COMCAST TECHNOLOGY SOLUTIONS

Managed Terrestrial Distribution Launch Document

Effective as of: May 9th, 2023

Contents:

Managed Distribution Customer Portal: 800-426-7790 ext. 2

MSD/MTD Customer Portal

Purpose:

- A system survey must be completed by the Customer and submitted to Comcast Technology Solutions before Managed Terrestrial Distribution signals can be provided.
- Return of this document to Comcast Technology Solutions confirms the location's intention to launch Managed Terrestrial Distribution services.

Instructions:

- Complete the following document as fully as possible.
- When completed, please e-mail document to your HITS Sales Representatives:
    - James Toburen and Rachel Vanderploeg.

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System Site Survey

Company Information

MSO/Company Name:	Click or tap here to enter text.
Survey Completed By:	Click or tap here to enter text.
Survey Completed Date:	Click or tap here to enter text.
Launch Date:	Click or tap to enter a date.

General Information

System Information

System Name	Click or tap here to enter text.				
Street Address	Click or tap here to enter text.				
City		State		Zip	
Phone Number	Click or tap here to enter text.				

Shipping Information

Headend Name	Click or tap here to enter text.				
Street Address	Click or tap here to enter text.				
City		State		Zip	
Phone Number	Click or tap here to enter text.				
ATTN To	Click or tap here to enter text.				

Installation Address

(if different from System Information or Shipping Information)

Headend Name	Click or tap here to enter text.				
Street Address	Click or tap here to enter text.				
City		State		Zip	
Phone Number	Click or tap here to enter text.				

Service Migration Strategy

Briefly describe what your plans are for future service delivery- this information will be used to determine hardware and network sizing. Please communicate:

- Expected number of HD/SD services at launch
- Expected number of HD/SD services in 6-12 months

Click or tap here to enter text.

Contacts

Primary Site Contact

Name	Click or tap here to enter text.
Phone	Click or tap here to enter text.
Mobile	Click or tap here to enter text.
Email	Click or tap here to enter text.

Backup Site Contact

Name	Click or tap here to enter text.
Phone	Click or tap here to enter text.
Mobile	Click or tap here to enter text.
Email	Click or tap here to enter text.

Headend Technical Information

Power: AC or DC? NOTE: For DC power-compatible equipment, there may be additional costs to replace the default AC power supplies.	Choose an item.
Cooling: HAC, CAC, or Neither?	Choose an item.
Does your system currently have an Ad Insertion solution implemented?	Choose an item.
For source redundancy, which APEX Gige ports will your system use for the MTD source feeds? NOTE: MTD requires a pair of Gige ports.	Choose an item.

VPN Information

Systems utilizing Managed Terrestrial Distribution signals require certain headend equipment for digital video delivery. Two (2) VPN devices will be provided by Comcast Technology Solutions. Any other Headend Equipment is to be ordered directly by Customer, at Customers' sole expense, via your preferred Headend Equipment vendor.

The site is responsible for ordering an always-on Internet connection providing bandwidth of at least 25 Mbps. Acceptable methods include T1, Cable-modem or DSL (Non-PPOE). Please provide the primary and backup ISP static IP address and default gateway and subnet mask.

Primary VPN

IP Address	Click or tap here to enter text.
Subnet Mask	Click or tap here to enter text.
Default Gateway	Click or tap here to enter text.
Primary Cell Provider (AT&T, Verizon, etc.)	Click or tap here to enter text.

Static Private IP Addresses for Video Delivery

The customer is responsible for providing private (RFC 1918) addressing between Comcast VDE servers and customer infrastructure.

Please provide the primary and backup private static IP address, default gateway, and subnet mask. The MTD Product will use these as defaults if no other variations are provided by the customer.

VDE Server 1 Private IP for Video Delivery

IP Address	10.10.10.10
Subnet Mask	255.255.255.0
Default Gateway	10.10.10.1

VDE Server 2 Private IP for Video Delivery

IP Address	10.10.10.11
Subnet Mask	255.255.255.0
Default Gateway	10.10.10.1

Attention Customers: If after launching you are going to make a Public IP change, you will need to coordinate prior to making that change with Comcast Technology Solutions to ensure no loss of connectivity for the system.

- The headend LAN will consist of two (2) VPN concentrators and two (2) switches.
- Comcast Technology Solutions will provide the configuration of the VPN concentrator(s).

Multicast Considerations for MTD Integration

This section describes the known technical details for integrating your existing site with the MTD product. This information is provided so a network engineer can make a prompt assessment of any changes that would be required to your system to support this product. Although these requirements are fixed, it is possible to begin the process of MTD installation without having these technical issues resolved. However, to test and launch your system, all these items must be addressed.

Plan New Multicast Address Space for Use

To make the transition from your Satellite feeds to your new MTD feeds as smooth as possible, it is recommended that you plan to use a multicast address that is similar but slightly different than your previous multicast addresses.

- For instance, if you previously had an HD mux with the multicast 239.0.1.10, consider using 239.0.10.10 or 239.0.2.10 for the new multicast addresses defined in the SAMS portal.
- This will not only make recognizing your new muxes easier but will also make changing your SEM/APEX configurations much quicker.

IGMPv3 is Required to be Running on your Network

New MTD multicasts require IGMPv3 to be enabled on the router ports connected to the MTD Servers. IGMPv3 enables SSM or Source Specific Multicast traffic which allows MTD server 01 and 02 to both output the same multicast for redundancy.

On your consuming devices input routing configuration (SEM, APEX, etc.), server 01 and 02 multicasts will be distinguished by their Source IP which is a required component of IGMPv3 (SSM) multicast routing.

Video Output Specifications

See below the specifications for the video streams that are egressing from the MTD-VDE equipment.

HD

- 1 video representation: AVC 720p60 @ 3.3752Mbps
- 1 primary audio representation: AC-3 48KHz @ 410.8Kbps
- 1 secondary audio representation: AC-3 48KHz @ 213.6Kbps
- MPEG-4; GOP size of 120; CBR

SD

- 1 video representation: H.262 480p30 @ 1.9796Mbps
- 1 primary audio representation: AC-3 48KHz @ 213.6 Kbps
- 1 secondary audio representation: AC-3 48KHz @ 116 Kbps
- MPEG-2; GOP size of 60; CBR

Stingray

- 1 video representation: H.262 480p30 @ 1.2968Mbps
- 1 primary audio representation: AC-3 48KHz @ 147.6 Kbps

Evaluate Capacity Planning on GigE Streaming Ports

Your new multicasts will be output from the MTD servers at 38.8Mbps regardless of the number of services in each mux (through null packet stuffing). It is important that you calculate ahead of time your existing multicast traffic and add the number of new muxes multiplied by (38.8). This total must be less than the capacity of the 1 Gig media ports on either SEMs or APEXs (approximately 960 Mbps).

As such, if additional capacity is needed, you will need to plan for and install additional cabling to one or more of the APEX GigE ports and move multicast joins to new GigE ports to ensure that enough capacity is in place ahead of the launch of your new MTD multicasts into production.

To walk through an example, if you currently have 30 non-MTD multicasts going into a mix of APEX ports GigE-1 and GigE-2 with a total bandwidth of 700 Mbps. You plan to consolidate services into 15 new MTD muxes which will total 582 Mbps (15 * 38.8). In this case, you would want to install a new GigE line to serve GigE-3 (and GigE-4 if you have redundancy on your old multicasts) and move all existing (non-MTD) multicasts onto GigE-3. Your 15 new MTD multicasts will be handled through GigE-1 for MTD Server 01 multicasts, and GigE-2 for MTD Server 02 (redundant) multicasts.

Apex Redundancy

APEX1000 GigE ports are designed to work in pairs for redundancy. For reference, below are the redundant pairs on the APEX1000:

- GigE-1 and GigE-2
- GigE-3 and GigE-4

For your new MTD multicasts it is required that Server-01 multicasts come in on either GigE-1 or GigE-3 and Server-02 multicasts come in on the paired port (Gige-2 or GigE-4). The recommended practice is to have all new MTD multicasts come in on GigE-1 (from Server-01) and GigE-2 (from Server-02). Move all other existing traffic off to GigE-3 and GigE-4.

Monitoring

All SNMP and ICMP monitoring of Comcast owned hardware will be configured and managed exclusively by Comcast. Customers are allowed to monitor their hardware up to the points of demarcation. Hardware configurations to support customer monitoring objectives are not supported at this time.

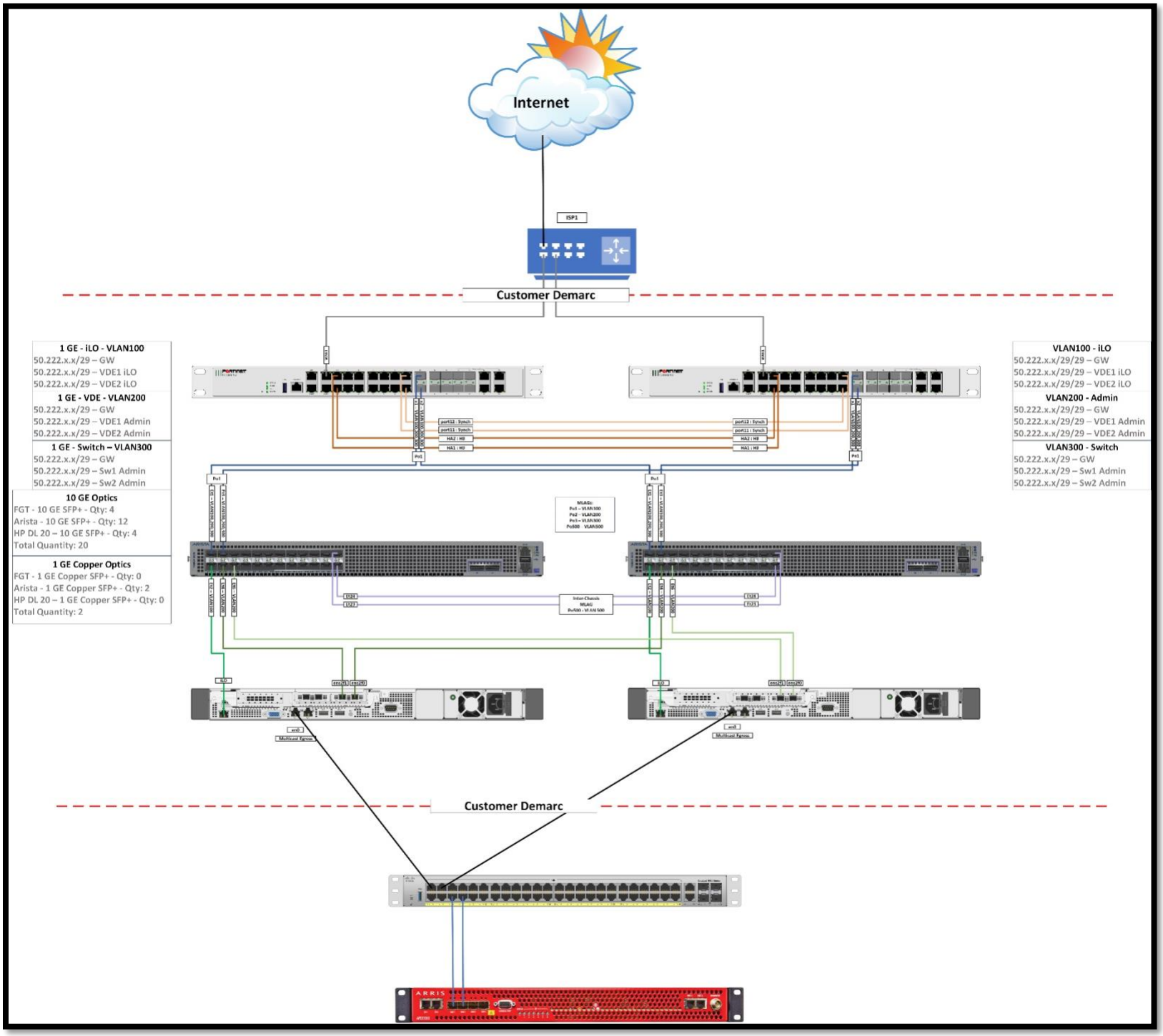
Site Readiness Requirements & Equipment Specifications

For delivery and installation of the necessary equipment for the Managed Satellite Distribution signals, site shall provide:

1. Static IP addresses (1) for VPN concentrators
2. Private static IP addresses (2) for Video Delivery (Comcast / Customer interconnect)
3. Bandwidth minimum requirements
    a. 25 MB/s per VPN concentrator (for VDE server management)
    b. Recommended dedicated bandwidth for video delivery: 500 Mb/s, 1 Gb/s for redundant video paths (please contact your CTS Account Representative to confirm exact bandwidth requirements, as they may vary based on your specific video package)
    c. Please note video bandwidth **does not** require a dedicated fiber line or interconnect to a designated data center or POP
4. Rack space requirements: 6 RU
5. Power requirements for CTS-provided equipment
    a. VPNs: (2) Fortigate FGT 100F (dependent on bandwidth) *OR*
        1. Power required: 100–240V AC, 50-60 Hz
        2. Average power consumption: 35.1 W
        3. Max power consumption: 38.7 W
        4. AC Current draw: 100V @ 1A or 240V @ .5A
        5. Max Heat dissipation: 119.77 BTU/h
    b. VPNs: (2) Fortigate FGT 200F (dependent on bandwidth)
        1. Power required: 100–240V AC, 50-60 Hz
        2. Average power consumption: 101.92W
        3. Max power consumption: 118.90W
        4. AC Current draw: 100V @ 2A or 240V @ 1.2A
        5. Max Heat dissipation: 405.70 BTU/h
    c. Network Switches: (2) Arista 7020SR-24C2-F
        1. Power input: 100 to 240V AC, 50 to 60 Hz
        2. Average power consumption: 95W
        3. Max power consumption: 105W
        4. AC Current draw: 100V @ 6.3A or 240V @ 2.3A
        5. Max Heat Dissipation: 357 BTU/h
    d. VDE servers: (2) HPE ProLiant DL20:
        1. Power required: 100–240V AC, 50-60 Hz
        2. Average power consumption: 500W
        3. Max power consumption: 500W
        4. AC Current draw: 100V @ 5.6A or 240V @ 2.3A
        5. Max Heat dissipation: 1979 BTU/h

Architecture Diagrams

FG-100F



FG-200F