Remote Bridging with IP Tunnels mini–HOWTO

Alexander Alekseev

alex@zapad.msk.ru

v1.0, May 12, 2002

Revision History

Revision 1.0	2002–05–12	Revised by: aa
first release		

This document describes how to unite two separate ethernet LANs with an IP tunnel between them.

Table of Contents

1. How does it work?....1
1.1. Bridging IP over ethernet traffic between 2 LANs....1
1.2. What about other protocols?....3

2. Copyright....4
2.1. GNU Free Documentation License....4
2.2. PREAMBLE....4
2.3. APPLICABILITY AND DEFINITIONS....4
2.4. VERBATIM COPYING....5
2.5. COPYING IN QUANTITY....5
2.6. MODIFICATIONS....6
2.7. COMBINING DOCUMENTS....7
2.8. COLLECTIONS OF DOCUMENTS....8
2.9. AGGREGATION WITH INDEPENDENT WORKS....8
2.10. TRANSLATION....8
2.11. TERMINATION....8
2.12. FUTURE REVISIONS OF THIS LICENSE....9
2.13. How to use this License for your documents....9

1. How does it work?

You can transparently bridge traffic between 2 ethernet LANs to unite them, if both of them are connected to Internet.

There is no way to do a "real" bridge, you can only bridge third level protocols, which linux knows how to route, but ethernet traffic with those protocols will seem bridged. You can make 2 ethernet bridges, to bridge IP and/or IPX traffic. You cannot transparently bridge any other third level protocols between distinct LANs. You should read the rest of this document to determine whether you can bridge any other protocol.

1.1. Bridging IP over ethernet traffic between 2 LANs.

If you have:

```
PC1   (192.168.0.1  /24)--|
PC3   (192.168.0.3  /24)--|
PC5   (192.168.0.5  /24)--|--[ eth0 - bridge_1 - eth1 (195.0.0.1) ]

PC253 (192.168.0.253/24)--|
                                          | (192.168.0.2  /24) PC2
                                          | (192.168.0.4  /24) PC4
[ (192.0.0.1) eth1 - bridge_2 - eth0 ] --| (192.168.0.6  /24) PC6

                                          | (192.168.0.254/24) PC254
```

bridge_1 and *bridge_2* are your Linux bridges and externally connected to the Internet interface eth1. So **`195.0.0.1`** and **`192.0.0.1`** can be any valid Internet addresses given to you by your ISP.

So, you should:

1. Get two linux computers with kernels 2.2 or 2.4. Kernels should be compiled with PPP and Advanced Router. You also need the iproute2 package properly installed. Information on iproute2 can be found in `Configure.help` of your kernel in the comments under Advanced Router. You also need the following utilities:

   - pppd (PPP daemon) – ftp://cs.anu.edu.au/pub/software/ppp/
   - PopTop (PPTP server) – http://poptop.lineo.com
   - PPTP (Linux PPTP Client, by C.S. Ananian) – http://www.pdos.lcs.mit.edu/~cananian/Projects/PPTP/
   - tarpd (a trivial proxy arp daemon) – htp://www.cs.hut.fi/~tricky/utils/net/tarpd–1.6.tar.gz

   You can also find them on http://www.freshmeat.net

   Please, keep in mind that you need special patches for pppd and the kernel if you want to do MS Chap and MS Encryption (MPPE). Refer to the PoPTop manual for instructions on how to get and install these patches.

2. Connect your routers to Internet, or establish any other communication between them with the exception of IP.

3. Make a PPTP tunnel between them. There are example configurations in the PoPToP (server) and pptp (client) manuals.
4. Now you should have two bridges and an IP tunnel between then, possibly encrypted (refer to the PPP manual). Let's configure bridging.
5. Remember that the bridge is really a router, so we need to run the following commands on our bridges (this assumes *bridge_1* and *bridge_2* are IP addresses, assigned to each end of the PPTP tunnel between bridges):

```
bridge_1$ip route add 192.168.0.2 via bridge_2
bridge_1$ip route add 192.168.0.4 via bridge_2
bridge_1$ip route add 192.168.0.6 via bridge_2

bridge_1$ip route add 192.168.0.254 via bridge_2
bridge_1$ip route add 192.168.0.255 via bridge_2
```

On the other side:

```
bridge_2$ip route add 192.168.0.1 via bridge_1
bridge_2$ip route add 192.168.0.3 via bridge_1
bridge_2$ip route add 192.168.0.5 via bridge_1

bridge_2$ip route add 192.168.0.253 via bridge_1
```

This will tell each of bridges which hosts are on the other side. You can do the same with the old−style **`route`** command. It will look like:

```
bridge_1$route add -host 192.168.0.2 gw bridge_2
bridge_1$route add -host 192.168.0.4 gw bridge_2
bridge_1$route add -host 192.168.0.6 gw bridge_2

bridge_1$route add -host 192.168.0.254 gw bridge_2
bridge_1$route add -host 192.168.0.255 gw bridge_2
```

On the other side:

```
bridge_2$route add -host 192.168.0.1 gw bridge_1
bridge_2$route add -host 192.168.0.3 gw bridge_1
bridge_2$route add -host 192.168.0.5 gw bridge_1

bridge_2$route add -host 192.168.0.253 gw bridge_1
```

Please note once more that *bridge_1* and *bridge_2* are *not* IP addresses given by your ISP, but IP addresses which *you* assigned to each end of the PPTP tunnel.

6. Now you have two bridges and each of them knows where to find a particular IP. But how do you tell those computers to send their traffic for the remote network to the local bridge? You need tarpd.

   `tarpd` is a very simple daemon, which replies to arp requests for certain IP addresses. You only need to run a **`tarpd`** on each bridge, and specify the list of IP addresses found on the remote end.

   For example, for those two bridges you should run:

```
bridge_1$tarpd eth0 192.168.0.2 255.255.255.255  \
                    192.168.0.4 255.255.255.255  \

                    192.168.0.254 255.255.255.255
```

On the other side:

```
bridge_2$tarpd eth0 192.168.0.1 255.255.255.255  \
                    192.168.0.3 255.255.255.255  \

                    192.168.0.253 255.255.255.255
```

You specify 128 remote pairs (IP/mask. Mask should be 255.255.255.255 in order not to confuse tarpd!) on each bridge.

7. Enjoy your bridges!

1.2. What about other protocols?

Really, I can say nothing about other protocol routing. I never used them. But I suppose if you are familiar with other protocols, it should not be too difficult to bridge it this way.

2. Copyright

Copyright © 2002 Alexander Alekseev

Permission is granted to copy, distribute and/or modify this document under the terms of the GNU Free Documentation License, Version 1.1 or any later version published by the Free Software Foundation; with no Invariant Sections, no Front−Cover Texts, and no Back−Cover Texts. A copy of the license is included in the section entitled "GNU Free Documentation License".

2.1. GNU Free Documentation License

Version 1.1, March 2000

Copyright (C) 2000 Free Software Foundation, Inc. 59 Temple Place, Suite 330, Boston, MA 02111−1307 USA Everyone is permitted to copy and distribute verbatim copies of this license document, but changing it is not allowed.

2.2. PREAMBLE

The purpose of this License is to make a manual, textbook, or other written document "free" in the sense of freedom: to assure everyone the effective freedom to copy and redistribute it, with or without modifying it, either commercially or noncommercially. Secondarily, this License preserves for the author and publisher a way to get credit for their work, while not being considered responsible for modifications made by others.

This License is a kind of "copyleft", which means that derivative works of the document must themselves be free in the same sense. It complements the GNU General Public License, which is a copyleft license designed for free software.

We have designed this License in order to use it for manuals for free software, because free software needs free documentation: a free program should come with manuals providing the same freedoms that the software does. But this License is not limited to software manuals; it can be used for any textual work, regardless of subject matter or whether it is published as a printed book. We recommend this License principally for works whose purpose is instruction or reference.

2.3. APPLICABILITY AND DEFINITIONS

This License applies to any manual or other work that contains a notice placed by the copyright holder saying it can be distributed under the terms of this License. The "Document", below, refers to any such manual or work. Any member of the public is a licensee, and is addressed as "you".

A "Modified Version" of the Document means any work containing the Document or a portion of it, either copied verbatim, or with modifications and/or translated into another language.

A "Secondary Section" is a named appendix or a front−matter section of the Document that deals exclusively with the relationship of the publishers or authors of the Document to the Document's overall subject (or to related matters) and contains nothing that could fall directly within that overall subject. (For example, if the Document is in part a textbook of mathematics, a Secondary Section may not explain any mathematics.) The relationship could be a matter of historical connection with the subject or with related matters, or of legal, commercial, philosophical, ethical or political position regarding them.

The "Invariant Sections" are certain Secondary Sections whose titles are designated, as being those of Invariant Sections, in the notice that says that the Document is released under this License.

The "Cover Texts" are certain short passages of text that are listed, as Front−Cover Texts or Back−Cover Texts, in the notice that says that the Document is released under this License.

A "Transparent" copy of the Document means a machine−readable copy, represented in a format whose specification is available to the general public, whose contents can be viewed and edited directly and straightforwardly with generic text editors or (for images composed of pixels) generic paint programs or (for drawings) some widely available drawing editor, and that is suitable for input to text formatters or for automatic translation to a variety of formats suitable for input to text formatters. A copy made in an otherwise Transparent file format whose markup has been designed to thwart or discourage subsequent modification by readers is not Transparent. A copy that is not "Transparent" is called "Opaque".

Examples of suitable formats for Transparent copies include plain ASCII without markup, Texinfo input format, LaTeX input format, SGML or XML using a publicly available DTD, and standard−conforming simple HTML designed for human modification. Opaque formats include PostScript, PDF, proprietary formats that can be read and edited only by proprietary word processors, SGML or XML for which the DTD and/or processing tools are not generally available, and the machine−generated HTML produced by some word processors for output purposes only.

The "Title Page" means, for a printed book, the title page itself, plus such following pages as are needed to hold, legibly, the material this License requires to appear in the title page. For works in formats which do not have any title page as such, "Title Page" means the text near the most prominent appearance of the work's title, preceding the beginning of the body of the text.

2.4. VERBATIM COPYING

You may copy and distribute the Document in any medium, either commercially or noncommercially, provided that this License, the copyright notices, and the license notice saying this License applies to the Document are reproduced in all copies, and that you add no other conditions whatsoever to those of this License. You may not use technical measures to obstruct or control the reading or further copying of the copies you make or distribute. However, you may accept compensation in exchange for copies. If you distribute a large enough number of copies you must also follow the conditions in section 3.

You may also lend copies, under the same conditions stated above, and you may publicly display copies.

2.5. COPYING IN QUANTITY

If you publish printed copies of the Document numbering more than 100, and the Document's license notice

requires Cover Texts, you must enclose the copies in covers that carry, clearly and legibly, all these Cover Texts: Front−Cover Texts on the front cover, and Back−Cover Texts on the back cover. Both covers must also clearly and legibly identify you as the publisher of these copies. The front cover must present the full title with all words of the title equally prominent and visible. You may add other material on the covers in addition. Copying with changes limited to the covers, as long as they preserve the title of the Document and satisfy these conditions, can be treated as verbatim copying in other respects.

If the required texts for either cover are too voluminous to fit legibly, you should put the first ones listed (as many as fit reasonably) on the actual cover, and continue the rest onto adjacent pages.

If you publish or distribute Opaque copies of the Document numbering more than 100, you must either include a machine−readable Transparent copy along with each Opaque copy, or state in or with each Opaque copy a publicly−accessible computer−network location containing a complete Transparent copy of the Document, free of added material, which the general network−using public has access to download anonymously at no charge using public−standard network protocols. If you use the latter option, you must take reasonably prudent steps, when you begin distribution of Opaque copies in quantity, to ensure that this Transparent copy will remain thus accessible at the stated location until at least one year after the last time you distribute an Opaque copy (directly or through your agents or retailers) of that edition to the public.

It is requested, but not required, that you contact the authors of the Document well before redistributing any large number of copies, to give them a chance to provide you with an updated version of the Document.

2.6. MODIFICATIONS

You may copy and distribute a Modified Version of the Document under the conditions of sections 2 and 3 above, provided that you release the Modified Version under precisely this License, with the Modified Version filling the role of the Document, thus licensing distribution and modification of the Modified Version to whoever possesses a copy of it. In addition, you must do these things in the Modified Version:

A. Use in the Title Page (and on the covers, if any) a title distinct from that of the Document, and from those of previous versions (which should, if there were any, be listed in the History section of the Document). You may use the same title as a previous version if the original publisher of that version gives permission.
B. List on the Title Page, as authors, one or more persons or entities responsible for authorship of the modifications in the Modified Version, together with at least five of the principal authors of the Document (all of its principal authors, if it has less than five).
C. State on the Title page the name of the publisher of the Modified Version, as the publisher.
D. Preserve all the copyright notices of the Document.
E. Add an appropriate copyright notice for your modifications adjacent to the other copyright notices.
F. Include, immediately after the copyright notices, a license notice giving the public permission to use the Modified Version under the terms of this License, in the form shown in the Addendum below.
G. Preserve in that license notice the full lists of Invariant Sections and required Cover Texts given in the Document's license notice.
H. Include an unaltered copy of this License.
I. Preserve the section entitled "History", and its title, and add to it an item stating at least the title, year, new authors, and publisher of the Modified Version as given on the Title Page. If there is no section entitled "History" in the Document, create one stating the title, year, authors, and publisher of the Document as given on its Title Page, then add an item describing the Modified Version as stated in the previous sentence.

J. Preserve the network location, if any, given in the Document for public access to a Transparent copy of the Document, and likewise the network locations given in the Document for previous versions it was based on. These may be placed in the "History" section. You may omit a network location for a work that was published at least four years before the Document itself, or if the original publisher of the version it refers to gives permission.
K. In any section entitled "Acknowledgements" or "Dedications", preserve the section's title, and preserve in the section all the substance and tone of each of the contributor acknowledgements and/or dedications given therein.
L. Preserve all the Invariant Sections of the Document, unaltered in their text and in their titles. Section numbers or the equivalent are not considered part of the section titles.
M. Delete any section entitled "Endorsements". Such a section may not be included in the Modified Version.
N. Do not retitle any existing section as "Endorsements" or to conflict in title with any Invariant Section.

If the Modified Version includes new front−matter sections or appendices that qualify as Secondary Sections and contain no material copied from the Document, you may at your option designate some or all of these sections as invariant. To do this, add their titles to the list of Invariant Sections in the Modified Version's license notice. These titles must be distinct from any other section titles.

You may add a section entitled "Endorsements", provided it contains nothing but endorsements of your Modified Version by various parties−−for example, statements of peer review or that the text has been approved by an organization as the authoritative definition of a standard.

You may add a passage of up to five words as a Front−Cover Text, and a passage of up to 25 words as a Back−Cover Text, to the end of the list of Cover Texts in the Modified Version. Only one passage of Front−Cover Text and one of Back−Cover Text may be added by (or through arrangements made by) any one entity. If the Document already includes a cover text for the same cover, previously added by you or by arrangement made by the same entity you are acting on behalf of, you may not add another; but you may replace the old one, on explicit permission from the previous publisher that added the old one.

The author(s) and publisher(s) of the Document do not by this License give permission to use their names for publicity for or to assert or imply endorsement of any Modified Version.

2.7. COMBINING DOCUMENTS

You may combine the Document with other documents released under this License, under the terms defined in section 4 above for modified versions, provided that you include in the combination all of the Invariant Sections of all of the original documents, unmodified, and list them all as Invariant Sections of your combined work in its license notice.

The combined work need only contain one copy of this License, and multiple identical Invariant Sections may be replaced with a single copy. If there are multiple Invariant Sections with the same name but different contents, make the title of each such section unique by adding at the end of it, in parentheses, the name of the original author or publisher of that section if known, or else a unique number. Make the same adjustment to the section titles in the list of Invariant Sections in the license notice of the combined work.

In the combination, you must combine any sections entitled "History" in the various original documents, forming one section entitled "History"; likewise combine any sections entitled "Acknowledgements", and any sections entitled "Dedications". You must delete all sections entitled "Endorsements."

2.8. COLLECTIONS OF DOCUMENTS

You may make a collection consisting of the Document and other documents released under this License, and replace the individual copies of this License in the various documents with a single copy that is included in the collection, provided that you follow the rules of this License for verbatim copying of each of the documents in all other respects.

You may extract a single document from such a collection, and distribute it individually under this License, provided you insert a copy of this License into the extracted document, and follow this License in all other respects regarding verbatim copying of that document.

2.9. AGGREGATION WITH INDEPENDENT WORKS

A compilation of the Document or its derivatives with other separate and independent documents or works, in or on a volume of a storage or distribution medium, does not as a whole count as a Modified Version of the Document, provided no compilation copyright is claimed for the compilation. Such a compilation is called an "aggregate", and this License does not apply to the other self−contained works thus compiled with the Document, on account of their being thus compiled, if they are not themselves derivative works of the Document.

If the Cover Text requirement of section 3 is applicable to these copies of the Document, then if the Document is less than one quarter of the entire aggregate, the Document's Cover Texts may be placed on covers that surround only the Document within the aggregate. Otherwise they must appear on covers around the whole aggregate.

2.10. TRANSLATION

Translation is considered a kind of modification, so you may distribute translations of the Document under the terms of section 4. Replacing Invariant Sections with translations requires special permission from their copyright holders, but you may include translations of some or all Invariant Sections in addition to the original versions of these Invariant Sections. You may include a translation of this License provided that you also include the original English version of this License. In case of a disagreement between the translation and the original English version of this License, the original English version will prevail.

2.11. TERMINATION

You may not copy, modify, sublicense, or distribute the Document except as expressly provided for under this License. Any other attempt to copy, modify, sublicense or distribute the Document is void, and will automatically terminate your rights under this License. However, parties who have received copies, or rights, from you under this License will not have their licenses terminated so long as such parties remain in full compliance.

2.12. FUTURE REVISIONS OF THIS LICENSE

The Free Software Foundation may publish new, revised versions of the GNU Free Documentation License from time to time. Such new versions will be similar in spirit to the present version, but may differ in detail to address new problems or concerns. See http://www.gnu.org/copyleft/.

Each version of the License is given a distinguishing version number. If the Document specifies that a particular numbered version of this License "or any later version" applies to it, you have the option of following the terms and conditions either of that specified version or of any later version that has been published (not as a draft) by the Free Software Foundation. If the Document does not specify a version number of this License, you may choose any version ever published (not as a draft) by the Free Software Foundation.

2.13. How to use this License for your documents

To use this License in a document you have written, include a copy of the License in the document and put the following copyright and license notices just after the title page:

> Copyright (c) YEAR YOUR NAME. Permission is granted to copy, distribute and/or modify this document under the terms of the GNU Free Documentation License, Version 1.1 or any later version published by the Free Software Foundation; with the Invariant Sections being LIST THEIR TITLES, with the Front−Cover Texts being LIST, and with the Back−Cover Texts being LIST. A copy of the license is included in the section entitled "GNU Free Documentation License".

If you have no Invariant Sections, write "with no Invariant Sections" instead of saying which ones are invariant. If you have no Front−Cover Texts, write "no Front−Cover Texts" instead of "Front−Cover Texts being LIST"; likewise for Back−Cover Texts.

If your document contains nontrivial examples of program code, we recommend releasing these examples in parallel under your choice of free software license, such as the GNU General Public License, to permit their use in free software.