VCom® Inc.

www.vcom.com

Advanced Broadband Products

DESCRIPTION

2.5 GHz MMDS/MDS BROADBAND WIRELESS INTERNET NETWORK

BWIN™ BASED ON DOCSIS™

150 Cardinal Crescent
Saskatoon SK
Canada S7L 6H7
306 955 7075

4210 Commerce Circle
Victoria BC
Canada V8Z 6N6
250 881 1982

1 EXECUTIVE SUMMARY

VCom Inc. is pleased to present you with this summary description of a typical Broadband Wireless Internet Network based on proven Data over Cable Service Interface Specifications (DOCSIS™) technology. Our Broadband Wireless Internet Network, ***BWIN™ BASED ON DOCSIS™*** proposal marries DOCSIS Cable Modem Termination Systems (CMTS) with VCom radio frequency (RF) technology. Commercial deployments have demonstrated that the ***BWIN™ BASED ON DOCSIS™*** approach achieves high performance and reliability in a cost-effective fashion.

VCom designs and supplies leading edge broadband access transmission equipment, primarily for broadband fixed wireless networks and data over cable. Service providers use VCom's products to deliver high-speed data, Internet, video on demand (VOD) and other bandwidth intensive services to residential and business subscribers. VCom's products are designed to allow service providers to rapidly and cost-effectively bridge the last mile, by overcoming the bottleneck resulting from insufficient bandwidth existing in legacy last mile infrastructures. The Company's customer base includes original equipment manufacturers (OEM), system integrators and leading multiple system operators (MSO) and other service providers. Please find details at http://www.vcom.com/.

The key feature of VCom's ***BWIN™ BASED ON DOCSIS™*** solution is that high volumes of standard DOCSIS™ modems are being produced by a large number of manufacturers; the economies of scale created by this situation results in inexpensive, feature rich subscriber equipment. The basic most cost-effective network is designed with only a limited amount of redundancy. Options are available that provide full 1 to 1 redundancy for all CMTS and base station RF equipment.

2 SYSTEM OVERVIEW

The architecture of the VCom ***BWIN™ BASED ON DOCSIS™*** system utilizes standard DOCSIS™ cable equipment as the network elements. Complementing this standard DOCSIS™ setup is VCom RF hardware designed to translate specific sub-bands of the DOCSIS™ cable frequency plan into the frequency allocations of each specific customer.

Key characteristics of the system are as follows:

- 27 Mbps time division multiplexed downstream using 64QAM in a 6 MHz channel, or 36 Mbps in an 8 MHz channel
- 256 Kbps to 10 Mbps time division multiple access burst upstream using QPSK or 16QAM in 200 kHz to 3.2 MHz bandwidths
- near line of sight performance
- systems already operating at 600 MHz, 700 MHz, 1.9 GHz, 2.1 GHz, 2.3 GHz, 2.5 GHz, 3.5 GHz and 5.7 GHz around the world
- audible installation alignment beeper available on some models to facilitate customer self-install and avoid a truck roll
- economies of scale by reusing existing DOCSIS™ products which are now being deployed in high volume worldwide

2.1 DOCSIS Overview

DOCSIS™ is an open industry standard developed and coordinated through the efforts of cable MSOs and technology manufacturers such as Cisco, Motorola, Arris etc. and VCom under the non-profit institution, CableLabs®. DOCSIS™ technology is mature and in operation in many countries around the world as the standard for Internet access on hybrid fibre coax cable systems. A fundamental advantage of using DOCSIS™ is the wide variety of manufacturers producing cable modems and the volumes currently being deployed which translate into very cost effective subscriber equipment. Over 15 million DOCSIS™ cable modems are currently deployed worldwide with over 200,000 upstream DOCSIS™ ports. DOCSIS™ cable modem pricing is now less than US$55 in quantity.

The technology behind DOCSIS™ also lends itself very well to use as a fixed broadband wireless access mechanism. A well-developed physical layer, sophisticated media access control, and a complete network reference model provide for a commercial grade wireless system.

A quick overview of features is given below, but a more thorough discussion on the specific technical requirements for wireless can be provided as your project matures. CableLabs® website, http://www.cablemodem.com/ also contains the current DOCSIS™ specifications.

2.1.1 Physical Layer Characteristics

Key parameters of the physical layer include:

Downstream:

- 30 Mbps in a 6 MHz RF channel (standard DOCSIS™)
- 64QAM modulation
- Reed-Solomon forward error correction (~10% overhead)
- time division multiplexing
- continuous transmission

Upstream:

- variable channel bandwidths from 200 KHz to 3.2 MHz
- QPSK or 16QAM modulation
- Reed-Solomon forward error correction (~10% overhead)
- burst mode transmission
- adaptive power control over 50 dB range

2.1.2 Media Access Control (MAC)

The DOCSIS™ MAC utilizes a request/grant mechanism under central management of the CMTS. This time division multiple access (TDMA) reservation-based protocol requires each CPE to request a time to transmit data. The CMTS examines all of the incoming requests and grants a time to transmit based on a multitude of parameters including CPE data rate limitations and service priorities. A DOCSIS™ 1.1 compliant system with full QoS features is also available.

2.1.3 Security

Baseline Privacy Plus (BPI+), included as part of the DOCSIS™ protocol, provides advanced security and privacy features for both the service provider and the customer. All over-the-air communications operate with 56-bit DES encryption (or 40 bit where regulations require). Additionally, encrypted key management between the CMTS and modems requires subscriber authorization and registration to ensure reliable and secure billing for multiple server classes which prevents unauthorized access to the system. Various cable modems support end to end 3DES encryption.

2.2 RF Systems

2.2.1 Point to Multipoint Configuration

Figure 1 shows the overall system diagram for point to multipoint communication. Detailed network capacity and RF planning is necessary to determine the optimum solution for a specific customer requirement.

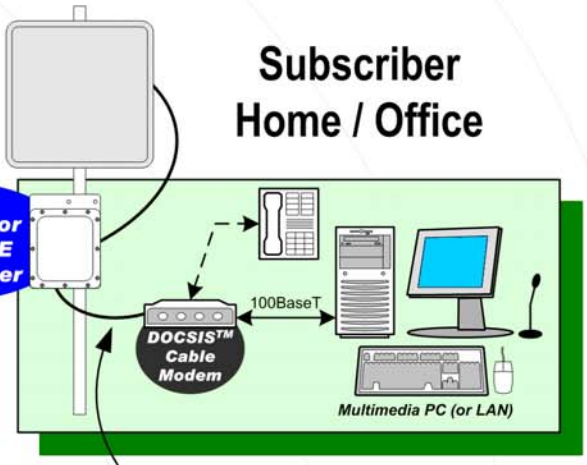
VCom® Inc.
www.vcom.com
Advanced Broadband Products
Voice: (306) 955-7075
Fax: (306) 955-9919
Email: sales@vcom.com
Web: www.vcom.com

FIGURE 1 - POINT TO MULTIPOINT SYSTEM OVERVIEW NORTH AMERICAN MDS/MMDS

Transceiver Reverse Path Output
TR2126SE → +25 dBm (at RF port)
TR2126C → +28 dBm (at RF Port)
Reach farther and capture more subscribers

Automatic Transmit RF Mute
Reduces power consumption and virtually eliminates broadband noise emissions

Compact, Very Easy to Install
Unique audible alignment beeper on some models to facilitate self-install



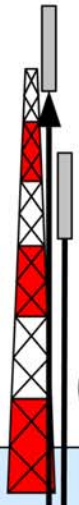
Downstream
2500 to 2686 MHz
(27 or 36 Mbps)

Upstream
2150 to 2162 MHz
(256 kbps to 10 Mbps)

DOCSIS™ cable modem frequencies

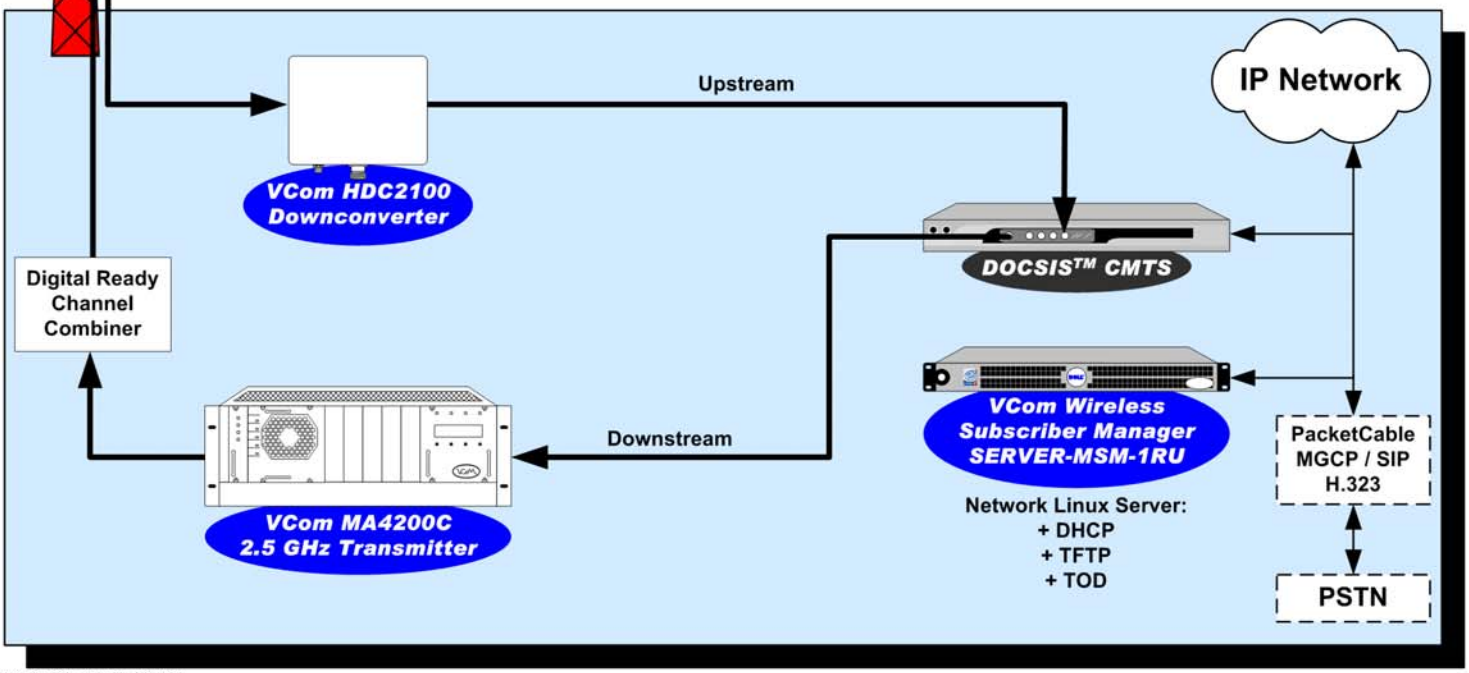
Full DOCSIS™ speeds
No limitation due to wireless link

Distances Up to 50 km
Depends on geography and tower height



Base Station

Utilizes Non-Proprietary DOCSIS™ equipment
Low cost, mature industry proven performance and quicker ROI



2.2.1.1 Base Station

Figure 2 shows a detailed diagram of a 2.5 GHz base station configured with an omnidirectional downstream and 4 sector upstream; the transport/network connection ties directly into the hub CMTS. ***BWIN™ BASED ON DOCSIS™*** capability at 2.5 GHz requires three additional VCom components to complement the CMTS at the base station (hub) site. These additional components serve to convert the standard DOCSIS™ cable frequency plan to the required 2.5 GHz frequency plan and include the following:

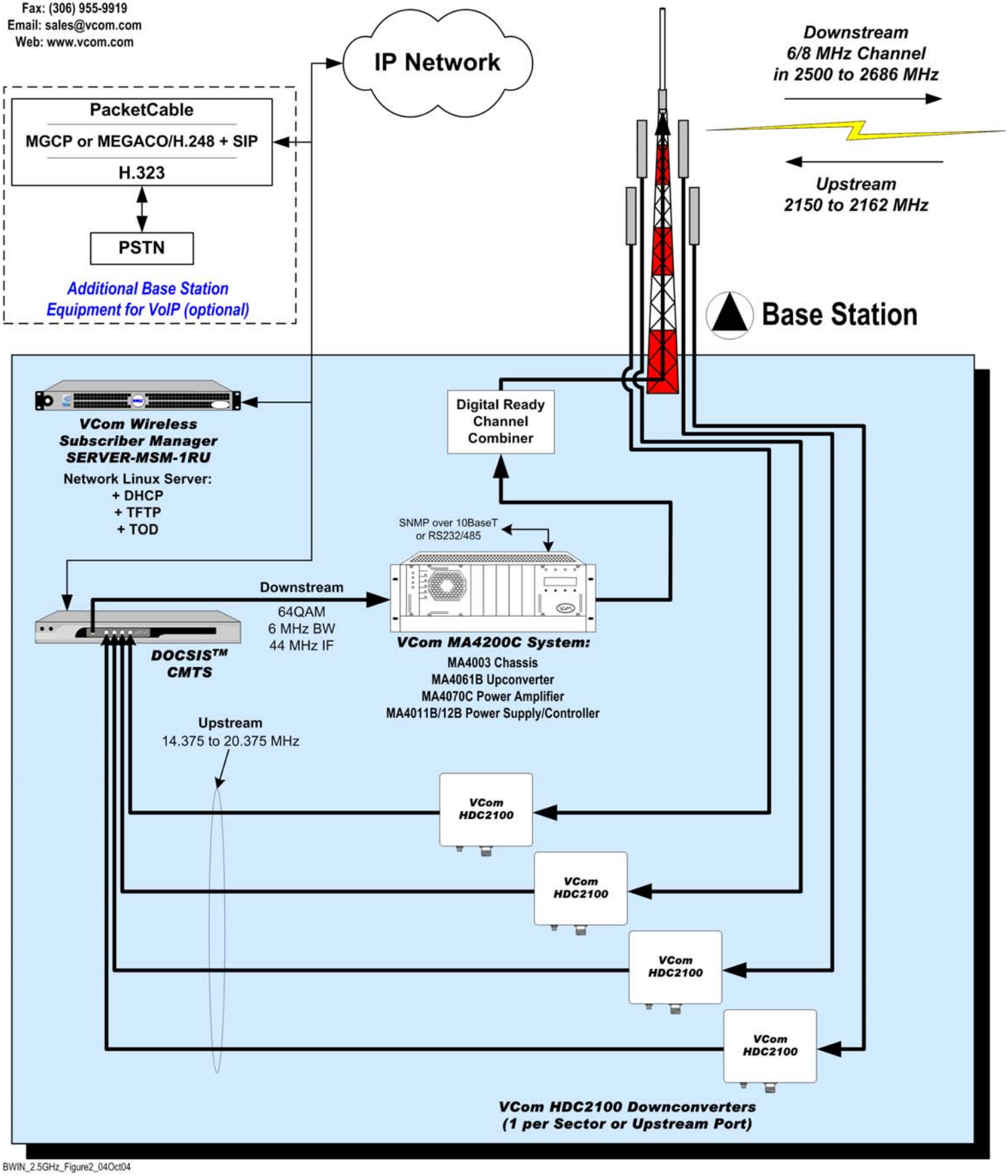
(1) MA4061B Agile Upconverter (Indoor Unit)
(2) MA4070C Power Amplifier (Indoor Unit)
(2) HDC2100 Headend Downconverter (Outdoor Unit)

Downstream subscriber traffic is time-division multiplexed and modulated by the DOCSIS CMTS into a 6 MHz (27 Mbps) downstream RF channel. This modulated signal at 44 MHz is fed into the WaveCom MA4061B upconverter for translation to any desired RF channel between the band edges. Following upconversion to the MMDS/MCS band, amplification through the WaveCom MA4070C Power Amplifier brings the total output power to a maximum of +37 dBm. A channel combiner is used to filter the output spectrum for harmonic content and also to allow for future combining of the outputs of multiple downstream channels for higher capacity. Low loss 50-ohm feeder cable runs up the tower to the omnidirectional or sectorized hub transmit antenna.

Subscribers within the main supercell are split into four 90º sectors to minimize the effect of multipath interference and increase upstream capacity. Each of these four sectors has a separate flat panel antenna and low-loss feeder cable that feeds into a VCom HDC2100 Headend Down Converter. The HDC2100 downconverts the upstream band into the 14.375 to 20.375 MHz return band required by the CMTS. The CMTS demodulates each upstream sector and routes to the appropriate network segment accordingly.

VCom® Inc.
www.vcom.com
Advanced Broadband Products
Voice: (306) 955-7075
Fax: (306) 955-9919
Email: sales@vcom.com
Web: www.vcom.com

FIGURE 2 - POINT TO MULTIPOINT BASE STATION DETAIL
NORTH AMERICAN MDS/MMDS
Omnidirectional Downstream & 4 Sector Upstream



2.2.1.2 Subscriber

Figure 3 details the configuration for a standard subscriber installation. There are two fundamental elements, each with multiple options depending on performance and feature set: the outdoor RF transceiver (TR2126C or TR2126SE) and the indoor DOCSIS™ modem.

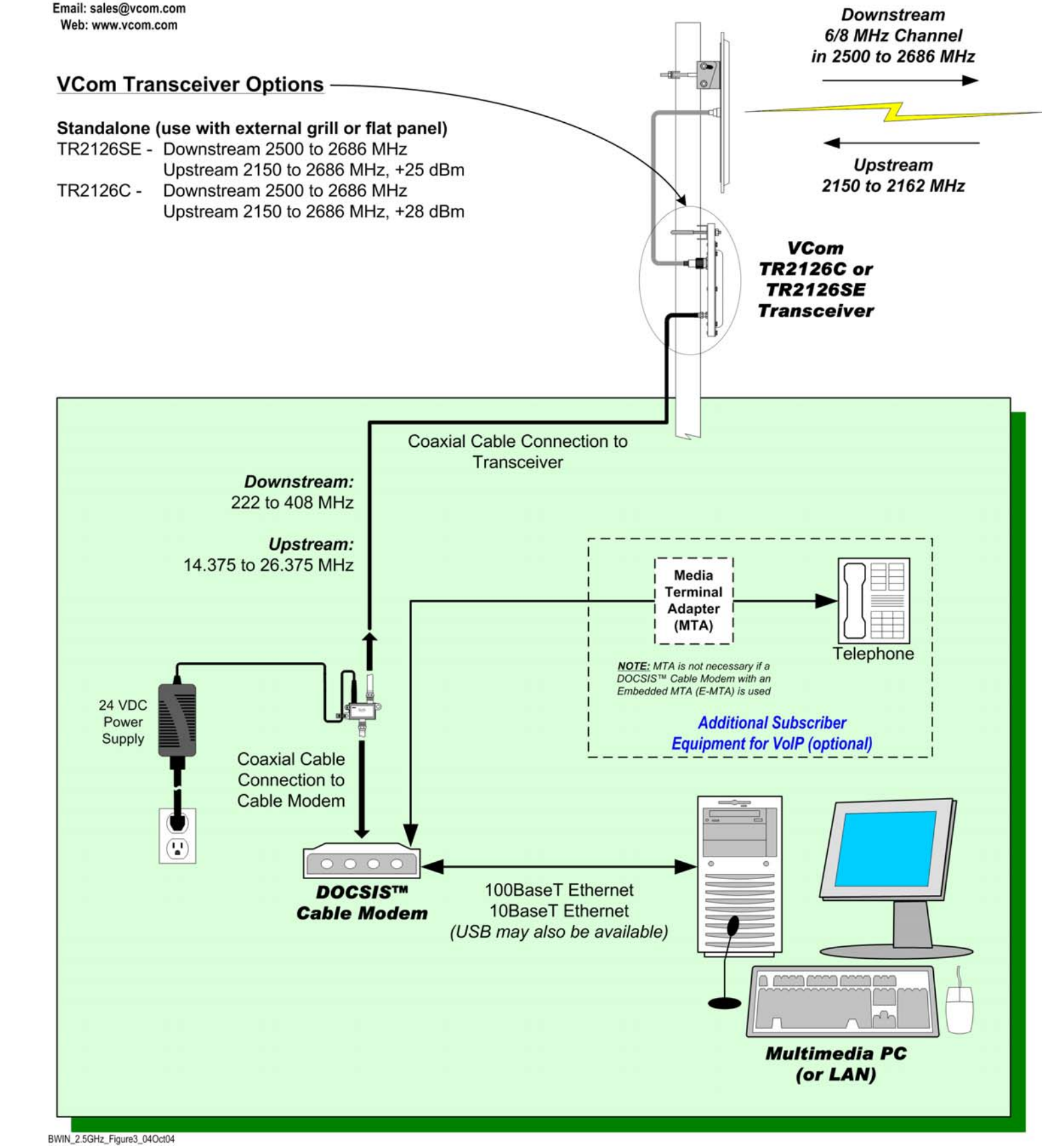
The TR2126C (or TR2126SE) subscriber transceiver serves to frequency translate and amplify the upstream and downstream signals to the appropriate cable frequencies for use by the indoor DOCSIS™ modem. A single low cost 75 ohm cable (i.e.: RG-59 or RG-6) is used to connect between the transceiver IF port and indoor AC/DC power inserter. A short jumper cable is used to connect to the DOCSIS™ modem. Recommended modems depend on the application.

VCom® Inc.
www.vcom.com
Advanced Broadband Products
Voice: (306) 955-7075
Fax: (306) 955-9919
Email: sales@vcom.com
Web: www.vcom.com

FIGURE 3 - POINT TO MULTIPOINT SUBSCRIBER DETAIL
NORTH AMERICAN MDS/MMDS
Subscriber Home/Office

VCom Transceiver Options

Standalone (use with external grill or flat panel)
TR2126SE - Downstream 2500 to 2686 MHz
Upstream 2150 to 2686 MHz, +25 dBm
TR2126C - Downstream 2500 to 2686 MHz
Upstream 2150 to 2686 MHz, +28 dBm



2.3 Element and Network Management

All network and RF elements, with the exception of the subscriber transceivers are fully visible on the network when using a VCom SERVER. VCom's SERVER is a Linux based web-server configured with VCom's Microwave History Manager (MHM) software. The MHM software offers basic logging and display of cable modem statistics.

VCom's optional Microwave Subscriber Manager (MSM) software offers DHCP, TFTP, customer database, individual control of cable modems, and latitude/longitude mapping support functions in addition to the basic functions available in MHM.

3 Ongoing Field Trial

VCom now has 33 different transceiver designs covering frequency bands from 500 MHz to 6 GHz and has sold thousands of CPE units globally. VCom's confidence in these products has lead to a launched a service provisioning (WISP) subsidiary under the name YourLINK (http://www.yourlink.ca/) and currently operates in Saskatoon, SK Canada.

References to customers with operational systems on 4 continents are available on request. VCom would be pleased to demonstrate this system and to put in place any particular tests or equipment configurations to demonstrate the performance and manageability of the system.

For more information contact:

VCom Inc.

150 Cardinal Crescent
Saskatoon SK
Canada S7L 6H7
306 955 7075

4210 Commerce Circle
Victoria BC
Canada V8Z 6N6
250 881 1982

e-mail: sales@vcom.com
http://www.vcom.com