



Virtual Engineer® Connected by the Internet

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The Background

25x8net, by definition, is a "Data Communication Architecture for Building Automation and Control Networks" developed by REMS. 25x8net is an open (non-proprietary) protocol specification that allows Environmental Control, Health & Safety Management, Building Automation, Telemetry systems (heating and air conditioning equipment controllers, lighting systems, security systems, fire and life safety systems, irrigation systems, elevator systems, any other "intelligent" microprocessor based controller or "dumb" relay based device at a location) made by different manufacturers, to communicate, share information and control each other.

The Internet, is the publicly owned (therefore FREE) network of computer systems connecting systems where ever the human race can be found, from the large Cities via dense jungles to deepest space.

REMS will explain how a location, or collection of sites with 25x8net based control systems, can connect to and utilise the Internet and what benefits that brings to you.

Your Benefits

- ✓ IP/VE is better equipped to handle future 25x8net scenarios.
- ✓ IP/VE permit the use of the Internet as a communication backbone.
- ✓ IP/VE's lower your capital costs and installation lead time.
- ✓ IP/VE reduce long term operational costs.
- ✓ IP/VE's can connect to the 25x8net from anywhere in the IP network.



The Opportunity

Initially, the Internet will be used for two purposes:

- 👉 To connect two or more remote 25x8net networks together (most likely individual buildings) using the Internet as the communication backbone. Currently, several proprietary control systems can utilise leased lines, fibre optics and other communications to create a dedicated Wide Area Network (WAN) for their sole use. Private systems become prohibitively expensive for multi-location and yet more so for multi-country networks. The Internet, on the other hand, only requires a short and less expensive connection to a local Internet Service Provider (ISP). Once your buildings are connected to the Internet, the cost for the network is the same regardless of whether the sites are in the same district or on the other side of the world.
- 👉 Remote access from your home, hotel room, mobile or office to your environment management system using a simple (and usually free) Internet browser (Microsoft Internet Explorer and Netscape being the two most common). Traditionally dialup connections were used to connect environment management systems, which were slow, usually required proprietary software and incurred long distance charges. High speed, local call charge or FREE Internet connections can be made around the world providing your 25x8net environment management system with much faster, cheaper and easier to access, view, command and query, enabling more sophisticated features and the use of FREE software.

REMS Solution

For 25x8net to utilise the Internet for communication, it must speak the language of the Internet known as "Internet Protocol" or IP. IP is an envelope with a "from" and "to" address (known as source and destinations addresses respectively) on the cover of the envelope and inside the envelope is the message being sent.



For equipment to communicate on the Internet a second transport layer protocol must also be used. Currently there are two primary transport layer protocols, "Transmission Control Protocol" or TCP and "User Datagram Protocol" or UDP.

TCP is a reliable connection-oriented transport service that provides end-to-end reliability, resequencing, and flow control. The TCP/IP protocol operates in a similar fashion to a telephone call: a connection is requested, established, and then bi-directional communication follows, when you browse web sites on the internet you are using HTTP within TCP/IP.

UDP is a connectionless "datagram" transport service. It is used by applications that do not require the transmission guarantees of TCP, or that wish to use communication services not available from TCP such as multicast and broadcast delivery. UDP is similar to a mobile text message (SMS) were you send the same message to one person, many people or all on the network but you never know who has received the message unless they reply. DHCP and DNS two important protocols for managing, naming and discovering sites on the Internet use UDP.

The 25x8net protocol utilises TCP for the guaranteed delivery of events and alarms with flow control.

25x8net solution requires specific IP devices or services to be available on the 25x8net network.

Figure 1 shows how a 25x8net TS connects none IP enables VE's onto an IP network (or the Internet). IP enabled VE's can connected directly to the Internet or dial up to an Internet POP.

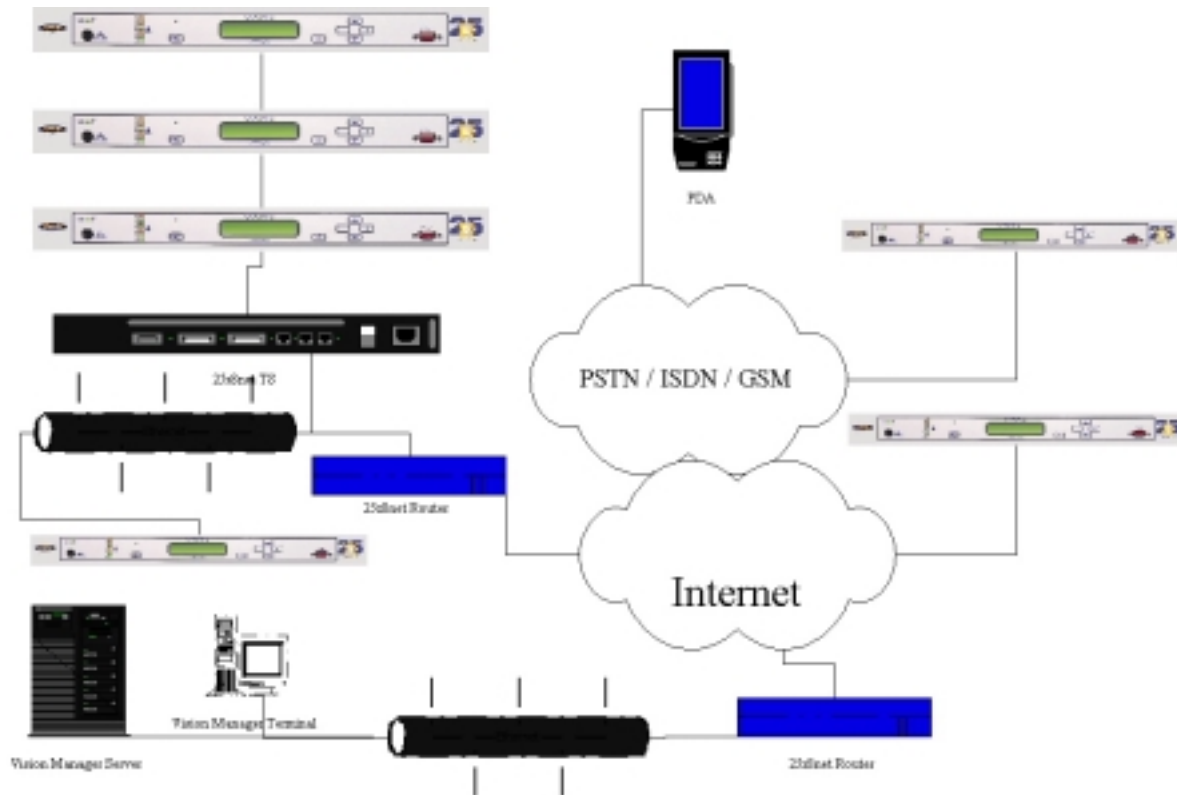


Figure 1: Multiple 25x8net locations connected via the Internet

REMS 25x8net TS

Using 25x8net TS devices is the simplest way to connect existing Virtual Engineers (VE's) to an IP network. Each 25x8net TS requires a table of all peer 25x8net TS and 25x8net routers, resulting in a small amount of manual programming (maintaining the tables) that needs to be completed in all 25x8net TS each time the configuration changes by adding or removing locations. Another concern is the addition of a single VE to a 25x8net solution via an IP network would require either the VE itself provides the IP service or the addition of a 25x8net TS that provides the IP service.



25x8net specifies an IP Terminal Server (25x8net TS) or IP Packet-Assembler-Disassembler (25x8net PAD) to be placed on every 25x8net location that is to be connected over an IP network to another 25x8net location where the VE's are not IP enabled. The 25x8net TS or 25x8net PAD does not need to be a physically distinct device and its services can be part of a device that carries other traffic within a network such as billing, office automation, email or management traffic. This device is known as the 25x8net TS.

The 25x8net TS or 25x8 PAD performs an 25x8net concentrator function with a few differences. When the 25x8net TS receives a message from a locally attached VE or other device it puts the message into a IP VPN packet (encrypted and/or authenticated for strong security depending on your needs) with the IP address of the destination 25x8net router on the destination 25x8net site and sends the packet over the IP network. The receiving 25x8net router removes the IP VPN information and transmits the message to the local 25x8net device.

REMS 25x8net Router

The 25x8net routers send messages directly to a known IP of another 25x8net router, the only broadcast traffic is that generated by the dynamic routing protocols within the IP network (OSPF, RIP or MPLS). In fact, the use of broadcasting IP messages is not usually allowed on IP networks due to the increased traffic and processing it introduces other than routing updates.

The 25x8net devices originating and receiving messages are unaware of the IP network and communicate with each other as if the 25x8net TS and 25x8net routers were transparent to the actual communication.



REMS 25x8net Design Consideration

Multicasting uses a special kind of broadcast that uses a reserved IP address range, and only devices set-up to receive Multicast messages will receive and process the messages. IP Multicast messages are in the range from 224.0.0.0 through 239.255.255.255. Some Network Administrators might prohibit multicasting.

Care must be taken to reduce the use of broadcast messages; where they cannot be minimised, the use of subnets should be examined.

REMS 25x8net Internet Connections

Once REMS have helped you define the necessary 25x8net devices, REMS will help you connect your 25x8net locations to the Internet. If you are using an existing office or building network for your 25x8net system, you may already have an Internet connection from the network. Consult REMS network specialists and engineer advice team before adding another connection.

There are two components to the Internet connection that you need to purchase on a monthly basis: 1) the Internet Service Provider (ISP) and 2) the actual data line connection from your location to the ISP provided by your local carrier (ILEC or CLEC). There are several different connection options to connect your site to the Internet. The main difference between the methods is the bandwidth (which equates to speed) of the connection. The more bandwidth available, the higher the cost of the connection. REMS can advise how much bandwidth you will require based upon your current and future expectations.



The most popular connection methods to the Internet are shown in Table 1. The estimated cost includes both the monthly carrier charge and the ISP. Initial installation charges are usually equivalent to about 1 month of service. DSL/ADSL bandwidth rates are listed as maximum and are not a guaranteed full time bandwidth, while Leased Line connections are usually guaranteed rates.

Connection Type	Bandwidth	Estimated Cost/Month
E1 Leased Line	2.048Mbit/s.	£3,000 - £5,000
64k Leased Line	64kbit/s.	£1,000 - £1,500
DSL or ADSL	256kbit/s – 2.048Mbit/s.	£40 - £300
Cable Modem	256kbit/s – 2.048Mbit/s.	£40 - £300
ISDN	64kbit/s – 128kbit/s	£30 - £60
Dialup PSTN Modem	28.8kbit/s – 56kbit/s	£0 - £30
Dialup GSM Modem	9.6kbit/s – 48kbit/s	£0 - £60

Table 1: Comparison of Internet connections



REMS 25x8net Internet Connections Sizing

Typically, for a small network of 10 to 50 workstations requiring access to the Internet for browsing and email, an ISDN connection will suffice. For 50 to 100 workstations, again only requiring Internet browsing access and email, DSL/ADSL will suffice. If your Internet connection is only for 25x8net traffic and not for Internet browsing, most systems will use ISDN or DSL/ADSL connection. For very small systems possibly a Dialup connection will be sufficient. If however, you will be connecting VE's, 50 or more Vision Manager workstations, 25x8net TS's, 25x8net Routers and a web site, then you will probably need an E1 line. REMS can check your local Internet Service Providers (ISP) for what type of connections they provide with their service and also contact your local carrier to see what types of lines will be available for your specific location. Not all locations in a 25x8net have the same services available.

If you install is a new connection to the Internet it is advisable to introduce protection from hackers with a firewall. 25x8net routers used to connect to the Internet include rudimentary firewalls and should be sufficient for environment management and control systems. However, if the network will also connect to office workstations and servers should invest in sophisticated firewall. REMS are able to provide recommendations specific to your needs if you require advice.

REMS 25x8net Solution

Connecting your 25x8net solution to the Internet will provide for ease of access from anywhere in the world via a simple Internet Browser. Freeing your company from purchasing expensive, application specific workstation software to access the system for simple tasks such as changing temperature set points or revising thresholds.



REMS are introducing browser based access products. This is accomplished by the introduction of 25x8net Web Server devices. Simply a Web Server at the core of the 25x8net, programmed by the REMS with graphical displays of your location, infrastructure or building and a database of 25x8net objects. From an Internet Browser, PDA, Mobile telephone, Laptop or workstation with an Internet connection (or intranet scenarios) you will type in the URL of your 25x8net solution e.g. www.25x8.net/offices2go and be able to view REMS performance, configuration and fault reports, temperatures, set points, alarms and everything else in your solution that your password permits access to (to command object values, the Web Server will need to download Java applets or other executables to your browser that will provide a more sophisticated interface). Which features of your 25x8net solution you will be able to view and command will depend on your requirements.

Even though 25x8net is an open architecture providing you freedom of choice from equipment manufacturers, it is not a human interface specification and the web server can be tailored by REMS to your specific requirements. Every 25x8net Vision Manager Workstation can be customised to create any interface you want, with wizards, shortcuts and helpful dialogs to squeeze the most features out of the 25x8net solution. Web Server features can vary, some will be a viewer only, while others will attempt to provide more of the features of the REMS Vision Manager Workstations. Since the Vision Manager workstations provide 25x8net functions, there will be less of a need to provide all features of the vision manager workstation via a browser, however it could be done.

Another reason for connecting your 25x8net solution to the Internet will be for REMS to provide you with data processing services that Vision Manager Workstations are not capable of. REMS provide Energy Reporting, Benchmarking, Efficiency and Revolutionary services for many different brands of proprietary environment management and building control systems. The REMS Energy Reporting and Benchmarking solution connects to multiple sites, gathers Energy and Water usage information and then creates Web reports for your consideration. Using an Internet connection ensures REMS deliver this service in real-time if required. Enabling efficient energy and water purchasing through the deregulated energy and water industries.



25x8net and Internet/Intranet connections facilitate the REMS Web based trouble call centres. Tenants of a 25x8net location can check on and/or modify the operation of HVAC, Lighting, Security and all Environment Services directly, bypassing (where allowed) building maintenance and management. The age of the virtual thermostat and light switch is here. The same Web site (www.25x8.net) includes forms for reporting troubles and requests for service to a regional dispatch/trouble shooting centre. This works seamlessly with the simple Web browsers that we all already have on our PC's. Proprietary expensive software for the client is becoming a thing of the past.

The standard that 25x8net provides, built by REMS Professional Services and Solutions, combined with Internet technology has set the platform for an explosion of new and exciting services.

References

25x8.net specification is available from REMS. See <http://www.25x8.org/>.

The REMS International solution can Monitor, Control and Manage all of the components regardless of manufacturer.

The Guild of Travel and Tourism approve REMS 25x8 Solutions and Advisory Services.

Further information can be obtained from REMS International, REMS House, 16, Ramsbury Road, St. Albans, Hertfordshire. AL1 1SL. (Telephone: 01727 848800; Email: VE.info@25x8.net).