 **1.0**

Macintosh UAR

Macintosh UAR is an AppleTalk Router that can be used on a Macintosh computer that is running Apple's Open Transport networking system. With Open Transport version 1.1, or later, UAR can be used to route between any combination of Ethernet ports available on the host machine, and can perform simple tunnelling over the IP Internet. With bug fixes provided in Open Transport 1.1.1, UAR can also route via LocalTalk ports (with some restrictions, see the notes below).

Macintosh UAR is available via anonymous FTP from `munnari.OZ.AU` as the file `mac/macuar.sit.hqx`. Please note, however, that it is not distributed as freeware. The program will run for 120 minutes at a time in a "demonstration mode". To enable continuous use, you need to obtain a UserKey using the order form provided at the end of this document.

UAR is shipped both as 68k-only and *fat* (combined 68k and PowerPC) binaries. Note that, because of the way that the LocalTalk multinode code is implemented in Open Transport, you must use the 68k binary on a PowerPC Macintosh if you want to route via a LocalTalk port.

This document gives a quick overview of AppleTalk, the operation of AppleTalk Routers and then details the installation and configuration steps required for the Macintosh UAR program.

AppleTalk

AppleTalk is a networking system that is available on all Apple Macintosh Computers and a variety of printer hardware. It is also available on many UNIX systems using various third party freeware and commercial packages. The AppleTalk protocol suite encompasses high level file sharing using AppleShare, LaserWriter printing services and print spoolers along with lower level data streams and simple datagram delivery.

The term AppleTalk was originally used for both the protocol and connecting cables, but when it became available on different media, **LocalTalk** was used to describe the simple shielded twisted pair cable used to connect Macs to other Macs or printers. **EtherTalk** is AppleTalk over ethernet and **TokenTalk** is AppleTalk via Token-Ring networks. AppleTalk data can also be carried within different protocols, this is known as **encapsulation** or **tunnelling**.

AppleTalk Addresses

Each unique entity on an AppleTalk network has an AppleTalk address consisting of a **node** number and a **network** number. Node numbers can range from 1 to 253 (254 on LocalTalk) and occupy a single byte. Network numbers are two bytes long and can

range from 1 to 65535. This can also be written in **dotted decimal notation** as 0.1 to 255.255. This is exactly the same as writing a four-byte Internet Protocol (IP) address in the form 128.250.1.21. Dotted decimal notation is used by preference in this document and in the provided sample configurations, but either format can be used in the configuration file.

On EtherTalk and TokenTalk **extended** networks, a **network range** may be assigned to the cable. This simply means that AppleTalk nodes on this cable are free to choose a network number from any of those within the specified range. Network ranges may be zero width (0.5 - 0.5), or larger (0.5 - 0.8). Care should be taken to choose a range with sufficient room for future expansion, without wasting address space that may be necessary when a connection to another AppleTalk internet becomes available.

The theoretical maximum number of AppleTalk nodes that can be accommodated on a single extended network cable is 16,580,355 (65535 x 253). LocalTalk networks are **non-extended** and may be assigned only a single network number. The theoretical upper limit for the number of nodes on a LocalTalk network is 254.

In reality there are physical limitations on the length of each type of cable and the number of possible electrical connections to it.

For convenience, network load sharing or administrative purposes, network numbers can be grouped together and described by a **zone name**. Lookups for AppleTalk entities in a specific zone generate (a lot of) traffic, but only on cables that contain those network numbers. An extended network may have up to 255 zones assigned to a single cable, one of these being denoted as the **default zone**.

A Macintosh on a multiple-zone extended-network may choose to live within any one of the available zones (selected by using the AppleTalk Control Panel, or the Network Control Panel on a Macintosh with classic AppleTalk networking). Non-extended networks are limited to a single zone name per cable.

Within a single physical node, different programs or services can open AppleTalk **sockets**. The full network/node/socket tuple is necessary to completely specify the final destination of an AppleTalk packet.

AppleTalk Named Objects

To assist humans in finding and distinguishing between different AppleTalk services, an AppleTalk address can be associated with a descriptive name using **NBP** - the **Name Binding Protocol**. Each entity or service can register an NBP object name and an object type within a zone. For example, a Laser Printer might register as

```
Gutenberg:LaserWriter@unimelb-CompSci
```

Where `Gutenberg` is the object name, `LaserWriter` the object type and `unimelb-CompSci` is the zone name. Each of the object, type and zone fields are limited to 32 characters in length.

A possible network/node/socket AppleTalk address tuple for `Gutenberg` could be written as `73.194/250/129`. That is, the printer process running on node `250` on network `73.194` is listening for printing requests on socket number `129`.

A Macintosh user normally only ever encounters object and zone names. The *Chooser* takes care of looking up NBP types and mapping the results to AppleTalk addresses.

AppleTalk Routers

An AppleTalk Router allows AppleTalk services that are visible on one network interface, such as the built-in ethernet port, to be used by other hosts connected to a different interface, perhaps on a LocalTalk cable plugged into the router printer port.

Maintaining zone names, looking up NBP names within zones, propagating network routing information and sending packets between different network interfaces is the responsibility of one or more AppleTalk Routers.

When multiple routers are connected to the same network, they may all be configured with the same network range and zone name information (they are all **seed** routers), or a router may start up **non-seed** and obtain configuration information from other routers that are already running. Once running, there is no practical difference between a seed and a non-seed router.

It is particularly important that all routers connected to a cable have the same configuration information for each of the network range, default zone and zone lists. If this is not the case then the network may be unpredictable, certain nodes may not be visible or connections may be lost. Some routers, including UAR, handle this potentially fatal situation by refusing to start up.

A non-seed AppleTalk entity that starts up on an extended network initially uses the network number **startup range** of 255.0 to 255.254 (65280 to 65534). This network range is used until a router is contacted and the real network range is determined. **Network ranges on different physical cables may not overlap**, therefore routers should **not** be configured with network numbers in the range 255.0 to 255.254.

DDP Checksums

The basic AppleTalk packet is carried by the DDP (**Datagram Delivery Protocol**) layer . One of the fields in the DDP packet header is a 16-bit checksum. This is used to protect packets against data corruption in intervening routers and noisy networks. Macintoshes always default to sending DDP packets with the checksum field disabled. It is ***strongly recommended*** that routers have checksum code enabled.

Open Transport

Open Transport is a modern networking platform for 68030, 68040 and PowerPC Macintosh Computers. It offers improved support for TCP/IP and AppleTalk

networks, including AppleTalk **multi-homing** - the ability to use multiple AppleTalk interfaces at the same time (more accurately, the ability to write a program that can open multiple AppleTalk interfaces).

To use all of the UAR functionality you must have Open Transport version 1.1.1, or later, the necessary support was not available, or was seriously broken, in earlier Open Transport releases.

Interfaces

Interface names are used to distinguish between physical network ports on a host computer. The names are usually a function of the underlying network hardware and software. Under Open Transport, the interface names are *enet0* to *enetN* for the built-in ethernet port and 'N' ethernet cards in NuBus or PCI slots; and *ltlkA*, *ltlkB* or *ltlkAB* for LocalTalk via the modem port, printer port, or the single port available on some machines, respectively.

Macintosh UAR Installation

The Macintosh UAR package is implemented as a *Faceless-Background-Application* System Extension and thus has no built-in user-interface. It does not appear either in the list of running Applications or in the *About This Macintosh* dialog box (memory allocated to UAR appears as part of the *System Software* total).

UAR is installed by copying it into the *Extensions Folder* (or by allowing the Finder to auto-route it by dropping it onto the *System Folder*).

UAR is started only at boot time, it cannot be run by double-clicking on the icon. The only method of stopping UAR is to remove it from the Extensions Folder, or to disable it using the *Extensions Manager* Control Panel and restart the Macintosh.

After UAR starts, the Macintosh Name, in combination with each interface name, is registered as an NBP object with the type "UAR", in the default zone. For example, if the *Sharing Setup* Macintosh Name is set to "gromit" and the router is configured to use enet1 and the ltlkB LocalTalk port, then UAR registers

```
gromit-enet1:UAR@unimelb-CompSci
gromit-ltlkB:UAR@unimelb-CompSci
```

Note: the Macintosh Name will be truncated if it is longer than 25 characters.

UAR Configuration

UAR is configured by editing the configuration file *UAR Config* (a SimpleText document within the Preferences Folder). If UAR is started without a *UAR Config* file, it will create a *UAR Config Sample* file in the Preferences Folder, write a notification error message to alert the user, and then quit.

The *UAR Config Sample* file lists all of the available AppleTalk interfaces on the Macintosh, together with the commands available to configure each of them (note that the configuration data is fictitious). To get UAR to use this sample file, it must be edited to uncomment the required interface setup lines, and to change these to reflect the required network configuration. The file must then be renamed to *UAR Config* and the machine restarted.

The UAR configuration file data takes the form of an interface name followed by the interface configuration information, repeated as many times as there are interfaces to be used. Comment lines begin with the '#' character. Indentation used in the following examples is optional for added clarity.

```
#
# UAR config example
#
interface enet1
    node 252
    network 64.126
    zone "twilight zone"
#
interface enet2
    node 252
    networklo 64.127
    networkhi 64.127
    zone "twilight zone"
    zonelist "twilight zone"
```

Note that both interface configurations specify essentially identical information, since the enet2 interface has a zero-width network range and a single zone name, it could have been simplified as follows

```
#
interface enet2
    node 252
    network 64.127
    zone "twilight zone"
```

An extended network, with a non-zero-width network range and multiple zone names would be represented as

```
#
interface enet3
    node 234
    network 64.129
    networklo 64.128
    networkhi 64.136
    zone "twilight zone"
    zonelist "twilight zone"
    zonelist "no parking zone"
    zonelist "demilitarised zone"
```

In this example, the network range is 64.128 - 64.136 (16512 - 16520) and the router is to use network 64.129 with a suggested node number of 234 (the node number entry is used to initialise the node number of the interface and will be the actual node

number chosen unless it is already in use by another entity on the cable). The zone list contains three zone names. with `"twilight zone"` being the default zone name.

To specify a network as non-seed, list only the interface name.

```
#
interface enet4
```

Note that this may cause problems if no other router is available on the network to provide seed configuration information.

The *UAR Config* file can be created using the SimpleText application, or an edited version of the *UAR Config Sample* file, as indicated above. It should be put into the Preferences Folder inside the System Folder.

The following *UAR Config* global commands are also available, they can be added to any interface configuration list, but affect all of the interfaces.

```
userkey "<key not set>"
```

sets the UserKey to enable continuous operation (see the order form at the end of this documentation).

```
checksum 0
```

disables the UAR DDP checksum code. By default DDP checksums are always generated in outgoing packets, and checked in incoming packets.

```
fastroute 0
```

disables UAR Fast Routing, used to speed the delivery of AppleTalk packets between Ethernet interfaces. Should not be necessary in normal circumstances.

```
dumptables 1
```

causes UAR to dump internal tables when the UAR program quits, for example, when the machine is shutdown or restarted. Note that for large networks the time taken to write the files will add appreciably to the restart time. The files are written into the Preferences Folder and have names of the form *UAR AARP Table* for each of the AppleTalk protocols AARP (AppleTalk Address Resolution Protocol), NBP (Name Binding Protocol), RTMP (Routing Table Maintenance Protocol) and ZIP (Zone Information Protocol). A file containing router statistics is also created. A sample AARP table might look like

```
UAR AARP Table:

  net    node  eaddr
 73.196     8  00:40:10:00:28:69
 73.195   108  08:00:07:7e:9b:f3
 73.196   253  02:60:8c:56:21:27


3 AARP entries
```

where the *eaddr* column lists the 48-bit ethernet hardware address for each node.

Time Server

UAR can provide an AppleTalk-based current time service to local Macintoshes using the *tardis* Chooser extension. You can enable timeserving on one or more UAR interfaces (but only one is necessary) by adding a configuration file entry of the form

```
timesrvr "timeServer"
```

to the selected interface. "timeServer" is the name to appear in the Chooser of the client Macintosh. The client Macintosh time is set from the selected server when the Mac is booted, by the user from the Chooser or daily at a specified time. The tardis Chooser document is installed by copying it to the Extensions Folder.

You should make every attempt to ensure that the UAR server Macintosh time is reasonably accurate. You can achieve this by using a **Network Time Protocol** (NTP) Internet client such as the *Network Time* utility.

NBP Filtering

A filter may be installed on each interface to either prevent AppleTalk entities on that interface from accessing AppleTalk services that are visible on the remaining interfaces (**restrict** mode), or to prevent nodes on other interfaces from seeing services registered on nodes connected to that interface (**protect** mode).

Filter configuration file entries are of the form

```
protect  "object"
restrict "object:type"
restrict "object:type@zone"
```

Each of "object", "type" or "zone" may be replaced by "=" to match anything, or prepended with a ! character to invert the test (NBP partial matching is not available).

For example, to stop users connected to interface *enet1* from accessing AppleShare servers in the zone `"no parking zone"`, seeing anything at all in the zone `"demilitarised zone"` and anything other than `Timelord` servers in the zone `"the white zone is for loading"`; and to prevent IP address assignment from outside interface *enet1*, insert entries into the UAR Config file as follows:

```
#
interface enet1
    node 252
    network 64.126
    zone "twilight zone"
    restrict "=:=@demilitarised zone"
```

```
    restrict "=:AFPServer@no parking zone"
    restrict "=:!Timelord@the white zone is for loading"
    protect  "=:IPGATEWAY"
```

Note that the NBP filter searches filter entries in reverse order to that listed in the *UAR Config* file. This may result in unexpected behaviour if multiple filter entries affect the same NBP object.

Tunnelling

UAR supports a simple method for tunnelling AppleTalk packets over an IP internet using UDP/IP. That is, isolated AppleTalk networks may be joined seamlessly by running UAR on hosts that are connected together via the Internet and to each of the individual networks. In this scheme, the Internet can be viewed as a pseudo cable connecting all of the different routers.

The only restriction is that network numbers at each location must be unique across the extended AppleTalk network. i.e.: network number remapping is not supported.

A Macintosh using the **IPTnnl** adev (a Network Control Panel client) can also be connected to a UAR tunnel, or used to connect to other IPTnnl equipped Macintoshes. For more details, refer to the *IPTnnl userDoc* file which is available via anonymous FTP from `munnari.OZ.AU` as part of the file `mac/iptnnladev.1.0.sit.hqx.Z`. Note that the IPTnnl adev is not currently compatible with Macintoshes running Open Transport.

IP tunnelling is specified as an additional *non-extended* pseudo interface in the configuration file of each participating UAR router. An example **tnnl** interface entry may be written as follows

```
#
interface tnnl
    node 253
    network 83.3
    zone unimelb-CompSci
    peer "253 @ 128.250.97.86"
    peer "252 @ 128.250.73.40"
```

Each UAR host or IPTnnl Macintosh participating in IP tunnelling must contain identical network, zone and peer entries and **each must have a unique node number**.

A UAR tunnel, since it is effectively a single network, must be assigned a separate network number (that is, a network number that is unused on any of the tunnelled networks). The peer entries are used to map node numbers to IP addresses, thus identifying the Internet location of each of the nodes.

> Note: It is more efficient to group tunnels by node number. For example, given two tunnels, it is better to make them nodes 123 and 124 than having one on node 1 and one on node 253.

For security reasons, remote UAR/IPTnnl clients are not permitted to participate in tunnelling unless their IP address is explicitly listed as a peer in the local configuration file or in the IPTnnl configuration dialog.

On UAR UNIX hosts that have multiple ethernet interfaces, and thus multiple IP addresses, an explicit peer entry for the local node number (253 in the above example) is used to specify which interface address value is to be used for outgoing traffic.

The default UDP/IP port used for tunnelling is `9115`. To change this on a UNIX host, add entries to the `/etc/services` file for all participating hosts:

```
tnnl            9115/udp                        # UAR tunnelling port
tnnl            9115/tcp                        # UAR tunnelling port
```

With Macintosh UAR, you can use a *UAR Config* file entry of the form

```
tnnludpport 9115
```

In the special case where Macintosh UAR is being used to connect Macintoshes on LocalTalk or EtherTalk ports, via a slow SL/IP or PPP IP tunnel to a larger network, NBP traffic can saturate the link, resulting in the Chooser only sporadically displaying services, or none at all. If this is a problem, the traffic can be minimised by specifying

```
tnnltraffic 1
```

in the *UAR Config* file. Setting `tnnltraffic` will have no noticeable benefit when UAR is used to connect two or more larger AppleTalk internets.

Command Summary

The following commands are valid in the *UAR Config* file.

`userkey`	Enter the UserKey string for continuous operation.
`interface`	The interface name used for the following commands.
`node`	Suggested node number for this interface (optional hint only).
`network`	AppleTalk network number for the interface, or the network number for UAR to use when a network range is specified.
`networklo`	The start of the network range for an extended network.
`networkhi`	The end of the network range for an extended network.
`zone`	The zone name for a non-extended network or the default zone name for an extended network.
`zonelist`	One entry for each of multiple zones on an extended network.
`checksum`	Enable or disable the use of DDP checksums (globally).
`restrict`	Prevent the specified NBP name being visible on the interface.
`protect`	Prevent the NBP name from being visible on other interfaces.
`timesrvr`	Register the specified name as a 'Timelord' time server.
`dumptables`	Dump internal AARP, NBP, RTMP, ZIP and stats tables.
`peer`	Specifies the IP address of a peer connected via a tnnl interface.
`tnnludpport`	Specifies the UDP/IP port number for the tnnl interface (9115).
`tnnltraffic`	Reduce NBP traffic sent across a slow tnnl link (see above).

Some of these commands are optional. The `network` entry is not required if both `networklo` and `networkhi` are provided and you don't care which network number the router uses (defaults to `networklo`). `zonelist` entries are not required for single zone extended networks, and are illegal for non-extended networks.

Determining your network number and zone list

You can use the Open Transport AppleTalk Control Panel to find out most of the necessary configuration information for each of your AppleTalk network ports. Carry out this step before you install UAR.

With the AppleTalk Control Panel open, go to the **Edit** menu and select *User Mode ...* Then check the *Advanced* box in the **User Mode** dialog and click on **OK**. Ensure that the AppleTalk Control Panel *User defined* box is unchecked.

In AppleTalk you will see a pop-up menu that lists all of the available AppleTalk interfaces:

```
Ethernet Slot 2
Ethernet Slot 3
Modem Port
Printer Port
```

(with only a single ethernet card, the ethernet port is marked simply `Ethernet`).

If you select each of these in turn, the Macintosh will report the network number and zones already in use on the interface (that have been created by another router on the network). A network number of zero on the LocalTalk ports - or one from the startup range on Ethernet ports - indicates that no other router exists. In this case the *Current zone:* field will also display the string `<no zones available>`. Note that the node number is that chosen by the Macintosh inbuilt AppleTalk stack, it is of no use to us.

If no other router exists on the port, then you are free to choose your own network number and zone information. Be aware, however, that most organisations have a central authority for assigning this information and they are likely to be particularly upset if you manage to choose a network number that is already in use somewhere else on your network. **Network numbers must be unique to each cable connected to the same AppleTalk internet** (careful readers will note some repetition here).

Write down the network number or network range (ignoring the network range 0 - 65534 listed for the LocalTalk ports) and the *Current zone:* name, or the multiple zonelist names if this field is a popup-menu. The *UAR Config* file **enetN** interface names map directly to the "Ethernet Slot N" strings so enet1 is "Ethernet Slot 2", enet2 is "Ethernet Slot 3" and so on. For LocalTalk ports, ltlkA is the Modem Port and ltlkB is the Printer Port. Use this information to create the *UAR Config* file.

The only information that this method does not provide is the default zone name for a multiple zone extended network. You should be able to get this information from your

network administrator. In any case, you should be courteous and inform her of your intention to run an AppleTalk Router on your Macintosh.

UAR Error Messages

Since UAR has no user interface, error messages are displayed using the Macintosh Notification Manager. They may also appear in a file called *UAR Log* in the Preferences Folder.

```
"Open Transport is not installed."
```
- somewhat self-explanatory.

```
"The application UAR could not be opened
because OTClientLib could not be found."
```
- an informative MacOS message meaning "Open Transport is not installed".

```
"UAR requires Open Transport version 1.1 or later."
```
- not an appropriate version of Open Transport.

```
"UAR LocalTalk routing requires Open Transport version 1.1.1,
or later."
```
- OT 1.1 was broken.

```
"Could not install AppleEvent handlers."
```
- an internal error, may indicate a low memory situation.

```
"Memory is dangerously low, adjust
UAR application size and reboot."
```
- do a "Get Info" on the UAR file and increase the 'Preferred Size' field.

```
"The configuration file (UAR Config) could not be found
(or is already open)."
```
- the config file does not exist or is already open for writing by an application.

```
"Could not open specified AppleTalk interfaces.
See "UAR Config Sample" in the Preferences Folder."
```
- one or more of the listed interfaces is not valid for the host machine.

```
"No interfaces were specified in the "UAR Config" file"
```
- one or more interface names must be specified.

```
"UAR PowerPC code cannot support LocalTalk Routing.
Use the 68k binary"
```
- run the 68k version of the program on a PowerPC to route via LocalTalk.

```
""UAR Config" has a missing or invalid 'userkey',
running in demo. mode for 120 minutes. Refer to
"http://www.cs.mu.OZ.AU/appletalk/atalk.html\"
for information on how to obtain a userkey."
```
- a key is required to run Macintosh UAR as a full-time router.

```
"Couldn't open the "enet2" interface"
```
- the specified interface is not available at this time (some OT Error).

`"I don't understand "phase 2" in configuration file "UAR Config""`
- an illegal/unknown command was used in the configuration file.

`"enet2: Bogus network range (lo > hi)"`
- the enet2 interface networklo field was larger than the networkhi field.

`"ltlkB: Network range illegal for Non-Extended/Phase 1"`
- a networklo/networkhi pair was specified for a non-extended LocalTalk net.

`"enet1: Net number not within lo/hi range."`
- the network field specified a network not covered in the networklo/hi range.

`"enet3: Configuration data incomplete."`
- an interface config specified network without zone or zone without network.

`"ltlkA: Zonelist entries illegal for Non-Extended/Phase 1."`
- a zonelist entry was specified for a non-extended LocalTalk network.

Known Problems

DDP MultiNode writes to LocalTalk ports produce short DDP packets with an incorrect LAP source address (OT 1.1). Routing via LocalTalk ports is thus unavailable when UAR is used with this version of Open Transport. This was fixed in Open Transport version 1.1.1.

In normal operation, AppleTalk services (for example FileSharing) registered on a local Macintosh port are not visible to UAR running on the same machine (packets sent by each protocol stack are not visible to the other due to the way the ethernet hardware works and limitations of the OT multinode code). In other words, the Macintosh acting as a UAR router may not provide services to other Macintoshes connected to the network, except for those directly connected to an ethernet or LocalTalk port of the router. Except that ...

Choosing a default ethernet port in the AppleTalk Control Panel - that is also being used for UAR routing - eventually results in Open Transport running out of memory (OT 1.1b16). The symptoms of this problem include all network services becoming "deaf", repeated -3211 memory errors in the *UAR Log* file and various error dialogs when trying to open the AppleTalk or TCP/IP Control Panels. This problem has been reported to Apple since early betas of OT 1.1 but still occurs in OT 1.1.1b8c5.

Using a SONIC Systems Inc. "NuBus A Series" ethernet card to route between multiple ethernet interfaces on a 680X0 Macintosh can result in random system crashes. This problem was known to exist with OT 1.1b11c3 on a Macintosh IIcx and did not occur when the SONIC card was replaced with an Apple NuBus ethernet card.

UAR Support

If you have any problems with Macintosh UAR, you can send an electronic mail message to the internet address

```
uar@cs.mu.OZ.AU
```

Please include useful information such as the version numbers of Open Transport, UAR and the Macintosh System Software, the type of Macintosh hardware and as much detail as possible about your AppleTalk network and the problem you are experiencing.

It may be necessary to include a debugging session from running UAR on your network. Details on how to do this will be provided when necessary.

You can send non-electronic mail to the address

```
Macintosh AppleTalk Router
Department of Computer Science
The University of Melbourne
221 Bouverie Street
Carlton 3053
Victoria
Australia
```

We are not currently able to offer telephone support.

UNIX UAR

The UAR package is also available to run on SUN SunOS/Solaris, DEC Ultrix/Alpha, SGI IRIX, Sony NEWS 4.2, HP-UX 8/9, IBM RS6000 AIX, Linux, BSDI BSD/386 1.1, NetBSD 1.0 and FreeBSD 2.0 workstations. For more information, refer to the WWW page at

```
http://www.cs.mu.OZ.AU/appletalk/atalk.html
```

or download the freeware version of UNIX UAR from

```
ftp://munnari.OZ.AU/mac/uar.tar.Z
```

Licensing

Any of the Macintosh or UNIX UAR packages may be licensed for redistribution or resale. Contact us using either of the above addresses.

Notice

UAR may not be publicly redistributed (for example via anonymous FTP), sold, or the UAR source used for any other purpose without the permission in writing of the copyright owners.

Ordering a UAR UserKey

Mail this form together with your credit card details or a non-personal cheque or International Money Order payable to the "Department of Computer Science" in the amount of US$50.00 (Australian sites send AUD$50, New Zealand sites NZD$50) to

```
Macintosh AppleTalk Router
Department of Computer Science
The University of Melbourne
221 Bouverie Street
Carlton 3053
Victoria
Australia
```

Credit card orders may also be faxed directly to

```
+61 3 9348 1063
```

Note: We are not yet able to accept credit card orders via electronic mail or telephone.

A UserKey will be returned via email if a reachable email address is provided below.

Please send me one or more UserKeys for Macintosh UAR. I have enclosed a cheque for the amount shown or debit my credit card for an equivalent amount in Australian Dollars using the details provided below. I prefer that you send me the UserKey using `email/fax/snail_mail`.

Name: _____ Date: _____

Organisation: _____

Postal Address: _____

_____

_____

Fax Number: _____

Email Address: _____@_____

Number of keys: _____ Amount (`USD/AUD/NZD`) $_____

Credit Card Details:

Expiry Date (`mm/yy`): _ _ / _ _

Cardholder Number: _ _ _ _ | _ _ _ _ | _ _ _ _ | _ _ _ _

Card Type (`Mastercard/Visa` only):_____

Cardholder Name: _____

Signature: _____

I undertake to use each UserKey with UAR **only** on a single Macintosh Computer.