Chapter

6

Tutorial: TTCN-SDL Co-Simulator (Windows)

This is an introductory tutorial to the TTCN-SDL Co-simulator in Windows and an example of a complete test session with Cbasic. The tutorial is divided into sections that describes steps that are performed during a typical test session.

Note: Windows version

This is the Windows version of the tutorial. The UNIX version is chapter 7, *Tutorial: TTCN-SDL Co-Simulator (on UNIX)*.

Purpose of This Tutorial

The purpose of this tutorial is to make you familiar with the TTCN-SDL Co-simulator. When you have read and practised this tutorial you will know the actions required to execute a simulated test.

It is assumed that you know how to use the SDL Simulator. More information can be found in *chapter 4, Tutorial: The SDL Simulator, in the SDL Suite Getting Started* and in *chapter 50, The SDL Simulator, in the User's Manual*.

The Steps in a Test Session

When a TTCN test suite and an SDL suite system already exists, this is what you do in a typical test session:

1. Generate and start the TTCN-SDL Co-simulator.
2. Generate and start the SDL Simulator.
3. Switch to simulation mode in the TTCN suite.
4. Set up the communication between the TTCN-SDL Co-simulator and SDL Simulator.
5. Start the simulation.
6. Start the TTCN-SDL simulation.
7. Perform the simulation.

The Test System

This section describes the system that is going to be tested and what roles the TTCN-SDL Co-simulator and SDL Simulator play in the test.

An SDL system called `ABP` will be used in this tutorial. The `ABP` system implements a small OSI stack containing a network layer, a data-link layer and a physical layer. The network component on one side is handled by the TTCN suite and on the other side by an SDL process.

The data-link layer implements a very simple protocol known as the Alternating Bit Protocol (ABP).

The network protocol is very simple protocol, where all messages are echoed back as an acknowledgment that they have been received.

This setup gives us the ability to send messages from the TTCN suite to the network peer simulated by the SDL suite, and to receive acknowl-

edgments in return. If the answer is identical to the message, we have managed to communicate successfully.

What we want to test is the ability of the Data-Link layer's protocol to deliver, even when messages are lost on the way. To enable this, we have introduced an extra channel between the TTCN-SDL Co-simulator and the SDL simulator, on which commands can be sent to make the physical layer lose messages.

The ABP system is stored in the Telelogic Tau installation, in the subdirectory `examples\bitprotocol`. If you have a default installation, the complete path is `C:\Telelogic\SDL_TTCN_Suite4.5\examples\bitprotocol`.

Setting Up a Simulation

What You Will Learn

- To set up the TTCN-SDL Co-simulator and SDL simulator
- To generate and build simulator executables
- To initialize the communication between the simulators
- To start the simulators

When you are finished with this section, the simulators should be ready to run a TTCN suite test on a simulated SDL system.

Generating and Starting the TTCN-SDL Co-Simulator

The first thing you should do is to generate and start the TTCN-SDL Co-simulator:

1. Start Telelogic Tau.
2. In the Organizer, load the system *ABP* from the file `abp.sdt`.

   You can find this file in `C:\Telelogic\SDL_TTCN_Suite4.5\examples\bitprotocol` (where `C:\Telelogic\SDL_TTCN_Suite4.5` is the default installation directory).

   You may also find it useful to copy the `bitprotocol` directory and the files included, to another directory. In any case, you have to

make sure the `bitprotocol` directories and files are **not** read-only.

3. Double-click the *abp* icon in the *TTCN Test Specification* chapter.

   This will start the TTCN suite with the `abp.mp` test suite opened in the Browser.

4. Select the node named *abp* in the Browser.

5. Select *Generate Code* from the *Build* menu.

   The *Analyzer/TTCN to C Compiler Settings* dialog is opened:

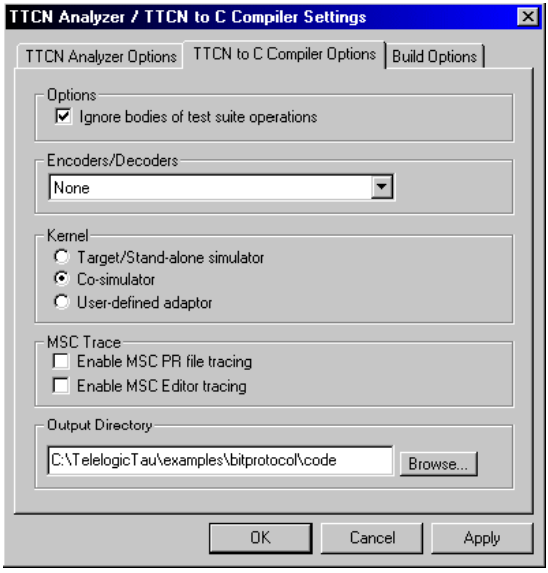

Figure 59: The TTCN to C compiler options

6. In the *TTCN to C Compiler Options*, make sure that *Co-simulator* is selected and that *Ignore bodies of test suite operations* is checked.

7. Select an output directory that has sufficient space and where you have write permission.

8. In the *Build Options*, ensure that the *Run Make* option is selected.

9. You may also have to change the *Makefile Type*.

10. Click *OK* to start the generation and compilation of the TTCN-SDL Co-simulator executable.

    The TTCN suite will now generate and build the TTCN-SDL Co-simulator executable. In the Log Manager window, you can see the what is happening.

11. Click the *Start Simulator* button in the TTCN suite tool bar.

    This is a toggle button, which means that if it is depressed, the simulator is in simulation mode. If the button is released, simulation is ended.

    The *Simulator Toolbar* is available whenever this button is depressed.

    – You can also select *Invoke Simulator* from the *Simulate* menu.

    A file selection dialog is opened.

12. Select `abp.exe` in the dialog.

    The TTCN suite simulation executable has the same name as the test suite that you are simulating.

    This step will put the TTCN suite in simulation mode, and it is now ready to simulate.

Generating and Starting the SDL Simulator

Now you have to set up the SDL simulator as well.

1. In the Organizer, select the system diagram *ABP* from the *SDL System Structure* chapter.
2. Click the *Simulate* button in the tool bar.

    – You may also want to check the settings in the *Make* dialog (opened from the *Generate* menu) before you generate and compile the simulator. If you select *Make* or *Full Make* in that dialog, you will have to open the Simulator UI and load the simulator after that.

The SDL simulator generates and builds a simulator executable. The simulator window is displayed with the simulator started. You are now ready to simulate.

Getting the Simulators to Communicate

The next step you should perform is to initialize the communication between the simulators:

- Enter the command **`start-itex`** in the SDL simulator window.

  This instructs the SDL simulator to communicate with the TTCN-SDL Co-simulator.

Performing the Simulation

What You Will Learn

- To single step a test case
- To run a test case at full speed
- To run a test batch
- To set and delete breakpoints
- To abort a simulation

Single Stepping Test Cases

1. In the TTCN Browser, select the test case *TC_01*.

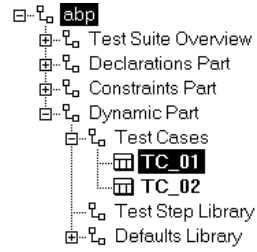

Figure 60: The test case TC_01 is selected in the Browser

This is the test case that you are going to execute.

2. Click the *Step Simulation* button.

   Each time you click this button, the TTCN-SDL Co-simulator executes one step of TTCN code.

   A Table Editor is opened. In the first line of TTCN code, there is a colored bar.

> **Note:**
> This bar indicates which line will be executed the **next** time you click the *Step Simulation* button.

3. Enter the command `go-forever` in the SDL simulator window.

The SDL simulator is now executing and it is possible to perform a simulation.

4. Click the *Step Simulation* button repeatedly until you reach the end of the test case.

When you have reached the end of the test case, the bar that indicates the current line will change color. The color indicates the result of the execution of the test case. The colors are as follows:

Color	Verdict
Green	PASS
Yellow	INCONC
Red	FAIL

At this point the SDL Simulator is running at full speed. This is normal and you can safely ignore it. The cause of this is a timer in the simulated system that fires repeatedly while waiting for input from the TTCN-SDL Co-simulator.

Running Test Cases at Full Speed

1. In the TTCN Browser, select the test case *TC_01* again.

   This time, you are going to execute the test case at full speed.

2. Click the *Run Simulation* button.

   The Table Editor is opened. The lines of TTCN code in the table will execute without pausing until the end of the test case is reached.

   – It is possible to stop the execution by clicking the *Pause Simulation* button

Running Test Batches

It is also possible to execute more than one test case or test group.

1. In the TTCN Browser, select the test case *TC_01* and *TC_02*.

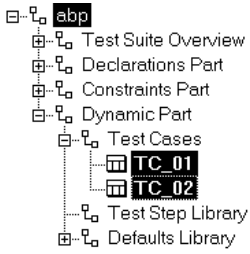

Figure 61: Selecting multiple test cases

2. Press the *Run Simulation* button.

   This will cause the TTCN-SDL Co-simulator to execute all the selected test cases in turn without pausing anywhere.

Note:

This requires an SDL suite system that always ends in a state from where you can execute a new test case. The SDL suite system may not require any manual resetting between test cases.

Toggling Breakpoints

1. Set the cursor on line 3 in the test case *TC_01*.

2. Press the *Toggle Breakpoint* button.

   This will set a breakpoint on line 3.

   The button will toggle the breakpoint status on the line that the cursor is placed on. If there is a breakpoint set on the line, it will be removed. If there is not a breakpoint there, one will be set.

3. Select test case *TC_01* in the Browser.
4. Press the *Run Simulation* button.

The TTCN-SDL Co-simulator will run without pausing between lines of TTCN code. When it reaches the line where the breakpoint was set, it will stop.

5. Set the cursor on line 3 in the test case *TC_01*.
6. Press the *Toggle Breakpoint* button.

   This will remove the breakpoint from line 3.
7. Press the *Run Simulation* button.

   The simulator now continues to run until it reaches the end of the test case.

Ending a Simulation

It is possible to end a simulation in the middle of an execution:

1. Select test case *TC_01* in the browser.
2. Click the *Step Simulation* button twice.

   This will place the current line on line 2 in the test case.

   You now realize that the execution was a mistake and you want to abort it.
3. Click the *Abort Simulation* button.

   This aborts the execution of the test case for the TTCN-SDL Co-simulator.
4. In the SDL simulator window, select *Restart* in the *File* menu.

   This restarts the SDL simulator. This step is necessary because otherwise the SDL Simulator and the TTCN-SDL Co-simulator would be out of sync.

   To continue co-simulation, you will need to enter the command **`start-itex`** in the SDL simulator, start running the test in the TTCN-SDL co-simulator, and then enter the command **`go-forever`** in the SDL simulator.

Taking a Look at the Log Window

Every execution of the TTCN-SDL Co-simulator produces a log. This log is output in the Log Manager. Every line in the test case that is executed will be present in the log.

This makes it possible to examine a trace of the execution after it has finished. This is valuable when running the test cases in a batch.

The log contains the test component, table name, line within the table, behaviour, constraint and verdict.

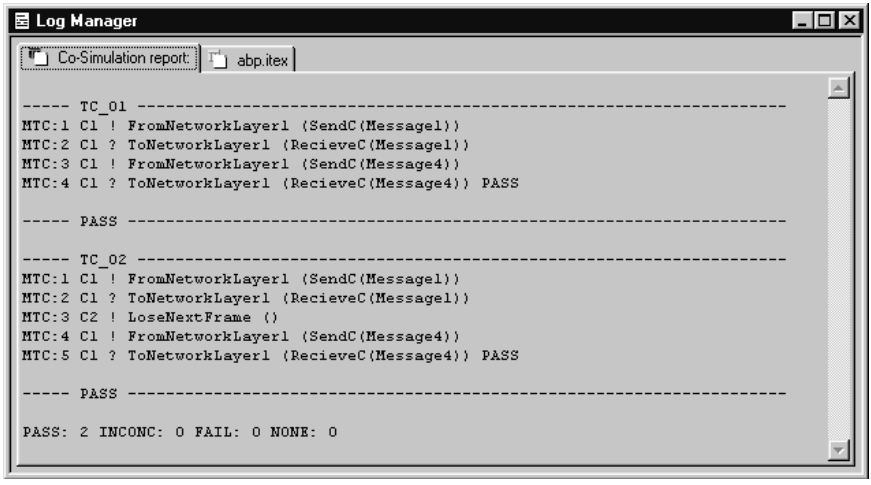

Figure 62: An execution log

Every test case also produces a conformance log. This log contains detailed information about the tests performed. It is very useful when determining why a test case failed or succeeded.

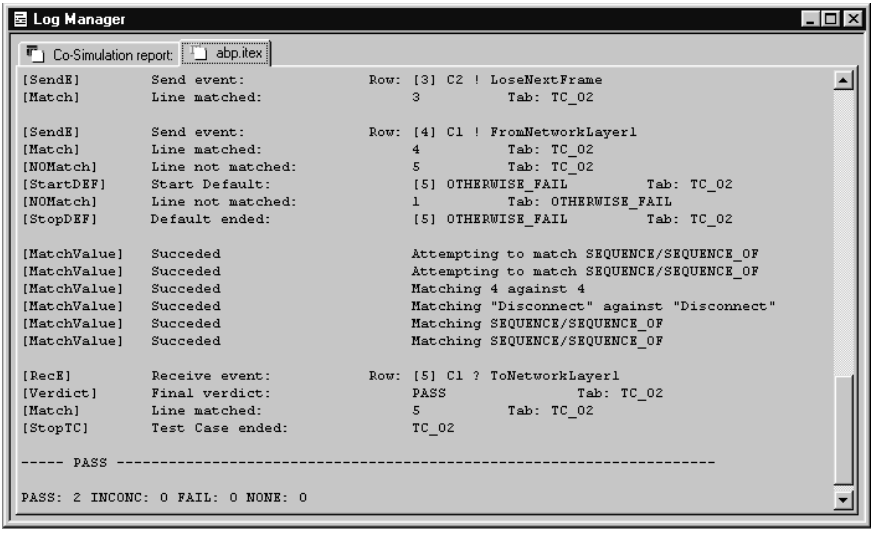

Figure 63: A conformance log