1 of 100 DOCUMENTS

Network World

March 1, 1999

SECTION: TECH; Pg. 35

LENGTH: 806 words

HEADLINE: Cable modems deliver fast 'Net access

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BODY:

Cable operators today are deploying cable modem technology that lets subscribers access the Internet over the same wires that deliver television signals at speeds 100 times faster than standard V.90 telephone modem technology - and without waiting for a dial-up connection.In 1996, several cable operators commissioned the development of the Data Over Cable Service Interface Specification (DOCSIS) with the objective of establishing a single specification for equipment. DOCSIS covers all operational elements used in delivering data service to end users, including service provisioning, security, data interfaces and radio frequency interfaces (RFI). RFIs are the keys to cable equipment interoperability.The architecture of the DOCSIS RFI consists of three major components: the Cable Modem Termination System (CMTS), installed in the head end, or main facility, of the cable operator; the hybrid fiber coaxial (HFC) cable network wiring infrastructure; and the cable modem, installed at customer premises.

In order for cable operators to deploy two-way data services, they must first upgrade their wiring infrastructure from one-way to two-way. Cable operators also install fiber optic cables from the head end to a fiber distribution node. These nodes distribute the signals to 500 to 2,000 homes, depending on configuration.By using fiber optic cabling in the trunk section of a cable network, cable operators can reduce the number of amplifiers needed to complete a circuit between the head end and the end user, thus greatly increasing reliability and signal quality.Cable modems are used to connect high-speed data pipes terminated in the cable operator's head end to the HFC infrastructure. The data connection is an IEEE 802.3-compliant 10M or 100M bit/ sec Ethernet port on a router. The router can be connected to the Internet via a high-speed (T-1 or faster) WAN interface.Cable modems translate Ethernet packets into radio frequency signals that are mapped into an unused 6-MHz television channel slot and broadcast to all the homes by the HFC node. The signal is received by any cable modems on the local LAN segment. It can travel anywhere in the downstream cable spectrum, from 91 MHz to 857 MHz.The downstream throughput of the cable modem can be 27M bit/sec or 40M bit/sec, depending on the quality of the HFC channel from the head end to the subscriber units.The cable modem at the cable operator's facility receives signals from all the downstream cable modems on a different set of upstream frequencies in the 5-MHz to 42-MHz band. The throughput of this channel is variable, based on the quality of the upstream channel. Throughput varies from 160K bit/sec to 10M bit/sec. The DOCSIS architecture provides for one downstream channel to send signals to all cable modems, which may broadcast return signals on several different, nonoverlapping frequencies.This allows the total throughput of the return channel to be increased by the number of

independent return channels used. For example, the total maximum return channel bandwidth for four 10M bit/sec independent upstream channels would be 40M bit/sec.

The cable modem translates the downstream radio frequencies into packets, determines if the packets are destined for that particular cable modem and sends the packets along to a computer or a LAN on the client side of the cable modem.This network connection is currently specified to be 10/100M bit/sec Ethernet, but alternative interfaces, such as Universal Serial Bus and PCI, are being considered for lower-cost applications. The cable modem also receives packets from clients on the LAN and translates packets onto the upstream frequency to which they have been assigned.

A cable modem and its media access control protocol use contention mode and time-division multiplexing (TDM) mode. The cable modem allocates a certain portion of time for contention mode or TDM mode, depending on how the cable operator configures the network. Contention mode works well under a light load, providing low delay and high throughput when needed. TDM mode works well under a heavy load or in cases in which guaranteed throughput is desirable. The drawback of TDM is that the peak throughput is limited to the amount of bandwidth allocated to the cable modem.In addition to the original DOCSIS specification, conventionally known as DOCSIS 1.0, upgraded versions of the specification are under development. These add features such as quality-of-service capabilities, which will enable the deployment of packet telephony across the cable infrastructure.

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LOAD-DATE: March 2, 1999