

Hypercable Internet

Réseau de Broadcast Terrestre Interactif

DVB-MC/S ETSi EN 300-748

Ethernet IP-TV encapsulé en DVB-S MPEG

GIGAPLEX 3.6 GHZ à 12.7 GHz



*Conception & Réalisation Hypercable MVDDS
Hybride, Broadcast HDTV et IP Duplex
Hypercable est le seul vecteur radio Broadcast
en mesure de diffuser la HDTV en relief*

MAINDATA DVB/ip GW & Hybrid-Net[®] over HYPERCABLE MVDS System

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1 Hybrid-Net[®]

Hybrid-Net module offers the integration of the DVB/IP GW with the management of the asymmetric Internet with classic return path and Hypercable download path.

1.1 Hybrid-Net Overview

Hybrid-Net is a combination of two communication systems into one that functions effectively with the asymmetry of data flow volumes in both forward and backward directions within an IP network.

There are several important aspects of such Asymmetric Internet:

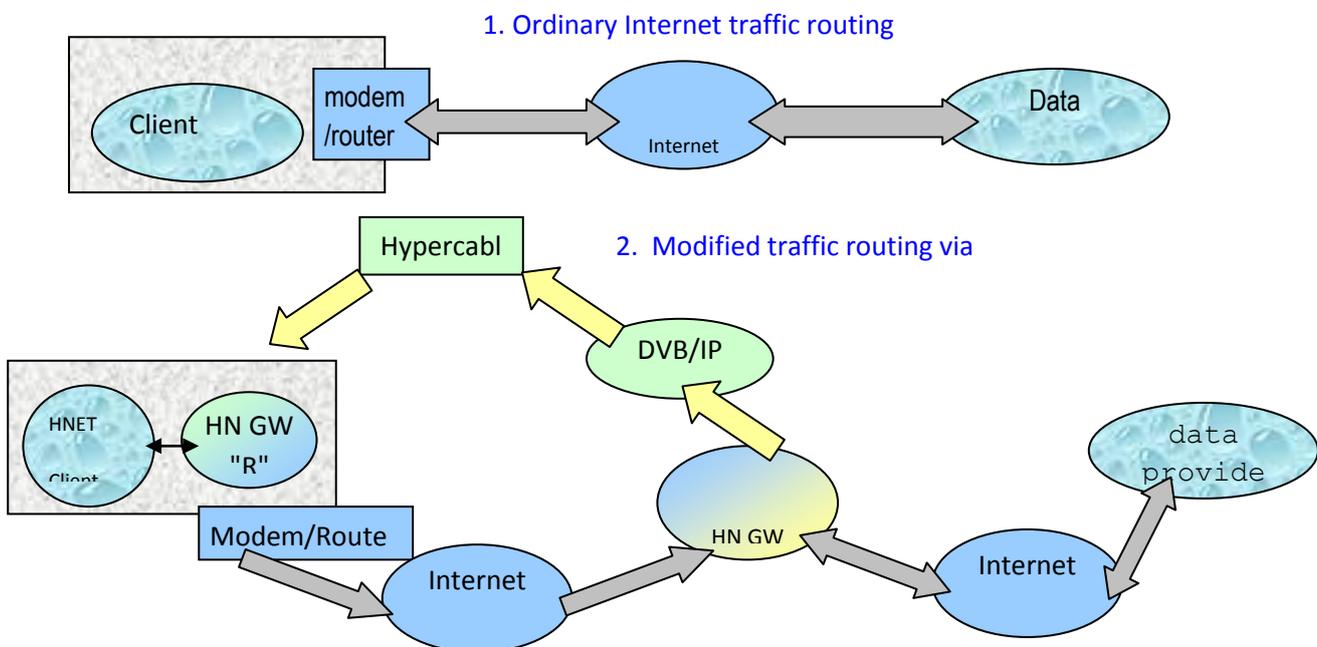
- a) ROUTING (transparency)
- b) PERFORMANCE (SPEED) CONSIDERATIONS
- c) HOW DOES HYBRID-NET WORK

1.1.1 Routing

In normal Internet communication, Internet selects the route how the packets are transmitted from Source to destination address via the chain of routers. In case of Hybrid-Net there is a need to reroute the answers from Internet to Hypercable end-user in such a way it go via a router connected to Hybrid-Net gateway "S" at Hypercable up-link center. This can be reached by variety of solutions.

These solutions differ by IP protocols/services support, by different demand of end-user to set-up each application individually or by a need to modify configuration by local ISP (in some systems switch off protection against spoofing in a sense of filtering strange IP source addresses).

DVB/IP gateway always has to contain a mechanism for addressing IP packets to end-user or to LAN gateway.



Hybrid-Net provides the unique solution we call "RAW IP TRANSPARENT" supporting ALL IP based protocols and services. It enables to use any of local ISP without any need for switching its protection against spoofing (filtering out strange source IP addresses), with creation of mapping tables in conjunction with DVB/IP gateway (mapping IP addresses to proper MAC address of DVB-S MVDS receiver (or DVB-T) with full support for single user as well as for LAN users and control over access Hypercable MVDS services for each Hybrid-Net end-user.

It requires reserving MWS_IP address for each individual Hybrid-Net user. MWS_IP address is IP address from a net @ MVDS Network.

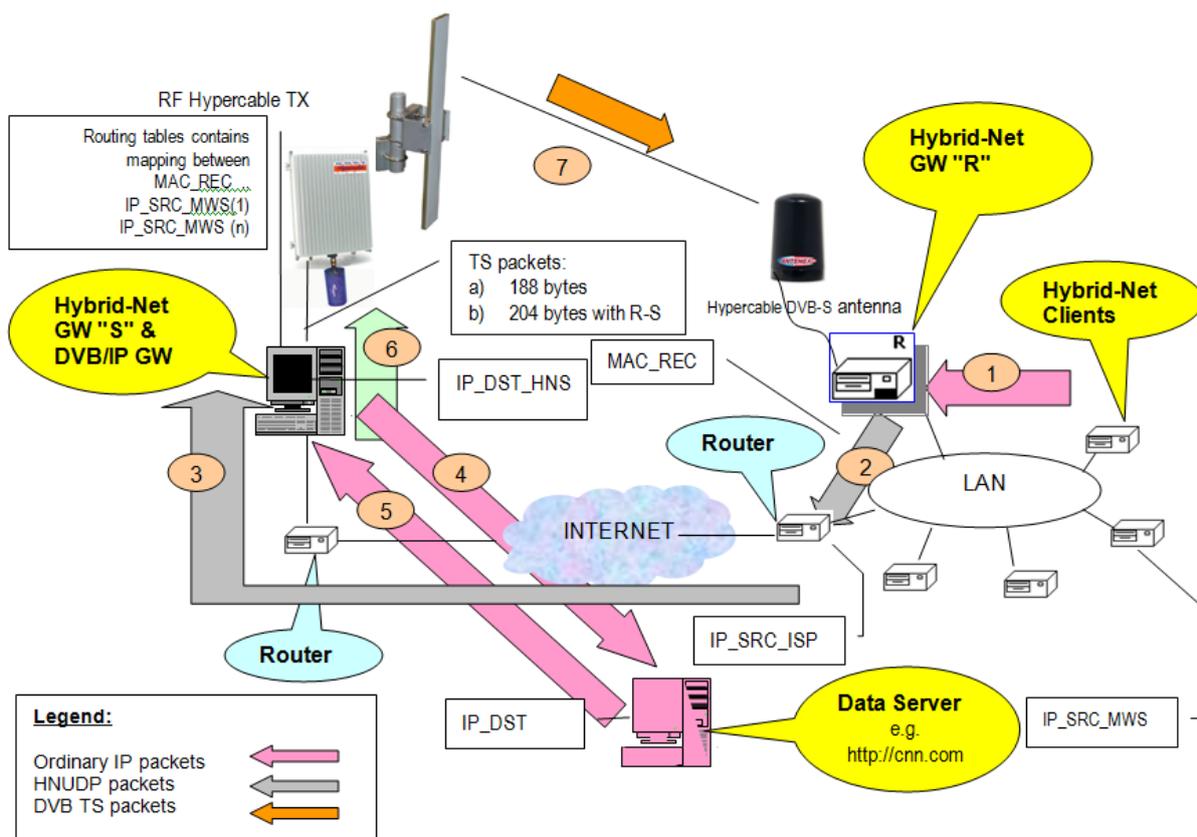
Hybrid Net's important feature is its **full IP protocol support - so it is transparent**. In this respect Hybrid-Net differs from for example Proxy based solution supporting typically only http, or ftp protocols (so for example e-mail is not supported as well as special protocols). Better solution is deploying of gateway with NAT system.

Hybrid Net GW "R" redirects receiver (client) IP requests coming from a LAN to the Hybrid-Net GW "S", what then performs the actual IP communication (as a rule faster than the receiver itself would do it,) sending the results via the Hypercable MVDS back to the receiver. The communication speed normally increases because the slowest part of the communication chain (connection receiver – IP provider) is replaced by the faster Hypercable MVDS connection.

1.1.2 How does the Hybrid-Net work

Hybrid-Net terminology used:

- **Hybrid-Net CLIENT** (Hybrid-Net Client):
Host (end-user) that can use Hybrid-Net service. One of the reserved IP addresses has to be set on that host. No special software needs to be installed.
- **Hybrid-Net Gateway "R"** ("R" for receiver) (HN GW "R") :
Host where Hybrid-Net Receiver driver is installed. It should be connected to Internet. It acts as a gateway for Hybrid-Net Clients.
- **Hybrid-Net Gateway "S"**("S" for Send) (HN GW "S") :
Host where Hybrid-Net Sender driver is installed.
- **Hybrid-Net NAT**
NAT translates IP_SRC_SAT address to Legal IP address from the Net of Hypercable up-link and sends this IP packet to Data Server (optional configuration without legal client IP addresses)
- **Data Server:**
Host where Hybrid-Net Clients make connection and transfers data from mainly. It can be for instance HTTP server, FTP server, Telnet server or host running any software that supports IP communication.
- **IP_SRC_SAT**
IP address from address range reserved for Hybrid Net Clients. These reserved addresses have to be routed to HN GW "S".
- **IP_DST**
Data Server destination IP address. It is IP address of the server that Hybrid Net client wants to access.
- **IP_SRC_ISP**
Source IP address assigned by ISP after client connects to it.
- **IP_DST_HNS**
IP address of the HN GW "S" set as destination address.
- **MAC_REC**
MAC address of DVB receiver
- **HNUDP**
Proprietary tunneling protocol based on UDP protocol, port 21000



Components functionality:

- **Hybrid-Net Gateway "R"(HN GW "R"):**

On the path from Hybrid-Net Client to Data Server – HN GW “R” is used to modify the way the packets travel from Hybrid-Net Clients to Data Server so that all packets get to HN GW “S”. To ensure this, IP packets from Hybrid-Net Clients are converted to HNUDP packets the way so that original packet can be later reconstructed. Destination IP address of the created HNUDP packet is set to IP address of the HN GW “S”. On the path from Data Server to Hybrid-Net Client- IP packets from Data Server to Hybrid-Net Client are transferred via Hypercable and are received at the HN GW “R”. Then they are sent to Hybrid-Net Client via LAN.

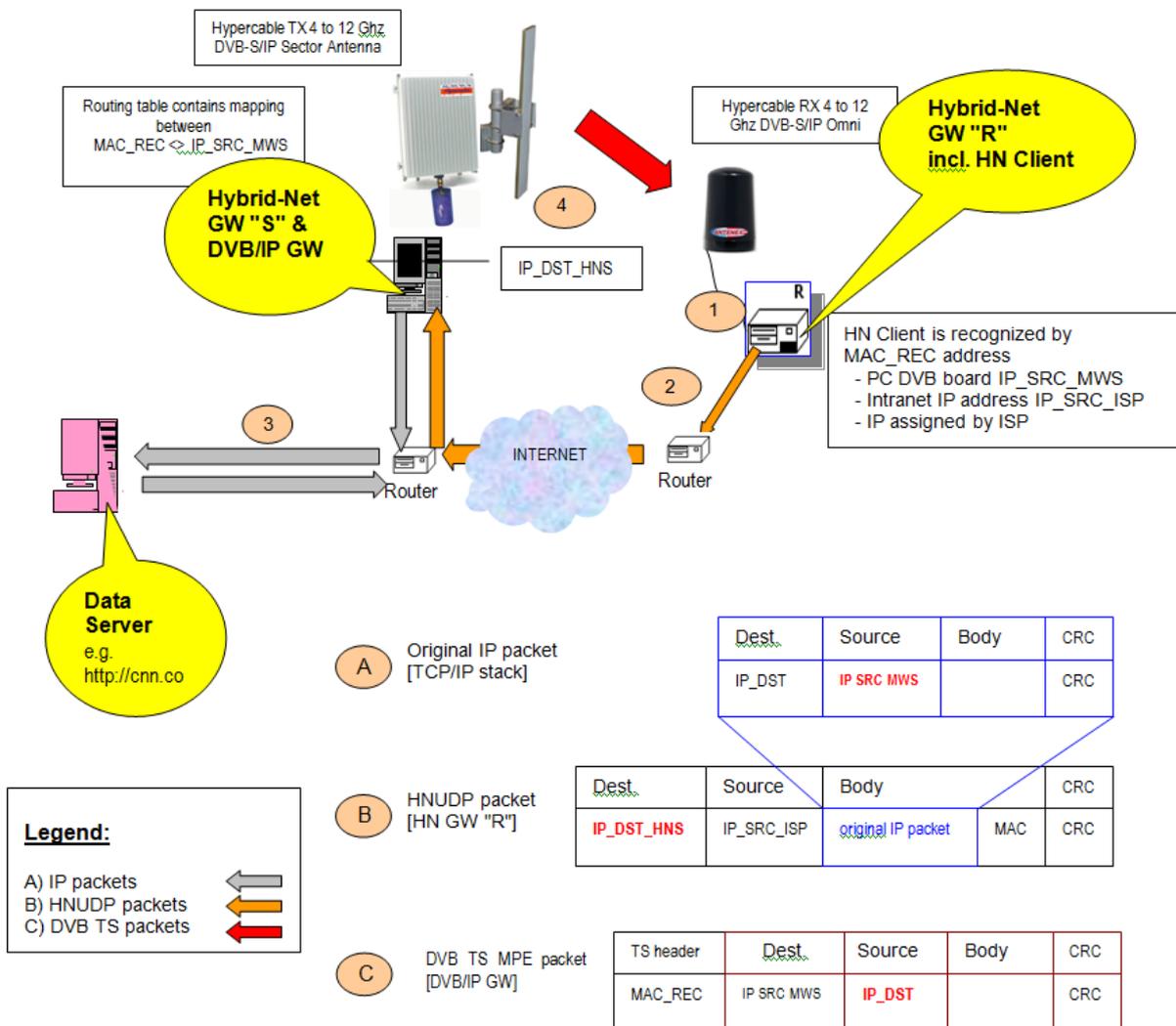
- **Hybrid-Net Gateway "S" (HN GW "S"):**

On the path from Hybrid-Net Client to Data Server - after HNUDP packets from HN GW “R” are received at the HN GW “S”, original packets are reconstructed and sent to Data Server. On the path from Data Server to Hybrid-Net Client– no functionality is used on this way. Response IP packets from Data Server have to be routed directly to DVB/IP gateway. Via Hypercable they get to HN GW “R”. From there they are sent to Hybrid-Net Client via LAN.

HN GW “S” is maintaining **ROUTING TABLES** – a mapping between MAC_REC address of DVB receiver and IP_SRC_SAT IP addresses of Hybrid-Net clients (several IP_SRC_SAT can be routed via same MAC_REC). This table is being maintained by Hybrid-Net GW "S" and further provided to DVB/IP Gateway.

1.1.3 IP-based Tunneling

Hybrid-Net Gateway "S" is a point where all the IP traffic from/to clients go through. Hybrid-Net software on a client side manages the routes, tunnels all the IP traffic and sends it to the Hybrid-Net Gateway "S" in form of HNUDP packets. Here the tunneling is removed and original IP packets are sent to their destination. Source IP address of these packets is the IP of the client's Hybrid-Net adapter (IP_SRC_SAT). Since this IP is a legal IP routed to a service provider answer from the data provider goes to a Hybrid-Net Gateway "S". It is captured by the Hybrid-Net Gateway "S" network driver and sent through a DVB/IP Gateway. Client application gets the IP packets from his DVB Hypercable board either directly using board's network driver (MPE solution) or using MAINDATA DVB Receiver software in cooperation with the Hybrid-Net client network driver (Piping solution).



1.2 Hybrid-Net configurations

There are 2 groups of possible scenarios possible.

- 1) User with **Legal IP** addresses
This configuration is described in above chapter. Major practical disadvantage is lack of legal IP addresses in IPV4.
- 2) Users with **Intranet IP** addresses
 - i. Router based NAT
 - ii. PC based NAT (linux) 2 legal IP address
 - iii. PC based NAT (linux) with IP forwarder 1 legal IP address

Hybrid-Net can be configured in such a way that some Hypercable users are addressed via Intranet addresses and another via Legal IP addresses.

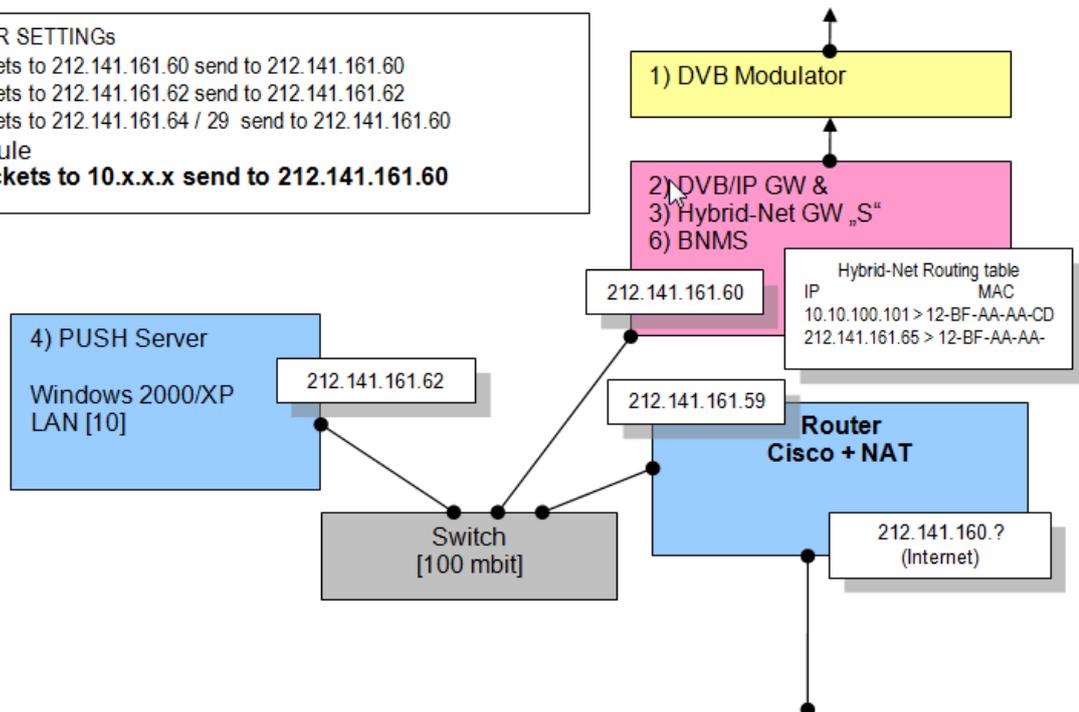
1.2.1 Hybrid-Net with NAT configuration – Router based NAT

Example of Legal IP addresses allocation

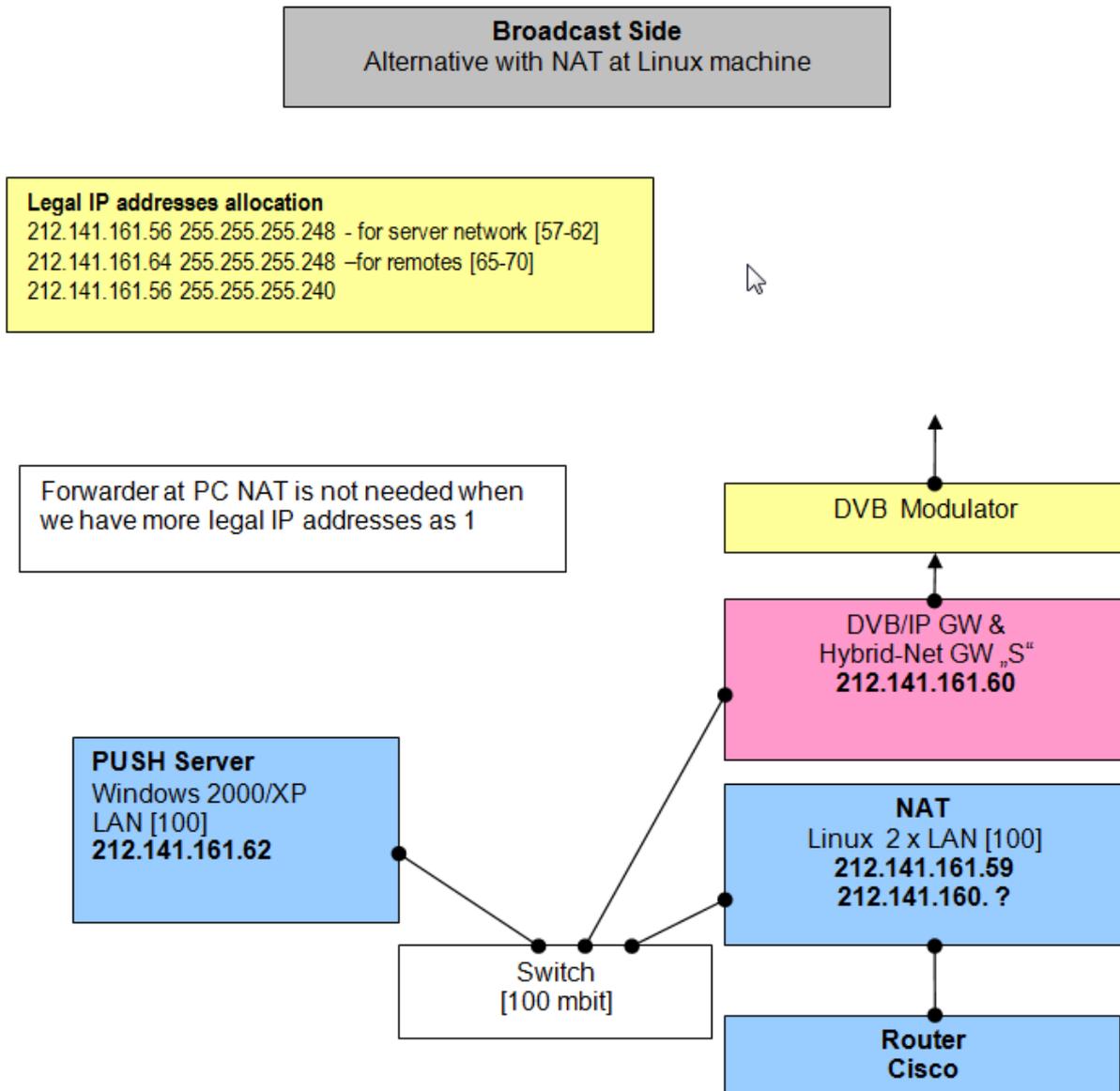
212.141.161.56 255.255.255.248 - for server network [57-62]
212.141.161.64 255.255.255.248 – for remotes [65-70]
212.141.161.56 255.255.255.240

ROUTER SETTINGS

All packets to 212.141.161.60 send to 212.141.161.60
All packets to 212.141.161.62 send to 212.141.161.62
All packets to 212.141.161.64 / 29 send to 212.141.161.60
NAT Rule
All packets to 10.x.x.x send to 212.141.161.60



1.2.2 Hybrid-Net with NAT configuration – PC Based NAT



2 Hypercable Gigaplex® transmitters

- ◆ Please refer to separate leaflets for Hypercable MWS MVDS systems