

## Recommendations for using Net2 with LAN and WAN networks

This document presents our recommended practice for using Net2 within a local area network (LAN) or wide area network (WAN). Some prior knowledge of the operation and configuration of LAN's, WAN's, Ethernet, TCP/IP and IP addressing and the differences between hubs, switches and routers is assumed.



### General recommendations

For larger networks, defined as those with greater than fifty users logged on concurrently, it is essential that you consult the IT manager and agree a design prior to installing Net2 on the client's network.

Paxton recommends the use of virtual local area networks (VLAN's) for these larger networks. These are discussed in more detail in a later section. Failure to configure a VLAN on these sites may result in unreliable operation of Net2. VLAN design examples and other documentation is available on the Paxton website to assist you with this. However, we recommend you consult the IT manager or seek specialist advice and help if you do not have prior experience of installing VLAN's.

### Summary of network requirements

If the client network is a single (flat) LAN with less than fifty users concurrently logged on and the network does not experience a large amount of broadcast traffic, you should be able to attach the Net2 system without any performance issues.

However, if the client network is a routed network with several subnets and upward of fifty concurrent users, it is recommended that a VLAN or a subnet separated by a router interface is used to isolate the Net2 system from other network traffic. This is also desirable from a security point of view.

A dedicated switch port for every Net2 485 TCP/IP Ethernet interface is recommended. The Net2 485 - TCP/IP Ethernet interface up to serial number 693000 runs at 10 Mbit/s and half duplex. Units with serial numbers beyond this operate at 100 Mbit/s, full duplex.

It is common for 10/100/1000 Mbit/s switch ports set to auto negotiate to only select a 100 or 1000 Mbit/s Ethernet link. In this case Net2 485 TCP/IP units with serial numbers up to 693000 may experience buffer overruns due to speed and duplex mismatches. It is recommended in this situation that you disable auto negotiation and manually configure the switch port to 10 Mbit/s and half duplex.

When defining IP Addresses, choose a network or subnet with enough host addresses for the Net2 Server and number of Ethernet interfaces you require.

IP addresses should be administered statically with the Net2 configuration utility and reserved by MAC address on a DHCP server. You should consult the IT manager for configuration of the DHCP server.

Configure the default gateway on the Net2 Server and Ethernet interfaces to point at the nearest router if they reside on different networks or VLAN's.

## Installation and configuration of the Net2 server

Because the Net2 Server is expecting a fixed IP address on the Paxton Ethernet interfaces, DHCP should not be used unless a reservation is made. In this case fixed IP addresses are reserved for specific MAC address.

## Virtual local area networks (VLAN's)

All currently supported Cisco switches and most of the 3com product range will support VLAN's. Other un-managed units will not be able to support VLAN's.

On larger networks a separate VLAN for Paxton Ethernet devices is advisable. This separates Net2 System traffic from other client traffic and improves the performance of the Net2 System without any impact on the client network. This is also more secure and is therefore considered 'best practice'.

Although VLAN's can support several subnets, for purposes of routing and administration it is recommended that one VLAN maps to one subnet.

A VLAN is essentially a broadcast domain. In function it is no different to a single physical LAN segment, in other words individual VLAN's do not see broadcast traffic from other VLAN's. Note that an InterVLAN router is required for routing between VLAN's.

Configuring VLAN's enables a segmented network architecture. This has many benefits including improved security, limiting broadcast traffic, using redundant paths for load balancing and fault tolerance and ease of troubleshooting. Flat or non-segmented networks offer none of these benefits and have the added risk of broadcast storms.

VLAN's are configured on the switches of a network. Essentially, individual switch ports can be configured as members of a VLAN. Most switches on the market today support VLAN's. Although VLAN implementation is not complex a basic working knowledge of subnetting, trunking protocols and routing is needed to configure VLAN's.

## IP addressing schemes

## IP addressing and VLAN configuration

Each Paxton Ethernet Interface will require an IP address and a subnet mask (if subnetting is being implemented). These should be provided by the client. The IP addresses allocated for the Ethernet Interfaces will invariably be taken from a private address pool (See RFC 1918 for IP Private Addressing).

### RFC 1918 Private Addressing

This provides for private IP address space. These addresses will never be allocated by IANA (Internet Assigned Numbers Authority) as public addresses and are therefore not routable on the Internet. The private address ranges available, with the number of networks and hosts they support are:

	Nets	Hosts
Class A: 10.0.0.0 - 10.255.255.255	1	33,554,430
Class B: 172.16.0.0 - 172.31.255.255	16	65,534
Class C: 192.168.0.0 - 192.168.255.255	256	254

These addresses may well be sub-netted on the clients network. Subnetting is beyond the scope of this document.

## Spanning tree protocol (STP)

In non-routed networks like switched networks, where parallel links exist, switches may fail to learn about each other and generate broadcast storms. STP is enabled by default on most proprietary switches and will put ports on redundant links into a blocking state to prevent loops.

Spanning Tree achieves a loop free switched or bridged network by building a tree through the network at layer 2 (the MAC layer). In a tree there is only one route from one end node (leaf) to any other end node. In fact anywhere in the tree there is only one route from one node to any other node. The reference point, or root, from which Spanning Tree builds this tree is not surprisingly called the Root Bridge. Although Spanning Tree will elect the Root Bridge automatically, it is often advisable for this to be manually determined by the Network Designer for a more efficient network operation.

### Spanning Tree switch settings

The switch ports that the Net2 system attaches to should be set to portfast in the case of Cisco switches and stpfaststart on 3Com switches. This forces the port switches into the forwarding state immediately and they do not participate in the Spanning Tree convergence.

### Bandwidth and Traffic

The traffic generated by the Paxton Net2 System includes server polling, event messages and ACU firmware upgrades. A maximum bandwidth of 200 Kbps is required. This may be an issue over low bandwidth WAN links such as BRI ISDN which runs at 128 Kbps.

## Ethernet Interface specification

Net2 485 TCP/IP Ethernet interface devices with serial numbers up to 693000 operate at 10 Mbps, half duplex. Units with serial numbers greater than this operate at 100 Mbps, full duplex.

### Switch Port Settings

It is recommended that the Ethernet interfaces be directly attached to a switch port. If the interface is attached to a hub it will share the LAN with other devices and this is not recommended. For a 10 Mbps interface, the switch port should be set to 10 Mbps and half duplex. If the port is left in auto negotiation mode a speed or duplex mismatch may occur resulting in the interface and attached ACU's going offline. (Please note: on Cisco and 3Com switches auto negotiation is only supported on Fast Ethernet and Gigabit Ethernet ports) On switches that can't be managed it will not be possible to disable auto negotiation and manually configure the speed and duplex settings. Ethernet interfaces with serial numbers up to 693000 are therefore not suitable for connection to these type of switches.

### Links to online documentation

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Info: [Compatibility and Support](http://paxton.info/720). < <http://paxton.info/720> >

Info: [AN1006 - Installing remote sites using TCP/IP](http://paxton.info/105). < <http://paxton.info/105> >

Instruction: [Ins-30001 - Net2 485 TCP/IP Ethernet Interface - Rev 4](http://paxton.info/1369). < <http://paxton.info/1369> >

Instruction: [Ins-30054 - Net2 485 TCP/IP Ethernet Interface - Rev 3](http://paxton.info/772). < <http://paxton.info/772> >

Instruction: [Ins-30032 - Paxton Net2 Ethernet Interface](http://paxton.info/819). < <http://paxton.info/819> >

Instruction: [Ins-30029 - Net2 485 TCP/IP Lantronix UDS10B Ethernet Interface](http://paxton.info/820). < <http://paxton.info/820> >

Instruction: [Ins-30044 - Demonstration Case TCP/IP](http://paxton.info/821). < <http://paxton.info/821> >