

## Capacity Management Plan

Hughes is selected for two categories to provide service:

- Fixed Satellite Services
- Small Office/Home Office (SOHO) services

In the context of those two services categories, for our Managed Services, Hughes offers the following tools for a customer to track site and network performance.

### **HX Network Management System (ExpertNMS™)**

Managing and monitoring an HX system is easily done using the HX ExpertNMS. The ExpertNMS provides the tools necessary for Hughes' operators and network engineers to commission, configure, modify, monitor, and isolate problems on the HX system. This ensures Hughes will be able to deliver quality operations and engineering support to the Customer.

High-level features of the ExpertNMS include:

- Browser-based client
- Real-time component health and status
- Real-time utilization – current utilization can be viewed
- Performance monitoring
- Automated network troubleshooting
- Installation wizard guides setup
- Simplified network component configuration
- Context-sensitive help and online reference library

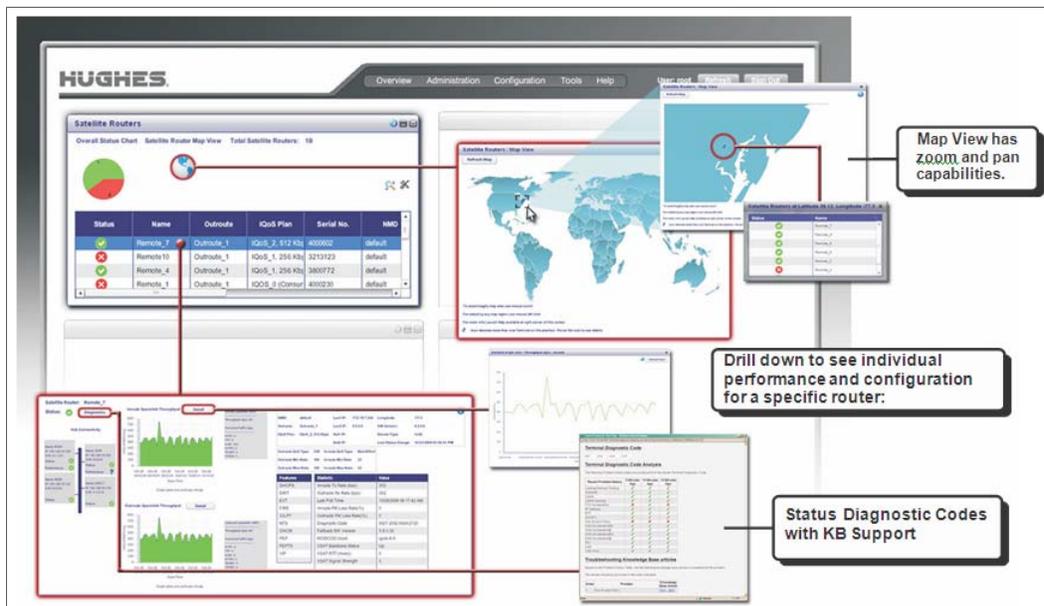


**Figure-1. HX ExpertNMS**

NetExpert provides Hughes operators with a comprehensive overview of their network's performance and the ability to quickly identify the root cause of performance issues.

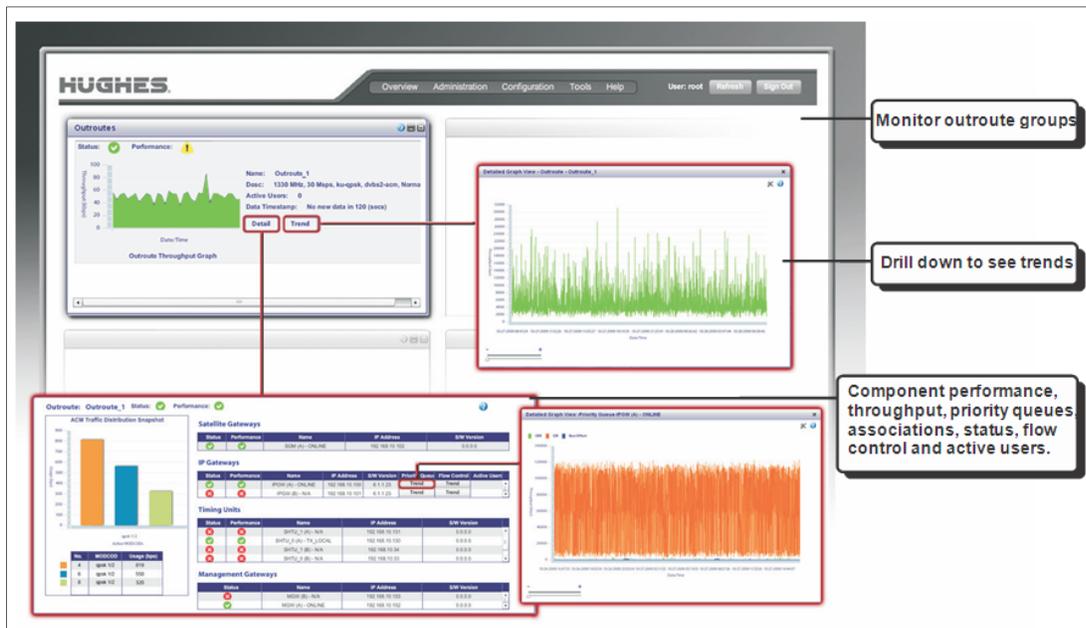
- User Interface
  - Browser-based client
  - Dynamic, context-sensitive window panes
  - Designed for large display in operations centers

- Quick Network Overview
  - Customizable network overview screen
  - Multiple graphs and pie charts give quick overview
  - Router overview - list/map view (aggregated router status)
  - Inroute group – throughput, status, statistics
  - Outroute – throughput, status, statistics
  - Users see only routers associated with their own network
- Network monitoring
  - Full-featured event manager with for event display, filtering, sorting, and acknowledgement
  - Continuous network monitoring with customizable network thresholds to provide notification to Hughes in the event of performance degradation
  - Performance and component status propagate to inroute group and outroute level
  - Detail views provide immediate component associations and status
  - Router diagnostics codes are leveraged to provide insight into router issues
- Simplified network configuration
  - Installation wizard
  - Configuration dashboard
  - Preset templates
- Help
  - Context-sensitive help on all screens
  - Full index and search of help topics
  - Access to a documentation library in PDF form



All return channel components, inroute QoS groups, and inroute bandwidth capacity are monitored via the ExpertNMS.

The ExpertNMS accommodates complete configuration, provisioning, enabling, and disabling of remote sites or groups of remote sites. With over 4,000 uniquely adjustable parameters, the HX system is unparalleled in its flexibility.



**FigureError! No text of specified style in document.-2. ExpertNMS Inroute Status**

**1.1 HUGHES CUSTOMER GATEWAY**

Hughes will provide a network performance portal called Customer Gateway to allow DIR and the Customer to view network performance. Hughes provides a comprehensive network management solution for enterprise and government networks. The Hughes Customer Gateway Portal will provide Customers with real-time, online status reporting on satellite, terrestrial (xDSL, cable), and wireless (EVDO/3G) implementations. The Customer Gateway enables Customers to receive Customer-specific network performance and fault management reports.

To simplify the Customer experience, Hughes provides a single Customer interface that allows enterprise customers and government agencies to administrate an entire network with minimal staffing resources. With a singular interface, Customers will be able to quickly track the installation schedules and the health/status of their digital signage networks.

The Customer Gateway is a Web-based application created and maintained by Hughes. The dashboard screen is shown in Figure-3. Each authorized Customer representative is assigned a user name and password to log into this secure portal. The portal contains information about Customer installation schedules, open tickets status, monthly reports, network engineering and operations problems, viewing technical documentation, gaining

access to knowledge-based articles and the customer can view real-time utilization including throughput, status, statistics for both inroute and outroute traffic.

The screenshot displays the Hughes Satellite Routers management interface. At the top, there are navigation tabs: Overview, Administration, Configuration, Tools, and Help. The main content area is titled "Satellite Routers" and includes an "Overall Status Chart" and a "Satellite Router Map View".

**Map View Callout:** A callout box states "Map View has zoom and pan capabilities." It points to a world map where a specific region is zoomed in, showing a detailed view of the satellite footprint.

Status	Name	Outroute	IQoS Plan	Serial No.	NMD
✓	Remote_7	Outroute_1	IQoS_2_512 Kb	400902	default
✓	Remote_10	Outroute_1	IQoS_1_256 Kb	3213123	default
✗	Remote_4	Outroute_1	IQoS_1_256 Kb	3800772	default
✗	Remote_1	Outroute_1	IQoS_1 (Contur)	400230	default

**Drill-down Callout:** A callout box states "Drill down to see individual performance and configuration for a specific router:". It points to a detailed view of a router, showing "Network Bandwidth Throughput" graphs and a "Terminal Diagnostic Code" table.

Diagnostic Code	Message	Value
DIAGNOSTIC_CODE	DIAGNOSTIC_CODE	000
LAST_PING_TIME	LAST_PING_TIME	1420208.001743 AM
DIAGNOSTIC_CODE	DIAGNOSTIC_CODE	007_000_00001700
DIAGNOSTIC_CODE	DIAGNOSTIC_CODE	000_000

**Status Diagnostic Codes Callout:** A callout box states "Status Diagnostic Codes with KB Support". It points to the "Terminal Diagnostic Code" table.



**Figure-3. Hughes' Customer Gateway**

The Customer Gateway also provides real-time status monitoring and alarm management for the Customer's network. The Web-based proactive monitoring tools developed by Hughes represent a real value-add to the Customer, materially reducing workload, improving communication of problems and status, and reducing the cycle times for problem detection and resolution. Hughes Network Management Service consists of fault management, performance management, and configuration management modules. It will also provide the Customer with a clear insight into their network's status and performance.

For each private network provisioned, Hughes will provide an online training session to network support personnel on how to access and use the Customer Gateway.

**1.2 PERFORMANCE MANAGEMENT**

Hughes' Managed Services will provide the following performance reporting to the Customer:

- **Help Desk:** Response time, dropped calls, and average speed to handle Web tickets.
- **Ticket per Subscriber:** A report that shows the total number of tickets escalated to Advanced Support during any given month. It compares ticket escalation to the total number of subscribers/sites and calculates tickets per subscriber percentage for a given month.
- **Mean Time between Failures (MTBF):** (based on remote maintenance reporting).
- **Average Restoral Time:** (based on remote maintenance reporting).

- **The Network Performance Summary:** A bar graph that shows a sliding 12-month breakdown of the NOC, remote, and network availability (weighted mean average). The number of sites is shown on the same chart in a line graph. In addition to the color graph, a network performance summary sheet identified as a remote performance summary report is included. This sheet includes trouble ticket breakdown, availability, contract field service response, noncontract field service response, Mean Time to Repair (MTTR), and MTBF. This is available through the Customer Gateway.
- **Outage Analysis:** This includes a breakdown of the trouble tickets for the reporting month, by cause, in the form of a color pie chart. In addition to the total number of sites in the Customer's network, the MTTRs for both clock and actual outage period are provided at the bottom of the page. The outage analysis detail and outage analysis percentage report from Hughes' Ticket System database allows the Customer to view the breakdown by problem, date, and time trouble ticket was opened; date and time it was closed; site number; to whom the problem was assigned; and the covered and elapsed hours. Outage analysis by site lists each site that had an outage during the reporting month. The information is the same as shown in the outage detail report. This is available through the Customer Gateway.

Actual trouble tickets from Hughes' ticket system database are available for viewing through the Customer Gateway, a Web-based application at support.hughes.com. A range of tickets can be selected for viewing on the Problem Search screen using a selection of the last 30 days, 7 days, and open tickets. Categories of tickets can be selected for viewing or printing from the Problem Status screen. The various categories include Open, Hold, Pending, Closed, or All. (Online documentation on the use and features of the Customer Gateway can be accessed by selecting the "About This Site" menu option.) Any of the categories can be selected and a specific date range specified. Any ticket that can be viewed can be printed using the Print Frame capability under the File Selection option. This is available through the Customer Gateway.

The Master Site List is a listing of all Customer-commissioned sites to date. This information comes from what is gathered by Hughes' ticket system database. This list is sorted by site ID number and includes the following fields: location name, site address, city, state, ZIP code, contact name and phone number, commission date, decommission date, type of unit installed, and the national NOC facility on which the site is supported. This is available through the Customer Gateway.

The Newly Commissioned Sites List shows all the sites that were commissioned in the reporting month. The information, which is gathered through Hughes' database, lists the Hughes site ID number and includes the following fields: location name, site address, city, state, ZIP code, contact name and phone number, commission date, decommission date, type of unit installed, and the national NOC facility on which the site is supported. This is available through the Customer Gateway.

As part of the Hughes managed service, Hughes offers an option for near real-time and historic traffic analysis reports for Customer network.

In the Managed Services environment, the following standard report options are available with Hughes service for current and historical traffic analysis:

**Fault Management** - provides status monitoring and alarm management, including remote site equipment, dedicated customer network infrastructure equipment, backhaul, and the NOC infrastructure. The Fault Management system generates alarms and automatic tickets for remote sites based on defined rules and thresholds. The Fault Management system provides a top level status view of the customer's network and detailed views of individual devices.

**Geographical Map** - The Fault Management system provides a geographic map view showing a map populated with all of the remote sites and their status indicated by color codes. A zoom-in capability allows the user to view individual remote sites. The map also has the weather information overlaid on the map to indicate rain activities in different regions (relevant for satellite locations). Weather information from the National Weather Service is used for this purpose and is updated every 12 minutes.

**Proactive Monitoring (Site Level Ticket Generation)** - The Fault Management system automatically generates trouble tickets in the Customer Gateway based on alarms when the primary or the backup (VADB) network at an individual site goes down. The system automatically clears the tickets when network connectivity is restored.

**Proactive Monitoring (Network Level Ticket Generation)** – The Fault Management system automatically generates trouble tickets in the Customer Gateway based on alarms associated with network elements that affect a group of remote site locations. Examples could be an IP Gateway, geographical region, DSL service provider, etc. These alarms are calculated using correlation techniques, network hierarchy, and predetermined threshold levels. These alarms are generated in anticipation that if multiple devices have multiple alarms (more than the defined thresholds), there is a high probability that the root cause of the problem is at a higher level network element. When the network level alarms are generated, all the associated individual alarms for the remote sites are suppressed. A trouble ticket is opened in the Customer Gateway based on the network level alarm. This Network Level trouble ticket contains the list of all sites affected. The network level ticket is directly assigned to the operations team and the resolution process starts immediately.

**Performance Management** - provides monitoring and reporting capabilities for the data flowing through the customer's network. These capabilities include utilization reports for traffic analysis and troubleshooting at the aggregate network level as well as the site level. The traffic reports are useful for understanding the network utilization and trends and for forecasting and capacity planning exercises.

The Standard Traffic Reports allow the customer to view aggregate traffic data at the network and site level on demand. The reporting interface provides multiple filters to Customer to choose from and run the appropriate report for a custom time period. The reports include traffic volume and top talkers and can be viewed by inbound or outbound traffic. Data is available with a 3 hour lag and goes up-to one year. The data is available at hourly granularity for the first 3 months and then at daily granularity.

MRTG (Multi-Router Traffic Grapher) reports are also provided which show near real-time aggregate network bandwidth utilization. The graphs show utilization for overall network by inbound and outbound traffic. The daily graphs are based on five (5) minute traffic samples. The weekly, monthly and yearly graphs rollup averages from a previous graph.

If Customer has elected to implement Virtual Automatic Dial Backup (VADB), then VADB utilization reports will be provided showing site usage. These real time reports include graphical representation of all sites currently in an active VADB session during the specified timeframe.

As an option Hughes can provide Premium services beyond the basic services included in the HughesNet service. These Premium services are also accessed through the Network Management system on the Customer Gateway. They are not available for HN9500 networks using D-Plans. Pricing for the Premium services is provided below.

**Premium Services**

The Premium services require Hughes to install and support additional equipment (dedicated probe and switch) in the Hughes NOC for the customer.

**Detailed Application and Protocol Reports**

This option provides the customer with the ability to run reports based on criteria such as time duration, traffic flow, individual site etc.

The following categories and types of reports are available:

- Top talkers, top applications, top conversation (between two hosts);
- Traffic by protocols – bytes vs. time for IP traffic, TCP traffic, UDP traffic; and
- Application performance – application response time, application throughput.
- 3-dimensional reports – Bytes vs Remotes sites with application distribution, Application throughput with top remote sites.

The query based capability provides the ability to select traffic flow by inbound and outbound, different networks defined per Customer specification, and the time duration. The query also provides the capability to view this data for an individual site or the entire network.

The data is available starting from the previous 15 minutes up to a year. The granularity level of the report is based on the duration of time selected for the report. The reports can be as granular as 5 minutes. This granularity is available if the report duration is small such as 1 hour.

**Real Time Traffic Analysis**

The optional detailed traffic analysis feature provides performance monitoring and analysis across the entire network in near real time. It has the capability to collect and aggregate traffic statistics at a one (1) second data interval.

The detailed traffic analysis service has traffic filtering capability to monitor and isolate traffic by protocols (IP, TCP, and UDP), application ports as well as source and destination host. Analysis can be performed for the entire network or an individual or group/range of remotes by IP address/subnets.

These enhanced services also includes up to ten (10) hours of Professional Services from Hughes. Customer can use these consulting hours for going over network issues they uncover using these reporting tools. The Professional Services team can also help in analyzing the application performance over the network and providing with recommendation to optimize the performance.