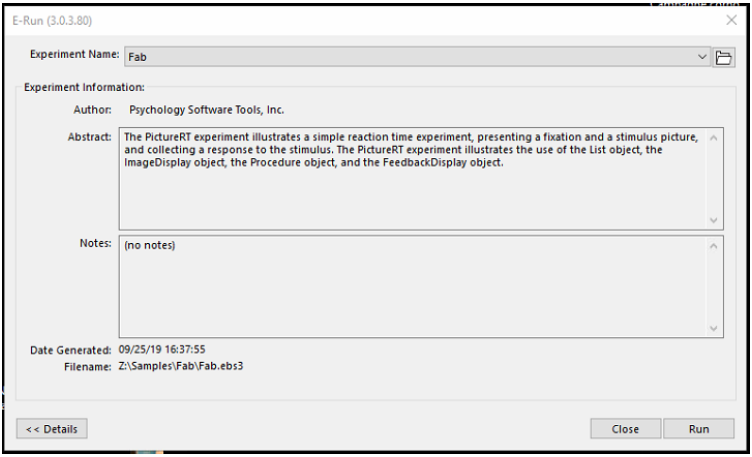
Notes

- The SyncTime routine of the **TheObserverXT** package reads the timestamps with high accuracy from E-Run, and writes it down in a text file named **NoldusSync.txt**. This time will be read by Noldus E-Prime Server when sending the E-Prime data to The Observer XT PC.
- The file **NoldusSync.txt** is stored in the same location as that of the experiment file.
- If the **TheObserverXT** package is not added to your E-Prime experiment, when importing the data from E-Prime The Observer XT shows a message in the **Comment** column of the first line of the E-Prime event log, that accurate synchronization is not possible for that E-Prime data set. The E-Prime event log is still added to the observation, but aligned with the Observer XT data with a 1-second accuracy.
- If you use E-Prime 2.0, see the Technical Note - E-Prime - The Observer 12.5, which you can also find on the Observer XT 12.5 download web page.

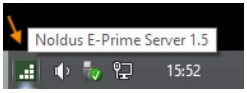
5 Acquire data

THINGS TO CHECK FIRST

1. On the E-Prime PC, make sure to close the E-Run window.



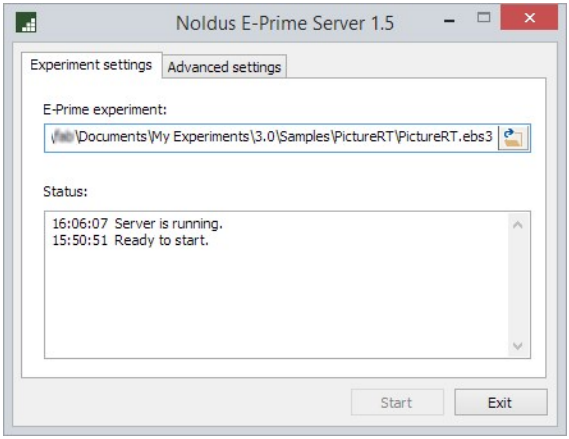
2. On the E-Prime PC, make sure that **Noldus E-Prime Server** is running in the background. To do so, check that its icon is visible in the taskbar:



   If Noldus E-Prime Server is not running, in the Apps screen choose **Noldus** > **E-Prime Server** (in Windows 7, choose **Start** > **All Programs** > **Noldus** > **E-Prime Server** > **E-Prime Server**).

3. On the E-Prime PC, in the Noldus E-Prime Server window, click **Start**.

   Result: Noldus E-Prime Server says “Server is running”.



IMPORTANT Do not click **Exit** until your test sessions are finished!

The **Start** button is not available when the server is already running.

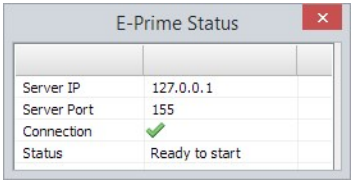
PROCEDURE

1. On the Observer XT PC, open your project in The Observer XT.

   OPTIONAL Create a coding scheme which you can use to annotate the test participant's behavior manually. See The Observer XT Help how to do so.

2. Create a new observation (**Alt+F6**) and give it a name, then click **OK**.

   Result: The **E-Prime Status** window opens. The status is **Ready to start**.



3. Ask your test participant to sit in front of the test PC, and give him/her the necessary instructions.

4. On the Observer XT PC, when ready, click the **Start observation** button.

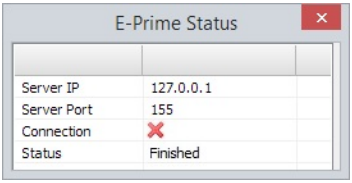
Result: The **E-Prime Status** window says:

Connection: ✔. **Status: Waiting for E-Prime**.

5. On the E-Prime PC, The experiment starts. Insert the subject and session data, then let the test participant carry out the assigned tasks. The **Noldus E-Prime Server** window says **Client connected**.

6. On the Observer XT PC, optionally manually code the test participant's behavior.

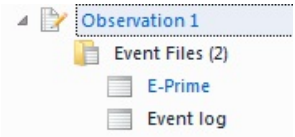
When the experiment in E-Prime is finished, the **E-Prime Status** window says **Finished**.



The Noldus E-Prime Server says **Client disconnected**.

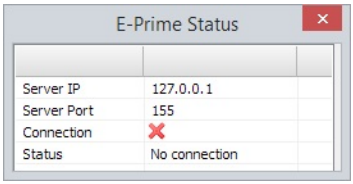
7. On the Observer XT PC, stop the observation by clicking the **Stop observation** button.

8. The E-Prime events are imported as a new event log named **E-Prime** in the current observation.



NOTES

- In order for the Noldus E-Prime Server to start correctly, the experiment script file ebs3/ebs2 file must be selected under **E-Prime Experiment**. See **Set up communication - THE E-PRIME PC** on page 11.
- If you create an observation (step **2** in the procedure above) before starting **Noldus E-Prime Server**, the **E-Prime Status** window on the Observer XT PC says **Connection** ✖.



To solve this problem, do the following:

a In The Observer XT, click another item in the Project Explorer, for example the coding scheme. This action closes the observation.

b On the E-Prime PC, in Noldus E-Prime Server, click the **Start** button.

c In the Observer XT, in the Project Explorer, click the name of that observation. This re-opens the observation.

Note that the observation name is labeled with a yellow triangle icon. This indicates that the observation has yet to be started.

d The **E-Prime Status** window says now **Connection** ✔. You are ready to start the observation.

- Make sure that you stop the observation in The Observer XT only when the **E-Prime Status** window says **Connection** ✖ and **Status Finished**. If you do it before, The Observer XT won't import the E-Prime data for that observation!
- If you cancel the run on the E-Prime PC after starting the observation, for example when clicking **Cancel** in one of the dialog

that appear at the start of the run, connection is lost for that observation. On the Observer XT PC, stop the observation, delete it and create a new one.

- There may be a significant delay (30 s or more) between the start of the observation (step **4**) and the start of E-run (step **5**). This could be doe to a number of factors, like:
  - The driver software of the E-Prime hardware key is not up-to-date. Go to http://sentinelcustomer.safenet-inc.com/sentineldownloads/, and download **Sentinel HASP/LDK Windows GUI Run-time Installer**. Next, remove the E-Prime hardware key for the E-Prime PC, and launch installation of the driver. After installation is complete, insert the hardware key in the E-Prime PC and start E-Studio.
  - The E-Prime PC has other hardware installed that conflicts with E-Prime, for example an additional network card. See **In case of complex setups** on page 7.
- When E-Prime data are imported into The Observer XT, it adds two subjects to the Coding Scheme (see page 40). When you now manually score events, The Observer XT expects that for each event you first score a subject and then a behavior. Define a subject in the Coding Scheme. Then choose **Setup** > **Project Settings** > **Scoring Options** and select **Auto-record subject**. You now have to score the subject only once at the start of the test.

SCORING DATA OFFLINE

Once you finish an observation, the E-Prime data are sent to The Observer XT. It may happen that you want to review the observation, possibly with external video, and score events manually. However, after data import, the coding scheme has two additional subjects: **User** and **System**. This means that every time you want to score an event manually, you must score the subject in the Observer XT's Codes window before you can score the event (behavior). To prevent this from happening, and to reduce the number of key presses, you can use the **Auto-record subject** function. With this option The Observer XT

assumes you will be scoring events for the first subject you score in an observation session.

1. In The Observer XT, choose **Setup** > **Project Settings** > **Scoring options**.
2. Select **Auto-record Subject**.
3. If they are not already present, define one or more Subjects (roles) in the coding scheme, which can be used to score events manually.
4. Open and start the observation as usual.
5. Position the observation (or video) at the time where you want to enter the event.
6. Score the event as usual, including the subject: [Subject] - [Behavior] - [Modifiers].
7. The next time you score an event, that subject is scored automatically. Complete the event with the Behavior and Modifiers.

For more information, see **Auto-record Subject** in the Observer XT Help.

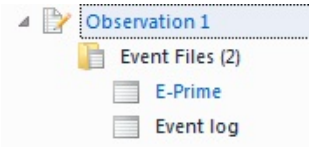
NOTE The subjects **User** and **System** added after E-prime data import are not shown in the Codes window.

6 Analyze data

HOW E-PRIME EVENTS ARE STORED IN THE OBSERVER XT

Event files

The data of E-Prime are stored in a separate event file named **E-Prime**. You can see this in the tree view of the Project Explorer. Click the observation name, and open **Event Files**.



- **E-Prime** contains all events imported from the E-Prime computer.
- **Event log** is the event file that The Observer XT creates by default when you create an observation. If you code events manually during the observation, the events are written to this file. If you do not code events, **Event log** only contains two lines that mark the start and the end time of the observation.

Click **E-Prime** to open the E-Prime event log.

Two subjects: System and User

In the E-Prime event log, the column named **Subject** specifies the subject of the event in each row.

Time	Subject	Behavior
17.434	System	Show Instructions
17.434	User	Answer
17.452	System	Show Fixation
18.452	System	Show Fixation
18.452	System	Show Stimulus

- **System**: for all events determined by E-Prime (for example, a stimulus presentation).
- **User**: for all responses by the test participant.

System events

Time	Subject	Behavior	Modifier
18.452	System	Show Stimulus	RedCar.bmp
19.193	System	Show Stimulus	RedCar.bmp

A state event like the presentation of a stimulus is indicated by two rows:

- The start row (with a green symbol in the **Behavior** column). The start time is the value of **OnsetTime** of the E-object in E-Prime.
- The stop row (with a red symbol in the Behavior column). The stop time is the value of **OnsetTime + Duration** of the E-object in E-Prime.

Note that the times in the event log may differ from the times in the E-Prime output file (a text file generated by E-Run). This is normal, since the time stamps are corrected to ensure millisecond-accurate synchrony between E-Prime and The Observer XT.

For system events, the name shown in the **Behavior** column is always Show followed by the name of the E-object.

User responses

Time	Subject	Behavior	Modifier
19.193	User	Answer	Correct: 1 Response: 1

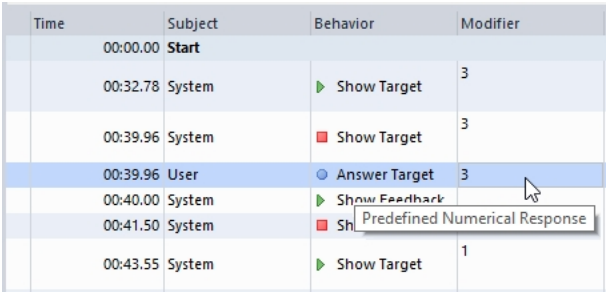
A point event like the user response is indicated by one row, with a blue circle in the **Behavior** column. The time of the event is the value of **OnsetTime** of the E-object in E-Prime.

The **Modifier** column shows two modifiers:

- **Response:** followed by the character(s) entered by the test participant
- **Correct:** followed by the correct response for the corresponding stimulus (that is set in the E-Prime Trial List).

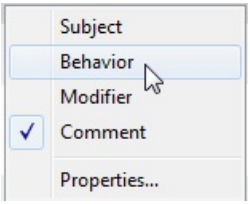
Numerical responses

Modifiers are by default **nominal**, unless you specified in E-Prime, they should be imported as **numerical** (see Example 3: To import responses as numerical modifiers on page 20). Numerical responses are then imported into the Event log as numerical modifiers.



Notes

- If events are missing or incomplete, it could be due to wrong settings in E-Prime. For example, if **RTTime** is not selected in E-Prime logging settings, user answers will not be imported in The Observer XT. If **CRESP** or **RESP** are not selected, an event line is imported but does not contain the corresponding modifier (correct response or actual response, respectively). If neither of the two is selected, the event is not imported at all.
- If the **Subject**, **Behavior**, or **Modifier** columns are not shown in the E-prime event log, right-click one of the column headers and select them.



- It is not possible to remove **Show** from the name of system events. It is also not possible to customize the behavior **Answer** and the part of its modifiers **Correct:** and **Response:**. You can only customize the responses; to do so, edit the values in the Trial List.
- See **Prepare the experiment in E-Studio** on page 13 for how to customize the information in the E-Prime events sent to The Observer XT.
- If the first event line of the E-Prime event log contains the message *The E-Prime data could not be synchronized automatically* in the **Comment** column, it means that E-Prime could not use the **TheObserverXT** package correctly, or the package was not installed (see page 23).

  In such cases the E-Prime event log is added to the observation and aligned with other data with a 1-second accuracy.
- Note that the times in the event log may differ from the times in the E-Prime output file (a text file generated by E-Run). This is normal, since the time stamps are corrected to ensure millisecond-accurate synchrony between E-Prime and The Observer XT (see page 23 for how to set this).

SYNCHRONICITY BETWEEN E-PRIME AND THE OBSERVER XT DATA

We advise to connect the Observer XT PC and the E-Prime PC to a local area network (LAN). In most cases the network speed is high enough to have a negligible delay between the start of the observation in The Observer XT and the start of the E-Run experiment. The Observer XT assumes that the start command arrives immediately to Noldus E-Prime Server.

To quantify network data delay, you can use a computer network administration utility like **Ping**.

- Windows 7: From the Windows **Start** menu of the Observer XT PC, select **Run** and type **cmd**, then press **Enter**.
- Windows 10: In the **Apps** screen, type **Run**, click the app, type **cmd** and press **Enter**.

In the DOS prompt window that appears, type **ping** followed by the IP number of the other computer, then press **Enter**. The **Average** statistic measures the Observer XT to E-Prime delay.

Note that the maximum time resolution that can be visualized in The Observer XT is 1 ms, therefore any delay time in the network smaller than 1 ms cannot be traced in The Observer XT data.

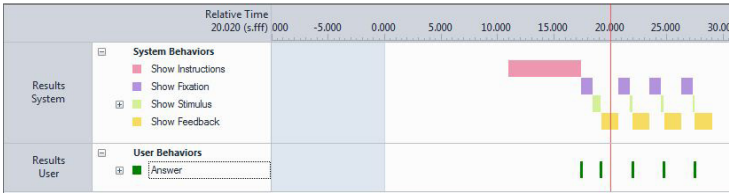
If for some reason the delay in the network is significant, the "zero time" of E-Run comes after the "zero time" of the observation. If you score events in The Observer XT during the experiment, then the E-Prime data and the manually-scored data may be slightly out of sync. If you score events offline, a network delay does not affect your data.

VISUALIZATION

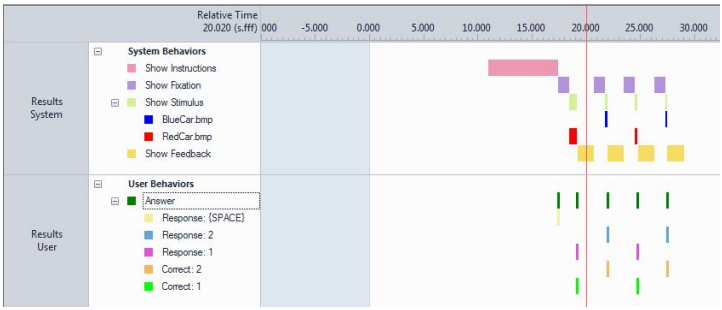
You can view the imported E-Prime events in a time-event plot.

Choose **Analyze** > **Visualization**. Select the observation you require.

The E-Prime data are shown in two charts, one for the subject **System** and the other for the subject **User**.



Click the **+** symbol next to the behaviors to expand the chart and view the modifiers.

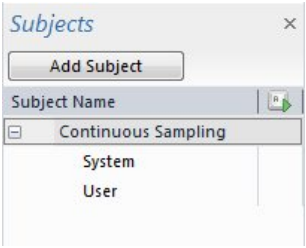


Notes

- All the system events are states of **Start-stop** type (see **Set up your Project** in The Observer XT Help for information on this event type).
- There is usually an empty area in the chart from the observation start time (Relative time 0) to the start of the first event (**Instructions** in the example above). This is the time from when the E-Run starts to when the first instructions are shown on the screen. This time may vary between observations, depending on how long it takes to fill in the information in the dialog boxes that appear at the start of the experiment (Subject ID, Session Number etc.)

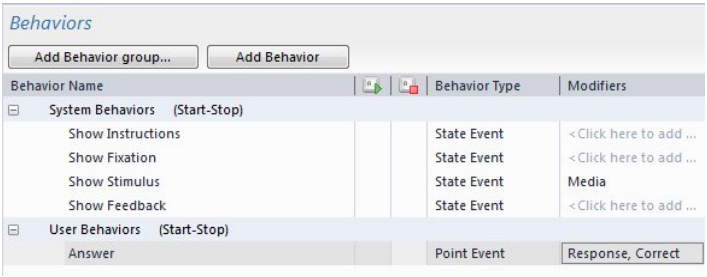
THE E-PRIME EVENTS IN THE CODING SCHEME

Subjects



Behaviors

The name of a behavior depends on the name of the corresponding E-object set in E-Prime (see **Prepare the experiment in E-Studio** on page 13).



System events and user responses are stored in separate Start-Stop behavior groups, **System Behaviors** and **User Behaviors**.

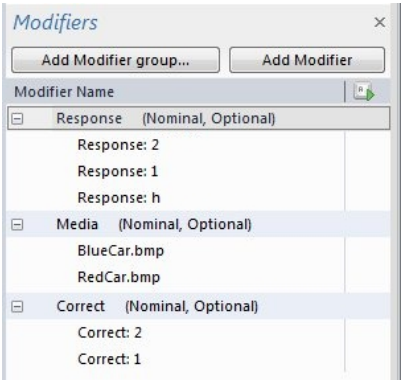
- **System Behaviors** contains events named **Show** followed by the E-object name.

  The **Show Stimulus** behavior has a modifier group attached, named **Media**. This group contains the names specified in the Trial List under **Stimulus**.

- **User Behaviors** contains a behavior named **Answer**.

The **Answer** behavior has two modifiers attached, **Response** and **Correct** (see below).

Nominal modifiers

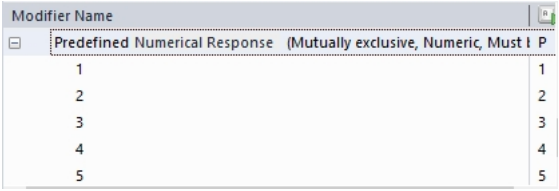


In this example, the following modifier groups have been imported, with their elements:

- **Response** (nominal). Contains **Response:** followed by the character(s) entered by the test participant.
- **Media** (nominal). Contains the filenames of the stimuli, or other attributes you may want to import (see page 16 for how to customize this).
- **Correct** (nominal). Contains **Correct:** followed by the correct response for the corresponding stimulus (that is set in the E-Prime's Trial List).

Numerical modifiers

If you specified in E-Prime that the answer was numerical, they are added as a numerical modifier group to the Coding Scheme. See ***Example 3: To import responses as numerical modifiers*** on page 20.



Note

You can modify the names of coding scheme elements at any time, however we advise you not to do so. If you import new data, these will have the names set in E-Prime, and added to the coding scheme. The same event type could therefore be represented by two or more different subjects, behaviors and modifiers, leading to wrong analysis results.

ANALYSIS

The analyses in The Observer XT allow you to calculate most statistics on the stimuli and the user responses.

Nominal (default) responses

Nominal responses are analyzed with a Behavior Analysis. Choose **Analyze** > **Behavior Analysis** > **New** and click **Calculate**.

Example 1: Correct vs. incorrect responses

In the default Behavior Analysis result, each cell contains the statistics of a specific combination of behavior and modifiers. For example, the table below lists the statistic **Total Number** for the events of type **Answer** and a specific combination of the modifiers **Correct** and **Response**.

Answer	Correct: 1; Response: 1	1
	Correct: 2; Response: 2	2
	Response: 2; Correct: 1	1
	Response: {SPACE}	1
	<Any Modifier>	5

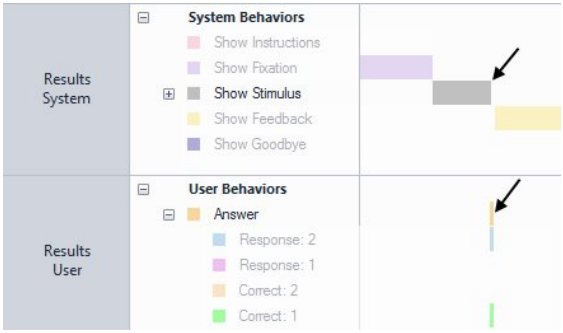
In this example, the test participant gave three times a correct response: one time when **Correct**= **1** and **Response**= **1**, and two times when **Correct** =**2** and **Response** =**2** (first two lines). In one case the test participant gave an incorrect response, when choosing **2** when the **Correct** response was **1** (third line). Therefore, the percentage of correct responses is 3/(3+1)= 75%.

In the table above, the response "SPACE" was given by the user to start the procedure and should be ignored. "Any Modifier" is the number of events with any combination of modifiers.

Example 2: Response time (RT)

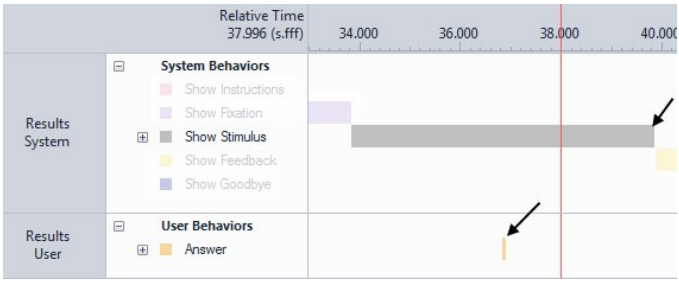
We have two main cases:

- If the stimulus ends exactly when the user gives a response, the response time is equal to the stimulus presentation time. For example:



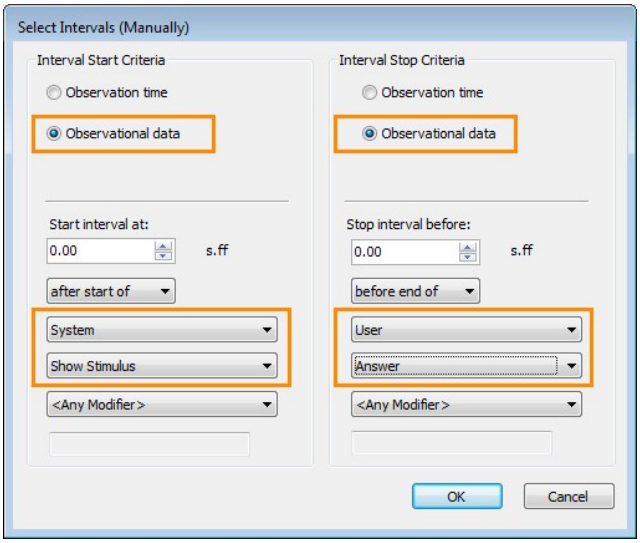
  In this case the response time is the duration of the state event **Show stimulus**.

- If the stimulus duration is independent of the user's response, like in this example:



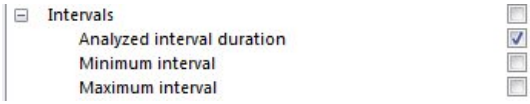
Then do the following:

a In the Data profile, choose **Select Intervals - By manual selection** and define an interval from the start of the event **Show Stimulus** to the start of the event **User Answer**.



b Choose **Analyze** > **Behavior Analysis** > **New**.

c Click the **Statistics** button and under **Intervals** select **Analyzed interval duration**.



d In the results table, look for the column named **Analyzed interval duration**.

Example 3: Response time grouped per response

In this example we want to calculate Response time (RT), but for when the subjects gave a particular response.

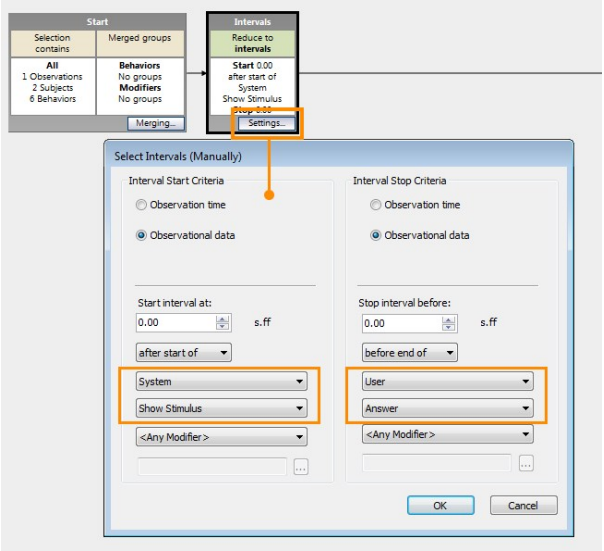
Here for simplicity we only show the solution for how to calculate RT when the subject responses were *correct*.

For example:

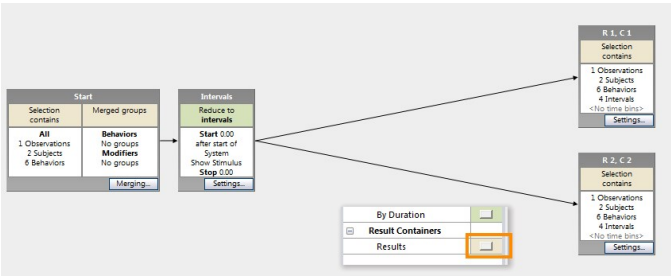
- **Correct** response was "1" - User **Response** was "1" ➜ RT was ...
- **Correct** response was "2" - User **Response** was "2" ➜ RT was ...

Etc.

1. We first define an interval that captures the response time, just like in Example 2 (see the figure on page 44). Choose **Intervals** - **By manual selection** and select **From System Show Stimulus to User Answer**. This is the least selective interval, because it captures all instances of response times, even those for incorrect responses. The following steps we add more interval criteria, to select only the instances of response time when Correct =1 and Response =1, OR Correct =2 and Response =2.



2. We then create two branches that point to two result containers (to create a new result container, click Result Containers - Result). One branch will select Correct = 1, Response = 1, the other Correct = 2, Response = 2. We name the result boxes **R1 C1** and **R2 C2**, respectively.

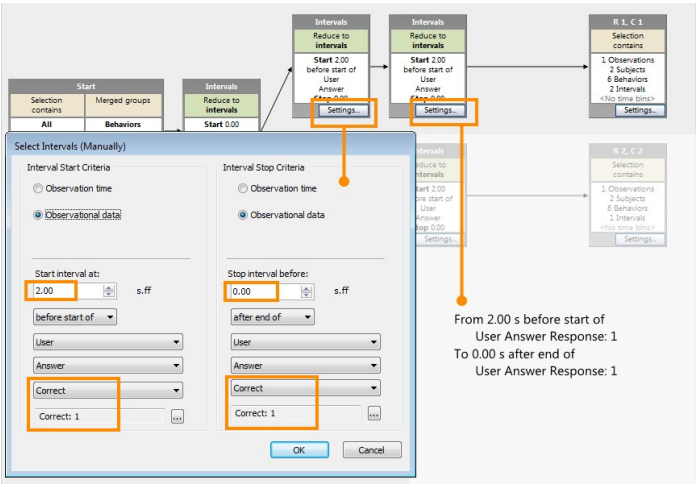


3. In each branch, we define intervals (**Select intervals - By manual selection**) that include a correct answer. Intervals are defined **From 2.00 s before start of User Answer - to 0.00 seconds after end of User Answer** *(see below why 2 seconds is chosen as a start criterion).* However, intervals can only be defined with one modifier (either Correct or Response). Therefore, we define two intervals in each

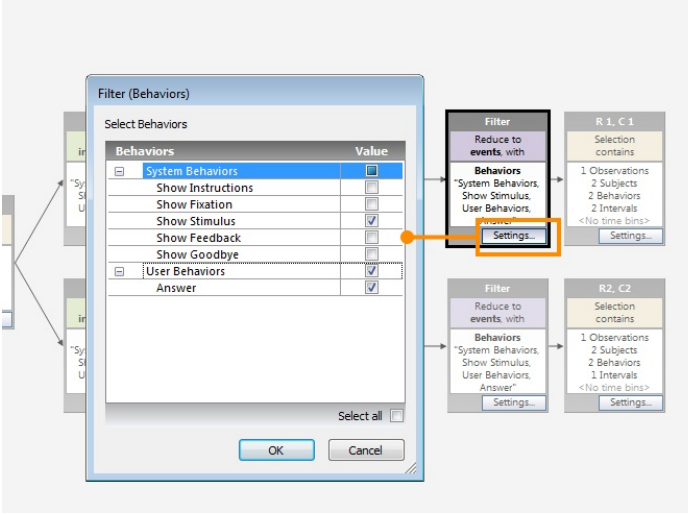
branch. For the branch ending with **R 1, C 1** (Correct response 1 when Response was 1), the first interval is based on Correct = 1, the second is based on Response = 1. By placing the two Interval boxes one after the other, we define an interval that meets both criteria, that is, an interval for when the Response 1 was Correct. We create a similar selection in the other branch, for Correct =2, and Response =2.

NOTE We choose "2 seconds before User Answer" to make sure that the time around the answer is included in the selection. Choosing 0 seconds for a point event like User Answer would make the selection invalid.

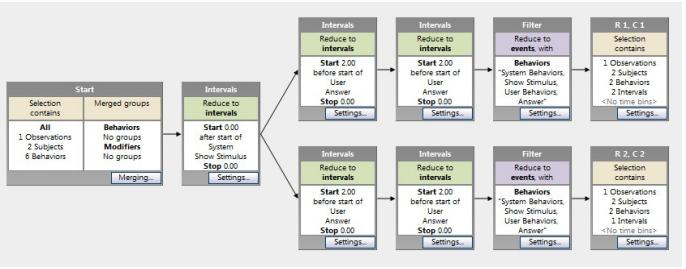
The intervals defined in this step reduce the total number of instances of response time, because they are set after the first, less selective Interval box made in step 1. Only the time segments corresponding to the most selective criterion will be in the Result Container.



4. Finally, we use a **Filter** to choose which data to analyze. This removes all events in the selected intervals that are not of interest. This box should be placed at the end of the branch.

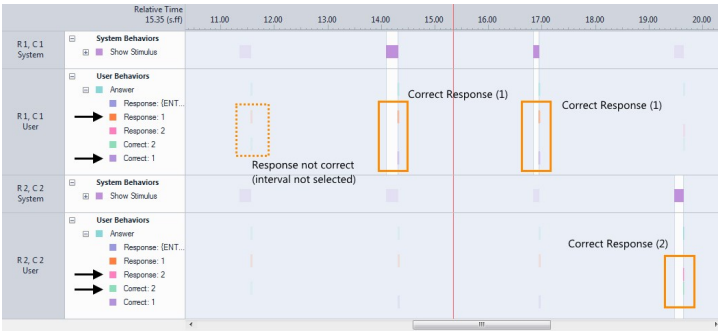


5. The Data profile looks like this:



For details about selecting events and intervals for analysis, see **Select Data for Analysis** in The Observer XT Help.

6. Select **Analyze** > **Visualize Data**. The two charts at the top show the intervals (response times) selected for **R 1, C 1**. The other charts show the same for **R 2, C 2**. You can see that the first instance of response time is not selected because of the incorrect response given (Response = 1, Correct = 2).



7. Run **Behavior Analysis** and look at the statistics that refer to a specific response (this is indicated with the **Result Container** column header).

8. To group results, select **Layout** > de-select **Intervals**. Look at the **Mean duration** statistic for the mean response time.

Result Container	Observations	Subjects	Behaviors	Modifiers	Mean duration	Total number
R 1, C 1	Observation 1	System	Show Stimulus	RedCar.bmp	0.17	2
R 2, C 2	Observation 1	System	Show Stimulus	BlueCar.bmp	0.18	1

Note:

- This data profile is also valid when the response does not terminate the stimulus presentation.
- You can create more complex data profiles by adding branches that select instances of incorrect responses (for example: Response was "1", Correct was "2").

Numerical responses

If you specified in E-Prime that the answer was numerical, for example to rate the stimulus, you may want to calculate numerical statistics, like the mean value or median. See ***Example 3: To import responses as numerical modifiers*** on page 20 how to specify the response as numerical. In The Observer XT, carry out a numerical analysis. Choose **Analyze** > **Numerical Analysis** > **New** and click the **Calculate** button.

By default the minimum value, maximum value and mean value of the numerical modifiers are calculated. To select other statistics, click the **Statistics** button on the toolbar and select the statistic under **Numerical Modifiers**.

Behaviors	Modifiers			
		Minimum value	Maximum value	Mean value
Answer Target	Predefined Numerical Response	1.00	4.00	2.00

For more information

See **Calculate Statistics** in The Observer XT Help.

LAG SEQUENTIAL ANALYSIS

With **Lag Sequential Analysis** you can quickly calculate how often a stimulus triggers a specific response.

Choose **Analyze** > **Lag Sequential Analysis** > **New**.

Example: how often a stimulus produces a correct response

In this example, a stimulus picture is presented for a few seconds, and the test participant must enter a response. The response ends the presentation of the stimulus. For this reason a **State lag** sequential analysis can be carried out (a **Time lag** analysis is also possible).

The stimulus presentation is as the behavior **Show Stimulus** and its modifier **Media**. The test participant's response and the correct response are stored as modifiers **Response** and **Correct** of the behavior **Answer**, respectively.

Click **Settings** and under **Lag Type** choose **State lag**. Because the stimulus and the response events are events scored for different subjects (System and User), de-select **Restrict lag to Subject-Behavior group combination**. Then run analysis.

In the Lag Sequential Analysis result, locate the part of the table that contains the transitions from the behavior **Show stimulus** (on the rows) to the behavior **Answer** (on the columns).

Behaviors	Modifiers			
		User		
		Answer		
		Correct: 1; Response: 1	Correct: 2; Response: 2	Response: 2; Correct: 1
Show Stimulus	BlueCar.bmp	0	2	0
	RedCar.bmp	1	0	1

In this example, the stimulus **BlueCar.bmp** was followed two times by a correct response (**Response**= **2** and **Correct**= **2**; see the middle cell in the first row). The stimulus **RedCar.bmp** was followed by one correct (**Response**= **1** and **Correct**= **1**; first cell in the second row) and one incorrect response (**Response**= **2** when **Correct**= **1**; third cell in the second row).

For more information

See **Lag Sequential Analysis** in The Observer XT Help.

7 Advanced settings

Aim

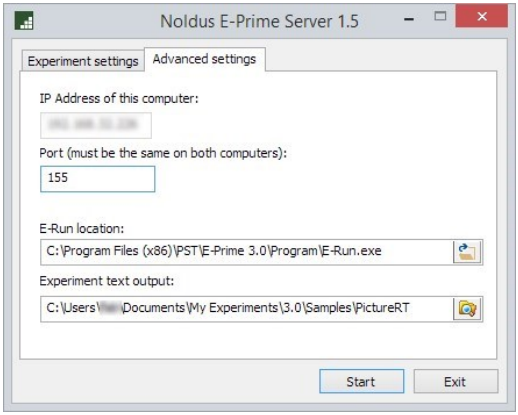
To change basic settings like the port number for communication between The Observer XT PC and the E-Prime PC, and the location of the E-Prime software and experiments.

If some events are not imported correctly to The Observer XT, see **Prepare the experiment in E-Studio** on page 13.

Procedure

1. On the E-Prime computer, start **Noldus E-Prime Server** (**Apps** > **Noldus** > **Noldus E-Prime Server**).

2. Click **Advanced Settings**.



IP Address

This is the IP address of the E-Prime computer. It is shown for information purposes only, and cannot be changed. This number must

be entered in the Noldus E-Prime Client software (see **THE OBSERVER XT PC** on page 9).

Port

The port number should always be the same as that set in The Observer XT (see **THE OBSERVER XT PC** on page 9). The default is 155.

E-Run location

This is the location on the E-Prime PC where the **E-Run.exe** software is installed. If it has been installed on another location, please specify that location here.

The default is **C:\Program Files (x86)\PST\E-Prime 3.0\Program**.

For E-Prime 2.0, the default location is **C:\Program Files (x86)\PST\E-Prime 2.0\Program**.

Experiment text output

This is the folder where the E-Prime output text file is stored. By default, this is the same folder as where the experiment file (*.ebs3/*.ebs2) you are using is stored (see **THE E-PRIME PC** on page 11).

- If you change the **Port** number after clicking **Start**, this has no effect on the software. Click **Restart** to activate communication on the new port.
- If you set the **Experiment text output** location in E-Prime different from that of the experiment file (*.ebs3/*.ebs2), you must specify this new location also in Noldus E-Prime Server.
- When clicked, the **Start** button of Noldus E-Prime Server does not start the E-Prime experiment; it activates the E-Prime Controller to accept messages from The Observer XT.

8 Troubleshooting

E-PRIME ERROR MESSAGES

Runtime error "Unable to obtain a valid refresh rate"

This occurs on Windows 10 computers with Windows version 1703 or later (Windows Creators).

Please see the workaround on the following web page:

https://support.pstnet.com/hc/en-us/articles/1150111821 47