In addition to this Installer’s Handbook, instructions are available in the Ksenos settings window. There is a icon next to some individual settings. By moving the mouse cursor on top of this icon, a help text describing the setting will appear.

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Configuring devices and servers

Storage and database

Normally recorder is pre-configured with at least 3 partitions. First partition is for operating system, second for database and third for recordings. Storage settings can be changed from Settings (Figure 1.1).

Figure 1.1: Storages
Storage settings will guide you in allocating partitions and inform you, if a configuration is not recommended. Database will be created to first added partition by default. If everything is in order with the recording space and database, you can move on to add cameras.

The amount of recording space required depends on the quality of the images being recorded, frame rates, and the amount of motion, among other things. The size of the database is affected by the amount of recordings, and normally it is enough to have five per cent of the total storage space reserved for it. The size of the database depends mostly on the amount of the recorded frames, approximately 150 bytes of metadata per frame are stored in the database. Running out of disk space for the database will prevent all recording!

Figure 1.2: Storage settings for one partition

![Settings - Not logged in]

Storage settings will guide you in allocating partitions and inform you, if a configuration is not recommended. Database will be created to first added partition by default. If everything is in order with the recording space and database, you can move on to add cameras.

The amount of recording space required depends on the quality of the images being recorded, frame rates, and the amount of motion, among other things. The size of the database is affected by the amount of recordings, and normally it is enough to have five per cent of the total storage space reserved for it. The size of the database depends mostly on the amount of the recorded frames, approximately 150 bytes of metadata per frame are stored in the database. Running out of disk space for the database will prevent all recording!

⚠️ Nothing can be recorded if the database runs out of space

The database will remain significantly smaller, if the "Image group recording" setting is enabled in "General settings". This will also speed up recording search. With this setting enabled any remote clients older than version 2.7 will not be able to correctly read recordings from this server. The recording mode can be altered 'on-the-fly', but an already existing large database file will not decrease in size, nor will the images saved in groups transform to be viewable using old client versions.
Settings overview

The settings are divided into categories (Figure 2.1):

- **General settings**
  The general settings of the program.

- **Hotkeys**
  The actions bound to the keys on the keyboard.

- **Rules**
  Scheduling recordings, controlling digital outputs and so on.

- **Users**
  Users and user permissions.

- **Network connections**
  Server settings and remote connections.

- **Network cameras**
  The connected network cameras.

- **Capture boards**
  The installed analog capture boards and cameras.

- **I/O devices**
  PTZ joystick and digital I/O devices.

- **Storage**
  Storage settings.

**Multiplexer**

It is possible to open a full screen multiplexed view to the selected displays. This mode will show the live images of the selected cameras on a grid on the screen.
The multiplexer view settings can be found in the settings under the "Multiplexer view" tab in "General settings". There is a setting group named "Multiplexer window on Display ..." for each display connected to the system.

The number of simultaneously visible cameras in the multiplexer view can be selected with the "Multiplexer grid layout" setting. This layout will set the number of camera images shown in horizontal and vertical rows. If more cameras are selected than fits the layout, the cameras are split to multiple pages, which are switched at the interval set in the "View switch interval" setting.

The cameras shown in the multiplexer view are selected by pressing the Select multiplexer cameras... button. The button will open a new camera selection window.

The selector is divided into two parts. The cameras that can be added to multiplexer view are on the left side. The cameras that are already added are listed on the right side.

Several cameras can be selected from both lists by pushing and holding down  [Ctrl] -button while selecting cameras with a mouse. Cameras can be added to the right side list by selecting cameras on the left side list and by pushing the Add selected button. The same camera can be added several
times. Respectively cameras can be removed from the right side list by selecting them and pushing the Remove selected button.

In addition to the cameras there is a selection called "(Empty)" on left side list. By adding these to the right side list you can add empty spaces in the multiplexer, and possibly move cameras to the next multiplexer view.

Camera positions can be changed on the right side list by choosing desired cameras and pressing the arrow keys in the window. The list is grouped into pages between which the multiplexer switches.

All changes made in editor come into effect immediately and need no separate approval.

Once the settings are OK, the multiplexer view can be shown by enabling the "Enable" setting. From now on the multiplexer view will open on the selected display even when rebooting, unless the view is disabled in the settings.

Email

The system can be configured to send notifications of various events by email (See chapter 6). The email settings must be configured for the transmission to work. The email settings can be found in the settings under the "Email" tab at "General settings".

You need to enter the SMTP server address at minimum. You might also need to enter the security, port and login settings depending on the server properties. The server properties might be provided by either your internet service provider or the local network administrator.

You can test sending email by entering your own email address into the "Default recipients" field and pressing the Send test email button.

Communications

The serial ports of the computer can be used for example to control analog PTZ cameras with an RS485 adapter. The port is enabled by setting its speed. The communication settings are found in
the settings under the “Communications” tab at “General settings”. The speed to use on the serial port depends on the device that is being communicated with through it.

![Communications settings](image)

Figure 2.5: Communications

In addition to the serial ports provided by the operating system, it is possible to use an external IP-based serial port. Read more on chapter 2.9.2.

**Rules**

You can automate different functions with rules. A rule consists of conditions, which can be different kinds of input or state information, and action, which is performed once the state of the condition is altered. Additional information of the rules can be found in the chapter 6.

**User control**

**Operating system user details**

- On Linux systems, default username is “ksenos”, with password “sonesk”.
- On Windows systems, default username is “ksenos”, with password “KSENOS” or “sonesk”.

These usernames and passwords are only for the operating system. All usernames and passwords are case sensitive. There are no users created for Ksenos by default, so keep the password of Ksenos safe.

![](warning)

The operating system must log in automatically, otherwise the recording will not start. Restrict the use of the recorder through the Ksenos user control (see chapter 2.5.2).

**Users**

Users are added by selecting "Users" from the settings window and pressing the Add user button. The first user created is the administrator, who has full privileges. The permissions of the users created after the first one can be modified by selecting the user in the settings window (Image 2.6).
If the system is connected to remotely, you must create at least one user, whose credentials are used to log into the system.
Examples on creating users:

Example 1:
Guard on a gate requires permissions to control PTZ cameras. There is no need for the guard to have all the permissions, so create a user "guard" with password "Gu4rd5". Required permissions for the user are chosen from settings. The following permissions are left unchecked: "Remote access to this recorder", "User control" ja "Quitting the program". Now the guard has nearly the same permissions as the admin, but no permission to modify user settings or quit the program.

Example 2:
A local store is using the web server in Ksenos to stream live images to the cashier. Cashier is not supposed to see images from the loading bay. In this case the following user can be made: "cashier" user with password "l0c4lSt0r3". Choose permissions: "Viewing live video" and "Remote access to this recorder". Next add this user to access group number /two.pnum. Now the cameras can be configured to certain access groups so this user does not see all the cameras from the store.

Now the browser from cashier's computer can be opened and directed to the address and port (for example 192.0.2.1:8080) of the recorder. The browser asks for authentication, after which all the cameras accessible by the user are now visible.

Network connections

The settings related to communication over a network can are altered from "Network connections" in the settings window. On a recorder you can enable servers, which allows you to use the program from other PCs. You can also create remote connections to other servers here.

Discover recorders from the network, enable or disable the Ksenos Server and the web server in "Network connections" (Figure 2.8).

Figure 2.8: Network connections.

Automatic server search

Ksenos will search for servers in the LAN automatically by selecting "Network connections".
Discovered servers will be shown in the list. The list displays the recorder name and its IP address. If the recorder is to be added to Ksenos, select the recorder from the list and click the [Add selected servers] button, and recorder will be added under the Network connections. Multiple servers can be chosen at once by holding [Ctrl] key while selecting recorders from list.

Ksenos searches for servers whenever “Network connections” is opened. For manual refresh, click [Refresh].

Usernames and passwords for added recorders must be set manually.

### Server

![Server settings](image1)

Figure 2.9: Server settings.

It is possible to access the recorder from any computer in the same network that has Ksenos installed (free client), by enabling the Server. The remote connection will fail if there are no users added to the system.

The recorder uses TCP port 9191 for remote connections by default. It is necessary to leave this port open on firewall and set up a proper port-forwarding if needed. The server accepts both IPv4 and IPv6 connections.

### Web Server

![Web server settings](image2)

Figure 2.10: Web server settings.

It is possible to watch video streams and modify settings of this recorder on a web browser. Enter the IP address of this recorder and, if necessary, the port used by the Web server, to the address line of the browser. The default port is 80, and does not need to be explicitly specified. To ensure that the server is running, direct the web browser on the server to the local address [http://127.0.0.1](http://127.0.0.1).

The web server can be made available to all the network users. This is however not recommended on big networks. It may be necessary to open ports on firewall for the web server. The server accepts both IPv4 and IPv6 connections.
Remote settings

New remote connection is made by choosing “Network connections” and clicking Add remote connection... button.

Figure 2.11: Remote connection settings.
Remote access requires username and password. The fields can be left empty and Ksenos will ask them when the connection is opened.

Connection can be set to automatically connect by choosing “Autoconnect”.

If the “Display an error when losing connection” is checked, error message appears on the main window when the connection to this recorder is lost.

**SMTP alarm receiver**

The SMTP server allows errors to be received by email. This can be used, for example, to monitor errors of a RAID controller, if the controller in question supports sending email on error.

The server generates a system error (see chapter 8.1) from the received emails, displaying them to the user from the -button. Afterwards the email message is destroyed without passing it forward. Thus the recipient of the email message is ignored, and all the emails passed to Ksenos are transformed to errors.

Once the SMTP server has been enabled, you can, for example, display the error messages of a RAID controller by setting the controller’s email server setting to the recorders IP address and the port as the one set in SMTP server settings. The server does not use encryption or authentication.
The RTSP servers is used to receive video streams from the recorder to other programs or devices. The RTSP server accepts only IPv4 connections.

The RTSP server is connected to from another program or device by using an RTSP URL. When you want to receive an image from a single camera, the path portion of the RTSP URL can be read from the “Camera identifier” setting of the camera. You can add parameters to the URL, which gives it a format such as `rtsp://192.0.2.1:8554/Brickcom_1?showTime=true&timeColor=00ff00&width=1270&height=720&time=20140119T11407Z&fps=10&quality=80`.

When you want images from several cameras multiplexed into one, the URL is of a format such as `rtsp://192.0.2.1:8554/?cameras=SonyIP_1,SonyIP_11,Brickcom_1&showTime=true&timeColor=00ff00&width=1270&height=720&time=20140119T11407Z`.

Possible parameters are:

- `showTime`: if "true", add a timestamp to the top of the image.
- `timeColor`: The color of the drawn time as an RGB hexadecimal value without a # character. The default value is ffffff, which means white.
- `width`: The width of the image in pixels. The default value is the width of the original video.
- `height`: The height of the image in pixels. The default value is the height of the original video.
- `time`: The time in ISO 8601 standard format (without - and : characters), from which to start the video playback (if there are recordings on that particular time). The playback begins from the current time by default.
- `fps`: How many images the server sends per second. The default value is 25.
- `quality`: The quality. 100 is the best. Default value 50.
- `live`: If "true", send the stream received from the camera unrecompressed. The other parameters will be ignored if this one is set to "true". This parameter will not work with multiplexed image.

### Network cameras

#### Automatic camera search

Ksenos starts automatically searching for IP cameras as soon as the Settings window is opened. Select “Network cameras” from the setting tree to open the search window. Cameras found are...
Network cameras

shown in the list, each camera shows information about manufacturer, model, IP address and type. If the type is not correct, it can be changed by right-clicking the camera and selecting "Select type...". The list can be refreshed by clicking Refresh.

To add cameras to the system, choose a camera from the list and click Add. To add multiple cameras at once, hold the Ctrl key while choosing the cameras.

The search protocol can be selected from the dropdown menu. By default "All protocols" is selected and cameras are searched using both UPnP and ONVIF protocols.

Other IP cameras and servers

Most modern cameras use the RTSP protocol which works out-of-the-box on Ksenos through the RTSP support. Some of the most common RTSP paths are listed in chapter 2.7.5. Also most ONVIF cameras are supported by Ksenos. General settings for both of these camera types should be done directly from the camera by its web configuration through a web browser. The web configuration can be reached by directing the browser to the camera's IP address and logging in. On most cameras the default login and password for the administrator are: admin. Check the camera manual for default IP and login information.

Many video servers use the same RTSP protocol to convert analog signals to digitals. These video servers either have separate IP address for each channel, or one IP address and separate RTSP paths for different channels. For more information, check device manual.

Replacing the camera

You might want to replace a network camera with another one, if the original has broken or the new one offers better picture quality or other benefits. If the new camera is compatible with the old one, for instance both supporting ONVIF, it suffices to either have the same IP address on the new camera as the old one did, or replace the camera address in Ksenos as well.

If the new camera is of a different type than the old one, you can remove the old camera first and then add the new one with the correct type. This would assign the new camera a new identifier, preventing the new camera from replacing the old one in the saved layouts or rules, and also the recordings of the old camera from showing up on the new one.

It is possible to replace a camera with a new one with different type by selecting the camera in the setup window and pressing the Change type... button. After this you select the camera type from the appearing window and the camera will be replaced with the new type. The common settings will be automatically copied from the old camera.

Common default ports for IP cameras

<table>
<thead>
<tr>
<th>Protocol</th>
<th>Port</th>
</tr>
</thead>
<tbody>
<tr>
<td>RTSP</td>
<td>554</td>
</tr>
<tr>
<td>HTTP</td>
<td>80</td>
</tr>
</tbody>
</table>

Default RTSP paths for common camera brands

<table>
<thead>
<tr>
<th>Brand</th>
<th>RTSP Path</th>
</tr>
</thead>
<tbody>
<tr>
<td>4XEM</td>
<td>live.sdp</td>
</tr>
<tr>
<td>ACTi</td>
<td>(empty) track1 track2</td>
</tr>
<tr>
<td>Acumen</td>
<td>mpg4/rtsp.amp</td>
</tr>
<tr>
<td>Airlive101</td>
<td>mpeg4</td>
</tr>
<tr>
<td>Airlive</td>
<td>video.mp4</td>
</tr>
<tr>
<td>ALinking</td>
<td>cam1/mjpeg cam1/mpeg4 cam1/h264</td>
</tr>
<tr>
<td>Manufacturer</td>
<td>Protocol/Pathway</td>
</tr>
<tr>
<td>--------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>Alliede</td>
<td>0/1:1/main</td>
</tr>
<tr>
<td>Aviosys</td>
<td>mpeg4</td>
</tr>
<tr>
<td>AVS Uriel</td>
<td>mpeg4</td>
</tr>
<tr>
<td>Axis</td>
<td>axis-media/media.amp mpeg4/media.amp</td>
</tr>
<tr>
<td>Basler</td>
<td>h264 mpeg4</td>
</tr>
<tr>
<td>BlueJay</td>
<td>mpeg4</td>
</tr>
<tr>
<td>Brickcom</td>
<td>channel1</td>
</tr>
<tr>
<td>CNB</td>
<td>(empty) mpeg4</td>
</tr>
<tr>
<td>Dynacolor</td>
<td>h264 mpeg4</td>
</tr>
<tr>
<td>Edimax</td>
<td>ipcam.sdp</td>
</tr>
<tr>
<td>Hunt Electr</td>
<td>video1+audio1</td>
</tr>
<tr>
<td>iCanTek</td>
<td>StdCh1</td>
</tr>
<tr>
<td>Infinova</td>
<td>1.AMP</td>
</tr>
<tr>
<td>IOimage</td>
<td>iolImage/1</td>
</tr>
<tr>
<td>IQinVision</td>
<td>now.mp4</td>
</tr>
<tr>
<td>Linksys</td>
<td>img/video.sav</td>
</tr>
<tr>
<td>Lorex</td>
<td>video.mp4</td>
</tr>
<tr>
<td>Lumenera</td>
<td>(empty)</td>
</tr>
<tr>
<td>Merit Li-Lin</td>
<td>rtsph264</td>
</tr>
<tr>
<td>Messoa</td>
<td>livestream/</td>
</tr>
<tr>
<td>Moxa</td>
<td>multicaststream</td>
</tr>
<tr>
<td>MultiPix</td>
<td>video1</td>
</tr>
<tr>
<td>Onix</td>
<td>cam0_0</td>
</tr>
<tr>
<td>Opttelecom</td>
<td>mpeg4</td>
</tr>
<tr>
<td>Panasonic</td>
<td>nphMpeg4/g726-640x480 MediaInput/mpeg4 MediaInput/h264</td>
</tr>
<tr>
<td>Samsung</td>
<td>mpeg4unicast</td>
</tr>
<tr>
<td>Sanyo</td>
<td>VideoInput/1/h264/1</td>
</tr>
<tr>
<td>Sentry</td>
<td>mpeg4</td>
</tr>
<tr>
<td>Seyeon Tech</td>
<td>cam0_1</td>
</tr>
<tr>
<td>Brand</td>
<td>File Path</td>
</tr>
<tr>
<td>---------</td>
<td>---------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Shany</td>
<td>PSIA/Streaming/channels/2?videoCodecType=H.264 h264</td>
</tr>
<tr>
<td>Sharx</td>
<td>live_mpeg4.sdp</td>
</tr>
<tr>
<td>Siemens</td>
<td>img/video.asf livestream</td>
</tr>
<tr>
<td>Sony</td>
<td>media/video1</td>
</tr>
<tr>
<td>Sparklan</td>
<td>mpeg4</td>
</tr>
<tr>
<td>Speco</td>
<td>(empty)</td>
</tr>
<tr>
<td>Swann</td>
<td>mpeg4</td>
</tr>
<tr>
<td>TCLink</td>
<td>live.sdp</td>
</tr>
<tr>
<td>TP-Link</td>
<td>video.mp4</td>
</tr>
<tr>
<td>TRENDnet</td>
<td>mpeg4</td>
</tr>
<tr>
<td>Truen</td>
<td>video1</td>
</tr>
<tr>
<td>Videolarm</td>
<td>mpeg4/1/media.amp</td>
</tr>
<tr>
<td>Vivotek</td>
<td>live.sdp</td>
</tr>
<tr>
<td>Y-cam</td>
<td>live_mpeg4.sdp</td>
</tr>
<tr>
<td>Zavio</td>
<td>video.mp4</td>
</tr>
</tbody>
</table>

Modify the settings for single cameras from the quick menu from camera windows. This is a fast way to try different settings. The settings of a camera can be applied to all the cameras of the same type by pressing the **Apply to all...** button.

⚠️ Rename cameras with descriptive names for easier browsing.

**Capture boards**

**Adding capture board and analog signals**

Ksenos supports Comart XeCap and Xed capture boards on analog recording.
Adding a capture board on Windows:

- Choose “Capture boards” from the settings tree.
- Click Add capture board... to add a new capture board. The capture card will appear automatically.
- Choose a capture card in the tree view and click Add camera... to add analog signals.

Adding a capture board on Linux:

- Choose “Capture boards” from the settings tree.
- Click Add capture board... to add a new capture board.
- Choose “Comart-capturedevice”.
- Choose a capture card in the tree view and click Add camera... to add analog signals.

Choose the number of signals to be add (Figure 2.15). By default, Ksenos will suggest the maximum number available.
**I/O devices**

**PTZ control and joysticks**

**General settings**

Ksenos supports Pelco-P, Pelco-D, American Dynamics, Panasonic, and JVC serial port protocols, and also IP PTZ control protocols of Axis, Brickcom, GSP, Hunt, Lilin, ONVIF standard, Panasonic, Samsung and Sony. PTZ control can be enabled in the camera settings by setting "PTZ control protocol" to the desired protocol. To control analog cameras, also serial port info is required. After these settings are set correctly, it is possible to use the mouse to control the pan, tilt and zoom functions by dragging on the image in camera window. The cameras connected to the same serial port can be identified with the "Address" setting, which is set to match the value set in the camera. Control speed can be modified by using the sliders in the "Settings" window.

![Default PTZ settings for analog dome camera.](image)

**Patrol**

Patrols can be programmed to PTZ cameras from the quick menu of the camera window. Each PTZ camera can have its own patrol. Patrol stops when camera is being controlled manually. The camera will resume the pre-configured patrol after a set time has passed since manual control. This delay is set from the "Return to patrol" slider in the camera settings.

**Joystick**

Joystick can be used to control PTZ cameras. The buttons on the joystick will also function as digital inputs, which allows you to choose cameras or open gates and electric locks.
Joysticks can be added just like any other device. Choose “I/O devices” from settings tree in Settings window and click “Add I/O device...”. After the device is added, its settings can be adjusted by selecting it in the settings tree. It is possible to add multiple joysticks on one recorder. First the “Joystick device” must be set. If there is only one joystick, the value can be set to “Automatic”. Joystick state and buttons are shown in the settings in the “Joystick status” tab.

The visible numbering on the joystick might not match the software numbering. For example, pressing the button 1 on the joystick might activate the button 11 on the program. In such case you should set the value of the “Keypad number” setting to 11, so that pressing the button number 1 outputs the number 1.

**Joystick and rules**

The buttons on the joystick work as digital inputs. This way the buttons can be set to control rules.

**Example:**

You want to open a gate by pressing a button. Set the condition type to “Digital input” and select the DIO device and input connected to the button. Set the action type to “Control a digital output” and select the DIO device which is connected to the gate opening system.

If necessary, closing the gate with a delay can be done using another rule. Set the condition type to “Wait for another rule”, set the rule to the gate opening rule created earlier, and select the desired delay in seconds. The action is created as previously, but set the digital output to the output that closes the gate.
IP serial ports

Serial port controlled cameras can also be used with external IP-based serial port devices. The control commands are sent through network to the device, which then converts them to regular serial traffic.

The external serial port device is enabled by adding a new device of type "IP serial device" under "I/O devices", and configuring its IP address and port. The device can then be set to be used as the serial port in the PTZ settings of the desired cameras.

Serial port passthroughs

A serial port passthrough allows two serial ports to be connected, sending the data from the first port to the second one and the data from the second port to the first one. This allows the use of external controller devices to be connected to cameras through Ksenos, making the cameras controllable from both Ksenos and the external controller.

The passthrough is created by adding a new device of type "Serial port passthrough" under "I/O devices", and selecting the desired serial ports from its settings.

The passthrough ignores the used protocol, and just transfers the data as it is. Because of this, the simultaneous use from both Ksenos and an external controller can cause some problems depending on the protocol, such as switching the controlled camera to the one used by the other controller. Reading from the serial port will also not work properly, if there are several readers. Incoming data cannot thus be reliably forwarded to multiple serial ports.
Camera settings

Disabling a camera

A camera can be temporarily removed by enabling the "Disable this camera" setting from the "General" tab of the camera. This causes the camera to record nothing, and be absent from camera listings. This is useful for example if the camera has broken, and you wish to remove it from the layouts until it can be replaced.

Analog camera settings

Settings for analog camera can be adjusted by selecting a camera from the settings tree. The most important settings are:

- **Image adjustments / Framerate**
  - How many image has been captured in a second

- **Image adjustments / Resolution**
  - Resolution (image size) of the analog signal recordings.

- **Image compression / Codec**
  - Compression codek that is being used for analog signal recordings. MPEG-4 is recommended.

  **Note!** When installing the signals, input connectors must be in numbered order. If there are any empty connectors in-between, recorder might not work stable.

On a basic installation, these are possible example settings for /one.pnum6 channel analog recorder with Comart XeCap /four.pnum/zero.pnum/zero.pnum capture board.

- Framerate: /two.pnum/five.pnum fps (frames per second)
- Compression: MPEG-4
- Resolution: 2CIF (704x288 pixels)

Other settings should be adjusted depending on ambient light and personal preferences. Single camera settings can be copied easily to other cameras by clicking the [Apply to all...] button in the camera's settings.

The image controls of the cameras

The image controls of the cameras are opened by right-clicking the camera window and selecting "Image controls..." from the menu that opens. You can select how the camera image is drawn and what additional information is displayed on the picture from the image controls.

- **Show information**
  - Shows the encoded image size, the frames rate, the average size of the image, the amount of recorded images, and the image resolution.

- **Show motion**
  - Shows small motion in the camera image in transparent green color. Transparent red color in the camera image indicates bigger changes. This function makes it easy to follow motion in the camera image.
Show mask
You can isolate a portion of the camera image to not be included in the motion detection. This area is called the mask of the camera. The mask can be created from the camera settings in the settings window, and it is shown on the camera window by selecting "Show mask" in the image controls.

Custom buttons
You can add buttons, that perform rule actions, to the camera window. For example, you can create a button that opens a gate.

The custom buttons are enabled from the camera settings under the "Custom buttons" tab.

You can add the button by checking the "Enable..." setting of the desired button. You can give the button a description and an alternative icon. The added button does not do anything in itself, but the functionality is added with rules. You can easily create a rule that responds to the new button being pressed by pressing the [Add rule for this button] button. Once the rule is created, go to the created rule by selecting it under "Rules" in the settings window, and add an action to the rule. The action will be performed when the created button is pressed on the camera window, and the optional release action will be performed when the button is pressed again. More information about editing the rules in chapter 6.

Digital I/O
This feature is supported with the ONVIF camera type. Make sure that the camera supports this feature. Enable the "Receive input events from this camera" setting in the "Digital I/O" group under the "General" tab in the camera settings. The status field will display "OK" if the events are enabled.

The digital input events can be handled through the rule system.

Sending audio to a speaker
Some cameras can be connected to a speaker, which can receive audio from a microphone connected to a Ksenos recorder.

Add a speaker to a camera by pressing the [Add speaker...] button. The address and login information of the speaker are by default the same as on the camera it's connected to. If you wish to use a separate audio device for the audio transmission, these settings can be adjusted.

When it is desired to only store the audio spoken to the microphone locally, and not transmit it to the speaker, the speaker type "Empty speaker" should be used.

⚠️ Remember to enable the local microphone on the recorder or a remote client from "Network connections" → "Local microphone".
Fisheye lenses

Ksenos has the "Fisheye viewer" camera type for cameras with a fisheye lense. The camera type allows dewarping and creating a view of multiple cameras from the fisheye image. You can also control the camera image with a mouse or a joystick.

The fisheye viewer is added by selecting "Network cameras" from the setting window and pressing the Add camera... button. This opens a dialog for adding cameras, from which "Fisheye viewer" is selected. A camera with a fisheye lense should also be added for the fisheye viewer to be usable.

Once the source camera has been selected to the fisheye viewer, select the cropping region to match the fisheye image. This can be achieved by using the radius and coordinate settings. An incorrect cropping is shown in the image 4.1, and a correct one in the image 4.2.

Figure 4.1: Incorrectly cropped fisheye image.
Settings

Source camera
From which camera the image is acquired? You should select a camera with a fisheye lens in this setting.

Use the fisheye settings of the source camera
The fisheye viewer uses the fisheye settings of the source camera. If the setting is enabled, the fisheye settings cannot be altered from the viewer, and the values are set based on the source camera.

Use fisheye dewarping
When the setting is enabled, the fisheye image is dewarped. The setting must be enabled to allow cropping the image.

Fisheye radius
The setting is used to select the area with the fisheye image from the image. The selected area needs to be the same size as the fisheye image.

The x coordinate of the fisheye center
The setting is used to move the fisheye cropping horizontally.

The y coordinate of the fisheye center
The setting is used to move the fisheye cropping vertically.

Depth correction
The setting can be used to fix any stretching and compression remaining on the dewarped image. The stretched or compressed image may be the result of inaccurate cropping. Make sure the cropping is accurate before using the depth correction.

Angle correction
The setting can be used to fix remaining skewness on the dewarped image. Typically a skewed image is the result of inaccurate cropping. Make sure the cropping is accurate before using the angle correction.

Advanced rendering
The setting needs to be enabled for the snapshots of the dewarped image to work. This will use additional CPU resources, and will not work on older graphics adapters.
Show fisheye direction image
When the setting is enabled, a small warped fisheye image with the area of the dewarped image drawn on top of it is shown on the camera window.

Figure 4.3: The camera window of a fisheye viewer with the direction image enabled.
Panomorphic lenses

Ksenos has the “Panomorph viewer” camera type for cameras with a panomorph lens. The camera type allows dewarping and creating a view of multiple cameras from the panomorph image. You can also control the camera image with a mouse or a joystick.

The panomorph viewer is added by selecting "Network cameras" from the setting window and pressing the Add camera... button. This opens a dialog for adding cameras, from which "Panomorph viewer" is selected. A camera with a panomorph lens should also be added for the fisheye viewer to be usable.

Settings

Source camera
From which camera the image is acquired? You should select a camera with a panomorph lens in this setting.

Enable
The panomorph image will be dewarped when this setting is enabled.

Lense type
The connected lense needs to be selected to the setting. The model of the lense is written on the base of the lense. Selecting a wrong lense might distort the image or prevent it from showing up at all.

Mount type
This setting defines that the camera is mounted on ceiling, floor or wall. Selecting the right installation type is important so that the controls work as expected.

Viewing mode
This setting defines the type of view to create. There are three different views.

Viewing mode settings

PTZ view
The image is dewarped and you can control the image with a mouse or a joystick.

Quad view
Four independent PTZ views are created from the image. You can control the views with a mouse or a joystick.

Perimeter view
If the mount type is either "Ceiling" or "Floor", two 180 degree views circling around the entire image are created from the image. If the mount type is "Wall", a single 180 degree view is created from the image.

Status
The status field shows any error messages that might emerge.
Rules

You can automate different functions with rules. A rule consists of conditions, which can be different kinds of input or state information, and action, which is performed once the state of the condition is altered.
Figure 6.1: Rules.

**Rule conditions**

Rule condition list can be opened from the "**Condition type**" drop-down menu (Image 6.2).
Conditions are presented in the following:

<table>
<thead>
<tr>
<th>Name</th>
<th>Active if...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Schedule</td>
<td>the present hour in schedule is active.</td>
</tr>
<tr>
<td>Digital input</td>
<td>An input of a connected I/O device is active.</td>
</tr>
<tr>
<td>Second rule</td>
<td>another rule is active.</td>
</tr>
<tr>
<td>Loss of video signal</td>
<td>Selected analog video signal is lost.</td>
</tr>
<tr>
<td>Wait for another rule</td>
<td>another rule has been active for x seconds.</td>
</tr>
<tr>
<td>Motion detection</td>
<td>Motion detected in selected camera.</td>
</tr>
<tr>
<td>Timer pulse</td>
<td>the on/off timer’s present state is on.</td>
</tr>
<tr>
<td>Rule</td>
<td>the selected rule is active.</td>
</tr>
<tr>
<td>Area motion detection</td>
<td>Motion has been detected in the selected area in camera view.</td>
</tr>
<tr>
<td>Connection lost</td>
<td>A connections is lost to a camera.</td>
</tr>
<tr>
<td>Recording error</td>
<td>recording fails because of an error, for example a hard disk failure.</td>
</tr>
<tr>
<td>Custom button pressed</td>
<td>the user presses a button on the camera window, which is added in the</td>
</tr>
<tr>
<td></td>
<td>“Custom buttons” section of the camera settings.</td>
</tr>
<tr>
<td>Motion detector</td>
<td>Motion is detected by &quot;Motion detector&quot; or &quot;Motion analyzer&quot; analytics.</td>
</tr>
<tr>
<td>Alert line</td>
<td>an alert line crossing is detected.</td>
</tr>
<tr>
<td>Counter</td>
<td>a counter surpasses its threshold value.</td>
</tr>
<tr>
<td>Tampering detector</td>
<td>a tamper detector detects modifications in the image.</td>
</tr>
</tbody>
</table>

The state is indicated with the image of a light bulb next to the condition. When the light is on, the
Rule operators

The operator selection (All conditions are met, some of the conditions are met) determines specific occasion when the action is triggered. For example “All conditions are met” requires all conditions to be active simultaneously before the action is triggered. When the light bulb is on next to the operators, the action is triggered.

Rule actions

Rule actions can be selected from drop down menu (Image 6.4).

Rule action descriptions are presented in following:

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control a digital output</td>
<td>Trigger a digital output of a connected I/O device.</td>
</tr>
<tr>
<td>Switch analog video output</td>
<td>Switch the analog output of the analog capture board to show the image of a certain analog camera.</td>
</tr>
<tr>
<td>Call PTZ preset</td>
<td>Call a preset of a certain PTZ camera.</td>
</tr>
<tr>
<td>Internal command</td>
<td>Perform an internal command (Only for advanced use).</td>
</tr>
<tr>
<td>Notification/Alarm</td>
<td>Pop-up notification to event and make an alarm log entry.</td>
</tr>
<tr>
<td>Change a setting</td>
<td>Change a certain setting of the program.</td>
</tr>
<tr>
<td>Send an HTTP URL request</td>
<td>Control an external web service by requesting an HTTP URL.</td>
</tr>
</tbody>
</table>
RULES

Rule actions

<table>
<thead>
<tr>
<th>Rule action</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Place a bookmark</td>
<td>Place a bookmark in the recordings at the same time of trigger.</td>
</tr>
<tr>
<td>Send an email</td>
<td>Send email including optional text and possibly camera images.</td>
</tr>
<tr>
<td>Select camera to virtual window</td>
<td>Choose specific virtual windows to show specific camera image.</td>
</tr>
<tr>
<td>Open window</td>
<td>Open the selected camera and map windows on a specific display.</td>
</tr>
</tbody>
</table>

Example rule 1 - Control digital output on video signal loss

Creating a new rule:

- Click "Rules" and click button **Add rule** (Figure 6.5).

![Figure 6.5: Rules.](image)

- Modify the rule (Figure 6.6):
  1. Select a rule to modify.
  2. The rule can be renamed in the text field.
Rule actions

Figure 6.6: Edit rule.

- Add a condition to the rule (Figure 6.7).

Figure 6.7: Add condition.

1. Click **Add condition**
2. Choose "Loss of video signal" from the "Condition type" drop-down menu.
3. Choose an analog camera from the "Channel" drop-down menu.

- Instead of choosing just one camera, it is possible to choose all the cameras from the device by choosing a capture board "Any channel on a device".

- Since this rule has only one condition, you can choose either operator (Image 6.3) without affecting the operation of the rule.

- Add an action to the rule by pressing the **Add action** button.
• Select an action "Control a digital output" (Figure 6.8). Select a device and desired output. Choose to which state the output is set when the action is triggered.

Figure 6.8: Choose actions.

Example rule - Scheduled area motion detection notification

Create a new rule:
• Click "Rules" and click Add rule button (Figure 6.5).
• Modify the rule (Figure 6.6):
  1. Choose the created rule to be modified.
  2. The rule can be renamed in the text field.
• Adding conditions (Figure 6.9):
  1. Add two conditions by clicking Add condition button.
  2. Choose "Schedule" from the "Condition type" drop-down menu of the first condition.
  3. Choose "Area motion detection" from the "Condition type" drop-down menu of the second condition.
RULES

Rule actions

Click the grid at the “Edit schedule” item of the first condition, which opens up the “Weekly schedule” dialog (Figure 6.10).

Remove the wanted times (for example working hours) and click OK. In this case the rule does not trigger any actions from Monday to Friday between 8:00 and 16:00.

Choose a camera from the “Camera” drop-down menu.

Open “Select motion area” window by clicking the white square at the “Edit the motion detection area” item.
• Click and hold left mouse button on the camera image and draw a mask for motion detection. The orange area drawn triggers the action, other parts will be ignored. (Figure 6.11). Click OK to accept.

Figure 6.11: Adding the Area motion detection-condition.

• Choose "All conditions are met" from operators (Figure 6.3). In this case the rule requires that the schedule is active when any motion is detected.

• Add an action to the rule by pressing the Add action button.

• Choose "Notification/Alarm" from the drop-down menu (Figure 6.12). Choose a camera for the notification event, camera name will be visible in the alarm log. Choose a background color for the notification and type a text to show in the notification, the text will also be visible in the alarm log.
When the notification event window is open, all the triggered notifications will be opened in it (Figure 6.13). Notification pop-up as motion is detected on "Hallway" camera. These notifications also open up over remote connection. Each notification is logged to Alarm log.

Create 3 rules:

- Click "Rules" and click Add rule button three times (Figure 6.5).
- See examples 1 and 2 on creating the rules. This rule explains one use for the "Wait for another rule" condition. This rule triggers an action if another rule is true.
- Choose first rule (Rule 1) and change the values to match the image 6.14. This rule is used much like condition. It is active outside working hours (Schedule condition) and when I/O-input is triggered but external alarm (Digital input condition).
Choose another rule (Rule 2) and add motion detection condition to wanted cameras (Figure 6.15). Rename the rule "Motion detection" for later recognition.
• Choose the third rule (Rule 3) and rename it to “Rule combination”. Add two conditions: "Another rule" for "Alarm system enabled" rule and "Wait for another rule" for "Motion detection" rule (Figure 6.16).

• "Another rule" condition is based on chosen rule status. In this case, when "Alarm system enabled" is active.

• "Wait for another rule" requires that the rule is in the selected state for a defined amount of seconds. In this case it works just like "time threshold" for motion.

• Choose "All conditions are met". This option requires that alarm system is enabled when the motion is detected.
Figure 6.16: Another rule.

- Choose fourth rule (Rule 4) and add one condition and one action.

- Choose "Another rule" and choose "Rule combination" and "Active" and set hold time to 10 seconds or more, so that rule does not place more than one bookmark for each motion detection event.

- Choose "Place a bookmark" and type in the wanted text (Figure 6.17).
This results in bookmarks on the timeline (Figure 6.18). Bookmarks are listed in the "Bookmarks" window, if the "Place a bookmark" rule has been active.
Figure 6.18: Bookmarks on the timeline.
Analytics

Ksenos video analytics is composed of areas drawn over the image, and analyzers attached to these areas. It is typically not necessary to perform video analysis for the entire image, therefore you can improve the performance of the analyzer by only using selected areas. You must also note that video analysis is not 100% accurate. The accuracy is affected by the lightning, the analyzer settings, the camera orientation and location amongst others. Generally the best results can be achieved by viewing the area being analyzed directly overhead.

**Motion detector**
- Allows performing motion detection only in the assigned areas.

**Motion analyzer**
- Measure the amount of motion in the area.

**Alert line**
- Detect if motion crosses a virtual line.

**Counter**
- Counts events from other analyzers.

**Areas**

You can create up to eight areas on each camera. The areas are modified in the area editor. You can open the area editor from the **Configure area** button of the analyzer.

There are draw tools at the left edge of the area editor, which can be used to draw an area or a line (Figure 7.1). You can draw areas by first selecting the tool (area or line) and then pressing corner points in the desired locations (Figure 7.2). You can end drawing the area by pressing the right mouse button.

You can move the completed area or its corner points by dragging. You can add corner points by double clicking the edge of the area.
Figure 7.1: The area draw tools at the left edge.
Adding an analyzer.

You can add an analyzer to a camera by selecting the camera in the setting window and pressing the Add analyzer button. Select the desired analyzer from the opening menu (Figure 7.3). After adding the analyzer, it will appear under the camera in the tree view.

Figure 7.2: Drawing an area.

Adding an analyzer.

You can add an analyzer to a camera by selecting the camera in the setting window and pressing the Add analyzer button. Select the desired analyzer from the opening menu (Figure 7.3). After adding the analyzer, it will appear under the camera in the tree view.
Adding an analyzer.

Figure 7.3: The option list of the new analyzer.

You can view the analyzer settings by pressing it in the settings window. Each analyzer has the following properties:

**General settings**
General settings define the analyzer name, whether the analyzer is enabled, and a restart button for each analyzer.

**Analyzer-specific settings**
The analyzer-specific settings affect the functionality of the analyzer. These are different depending on the type of the analyzer.

**Area selection**
Area selection displays the camera image and the areas drawn to it. You can press an area to select it for the analyzer. The selected area is displayed clearly over the image, and unselected ones are faded.

**Area editor**
You can press the `Configure area` button to open the area editor, which can be used to modify or create new areas.
Motion detector

The motion detector allows you to limit the motion detection to a specific area. A camera may have multiple motion detectors analyzing different areas. This allows you to have different settings on the motion detectors of different areas. The motion detector generates an event if there is motion in the area. The event may be handled in the rules by selecting “Motion detector” as the condition (Figure 7.6).

Figure 7.4: Analyzer settings.

Figure 7.5: Motion detector settings
Motion analyzer

The motion analyzer is used to measure the motion occurring in an area. You can set a threshold value with the analyzer. If the amount of motion is either higher or lower than the threshold, the analyzer will generate an event.

The event can be handled in the rules by selecting "Motion detector" as the condition (Figure 7.8).

Figure 7.6: A rule for motion detector.

Figure 7.7: Motion analyzer settings

Figure 7.8: A rule for the motion analyzer.
Alert line

Alert line monitors any motion passing over the set line. The alert line deduces the direction of the motion, triggering events only if the motion is headed in the selected direction.

The image needs to have a line instead of a closed area for the alert line. You can add points into the line, making the areas between the points act as separate detection points. This allows several simultaneous detections.

The alert line works best if the camera is positioned right above the monitored section, and the alert line is placed in the middle of the camera image.

Counter

Counter counts events from other analyzers. When the counter reaches a set value, an event is generated. (Figure 7.10)

Tampering detector

Tampering detector monitors any changes in the image. The detector will issue an alarm if the image is altered heavily.

There are two settings on the detector: “Sensitivity” and “Duration”.

Sensitivity

The smaller the value, the more sensitive the detector is. With small values even tiny changes in the image will cause an alarm. Typically a good value is somewhere between 20-50.

Duration

The time in seconds, after which an event is produced from the tampering.

An event from tampering detector can be handled in the rules by selecting “Tampering detector” as the condition.
Examples

The problem: There is a swinging tree in the camera image causing unnecessary recordings.
   The solution is to create areas for the camera in important spots, and add motion detectors to these areas. This way the swinging motion of the tree does not cause recordings, but any motion in the areas will be recorded.

The problem: You want an entry in the alarm log if there is continuous motion in the image for over 5 seconds.
   The solution is to create an area over the entire camera image, and add a motion analyzer. Add the time limit of the motion analyzer to five seconds. Create a rule with "Motion analyzer" as the condition and set the action to write an entry in the alarm log.
Troubleshooting

Ksenos error messages

When an error occurs in the system, the button appears in the main window, and timeline starts flashing in red. If the problem resolves itself, for example a temporarily lost connection to an IP camera returns, the timeline stops flashing and the button turns into yellow.

Clicking the alert button opens up a dialog that shows errors that have not been acknowledged. Error can be acknowledged by checking the error and clicking "Acknowledge", and it will stay acknowledged until it occurs again. When there are no errors to acknowledge in the system, the error button disappears.

These errors are also transferred to remote clients, and should the error be acknowledged from a remote client, it also disappears from the recorder and all other remote clients.

"Unable to write to database"
There is a problem with the database. Check the permissions and status of the recording hard disks.

"Recording file can not be opened"
Ksenos is unable to write to recordings folder. Check read and write permissions. If permissions are correct, check the status of the hard disks.

"Unable to write recordings to a file"
Writing to a file failed. Check hard disk status.

"Error on opening the database"
The database is faulty or system cannot write in to the database. If Ksenos is writing to the database when the computer loses power, it can produce a faulty data in database. If Ksenos is unable to fix the error in next restart, it is possible to remove the faulty database and let Ksenos create a new one. Note! This leads to losing all the recordings! In situations where recordings are important, it is possible to generate a new database from the existing recordings. In these situations, contact Ksenos Support by phone or email.

"Storage has not been properly set up. Nothing will be recorded."
There are cameras connected to the system but the storage has not been configured. See section 1.1.

"Video signal from camera lost"
A camera has not received a new video feed in a while. This setting can be modified from camera settings with "Video disconnection timeout" setting. Only cameras that have "Show system error on video disconnection" setting enabled can cause this error.

"Compressed image was too big to be saved"
Size of an image received from camera was abnormally large. This probably means that there was an error receiving the image and the size information is incorrect. Image is not recorded so the recording won't get stuck because of this. In case the error happens again, camera status should be checked.

"Connection to server lost"
The connection to a remote server is lost without the user's intent and the "Display an error when losing connection" is enabled from remote connection settings. Reasons for this error can be for example shutting down the recorder or unplugging the network cable.
"A RAID array is in degraded state."
There is an error with a RAID array. Check the state of the disks from the RAID management.

"License plate recognition failed"
The license plate recognition engine has failed. Make sure that the USB key of the engine is connected and the drivers are installed.

Network

Usually Ksenos is installed with two networks. One network is for cameras, other for possible remote connections. Problems in these networks can be traced using the "Ping" command. On the network, each device has its own IP address to which connection tests can be made, from either Windows or Linux command line. The command "ping 192.0.2.3" tells if the connection is OK. If Ping shows the time it required to transfer to given IP address and back, the device with this IP address is connected to the same network and working.

In a network with multiple recorders two devices can't have the same hostname or IP address. Recorders should also be named individually. For example, names such as "Ksenos1" and "Ksenos2" could be used.

Many of the common network problems are caused by local network configuration. In these situations it is recommended to contact local network administrator.

Remote access

Local network configuration requires allowing the remote connection ports to be used. Firewall must be set to allow traffic to HTTP server on port 80 and remote connection to TCP port 9191.

It is recommended to be careful on opening firewall ports when remote connections is configured outside the local area network.

Older driver versions for Intel graphics adapters are known for slow and faulty behavior. When Ksenos is run on a computer with Intel GPU, it is recommended to update the graphics adapter driver to the newest version, available either from the computer manufacturer or Intel.
## Technical specifications

| Camera inputs          | 16 analog @ 400 fps*  
|                       | 32 analog @ 800 fps*  
|                       | 32 IP cameras*        |
| Analog image size      | At most 4CIF (704x576) |
| Image compression method | MPEG-4  
|                       | MJPEG                 
|                       | H.264                 |
| Video clip export      | AVI (MPEG-4)          |
| Snapshot export        | JPEG                  
|                       | PNG                   |
| Remote client protocol | TCP/IP                
|                       | HTTP                  |
| PTZ protocols (serial port) | American Dynamics  
|                       | JVC                   
|                       | Panasonic             
|                       | Pelco-D               
|                       | Pelco-P               |
| PTZ protocols (IP)     | Axis                  
|                       | Brickcom              
|                       | GSP                   
|                       | Hunt                  
|                       | Lilin                 
|                       | ONVIF                 
|                       | Panasonic             
|                       | Samsung               
|                       | Sony                  |

* Depending on the license