



# HPD Standalone Master Site

**NOVEMBER 2016**

**MN003301A01-A**



# Copyrights

The Motorola Solutions products described in this document may include copyrighted Motorola Solutions computer programs. Laws in the United States and other countries preserve for Motorola Solutions certain exclusive rights for copyrighted computer programs. Accordingly, any copyrighted Motorola Solutions computer programs contained in the Motorola Solutions products described in this document may not be copied or reproduced in any manner without the express written permission of Motorola Solutions.

© 2016 Motorola Solutions, Inc. All Rights Reserved

No part of this document may be reproduced, transmitted, stored in a retrieval system, or translated into any language or computer language, in any form or by any means, without the prior written permission of Motorola Solutions, Inc.

Furthermore, the purchase of Motorola Solutions products shall not be deemed to grant either directly or by implication, estoppel or otherwise, any license under the copyrights, patents or patent applications of Motorola Solutions, except for the normal non-exclusive, royalty-free license to use that arises by operation of law in the sale of a product.

## Disclaimer

Please note that certain features, facilities, and capabilities described in this document may not be applicable to or licensed for use on a particular system, or may be dependent upon the characteristics of a particular mobile subscriber unit or configuration of certain parameters. Please refer to your Motorola Solutions contact for further information.

## Trademarks

MOTOROLA, MOTO, MOTOROLA SOLUTIONS, and the Stylized M Logo are trademarks or registered trademarks of Motorola Trademark Holdings, LLC and are used under license. All other trademarks are the property of their respective owners.

## European Union (EU) Waste of Electrical and Electronic Equipment (WEEE) directive



■ The European Union's WEEE directive requires that products sold into EU countries must have the crossed out trash bin label on the product (or the package in some cases).

As defined by the WEEE directive, this cross-out trash bin label means that customers and end-users in EU countries should not dispose of electronic and electrical equipment or accessories in household waste.

Customers or end-users in EU countries should contact their local equipment supplier representative or service centre for information about the waste collection system in their country.

This page intentionally left blank.

# Contact Us

## Motorola Solutions Support Center

The Solutions Support Center (SSC) is the primary Motorola Solutions support contact. Call:

- Before any software reload.
- To confirm troubleshooting results and analysis before removing and replacing a Field Replaceable Unit (FRU) and Field Replaceable Entity (FRE) to repair the system.

For...	Phone
United States Calls	<b>800-221-7144</b>
International Calls	<b>302-444-9800</b>

## North America Parts Organization

For assistance in ordering replacement parts or identifying a part number, contact the Motorola Solutions Parts organization. Your first response when troubleshooting your system is to call the Motorola SSC.

For...	Phone
Phone Orders	<b>800-422-4210</b> (US and Canada Orders) For help identifying an item or part number, select choice 3 from the menu. <b>302-444-9842</b> (International Orders) Includes help for identifying an item or part number and for translation as needed.
Fax Orders	<b>800-622-6210</b> (US and Canada Orders)

## Comments

Send questions and comments regarding user documentation to [documentation@motorolasolutions.com](mailto:documentation@motorolasolutions.com).

Provide the following information when reporting a documentation error:

- The document title and part number
- The page number with the error
- A description of the error

We welcome your feedback on this and other Motorola Solutions manuals. To take a short, confidential survey on Motorola Solutions Customer Documentation, go to [docsurvey.motorolasolutions.com](https://docsurvey.motorolasolutions.com) or scan the following QR code with your mobile device to access the survey.



This page intentionally left blank.

# Document History

Version	Description	Date
MN003301A01-A	Original release of the <i>HPD Standalone Master Site</i> manual	November 2016

This page intentionally left blank.



# Contents

<b>Copyrights.....</b>	<b>3</b>
<b>Contact Us.....</b>	<b>5</b>
<b>Document History.....</b>	<b>7</b>
<b>List of Figures.....</b>	<b>11</b>
<b>List of Tables.....</b>	<b>13</b>
<b>About HPD Standalone Master Site.....</b>	<b>15</b>
What Is Covered in This Manual?.....	15
Helpful Background Information.....	16
Related Information.....	16
<b>Chapter 1: HPD Standalone Master Site Description.....</b>	<b>17</b>
1.1 HPD Standalone Master Site .....	17
<b>Chapter 2: HPD Standalone Master Site Theory of Operations.....</b>	<b>19</b>
2.1 Master Site Equipment.....	19
2.1.1 Resource Management Subsystem.....	21
2.1.2 Network Management Subsystem.....	24
2.1.2.1 System-Level Server Applications.....	26
2.1.2.2 Network Transport Management Servers.....	26
2.1.2.3 Zone-Level Server Applications.....	26
2.1.3 Network Transport Subsystem.....	27
2.1.4 Data Subsystem.....	28
2.2 HPD Packet Data Gateway.....	29
2.2.1 HPD Packet Data Router.....	29
2.2.2 HPD Radio Network Gateway.....	30
2.3 GGSN.....	31
2.4 Private Radio Network Management (PRNM) Applications.....	32
2.5 Dynamic System Resilience.....	32
2.6 HPD Broadcast Data.....	32
<b>Chapter 3: HPD Standalone Master Site Installation.....</b>	<b>33</b>
3.1 Master Site Installation.....	33
3.2 LAN Switch Connections.....	34
3.3 GGSN Connections.....	34
3.4 HPD Packet Data Gateway Connections.....	35
3.5 High Availability for HPD Installation.....	35
<b>Chapter 4: HPD Standalone Master Site Configuration.....</b>	<b>37</b>
4.1 Configuring the Master Site.....	37

<b>Chapter 5: HPD Standalone Master Site Optimization.....</b>	<b>39</b>
5.1 Master Site Optimization.....	39
<b>Chapter 6: HPD Standalone Master Site Operations.....</b>	<b>41</b>
6.1 Master Site Operations.....	41
<b>Chapter 7: HPD Standalone Master Site Maintenance.....</b>	<b>43</b>
7.1 Master Site Maintenance.....	43
<b>Chapter 8: HPD Standalone Master Site Troubleshooting.....</b>	<b>45</b>
8.1 Master Site Troubleshooting.....	45
<b>Chapter 9: HPD Standalone Master Site FRU/FRE Procedures.....</b>	<b>47</b>
9.1 Master Site FRU/FRE Procedures.....	47
<b>Chapter 10: HPD Standalone Master Site Reference.....</b>	<b>49</b>
10.1 Master Site Reference Information.....	49

# List of Figures

Figure 1: HPD Standalone System – Single Zone Non-Redundant Configuration.....	20
Figure 2: HPD Standalone Master Site – Single Zone Redundant Configuration.....	20
Figure 3: HPD Standalone Master Site – Multi-Zone Capable Configuration.....	21
Figure 4: Resource Management Subsystem – Single Zone Non-Redundant Configuration.....	22
Figure 5: Resource Management Subsystem – Single Zone Redundant Configuration.....	22
Figure 6: Resource Management Subsystem – Multi-Zone Capable Redundant Configuration.....	23
Figure 7: Network Management Subsystem – Single Zone Non-Redundant Configuration.....	24
Figure 8: Network Management Subsystem – Single Zone Redundant Configuration.....	25
Figure 9: Network Management Subsystem – Multi-Zone Capable Redundant Configuration.....	25
Figure 10: Network Transport Subsystem – Single Zone Non-Redundant Configuration.....	27
Figure 11: Virtual Management Server HP DL380 Gen9.....	29
Figure 12: Virtual Management Server HP DL360 G6.....	29
Figure 13: GGSN – GGM 8000.....	31
Figure 14: GGSN – S6000.....	31

This page intentionally left blank.

# List of Tables

Table 1: HP 3500/HP 3800 Ethernet LAN Switch Connections.....	34
Table 2: GGSN Connections.....	34
Table 3: HPD Packet Data Gateway Connections.....	35

This page intentionally left blank.

# About HPD Standalone Master Site

This booklet provides an introduction to the High Performance Data (HPD) standalone master site, which includes all the equipment for centrally managing and routing traffic within a zone. The master site includes the zone controller, core routing infrastructure, Network Time Protocol (NTP) server, network management servers, and data routing equipment. The master site equipment maintains the zone infrastructure configuration and provides fault management and statistical reporting resources for the zone.

This booklet is intended to be used by field service manager and field service technicians after they have attended the Motorola Solutions formal training.

## What Is Covered in This Manual?

This booklet contains the following chapters:

- [HPD Standalone Master Site Description on page 17](#) provides an overview of the HPD standalone master site. Each zone in the system consists of a master site and HPD remote sites. The master site includes all the equipment for centrally managing and routing traffic within a zone.
- [HPD Standalone Master Site Theory of Operations on page 19](#) explains how the HPD standalone master site works in the context of your system.
- [HPD Standalone Master Site Installation on page 33](#) provides installation procedures relating to the HPD standalone master site.
- [HPD Standalone Master Site Configuration on page 37](#) provides configuration procedures relating to the HPD standalone master site.
- [HPD Standalone Master Site Optimization on page 39](#) provides optimization procedures and recommended settings relating to the HPD standalone master site.
- [HPD Standalone Master Site Operations on page 41](#) provides tasks to perform once the HPD standalone master site is installed and operational on your system.
- [HPD Standalone Master Site Maintenance on page 43](#) describes periodic maintenance procedures relating to the HPD standalone master site.
- [HPD Standalone Master Site Troubleshooting on page 45](#) provides fault management and troubleshooting information relating to the HPD standalone master site.
- [HPD Standalone Master Site FRU/FRE Procedures on page 47](#) provides the Field Replaceable Units (FRUs) and Field Replaceable Entities (FREs), and includes replacement procedures applicable to the HPD standalone master site.
- [HPD Standalone Master Site Reference on page 49](#) contains supplemental reference information relating to the HPD standalone master site.

## Helpful Background Information

Motorola Solutions offers various courses designed to assist in learning about the system. For information, go to <http://www.motorolasolutions.com/training> to view the current course offerings and technology paths.

## Related Information

For associated information about the radio system, see the following documents:

Related Information	Purpose
<i>Standards and Guidelines for Communication Sites</i>	Provides standards and guidelines to follow when setting up a Motorola Solutions communications site. Also known as R56 manual. This may be purchased on CD <b>9880384V83</b> by calling the North America Parts Organization at 800-422-4210 (or the international number: 302-444-9842).
<i>System Overview and Documentation</i>	Provides an overview of the ASTRO® 25 new system features, documentation set, technical illustrations, and system-level disaster recovery that support the ASTRO® 25 radio communication system.



## Chapter 1

# HPD Standalone Master Site Description

This chapter provides a high-level description of High Performance Data (HPD) Standalone Master Site and the function it serves in your system.

### 1.1

## HPD Standalone Master Site

Each zone in the system consists of a master site and HPD remote sites. The system may also include remote network management sites and control room sites.

The master site includes all the equipment for centrally managing and routing traffic within a zone. The master site includes the zone controller, core routing infrastructure, Network Time Protocol (NTP) server, network management servers, and data routing equipment. The master site equipment maintains the zone infrastructure configuration and provides fault management and statistical reporting resources for the zone.

Equipment at the master site handles registration, context activation, and IP bearer services.

This page intentionally left blank.

## Chapter 2

# HPD Standalone Master Site Theory of Operations

This chapter explains how the HPD Standalone Master Site works in the context of your system.

## 2.1

### Master Site Equipment

The master site includes the core infrastructure for controlling operations, managing the network, and routing traffic within a zone. Each zone includes one master site and two or more remote sites. In a multi-zone system, multiple master sites are connected together to form the system.

Master site equipment used in the HPD system varies depending on system configuration. All of the master site equipment is centrally connected to a common LAN. The master site communicates with its own remote sites and other zones through Cooperative WAN Routing (CWR). In the United States, these connections are typically made through T1 links. Other locations outside the United States may use E1 links. Terminal servers are connected to the master site equipment, providing administrative access to the different devices on the master site network.

Each master site includes the following major subsystems. These subsystems work together to provide the control, routing, management, security, and data services within the zone.

- Resource management subsystem
- Network management subsystem
- Network transport equipment
- Network security subsystem
- Data subsystem

One master site in the system is designated as the system master site. This system master site contains the System Statistics Server (SSS) application, and the Unified Network Configurator (UNC) server, which are used for system-level configuration and statistics. Only one UCS server application, one SSS server application, and one UNC server are required per system. Each system-level server application runs in its own server environment (or container) on a Virtual Management Server (VMS).

Depending on your organization's needs, there are several master site configurations available.

- Single Zone Non-Redundant.
- Single Zone Redundant.
- Multi-Zone Capable Redundant.



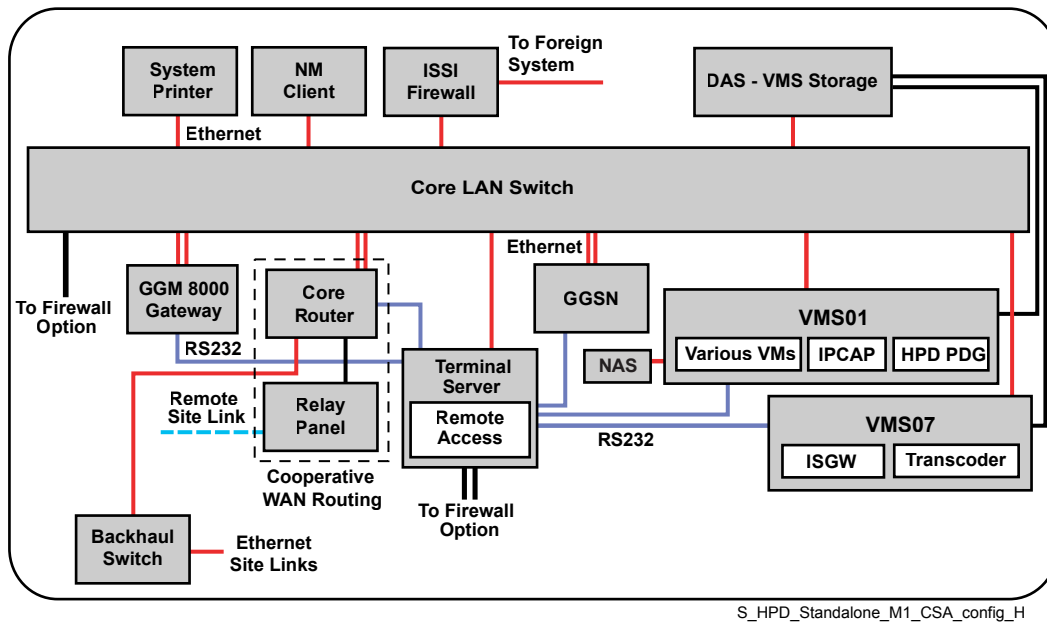
#### NOTICE:

L2, M2, and M3 zone cores can be configured with a vCenter server and redundant PDGs, GGSN routers, and CNI path equipment (RNI-DMZ Firewall, DMZ Switch, Peripheral Network Routers, Border Routers) to support the High Availability for Trunked IV&D and HPD (HA Data) feature. See [High Availability for HPD Installation on page 35](#) for more information.

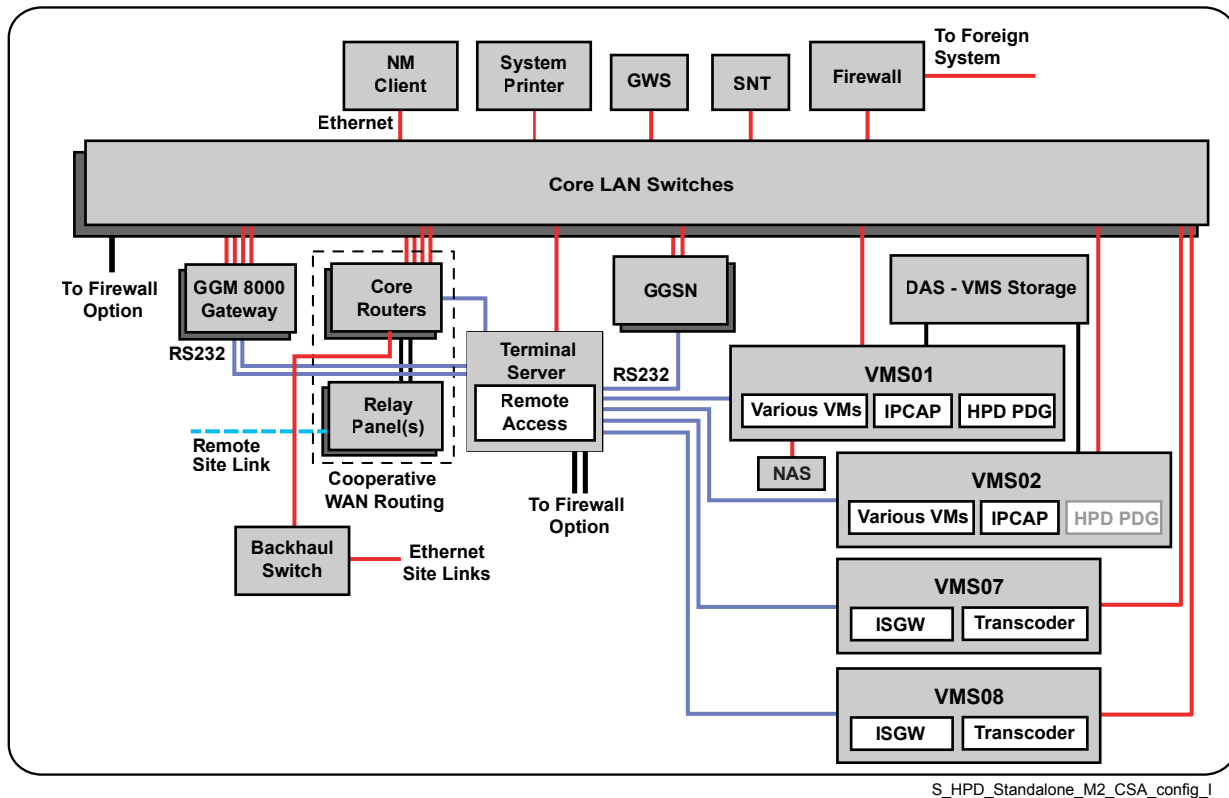
For more information on the VMS Host architecture, see the *Virtual Management Server Software* manual.

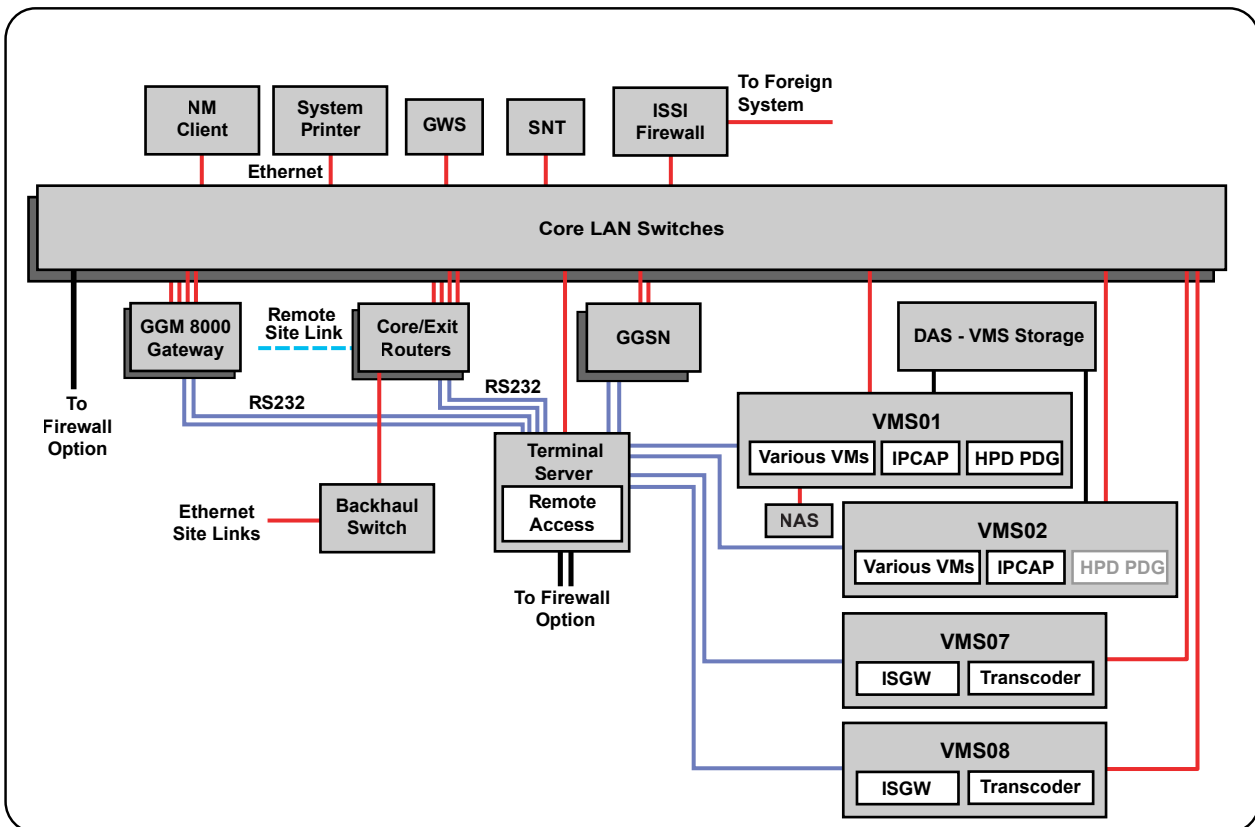
For additional configurations, see the *Dynamic System Resilience* manual.

**Figure 1: HPD Standalone System – Single Zone Non-Redundant Configuration**



**Figure 2: HPD Standalone Master Site – Single Zone Redundant Configuration**



**Figure 3: HPD Standalone Master Site – Multi-Zone Capable Configuration**

S\_HPDPStandalone\_M3\_CSA\_config\_K

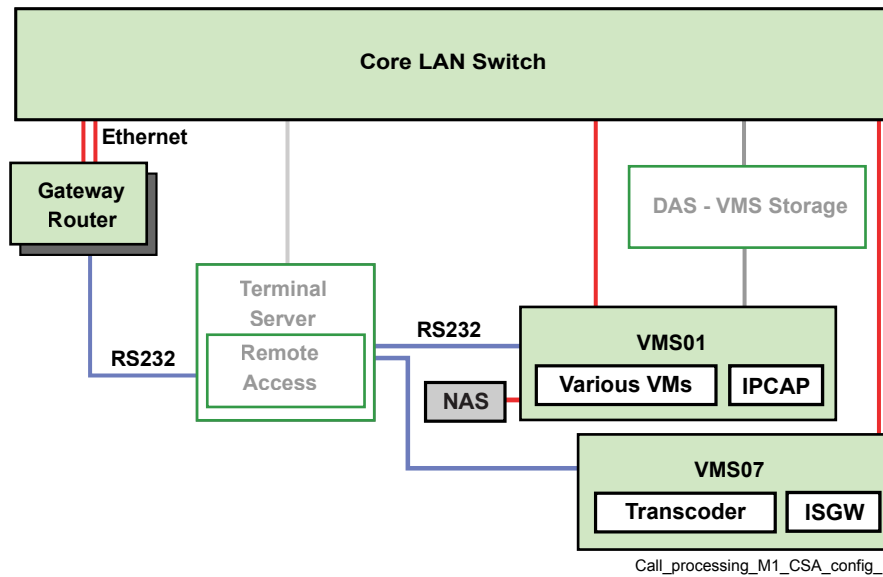
### 2.1.1

## Resource Management Subsystem

The resource management subsystem consists of the zone controller (ZC) platform. See the zone controllers in the following diagrams showing the available configurations of the resource management subsystem.

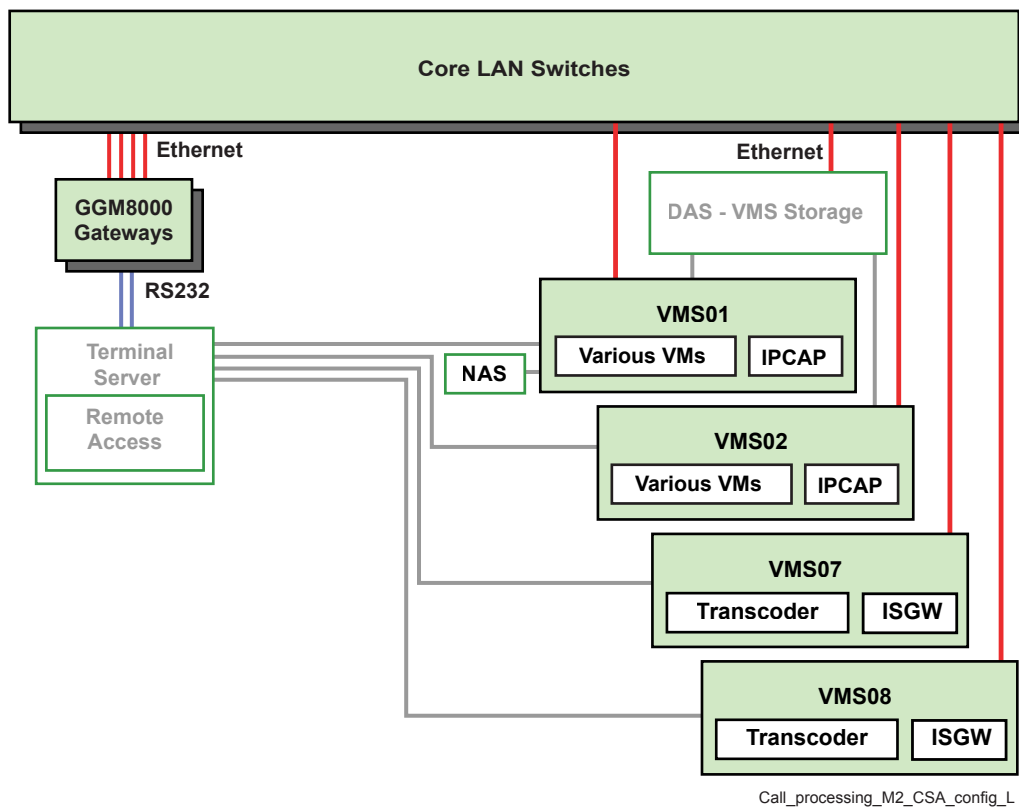
**Figure 4: Resource Management Subsystem – Single Zone Non-Redundant Configuration**

The HPD PDG is included in the virtual machines labeled as **Various VMs**.



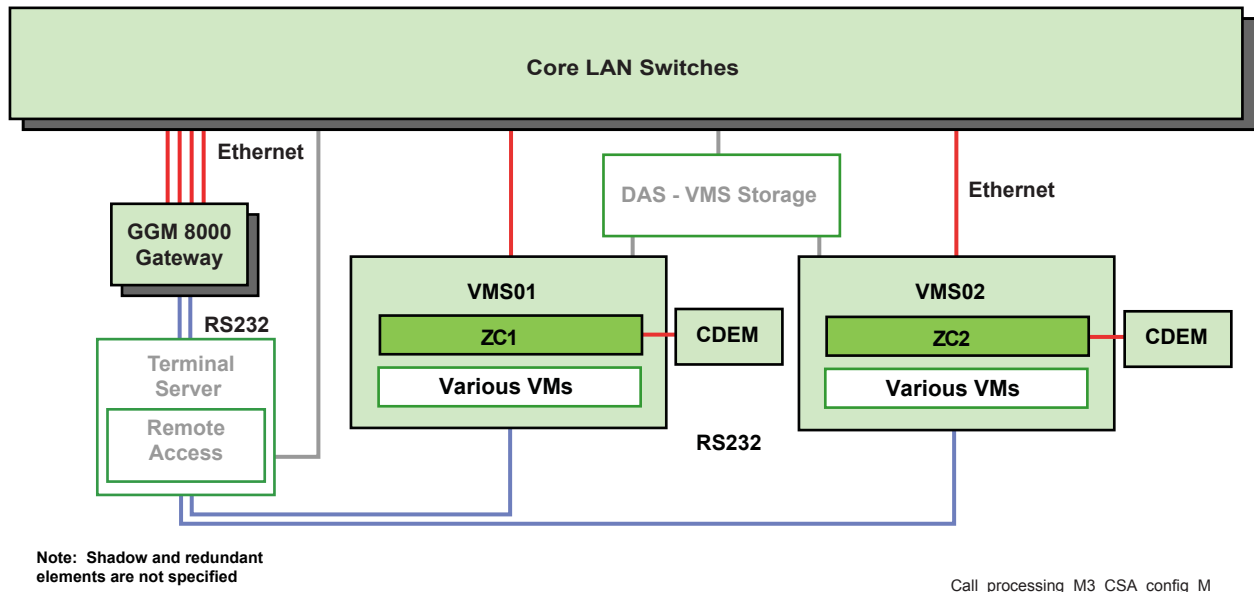
**Figure 5: Resource Management Subsystem – Single Zone Redundant Configuration**

The HPD PDGs are included in the virtual machines labeled as **Various VMs**.



**Figure 6: Resource Management Subsystem – Multi-Zone Capable Redundant Configuration**

The HPD PDGs are included in the virtual machines labeled as **Various VMs**.



The zone controller has many important responsibilities for HPD operation including the following:

- Handles registration and location registration requests for mobile subscriber units (MSUs) in the zone.
- Interacts with the HPD site controllers in the zone during initialization and recovery.
- Dictates the operating mode for each HPD remote site in the zone (wide area mode or local mode).
- Sends updates to HPD remote sites for adjacent site status and other information.
- Selects the home channel for HPD remote sites.
- Maintains configuration records for MSUs in the Home Location Register (HLR).
- Maintains mobility information for MSUs in the zone in the Visitor Location Register (VLR).
- Pushes VLR data to the HPD RNG to keep the PD-VLR updated. Also handles queries from the HPD RNG in the zone.
- Handles queries from the HPD PDR in the zone.

The zone controller maintains control of operations within the zone and manages the zone resources. The zone controller manages the status of all the HPD remote sites within the zone. The zone controller determines whether the sites can be placed in wide area or local modes. The zone controller interacts with remote sites during initialization and recovery events to bring the sites into wide area mode. The zone controller also keeps HPD remote sites up to date with adjacent site status information.

The zone controller maintains several databases including the Visitor Location Register (VLR), Home Location Register (HLR), and infrastructure information. The VLR manages mobility information for all the MSUs that are currently registered in the zone. The HLR manages the configuration settings for all the MSUs that are fleet mapped to the zone (as provisioned through the Provisioning Manager application). The zone controller pushes VLR data to the HPD RNG. The HPD RNG uses the location information to handle routing and administration of HPD traffic flowing through the zone.

At any point in time, one zone controller is active and the other zone controller is in standby mode. The zone controllers monitor one another over a negotiation link. If an active zone controller fails, the standby zone controller takes over operations without affecting services on the network.

The gateway routers support the delivery of all control traffic between the zone controllers and the other devices on the network.

For more information on the VMS Host architecture, see the *Virtual Management Server Software* manual.

For configuration details, see the *Dynamic System Resilience* manual.

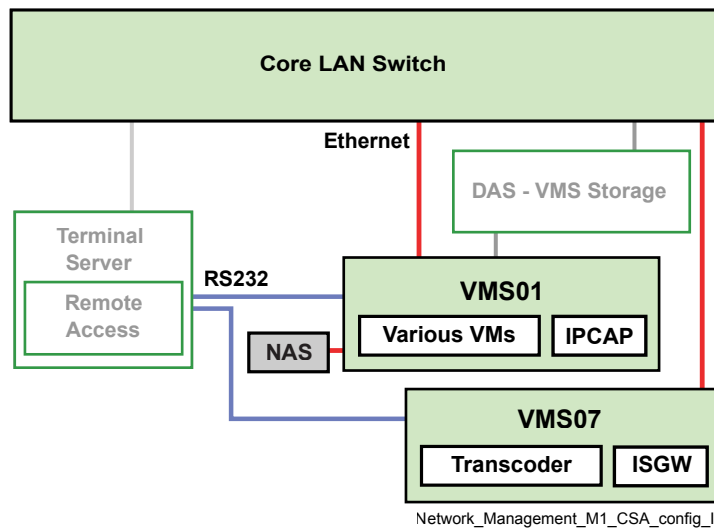
### 2.1.2

## Network Management Subsystem

The network management subsystem includes the zone-level server applications, network transport server applications, and the system-level server applications at the system master site. All these server applications perform diverse functions that are critical to the system.

### Figure 7: Network Management Subsystem – Single Zone Non-Redundant Configuration

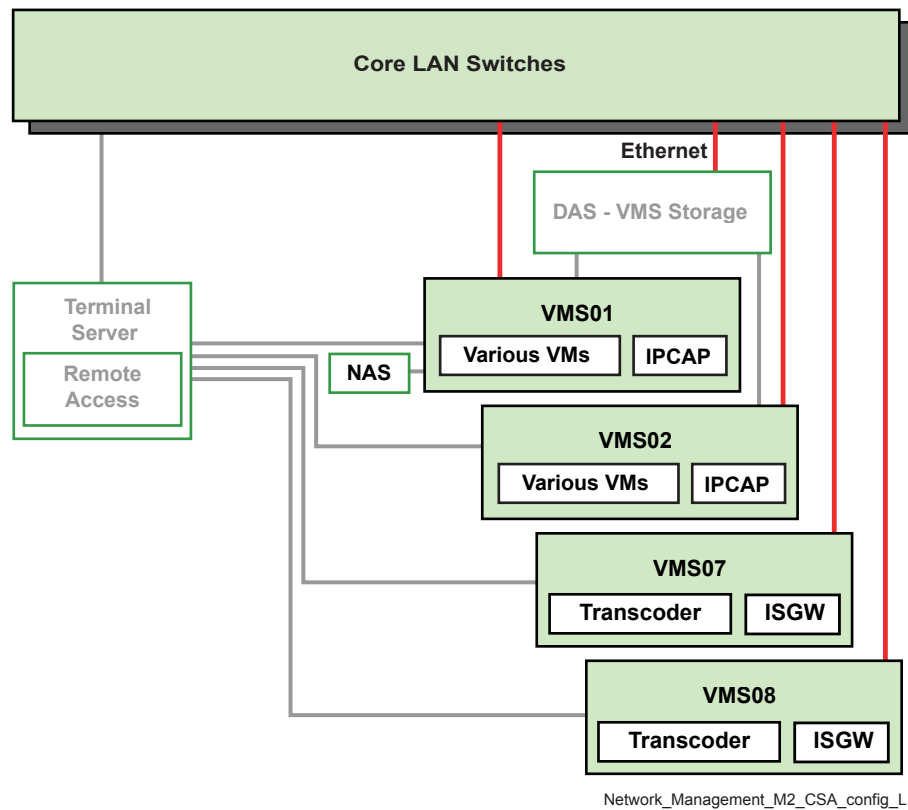
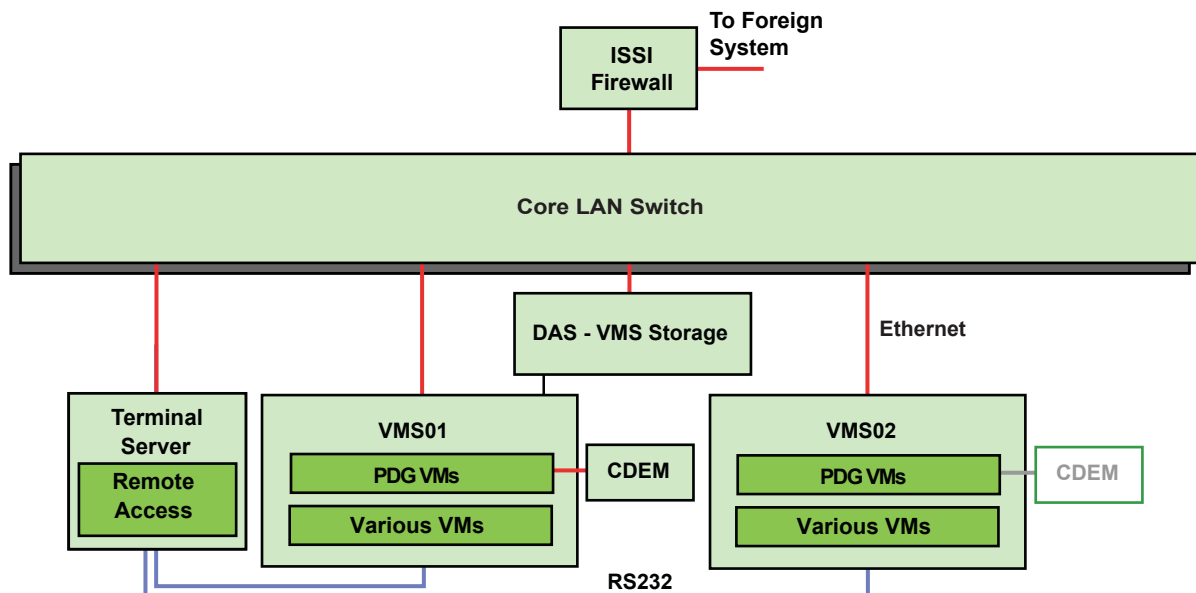
The HPD PDG is included in the virtual machines labeled as **Various VMs**.





**Figure 8: Network Management Subsystem – Single Zone Redundant Configuration**

The HPD PDGs are included in the virtual machines labeled as **Various VMs**.

**Figure 9: Network Management Subsystem – Multi-Zone Capable Redundant Configuration**

Note: Shadow and redundant elements are not specified

For more information on the VMS Host architecture, see the *Virtual Management Server Software* manual.

For configuration details, see the *Dynamic System Resilience* manual.

#### 2.1.2.1

### System-Level Server Applications

The system includes the following system-level server applications: Unified Network Configurator (UNC) and System Statistics Server (SSS).

#### Unified Network Configurator (UNC)

The UNC application maintains a configuration database for equipment in each zone. This database includes information provisioned for both IV&D and HPD infrastructure.

#### System Statistics Server (SSS)

The SSS application is the central collection server application for system-wide statistics. The SSS server application does not collect statistics for HPD operation in the system.

#### 2.1.2.2

### Network Transport Management Servers

The system includes two applications that manage the network transport equipment: InfoVista and Unified Network Configurator (UNC).

#### InfoVista

The Transport Network Performance Server (TNPS) hosts the InfoVista application. InfoVista may be used to collect and display statistics for the HPD PDR, HPD RNG, and HPD remote site equipment.

#### Unified Network Configurator (UNC)

The UNC server application hosts the UNC software that is used to manage the network transport equipment.

#### 2.1.2.3

### Zone-Level Server Applications

Each zone includes the following set of zone-level server applications.

- Zone Database Server (ZDS) application
- Air Traffic Router Server (ATR) application
- Zone Statistics Server (ZSS) application
- Fault Management Application Server

The UNC application maintains a configuration database for equipment within the zone. This database includes information provisioned for both IV&D and HPD infrastructure. Mobile users are configured in the Provisioning Manager application.

The Air Traffic Router Server (ATR) application receives raw processing information from the zone controller. The ATR transforms the raw data into Air Traffic Information Access (ATIA) packets that are used for statistics, ZoneWatch events, and other logging activities. The ATR server application logs the HPD registration events and you can view them through ZoneWatch or ATIA Log Viewer applications.

The Zone Statistics Server (ZSS) application maintains a database of zone-level statistics and provides information for performance reports and historical reports for traffic within the zone. The ZSS server application only maintains statistics for IV&D traffic in the zone and does not collect statistics for HPD service.

The fault management application server hosts the fault management client applications for the zone. The server application manages the alarms and status information for all the devices within the zone, including the HPD PDG, GGSN, and HPD remote site equipment.

## 2.1.3

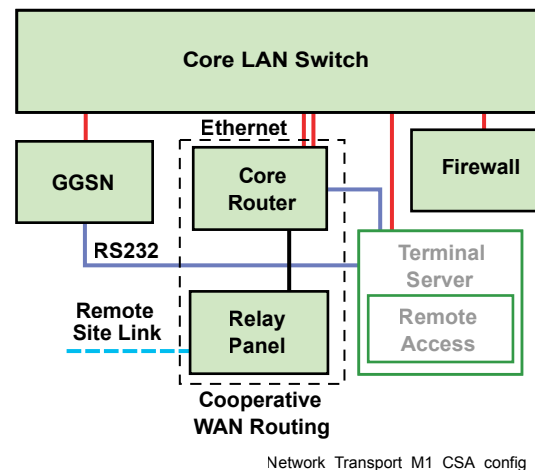
## Network Transport Subsystem

The network transport subsystem consists of the routers and switches at the master site that provide routing and network connections between different devices.

Depending on the master site configuration, different equipment can be installed at the site:

- Core LAN switch
- Cooperative WAN routing
- Gateway routers
- Standalone core routers and exit routers or combined core/exit routers

**Figure 10: Network Transport Subsystem – Single Zone Non-Redundant Configuration**



### Core LAN switch

The core LAN switch interconnects all devices at the master site. The switch includes separate virtual LANs (VLANs) that keep traffic isolated from unnecessary devices on the LAN.

### Gateway routers

A pair of gateway routers is connected to the core LAN switch to route traffic between different VLANs. HPD registration traffic is routed over the control VLAN to the zone controller. Context activation and HPD user data traffic is routed over the data VLAN to the HPD PDG (PDR/RNG) and GGSN. The gateway routers are also responsible for routing traffic over the DMZ VLAN to the customer network interface or optional firewall.

### Core routers and exit routers

Core routers exist at the master site to route traffic between the core infrastructure and remote sites within the zone. The core routers direct inbound HPD traffic to the gateway routers for traffic flow to the data subsystem.

Exit routers exist at the master site to route traffic to other zones or to backup zone cores within the same zone. If either the home PDR for an MSU or the GGSN is located in another zone, HPD traffic may need to cross zones.

Core and exit routers may be deployed as separate standalone routers or combined in a single core/exit router depending on your system configuration. Standalone core and exit routers are used on T1/E1 or Ethernet site links. Combined core/exit routers may only be used with Ethernet site links.

## Cooperative WAN Routing

Cooperative WAN Routing provides the physical connection to the remote site links and InterZone links. Inbound/outbound HPD traffic and InterZone routing of HPD traffic pass through CWR. CWR also provides redundant Wide Area Network (WAN) failover capabilities. The CWR solution consists of CWR peers (two S6000 routers with 12-port T1/E1 modules) connected to the relay panel.

## Terminal server

The terminal server provides administrative access to the master site components. Client PCs can access local interfaces for the HPD PDR, HPD RNG, and GGSN through the terminal server via a modem or over the network using ssh or sphere client.



### NOTICE:

For more information on the VMS Host architecture, see the *Virtual Management Server Software* manual.

For configuration details, see the *Dynamic System Resilience* manual.

### 2.1.4

## Data Subsystem

The data subsystem is responsible for establishing contexts and tunneling traffic between the remote sites and the Customer Enterprise Networks (CENs).

The data subsystem consists of the following devices:

- HPD Packet Data Gateway
- Gateway GPRS Service Node (GGSN)

The HPD PDG comprises of the following software components for handling context activation requests and routing HPD traffic between the sites and your organization's network:

- Radio Network Gateway (RNG)
- Packet Data Router (PDR)

The Radio Network Gateway (RNG) is a software component located in the HPD PDG to handle inbound and outbound traffic routing with the remote HPD sites. The RNG provides a logical interface between the local Radio Frequency (RF) resources and the PDR to support data calls to subscriber radios. The RNG maintains a Visitor Location Register for packet data users that are registered in the zone. The RNG interacts with the zone controller to keep its VLR information updated. HPD traffic from an MSU is routed through the RNG that is in the current zone, even if the MSU is mapped to another home zone. The RNG that is providing the service is referred to as the serving RNG.

The HPD Packet Data Router (PDR) is a software component installed in the HPD PDG to register MSUs. The PDR manages all aspects of the IP protocol. The PDR routes traffic between the Sub-Network Dependent Convergence Protocol (SNDCCP) tunnel (to the MSUs) and the GTP tunnel (to the GGSN). The HPD PDR maintains a Home Location Register with the system configuration for all HPD users that are fleet mapped to the zone. The HPD PDR is responsible for routing HPD traffic for all users that are mapped to the zone. Each HPD user has a "home PDR" through which all context requests and HPD user data are routed. The HPD traffic is routed through the home PDR even if the HPD user is in another zone. The serving RNG and the home PDR may be in different zones, and the HPD traffic may travel through different zones.

The GGSN establishes contexts with the appropriate customer networks as requested by MSUs and provides IP-IP tunneling to the customer networks. The GGSN can be configured with a pool of addresses for dynamic (DHCP) addressing of MSUs. The GGSN also may forward dynamic address requests or authentication requests to the proper DHCP or RADIUS server located on the customer network.

For information on how the data subsystem fits into master site architecture, see the GGSN and HPD PDG in the system diagrams in [Master Site Equipment on page 19](#).



**NOTICE:**

L2, M2, and M3 zone cores can be configured with a vCenter server and redundant PDGs, GGSN routers, and CNl path equipment (RNI-DMZ Firewall, DMZ Switch, Peripheral Network Routers, Border Routers) to support the High Availability for Trunked IV&D and HPD (HA Data) feature. See [High Availability for HPD Installation on page 35](#) for more information.

For configuration details, see the *Dynamic System Resilience* manual.

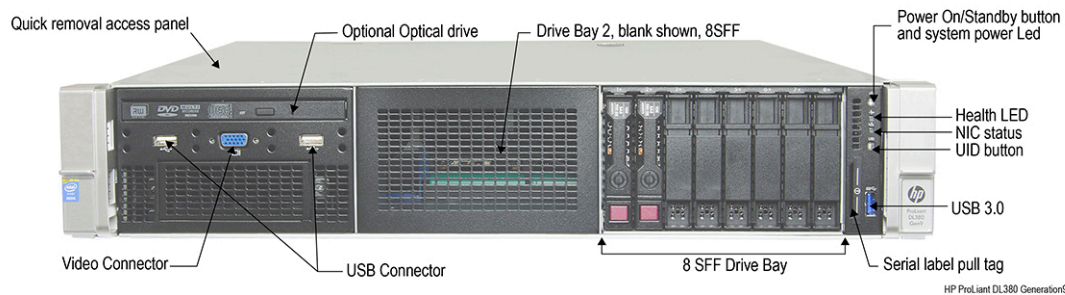
## 2.2

### HPD Packet Data Gateway

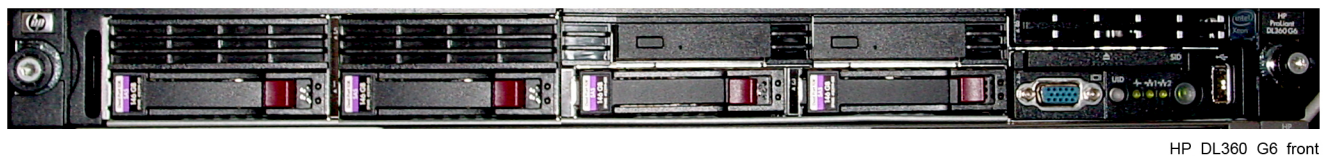
An HPD Packet Data Gateway (PDG) is added to each zone that requires HPD coverage. Zones that do not require HPD coverage do not have an HPD PDG installed. The HPD PDG application is critical to context activation, IP bearer services, and mobility management of Mobile Subscriber Units (MSUs) within the zone. An HPD PDG is hosted as a virtual machine on a Virtual Management Server (VMS).

For a detailed description of the VMS platform, see the *Virtual Management Server Hardware* manual.

**Figure 11: Virtual Management Server HP DL380 Gen9**



**Figure 12: Virtual Management Server HP DL360 G6**



### 2.2.1

#### HPD Packet Data Router

The HPD Packet Data Router performs activities for context activation and routing of HPD traffic between the HPD RNGs and GGSN.

The HPD PDR:

- Manages context activation and deactivation
- Approves/denies context activation of MSUs based on provisioning in Provisioning Manager
- Contains a database of provisioned information for MSUs and Broadcast Data Agencies mapped to the zone
- Routes HPD traffic between the HPD RNG and GGSN
- Originates/terminates the SNDCCP and GTP tunnels

- Buffers outbound messages
- Provides a network management interface for HPD RNG
- Generates ICMP error notifications for failed delivery of HPD traffic

MSUs perform context activation with their home HPD PDR. The home HPD PDR is located in the zone where the MSU is home zone mapped. When a context activation request is received from an MSU, the HPD PDR determines whether the context activation is granted or rejected. This decision is made by checking the request information against the information provisioned in the system for the MSU. If the request and the provisioned information for the MSU are mutually acceptable, the HPD PDR requests that the GGSN establish a context to the requested CEN. This request occurs when the network conditions permit.

The HPD PDR maintains a local database, called the Packet Data Home Location Register (PD-HLR). The PD-HLR contains the Provisioning Manager record settings for MSUs mapped to the zone. The HPD PDR may also query the zone controller for zone location information.

After an MSU is context activated, all inbound or outbound traffic associated with the MSU is routed through its home HPD PDR. For inbound traffic, the HPD PDR receives the traffic from the serving HPD RNG in the zone where the MSU is located. The HPD PDR forwards the inbound traffic to the GGSN. The GGSN delivers the traffic to the appropriate CEN. The HPD PDR terminates the SMDCP tunnel from the HPD RNG and originates the GTP tunnel to the GGSN.

Outbound traffic takes place in the reverse direction. The GGSN sends traffic to the HPD PDR. The HPD PDR forwards the traffic to the serving HPD RNG that is in the zone where the MSU is currently registered.

The HPD PDR buffers outbound traffic. If the delivery fails due to a timeout of buffered datagrams, connection loss, or unexpected context deactivation, the HPD PDR sends an ICMP error notification to the traffic originator.

The HPD PDR may deactivate a context for an MSU under any of the following conditions:

- The context has been deactivated with the GGSN.
- The HPD PDR is unable to contact the HPD RNG.
- MSU provisioning information has changed or been deleted.

The HPD PDR monitors its links to the GGSN, zone controller, and local RNG. The HPD PDR performs services for the local HPD RNG. If the HPD PDR fails, the HPD RNG within the chassis also fails.

### 2.2.2

## HPD Radio Network Gateway

The HPD RNG is responsible for routing traffic between HPD PDRs and the HPD remote sites within the zone. MSUs may be assigned to HPD PDRs in different zones, and MSUs may be roaming to different sites. Thus the HPD RNG must maintain the site location and home HPD PDR assignments for MSUs in the zone.

The HPD RNG tracks the active context state for each MSU in the zone and determines how to route the messages to the appropriate home HPD PDR. For this purpose, the HPD RNG maintains a database of MSUs that are currently registered in the zone. This database is called the Packet Data Visitor Location Register (PD-VLR). The PD-VLR is pushed to the HPD RNG from the zone controller. The HPD RNG may also query the zone controller for PD-VLR information.

When inbound traffic is received, the HPD RNG forwards the traffic to the home HPD PDR that is associated with the MSU sending the traffic. When outbound traffic is received from an HPD PDR, the HPD RNG sends the traffic to the appropriate site for the target MSU.

The HPD RNG tracks the current SMDCP Standby Timer status for each MSU. The SMDCP Standby Timer determines how long the MSU may remain context activated without receiving a renewal before



it is removed from the system. The System record in Unified Network Configurator (UNC) contains provisioning information for the SND CP Standby Timer.

### 2.3

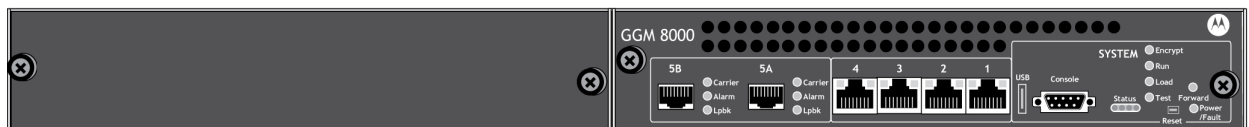
## GGSN

The GGSN acts as a gateway for all IV&D and HPD traffic in and out of the system. It connects with the data subsystem through a GTP tunnel and connects with the CENs through an IP-IP tunnel.

The GGSN performs the following specific functions:

- Forwards outbound traffic to the appropriate home HPD PDRs
- Sends inbound traffic through VPN tunnels to the appropriate CEN
- Originates/terminates the GTP tunnels to the HPD PDRs and the IP-IP tunnels to the CENs
- Sends dynamic updates to the DNS server on the CEN for MSUs after context activation (if configured)
- Queries the RADIUS or DHCP server on the CEN for authentication or dynamic addressing (if configured)
- Provides local dynamic addressing for MSUs (if configured)

**Figure 13: GGSN – GGM 8000**



GGM\_8000\_base\_no\_callouts

**Figure 14: GGSN – S6000**



S6000\_router\_front

The GGSN originates IP-IP tunneling to the CENs. These IP-IP tunnels provide secure data delivery traffic to the CENs over the peripheral network. The IP-IP tunneling also provides IP isolation between the system and the CENs to prevent IP addressing conflicts.

The GGSN is configured with an Access Point Number (APN) for each CEN using Unified Network Configurator (UNC). This APN is mapped to the physical/virtual ports assigned for each of the CEN border routers. Each MSU is assigned to a particular CEN/APN using Provisioning Manager. When the GGSN receives inbound traffic, it forwards the traffic to the appropriate CEN according to the APN.

The GGSN may be provisioned to interact with a RADIUS server, DHCP server, and DNS server on each CEN. The GGSN can query a RADIUS server on the CEN with authentication credentials received from a context activating MSU. It permits mobile users to authenticate with the CEN during the context activation process.

Depending on the MSU and system configuration, the GGSN may also query a DHCP server on the CEN to receive dynamic addresses for context activating MSUs. If a RADIUS server is used at the CEN, it may operate as both an authentication server and DHCP server. Otherwise, the GGSN may be configured with its own pool of IP addresses to locally provide dynamic addresses to context activating MSUs.

The GGSN may also be configured to supply dynamic updates to a Domain Name Server (DNS) on the CEN. These dynamic updates would provide fully qualified domain name (FQDN) bindings for each context activating MSU (for example, c620100000e0df659f.hpd.cen20). This FQDN consists of a host name plus the domain name for the MSU.

## 2.4

# Private Radio Network Management (PRNM) Applications

The following Private Radio Network Management (PRNM) applications relate to High Performance Data (HPD) operation or configuration.

### Affiliation Display

Affiliation Display can be configured to display the site location and registration status of MSUs within a zone.

### ATIA Log Viewer

ATIA Log Viewer can be configured to archive daily logs of system activity. The daily logs include the same information that is displayed in the ZoneWatch raw display window. Logging on the ATR must be turned on if archives should be collected for this application.

### Dynamic Reports

The Dynamic Reports application does not generate any reports that apply to HPD operation. Instead, use InfoVista to generate reports for the HPD PDG, GGSN, or HPD remote site equipment.

### Historical Reports

The Historical Reports application does not generate any reports that apply to HPD operation. Instead, use InfoVista to generate reports for the HPD PDG, GGSN, or HPD remote site equipment.

### Provisioning Manager

Provisioning Manager must be used to provision the HPD Radio record (for each HPD modem and mobile user).

### Radio Control Manager (RCM)

RCM only applies to IV&D operation. RCM commands, such as lock, inhibit, or other status/command features do not apply to HPD modems.

### ZoneWatch

ZoneWatch can be configured through Provisioning Manager to show a raw data display, site display, and channel grid. The raw display and site displays can show HPD-related events taking place in the zone (such as registration events from the HPD MSUs). The channel grid shows the channels at the sites in the zone, along with the status and home channel information. HPD activities (such as MSUs sending traffic) are not shown on the channel grid. ZoneWatch filters can be configured in Provisioning Manager to define the types of mobile subscribers that are logged in the raw display window (HPD, IV&D, or All).

## 2.5

# Dynamic System Resilience

For HPD configuration with Dynamic System Resilience (DSR), see the *Dynamic System Resilience* manual.

## 2.6

# HPD Broadcast Data

For information about HPD Broadcast Data, see the *HPD Packet Data Resource Management* manual.



## Chapter 3

# HPD Standalone Master Site Installation

This chapter details installation procedures relating to the HPD Standalone Master Site.

### 3.1

## Master Site Installation

Install the following components at the master site.

- Optional network interface barrier (firewall, IDS, and Core Security Management Server (CSMS))
- Network Transport Management Server
- Network transport devices:
  - LAN switch
  - Standalone core routers and exit routers or combined core/exit routers
  - Gateway routers
  - Terminal servers
  - GGSN
- Private Network Management (PNM) Servers
- Network Time Protocol (NTP) Server
- Zone Controllers
- ISSI 8000/CSSI 8000 Intersystem Gateways (ISGWs) (optional in M series master sites)
- MOSCAD Network Fault Management (NFM) equipment (optional)

In addition to these devices, install the HPD Packet Data Gateway (PDG) at the master site.

For information on installation procedures for specific Master Site devices, see the *Master Site Infrastructure Reference Guide* manual.

The following sections provide connection information for the GGSN, Ethernet LAN switch, and the HPD Packet Data Gateway:

- [LAN Switch Connections on page 34](#)
- [GGSN Connections on page 34](#)
- [HPD Packet Data Gateway Connections on page 35](#)

### 3.2

## LAN Switch Connections

The following table describes the port connections for the HP 3500 and HP 3800 Ethernet LAN switch. See the *System LAN Switches* manual for details.

Table 1: HP 3500/HP 3800 Ethernet LAN Switch Connections

Port	Destination	Type of port
Assignable	DMZ Switch	RJ45
Assignable	GGSN	RJ45
Assignable	HPD RNG	RJ45
Assignable	HPD PDR	RJ45
Assignable	Optional network interface barrier: firewall, IDS, and Core Security Management Server (CSMS)	RJ45
Assignable	Network transport devices: <ul style="list-style-type: none"><li>• LAN switch</li><li>• Standalone core routers and exit routers or combined core/exit routers</li><li>• Gateway routers</li><li>• Terminal routers</li></ul>	RJ45
Assignable	Generic Application Servers and NM clients	RJ45
Assignable	NTP Server	RJ45
Assignable	Zone Controllers	RJ45
Assignable	MOSCAD NFM Equipment (optional)	RJ45

### 3.3

## GGSN Connections

The following table describes the master site connections to the GGSN. All connections for a data subsystem are assignable on an HP 3500/HP 3800 Ethernet LAN switch, not statically defined.

Table 2: GGSN Connections

De-vice	Port / Type	Device	Port / Type	Notes
GGSN	RJ45	Master Site Ethernet LAN Switch #1	RJ45	GGSN connection to the ZNM VLAN on the master site LAN switch.
GGSN	RJ45	Master Site Ethernet LAN Switch #2	RJ45	GGSN connection to Data VLAN on the master site LAN switch.
GGSN	RJ45	Master Site Ethernet LAN Switch #2	RJ45	GGSN connection to DMZ VLAN on the master site LAN switch.

### 3.4

## HPD Packet Data Gateway Connections

The following table describes the master site connections to the HPD PDG.

Table 3: HPD Packet Data Gateway Connections

Device	Port / Type	Device	Port / Type	Notes
HPD PDR module	10/100 Base-T, RJ45	Master Site LAN Switch #2	RJ45	HPD PDR connection to the master site LAN.
HPD RNG module	10/100 Base-T, RJ45	Master Site LAN Switch #2	RJ45	HPD RNG connection to the master site LAN.

### 3.5

## High Availability for HPD Installation

L2, M2, and M3 zone cores in Common Server Architecture (CSA) systems can be configured with redundant devices in the data subsystem to provide high availability of data services and automatic switchover in case of a component failure.

Enabling the High Availability for HPD (HA Data) feature requires:

- Installing the VMware vCenter application and enabling the Fault Tolerance feature for PDGs. See the *ASTRO 25 vCenter Application Setup and Operations Guide*.
- Installing redundant GGSN routers. See the *GGM 8000 System Gateway or S6000 and S2500 Routers* manuals.
- Installing redundant CNl path equipment (RNI-DMZ Firewall, DMZ Switch, Peripheral Network Routers, Border Routers). See the *System LAN Switches, GGM 8000 System Gateway or S6000 and S2500 Routers*, and *Fortinet Firewall* manuals.

For a description of HA Data and operations related to this feature, see the *HPD Packet Data Resource Management* manual.

This page intentionally left blank.

## Chapter 4

# HPD Standalone Master Site Configuration

This chapter details configuration procedures relating to the HPD Standalone Master Site.

### 4.1

## Configuring the Master Site

This process provides general guidelines for configuring the master site equipment for HPD operation.

### Process:

- 1 Configure the master site equipment according to the master site installation instructions. See the *Master Site Infrastructure Reference Guide* manual.
- 2 Configure any additional parameters in the GGSN as necessary. Define any CENs to be added to the GGSN configuration through Unified Network Configurator (UNC). See the *Unified Network Configurator* manual.
- 3 Install and configure the HPD PDG software. See the *Packet Data Gateways* manual.
- 4 Configure data parameters in UNC and Provisioning Manager. See the *Provisioning Manager* and *Unified Network Configurator* manuals.

This page intentionally left blank.

## Chapter 5

# HPD Standalone Master Site Optimization

This chapter contains optimization procedures and recommended settings relating to the HPD Standalone Master Site.

### 5.1

## Master Site Optimization

For information on optimization procedures for specific Master Site devices, see the *Master Site Infrastructure Reference Guide* manual. No additional optimization procedures are required for a master site in an HPD system.

This page intentionally left blank.



## Chapter 6

# HPD Standalone Master Site Operations

This chapter details tasks to perform once the HPD Standalone Master Site equipment is installed and operational on your system.

### 6.1

## Master Site Operations

Operations for a master site are done at the device level. For operations procedures, see the individual device manuals. No additional operations procedures are required for the master site in an HPD system.

This page intentionally left blank.

## Chapter 7

# HPD Standalone Master Site Maintenance

This chapter describes periodic maintenance procedures relating to the HPD Standalone Master Site equipment.

### 7.1

## Master Site Maintenance

Maintenance for a master site is done at the device level. For maintenance procedures, see the individual device manuals. No additional maintenance procedures are required for the master site in an HPD system.

This page intentionally left blank.

## Chapter 8

# HPD Standalone Master Site Troubleshooting

This chapter provides fault management and troubleshooting information relating to HPD Master Site equipment.

### 8.1

## Master Site Troubleshooting

For information on troubleshooting procedures for master sites, see the *Master Site Infrastructure Reference Guide* manual. No additional troubleshooting procedures are required for the master site in an HPD system.

This page intentionally left blank.

## Chapter 9

# HPD Standalone Master Site FRU/FRE Procedures

This chapter lists the Field Replaceable Units (FRUs) and Field Replaceable Entities (FREs) and includes replacement procedures applicable to the HPD Master Site equipment.

### 9.1

## Master Site FRU/FRE Procedures

For the FRU/FRE procedures for specific devices at a master site, see the device manuals. No additional FRU/FRE procedures are required for the master site in an HPD system.

This page intentionally left blank.



## Chapter 10

# HPD Standalone Master Site Reference

This chapter contains supplemental reference information relating to the HPD Standalone Master Site equipment.

### 10.1

## Master Site Reference Information

For reference information for specific Master Site devices, see the *Master Site Infrastructure Reference Guide* manual. No additional reference information is required for the master site in an HPD system.

This page intentionally left blank.