



## Wake on LAN and Remote Desktop using TP-link routers family

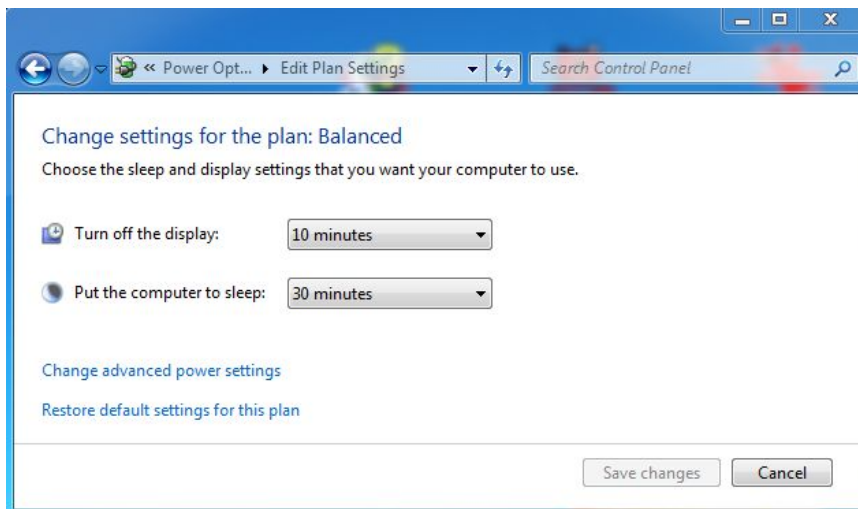
This tutorial shows the easiest way to implement WOL and RDC procedures using the TP-link routers family.

The use of a remote PC from another PC's keyboard is provided by Windows [Remote Desktop Connection](#). The characteristics of the two computers are:

- The **remote** computer is the remotely controlled PC and it is connected in LAN.
- The **client** computer may be connected to the same LAN or can use other Internet connection.

The Remote Desktop Connection running on the **client** computer works only if the **remote** computer is awakened. Sleep, hibernate or shutdown states are not supported on the remote computer.

Current computers ensure an efficient energy-saving mode via the [Control Panel / Power Options / Change plan settings / Put the computer to sleep](#) functions.



The uneconomic solution is using **Never** in [Put the computer to sleep](#) option. The remote computer is wasting energy to achieve high performances even when unneeded.

The economical solution is to use an application installed on the **client** computer from which there is sent a [Magic Packet](#) to the **remote** computer to be awakened from shutdown, sleep, hibernate.

**Note 1:** The implementation of WOL procedure depends on many factors. In this tutorial [WOL](#) designates the IBM patent and the procedure and [RDC](#) designates the Remote Desktop Connection

The [WOL](#) and [RDC](#) implementation is exemplified using the following **free** applications:

- [TeamViewer](#) → see [chapter 3](#).
- [Aquila WakeOnLan](#) → see [chapter 4](#).

Our paper is presenting also a comparative analysis between the above applications.

The configurations of the remote computer and router ([chapter 2](#).) are identical for the both applications.

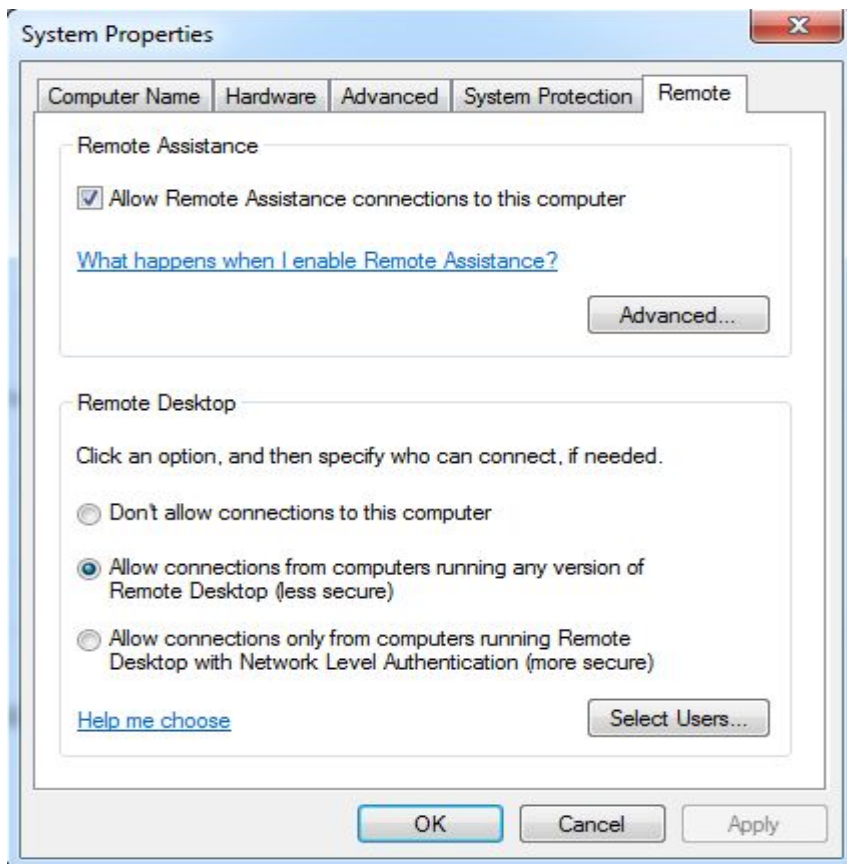
In our experiments we have used a PC Windows 7 station and a notebook Windows XP.

[WOL](#) and [RDC](#) have been in Internet verified, in alternate way on both computers.

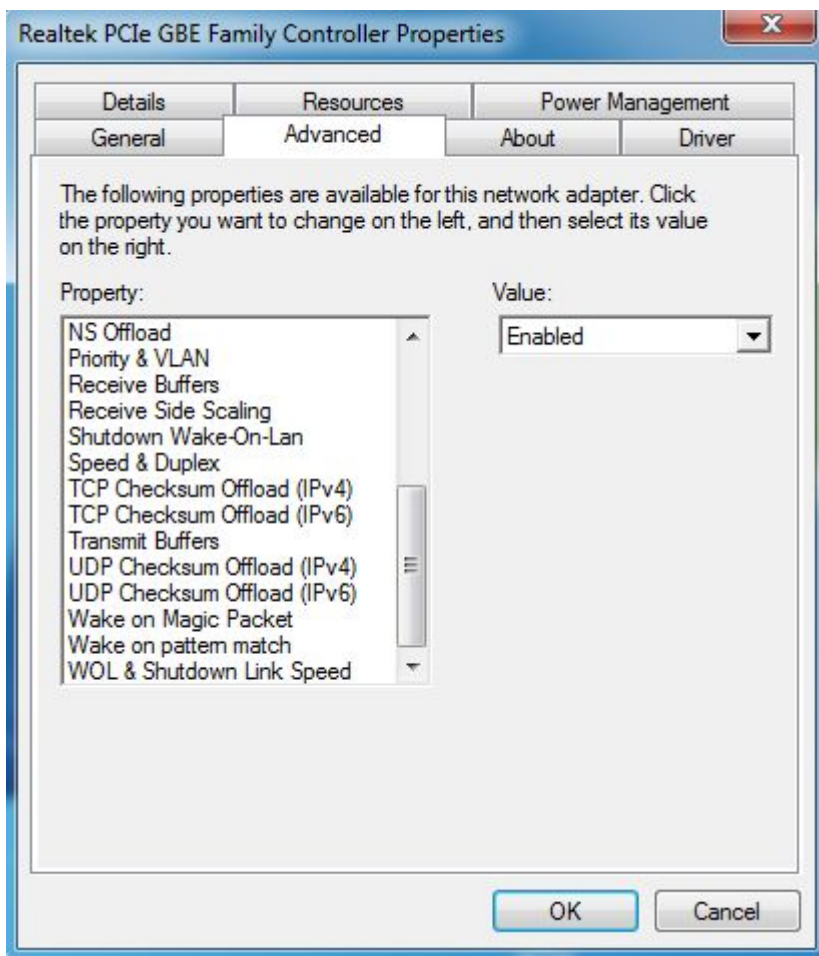
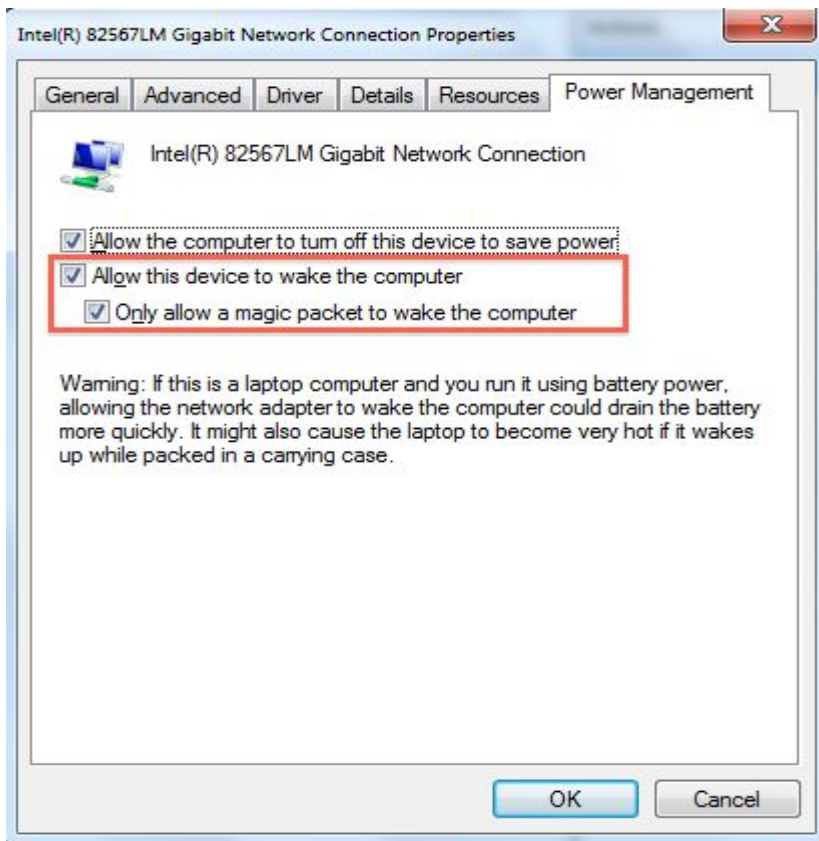
The remote computer is connected in LAN, behind the router and the client computer is Internet connected using a SIM card GPRS modem.

## 1. The WOL remote computer's configuration

For **Windows 7**, in [Control panel / System / remote settings](#) we have:

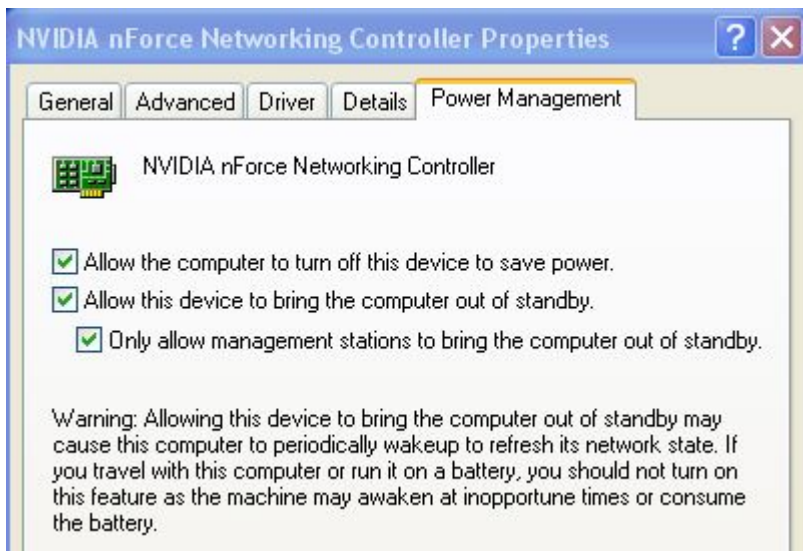
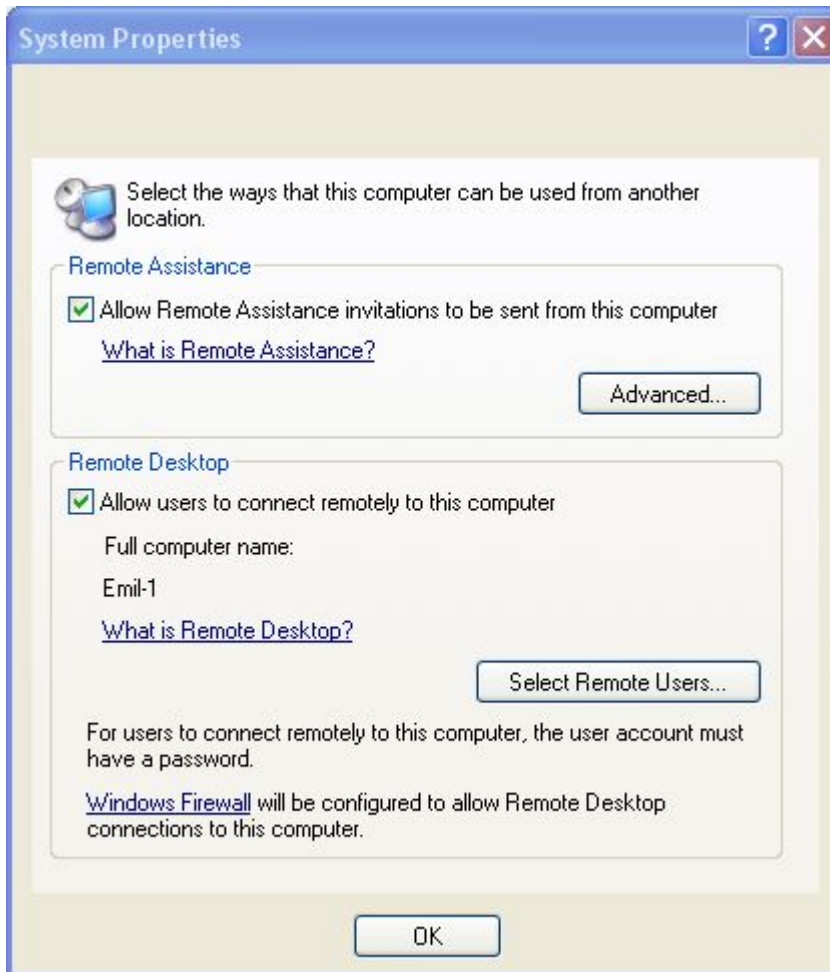


The network card is configured in [Device Manager / Network Adapter / Properties / Power Management](#).



It may be observed some features concerning WOL, Shutdown on LAN, Magic Packet. All of them must be in the Enable state.

In **Windows XP** the options are:



**Management stations** in fact refers to **Magic Packet**.

## 1.1. Configurations in Windows Firewall

In **Windows 7** there are activated the options:

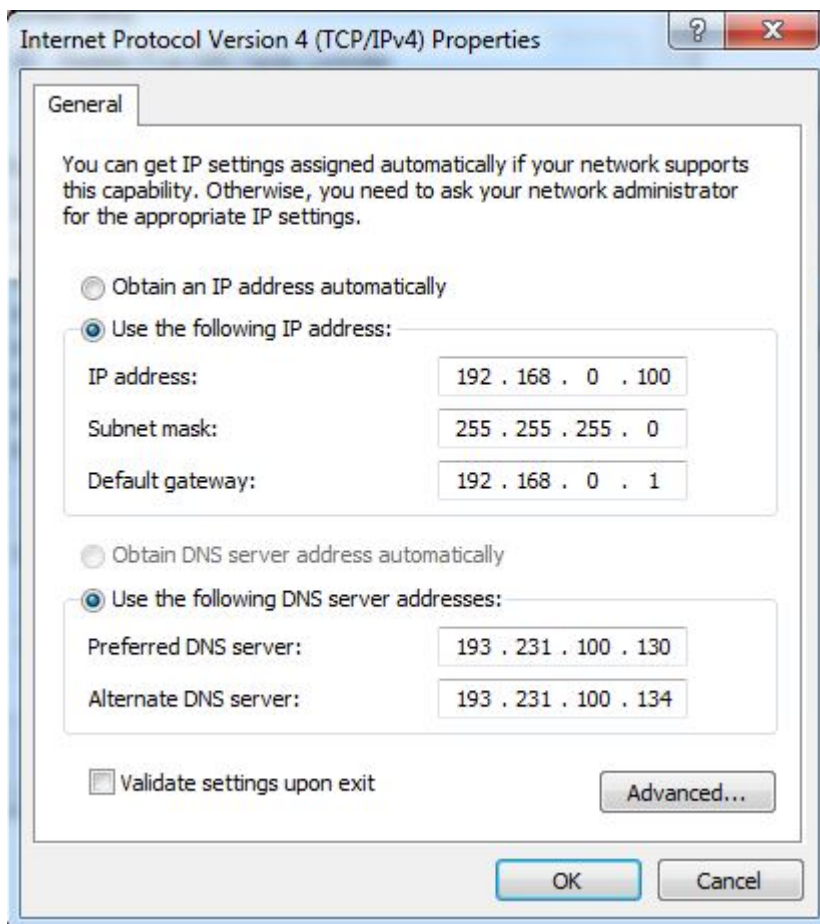
- [File and Printer Sharing](#) (Echo Request – ICMPv4-In)
- [Windows Firewall Remote Management](#) (RPC)
- [Windows Management Instrumentation](#) (WMI-In)

In **Windows XP** there are activated the options:

- [File and Printer Sharing](#)
- [UPnP Framework](#)

## 1.2. Static LAN IP addresses for the remote computers

Setup static IP addresses both for LAN cabled Ethernet and Wireless LAN.



**Nota 2:** Take into account if both connections are enable, Wireless LAN has priority !

Although [WOL](#) and [RDC](#) are properly working in Wireless LAN, **we are recommending to use cabled Ethernet LAN** and to disable the Wireless WAN.

The DNS servers are belonging to the ISP and are easy to be get.

## 2. The router's configuration

The experiments are done in the same room to closely study the functioning of both computers.

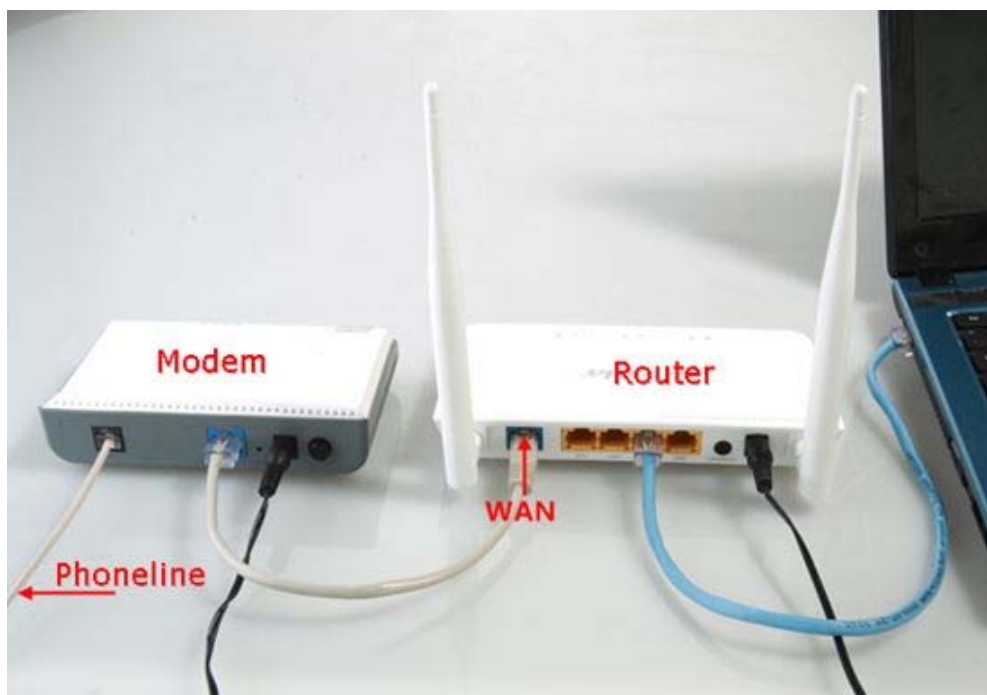
The [WOL](#) and [RDC](#) implementation require router's configurations:

- DynDNS
- Port forwarding
- WOL explicite configurations

There are many cases when the Internet ISP's devices already installed in the customers' locations do not supply at least the minimal DynDNS feature.

The solution has two steps:

- To modify these devices to the minimal bridge "dumb" modem. Disable DHCP option. This configuration is done from case to case using the installation CD or the device' web page. In some cases it is necessary to be done by the ISP on the customer's demand.
- Connect a router to this modem. You have to buy it. We are sugesting the TP-link family routers ex TL-WR841N. The price is minimal and the WOL configurations are very simple. For the ADSL ISP you need the username and password in the contract. Setup VPI/VCI to 0,35 value.



**Note 3:** In the RDS ISP case, the TP-link router is directly connected to the provider's UTP cable.

## 2.1. DynDNS name router's configuration

It is done only if the public routing WAN IP address is dynamic.

As a rule, only the companies can have public static addresses. That means the private customers have to use the DynDNS services.

In this moment there are practically remaining only two DynDNS providers:

- DynDNS ([www.dyn.com/dns](http://www.dyn.com/dns)). Since 2014 this service is to be paid.
- No-IP ([www.noip.com](http://www.noip.com)). **It is free**. One in a month you'll be receiving an email requesting to refresh your ddns name you already have. See this [link](#).

DDNS

Service Provider: No-IP ( www.noip.com ) [Go to register...](#)

User Name: office@acdcelectronic

Password: ●●●●●●●●

Domain Name: my\_ddns\_name@ddns.net

Enable DDNS

Connection Status: Succeeded!

Login Logout

Save

The web configuration TP-link page is <http://192.168.0.1/>

## 2.2. Remote Desktop Connection router's configuration

The router has access to the Internet using the WAN IP public address. The router must be configured to remotely accept the connection requests coming from the client application [Remote Desktop Connection](#) and to forward the connection to a specific computer on your LAN.

For this purpose there are defined new rules (new entries) in the routing table. The procedure is executed on the router and it is called: port forwarding, port mapping, NAT, virtual server etc.

The procedure is similar for any router and usually has two stages:

- Give a desired name to the new rule and assign a particular port to it.
- Assign this rule to a specific computer on your LAN.

**Note 4:** The procedure is very simple for the TP-link routers family. The name of the routing rule is not necessary.

It is necessary the port or the range of the incoming ports and the translation to the target port used by those computer which has the server application attached to the target port.

[Remote Desktop Connection](#) is using 3389 port.

Virtual Servers						
ID	Service Port	Internal Port	IP Address	Protocol	Status	Modify
1	7	7	192.168.0.150	UDP	Enabled	<a href="#">Modify</a> <a href="#">Delete</a>
2	3389	3389	192.168.0.150	All	Enabled	<a href="#">Modify</a> <a href="#">Delete</a>

The [IP Address](#) belongs to the remote computer.

### 2.2.1. Use Remote Desktop Connection in client computer

Open the [Remote Desktop Connection](#) application in the client computer.

In [Computer](#) write the public static router's if you have it.



If you haven't the public static router's (physical persons case), you'll write the dynamic DNS name ex [my\\_ddns\\_name.ddns.net](#) as in [chapter 2.1](#).





Add “:” followed by the **3389 port** belonging to [Remote Desktop Connection](#) application.

After pushing [Connect](#), once authorized with name and password, enter into the remote computer desktop and perform any activity.

**Note 5:** In this paper, the [Remote Desktop Connection](#) is only informal presented. Both [TeamViewer](#) and [Aquila WakeOnLan](#) are internally calling the [RDC](#) features.

## 2.3. Router’s magic WOL packet configuration

The TP-link router has explicit configuration options for WOL. The configuration is very simple.

Access [IP& MAC BINDING](#) feature in the router’s web page.

ID	MAC Address	IP Address	Bind	Modify
1	00-1B-38-4F-00-4E	192.168.0.150	<input checked="" type="checkbox"/>	<a href="#">Modify</a> <a href="#">Delete</a>
2	74-D4-35-03-8B-58	192.168.0.100	<input checked="" type="checkbox"/>	<a href="#">Modify</a> <a href="#">Delete</a>

To the computer to be wakened in LAN has to be attached its own MAC and LAN IP addresses.

Select [ARP binding](#).

The magic packet is sent on port 7 or port 9 using UDP protocol.

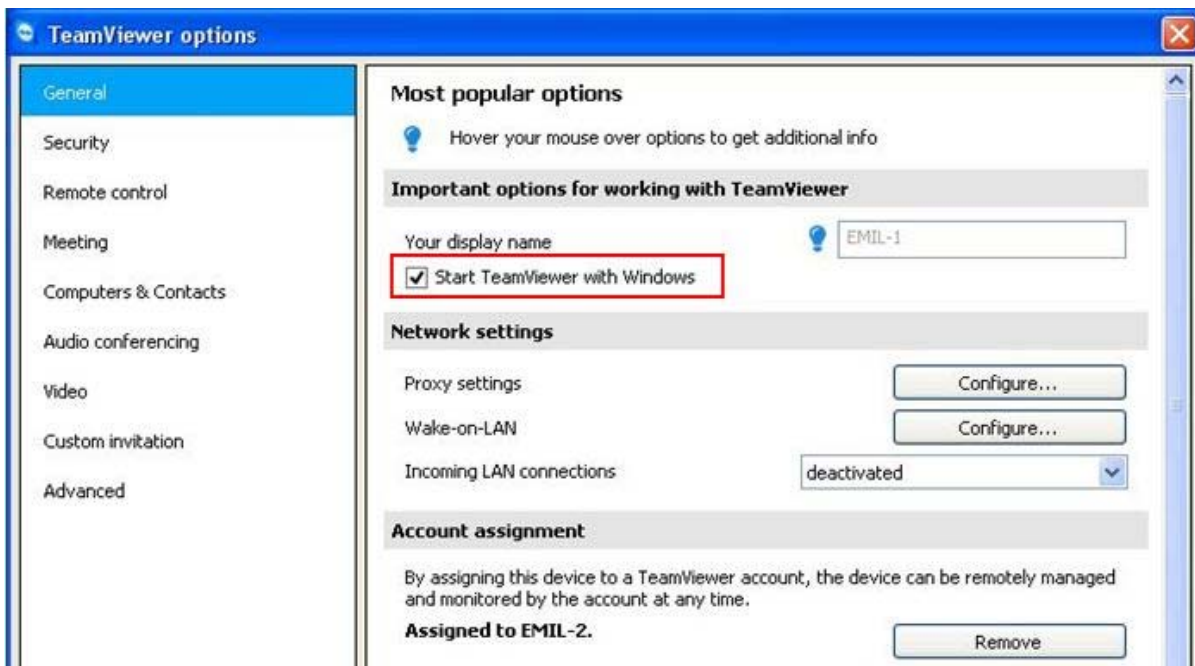
Write this new rule in the routing table.

ID	Service Port	Internal Port	IP Address	Protocol	Status	Modify
1	7	7	192.168.0.150	UDP	Enabled	<a href="#">Modify</a> <a href="#">Delete</a>
2	3389	3389	192.168.0.150	All	Enabled	<a href="#">Modify</a> <a href="#">Delete</a>

### 3. The TeamViewer's configuration in the remote computer

A [TeamViewer's](#) particularity is to be installed on both remote and client computers.

Enter in [Extras / Options / General](#) and select [Start TeamViewer with Windows](#)



Enter in [Extras / Options / Wake-on-LAN](#) → [Configure](#).

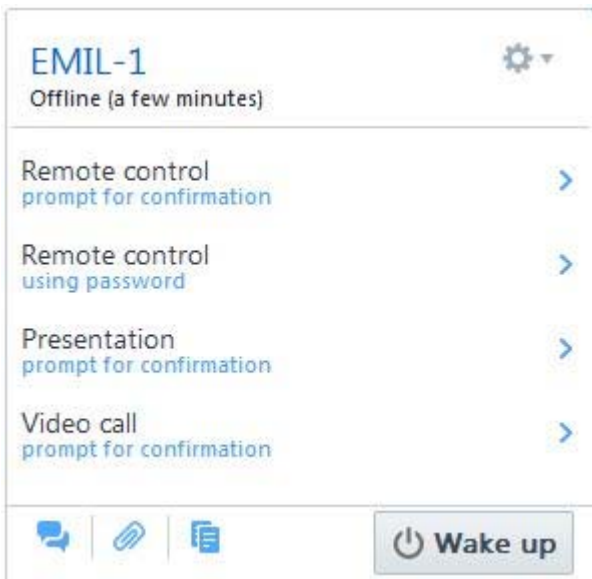


Public address is the public static WAN IP or the dynamic DNS name as described in [chapter 2.1](#).

The & UDP port is previously configured as described in [chapter 2.3](#).

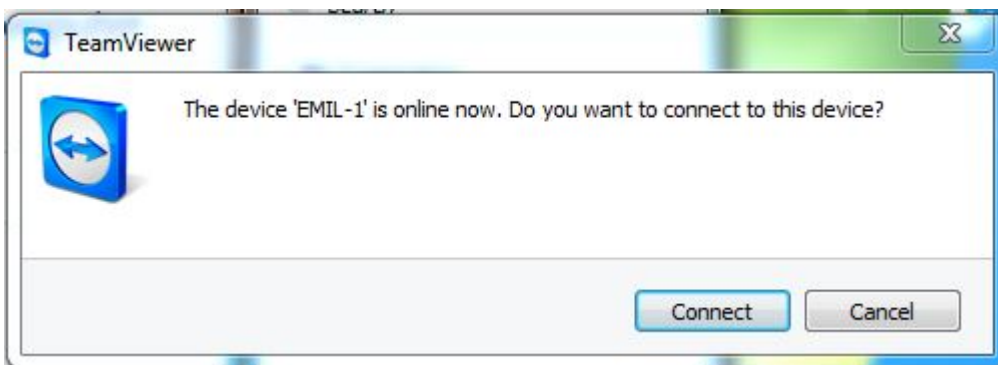
In this way, [TeamViewer](#) is launched together and in the same time with Windows OS, a crucial feature when receiving the magic [WOL](#) packet.

### 3.1. The TeamViewer's usage in the client computer



Select the offline remote computer and press the [Wake up](#) button.

After a short delay, it is automatically opened the next window:

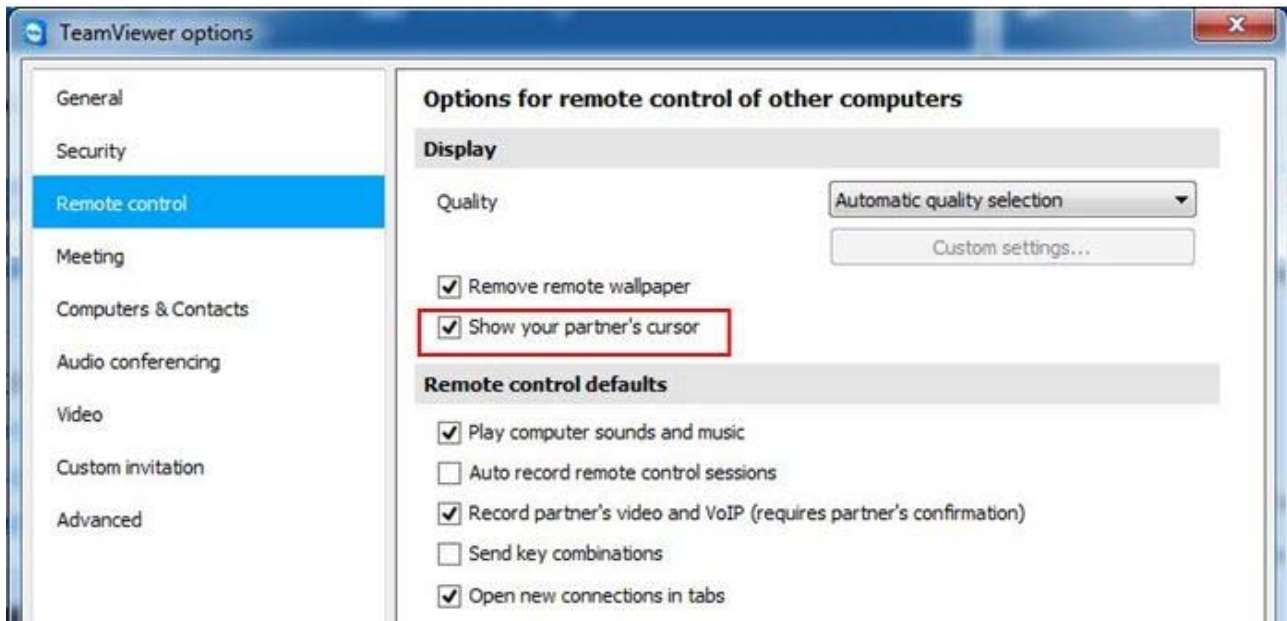


Press the [Connect](#) button, authorise yourself, enter in the remote computer's desktop and perform any activity.

### 3.2. Observations concerning TeamViewer

TeamViewer is working **excelent**.

The [Show your partner's cursor](#) feature is ensuring the colaboration of both partners.



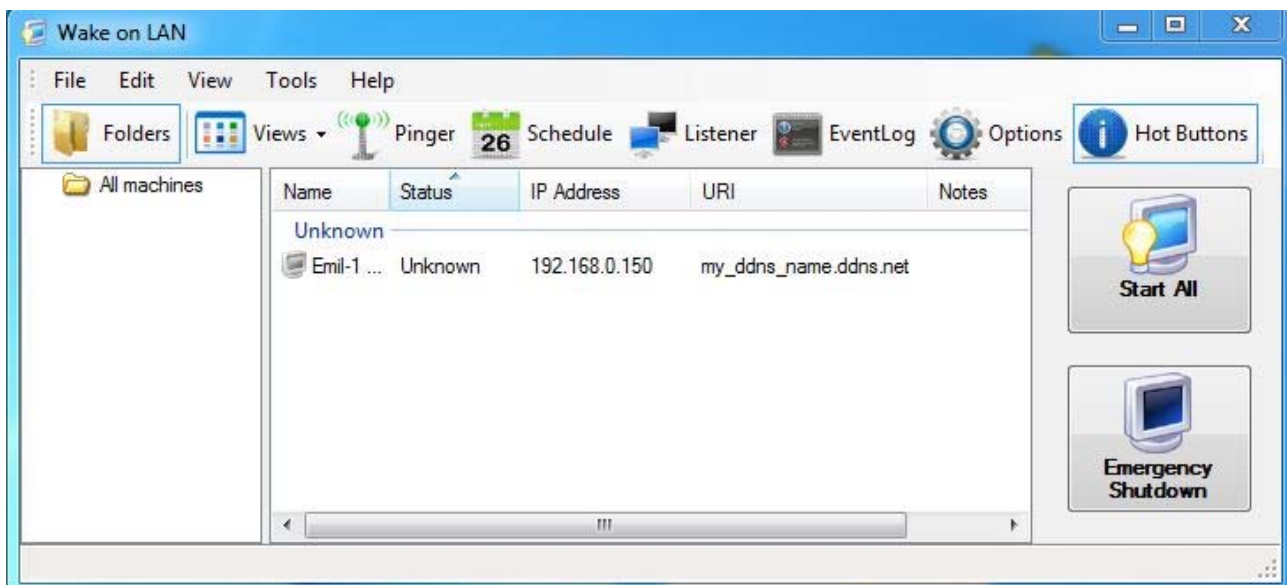
The online or offline remote computer's status it is always showed in the client computer.

TeamViewer has full access over the remote desktop, so that the remote computer's shutdown is done without any problem.

There are a lot of net exaples concernig the the remote computer may be a [smartPhone](#) or an [iPad](#) Apple.

### 4. The Aquila WakeOnLAN configuration in the client computer

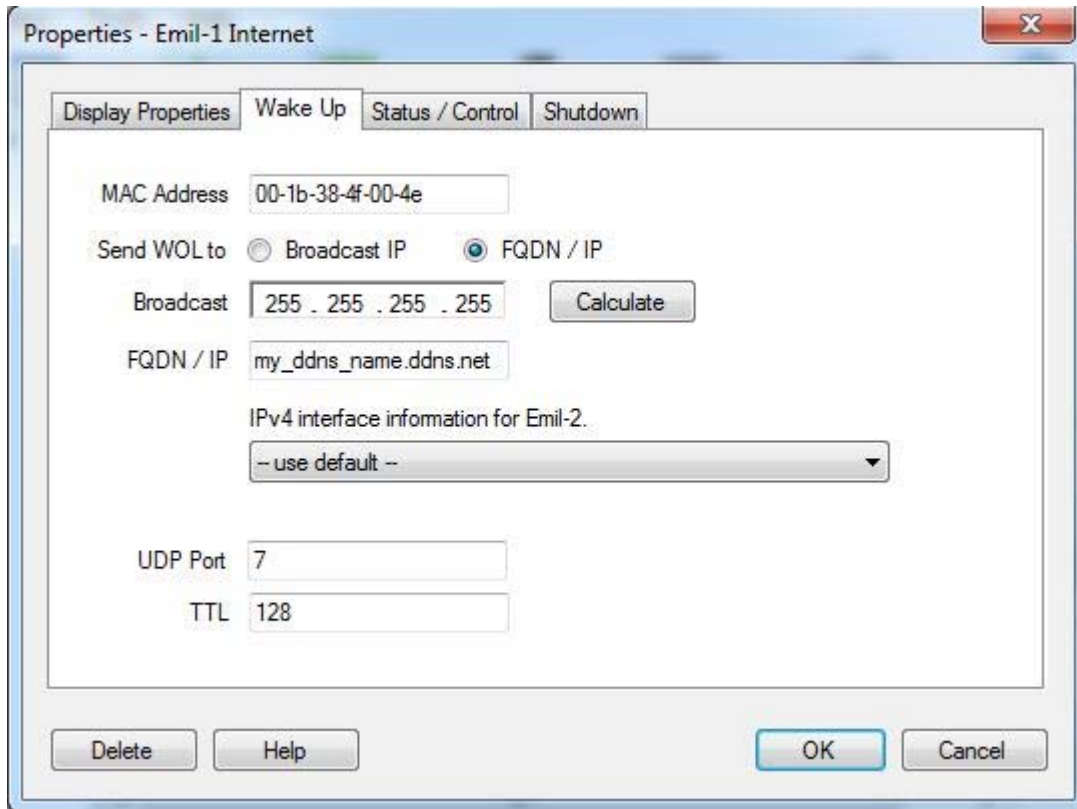
The [Aquila WakeOnLAN](#) application has to be installed only in the client computer.



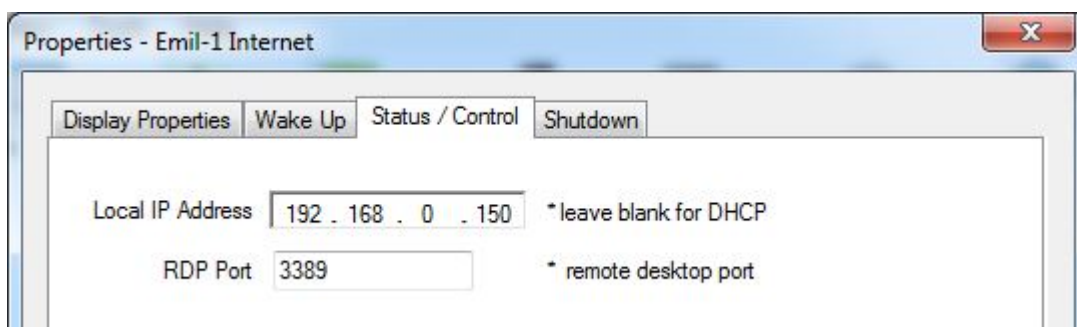
This reason might be the cause of the disadvantages comparing with [TeamViewer](#).

The remote computer configuration is done in in [File / New Host](#).

The remote computer's properties are:



- [FQDN / IP](#) is the public static router's WAN IP address or the dynamic DDNS name.
- In [Send WOL to](#) select [FQDN / IP](#). The [Broadcast IP](#) is get pushing [Calculate](#) and the value is usually 255.255.255.255
- [UDP](#) port for the magic [WOL](#) packet may be 7 or 9 as in [chapter 2.3](#).



- The [Local IP](#) address is the LAN IP of the remote computer.
- The RDP port is [3389](#) as described in [chapter 2.2](#).

## 4.1. The Aquila WakeOnLAN's usage in the client computer

Send the [Wake up](#) command from the client computer.

In case the remote computer is awakened from the shutdown, sleep or hibernate status, you have to wait 1...3 minutes before sending the [Remote Desktop](#) command.

Once authorised, enter in the remote computer's desktop and perform anything you want.

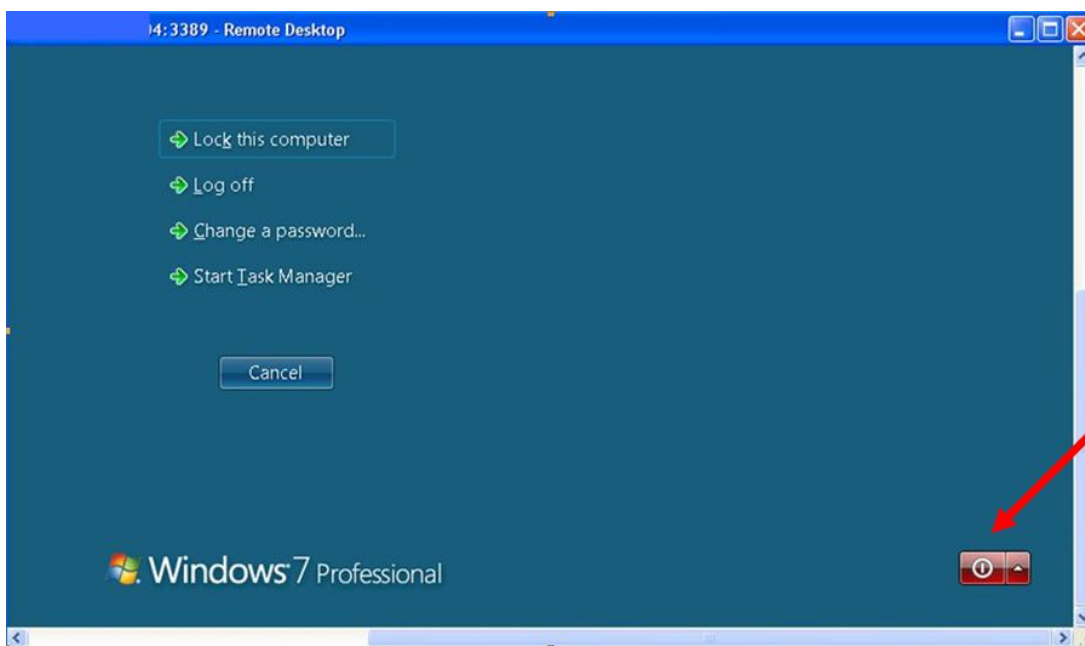
### 4.1.1. Sending Shutdown command

In our experiments, both Win XP and Win 7 computers do not execute the shutdown command.

#### 4.1.1.1. Alternate Shutdown solution

The closure of Win 7 remote computer is done in [Windows Security](#) by pressing the red button.

[Windows Security](#) is opened by **ctrl alt end** or pressing [Start](#) button.





In Win XP, **ctrl alt end** opens [Task Manager](#) which provides [Shut Down - Turn Off](#) option.

## 4.2. Observations concerning Aquila WakeOnLAN

[Aquila WakeOnLAN](#) is performing the main tasks in Internet. There are some lacks:

- The remote computer's online and offline status are unknown.
- The Shutdown command does not work. It has to be used the alternate solution presented in [chapter 4.1.1.1](#).
- We haven't experimented [iPad](#) and [smartPhone](#) devices as client computer. Some useful links might be:
  - [here](#)
  - [here](#)
  - or [here](#)

**Note 6:** From the graphical point of view, the [Aquila WakeOnLAN](#)'s advantage is a more efficient remote desktop usage comparing with [TeamViewer](#).

Both applications may be used alternatively.

## 5. WOL and RDC for several remote computers in the same LAN

For the second remote computer in the same LAN use port 9 for the magic WOL packet.

Virtual Servers						
ID	Service Port	Internal Port	IP Address	Protocol	Status	Modify
1	7	7	192.168.0.150	UDP	Enabled	<a href="#">Modify</a> <a href="#">Delete</a>
2	3389	3389	192.168.0.150	All	Enabled	<a href="#">Modify</a> <a href="#">Delete</a>
3	9	9	192.168.0.100	UDP	Enabled	<a href="#">Modify</a> <a href="#">Delete</a>
4	3390	3389	192.168.0.100	All	Enabled	<a href="#">Modify</a> <a href="#">Delete</a>

For the second remote computer use port 3390 for Remote Desktop Connection.

Virtual Servers						
ID	Service Port	Internal Port	IP Address	Protocol	Status	Modify
1	7	7	192.168.0.150	UDP	Enabled	<a href="#">Modify</a> <a href="#">Delete</a>
2	3389	3389	192.168.0.150	All	Enabled	<a href="#">Modify</a> <a href="#">Delete</a>
3	9	9	192.168.0.100	UDP	Enabled	<a href="#">Modify</a> <a href="#">Delete</a>
4	3390	3389	192.168.0.100	All	Enabled	<a href="#">Modify</a> <a href="#">Delete</a>

**Note 7:** The routing table cannot use several incoming ports (service port) having the same value.

The target ports (internal port) may have the same value because they belong to different computers.

As a result, in case there are several computers accessed by RDC, in the routing table are defined different ports (ex 3390, 3391 etc) which are translated to the 3389 computer's port.

[Remote Desktop Connection](#) is not limited concerning the used service ports number.

**Note 8:** At the first view, the max two remote computers limit is caused by the lack of other UDP ports (7 and 9) to supply the magic WOL packet. We have experimented the UDP ports 8, 10, 11 and so on. **They are working !**

In other words, the number of computers in the same LAN receiving the WOL magic packet is unlimited !



## 6. The remote control of Dispatcher server PC

WakeOnLAN and Remote Desktop Connection are very good solutions in applications with multitasking programable [Mini PLC440x](#) and [Dispatcher server PC](#).

Dispatcher server PC is using port 50000.

Forward port 50000. The routing table is as follows.

Virtual Servers						
ID	Service Port	Internal Port	IP Address	Protocol	Status	Modify
1	7	7	192.168.0.150	UDP	Enabled	<a href="#">Modify</a> <a href="#">Delete</a>
2	3389	3389	192.168.0.150	All	Enabled	<a href="#">Modify</a> <a href="#">Delete</a>
3	9	9	192.168.0.100	UDP	Enabled	<a href="#">Modify</a> <a href="#">Delete</a>
4	3390	3389	192.168.0.100	All	Enabled	<a href="#">Modify</a> <a href="#">Delete</a>
5	50000	50000	192.168.0.100	All	Enabled	<a href="#">Modify</a> <a href="#">Delete</a>

**The Dispatcher server PC station and PLC440x clients have some particularities.**

The PLC440x clients periodically send [the request](#) for the establishment of Internet client-server connection.

The user send commands to the PLC440x clients using GUI Dispatcher server PC keyboard. The commands are changing the activities that PLC440x execute in the future, independently of the connection with Dispatcher server PC.

In most applications, Dispatcher server PC isn't standing open all the time, it is used only when the user submit new commands. From here comes important energy savings.

**Modes of work [Shutdown](#), [Sleep](#), [Hibernate](#) are perturbed in Dispatcher server PC station.**

On the one hand, when it is opened, the Dispatcher server PC application forbids its own computer to go in Sleep mode. This **is normal**, the user decided Dispatcher server PC to be in stand-by when running a server application.

On the other side, when Dispatcher server PC application is closed, its own computer is periodically awakened by PLC440x connection requests which are received by network card.

To eliminate this **troublesome disturbance**, the user select [Only allow a magic packet to wake the computer](#) in Device Manager / Network Adapter / Properties / Power Management, see [chapter 1](#).

At the user's command, [Magic packet](#) wake up the computer where Dispatcher server PC is installed. An that is done from big distance, via Internet!

The next step is the Remote Desktop Connection from your PC, notebook, iPad, iPhone at home or anywhere.

Open Dispatcher server PC, wait 10...15 seconds to establish Internet connection with the PLC440x client and submit any commands.