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# How to connect TINI servers to the Internet

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## 1 Introduction

This document explains how to connect TINI to an Internet Service Provider (ISP).

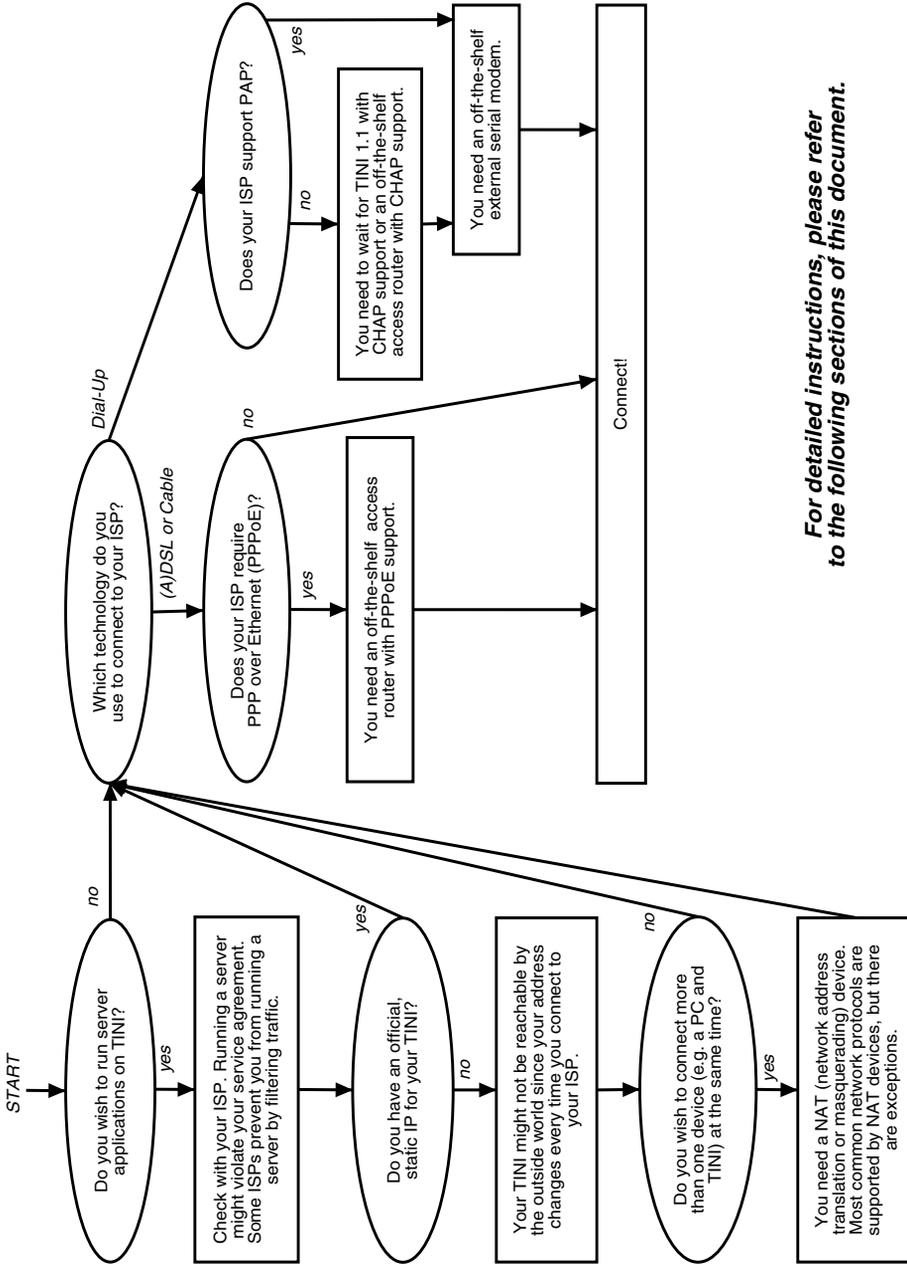
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## 2 Overview

The following diagram is an overview of all the steps you have to take. These steps will be explained in full detail in the following paragraphs.

# How to connect TINI servers to the Internet

## How to connect TINI to your ISP



**For detailed instructions, please refer to the following sections of this document.**

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## 3 TINI as a Server

There's a difference between connecting to the Internet uploading data and a full capability server. Offering services to the Internet, i.e. running server applications on TINI requires additional considerations outlined below (e.g. running a temperature monitor on TINI which is periodically polled from a remote site connected via the Internet). If you just push (upload) data to the Internet, you don't have to run a full capability server and this discussion does not apply to you – please continue with “Technology to Connect” on page 4.

### 3.1 ISP Service Agreement

Some ISP service agreements do not allow running servers for economic reasons. Running a high capacity file server, for example, would generate too much network traffic and invalidate the ISP's pricing model designed for an individual surfing the web – the ISP would prevent such a file server using a network filter. In contrast, TINI won't be generating much traffic. However, it is still a good idea to check with your ISP.

### 3.2 Static IP Address

The next hurdle to running servers on TINI is the IP address. In order for other machines to be able to reach TINI, TINI must have a static IP address (most ISPs offer static IPs as an extra). If you don't have a static IP for TINI, chances are the IP changes every time you connect to the ISP (dynamic IP). There are some services where this does not matter (protocols where TINI posts/uploads its IP address every time an ISP connection is established), but for many services (e.g. running a web server) a static IP address is important.

In an environment running IPv6 (supported by TINI), there is no shortage of IP addresses and dynamic IPs are not an issue. However, IPv6 has not yet been adopted by all ISPs.

### 3.3 Address Sharing and NAT

Again, the following discussion does not apply to IPv6 where there is an abundance of addresses. Under IPv4, official routed IP addresses are scarce and precious. IP allocation is therefore restricted and limited by the ISPs.

Having only one official routed IP address (static or dynamic) will make it more difficult if you wish to connect multiple devices to your ISP at the same time (e.g. TINI *and* a personal computer). Since both have to share one IP address, special software or hardware needs to be installed that dynamically remembers connections as they are made and redirects the return packets to the correct device.

This software or hardware performs a function known as NAT (network address translation). Under Linux, you would install masquerading. Under Windows, you can find it under the name “Internet Connection Sharing”. Note that not all servers and protocols will function over NAT. NAT does support common protocols like HTTP, FTP or SMTP (web, file transfer and email). However, NAT usually does not support user defined protocols or new protocols based on UDP. For simple servers like a web server on TINI, you can use port forwarding (i.e. configure the NAT so that all incoming connection requests to port 80 are directed to TINI).

Unfortunately, there is no generic configuration procedure and you will have to check the documentation of your specific NAT hardware or software. We include instructions on how to configure NAT and port forwarding on the *D-LinkAir DI-713P IEEE 802.11b Compliant Wireless Gateway and Print Server* in Appendix A. Certainly, other hardware and software can also be used; please consult the manufacturer’s documentation for configuration details.

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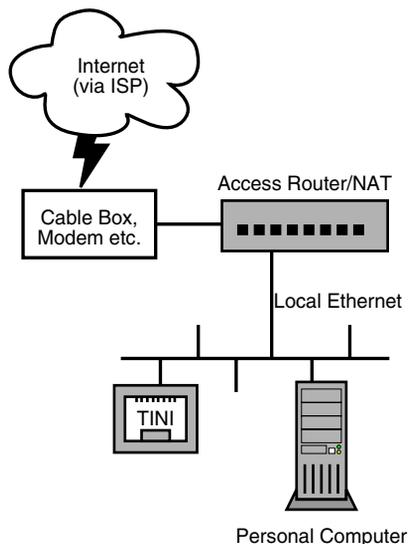
## 4 Technology to Connect

The TINI<sub>m390/400</sub> evaluation module includes serial interfaces and a 10 MBit<sup>1</sup> Ethernet interface. For dial-up access, you can connect a modem directly to TINI’s serial port or to an access router (which in turn can be connected to the TINI’s Ethernet interface). For broadband (A)DSL or cable service, you would connect the access router to TINI’s Ethernet interface.

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1. 10/100 MBit on the TINI<sub>m400</sub>

The following picture shows a typical network topology with an ISP connection, an access router, a TINI and a personal computer:



### 4.1 (A)DSL and Cable

Some providers require the PPP over Ethernet (PPPoE) protocol. As a result, you have to install special drivers on your personal computer. Since these drivers are not available for TINI, you cannot directly connect TINI to these providers. Instead, you should obtain an access router that supports PPPoE. TINI can then use standard Ethernet protocols – the access router encapsulates all packets and forwards them to the ISP. The *D-LinkAir DI-713P* mentioned above supports PPPoE, for example.

### 4.2 Dial-Up Modem (56K Service) or Wireless Modem (Ricochet technology or equivalent)

In principle, TINI can connect to all of these services. However, some ISPs have special requirements for the authentication process and do not accept all common authentication protocols. A nationwide ISP might have different authentication requirements at different locations! You need to find out whether your ISP requires the use of CHAP or if the ISP supports PAP. Unfortunately, CHAP will only be sup-

ported in TINI 1.1. Please bear with us! If you can use PAP, the following sections describe the configuration on more detail. If you cannot use PAP, you need to obtain an access router that supports CHAP (e.g. the aforementioned *D-LinkAir DI-713P*).

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## 5 Configuring PPP on TINI

Using PPP, TINI has the ability to perform dial-up networking using a standard modem and an ISP dial-up account. TINI PPP supports static or dynamic dial-up addressing and authentication using the PAP protocol. PPP on TINI runs as a user process and can be included within a user application or run separately from the slush shell. Adding PPP functionality to your application does not require a separate PPP process, allowing PPP to be part of an application that runs from flash memory. A PPP example implemented as a slush command is included with the TINI firmware distribution. The slush command example includes code for both PPP client and PPP server. A stand-alone PPP client application (*PPPClient*) is available from the Dallas ftp site at <ftp://ftp.da.lsemi.com/pub/tini/examples/ppp/>; *PPPClient* is the example referenced in this document. Please feel free to modify and enhance *PPPClient* to suit your needs.

*PPPClient* implements a simple PPP client that is started from a slush prompt. The application takes four command line parameters: serial port number, username, password and ISP phone number. The serial port number will depend on the ports available on your TINI hardware setup. The username, password and phone number were given to you when you signed up for dial-up Internet service. Using the information above, the PPP client command line would appear as:

```
java pppClient.tini 1 myusername mypassword 55598761234
```

When a PPP connection has been established, a PPP network interface will be added to the network interface list and the status of the PPP connection can be examined using the slush command `ipconfig` with the `-x` (list all interfaces) option:

```
TINI/> ipconfig -x
Interface 0 is active.
Name       : eth0 (default)
Type      : Ethernet
IP Address : 10.12.0.100
Subnet Mask : 255.0.0.0
Gateway   : 0.0.0.0
```

## Configuring PPP on TINI

Interface 1 is active.

Name : lo  
Type : Local Loopback  
IP Address : 127.0.0.1  
Subnet Mask : 255.0.0.0  
Gateway : 0.0.0.0

Interface 2 is active.

Name : ppp0  
Type : Point-to-Point Protocol  
IP Address : 192.168.1.2  
Subnet Mask : 255.255.255.0  
Gateway : 0.0.0.0

Interface 3 is not active.

## Appendix A How to Configure the D-LinkAir DI-713P

**All Protocols.** First, make sure both your TINI and the D-LinkAir have the latest firmware. We've tested only this combination and earlier D-LinkAir firmware revisions do not support all of the features described below. Also, the following tips assume the default configuration on the gateway (DHCP enabled and no access control). Please also understand that this is not the only possible configuration, but probably the easiest since it uses DHCP on TINI.

- Configure TINI to use DHCP (execute the slash command `ipconfig -d`). Wait for TINI to report the successful address lease. Then use the command `ipconfig -x` to display the IP address and write it down.
- The next step ensures that TINI will always get the same IP address: In the D-LinkAir setup, click on “DHCP” and then “Fixed Mapping”. Use the “Copy to” button at the end of the list to copy TINI’s MAC ID (physical layer address) into the “MAC Address” field. Set the “IP Address” to the address you wrote down above. Check both the “C” and “A” boxes. Save your changes.

The screenshot shows the configuration page for a D-Link DI-713P Wireless Gateway. The page title is "D-Link Wireless Gateway DI-713P". The main content area is divided into two sections: "MAC Address Control" and a table for "DHCP clients".

**MAC Address Control Section:**

- MAC Address Control:**  Enable
- Connection control:**  Wireless and wired clients with C checked can connect to this device; and unspecified MAC addresses to connect. (deny)
- Association control:**  Wireless clients with A checked can associate to the wireless LAN; and unspecified MAC addresses to associate. (deny)

**DHCP clients Table:**

ID	MAC Address	IP Address	C	A
1	00-05-5D-F1-07-21	192.168.0.112	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
2	00-60-35-00-90-E4 ← TINI	192.168.0.113 ←	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
3	00-05-5D-F1-07-22	192.168.0.114	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
4		192.168.0.	<input type="checkbox"/>	<input type="checkbox"/>

Below the table, there is a "DHCP clients" dropdown menu with "-- select one --" selected. To its right is a "Copy to" button and an "ID" dropdown menu with "2" selected. A red arrow points to the "Copy to" button. Below the dropdown menu, a tooltip shows the selected entry: "00-05-5D-F1-07-21 : 192.168.0.112 (VAIO)".

At the bottom of the page, there are navigation links: "Previous page", "Next page", "Save", "Undo", "Help", "Information", "Tools", "Setup", "DHCP", "Wireless", "Advanced", and "Log out".

**Generic UDP (or UDP and TCP) based Servers.** If you want to run generic UDP (or UDP and TCP) based servers on TINI, you need to do the following:

- Click on “Advanced” and then “Misc. Items.”. Set “IP Address of DMZ Host” to TINI’s IP address you’ve written down above. Click on “Enable”. Save your changes.

Miscellaneous Items			
IP Address of DMZ Host	192.168.0.113	← TINI's IP	<input checked="" type="checkbox"/> Enable
Remote Administrator Host	0.0.0.0		<input type="checkbox"/> Enable
Non-standard FTP port	0		
Discard PING from WAN side			<input type="checkbox"/> Enable

Save Undo Help

## How to connect TINI servers to the Internet

**TCP based Servers only.** If you only want TCP based servers on TINI, do the following:

- Click on “Advanced” and then “Virtual Server”. Set the “service port” to the port of the server running on TINI, e.g. 80 for a web server. Set the “Server IP” to TINI’s IP address you’ve written down above. Click on “Enable”. Save your changes.

ID	Service Port	Server IP	Enabled
10		192.168.0.	<input type="checkbox"/>
11	80	192.168.0.113 ← TINI	<input checked="" type="checkbox"/>
12		192.168.0.	<input type="checkbox"/>
13		192.168.0.	<input type="checkbox"/>
14		192.168.0.	<input type="checkbox"/>
15		192.168.0.	<input type="checkbox"/>
16		192.168.0.	<input type="checkbox"/>
17		192.168.0.	<input type="checkbox"/>
18		192.168.0.	<input type="checkbox"/>
19		192.168.0.	<input type="checkbox"/>
20		192.168.0.	<input type="checkbox"/>

Well known services -- select one -- Copy to ID --

Save Undo Help

[Virtual Server](#) [Special AP](#) [Access Control](#) [Misc Items](#) [Wireless](#) [Basic](#) [Log out](#)

**Outgoing UDP Services.** If you have a UDP protocol where TINI always sends a packet first and expects a response, you can either use the “DMZ Host” method described above or the following:

- Click on “Advanced” and then “Special AP”. Assuming TINI sends out UDP packets on port 8001 and expects a response on port 8001, set both “Trigger” and “Incoming Ports” to 8001. Check “Enable”. Save your changes.

**D-Link** Wireless Gateway **DI-713P**

**Special Applications**

ID	Trigger	Incoming Ports	Enable
1	8001	8001	<input checked="" type="checkbox"/>
2			<input type="checkbox"/>
3			<input type="checkbox"/>
4			<input type="checkbox"/>

Popular applications -- select one -- Copy to ID --

Save Undo Help

[Virtual Server](#) [Special AP](#) [Access Control](#) [Misc Items](#) [Wireless](#) [Basic](#) [Log out](#)

Don't forget to reboot the gateway after applying the new settings!

**Security Issues.** In addition to these settings, you might also want to tighten the security on your wireless gateway (please consult the manufacturer's documentation for details):

- Enable 128bit encryption
- Define MAC level access control
- Define access control

Remember that even with encryption, due to shortcomings in the encryption protocol, an eavesdropper can sniff and decode all your network traffic.