

SLStreamer Lite SLStreamer Pro



Programs for Configuring,
Monitoring & Managing
Digital Broadcasting Schemes

*Revision as of
December 21, 2009.*

User's Guide



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Introduction

Forward TS product line is designed to provide TV streaming via IP and ASI interfaces. Using the products, it is possible to build solutions of different complexity and configurations: one computer or a distributed system including several servers.

The products are software or hardware-software systems based on the ForwardTS software and FD300 or FD401 boards.

ForwardTS software contains various program modules that provide creation, configuration, and uninterrupted operation of schemes of receiving, processing, and streaming audio/video data.

This User's Guide covers two programs from the ForwardTS software designed to create and configure streaming schemes, control the start/stop function and monitor their state:

- SLStreamer Lite – to work using typical streaming templates;
- SLStreamer Pro – to work with schemes of any configuration and complexity not confined to templates.

In addition, it is recommended that you look through the following user's guides:

- «ForwardTS Product Line» – general description of the products, information about the hardware and software, algorithm for choosing a product;
- «ForwardTS Software Setup» – installation and configuration procedures, configuration features of distributed systems.



ForwardTS Software. General Information

ForwardTS Software Components

ForwardTS software has a multilayer architecture. It is a three-level system: client applications – SLStreamer Lite and SLStreamer Pro, control server – Scheduler, executive servers.

In the final solution, the said components may be both on the same network node and on different nodes.

1. Client Applications: SLStreamer Lite and SLStreamer Pro

The SLStreamer Lite and SLStreamer Pro programs are client applications and both have the same function. Each of them provides an interface for working with schemes of receiving, processing, and streaming audio/video data: configuration, start/stop control, and monitoring of the current state.

Both programs provide access to the same objects. When one of the programs performs an operation over schemes – creating a new streaming scheme, changing the settings of a node, starting or stopping – the result is reflected in both.

The programs differ in the functional completeness (see the Table below). SLStreamer Lite has a basic functionality and is used to work with typical streaming schemes based on the templates (see the «Templates» Section). SLStreamer Pro has advanced, in comparison with SLStreamer Lite, functionality and is used to work with schemes of any configuration and complexity not confined to templates.



Tip: It is not recommended to use both programs simultaneously: if a scheme is created and configured in SLStreamer Lite, control its start/stop function using this same program.



Table 1. Program Comparison Chart

Functional Characteristics	Program	
	SLStreamer Lite	SLStreamer Pro
Configuration of schemes of receiving, processing, and streaming audio/video data	Typical schemes based on templates.	Schemes of any complexity not confined to templates. Schemes can be dependent on each other.
Location of the schemes (Executive servers)	On the local computer only.	Both on the local and on remote computers. May be on different computers.
Scheduler Selection	A Scheduler on the local computer only.	It is possible to connect to a Scheduler choosingly. It can be both on the local and a remote computer.
Scheme operation control	Manual start/stop.	Automatic control of schedule execution.

2. Executive Servers

Executive servers are system services that receive, process, and transmit audio/video data.

An Executive server is identified by the name and IP address (or DNS name) of the computer on which it is running. Names are assigned to the Executive servers using a configuration file.

Note: The computer on which an Executive service is running is hereinafter referred to as Executive server.

3. Control Server – Scheduler

Control server or Scheduler is a system service designed to control the schemes of receiving, processing, and streaming audio/video data and store the descriptions of the schemes.

Only one Scheduler can run on a computer. The Scheduler identifier is the IP address of the computer on which it is running.

Note: The computer on which the Scheduler is running is hereinafter referred to as Control server.

The Scheduler controls the schemes on the specified Executive servers. One Scheduler can control several servers simultaneously. The links between the Scheduler and Executive servers are established using the configuration file.



Configuration File

Using the configuration file, you assign names to the Executive servers and establish links between the Scheduler and the servers.

The Configuration file is used by the Scheduler, which is running on the same computer as the said file.

The full path to the configuration file: ~\Bin\servers.xml (where ~ denotes the directory in which ForwardTS software is installed, the default being C:\Program Files\ForwardTS).

The file data is stored in the XML format. The file contains tags that describe the Executive servers – one record for each server. The records have the following format:

```
<Server Name = "NNN" Address = "IP-address" />
```

where:

- NNN – the Executive server name;
- IP-address – the IP address of the node on which the server is running.

✓ **Important:** The node on which the Executive server is running must have a fixed IP address.

Tag (1) written in the file by default specifies a standard configuration: Scheduler controls one Executive server named Server 1; Controlling and Executive servers are located on the same network node.

```
servers.xml - Notepad
File Edit Format View Help
<?xml version="1.0" encoding="utf-8"?>
<GraphScheduler>
  <Server Name="Server 1" Address="localhost" />
</GraphScheduler>
```



Licenses

License – permission to use a certain function of the Software. A set of licenses is determined by the current registration.

The registration key comes with the ForwardTS products, it being a registration file or USB dongle HASP HL.

There are several license types in ForwardT Software and ForwardTS allowing to use the following program modules:

- Videoprocessor – to work with the FDO nAir program;
- MPEG2 encoder – to stream in the MPEG-2 format;
- AVC encoder – to stream in the AVC format.

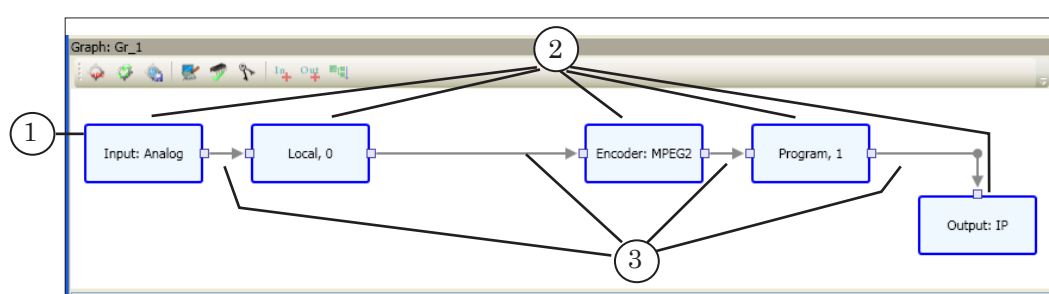
Working with Graphs. General Information

Graphs and Tasks

Graphs and tasks are used in the SLStreamer Lite and SLStreamer Pro programs to work with schemes of receiving, processing, and streaming audio/video data.

1. Graph

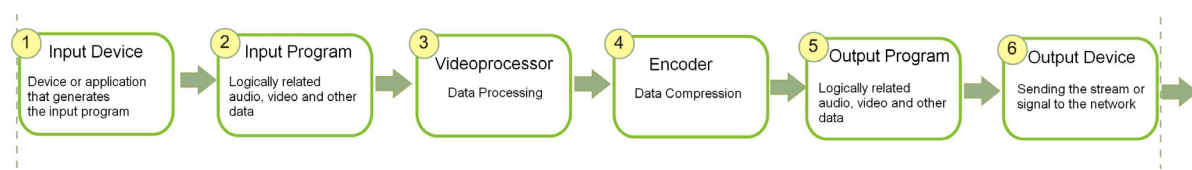
Graph (1) – graphic representation of a streaming scheme. A graph is identified by the name (unique arbitrary text specified by the user) and is connected with a certain Executive server.



A graph consists of nodes (2) and directed lines (3). Each node corresponds to a certain element(s) of the scheme: device, program module, or program with TV data. The sequence order of the nodes (left-to-right) shows the audio/video data forwarding procedure. The nodes are named. A node name is an arbitrary text. When adding a node, it is automatically named in a standard way, and can then be edited by the user.

The following node types are supported: Input, Input Program, Videoprocessor, Encoder, Output Program, Output (for details, see the «Graph Nodes» Section).

The node structure of a graph can vary and depends on the task to be performed. In the general case, a graph may look as shown in the Figure below.



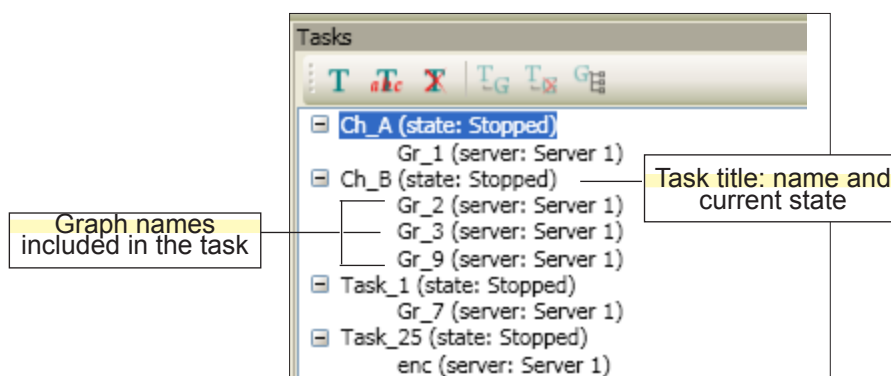


2. Task

Tasks are used to control (start/stop) the broadcast schemes. A task is a named set of graphs.

A task can be empty or can contain one or several graphs. The same graph can be only in one task. Graphs included in the same task can be located on different Executive servers.

Information about the existing tasks is displayed in the SLStreamer Pro window as a hierarchical list.



Note: The SLStreamer Lite program has a simplified workflow, and information about tasks is not displayed. The task is created automatically (when the graph is started) and can have only one graph. The task name is the same as the graph name.

3. Dependencies between Graphs

You can specify a dependency between graphs. For example, when the output devices of graph A are connected to the input devices of graph B, then B is dependent on A.

It is possible to specify a dependency in the following ways:

- one graph is dependent on another (1:1);
- one graph is dependent on multiple graphs (M:1);
- multiple graphs are dependent on one (1:M).

You can specify a dependency only for graphs that are in the same task.

Such a dependency can be specified and used only in the SLStreamer Pro program.

4. Creating and Configuring Graphs and Tasks

It is possible to configure and run several different schemes in the system. The number of possible schemes is limited by the number of the licenses available. Schemes can be dependent on each other.

To build a certain scheme of receiving, processing, and streaming audio/vidio data, you must create and configure a graph (or several graphs) and make up a task.



A new graph can be created in the following three ways:

- by using a template (in SLStreamer Lite or SLStreamer Pro) – in this case, you use a standard graph template, which contains all the required nodes in the necessary order. It remains only to adjust the nodes according to the specific situation;
- without using a template, from scratch (in SLStreamer Pro only) – first, you create an empty graph, then add one after another the appropriate nodes in the required sequence and adjust their properties;
- by using an existing XML description stored in a text file (in SLStreamer Pro only) – in this case, you add a graph, whose nodes and their configuration completely meet the specified description.

When creating graphs, it is important that all the configured devices operate, audio/video data coming to the receiver.

Tasks are created from the existing graphs. Graphs can be added to a task in any combination provided one graph can be only in one task at the same time.

Note: In SLStreamer Lite, tasks are created automatically. One task can have only one graph.

5. Execution of Graphs and Tasks

Receiving, processing, and streaming audio/video data according to a certain scheme is being performed if the graph is in the running state.

In SLStreamer Lite, graphs are started and stopped manually.

In SLStreamer Pro, graphs are controlled according to the tasks. Tasks are executed automatically according to the specified schedule. It is possible to set the start time, stop time, and periodicity of runs – once or daily.

When exiting SLStreamer Lite or SLStreamer Pro, the current state of the graphs and tasks is saved. After the computer is restarted, the operation of all the started schemes is automatically restored.



Graph Nodes

This Section contains information about the node types and their appropriate elements.

1. Input

The Input node is used to configure the input device. The input device is the scheme element that generates (supplies to the system) the input program(s). Such an element may be a physical device or a program module (see the Table below).

Table 2. Input Devices Supported

Type	Designation	Description/Data Type
Programs	Frame Generator	Program module Frame Generator from ForwardTS software. Generates frames with the required frequency and size («chequered pattern» image).
	Title Generator	Program module from ForwardT Software. Includes Frame generator and Videoprocessor. A «Videoprocessor» license is required for use.
FD300/FD401 boards	Board #: Line A Board #: Line B (# denotes the board number)	FD300/FD401 board input, a specified line (A/B). Analog or SDI signal.
	Board #: Output	FD300/FD401 board output. Analog or SDI signal.
	Board #: ASI	ASI interface of the FD401 board and demultiplexer. MPEG TS stream.
IP interface	Network	IP interface (netcard) and demultiplexer. MPEG TS stream. The protocols used: UDP, RTP/AVP, TCP, RTP/AVP over TCP.
	Network (Raw TS)	Ditto without the demultiplexer.

2. Programs

Program – logically connected video, audio, and data related to them. Video and audio are synchronized. The data may contain title elements, teletext, information about the program (name, owner, description), etc.

In MPTS, each program has the following characteristics: name, number, video and audio packet identifiers (video PID and audio PID).

Each graph has at least two nodes for configuring the program parameters:



- Input Program – program received from the input transport stream or analog signal for further processing (e.g. inserting commercials). The configuration must be performed when the data come to the receiver, and the Input Device node is configured.
- Output Program – program passed to the transport stream or analog signal at the output. The program is a result of some processing (e.g. inserting commercials). The name, number, and other characteristics of the output program are transmitted in the output transport stream and can be used to identify the program at the receiving end.

3. Videoprocessor

The Videoprocessor node is used to configure the video processor – program module that processes audio/video data, e.g. adds title elements.

4. Encoder

The Encoder node is in charge of the encoders – program modules designed to compress video and audio data. Forward TS product line supports two video compression standards: MPEG-2 and AVC.

5. Output

The Output node is used to configure the scheme element that generates and transmits via the output device the output signal or transport stream created from one or several output programs. The output device may be a physical device, program module, or a file (see the Table below).

**Table 3.** Output Devices Supported

Output Device	Type (Designation)	Description/Data Type
FD300/FD401 boards	Board #: foreground (# denotes the board number)	FD300 board. Analog or SDI signal.
	Board #: ASI	Multiplexer and ASI interface of the FD401 board. MPEG TS stream.
FD300 board, title layer	Named Region > FD300 Board (see the Note*)	Output to the FD300 board to the specified bounding rectangle on the title layer. Analog or SDI signal.
IP interface	SL RTP; SL RTSP; Network	Multiplexer and IP interface (netcard). MPEG TS stream. The protocols used: <ul style="list-style-type: none"> • SL RTP – UDP, RTP; • SL RTSP – RTSP; • Network – UDP, RTP/AVP, TCP, RTP/AVP over TCP.
	SL RTP (Raw TS); SL RTSP (Raw TS); Network (Raw TS)	Ditto without the multiplexer.
	Windows Media	IP interface (netcard). Windows Media (WMV) stream via HTTP. Network streaming.
Device DVM-6	Named Region > DVM-6 Board (see the Note*)	Output to DVM-6 to the specified bounding rectangle. Analog or digital signal.
Program module	Named Region > Videoprocessor (see the Note*)	Transfer to the program module Videoprocessor to the specified bounding rectangle.
File	File Writer	Service filter for writing the stream to a file with multiplexing. Includes a multiplexer.
	File Writer (Raw TS)	Service filter (without a multiplexer) for writing the stream to a file without multiplexing. Can be used in the lines where the input transport stream is not demultiplexed.

Note: * Earlier versions of the software used the designation DVM-6 Renderer instead of Named Region.



Templates

Template – graph draft for a certain scheme of receiving, processing, and streaming data.

Using templates allows you to quickly and easily build typical solutions. It is only required to select a suitable template from the available list and fine-tune its elements according to the specific situation, e.g. to specify the required parameters of audio/video data compression, specific IP addresses, etc.

A standard set of templates (see the Table below) comes with the software. The set can be complemented by new templates.

Note: A complete list of existing templates is available in the Create Graph window both in the SLStreamer Lite and SLStreamer Pro programs (to open the window in SLStreamer Pro, click the button whose tooltip reads Create new graph from template).

Table 4. Standard Templates

Name	Description (Data Type, Interface)	
	Input	Output
Converting digital signal to analog		
Decoder_ASI_Analog	MPTS, ASI	Analog signal
Decoder_IP_Analog	MPTS, IP	Analog signal
Converting analog signal to digital		
Encoder_Analog_IP	Analog signal	MPTS, IP
Encoder_Analog_ASI	Analog signal	MPTS, ASI
Encoder_Analog_ASI+IP	Analog signal	MPTS, ASI and IP interfaces
Streaming – playback of video clips, commercials, titles etc. from local or network drives according to the schedule, without using input programs		
OnAir_0_IP	–	MPTS, IP
OnAir_0_ASI	–	MPTS, ASI
OnAir_0_ASI+IP	–	MPTS, ASI and IP interfaces
Retransmitting – inserting blocks of commercials, local programs, and titles into an existing program		
OnAir_Analog_IP	Analog signal	MPTS, IP
OnAir_Analog_ASI+IP	Analog signal	MPTS, ASI and IP interfaces
OnAir_ASI_ASI	MPTS, ASI	MPTS, ASI



Name	Description (Data Type, Interface)	
	Input	Output
OnAir_ASI_AS+IP	MPTS, ASI	MPTS, ASI, and IP interfaces
OnAir_ASI_ASI+Analog	MPTS, ASI	MPTS over ASI and analog signal
OnAir_IP_IP	MPTS, IP	MPTS, IP
OnAir_IP_IP+Analog	MPTS, IP	MPTS over IP and analog signal
Remultiplexing – streaming existing programs received from one transport stream to another without any insertions and program changes		
Remux_ASI_IP	MPTS, ASI	One program streamed over IP as MPTS
Remux_ASI_2IP	MPTS, ASI	Two programs streamed over IP as MPTS
Remux_ASI_3IP	MPTS, ASI	Three programs streamed over IP as MPTS
Remux_ASI_4IP	MPTS, ASI	Four programs streamed over IP as MPTS
Remux_IP_ASI	MPTS, IP	MPTS, ASI
Remux_2IP_ASI	Two MPTS received over IP	MPTS, ASI
Remux_3IP_ASI	Three MPTS received over IP	MPTS, ASI
Remux_4IP_ASI	Four MPTS received over IP	MPTS, ASI

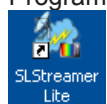


SLStreamer Lite. Interface and Workflow

Main Window

1. Launching the Program

To open the SLStreamer Lite main window, use the Start menu: Programs > ForwardTS > SL Streamer Lite or the desktop icon:

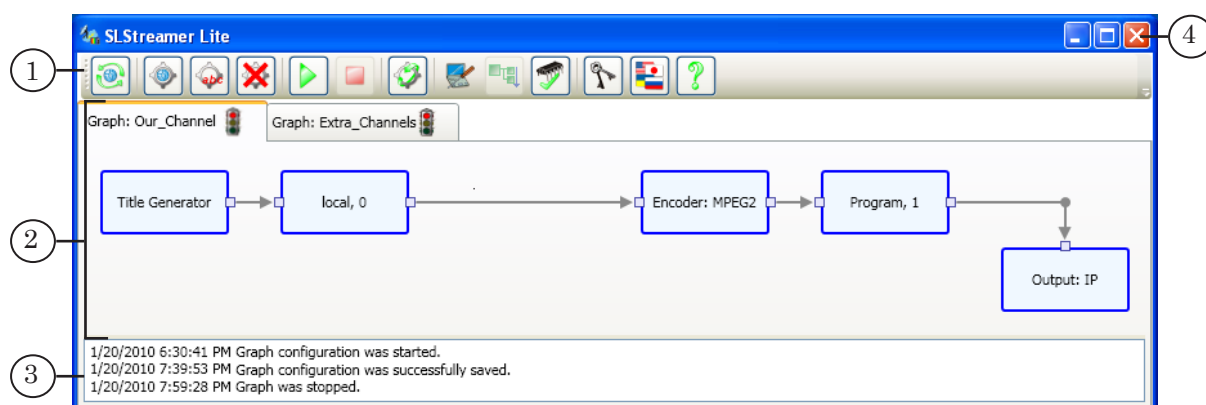


2. Main Window Overview

The main window is used to create and configure graphs according to the templates, control the start/stop functions of the graphs, and monitor their state.

The main window contains the following areas:

- toolbar (1) – buttons for creating graphs, configuring them, and controlling their state;
- area for working with graphs (graphs area) (2) – tabs, each containing one graph;
- log area (3) – information about actions performed with the graphs: date, time, action

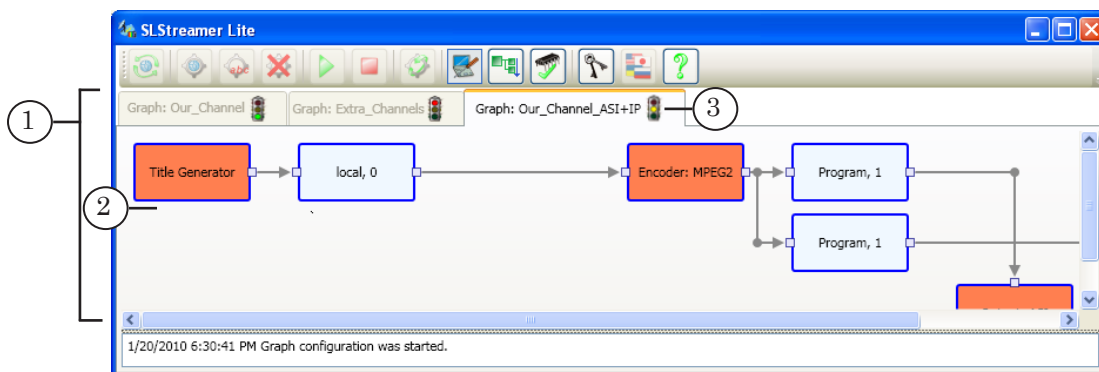


To exit the program, click the Close button (4) in the title bar.



3. Graphs Area

The area for working with graphs contains tabs (1). Each tab – one graph (2). Commands for configuring the graph and controlling its state are applied to the graph whose tab is currently selected.



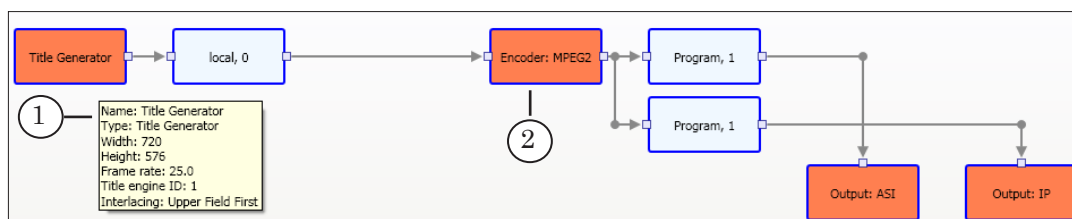
The tab caption (3) contains a graph name specified by the user and an icon that shows the current state of the graph:

- – stopped; in preview mode: the scheme is not operated; you cannot configure the graph in this state;
- – stopped; in configuration mode: the scheme is not operated; you can configure the graph in this state;
- – running: the scheme is being operated. You cannot edit the operation parameters in this state.

To switch the graph from one state to another, use the toolbar buttons (see the next Section). The current state of the graph is saved when exiting the program.

Each node of the graph is represented by a box that displays its name and/or the device type. When placing the cursor over a node, a short list of the current settings appears (1). To view a complete list of properties or edit them, double-click on the node. Editing is only possible in configuration mode: when the Configure graph button is clicked.

All the nodes that must necessarily be configured are marked orange (2).


















4. Toolbar Buttons

Commands for configuring and controlling the graph state are applied to the graph whose tab is currently selected.

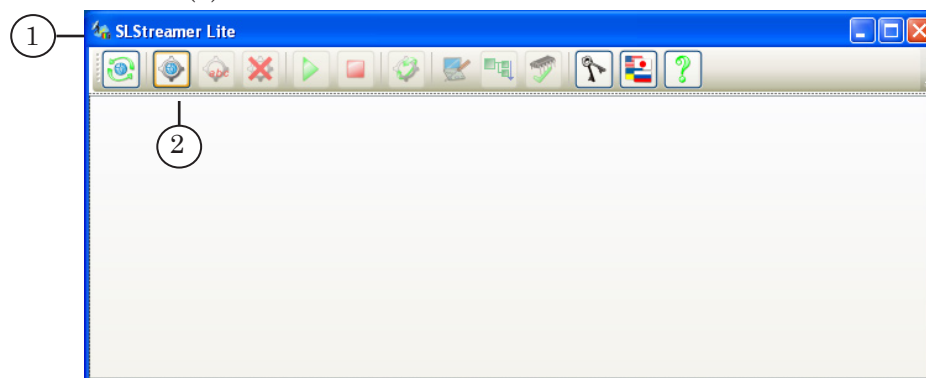
Table 5. Toolbar Buttons

Button	Name	Action
Connection with the control server		
	Reconnect	Reconnect the Scheduler.
Editing graphs		
	Create new graph	Add a new graph according to the selected template.
	Rename graph	Rename the graph.
	Remove graph	Remove the selected graph and all the settings for the corresponding scheme.
Control of the graph state		
	Start graph	Switch the scheme to execution mode.
	Stop graph	Stop the scheme.
	Update graph	Update properties for the scheme elements when some changes were introduced in the streaming scheme of another program.
Configuration		
	Configure graph/ Finish graph configuration	Switch to the mode of editing the graph settings/ Exit editing mode.
	Parse input programs	Parse the input stream into separate programs, detect the program numbers and video/audio PIDs. Available in configuration mode only.
	Configure CPU usage	Open a window for viewing and selecting (in configuration mode only) a priority for the graph execution and the CPUs that will be enabled for the graph.
Help		
	Licenses	Open a window that contains a list of available licenses.
	Select language	Select a language of the user interface.
	About SLStreamer Lite	Display supplemental information about the program including the version number.



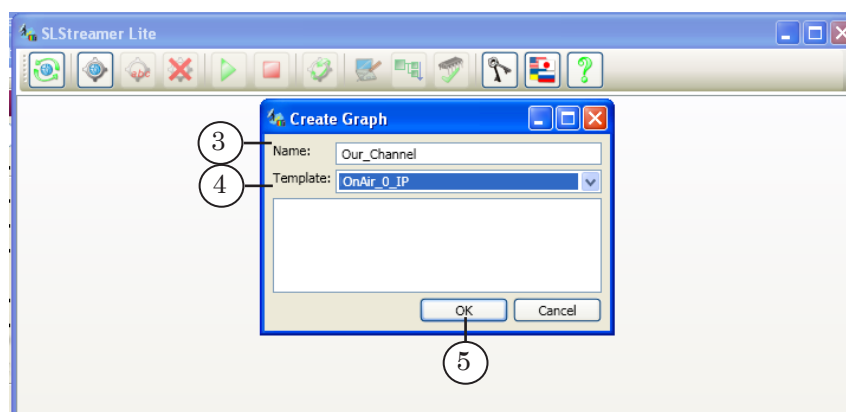
General Workflow

1. Launch SLStreamer Lite (1) using the desktop icon or the Start menu: Programs > ForwardTS > SLStreamer Lite.
2. Create a graph. To do so, click the Create new graph button (2).

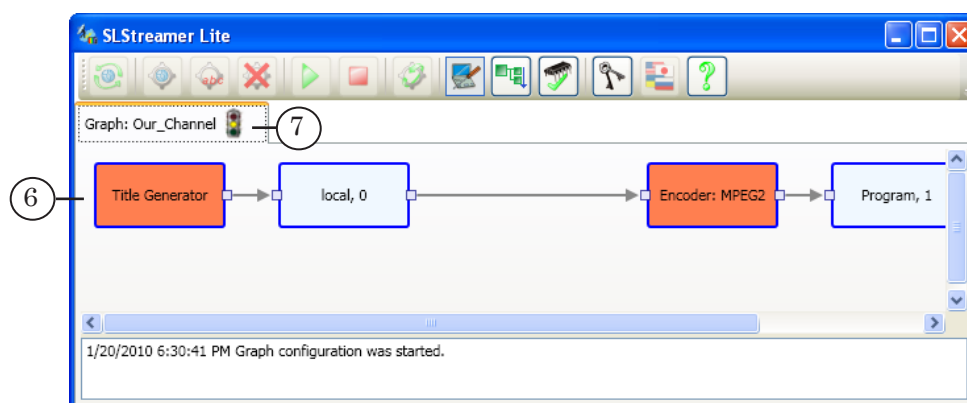


3. When the window opens, specify a convenient name (3). Select a template according to the required streaming configuration (4). Click OK (5).

For a description of the standard templates, see the «Templates» Section.



4. A new tab with the graph created by the selected template is added (6), and the graph configuration mode is automatically on, which is indicated accordingly (7).

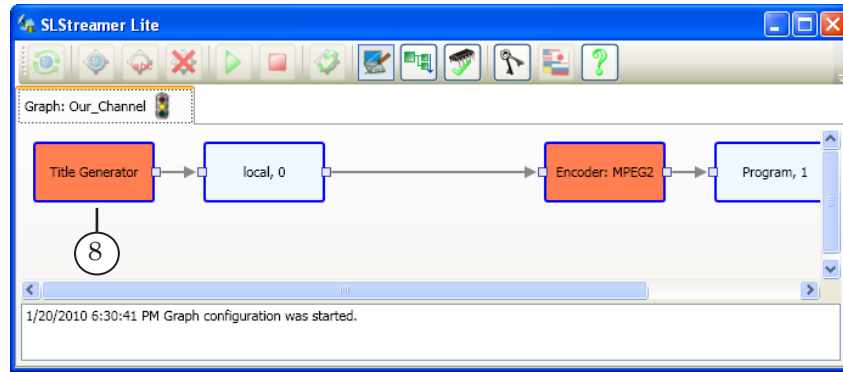




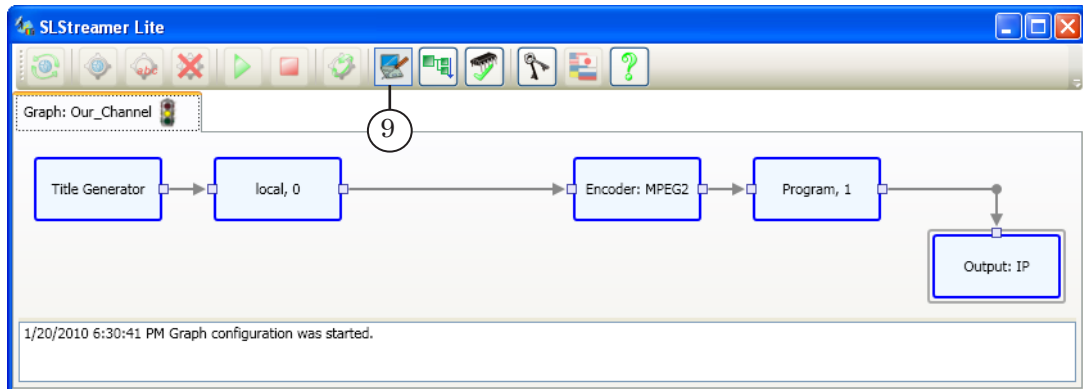
5. All the nodes that must necessarily be configured before starting the graph are marked orange (8) The other nodes can also be edited, e.g renamed.

Configure each node one after another. To open the properties windows, double-click on the nodes.

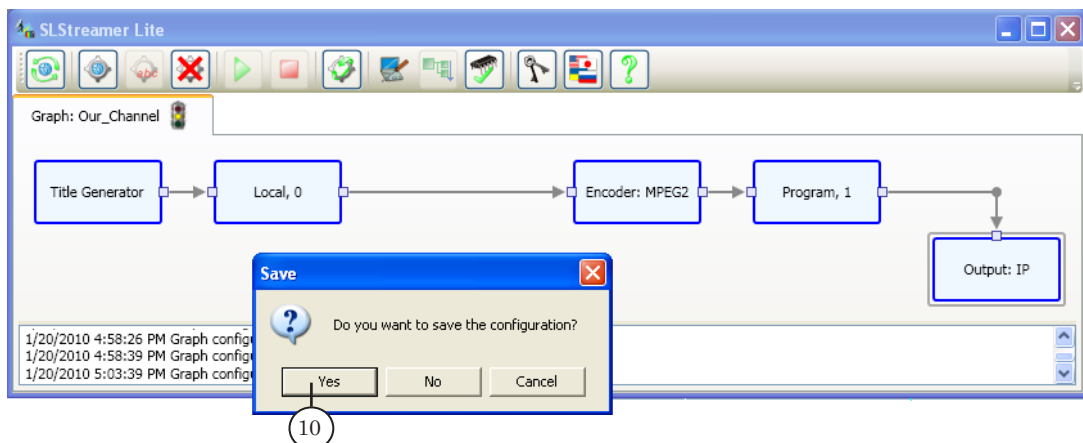
The nodes configuration procedure is discussed in the «Working with the Programs. Configuring Graph Nodes» Section.



6. To exit configuration mode, click the Finish graph configuration button (9). This is a toggle button that switches configuration mode on and off.

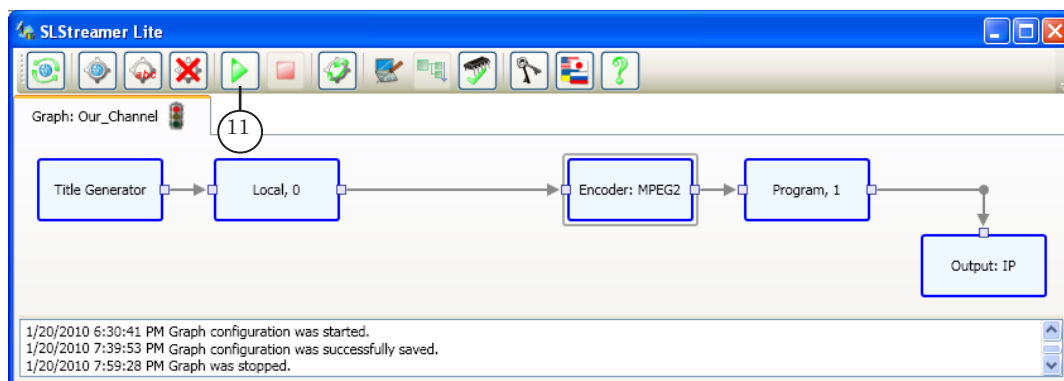


7. When the Save window opens, click Yes (10) to save the settings.





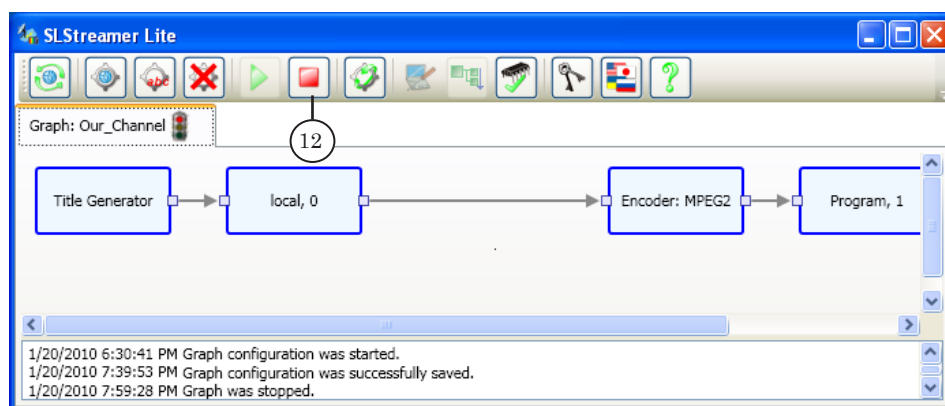
8. To start the scheme, click the Start graph button (11).



9. When the graph is started, the program can be closed – it will not affect the operation of the scheme. After the computer is restarted, all the formerly started graphs will run automatically.

10. To get information about the operation of an element of the scheme, right-click on the node and select Statistics... from the context menu. The Statistics window opens. It displays information about the operation parameters of the selected element.

11. To stop the scheme, click the Stop graph button (12).



Note: All operations are performed for the graph whose tab is selected when clicking the buttons.



SLStreamer Pro. Interface

Launching the Program and Connecting to the Scheduler

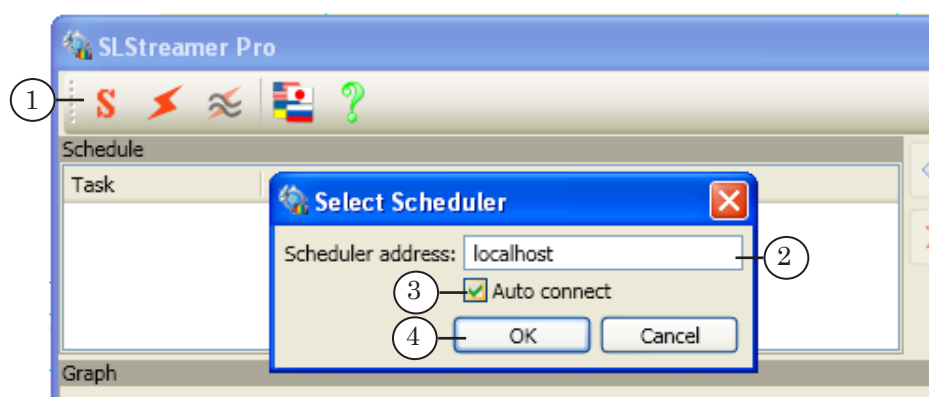
To launch SLStreamer Pro, use the Start menu: Programs > ForwardTS > SL Streamer Pro or the desktop icon:



The program main window opens.

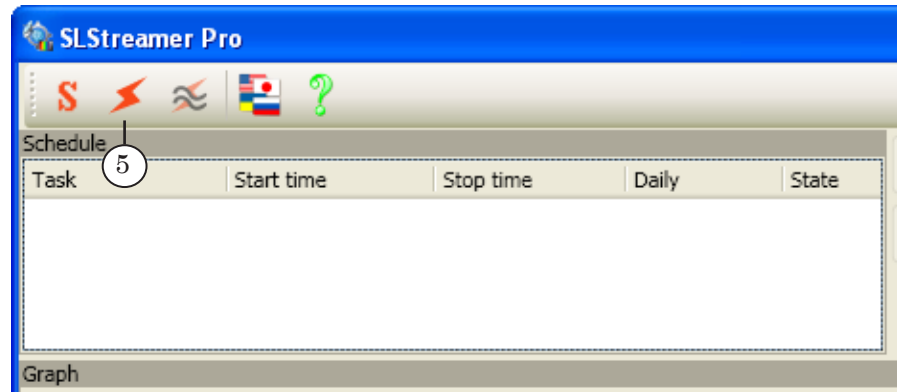
First of all, connect to the Scheduler. To do so, at the first program start (and at subsequent starts if automatic connection is not enabled), complete the following actions:

1. Select a Scheduler:
 1. Click the Select scheduler button (1) on the main toolbar.
 2. When the window opens, specify the IP address of the computer (2), where the Scheduler is running.

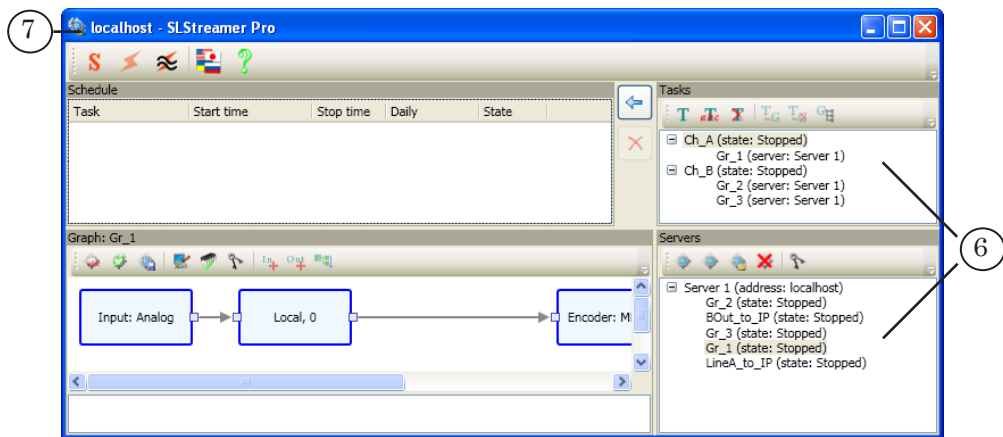


Tip: To automatically connect to a server with the specified address (in the current session and at subsequent program starts), check the Auto connect check box (3).

3. Click OK (4) to apply the settings and close the window.
2. If the connection is not established automatically, connect to the Scheduler manually: click on the Connect button (5).



As a result, a connection to the specified server is established. The program window displays information about all graphs and tasks the selected Scheduler (6) controls, and the window title bar – its address (7).



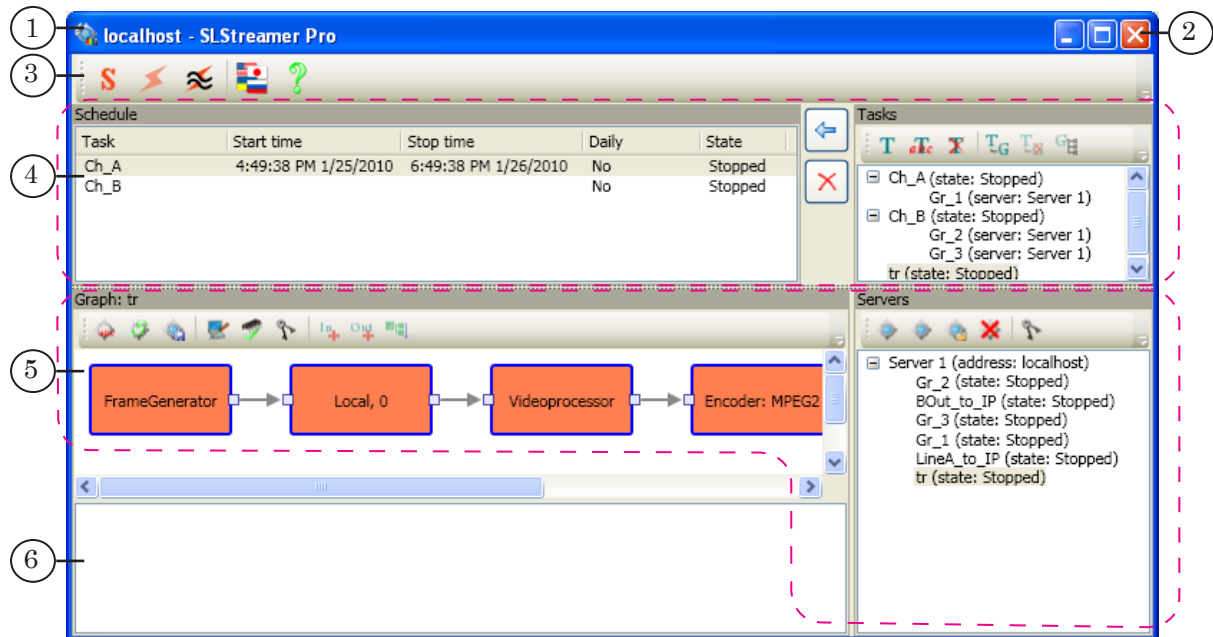


Main Window

1. Overview

The main window is used to create and configure graphs and tasks, monitor their state, create the task execution schedule.

The title bar (1) displays the IP address of the Scheduler to which the connection is established. To exit the program, click the Close button (2).



The main window contains the following areas:






- main toolbar (3) – buttons used to control connection to the Scheduler, select a language, and open the About... window;
- tasks area (4) – panels used to create/delete and edit tasks, create the task execution schedule and control it;
- graphs area (5) – panels used to work with graphs: create/delete, preview, edit graphs;
- log area (6) – displays information about the actions with graphs and tasks: date, time, action.



2. Main Toolbar

The main toolbar contains buttons used to control connection to the Scheduler, select the language, and open the About... window (see the Table below).

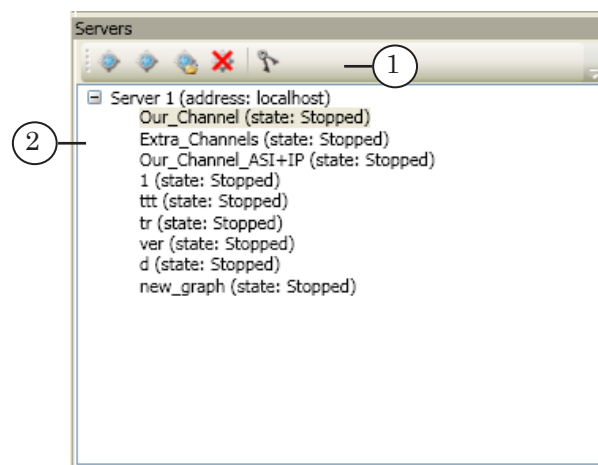
Table 6. Main Toolbar Buttons

Button	Name	Description
Connection to the scheduler		
	Connection settings	Open a window for specifying the Scheduler IP address.
	Connect	Establish connection to the specified Scheduler.
	Disconnect	Break the current connection to the Scheduler.
Language and supplemental information		
	Select language	Open a window for selecting the user interface language.
	About SLStreamer Pro	Display supplemental information about the program, including the version number.

3. The Servers Panel

The Servers panel is used to work with the graph sets controlled by the specified Scheduler. Here you can view the current state of the graphs, add or delete a graph, select a graph for editing or adding it to a task.

The panel toolbar (1) contains buttons for editing the set of graphs (see the «Commands for Working with Graphs and Nodes» Section).



The client area of the panel displays a tree view of the graphs (2). The graphs in the list are grouped by their location on the Executive servers. The header of each group indicates the name of the corresponding server and its IP address.



Each graph entry indicates its current state. The possible values are as follows:

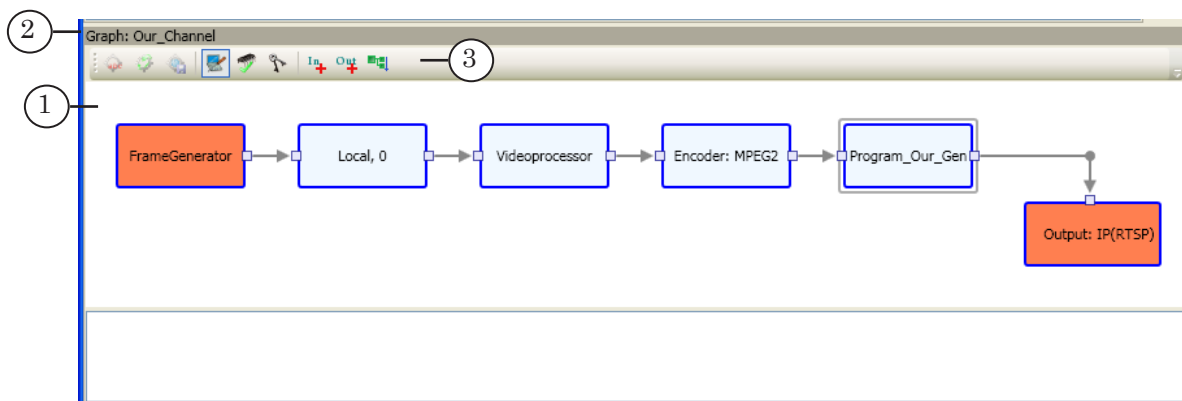
- Stopped – the scheme is not operated. In this state, it is possible to switch to configuration mode to edit parameters;
- Configuration – the scheme is not operated; configuration mode is on;
- Running – the scheme is being operated. In this state, it is only possible to view the current settings and node operation statistics.

The graphs are started/stopped when starting/stopping the corresponding task (task that contains the graph). The current state of the graphs is saved when exiting the program as well.

4. The Graph Panel

The Graph panel is used to view and edit individual graphs. Here are performed the following operations with graphs: adding/deleting nodes, viewing and configuring node properties, viewing the operation statistics of individual nodes.

The graph area (1) displays the graph selected in the list in the Servers panel. The panel title bar (2) displays the name of the processed graph. The toolbar (3) contains buttons used to call the graph configuration commands (see next the «Commands for Working with Graphs and Nodes» Section).















5. Commands for Working with Graphs and Nodes

This Section covers the following commands:

- commands for working with graphs;
- commands for working with graph nodes.

Buttons used to call commands for working with graphs (see the Table below) are on the toolbars of the Graph and Servers panels.




Table 7. Commands for Working with Graphs

Button	Name	Description
Editing the set of graphs		
	Create new graph	Add an empty graph.
	Create new graph from template	Add a new graph according to the selected template.
	Load graph from file	Add a new graph according to the description in a specified XML file.
	Delete graph	Delete the selected graph and all the settings for the corresponding scheme.
Editing graph parameters		
	Update graph	Update node settings for the selected graph when some changes were introduced in the streaming scheme of another program.
	Rename graph	Rename the graph.
	Save graph	Save the XML description of the selected graph to a file.
Configuration		
	Configure graph/ Finish graph configuration	Switch to graph configuration mode/Exit configuration mode. This is a toggle button: when clicked, the mode is on; when released, the mode is off.
	Show CPU usage	Open a window for viewing and selecting (in configuration mode only) a priority for the graph execution and the CPUs that will be enabled for the graph.
Help		
	Licenses	Open a window that contains a list of available licenses.



To call commands for working with individual graph nodes, use toolbar buttons on the Graph panel and the node context menus.

Table 8. Commands for Working with Graph Nodes

Button, Name	Node Types (from which it is called)	Action
Node properties		
Properties...	All types.	View (when configuration mode is off) or view and edit (when configuration mode is on) the current node settings.
Export properties...	All types except Input Program, Output Program.	Save the current node settings description to an XML file. Available in any mode.
Import properties...	All types except Input Program, Output Program.	Load the node settings from an XML file. Available in configuration mode only.
Set clock	Input Device Output Device.	Enable synchronization to this node. Available in configuration mode only
Statistics...	All types except Input Program, Output Program.	View the progress information. Available in execution mode only.
Add/delete a node. Available in configuration mode only		
 Add input device		Add an Input Device node. The node is added as the first in the line.
 Parse input programs		Parse the input stream into separate programs, detect the program numbers and video/audio PIDs.
 Add output device		Add an Output Device node. The node is added as the last in the line.
Add program...	Input Device	Add an Input Program node after the selected node.
Add output program...	Encoder Input Program Videoprocessor	Add an Output Program node after the selected node.
Add videoprocessor...	Input Device	Add a Videoprocessor node after the selected node.
Add encoder...	Input Program Videoprocessor	Add an Encoder node after the selected node.
Delete	All types.	Delete the selected node from the graph. All the nodes after it and before the Output Program node are also deleted.

6. The Tasks Panel

The Tasks panel is used to work with tasks: create, edit, delete tasks, view their current state, select tasks to add to the schedule. The panel contains a toolbar (1) and client area.

The client area contains a tree view of the tasks (2), which consists of expandable nodes. Each node corresponds to one task – contains a list of graphs that belong to the task, with the indication of the graph name and location. The node header indicates the task name and current state.

The existing dependencies between graphs are indicated with arrows (3). All the graphs on which the selected graph is dependent, are marked with the «outgoing» arrows: ←.

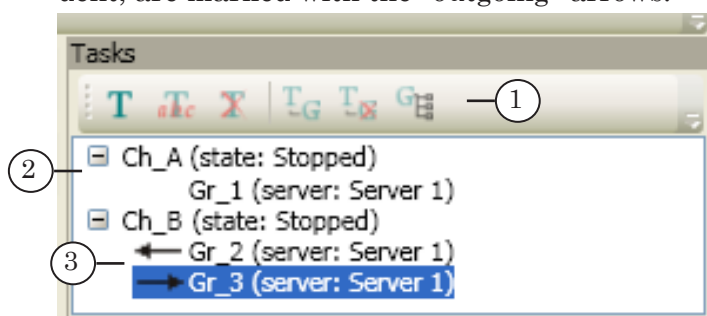


Table 9. Tasks Panel Toolbar

Button	Name	Action
Editing the list of tasks		
	Create new task	Add an empty task to the list.
	Rename task	Rename the selected task.
	Delete task	Delete the selected task.
Editing the selected task		
	Add graph to task	Add a graph selected in the list of graphs to the selected task. Available if selected is a graph not yet added to any task.
	Remove graph from task	Remove a graph selected in the task list. Available if the task is stopped.
	Graph dependencies	Open a window for viewing and/or setting dependencies of the selected graph, that is specifying graphs on which the selected graph will be dependent. Available if the task is stopped.

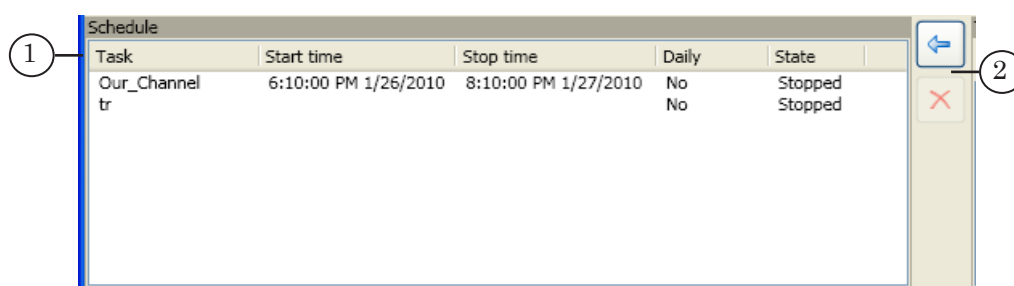


7. The Schedule Panel

This panel is used to create a schedule of tasks and to control their execution.



The schedule is presented as a table (1) whose columns display the following information:

- Task – task name;
- Start time – time and date of the task start;
- Stop time – time and date of the task stop;
- Daily – enable daily task execution:
 - Yes – execute every day at the specified time;
 - No – execute once;
- State – current state indicator.



The panel toolbar (2) contains buttons used to call comands for editing the schedule.

Table 10. Buttons for Editing the Schedule

Button	Name	Action
	Add selected task to schedule	Add a task selected in the list of the Tasks panel to the schedule; set the start and stop time.
	Remove selected task(s) from schedule	Remove the task(s) selected in the table from the schedule. All the graphs included in the task are automatically stopped.

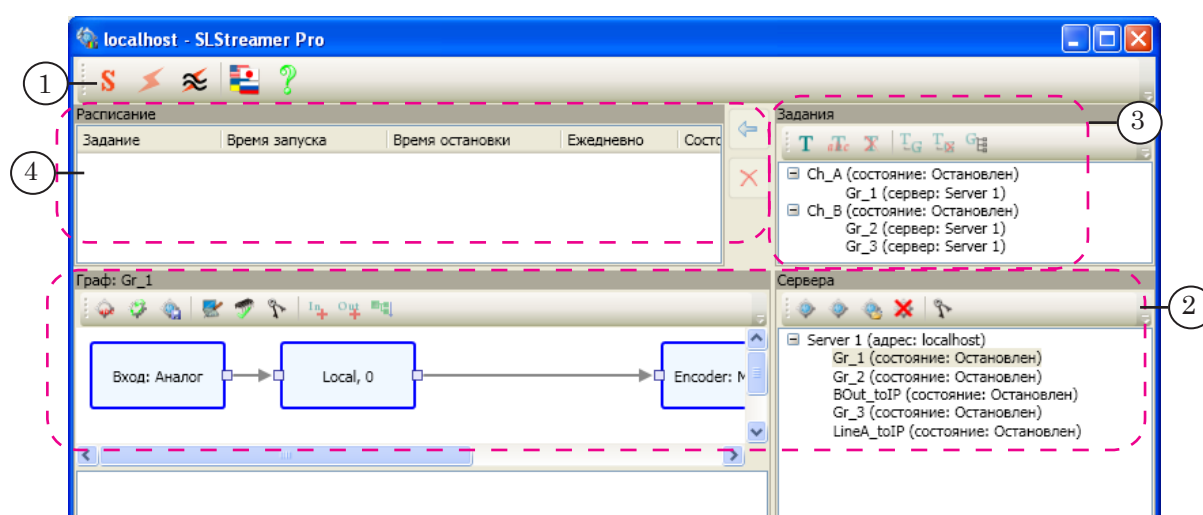


SLStreamer Pro. Working with the Program

General Workflow

This Section covers the general workflow in the SLStreamer Pro program. For more details about each step, see the appropriate Sections below.

1. Launch SLStreamer Pro using the desktop icon or the Start menu: Programs > ForwardTS > SLStreamer Pro.

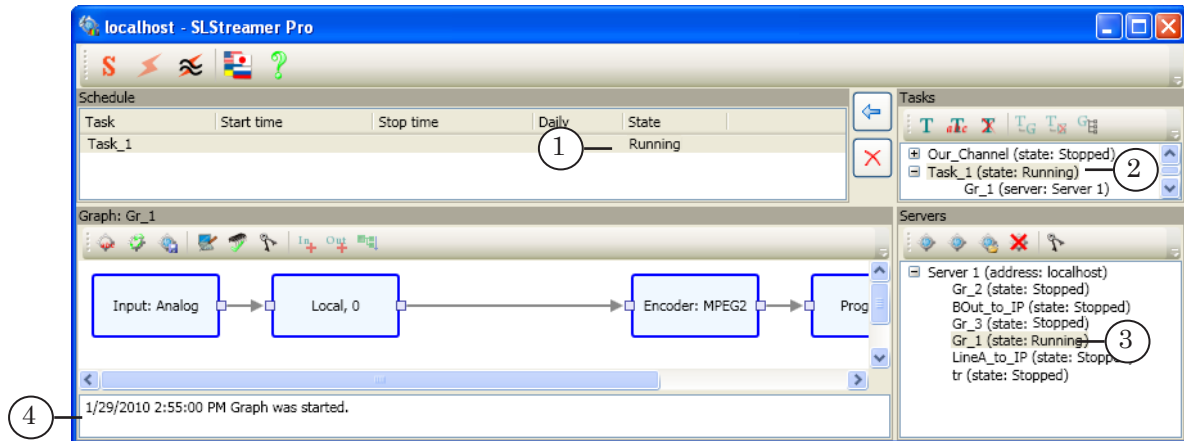


2. Connect to the required Scheduler using the toolbar buttons (1). When the connection is established, the window displays information about the existing graphs controlled by the selected Scheduler.
3. Create and configure a new graph. To do so, use the Servers and Graph panels (2).
4. In the Tasks panel (3): create a task. Add the graph(s) to the task. If necessary, configure dependencies between graphs.
5. Add the task to the schedule table in the Schedule panel (4). The task will be executed according to the specified schedule in automatic mode. Now the program can be closed – it will not affect the operation of the scheme. If the computer is restarted, all the formerly started graphs will run automatically.



- The current state of the tasks and graphs is displayed by the appropriate indicators (1–3): Stopped and Running. Progress messages are displayed in the log area (4).

To view information about the operation of a scheme element (input device, encoder, etc.), select Statistics... from the context menu of the corresponding node.



- The operation of a scheme will be stopped automatically according to the current schedule or when removing the task from the schedule table.

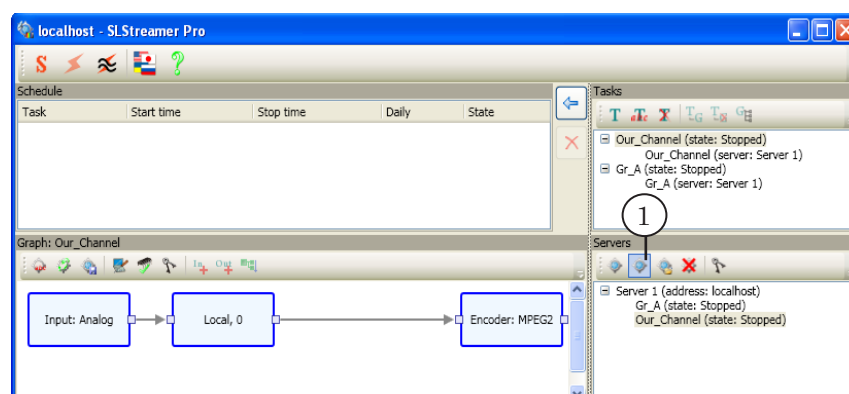


Creating and Editing Graphs

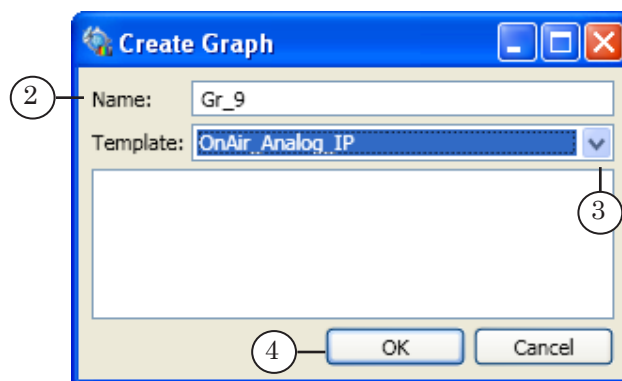
1. Creating a Graph by Using a Template

To create a new graph by using a template – a standard graph draft, complete the following actions:

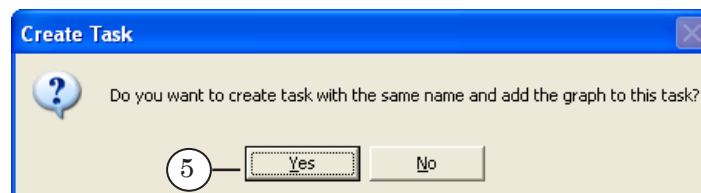
1. Click the Create new graph from template button on the toolbar of the Servers panel (1).



2. When the window opens, specify a convenient graph name (2). Select a template (3) that corresponds to the required streaming configuration. Click OK (4).
For a description of the standard templates, see the «Templates» Section.



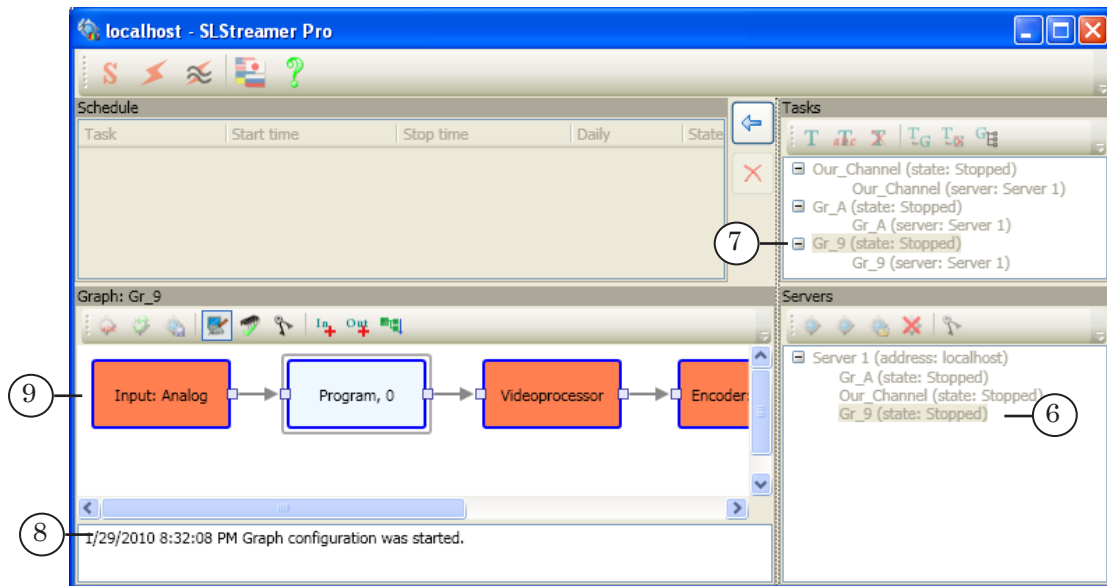
3. To immediately create a new task that includes the added graph, click Yes (5) when the Create Task window opens.



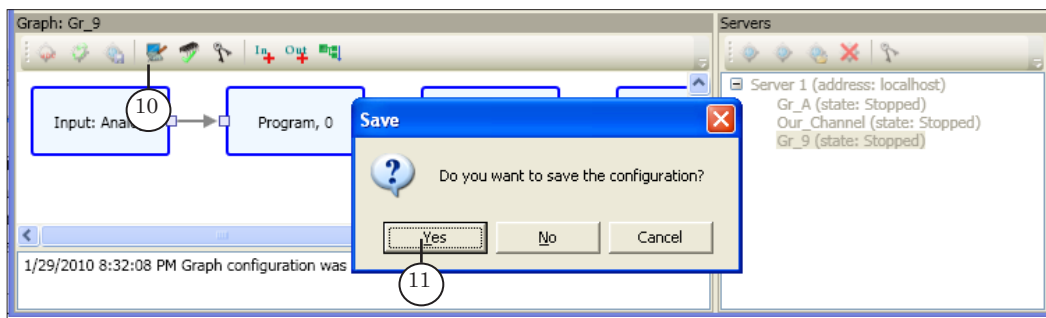
4. A new graph with the specified name is added to the list of graphs on the selected server (6). A new task that contains the graph is added to the list of tasks (7). Configuration



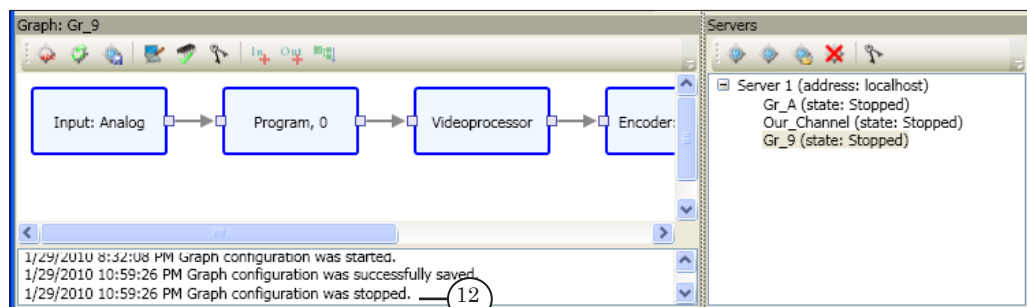
mode is automatically on (8). The graphs area displays a new graph that corresponds to the selected template (9). The nodes that must necessarily be configured before starting the graph are marked orange.



5. While in configuration mode, configure nodes one after another as needed. For more details about configuring nodes, see the «Working with the Programs. Configuring Graph Nodes» Section.
6. To finish creating the graph and exit configuration mode, click the Finish graph configuration button (10). When the window opens, click Yes to confirm that you want to save the changes (11).



7. The graph configuration is complete (12).

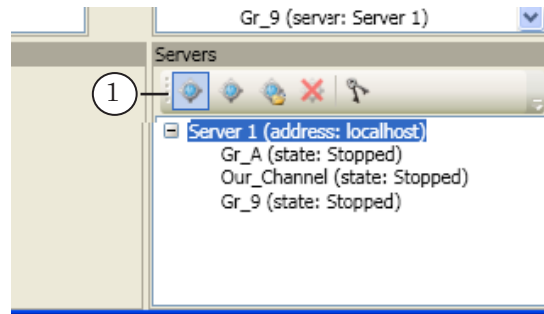




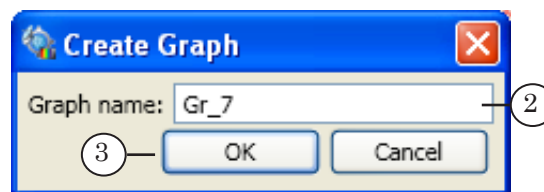
2. Creating a Graph without a Template

Creating a graph without a template is performed in two steps. First, create a new empty graph, then add to it the required nodes.

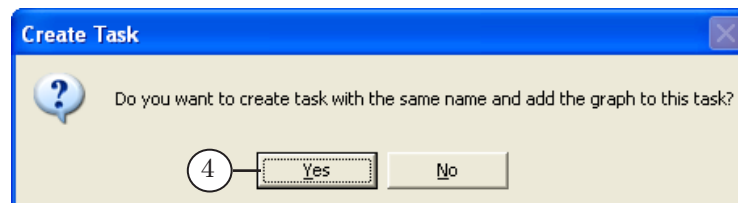
1. Click the Create new graph button on the toolbar of the Servers panel (1).



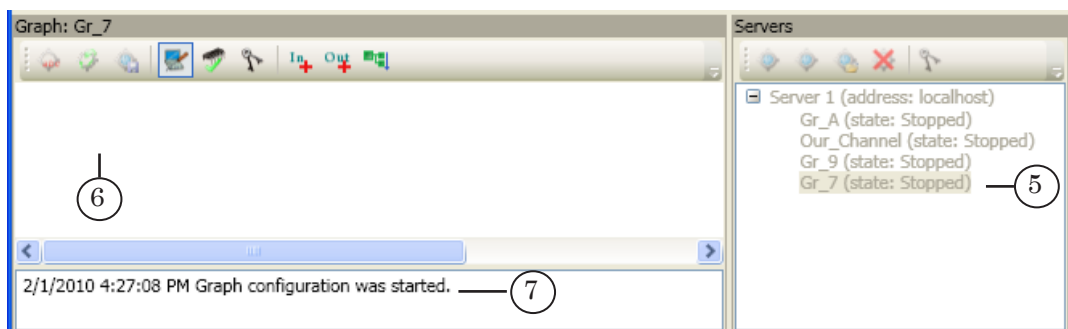
2. When the window opens, enter a unique name for the new graph in the Graph name field (2). Click OK (3) to close the window.



3. To immediately create a new task that includes the added graph, click Yes (4) when the Create Task window opens.



4. A new graph with the specified name is added to the list of graphs on the selected server (5). The graph area in the Graph pane is empty (6), since the new graph does not contain any nodes yet. Configuration mode is automatically on (7).

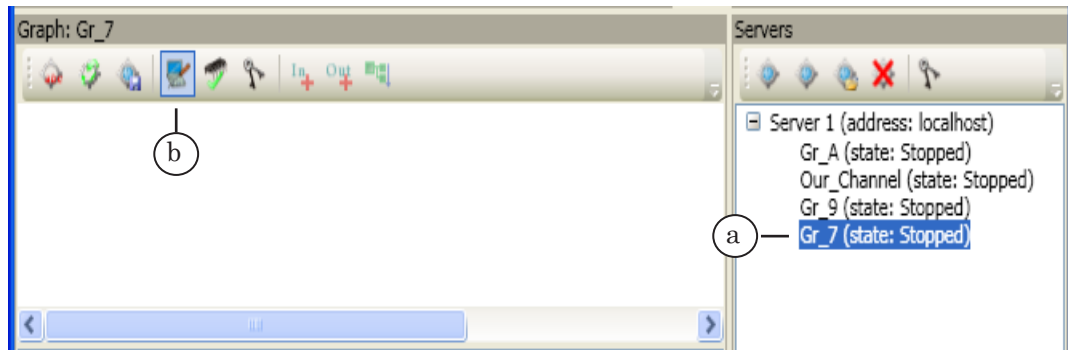




5. While in configuration mode, add and configure the required nodes one after another, left-to-right. A graph must contain at least four nodes: Input Device, Input Program, Output Program, Output Device.

Note 1: If configuration mode is off, switch to it. To do so:

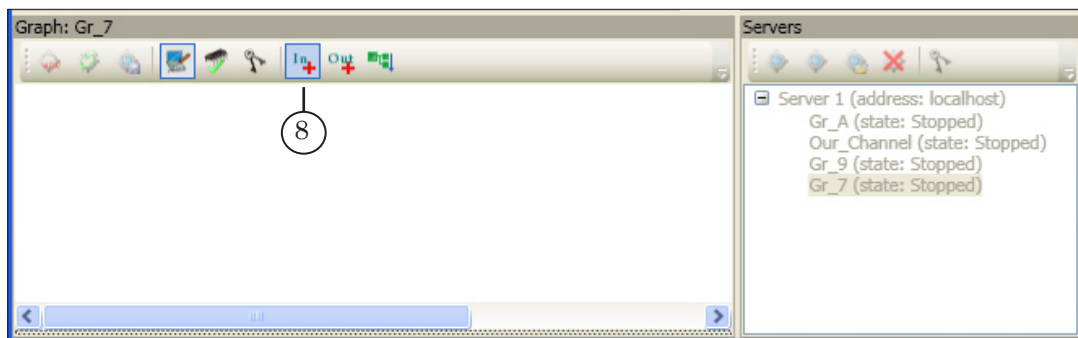
1. Select a graph in the list of graphs in the Servers panel (a).
2. Click the Configure graph button (b) on the toolbar of the Graph panel.



Note 2: When adding nodes, the properties windows are opened automatically. In the course of further work, the node parameters can be edited by selecting **Properties...** from the context menu of the corresponding nodes. For more details about configuring nodes, see the «Working with the Programs. Configuring Graph Nodes» Section.

Nodes are added as follows:

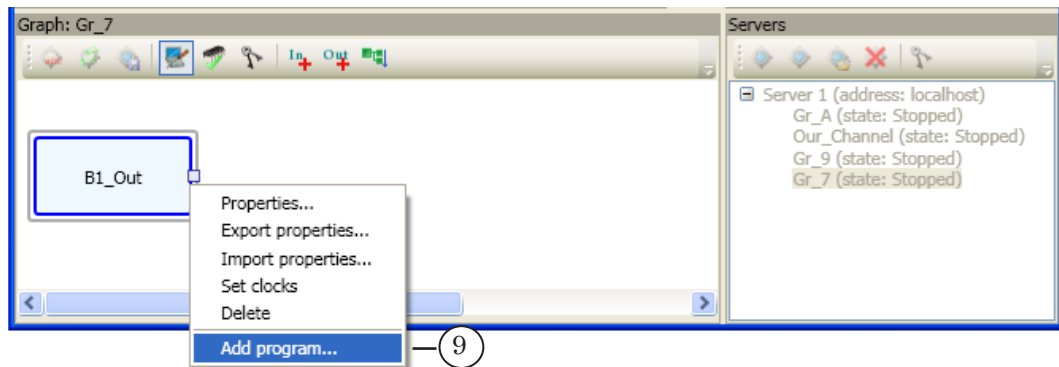
1. Input Device – use the Add input device button (8).



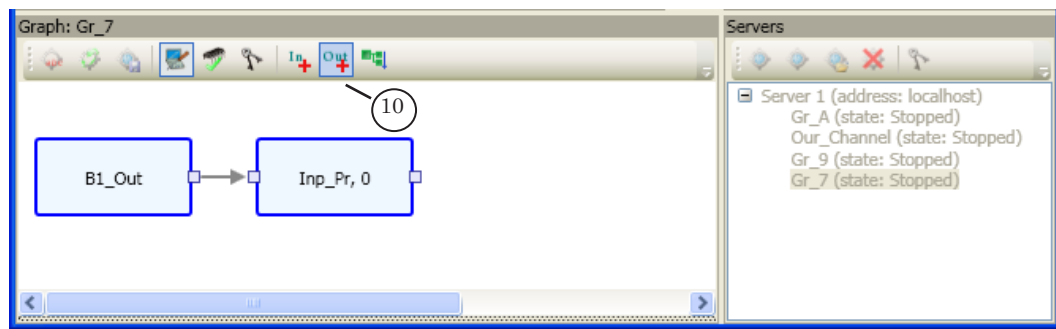
✓ **Important:** By the moment of adding and configuring the input node, the input data must be present at the input.



2. Input Program – right-click on the Input Device node. Select Add program... (9) from the context menu.

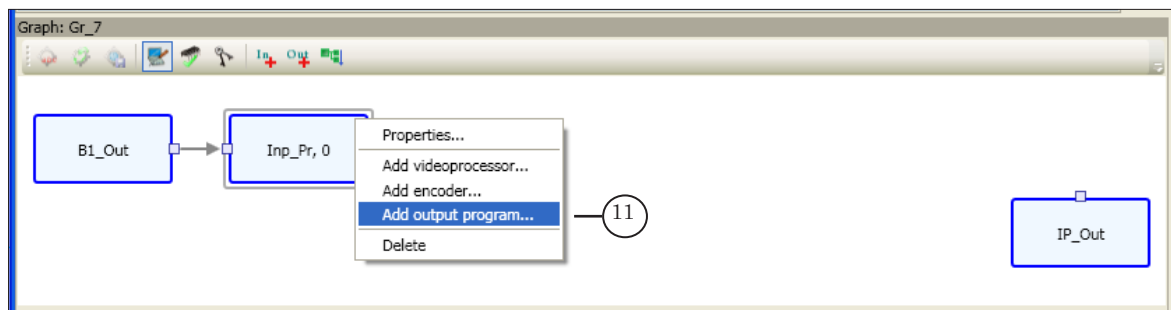


3. Output Device – use the Add output device button (10).



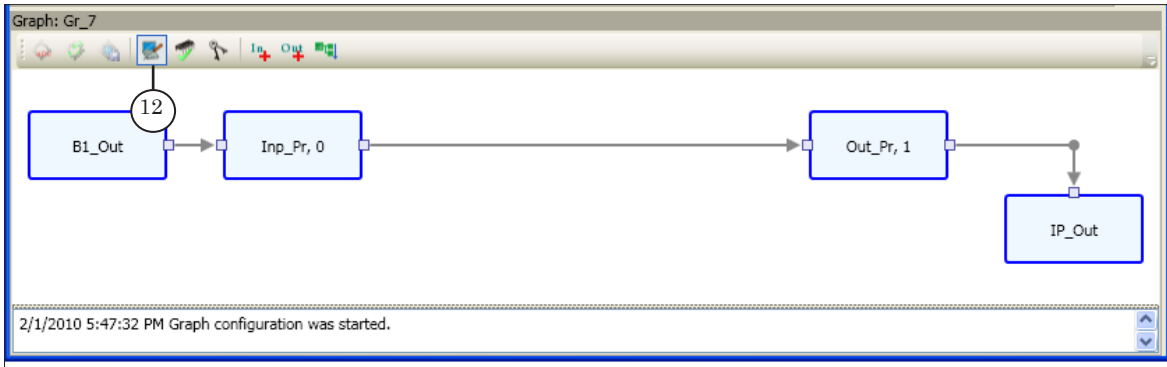
4. All the rest of the required nodes. To add a node, use the appropriate Add... command of the context menu of the node after which the new node is to be added.

5. The last added is the Output Program node (in graph, it is before the Output Device node). To add it, right-click on the node which is currently the last before the Output Device node (e.g. Input Program). Select Add output program... (11) from the context menu.

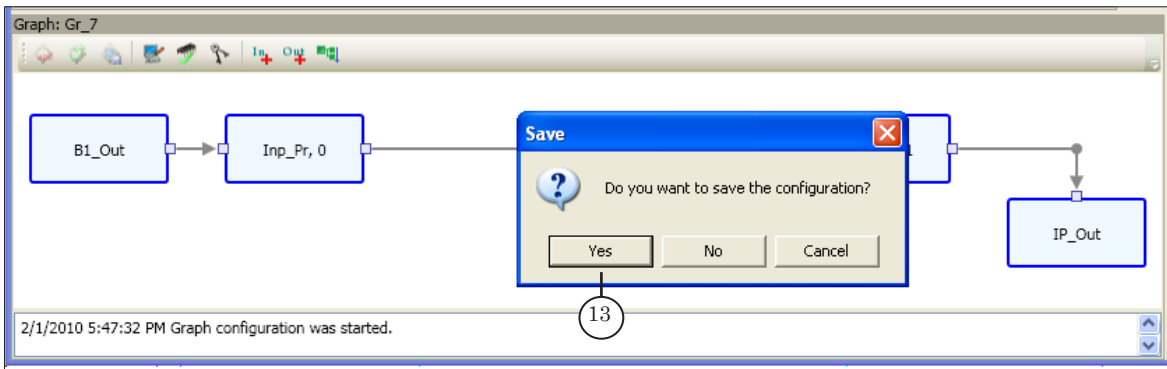




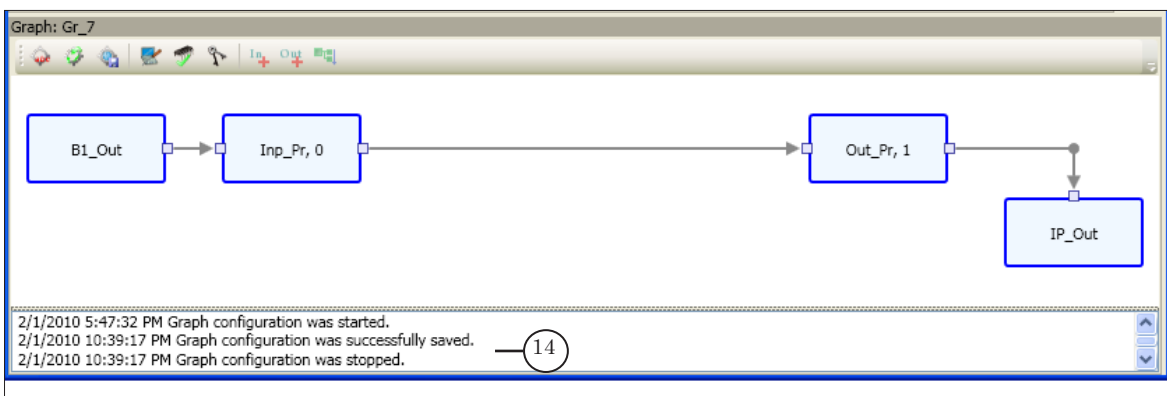
- To save the graph configuration and exit configuration mode, click the Finish graph configuration button (12).



- When the window opens, confirm that you want to save the changes (13).



- The graph configuration is complete (14).





Creating and Editing Tasks

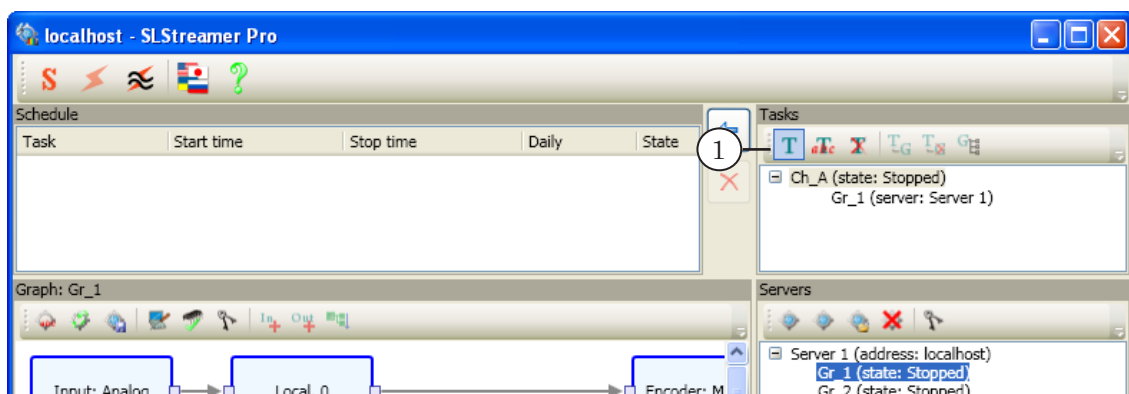
To run a graph, it is necessary to add it to a task.

Tasks are created and edited in the Tasks panel. First of all, create a new empty task, then add to it the required graphs and specify dependencies between graphs when necessary.

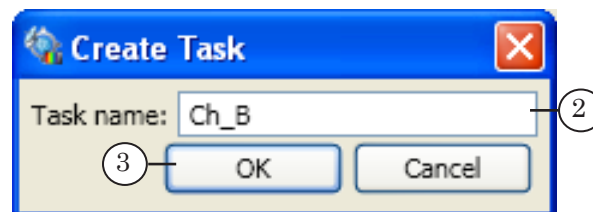
1. Creating a Task

To create a new empty task, complete as follows:

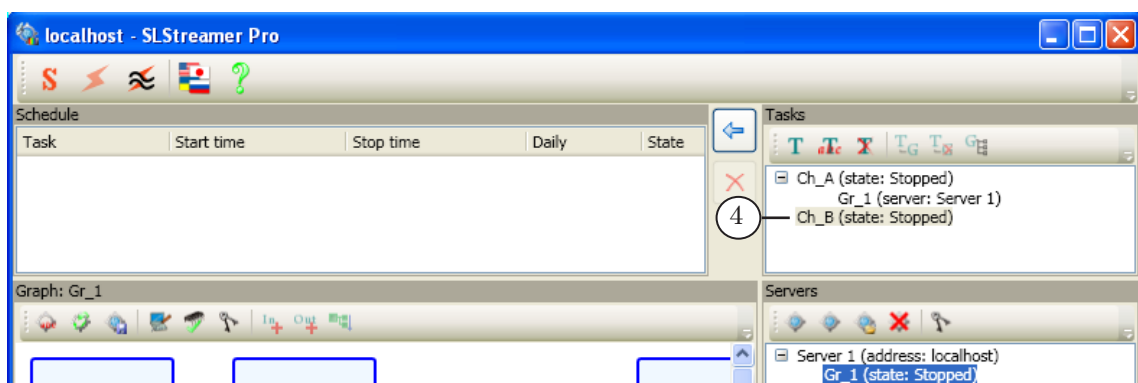
1. Click the Create new task (1) button in the Tasks panel.



2. When the window opens, enter a task name (2). The name must be unique. Click OK (3).



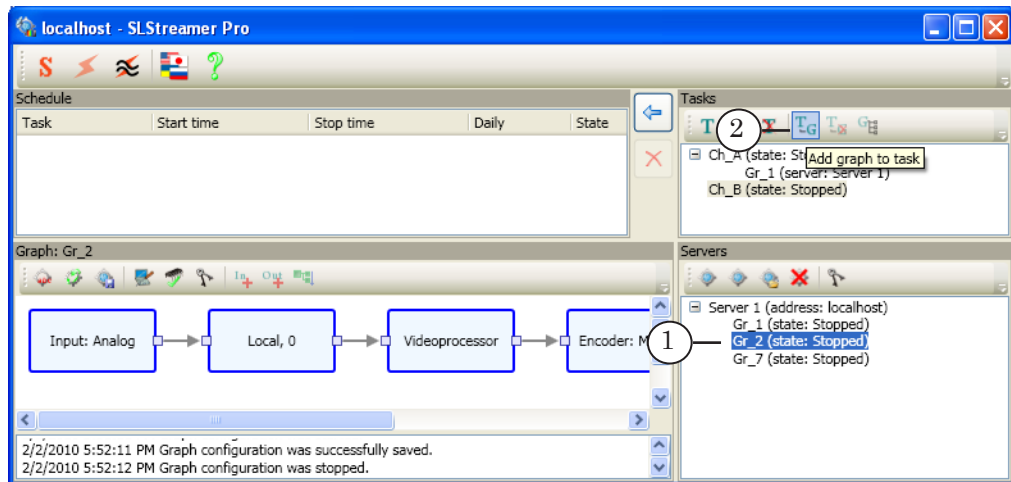
3. The new task is added to the list (4).



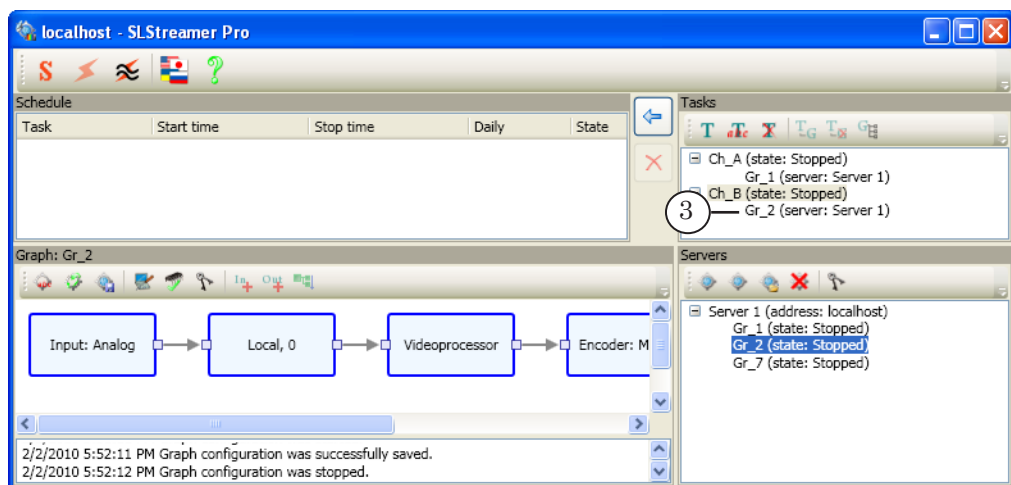


To add a graph to a task:

1. Select a required graph in the Servers panel (1).
Note that one graph cannot be in different tasks at the same time.



2. Click the Add graph to task button (2) in the Tasks panel.
3. The graph is added to the selected task in the Tasks panel (3).



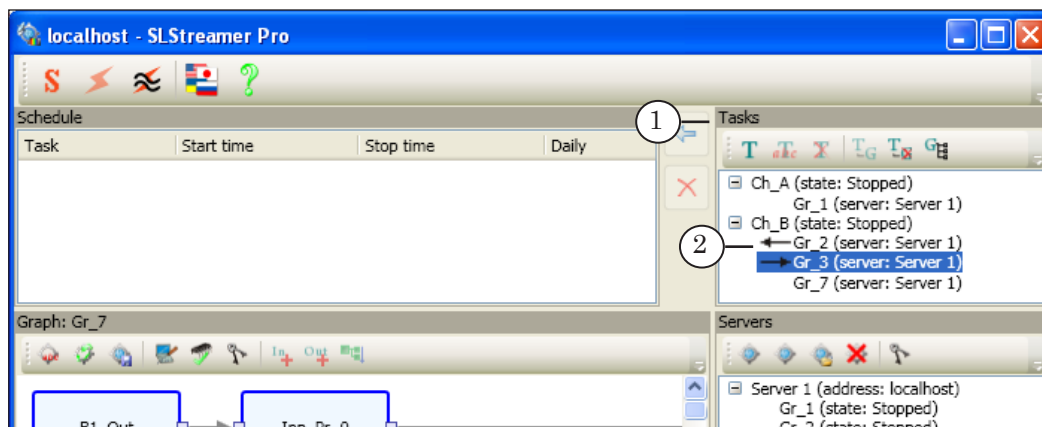


2. Viewing and Specifying Dependencies between Graphs

You can specify dependencies between graphs included in the same task. For example, if graph A is the first to start, and graph B is next after it, then B is dependent on A.

Dependencies are indicated and specified in the Tasks panel (1).

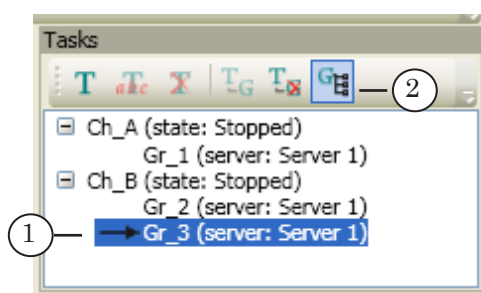
To view information about the dependencies of a graph, select it in the list. All graphs on which it is dependent are marked with the «outgoing» arrows: ← (2).



Specifying dependencies between graphs is only available when the current state of the task is – Stopped.

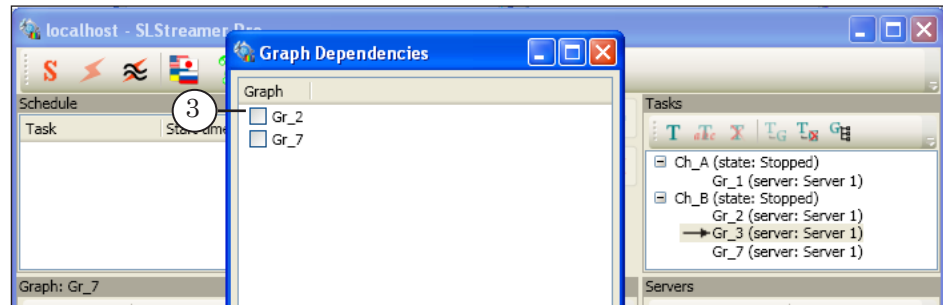
Let's see an example of how to specify dependencies of the following type: «graph B is dependent on graph A». In our example: «graph Gr_3 is dependent on Gr_2». To specify this dependency, perform the following steps:

1. Select a graph named Gr_3 (1) in the list of graphs in the Tasks panel. Click the Graph dependencies button (2).

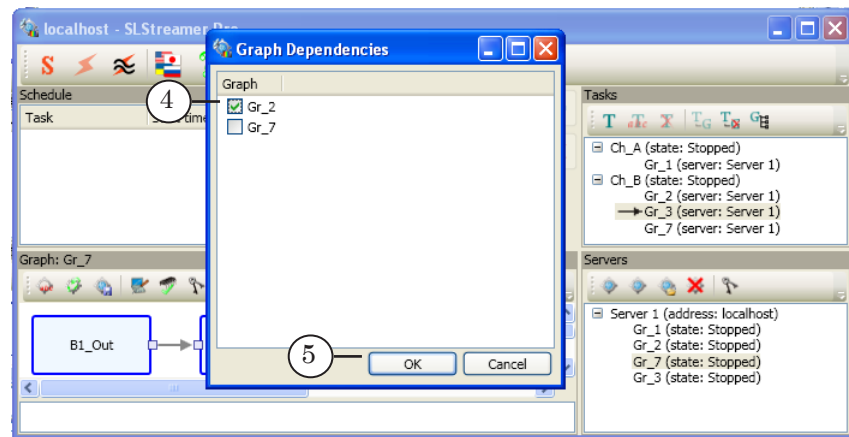




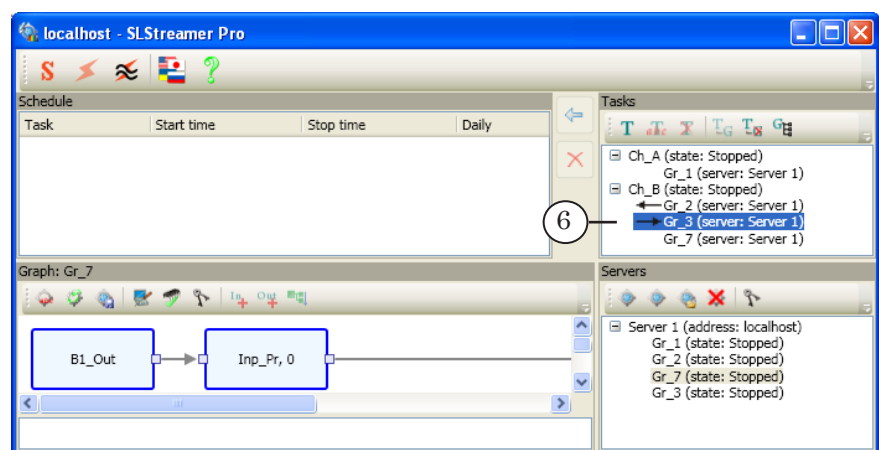
- The window contains check boxes with the names of the graphs (3) on which the graph selected in task list can be dependent.



- Check the appropriate check box to specify a required dependency. In our example, it is a graph named Gr_2 (4). Click OK (5).



- The specified dependency is indicated with arrows in the task list (6): graph named Gr_3 is dependent on Gr_2.





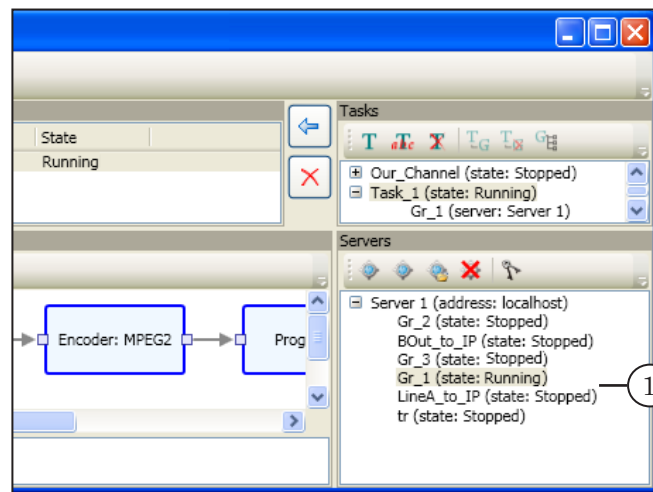
Control of Graphs and Tasks. Monitoring

1. Execution of Graphs

A graph can be in one of the following states:

- Stopped – the scheme is not operated. In this state, it is possible to switch to configuration mode;
- Configuration – the scheme is not operated; configuration mode is on – you can add nodes and edit parameters;
- Running – the scheme is being operated. In this state, it is only possible to view the current settings and node operation statistics.

The current state indicators are displayed in the list of graphs in the Servers panel (1).



When working with graphs, the following rules are applied:

1. If a graph is not added to a task, it cannot be switched to the Running state.
2. A graph is started and stopped automatically according to the settings and current state of the task that contains it.
3. Exiting the program does not affect the current state of the graphs. After the computer is restarted, the current state is restored.



2. Execution of Tasks

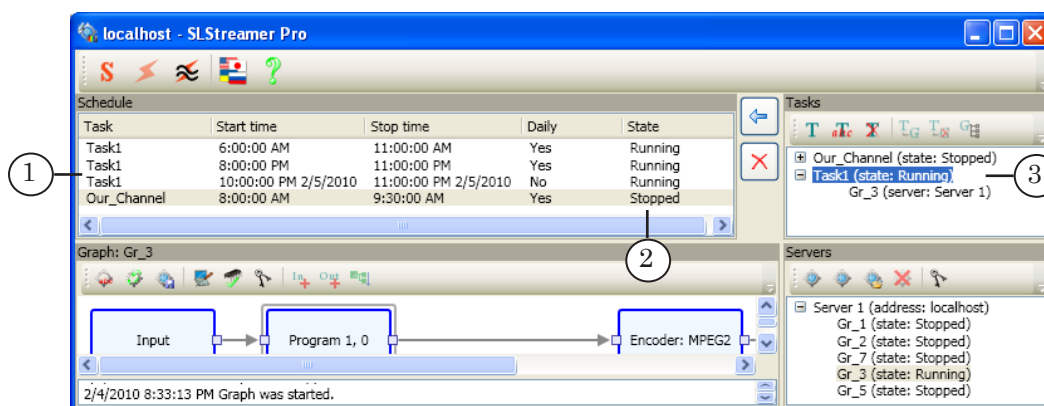
A task can be in one of two states:

- Stopped – the scheme is not operated. In this state, you can edit the task: add/ delete graphs, change dependency settings;
- Running – the scheme is being operated according to the specified task. You cannot edit the task in this state.

When working with tasks, the following rules are applied:

1. Executed can be only the tasks that are added to the table in the Schedule panel.
2. It is possible to set the start time, stop time, and periodicity of runs: once (date being specified) or daily.
3. Tasks are started automatically:
 - according to the time specified when adding the task to the schedule table;
 - immediately after adding to the table, if the start time is not set.
4. Tasks are stopped automatically:
 - according to the time specified when adding the task to the schedule table;
 - immediately after removing the task from the table.
5. The same task can be added to the schedule table several times with different time settings (as a result, the table may contain several lines for the same task). It allows you to create any required flowchart (see the example in the Figure below (1)).
6. Exiting the program does not affect the current state of the tasks. After the computer is restarted, the current state is restored.

The current state indicators are displayed in the schedule table (2) and in the list of tasks (3).

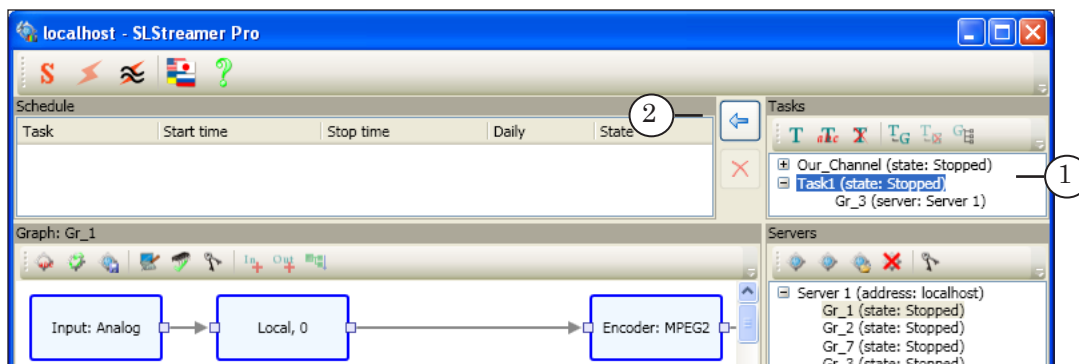




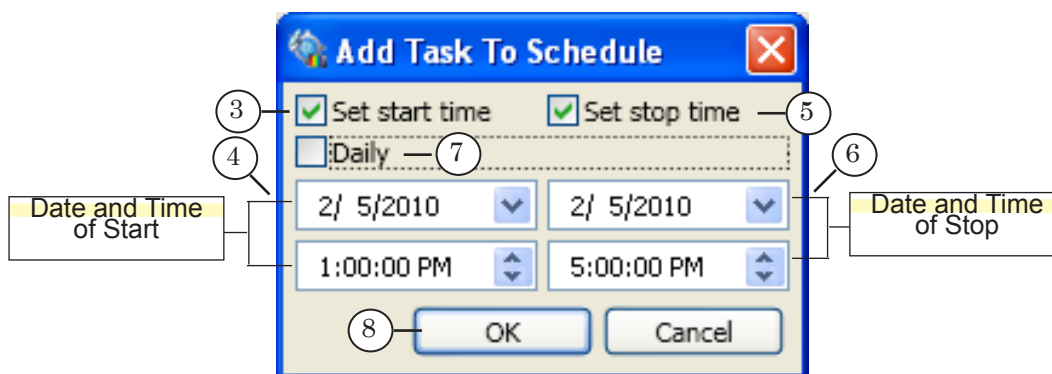
3. Adding Tasks to Schedule

To add a task to the schedule, complete the following actions:

1. Select a task in the list of tasks (1) and click the Add selected task to schedule button (2).



2. When the window opens, set the start/stop date and time when necessary:
 1. To specify the start time, check the Set start time check box (3). The fields below become available (4). Specify the required date and time.
 2. To specify the stop time, check the Set stop time check box (5). Specify the required date and time in the fields below (6).
 3. To run the task periodically (daily) according to the specified time, check the Daily check box (7).

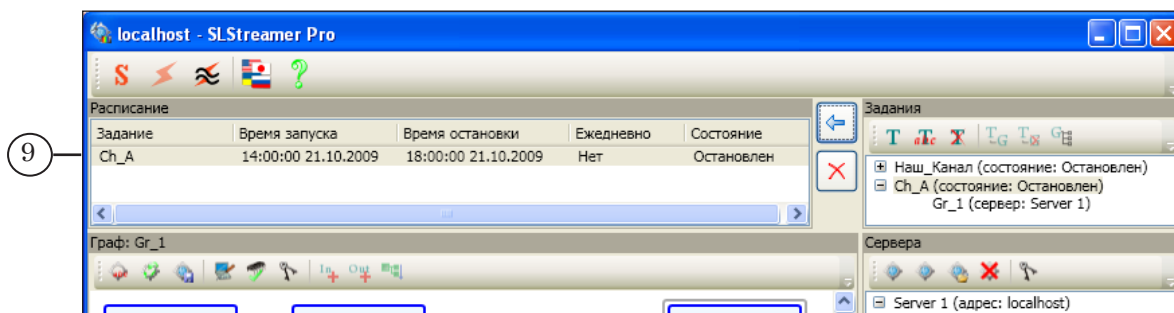


Tip: If the check box (3) is not checked, the task starts on adding to the schedule table. If the check box (5) is not checked, the task runs until removing from the schedule table manually.

3. Click OK (8) to close the window and add the task to the schedule table.



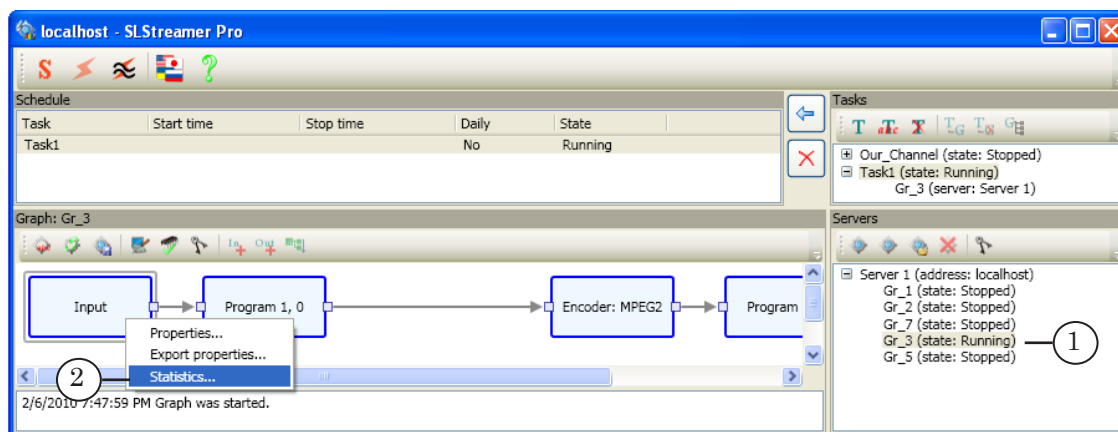
4. The task is added to the schedule table (9).



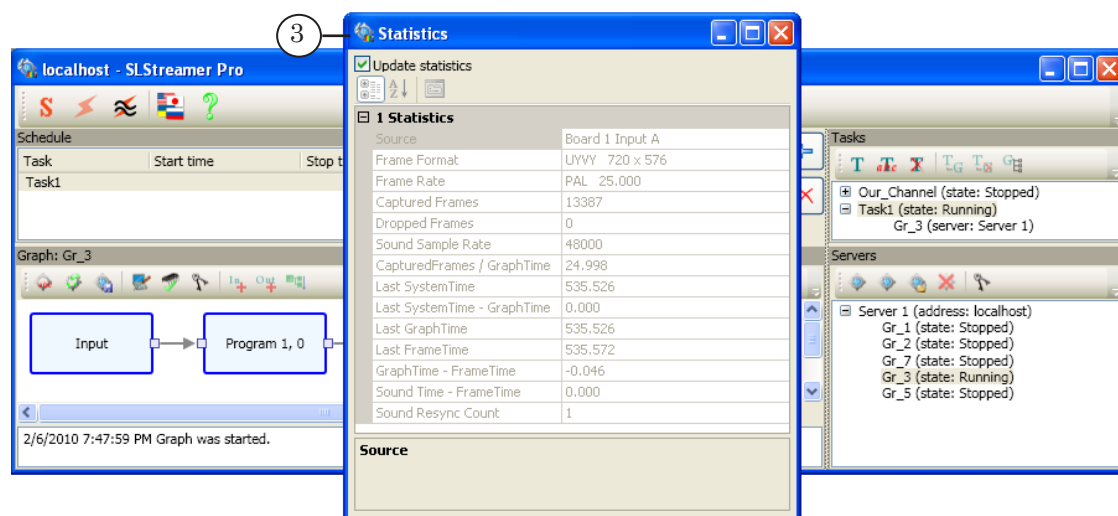
4. Viewing Node Statistics

If a graph is in the Running state (1), viewing the current statistics of its nodes is available – except for the Input Program and Output Program nodes.

To get information about the operation of a node, right-click on the node and select Statistics... (2) from the context menu.



The window (3) displays the current operation parameters of the selected node.





Working with the Programs

This Section covers information common for SLStreamer Lite and SLStreamer Pro about the procedure of configuring graph nodes and making some additional settings.

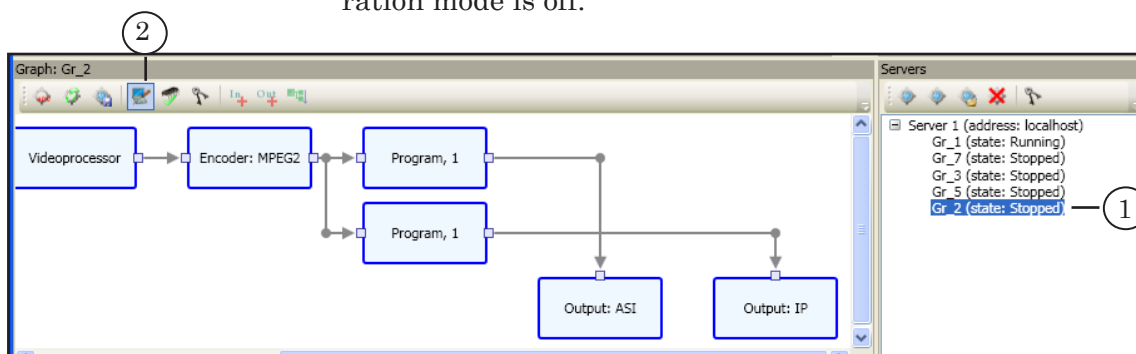
Configuring Graph Nodes

1. General Information

Graph nodes are configured in configuration mode. You can only switch to this mode if the graph is in the Stopped state (1).

When creating a new graph, configuration mode is automatically on.

To manually switch to configuration mode, click the Configure graph button (SLStreamer Lite – main toolbar; SLStreamer Pro – the Graph panel toolbar (2)). This is a toggle button: when the button is clicked – the mode is on. To exit configuration mode, click on the button again. When the button is released, configuration mode is off.



It is recommended to configure nodes in the order they are in the graph – left-to-right – since in most cases a node settings depend on the settings of the previous nodes.

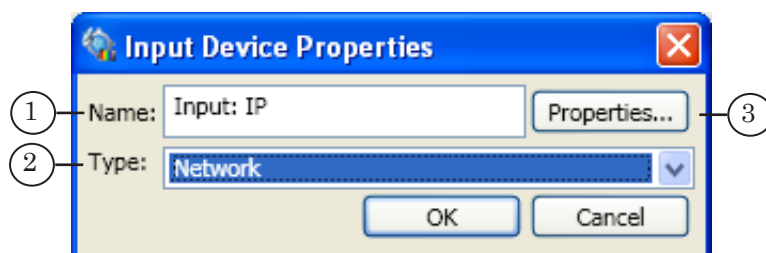
To open the properties window of a node, double-click on the node or select Properties... from the context menu of the node.



2. Input Device

The operation parameters of the input device are configured in the Input Device Properties window. To open the window, double-click on the Input node.

Specify a node name (1) and select a device type (2). For an itemization of the items, see the Table below. Then click Properties... (3) to proceed to configuration of the selected device parameters.

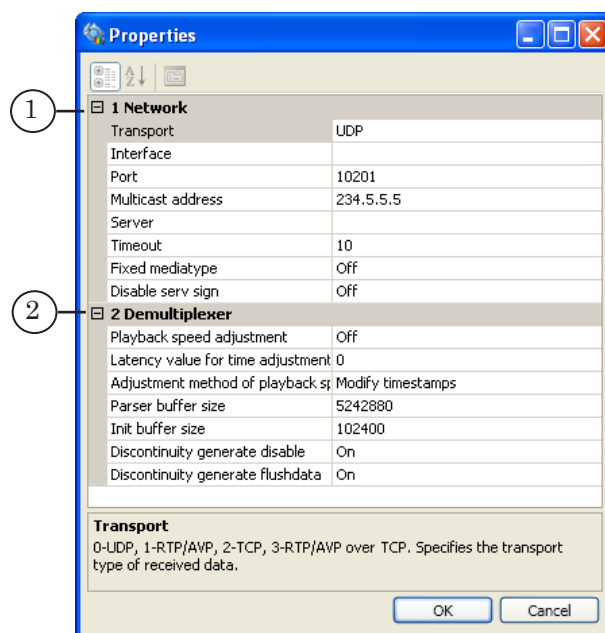


Type (Designation)	Description/Data Type
Frame Generator	Program module Frame Generator from ForwardTS software. Generates frames with the required frequency and size («chequered pattern» image).
Title Generator	Program module from ForwardT Software. Includes Frame Generator and Videoprocessor. A «Videoprocessor» license is required for use.
Board #: Line A Board #: Line B (# denotes the board number)	Input of the FD300 board with the specified number, a specified line (A/B). Analog or SDI signal.
Board #: Output	Output of the FD300 board with the specified number. Analog or SDI signal.
Board #: ASI	ASI interface of the FD401 board with the specified number. MPEG TS stream. This case also implies the necessity to configure the demultiplexer parameters.
Network	IP interface (netcard) and demultiplexer. MPEG TS stream. The protocols used: UDP, RTP/AVP, TCP, RTP/AVP over TCP. This case also implies the necessity to configure the demultiplexer parameters.
Network (Raw TS)	IP interface (netcard), no demultiplexer. MPEG TS stream. The protocols used: UDP, RTP/AVP, TCP, RTP/AVP over TCP.

Parameters of the selected device are configured in the Properties window. Depending on the device type, the window may contain one or two collapsible tables:

- (1) – parameters of the device that receives the signal or stream. The table name and set of parameters depend on the selected device type;
- Demultiplexer (2) – demultiplexer parameters. Present, if an appropriate device type is selected (for receiving and demultiplexing the transport stream).

For a description of the input device parameters, see the Reference Section «Property sheets».



3. Input Program

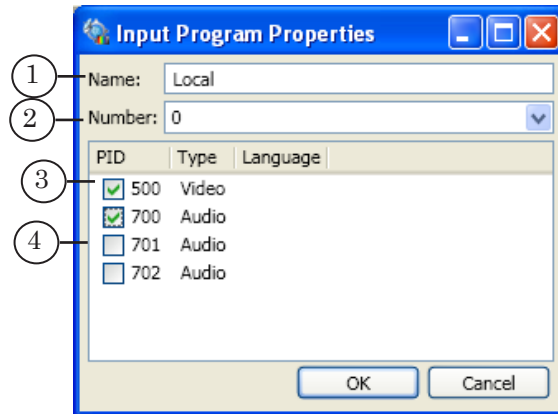
The parameters of the program received from the input transport stream or analog signal for further processing are configured in the Input Program Properties window. To open the window, double-click on the Program node.

Configuration is performed when data are coming to the receiver, and the Input node is configured.

A name for the input program node (1) is specified arbitrarily. It must be a convenient and unique identifier.

The Number drop-down list (2) contains the numbers of all programs detected in the input stream, and is used to select a program for further processing.

The table (3) contains a list of video and audio PIDs (for the selected program) detected in the input stream. To select the required PIDs for processing, check the appropriate check boxes.



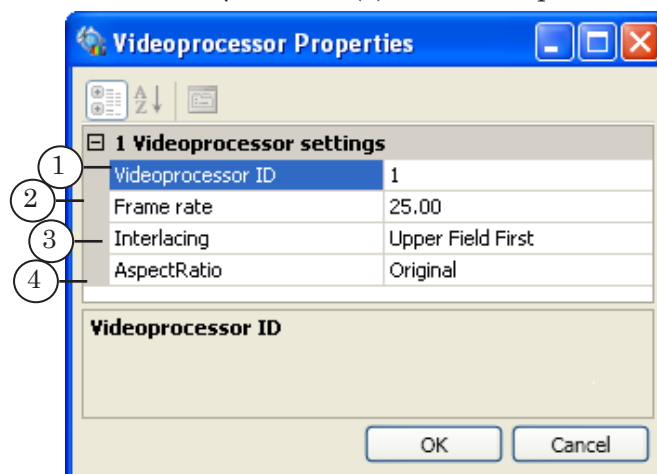
Note: If selected for processing is a program that comes from the FD300 board output, the table (3) displays PIDs of three audio streams (according to the number of the board audio devices). PID 700 corresponds to the audio device specified in the FDO nAir program as Sound1, 701 – Sound2, 702 – Sound3. Select the required audio stream by checking the appropriate check box depending on which audio device is selected to be used in FDO nAir.

4. Videoprocessor

Configuration is performed in the Videoprocessor Properties window. To open the window, double-click on the Videoprocessor node.

When configuring the video processor, specify the following parameters:

- Videoprocessor ID (1) – video processor identifier. The number is used to identify this instance of the video processor by other programs, e.g. FDO nAir;
- Frame rate (2) – frame rate when processing;
- Interlacing (3) – scan mode and field order;
- Aspect Ratio (4) – frame aspect ratio.



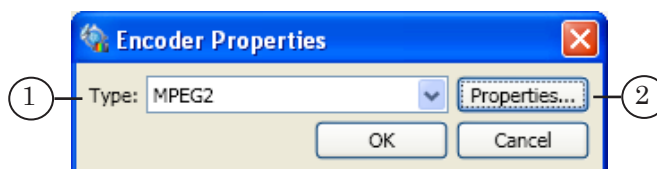
✓ Important: The frame rate and field order must match the parameters of the processed program.



5. Encoder

Configuration is performed in the Encoder Properties window. To open the window, double-click on the Encoder node.

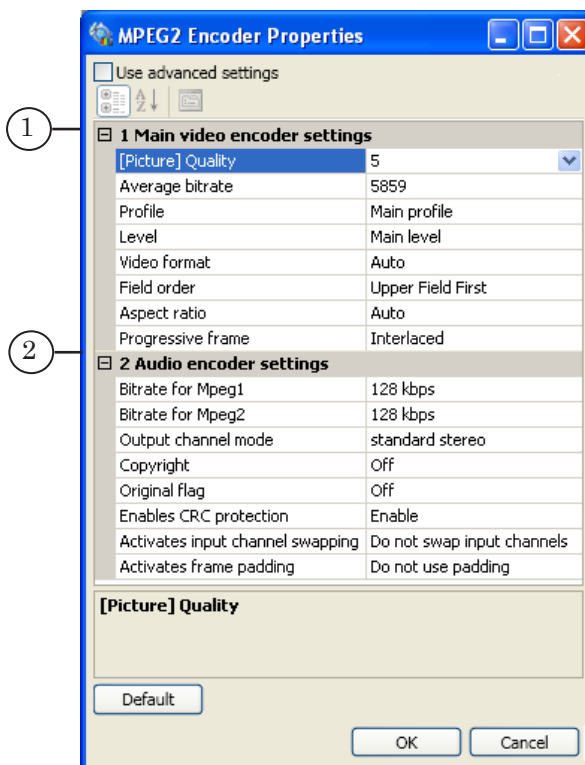
When configuring the encoder, first of all select a video compression type (1): MPEG2 or AVC. Then click Properties... (2) to proceed to further configuration of the encoder parameters: video and audio.



Further configuration of the parameters is performed in the Properties child window. The window contains two collapsible tables:

- Main video encoder settings (1) or Advanced video encoder settings (if the Use advanced settings check box is checked) – basic or advanced set of video encoder parameters;
- Audio encoder settings (2) – audio encoder parameters.

The list of video encoder properties depends on its type. For a description of the parameters, see the Reference Section «Property Sheets».





6. Output Program

Output program – program passed to the transport stream or analog signal at the output as a result of some processing (e.g. inserting commercials).

The parameter values of the output program are transmitted in the output transport stream and can be used to identify the program at the receiving end.

The program parameters are configured in the Output Program Properties window. To open the window, double-click on the Output Program node.

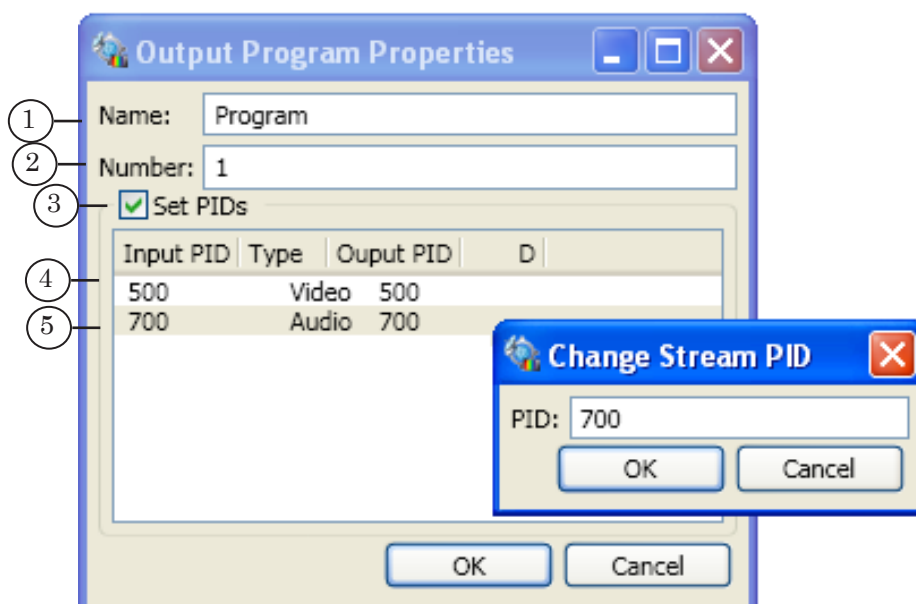
The window contains text fields used to specify:

- a name for the output program (1);
- a program number (2).

To view and edit the video/audio PIDs, use the following controls:

- Set PIDs (3) – to select a way of setting PIDs. If the check box is unchecked, the values are set automatically; if checked – manually;
- table (4) that displays the input and output PID values.

To change an output PID value, check the Set PIDs check box and double-click the appropriate line. When the window opens, specify the required value.

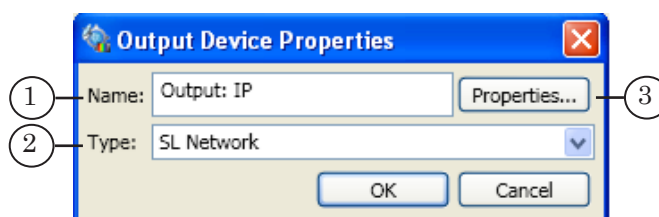




7. Output Device

Configuration is performed in the Output Device Properties window. To open the window, double-click on the Output node.

First of all specify a node name (1) and select a device type (2). For an itemization of the items, see the Table below. Then click Properties... (3) to proceed to configuration of the selected device parameters.



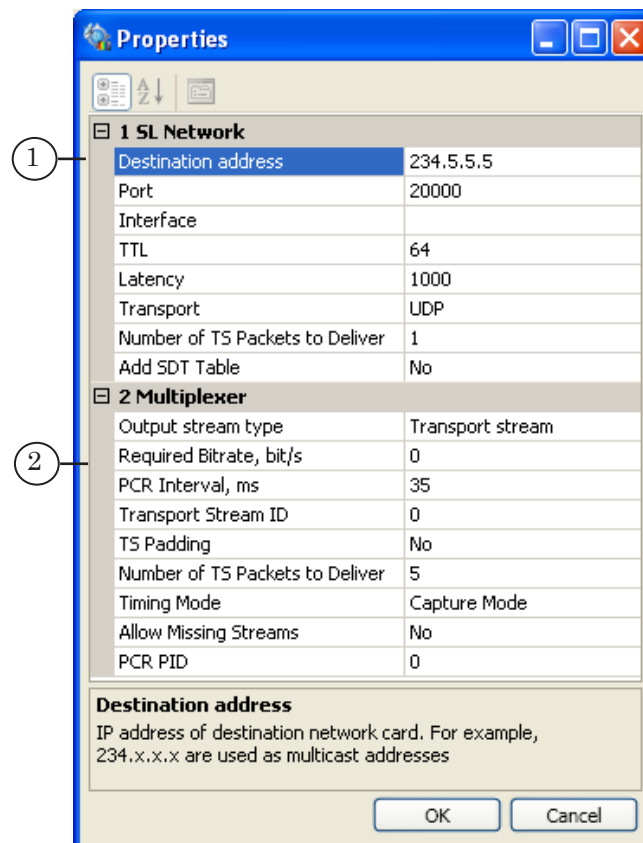
Type (Designation)	Description/Data Type
Board #: foreground (# – denotes the board number)	FD300 board with the specified number. Analog or SDI signal.
Board #: ASI	FD401 board with the specified number, ASI interface. MPEG TS stream. This case also implies the necessity to configure the multiplexer parameters.
SL RTP; SL RTSP; Network	IP interface (netcard). MPEG TS stream. This case also implies the necessity to configure the multiplexer parameters. The protocols used: <ul style="list-style-type: none"> • SL RTP – UDP, RTP; • SL RTSP – RTSP; • Network – UDP, RTP/AVP, TCP, RTP/AVP over TCP.
SL RTP (Raw TS); SL RTSP (Raw TS); Network (Raw TS)	Ditto without the multiplexer.
Windows Media	IP interface (netcard). IP interface (netcard). Windows Media (WMV) stream via HTTP. Network streaming.
Named Region Earlier versions of the software used the designation DVM-6 Renderer instead of Named Region.	Output to the specified bounding rectangle: <ul style="list-style-type: none"> • FD300 Board – on the title layer of the FD300 board; • DVM-6 Engine – to the device DVM-6; • Videoprocessor – to the program module Videoprocessor.
File Writer	Service filter for multiplexing and writing the stream to a file. Includes a multiplexer.
File Writer (Raw TS)	Service filter (without a multiplexer) for writing the stream to a file without multiplexing. Can be used in the lines where the input transport stream is not demultiplexed.



Parameters of the selected device are configured in the Properties window. Depending on the device type, the window may contain one or two collapsible tables:

- (1) – parameters of the device that sends the signal or stream. The table name and set of parameters depend on the selected device type;
- Multiplexer (2) – multiplexer parameters (may be absent).

For a description of the output device parameters, see the Reference Section «Property sheets».



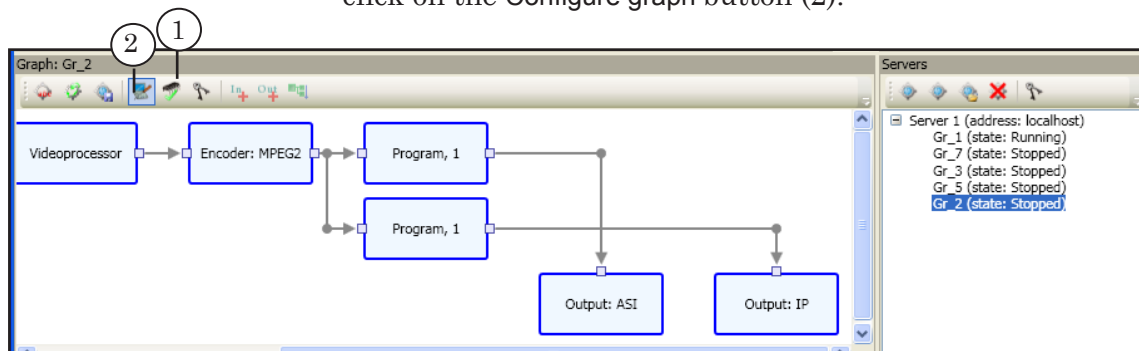


Additional Information and Settings

1. Using CPUs

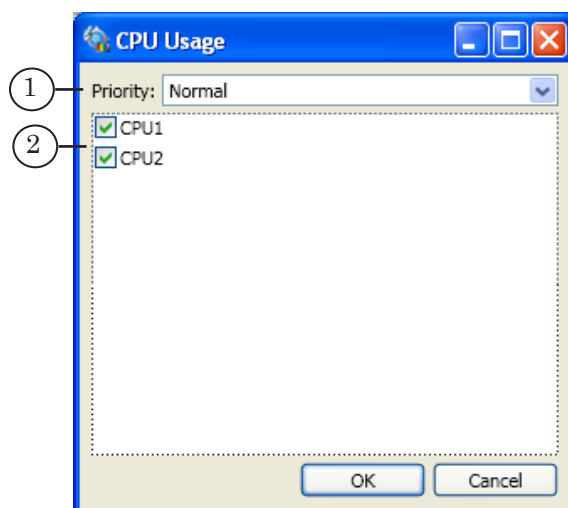
The CPU Usage window is used to view and edit the priority and CPU usage for the execution of the selected graph. To open the window, click on the Show CPU usage button (SLStreamer Lite – the main toolbar; SLStreamer Pro – the Graph panel toolbar (1)).

Editing is only possible in configuration mode. To switch to it, click on the Configure graph button (2).



The window contains the following controls:

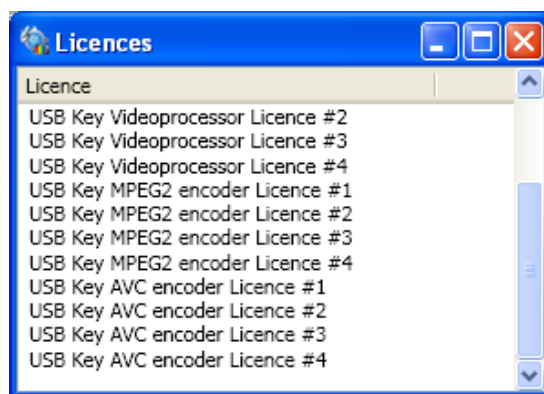
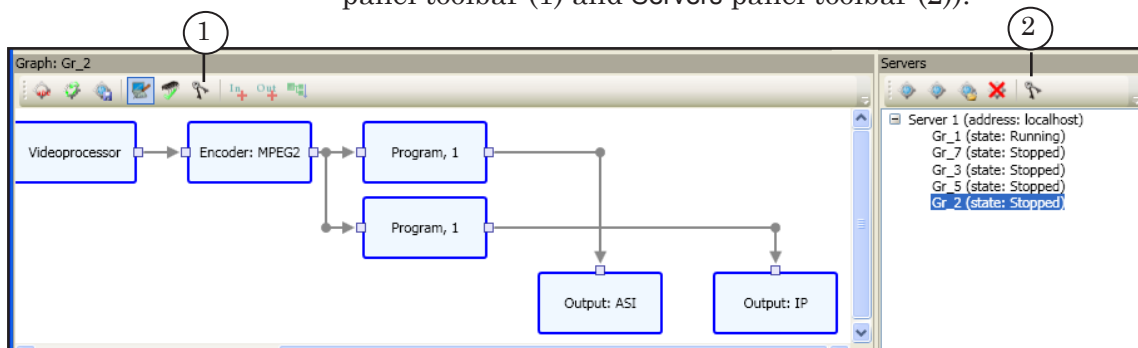
- Priority (1) – drop-down list used to select a priority for the graph execution;
- CPU check boxes (2) – checking a check box enables the CPU for the graph.





2. Viewing License Information

The Licences window – reference window that contains a list of all available licenses. To open the window, click on the Licences button (SLStreamer Lite – main toolbar; SLStreamer Pro – Graph panel toolbar (1) and Servers panel toolbar (2)).



The list indicates for each license:

- registration type – USB Key (the registration is performed using the USB dongle HASP HL);
- license type – which function of the software is enabled:
 - Videoprocessor;
 - MPEG2 encoder;
 - AVC encoder;
- sequence number.



Examples

Configuring OnAir_0_IP Template Line (SLStreamer Lite)

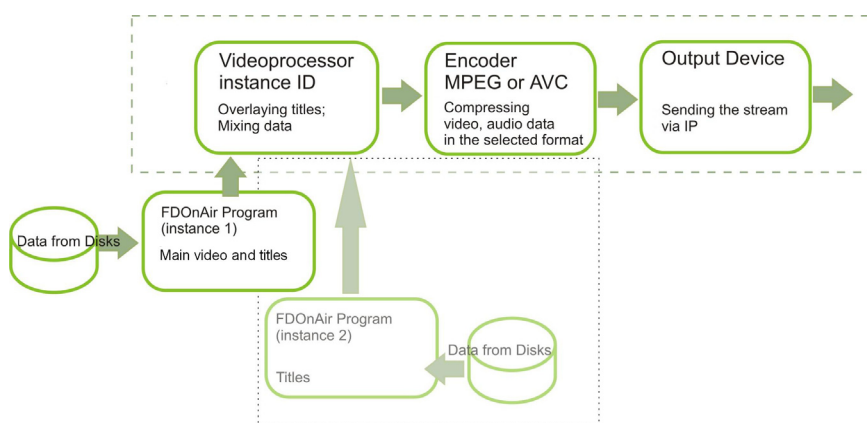
Let us see an example of how to configure network streaming of your own programs with inserting commercials and title elements provided all the necessary data are stored on local or network disks. Streaming will be performed via RTSP.

To preview the network streaming data, we will use the VLC media player program (version 0.9.6). It is a free program, which allows you to preview media data. The program can be downloaded from www.videolan.org

1. Streaming Scheme

The OnAir_0_IP template should be used to create streaming schemes designed to play video clips, commercials, titles, etc. from local or network disks according to the schedule without using input programs. On the output, the data are converted to MPTS streamed to the receiving end over IP.

A scheme of streaming by this template is shown in the Figure.



Note: When working by the scheme, several FDO nAir instances can be used. One – as a background server (video server) and foreground server (title server), others – to add titles.



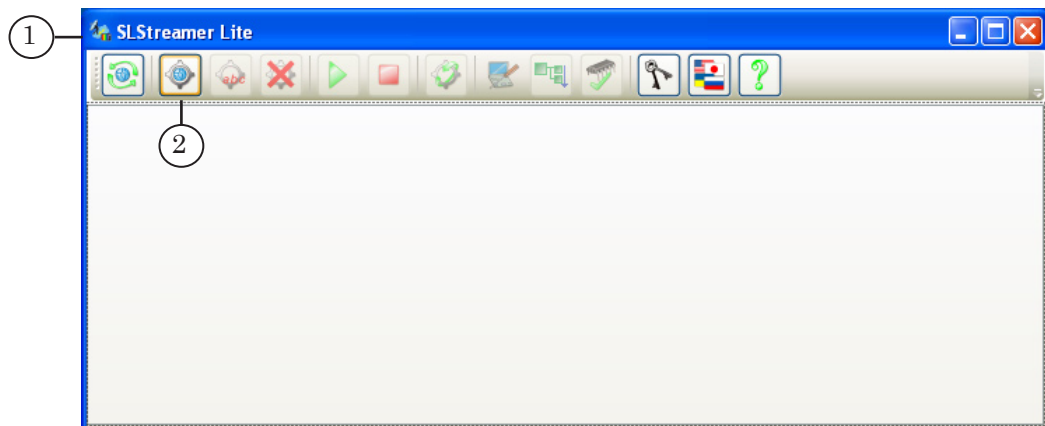
2. Configuration Procedure

To configure and test the operation of the selected scheme, perform the following steps (the order is fixed):

1. Launch the SLStreamer Lite program. Create a graph.
2. Configure the graph.
3. Run the graph.
4. Launch and configure the FDOOnAir program.
5. Create a broadcast schedule or download from the file. Start the schedule.
6. Configure the VLC media player program.
7. Preview the result in VLC media player.
8. Adjust the compression quality.

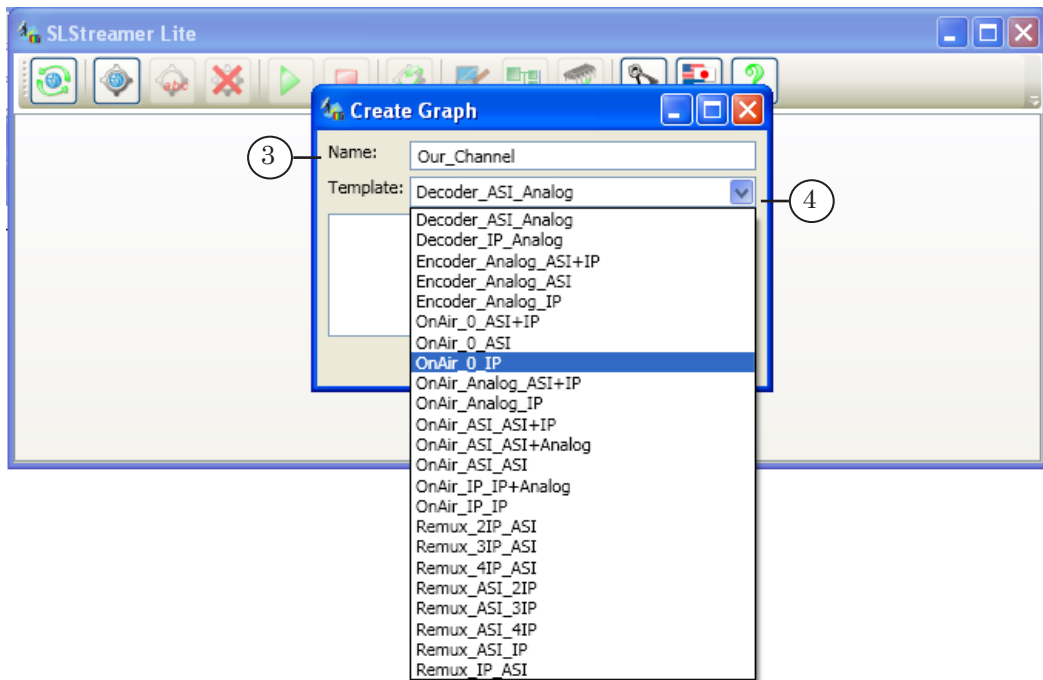
3. Launching SLStreamer Lite. Creating Graph by OnAir_0_IP Template (Step 1)

1. Launch SLStreamer Lite (1) using the desktop icon or the Start menu: Programs > ForwardTS > SLStreamer Lite.
2. Add the graph: click the Create new graph button (2).

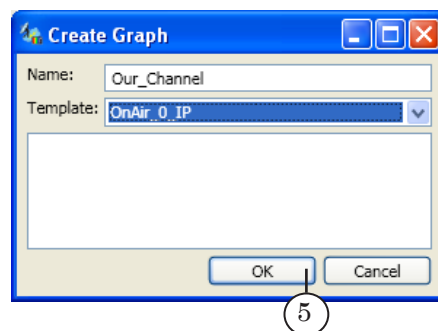




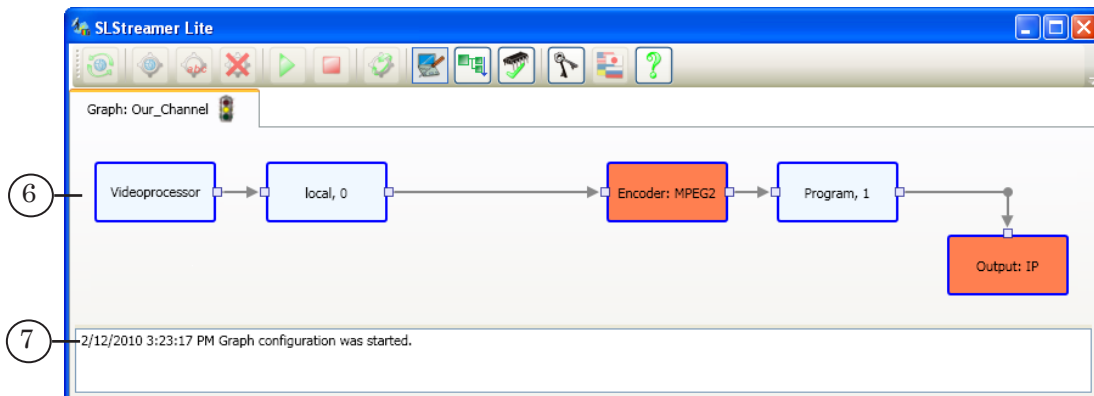
- When the window opens, specify a graph name (3), e.g. Our_Channel. Select the OnAir_0_IP template from the drop-down list (4).



- Click OK (5) to apply the settings.



- A new tab with the specified graph is added to the graphs area (6), and configuration mode is automatically on (7).



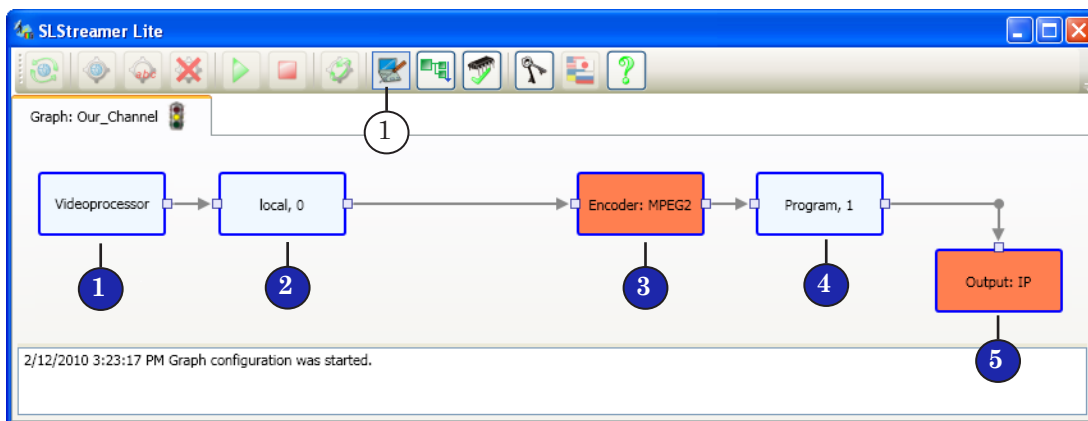


4. Configuring the Graph (Step 2)

Performed in the SLStreamer Lite window.

While in configuration mode, configure each node one after another (see steps 1–5 below). Double-click on a required node to open the properties window.

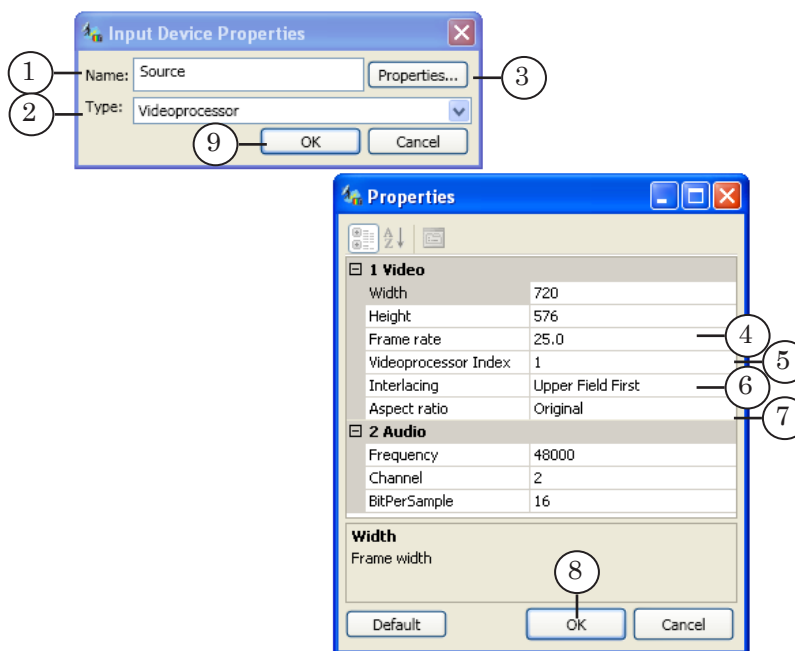
Note: If configuration mode is off, switch to it by clicking the Configure graph button (1).



1. Videoprocessor*

Note: * Earlier versions of the software used the designation Title Generator instead of Videoprocessor.

In the Input Device Properties window, specify a convenient node name (1). Make sure that Videoprocessor is selected from the drop-down list (2). Click Properties... (3).





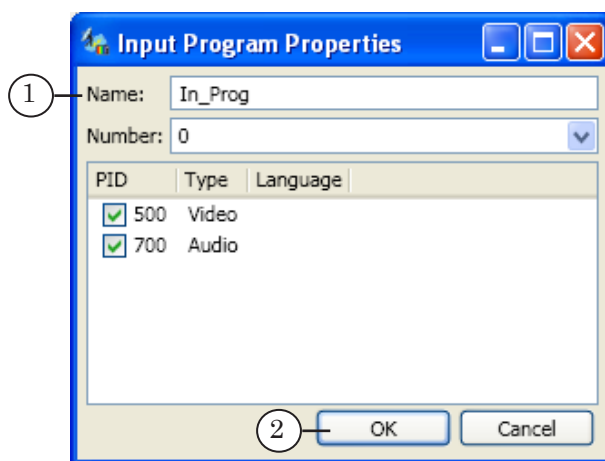
When the Properties window opens, specify the required parameter values in the right column. The values will be used when processing video data by the Videoprocessor instance:

- frame rate (4);
- videoprocessor index (5). The index is used to identify this instance of the videoprocessor by FDO nAir;
- scan mode and field order (6);
- aspect ratio (7).

Close the properties windows in consecutive order clicking OK (8, 9) to save the changes.

2. Local, 0 (Input Program).

In the Input Program Properties window, specify a name convenient for the program identification (1). Click OK (2) to save the changes and close the properties window.



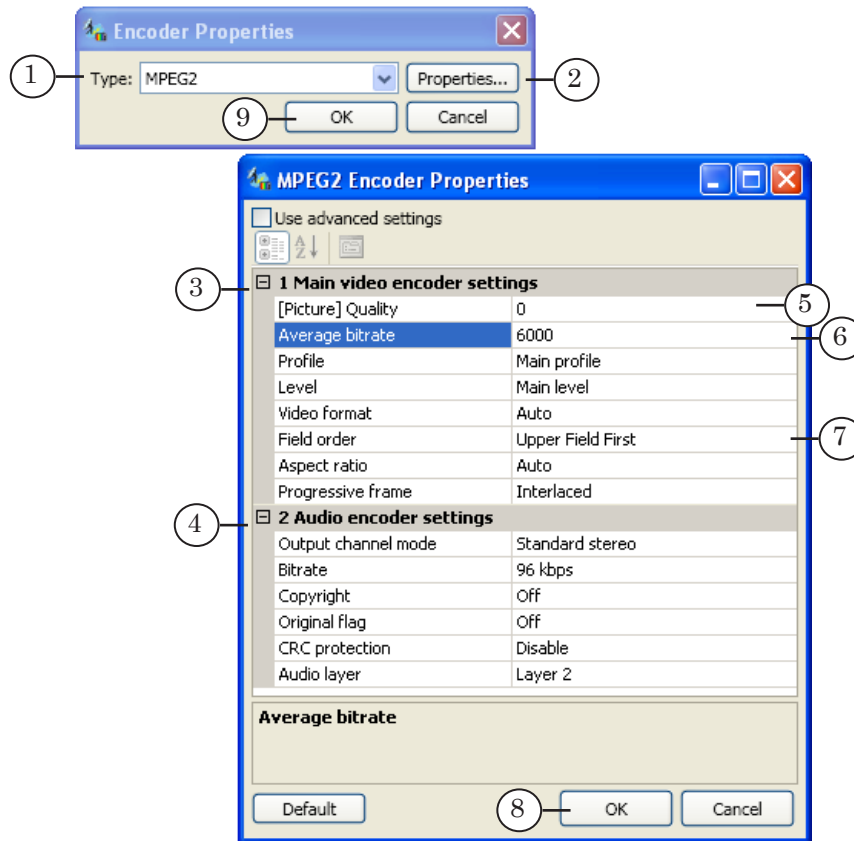
3. Encoder.

In the Encoder Properties window, select a compression type (1): MPEG2 or AVC. Click Properties... (2).

When the properties window opens, specify the video encoding (3) and audio encoding (4) parameters.

Among them, specify the following parameters for the video encoder:

- output image quality – the [Picture] Quality drop-down list (5). Select first a minimum value, e.g., 0. To select the optimal value, resume setting the parameter after the main setting and first preview (see Step 8);
- Average bitrate (6). The value is specified in kbps. The recommended value: for MPEG2 – 6000 kbps (i.e. 6 Mbps), for AVC – 3000 kbps;
- field order – the Field order drop-down list (7). The selected value must match the Interlacing value of the Videoprocessor node (see paragraph 1 of this Section).

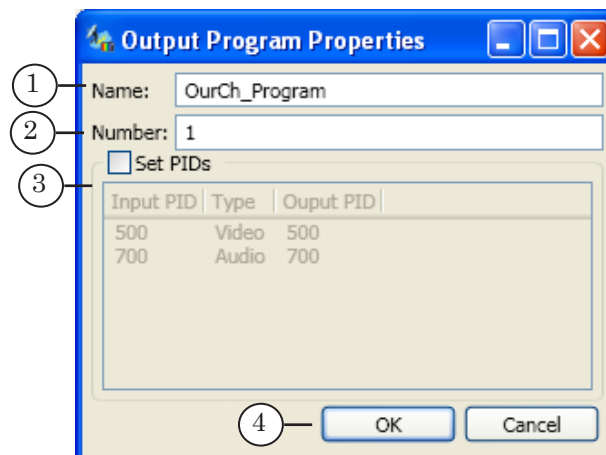


Close the properties windows in consecutive order clicking OK (8, 9) to save the changes.

4. Output Program.

In the Output Program Properties window, specify the program parameters that will be transferred in the output stream: name (1) and number (2). The number will be used at the receiving end to identify this program. The video and audio PIDs are set in our example automatically (3).

Click OK (4) to save the changes and close the properties window.





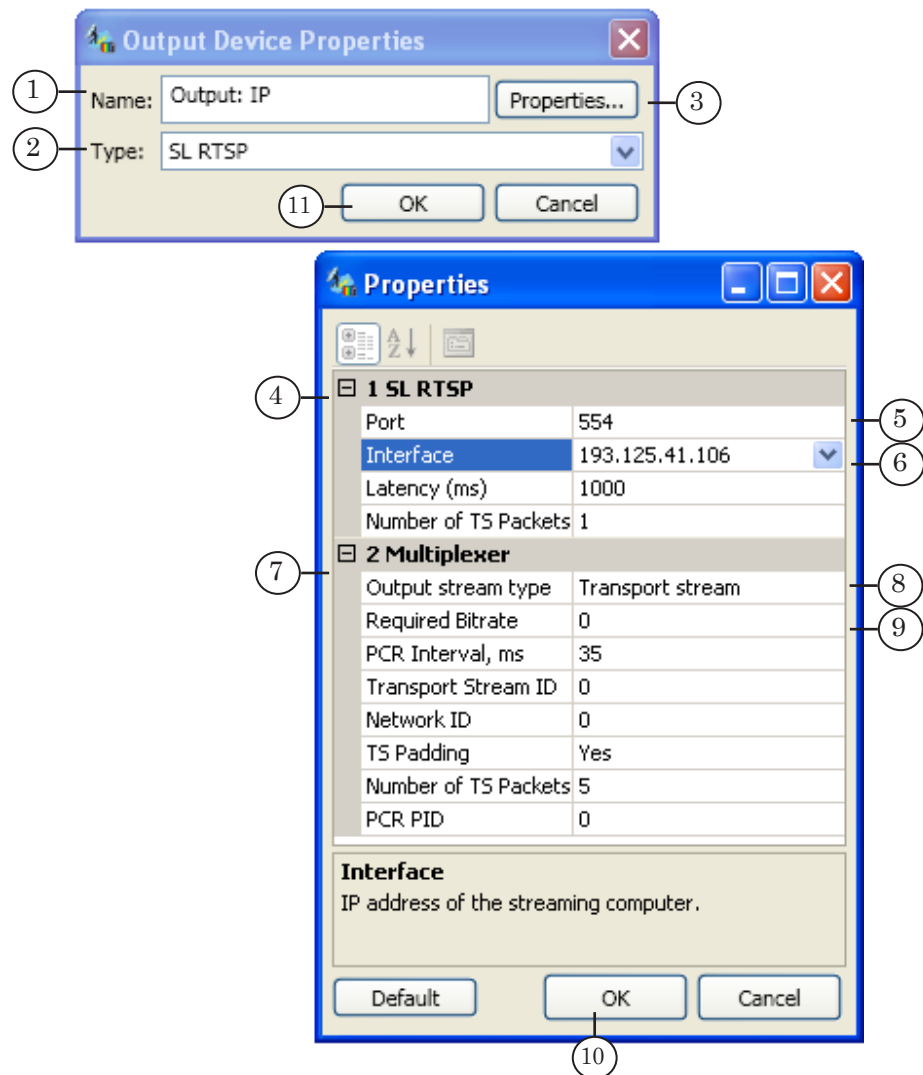
5. Output

In the Output Device Properties window, specify a name (1) convenient for the device identification. Select a device type in the drop-down list (2). Selected in our example is SL RTSP to provide streaming data via RTSP. Click Properties... (3).

When the Properties window opens, specify:

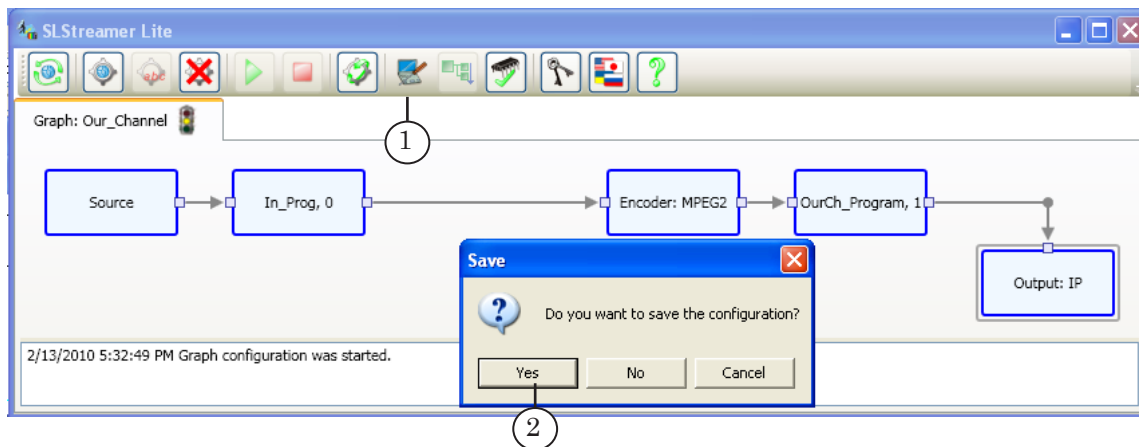
- the device parameters (4):
 - specify the number of the port (5) that will be use to stream data;
 - select the IP address of the computer streaming to the network (6).
- the multiplexer parameters (7). Among them:
 - output stream type (8) – Transport stream;
 - bitrate (9) – a 0 value implies that the bitrate will be set automatically.

Close the properties windows in consecutive order clicking OK (10, 11) to save the changes.





To complete the graph configuration, click the Finish graph configuration button (1). When the window opens, click Yes (2) to save the changes and apply them.

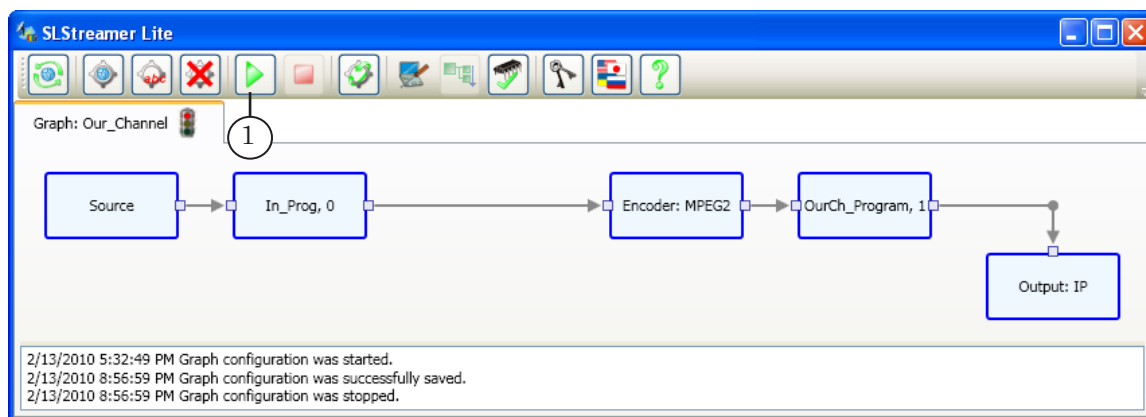


5. Running the Graph (Step 3)

Performed in the SLStreamer Lite program.

To run the graph, click the Start graph button (1).

Note: Configuration mode must be off: the Configure graph button – released.



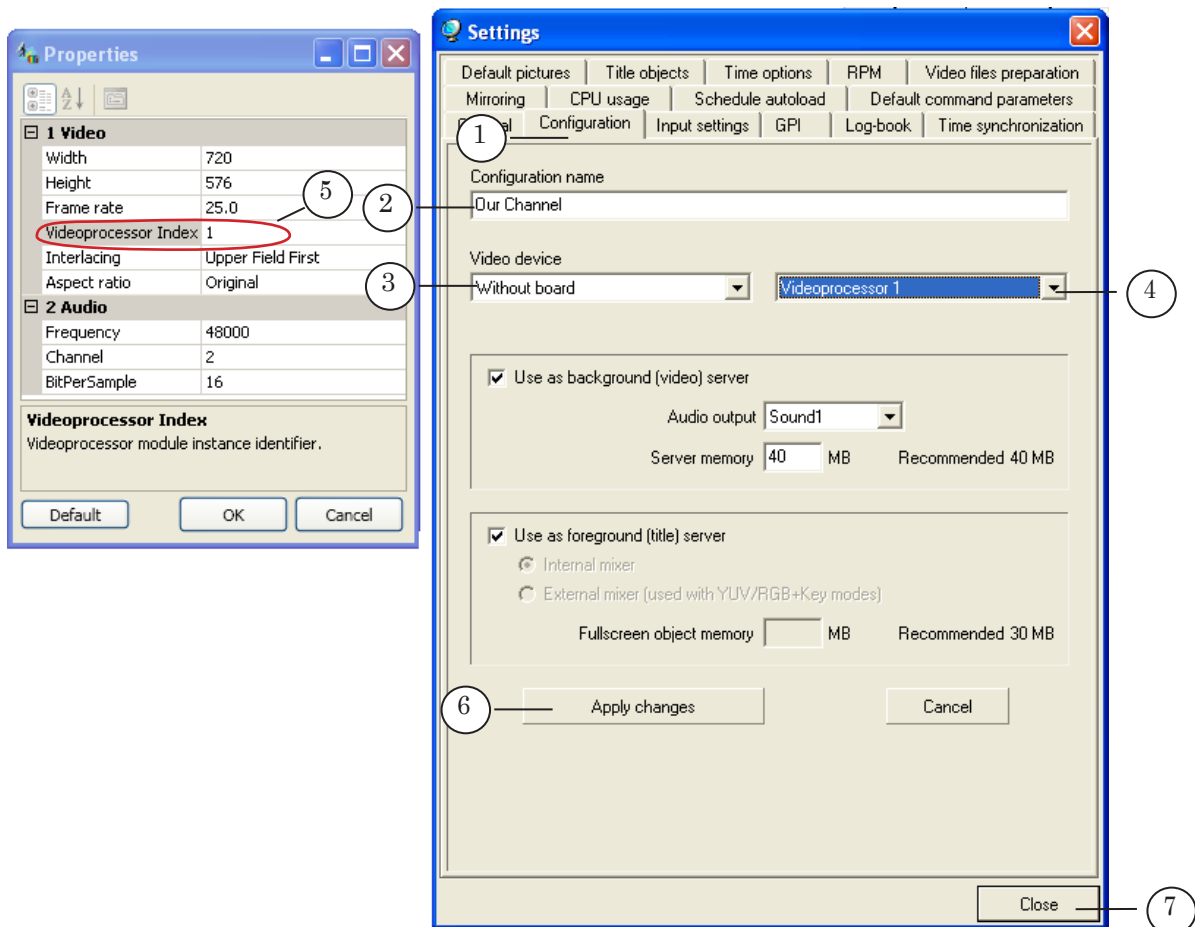
When the graph is switched to the Running state, the scheme of receiving, processing, and streaming data is activated. Including the instance of the Videoprocessor (Title Generator) module configured in our graph, which is also running.

It is important that the graph be running before the FDO nAir program settings are performed.



6. Launching and Setting FDO nAir Instance (Step 4)

1. Launch the FDO nAir program using the desktop icon or the Start menu: Programs > ForwardT Software > OnAir.
2. Click Settings in the main window.
3. When the Settings window opens, select the Configuration tab (1). In the Configuration name text field (2), specify a name that will be displayed in the title bar of the FDO nAir main window. Select from the drop-down lists under Video device:
 - mode of operation (3) – Without board;
 - device (4) – Videoprocessor1, since identifier 1 (5) was assigned to it when configuring the Source node in SLStreamer Lite (see Step 2, paragraph 1).



4. Click Apply changes (6), then – Close (7).

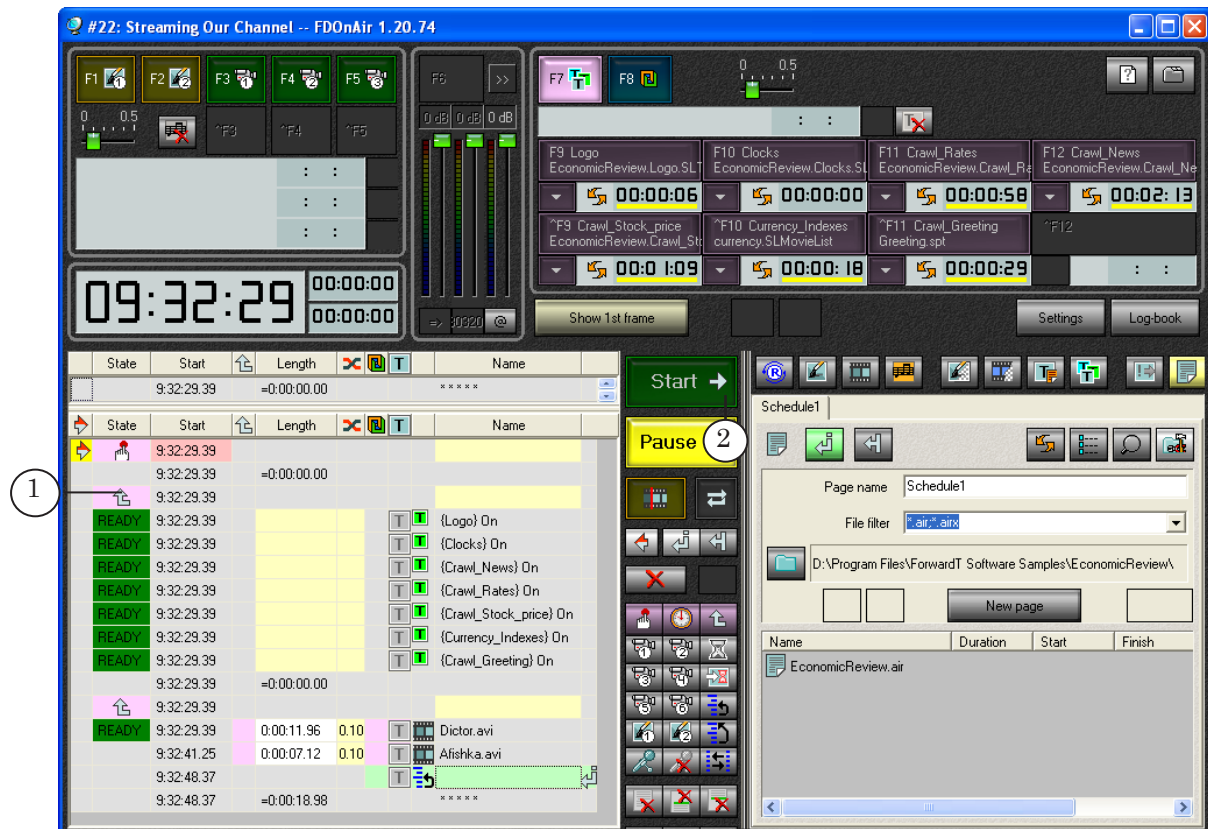
✓ **Important:** The changes are applied only when the Apply changes button is clicked!



7. Loading and Starting the Schedule (Step 5)

Performed in the FDO nAir program.

1. Load from the file or create a broadcast schedule (1).
A schedule from the demo sample EconomicReview (<http://www.softlab-nsk.com/forward/demo.html>) is loaded in our example.
2. To start the schedule, click Start (2).

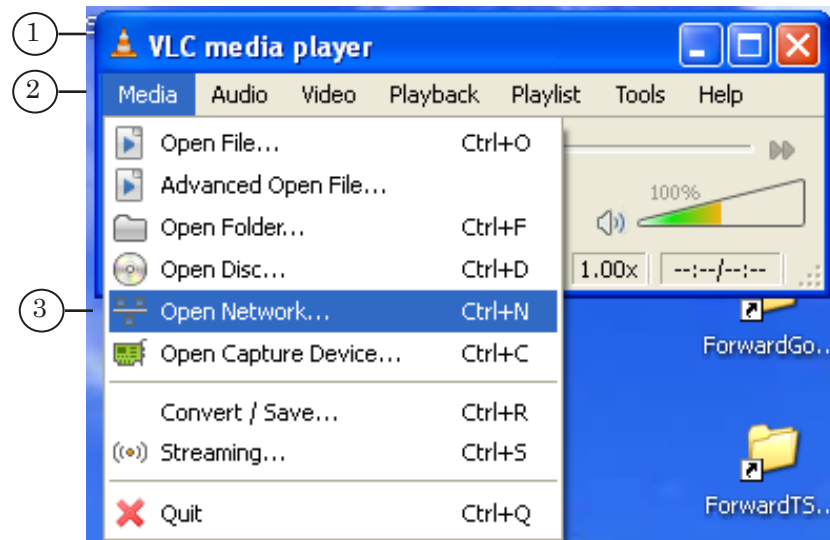


3. Streaming data over the network is started. The program is being sent in the transport stream over IP interface at the specified address.

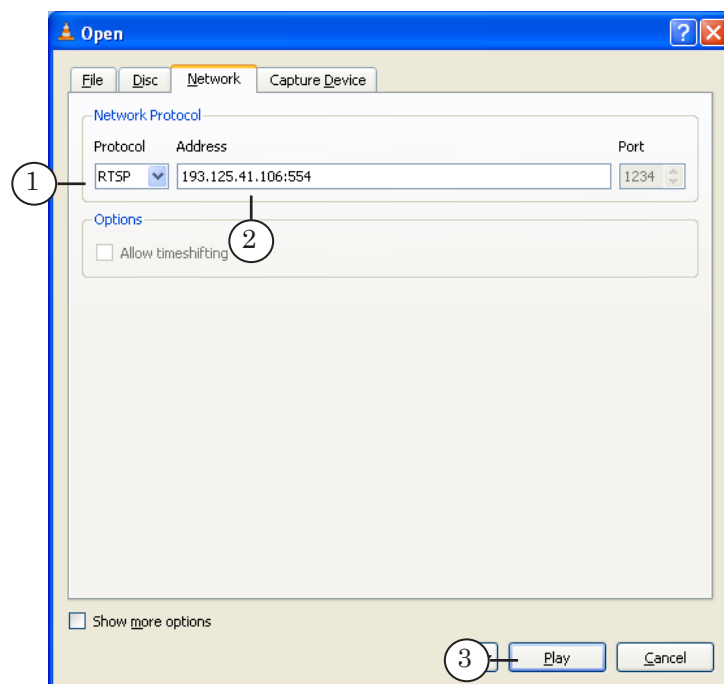


8. Launching and Setting VLC Media Player (Step 6). Preview (Step 7)

1. Launch the VLC media player program (1).
2. Open the Media submenu (2) of the main program menu.
3. Select Open Network... (3).

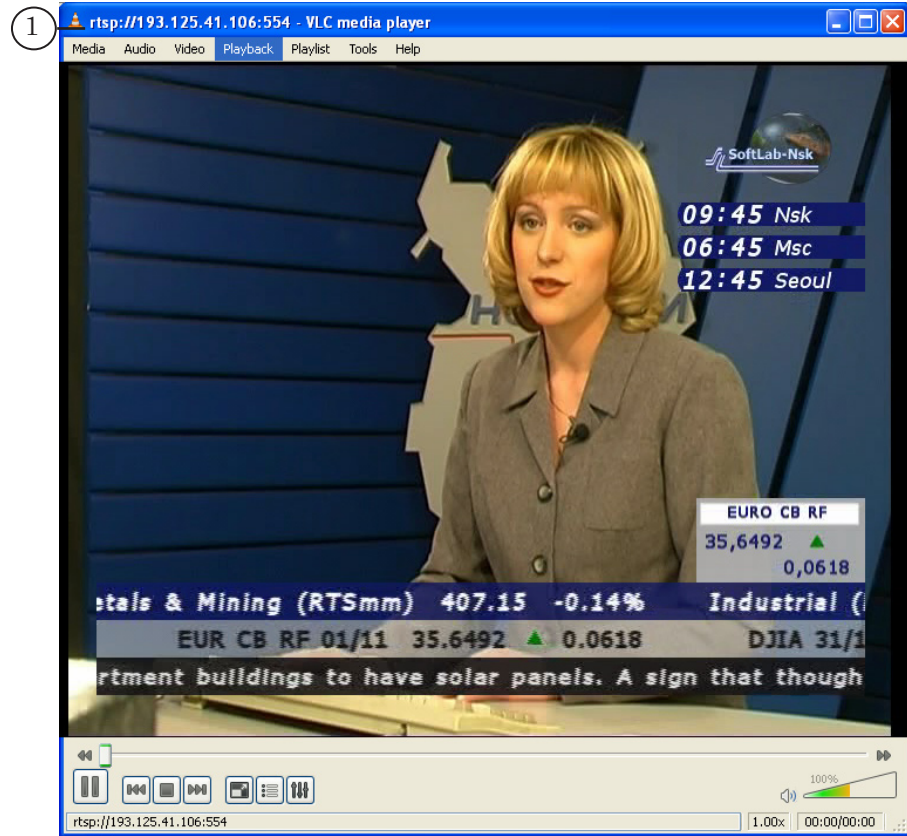


4. When the Open window opens, specify the network parameters. The values must match the settings of the Output node in the SLStreamer Lite program (see Step 2, paragraph 5):
 - select a data streaming protocol (1). In our case, RTSP;
 - specify the IP address of the streaming computer (2).
5. Click Play (3).





6. The preview window opens and the playback of the clips and titles that are executed by the schedule in the FDO nAir instance named Streaming Our Channel and streamed to the network over RTSP from the specified IP address (1) starts.





9. Selecting the Optimal Value for the Compression Quality (Step 8)

9.1. General Order of Operations

The Quality parameter in the video encoder settings allows you to adjust the video compression quality. The greater the value, the higher the compression quality at the same output stream.

But then note that the compression quality value strongly affects the CPU load. Therefore, the optimal value should be selected on the basis of the specific situation (characteristics of the streaming computer and data), experimentally.

When selecting the optimal value for the Quality parameter, keep to the following order of operations:

1. Prepare and start streaming according to the selected scheme (see Steps 1–7 described in the previous Sections) with the minimum value of the Quality parameter specified, as was discussed in paragraph 3, «Configuring the Graph».
2. When streaming, estimate the CPU load (in Windows Task Manager) and the output image quality (in the preview program).
3. When making a decision about further actions, be guided by the following rules:
 - if the CPU load is less than 30% – increase the quality value;
 - if the CPU load exceeds 70% – reduce the quality value;
 - if a frame flicker, stopping, etc. occurs – reduce the quality value;
 - if the CPU load does not exceed 60–70%, the image quality being satisfactory, you may finish selecting the optimal value for the parameter.
4. Stop the streaming, change the Quality value.
5. Repeat steps 2–4 as many times as required to achieve the optimal result.

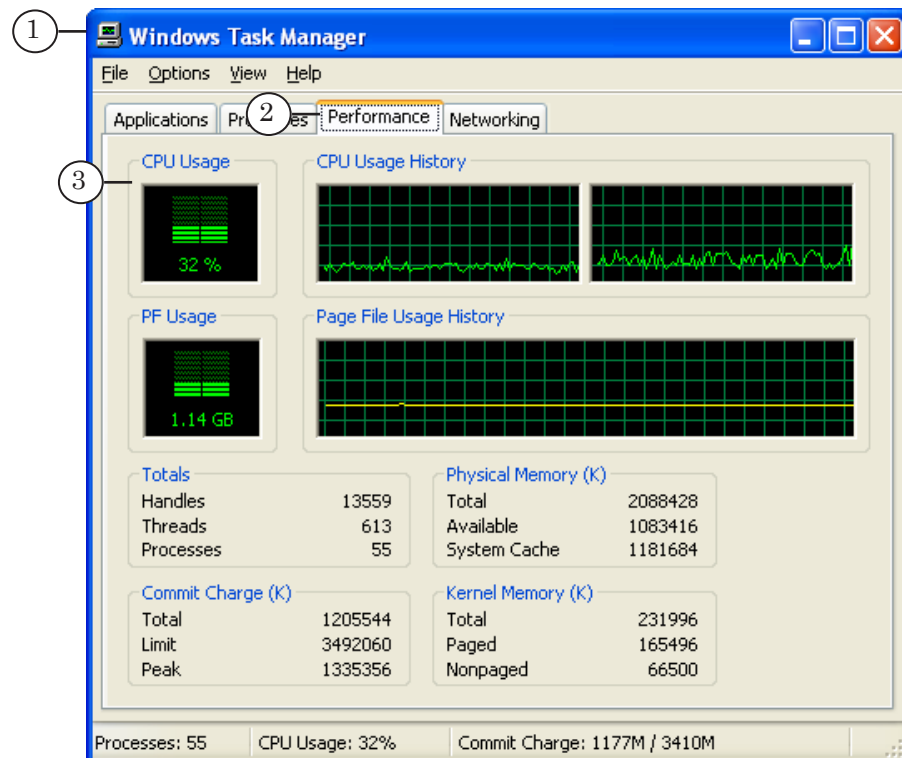


9.2. Checking the CPU Load

It is necessary to check the CPU load when streaming (i.e. when the graph is running, the FDO nAir schedule being executed).

To estimate the CPU load:

1. Launch Windows Task Manager. To do so, right-click an empty space on the taskbar and select Task Manager from the contextual menu.
2. Select the Performance tab.
3. The CPU Usage indicator displays the current CPU load.





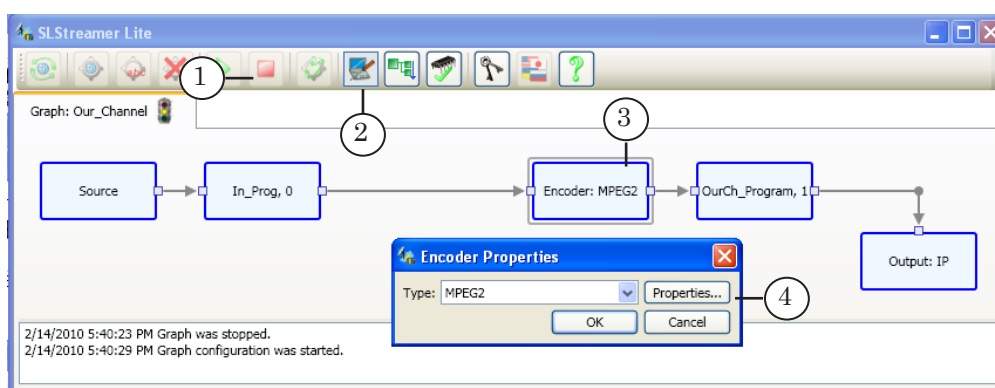
9.3. Changing the Quality Value

To change the Quality value, perform the following steps:

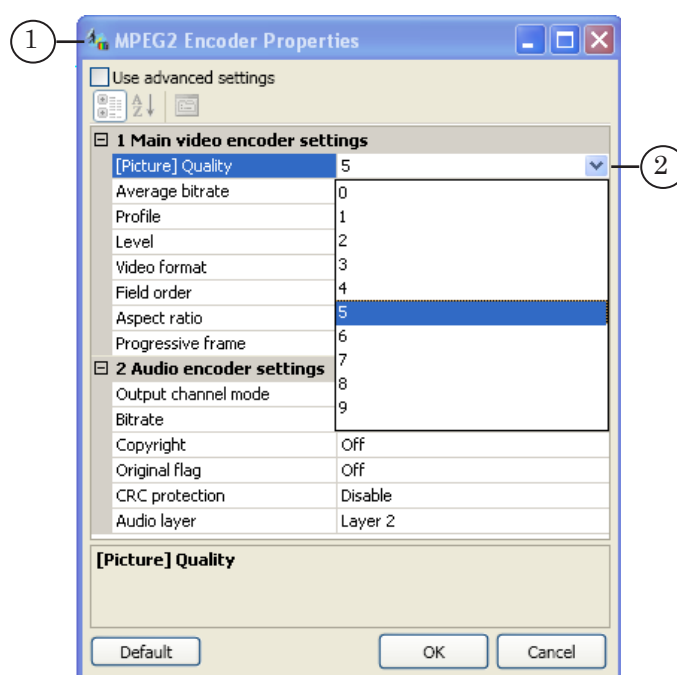
1. Stop the playback in VLC media player.
2. Stop the schedule in FDO nAir. Close FDO nAir.

Perform steps 3–10 in SLStreamer Lite:

3. Stop the graph: click the Stop graph button (1).
4. Switch to configuration mode: click the Configure graph button (2).
5. Double-click on the Encoder: MPEG2 node (3).
6. When the Encoder Properties window opens, click Properties... (4).

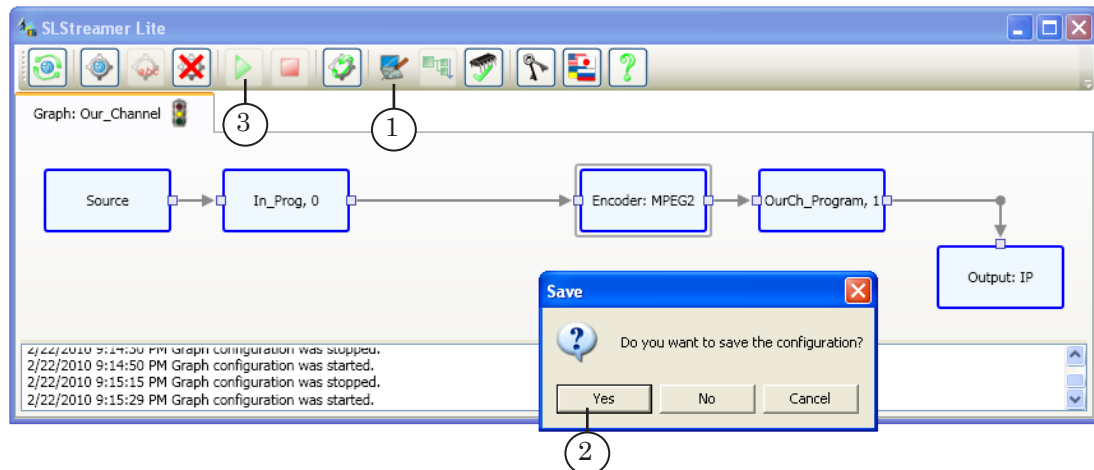


7. In the MPEG2 Encoder Properties window (1), select the required value from the [Picture] Quality drop-down list (2).





8. Close the properties windows by clicking OK.
9. To complete the graph configuration, click the Finish graph configuration button (1). When the Save window opens, click Yes (2) to save the settings and apply them.
10. To run the graph, click the Start graph button (3).



11. Open the FDO nAir program. Start the schedule.
12. Start playback in VLC media player.



Configuring Network-to-Network Scheme (SLStreamer Pro)

(This Section is being updated)

1. Streaming Scheme

Let us see an example of how to configure the following solution: let it be required to insert titles, commercials, your own programs into a program that comes in the transport stream over IP channels and send the processed program to the receiving end as MPTS over IP channels (via the RTP protocol).

In this case, the FDO nAir program is used to insert programs and add titles.

2. Solution Features

Target – create a scheme resistant to disturbances (interruptions) on the input, independent from the problems of the input device.

To do so, create a task of two graphs: input graph (A) and output graph (B). B is dependent on A.

3. Configuration Procedure

To configure and test the operation of the selected scheme, perform the following steps (the order is fixed):

1. Configure and start receiving the stream via IP.
2. Launch the SLStreamer Pro program.
3. Create graph A. Configure the graph.
4. Create graph B. Configure the graph.
5. Create a task. Add the graphs. Specify the dependency.
6. Add the task to the schedule. Run the task.
7. Launch and configure the FDO nAir program.
8. Create a broadcast schedule or download from the file. Start the schedule.



Tips and Recommendations

How to Get Information about Parameters of the Processed Program

1. General Information

The Videoprocessor module must be configured in strict conformity with the input program parameters. For correct configuration, it is necessary to have information about the following parameters of the video included in the program:

- frame size and frame rate;
- aspect ratio;
- scan mode and field order.

The way to configure the program parameters and get information about them depends on which way the data that relates to the program comes to the system. The input program can be received as:

- data generated by the program module Frame Generator;
- analog or SDI signal that comes via an FD300 board;
- decoded from the MPEG TS that comes via ASI interface of the FD401 board or via IP interface.

The next Sections discuss the configuration of the program parameters for each of the ways.



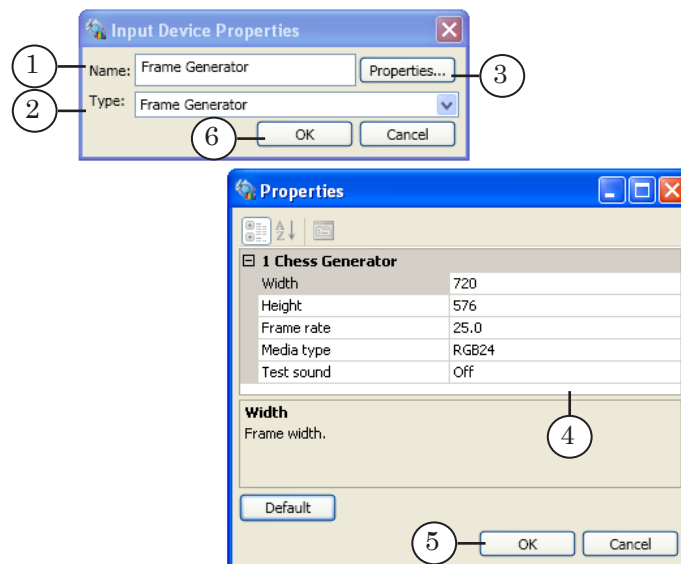
2. Input Device: Frame Generator

Let us see the way in which the video frames for the input program are generated on the computer by the program module Frame Generator.

In this case, the video parameters are specified when configuring the module.

To get information about the current video settings, perform the following steps:

1. Double-click on the Frame generator node.
2. When the Input Device Properties window opens, make sure that Frame Generator is selected from the drop-down list (2) and click Properties... (3).
3. The Properties window (4) displays the current video settings.
4. Close the windows in consecutive order by clicking OK (5, 6).





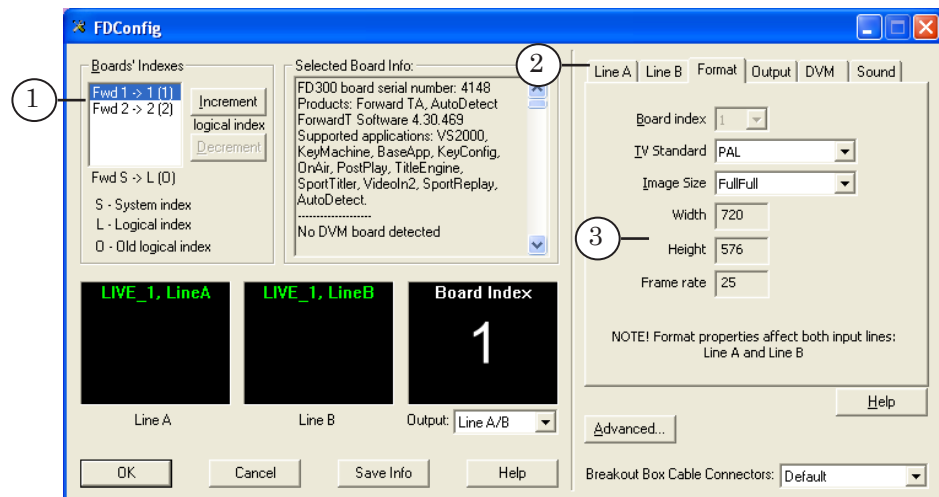
3. Input Device: FD300 Board

Let us see the way in which the video frames for the input program come as an analog or SDI signal via an FD300 board.

In this case, the frame size and frame rate are specified in the FDConfiguration program (see the «FDConfiguration: FD300 Board Settings» user's guide). The field order is selected automatically – lower field first.

To get information about the current video settings, perform the following steps:

1. Launch FDConfiguration using the desktop icon or the Start menu: Programs > ForwardT Software > Board Setup > FD300 Configuration
2. When the FDConfig window opens, select the required board in the Boards' Indexes (1) list.
3. Select the tab of the required line (2): Line A or Line B.
4. The appropriate fields in the tab (3) display the current settings: frame size and frame rate.





4. Input Device: ASI Interface of the FD401 Board or IP Interface

(This Section is being updated)

Let us see the way in which the processed program is decoded from the MPEG TS that comes via ASI interface of the FD401 board or via IP interface.

In this case, the parameter settings specified when sending the program, remain valid. Information about them is not indicated explicitly.

When configuring the Videoprocessor module, experimentally select the appropriate values for the frame rate and field order.

To do so, perform the following steps:

1. Configure the graph nodes for the required scheme of receiving, processing, and streaming the program. Keep the default values for the appropriate video parameters.
2. Launch and configure the FDOOnAir program. Load the schedule and a title project with a RollCrawl (using the RollCrawl simplifies the detection of possible image faults that appear because of the wrong field order).
Start streaming with adding title elements.
3. Connect a TV set with a set-top box to the board output.
4. Preview the video on the TV set. If the RollCrawl moves smoothly, the field order is specified correctly. If not, stop the playback, change the field order of the Videoprocessor node to the opposite, start streaming anew and preview again.



Property Sheets (Reference Section)

Input Devices

1. Frame Generator

Name	Description	Possible Values/ Restrictions	Default Value
Width	Frame width.		720
Height	Frame height.		576
Frame rate			25
Media type	Image data format.	RGB24; ARGB; YUY2; UYVY; YVYU	RGB24
Test sound	Test signal generation	Off; On.	Off

2. Title Generator

Name	Description	Possible Values/ Restrictions	Default Value
Width	Frame width.		720
Height	Frame height.		576
Frame rate			25
Title engine ID	Videoprocessor instance ID.		1
Interlacing	Scan mode and field order.	Upper Field First; Lower Field First; Progressive.	Upper Field First
Aspect ratio	Frame aspect ratio.	Original; SquarePixel 4:3; SquarePixel 16:9; 720 pixel width.	Original



3. Network

Name	Description	Possible Values/ Restrictions	Default Value
Transport protocol	Network protocol.	UDP; RTP/AVP; TCP; RTP/AVP over TCP.	UDP
Interface	IP address of the computer that receives the stream.		
Port	Port used to receive data.	1024 – 65535	10201
IP address	IP address (or DNS) of the multicast group.		234.5.5.5
Server	Address of the source server (IP or DNS).		
Timeout	Waiting time (in s).	0 – 65535	10
Fixed mediatype		Off; On.	Off
Server signature validation	Validation of the server signature.	Off; On.	Off

4. Demultiplexer

Name	Description	Possible Values/ Restrictions	Default Value
Playback speed adjustment		Off; On.	Off
Latency value for time adjustment			0
Adjustment method of playback speed		0 – Generate clock; 1 – Modify timestamps.	Modify time-stamps
Parser buffer size			20971520
Init buffer size			102400
Discontinuity flag generation		On; Off.	Off
Discontinuity data flush		On; Off.	Off
PTS jump threshold			300000000



Encoders

1. Video Encoder MPEG2. Main Parameters

Name	Description	Possible Values/ Restrictions	Default Value
[Picture] Quality	Determines the output image quality at a constant average rate. The higher quality, the larger the CPU load.	0 – 9	5
Average bitrate (kbps)			5859
Profile	The video profile. The profile and level impose restrictions on the video encoding parameters, which provides compatibility with the playback devices.	High profile; Main profile; Simple profile; 422 profile.	Main profile
Level	The video level (see above).	High level; High 1440 level; Main level; Low level; Unspecified level.	Main level
Video format	TV standard.	Auto; PAL; NTSC; SECAM; MAC; Unspecified.	Auto
Field order		Upper Field First; Lower Field First	Upper Field First
Aspect ratio	Frame aspect ratio.	Auto; Square pels; 4:3; 16:9; 2:21:1.	Auto
Progressive frame	Frame encoding mode: interlaced or progressive encoding.	Interlaced; Progressive.	Interlaced



2. Video Encoder AVC. Main Parameters

Name	Description	Possible Values/ Restrictions	Default Value
[Picture] Quality	Determines the output image quality at a constant average rate. The higher quality, the larger the CPU load.	0 – 9	5
[RC] Avg bitrate	Average bitrate (kbps).		2929
[AVC] Profile	The video profile. The profile and level impose restrictions on the video encoding parameters, which provides compatibility with the playback devices.	Baseline; High; Main.	Baseline
[AVC] Level	The video level (see above).	Level 1, Level 1.1, Level 1.2, Level 1.3; Level 2, Level 2.1, Level 2.2; Level 3, Level 3.1, Level 3.2; Level 4, Level 4.1, Level 4.2; Level 5, Level 5.1; Level Auto	Level Auto
[Picture] Video format	TV standard.	Auto; PAL; NTSC; SECAM; MAC; Unspecified format.	Auto
[Picture] Interlace mode	Frame encoding mode: interlaced encoding.	Frame; Field; MBAFF.	Frame
[Picture] Field order		Upper Field First; Lower Field First	Upper Field First

3. Audio Encoder

Name	Description	Possible Values/ Restrictions	Default Value
Bitrate	Bitrate for MPEG2 Audio (kbps).	32; 48; 56; 64; 80; 96; 112; 128; 160; 192; 224; 256; 320; 384.	96 kbps
Output channel mode	Mode of compressing stereo audio channels	standard stereo; joint stereo; dual channel; mono.	standard stereo
Physical model		Model 1; Model 2	Model 2



Name	Description	Possible Values/ Restrictions	Default Value
Copyright	Encoded data copyright indicator.	Off; On.	Off
Original flag	Indication that the encoded data is original (source data).	Off; On.	Off
CRC protection	Recording checksums to the compressed audio stream.	Yes; No.	Yes

4. Video Encoder MPEG2. Advanced Parameters

Name	Description	Possible Values/ Restrictions	Default Value
Profile	The video profile. The profile and level impose restrictions on the video encoding parameters, which provides compatibility with the playback devices.	High profile; Main profile; Simple profile; 422 profile.	Main profile
Level	The video level (see above).	High level; High 1440 level; Main level; Low level; Unspecified level.	Main level
Video format	TV standard.	Auto; PAL; NTSC; SECAM; MAC; Unspecified.	Auto
GOP Length	Number of frames in GOP.	1 – 100	12
B-Frame count	Number of B-frames between I and P-frames. Distance between keyframes.	0 – 7	3
Closed GOP interval	Distance between GOPs.		0
Mode bitrate	Mode: constant or variable bitrate.	CBR; VBR.	CBR
Average bitrate	Average bitrate (bps).		6000000
Max bitrate	Maximum bitrate (for a variable bitrate).		8000000
Min bitrate	Minimum bitrate (for a variable bitrate).		4000000
Field order		Upper Field First; Lower Field First	Upper Field First



Name	Description	Possible Values/ Restrictions	Default Value
Sequence	The scan mode in the stream: interlaced or progressive.	Interlace; Progressive.	Interlace
Aspect ratio	Frame aspect ratio.	Auto; Square pels; 4:3; 16:9; 2.21:1.	Auto
Frame rate		Autodetect; 23.976 fps; 24.0 fps; 25.0 fps; 29.97 fps; 30.0 fps; 50.0 fps; 59.94 fps; 60.0 fps.	Autodetect
Pulldown flag	Convert 24 fps to 30 fps.	No pulldown; Encode 2:3 pulldown; Encode 3:2 pulldown.	No pulldown
Write a sequence header every GOP	Add a sequence header at the beginning of each GOP.	0 – no; add only once, at the stream beginning. 1 – yes.	1
Write a sequence end code	Add a sequence completion code to the stream.	0 – no; 1 – yes.	1
Write a sequence display extension	Add a sequence display extension to each GOP.	0 – no; 1 – yes.	0
Write a picture display extensions	Add a picture display extension to the video stream.	0 – no; 1 – yes.	0
Intra DC precision	Precision of discrete cosine transform.	8 bit; 9 bit; 10 bit; 11 bit.	9
Progressive frame	Treat the input video as progressive or interlaced.	Interlaced; Progressive.	Interlaced
Repeat first field		No; Yes.	No
Motion search quality	Precision of motion search in the frame.	0 – 15 0 – no search; 7 – medium quality; 15 – high quality.	5
HalfPel search	Enable a higher motion search in the frame.	Yes; No.	Yes



Name	Description	Possible Values/ Restrictions	Default Value
Motion search range	The range of motion search.	0 – 31 0 – no search, high speed; 31 – maximum range, low speed.	15
Deinterlacing mode	Enable deinterlacing.	No; Yes.	No
Scene change detection	Mode of detecting the scene change.	None; Fast; Refined.	None
Out sample size			0
Pad skipped frames	Pad skipped frames.	No; Yes.	No
Chroma format	Pixel color format.	4.2.2; 4.2.0.	4.2.0
Quantization scale type	The quantization scale type used when quantizing DCT coefficients.	Linear; No Linear.	Linear
Intra VLC	Specifies which of the two variable length coding tables is used for the intra coded blocks.	Table0; Table1.	Table0
Scanning type	Scanning type when encoding DCT coefficients.	Alternate scan; Zig zag scan.	Alternate scan
Vbv buffer size	Video buffer size.	0 – compute automatically	0
Performance Online		0 – 31	31
Performance Offline		0 – 31	0



5. Video Encoder AVC. Advanced Parameters

Name	Description	Possible Values/ Restrictions	Default Value
[AVC] Profile		Baseline; Main; High.	Baseline
[AVC] Level		Level 1, Level 1.1, Level 1.2, Level 1.3; Level 2, Level 2.1, Level 2.2; Level 3, Level 3.1, Level 3.2; Level 4, Level 4.1, Level 4.2; Level 5, Level 5.1; Level Auto	Level auto
[Picture] Video format		Auto; PAL; NTSC; SECAM; MAC; Unspecified.	Auto
[Picture] Interlace mode		Frame; Field; MBAFF.	Frame
[Picture] Field order		Upper Field First; Lower Field First.	Upper Field First
[Picture] Video pulldown flag		None pulldown; 2:3i mode; 3:2i mode; 2:3p mode; 3:2p mode; Auto.	Auto
[AVC] Slice count			1
[GOP] Max GOP length		1 – 300	33
[GOP] Max number of B-frames			2
[RC] Scene change detector		Enable; Disable.	Enable
[RC] Bitrate mode		CBR; ConstQ; VBR.	CBR
[RC] Avg bitrate			3000000
[RC] Max bitrate			3500000
[RC] Bitrate buffer size (bits)		1024 – 288000000	1500000
[RC] Initial VBV buffer fullness (90 kHz)			67500
[RC] Final VBV buffer fullness (90 kHz)			0
[GOP] Frequency of IDR-pictures			1
[GOP] Use B-frame as reference		Yes; No.	No
[GOP] Use pyramid coding		Yes; No.	No



Name	Description	Possible Values/ Restrictions	Default Value
[GOP] Use adaptive B-frames placement		Yes; No.	No
[RC] Quantizer for I-slice		0 – 51	25
[RC] Quantizer for P-slice		0 – 51	25
[RC] Quantizer for B-slice		0 – 51	27
[RC] Cb chroma qp offset		-51 – 51	1
[RC] Cr chroma qp offset		-51 – 51	1
[ME] Search range		0 – 511	63
[ME] Number of reference frame		0 – 16	1
[ME] Use subblock search		Yes; No.	Yes
[ME] Subpixel depth		FullPel; HalfPel; QuarterPel.	QuarterPel
[ME] Use weighted prediction		Yes; No.	No
[ME] Use fast multi reference ME algo		Yes; No.	Yes
[ME] Use fast sub block ME algo		Yes; No.	Yes
[ME] Allows mv's out of picture boundaries		Yes; No.	Yes
[IP] Use intra 16x16 mode in intra slices		Yes; No.	Yes
[IP] Use intra 8x8 mode in intra slices		Yes; No.	Yes
[IP] Use intra 4x4 mode in intra slices		Yes; No.	Yes
[IP] Use intra pcm mode in intra slices		Yes; No.	No
[IP] Use intra 16x16 mode in inter slices		Yes; No.	No
[IP] Use intra 8x8 mode in inter slices		Yes; No.	Yes
[IP] Use intra 4x4 mode in inter slices		Yes; No.	Yes
[IP] Use intra pcm mode in inter slices		Yes; No.	No
[Deblock] Use deblocking filter		Yes; No.	No
[Deblock] Deblocking alpha c0 offset		-6 – 6	-1
[Deblock] Deblocking beta offset		-6 – 6	-1



Name	Description	Possible Values/ Restrictions	Default Value
[AVC] Entropy coding mode		CAVLC; CABAC.	CAVLC
[RDO] Use RD optimization		Yes; No.	Yes
[RDO] Use fast RD optimization		Yes; No.	Yes
[RDO] Use Hadamard transform for mode decision		Yes; No.	Yes
[RDO] Use fast inter decision		Yes; No.	Yes
[RDO] Use fast intra decision		Yes; No.	Yes
[RDO] Quantization optimization		Mode1; Mode2; Ref.	Mode2
[Misc] Film grain optimization strength		0 – 100	0
[Misc] Black normalization level		0 – 255	0
[Picture] Use sample or picture AR		Sample; Picture.	Sample
[Picture] Picture aspect ratio		User-defined; Auto.	User-defined
[Picture] Picture aspect ratio x			4
[Picture] Picture aspect ratio y			3
[Picture] Sample aspect ratio		User-defined; Auto	User-defined
[Picture] Sample aspect ratio x			1
[Picture] Sample aspect ratio y			1
[Misc] Output stream type		Type1; Type11; SEI.	Type11
[Misc] Use full range colors		Yes; No.	No
[Misc] Write access unit delimiters		Yes; No.	Yes
[Misc] Write end of sequence code		Yes; No.	Yes
[Misc] Write timestamps		Yes; No.	Yes
[Misc] Enable all CPU tech optimization upto selected		Auto; PlainC; MMX; MMX_Ext; SSE; SSE2; SSE3.	PlainC
[Misc] Number of threads to be used		0 – 16	0



Output Devices

1. Multiplexer

Name	Description	Possible Values/Restrictions	Default Values
Output Stream type		Transport stream; DVB.	Transport stream
Required Bitrate	Required output bitrate (bit/s).	0 – 100M 0 – select automatically.	0
PCR Interval	Maximum time interval between two sequential PCR samples (ms).	10 – 100	25
Transport Stream ID	Transport stream ID – hexadecimal value.	0 – 0xFFFF	0
Network ID			0
TS Padding		Yes; No.	Yes
Number of TS Packets to Deliver	Number of transport packets in one network packet.		7
PCR PID			

2. SL RTSP

Name	Description	Possible Values/Restrictions	Default Value
Port	Port used to stream data.	554 – 9999	554
Interface	IP address of the streaming computer.		
Latency	Data delay time (buffering) in ms.	0 – 3000	1000 ms
Number of TS Packets to Deliver	Number of transport packets in one network packet.	1 – 100	1

3. SL Network

Name	Description	Possible Values/Restrictions	Default Value
Destination address	IP address of the receiving netcard or multicast group.		



Name	Description	Possible Values/ Restrictions	Default Value
Port	Port used to stream data.	10000 – 65535	20000
Interface	IP address of the streaming computer (netcard via which the streaming is performed).		
TTL			64
Latency	Data delay time (buffering) in ms.		1000 ms
Transport protocol	Link protocol.	UDP; RTP.	UDP
Number of TS Packets to Deliver	Number of transport packets in one network packet.	1 – 100	1
Add SDT Table	Automatically generate the SDT table.	No; Yes.	No

4. Network

Name	Description	Possible Values/ Restrictions	Default Value
Transport protocol	Link protocol.	UDP; RTP/AVP; TCP; RTP/AVR over TCP.	UDP
Destination	IP address of the receiving netcard or multicast group.		
Interface	IP address of the streaming computer (netcard via which the streaming is performed).		
Port	Port used to stream data.	0 – 65535	10201
Port video		0 – 65535	10201
Port audio		0 – 65535	10301
Port BIFS		0 – 65535	10401
TTL		0 – 255	64
Fixed ports		Off; On.	Off
Connection speed			100000000
Max bitrate		0 – 1000	0
Max video bitrate		0 – 1000	0
Max audio bitrate		0 – 1000	0



Name	Description	Possible Values/ Restrictions	Default Value
Sync point		False; True.	False
Max UDP size			65535
Control send rate		False; True.	False
Bitrate smoothing		Off; On.	Off
Max packet size			65535
TC packets			7
Buffer size			2097152
Broadcasting mode		From capture; From file.	From capture
Time source		Auto detection; Get from simple; Get from stream.	Auto detection
Synchronization		Off; On.	Off
Restore DTS		Off; On.	Off
Repeat mode		Off; On.	On
Send announces		Off; On.	On
User name			
Session name			
Session info			
Description			
Email			
Phone			

5. Windows Media

Name	Description	Possible Values/ Restrictions	Default Value
Profile	Full path to the compression settings file.		
Interface	IP address of the streaming computer (netcard via which the streaming is performed).		
Port	Port used to stream data.		8080
Maximum number of clients	Maximum number of clients to connect.	1 – 50	5



Name	Description	Possible Values/ Restrictions	Default Value
Live source		Yes; No.	Yes
Network protocol	Link protocol	HTTP	0

6. File Writer

(Earlier versions of the software used the designation MPEG File Sink or Sink Filter instead of File Writer).

Name	Description	Possible Values/ Restrictions	Default Value
File name	The name of the file to which recording is performed.		~\Bin\Test.mpg
Crop mode	Cropping to files (one or several files).	Don't crop – record to one file; Crop by Size (kb) – split into several files of the specified size; Crop by Time (ms) – split into several files of the specified duration.	Don't crop
Crop size	The size of one file.		1024
Output mode	Add to the file end or overwrite the existing file.	Sink to null; Overwrite; Append; Overwrite (no buffering).	Overwrite
Stream Type	Stream container type.	MPEG-2 Program Stream; MPEG-2 Transport Stream.	MPEG-2 Transport Stream
Start Time			0
Files to Write	Maximum number of output files	0 – no restriction	0



7. Named Region

(Earlier versions of the software used the designation DVM-6 Renderer instead of Named Region).

Name	Description	Possible Values/Restrictions	Default Values
Device Type	The device type used for rendering.	DVM-6 Board ; Videoprocessor; FD300 Board.	
Device Index	The device ID.		
Buffer Capacity	Buffer capacity in ms.		3000
Latency	Data delay time (buffering) in ms.		1000
Jitter	Allowable jitter in ms.		80
Left	Horizontal coordinate of the upper-left corner of the bounding rectangle.	Value must be a multiple of 16.	0
Top	Vertical coordinate of the upper-left corner of the bounding rectangle.	Value must be a multiple of 2.	0
Right	Horizontal coordinate of the lower-right corner of the bounding rectangle.	Value must be a multiple of 16.	
Bottom	Vertical coordinate of the lower-right corner of the bounding rectangle.	Value must be a multiple of 2.	
Z Order	Z-coordinate. The value -32768 is used to work with FDO nAir.		
Sync Mode	Synchronization mode.	By Video statistics; By Audio statistics; Common statistics for video and audio; Specific statistics for video and audio.	
Region name	The name of the bounding rectangle. Used to control the region from the appropriate program modules.	May be empty. LIVE – reserved for FDO nAir.	



8. Board: Foreground

Name	Description	Possible Values/Restrictions	Default Values
Field order		Lower Field First; Upper Field First.	Lower Field First
Flip		No; Yes.	No
Show input mixer	Display the input data used for mixing.	No; Yes.	Yes
Latency	Data delay time in mc.		1000
Auto resize	Scale the image to the frame size on the board (720x576).	None – do not resize the original image; Resize the original image to the frame size: Entire Image – resize the image to fit the frame without keeping aspect ratio; Keep AspectRatio – resize the image to fit the frame, keeping aspect ratio; Entire Image by fields – resize the image to fit the frame by half-frames without keeping aspect ratio; Keep AspectRatio by fields – resize the image to fit the frame by half-frames, keeping aspect ratio.	Entire Image
Input mixer	Selection of the board input for mixing.	Mixer Input Artist; Mixer Input Scene; Mixer Input Mask; Mixer Input Title.	Mixer Input Artist
Aspect ratio	Frame aspect ratio.	Auto; 4x3; 16x9.	Auto
Jitter	Allowable jitter in ms.		80
Playback speed adjustment		No; Yes.	Yes



Glossary

Audio and Video Compression Standards

1. MPEG-2

MPEG-2 – audio and video compression standard developed by the Moving Pictures Expert Group.

MPEG-2 is widely used as the format of digital television. It also specifies the format of movies and other data that are distributed on DVD video discs. DVD players, Set-top boxes, and other equipment are often designed to this standard.

MPEG-2 provides support for progressive and interlaced scan. This standard provides video quality acceptable for digital broadcast.

Jointly with MPEG-2 video, the audio is usually compressed in the MPEG Audio standard (which has several varieties).

2. H.264/AVC/MPEG-4 Part 10

H.264 (AVC – Advanced Video Coding, MPEG-4 Part 10) – video compression standard developed by ITU-T Video Coding Experts Group (VCEG) in collaboration with ISO/IEC Moving Picture Experts Group (MPEG).

Using enhanced coding algorithms provides a high compression ratio with a high image quality.

In comparison with MPEG-2, provides much higher image quality at the same bit rate. But then, compression and decoding in this standard require a higher processing power compared with MPEG-2.

Not all playback devices support this standard.

3. AAC

AAC (Advanced Audio Coding) – audio compression standard often used jointly with MPEG-4 video.

Usually provides a higher audio quality than MP3 at the same bit rate. Allows to compress audio with a higher sampling rate (up to 96 kHz) including multichannel audio (up to 48 channels) with an enhanced high-frequency component.



Not all playback devices support this standard

Transport Streams

1. MPEG TS

MPEG TS (MPEG Transport Stream) – a data container format allowing to stream video and audio data as interleaved packages usually compressed. Video is usually streamed in the compression formats MPEG2 or H.264 (AVC); audio – in the formats MPEG Audio, AC3 (Dolby Digital), AAC.

2. SPTS

SPTS (Single Program Transport Stream) – a variant of MPEG TS, in which one program is streamed, e.g. only one video and one or several audio streams. In essence, it is similar to MPEG2 PS (Program Stream) container used in DVD Video.

3. MPTS

MPTS (Multi Program Transport Stream) – a variant of MPEG TS, in which several programs are streamed, e.g. each program corresponds to one TV channel streamed. Each program may contain several video and audio streams, e.g. several video streams with different image quality (definition, compression quality, frame rate) and several audio streams (e.g. in different languages). MPTS is used in digital television to stream a large quantity of TV programs in one data stream via different interfaces (e.g. ASI) over satellite, cable, fiber-optic communication links.

4. Demultiplexer

Demultiplexer – a module designed to analyze a combined MPEG stream (e.g. MPEG TS) with heterogeneous data (usually video and audio as well as some other data types) and split it into elemental data streams for further processing and/or streaming. The process of this analysis and splitting is referred to as demultiplexing.

5. Multiplexer

Multiplexer – a module designed to assemble a combined MPEG stream (e.g. MPEG TS) with heterogeneous data (usually video and audio as well as some other data types) from elemental (separate) streams. The initial data (video, audio) are divided



into short fragments (frames or frame groups), from which the output stream is formed by interleaving.

Such stream assembling is referred to as multiplexing.

6. Remultiplexing

Remultiplexing – a way of streaming MPEG TS in which the input stream is first demultiplexed, then only some programs (video and audio streams) are selected from it, and a new output MPEG TS stream is formed (multiplexed) from them.

Some programs from the input stream (or a part of video and/or audio data streams) may be not included in the output stream.

The video and audio data are not processed or recompressed being streamed without changes.

7. PID

PID (Packet Identifier) – the packet identifier of a data stream. A numerical value unique for each data stream (video, audio) in the MPEG TS.

When analyzing a stream, the demultiplexer selects data packages with the same PID and forms elemental data streams from them.

When forming an MPEG TS, the multiplexer assigns the same PID to data packages of one initial stream.



Interfaces

1. SDI

SDI (Serial Digital Interface) is designed to stream uncompressed digital video data without audio or with it. In the latter case, audio streamed with the video is referred to as Embedded Audio. Usually, to connect wired devices that transmit or receive SDI signals, BNC connectors and coaxial cable with a surge impedance of 75 ohm are used. This interface is used to connect professional digital video equipment (video cameras, video mixers, recorders, etc.).

In Forward T and Forward TS products, an SDI board – as an additional option to the FD300 board – is used to work with SDI signal.

2. ASI

ASI (Asynchronous Serial Interface) is designed to stream in the MPEG format (MPEG TS) via satellite, cable, fiber-optic communication links. Electrically identical to SDI interface, transmits data stream up to 270 megabit/s. The difference between ASI and SDI is the transmitted data format: SDI streams uncompressed data, while ASI – compressed, in MPEG TS container.

In Forward TS products, an FD401 board with ASI option is used to work with transport streams transmitted over ASI interface.

3. IP

IP interface (Internet Protocol) is used to stream MPTS over the network. To stream data, TCP, UDP, RTP, RTSP can be used.



Version 2.0 Limitations

ForwardTS software version 2.0 has the following limitations.

1. Has no support for teletext, subtitles, etc. in programs, received from MPTS. Supports only video and audio.
2. When creating a new graph by a template in the SLStreamer Lite program, each graph element must necessarily be configured.
3. The output transport stream does not contain the program name.



Useful Links

ForwardT Product Line: Description, Software Delivery, Documentation, Ready Solutions

<http://www.softlab-nsk.com/forward/index.html>

Tech Support

<http://www.softlab-nsk.com/support.html>

e-mail: forward@softlab.tv

forward@sl.iae.nsk.su

forward@softlab-nsk.com

Forums

<http://www.softlab-nsk.com/forum> (currently available in Russian only)