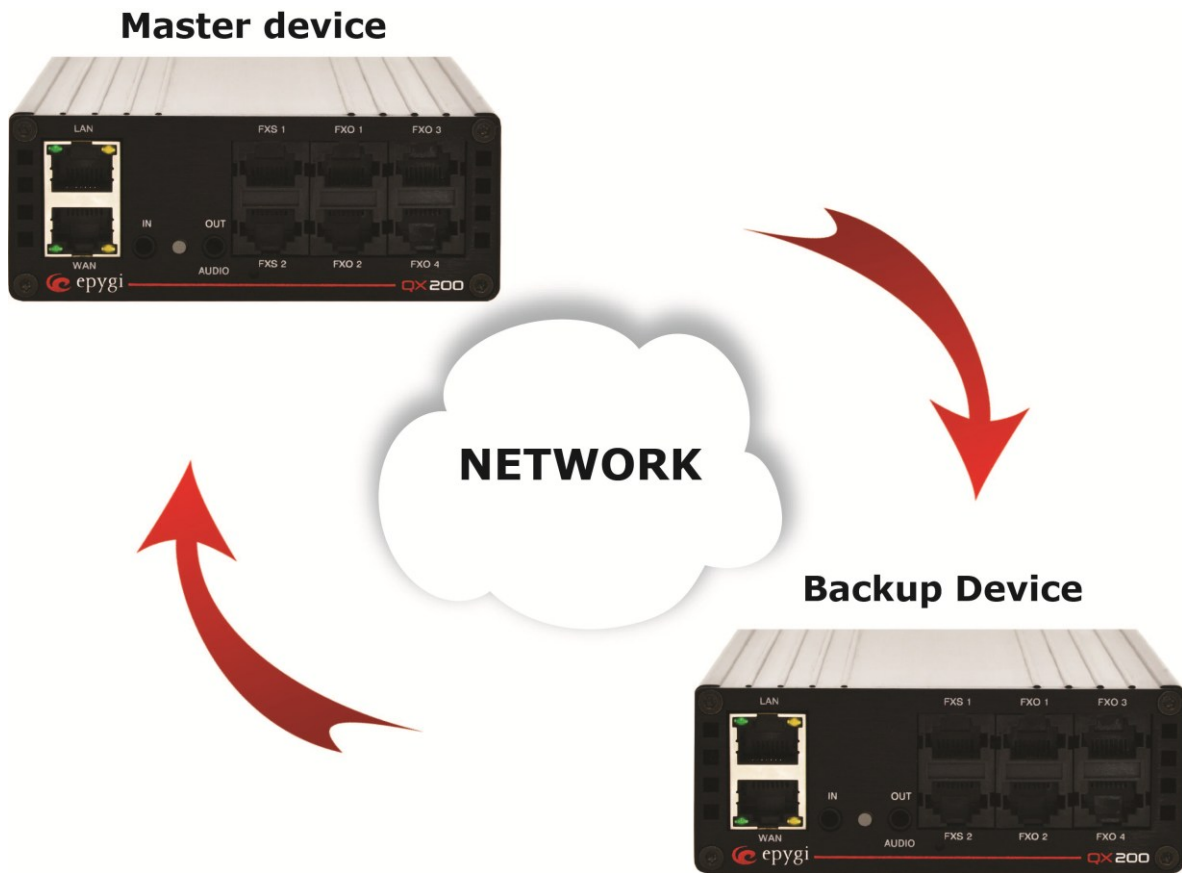


QX50/QX200/QX2000/QXISDN4+ Redundancy Feature



Revision: 1.0

Abstract: This document describes the redundancy feature functionality on QX50/QX200/QX2000 /QXISDN4+ and explains how to configure and use it.

Table of Contents:

1 Introduction 4

2 Functional Description 6

3 Redundancy Configuration 6

 3.1 Configuring First PBX..... 6

 3.2 Configuring Second PBX 7

4 Deployment Procedure 8

5 Failover to the Backup Device..... 9

6 Accessing GUI and Checking the Status of the Backup Device 9

7 Backup Device Modes 10

8 Swapping the Master and Backup..... 11

9 Firmware and Language Pack upgrade..... 11

10 License Key Update Procedure 12

11 Restoring Configuration 13

12 Event Notification..... 14

13 References 15

Document Revision History

Revision	Date	Description	Valid for SW	Valid for models
1.0	26-Dec-2014	Initial release	6.0.x	QX50/QX200/QX2000/QXISDN+

1 Introduction

The Redundancy feature of the QX50/QX200/QX2000/QXISDN4+ is intended to increase the device availability by using a second device as the Backup.

This feature requires a Master and a Backup device. Both devices will need to be installed with the same version of firmware and connected as depicted in Figure 1, Figure 2 and Figure 3. The QX IP PBXs will also need to have matching license keys installed on both units at all times. When using the Redundancy feature, anytime a software license key is purchased and installed on one device, a similar license key must be installed on the Backup device.

Please Note: Redundancy is an optional feature for the QX IP PBXs and can be activated with a licensed feature key from the QX IP PBXs' **Setup->Licensed Features->Feature Keys** GUI page. Once the Redundancy license key is installed, for any additional feature keys that have been purchased, Epygi will supply a set of matching feature keys for the secondary device. When ordering any feature keys, the serial numbers for both devices should be provided. The two devices will always be bound to each other and cannot be used independently.

Please Note: Only two identical devices, with identical software could be used in a redundancy group.

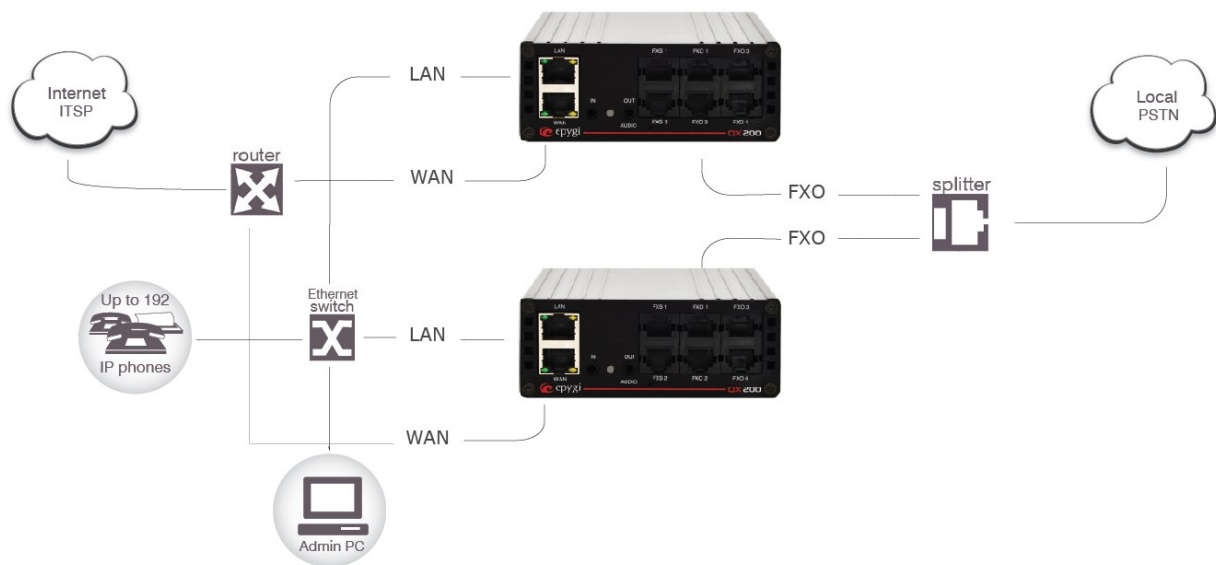


Figure 1

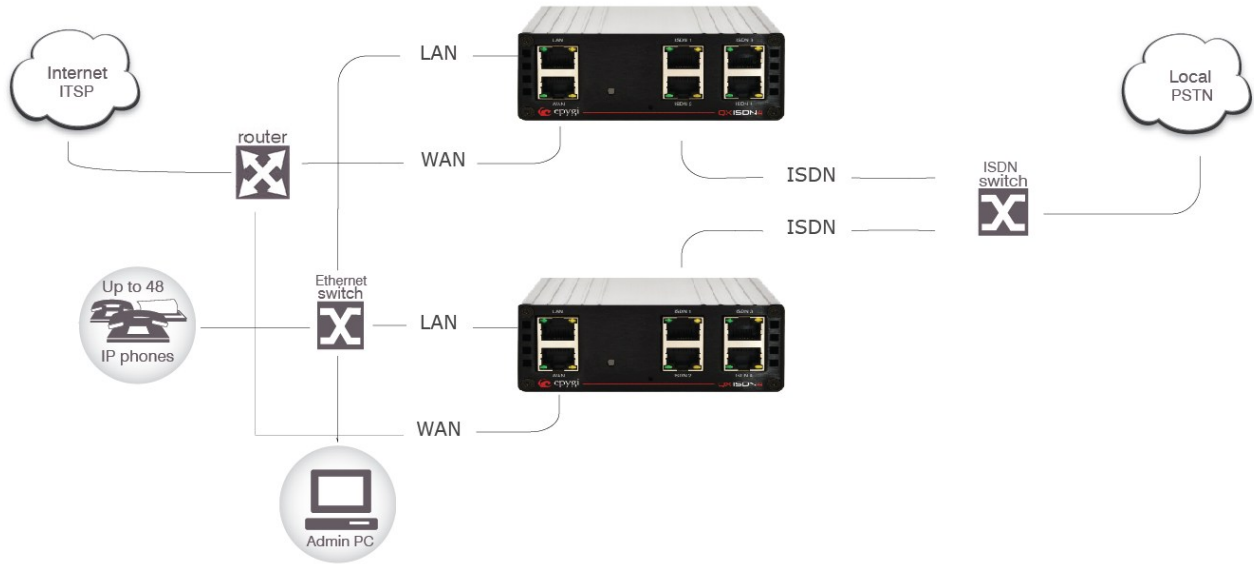


Figure 2

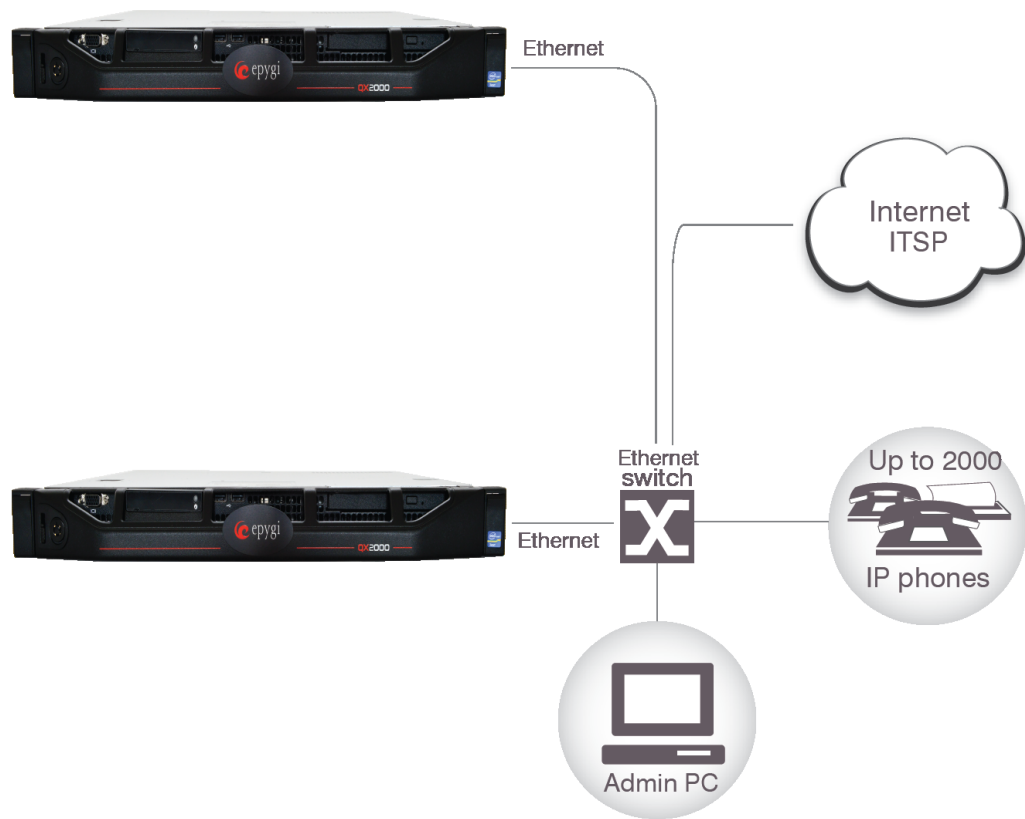


Figure 3

2 Functional Description

The Redundancy Feature is implemented using the VRRP (Virtual Routing Redundancy Protocol, RFC-3768) method to periodically determine the state of the devices in the redundant group.

The VRRP protocol uses the same unique ID (called Redundant Group ID) for both the Master and Backup device. This ID is configurable from the Epygi PBX GUI and must be set to the same value in both PBXs to make them members of the same redundancy group.

After configuring the Redundancy Settings from the GUI, the Epygi IP PBX that boots up first becomes the Master device. The second Epygi IP PBX, booting up with some delay after the first one, will become the Backup after checking and finding that there is already an active Master in its redundancy group.

The Master QX IP PBX will run all applications that are typically running on a standalone QX IP PBXs. Additionally, it is running the synchronization server process to maintain the configuration and voice data synchronization with the Backup QX IP PBXs.

The Backup QX IP PBXs does not run any processes required for active calls. It will run the "keepalived" process needed to check the status of the Master QX IP PBX. It will also run the synchronization client, which periodically (period is configurable and is set to 60 seconds by default) synchronizes the configuration and voice data changes with the Master PBX.

When the Backup PBX cannot find the Master in its network because it is failing to get the keep-alive messages on the Ethernet port (see Figure 1, Figure 2, Figure 3) it starts the failover to Master procedure. The system will begin launching all the applications which were running on the Master PBX before the failure, using the latest configuration and voice data retrieved from the Master.

If the old Master Epygi IP PBX becomes available again, it will determine if there is a Master already running on the redundancy network and automatically starts in Backup mode.

3 Redundancy Configuration

Before connecting the Epygi IP PBX working in a redundant scenario on the network, some minimum redundancy configuration needs to be completed on both Epygi devices.

3.1 Configuring First PBX

Open the **Redundancy Settings** from the **Setup->Redundancy** menu on the first QX IP PBXs (see Figure 4 below).

Please Note: The first configured QX IP PBX will stand as master device, therefore start with the device that is already configured with IP phones and other settings and is running in stand-alone mode.

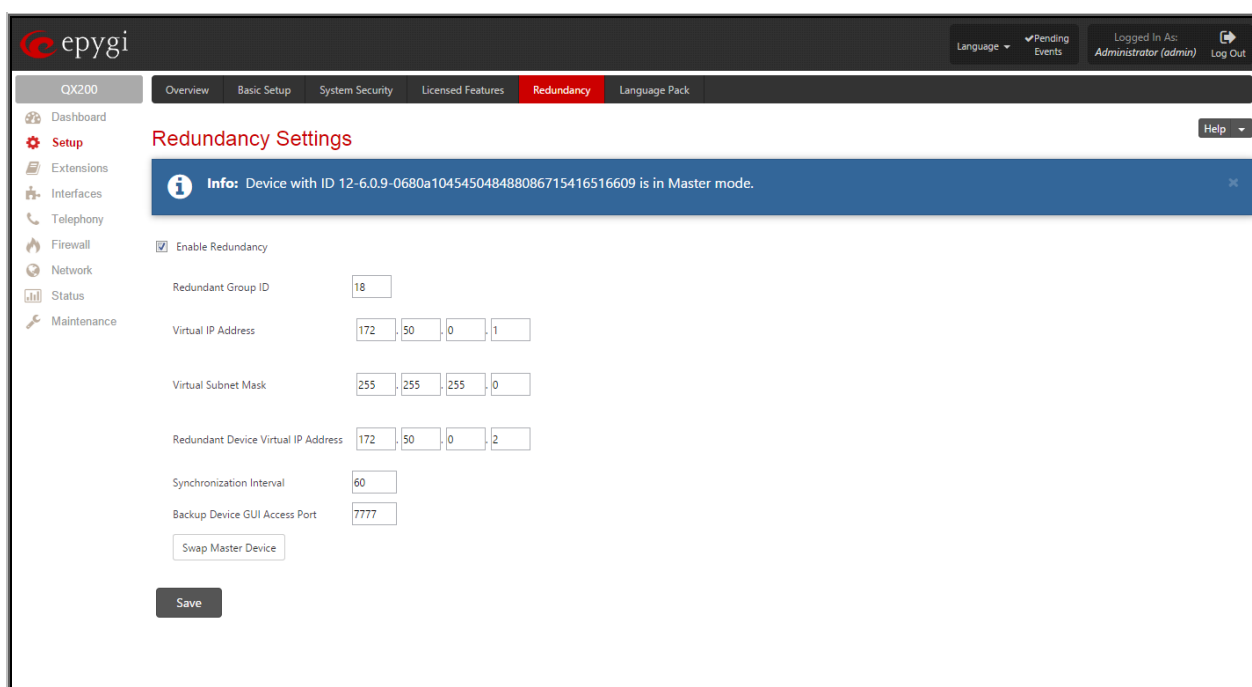


Figure 4

- **Enable Redundancy** – enables/disables the membership of the Epygi PBX in the redundancy group identified by “Redundant Group ID”. Click the checkbox to make the Epygi PBX a member of the redundancy group.
- **Redundant Group ID** – the unique ID identifying the redundancy group. The same value must be set on both IP PBXs to be included into redundant group (the value is 18 in the example above). Please make sure that the **Redundant Group ID** is unique in your network.
- **Virtual IP Address/Virtual Subnet Mask** – an alternate IP network of the LAN interface which stays unchanged when the device switches its mode (from Master to Backup or vice versa). The configuration and voice data synchronization process uses this IP address to communicate with the second Epygi PBX.
- **Redundant Device Virtual IP Address** – the alternate Virtual IP address of the LAN interface of the second PBX.
- **Synchronization Interval** – period of time in seconds between two consecutive configuration and voice data synchronizations from Master to Backup device.
- **Backup Device GUI Access Port** – this port will be used for accessing the GUI of the Backup device through Master (available only for QX50, QX200 and QXISDN4+). For example, to open the GUI of Backup device you have to enter ***http://192.168.74.12:7777***, where 192.168.74.12 is the IP address of the Master device and 7777 is the port number configured on master device (“Backup Device GUI Access Port” field).

The IP address of the regular LAN port on the PBX does not need to be changed – leave it in the default value: 172.30.0.1 for the QX50/QX200/QXISDN4+ and 192.168.0.200 for the QX2000.

3.2 Configuring Second PBX

Now open the **Redundancy Settings** page on the second QX IP PBX and configure the redundancy settings as depicted on Figure 5 below. Do not be misled by the following message

on the screen: “Info: Current mode: Device is in Master mode” – at this point, since we are configuring the devices separately and they are not connected to the redundant network yet - each IP PBX assumes that it is in Master mode.

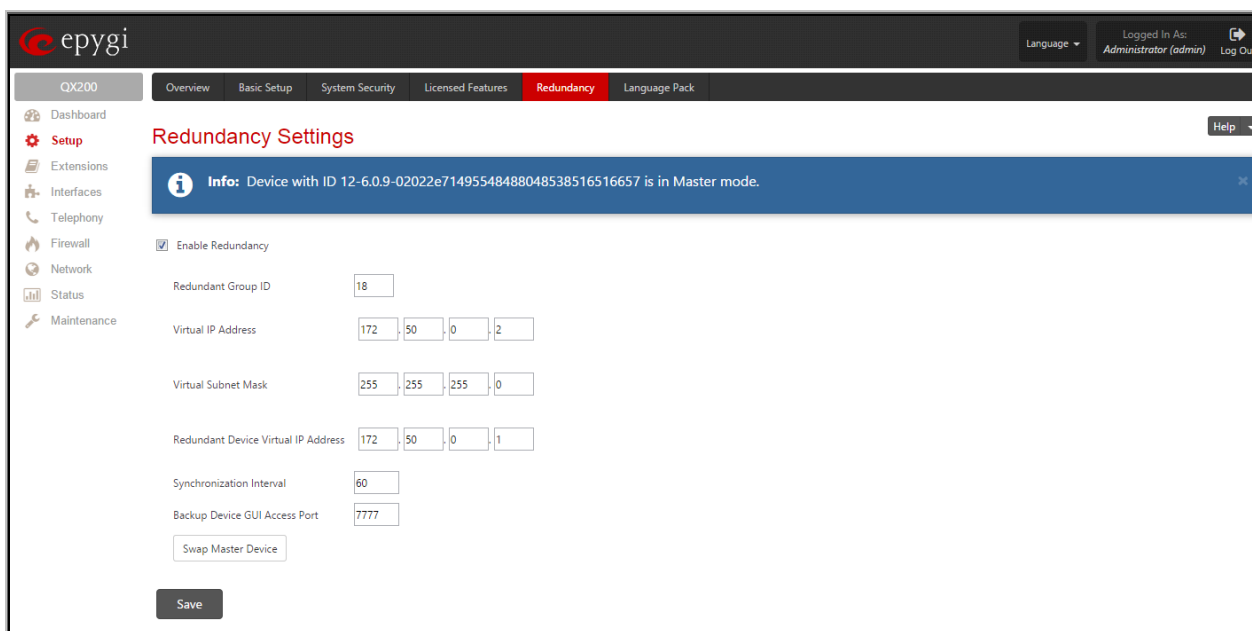


Figure 5

4 Deployment Procedure

1. Configure the redundancy settings separately on both IP PBXs as described above connecting the PC to the LAN port of each device. The default IP address of the LAN port is 172.30.0.1 for the QX50/QX200/QXISDN4+ and 192.168.0.200 for the QX2000. Install all needed license keys on both PBXs.
2. Configure the other settings as needed on the device that is assumed to be the Master. There is no need to configure those settings on the second device assumed to be the Backup because it will synchronize its settings automatically with Master as soon as you connect it to the redundant network.
3. Connect the devices as depicted on Figure 1, Figure 2 and Figure 3. Connect Ethernet ports of Epygi IP PBXs to switch using Ethernet cable.
4. Power up the device that will be running in Master mode, leaving the Backup powered off. The powered up PBX will start running in Master mode.
5. Configure all remaining settings on the first (powered) PBX including IP phones and FXO settings (available only for QX50/QX200).
6. Configure all remaining settings on the first (powered) PBX including IP phones and ISDN settings (available only for QXISDN4+).
7. Test the system to be sure that all services are working as intended. At this point the system should be fully functional – the only missing part in the system should be the Backup functionality.
8. Power up the PBX designated to be the Backup. Upon detecting that there is already a Master in its redundancy group, it will start in Backup mode. The system will generate a corresponding event.
9. See [Event Notification](#).

5 Failover to the Backup Device

If the Master PBX fails for any reason and does not send the keep-alive messages, the Backup PBX will start the failover procedure. At this point it will launch all the applications running on the failed Master PBX and restarts all the IP phones connected to the Epygi PBXs.

During the failover procedure, all active calls will be disconnected and the system will be out of service for two to five minutes (depending on the number of IP phones connected to the system). This period is needed to start running the applications and reboot the phones. The IP phones will be rebooted by the PBX at certain intervals with the default of one second. Thus, if there are many phones connected to the network it may take some time until the Epygi PBX reboots the last phone.

Please Note: If there are IP phones in the network that are not auto configured by the IP PBX (IP phones not supported by Epygi), they will not reboot automatically - you will need to manually reboot them. If an IP Phones' login name or password has been changed manually, they will not reboot automatically even though they are auto configured by the Epygi PBX. These phones will also need to be rebooted manually.

The failover is an automatic process and does not require user intervention unless there are phones that need to be rebooted manually.

After replacing the failed PBX and powering it up, it will start running in Backup mode. The system will generate a corresponding event. See [Event Notification](#).

Please Note: After failover the license keys are not transferred from the Master to Backup device therefore, the same license keys will need to be installed on both PBXs included in the redundancy group. The same with firmware and Language Pack - be sure to install the same firmware and Language Pack on both devices.

6 Accessing GUI and Checking the Status of the Backup Device

To access the GUI of a Master/Backup QX50/QX200/QXISDN4+, follow the steps below:

- To access the GUI of the Master device, enter the IP address of the Master device (LAN or WAN) or **Virtual IP address** in a browser's address field.
- To access the GUI of the Backup device, enter the IP address of the Master device (WAN) followed by **Backup Device GUI Access Port** (see Figure 5) or **Redundant Device Virtual IP address** in a browser's address field.

To access the GUI of a Master/Backup QX2000, follow the steps below:

- To access the GUI of the Master device, enter the IP address of the Master device in a browser's address field.
- To access the GUI of the Backup device, enter the IP address of the **Redundant Device Virtual IP Address** (see Figure 5) in a browser's address field.

To check the status of the Backup PBX, select the **Status -> Hardware Status** on Master PBX management interface. On the opened page you will see the status of the backup device along with its unique ID (see the example on Figure 6).

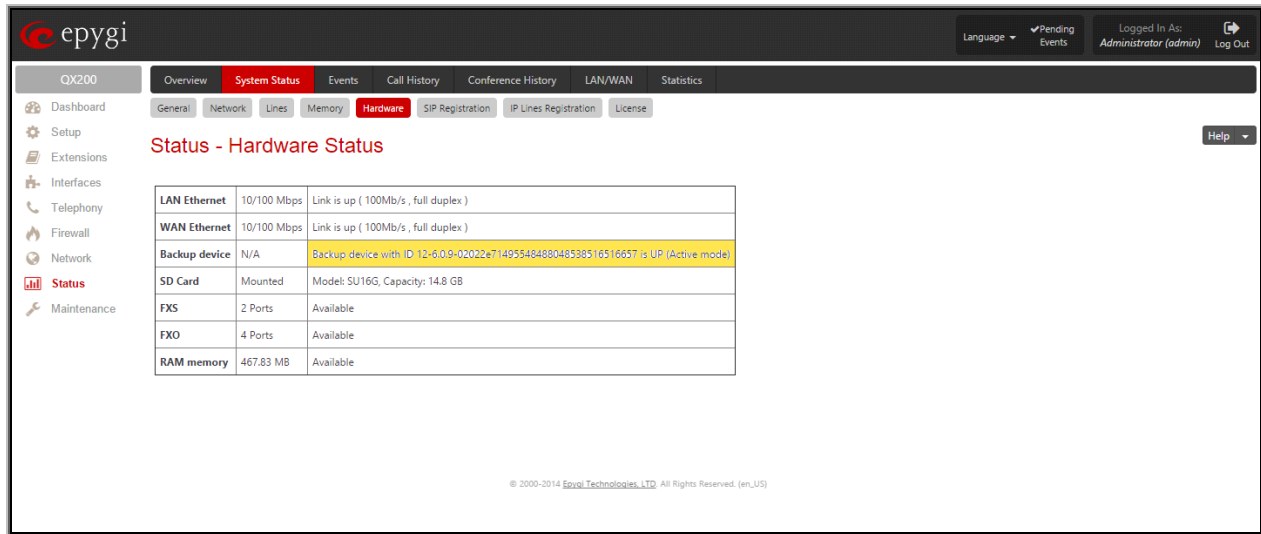


Figure 6

7 Backup Device Modes

The regular mode of the Backup device is **Active** mode. In that mode the Backup listens to keep-alive messages from the Master, synchronizes its configuration with the Master and is ready to take over the control (become the Master) if the Master fails.

For reasons discussed below in more detail, the user may wish to manually change the mode of Backup device to **Passive**. In this mode the Backup stops listening to the keep-alive messages and synchronizes its configuration with the Master. In this mode the Backup device cannot take over the control in case Master fails unless the **Swap Master Device** button is pressed on Master PBX.

To change the Backup device mode, open the **Redundancy Settings** page as described above and switch the mode in the drop-down list to **Backup Device Mode** in the configuration field and press the **Save** button (see example on Figure 7).

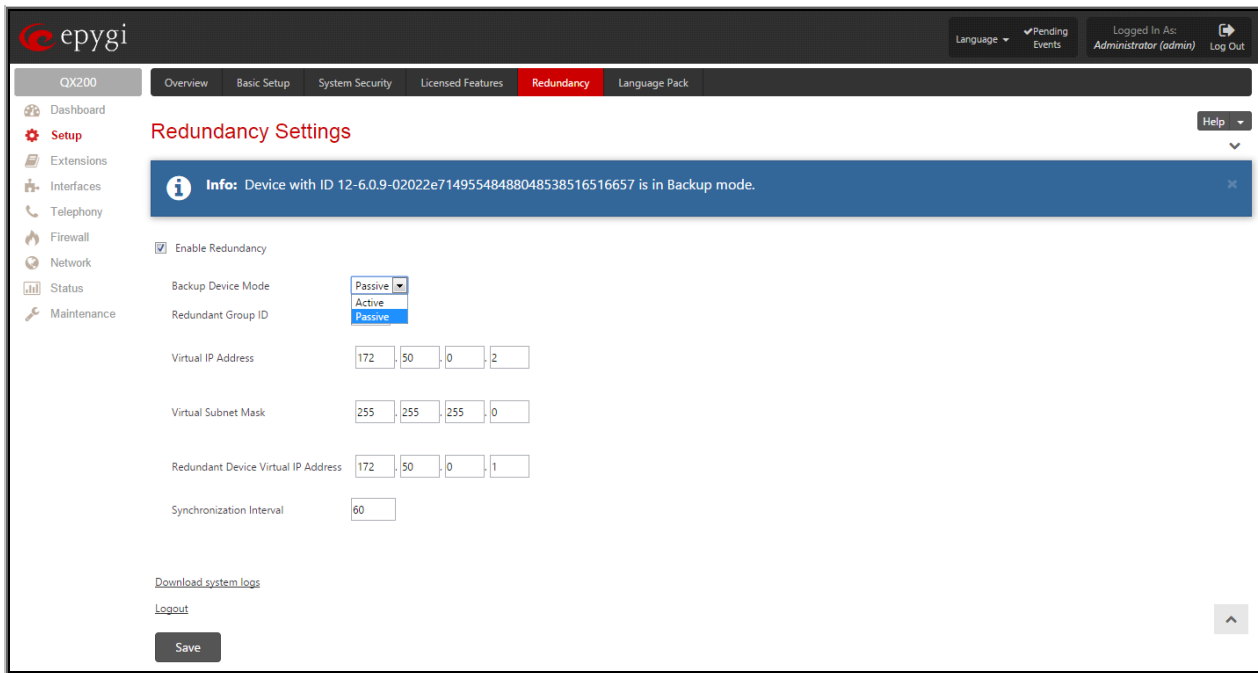


Figure 7

8 Swapping the Master and Backup

For maintenance or other reasons, there might be a need for a manual swap of functionality of the Master and Backup devices in a redundant system. To swap modes, open the **Redundancy Settings** page on the Master device and press the **Swap Master Device** button. This action will result in switching the current Backup to Master and rebooting the current Master. After rebooting the current Master, the device will begin running in Backup mode. Switching the Backup to Master starts all applications on the IP PBX and causes all IP phones to reboot. The transition of Backup to Master takes around one minute; however, another one to three minutes are required to reboot all the IP phones connected to the redundant system.

If the Backup device was in passive mode before the swap, then after the swap, the Master will start running as Backup in passive mode. Otherwise, if the IP PBX was in active mode then the Master will start running as Backup in active mode.

9 Firmware and Language Pack upgrade

The firmware upgrade procedure stops the telephony services, therefore, the upgrade process shall be carefully planned to avoid unnecessary failovers, disabling the overall functionality of the redundant system and disrupting the services. Choose the proper time for the firmware upgrade taking into account that the process will take approximately 2-5 minutes during which time the system will not be functional. Before starting the upgrade, do not forget to save the latest configuration of the Master device. You will need this backup to restore the configuration if needed.

There are several ways to upgrade the Firmware and Language Pack of a PBX in a redundant setup, however, the procedure described below is the best for all upgrades (see Figure 8).

The recommended upgrade procedure is as follows:

1. Open the **Redundancy Settings** page of the Backup device and change the mode to **Passive**. This page for the Backup device in **Passive** mode displays the **Firmware Update** and **Upload Language Pack** links.
2. To upgrade the Firmware or Language Pack, click on one of the links and start upgrading as a normal stand-alone Epygi PBX. At the end of the upgrade process, the device will reboot and start running in **Passive** mode again with the updated Firmware or Language Pack.
3. Open the **Redundancy Settings** of the Master device and press the **Swap to Master Device** button. Pressing this button will initiate the reboot of the Master PBX and switch the Backup device to Master mode. The transition of Backup to Master will take around one minute, after that the new Master will start rebooting the phones. After the reboot, the previous Master device will start running in Backup passive mode.
4. To upgrade the Firmware or Language Pack of the new Backup device (old Master), open its **Redundancy Settings** page and click on the Firmware or Language Pack upgrade link. At the end of the upgrade process, the device will reboot and start running in **Passive** mode again with the updated Firmware or Language Pack.
5. After reboot, open the **Redundancy Settings** of the new Backup PBX and switch its mode to **Active**.

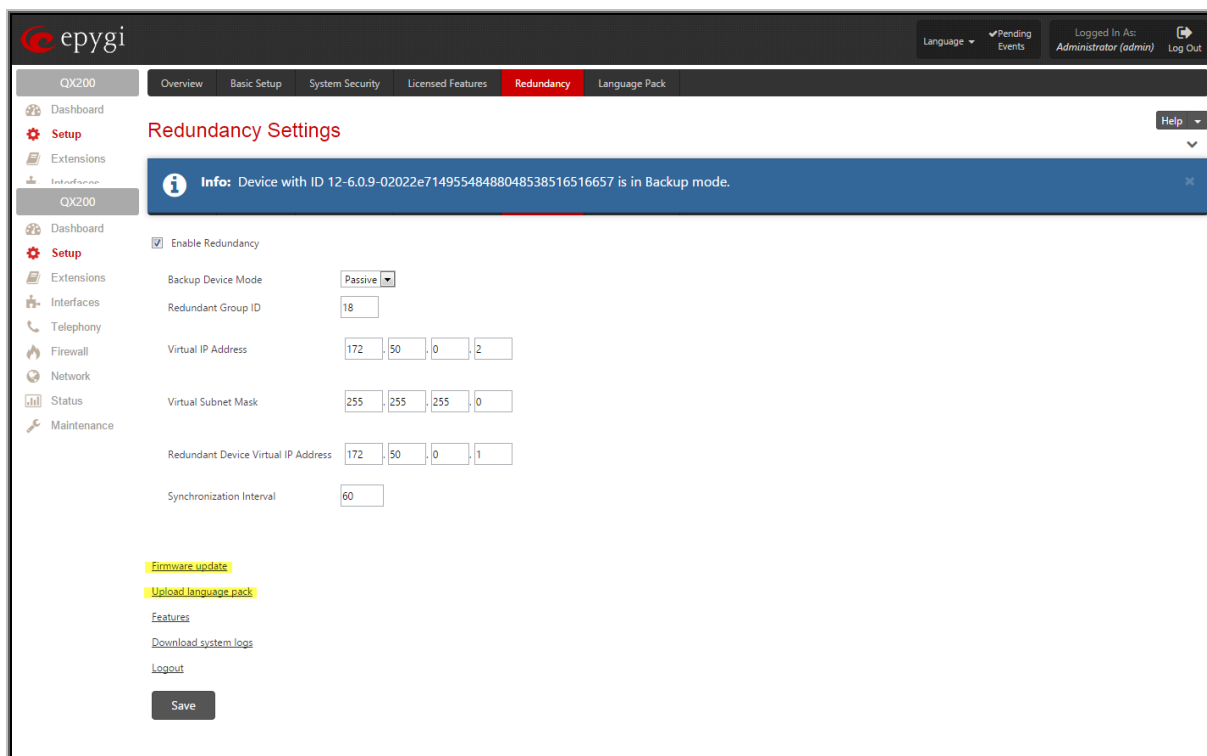


Figure 8

10 License Key Update Procedure

The software license key update procedure stops the telephony services, therefore, this process should be carefully planned to avoid unnecessary failovers, disabling the overall functionality of the redundant system and disrupting service. Choose the proper time for the license key update, taking into account that the process will take approximately two to five minutes, during which

time the system will not be functional. Before starting the license key update procedure, do not forget to save the latest configuration of the Master device. You will need this backup to restore the configuration if needed.

There are several ways to install a new license key in a redundant setup, however, the procedure described below is the best (see Figure 9).

The recommended procedure is as follows:

1. Open the **Redundancy Settings** page of the Backup device and change the mode to **Passive**. For the Backup device, this page in **Passive** mode will display the **Features** link.
2. To install a new license key, click on the **Features** link and start the installation as a normal stand-alone Epygi PBX. At the end of the installation process, the device will reboot and start running in **Passive** mode again with the updated license key.
3. Open the **Redundancy Settings** of the Master device and install the license key. At the end of the installation process, the device will reboot and start running again with the updated license key.
4. After all these steps, open the **Redundancy Settings** of the Backup device and switch its mode to **Active**.

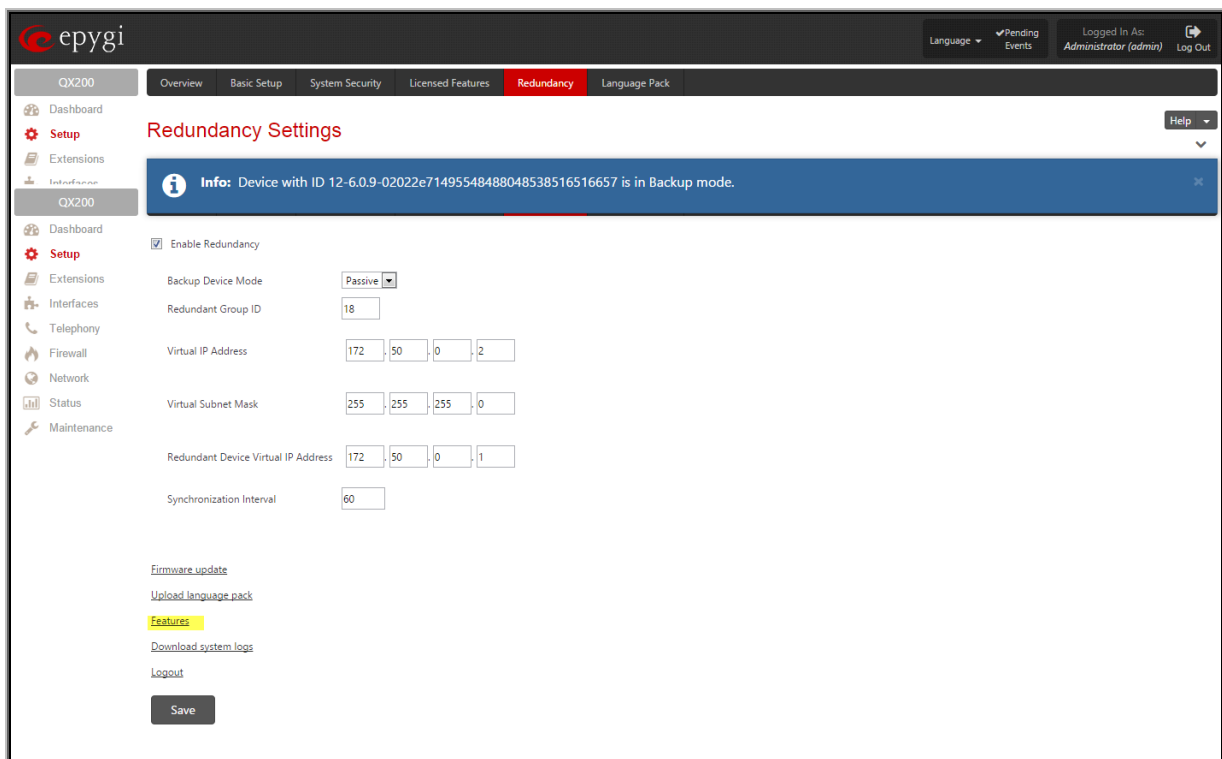


Figure 9

11 Restoring Configuration

The configuration restoring process stops the telephony services and reboots the Epygi PBX. The same takes place when changing some configuration settings on the IP PBX from the GUI (in the latter case a warning message will be displayed on the IP PBX GUI).

Therefore, this process should be carefully planned to avoid unnecessary failovers, disabling the overall functionality of the redundant system and disrupting the services. Choose an appropriate time for restoring the configuration or making configuration changes requiring a reboot. Take into account that the process will take approximately 2-5 minutes during which time the system will not be functional.

The suggested procedure to restore the configuration is as follows.

1. Open the **Redundancy Settings** page of the Backup device and change its mode to **Passive**. To access the GUI of the Backup device enter the IP address of the Master device and backup device access port in a browser's address field.
2. To restore the configuration or make configuration changes requiring reboot, go to the Master device and follow the procedure of a stand-alone device. At the end of the configuration restore process, the device will reboot and start running again as a Master with the restored configuration.
3. Go back to **Redundancy Settings** of Backup device and change its mode to **Active**.

12 Event Notification

You will get feedback of the backup device action as a notification (one or more) in the **Status->Events->System Events** GUI page and depending on the chosen settings Mail, SMS, Flash LED (Flash LED action is not available for QX2000), SNMP , Display notification will be generated (see Figure 10).

The notifications will be the following:

1. "Backup device is UP (Active mode)".
2. "Backup device is UP (Passive mode)".
3. "Backup device is DOWN".

Status	Timestamp	Priority	Application	Name	Description	Reference
New	Tue Dec 9 17:13:17 2014	2	REDUNDANCY	up passive	Backup device with ID 12-6.0.9-02022e71495548488048538516516657 is UP (Passive mode)	
New	Tue Dec 9 17:12:57 2014	3	REDUNDANCY	down	Backup device is DOWN	
New	Tue Dec 9 17:05:35 2014	2	REDUNDANCY	up passive	Backup device with ID 12-6.0.9-02022e71495548488048538516516657 is UP (Passive mode)	
New	Tue Dec 9 16:59:17 2014	1	REDUNDANCY	up active	Backup device with ID 12-6.0.9-02022e71495548488048538516516657 is UP (Active mode)	
New	Tue Dec 9 16:55:47 2014	2	REDUNDANCY	up passive	Backup device with ID 12-6.0.9-02022e71495548488048538516516657 is UP (Passive mode)	
New	Tue Dec 9 16:54:29 2014	3	MG	call quality warning	Low call quality detected	Call Statistics
New	Tue Dec 9 16:34:26 2014	1	REDUNDANCY	up active	Backup device with ID 12-6.0.9-02022e71495548488048538516516657 is UP (Active mode)	
New	Tue Dec 9 16:32:34 2014	3	SIP	ip phone registration rejected	IP phone user SIPTunnel_Tun_to_M32x [192.168.24.15:5060]: registration failed. Reason: No Such Line Configured.	IP Lines Registration Status
New	Tue Dec 9 15:34:35 2014	3	SIP	ip phone registration rejected	IP phone user SIPTunnel_Tun_to_M32x [192.168.24.15:5060]: registration failed. Reason: No Such Line Configured.	IP Lines Registration Status

Figure 10

13 References

Following documents for the corresponding software release:

- Manual II – Administrator’s Guide.

THIS DOCUMENT IS PROVIDED TO YOU FOR INFORMATIONAL PURPOSES ONLY. The information furnished in this document, believed by Epygi Technologies to be accurate as of the date of publication, is subject to change without notice. Epygi Technologies assumes no responsibility for any errors or omissions in this document and shall have no obligation to you as a result of having made this document available to you or based upon the information it contains.

Epygi is a registered trademark of Epygi Technologies, Ltd. All other products and services are the registered trademarks of their respective holders.