



Managed Network Services **White Paper**

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CORPORATE OFFICE
4710 Eisenhower Blvd. Suite E-8
Tampa, FL 33634-6337

855-638-9658 (NET-WOLV) www.NetWolves.com

Metrics That Matter

Maintaining a network infrastructure requires a team of dedicated professionals with the expertise and know-how to manage all the inherent design complexities. The cost of doing this is expensive. NetWolves offers a cost-effective, no-nonsense business approach with “metrics that matter.”

NetWolves measures the holistic quality of a network (NHQ) by analyzing and reporting on the following areas:

- Network availability
- Network node performance
- Utilization
- User behavior
- Traffic trending

By aggregating these metrics, NetWolves can provide true insight into your network infrastructure and demonstrate the benefits of using our services.

Network Availability

Network availability is measured at the facility level by providing a percentage of time that users or services are accessible from the WAN. This can be accomplished using different methods depending on the Customer Premises Equipment (CPE), network design, and the level of monitoring you choose. For basic networks where only a single circuit and base model CPE are suitable for your connectivity requirements, NetWolves monitors network availability using ping requests to the WAN interface of the edge device. The default polling time is every minute. When SNMP capable nodes are serving as the WAN edge devices, NetWolves requires read-only access to these devices for more accurate monitoring and sampling. All equipment provided by NetWolves is SNMP capable. In more robust network designs, NetWolves can monitor the WAN edge devices and circuits, and monitor an internal probe as well. This more intrusive monitoring model provides an overall availability metric for your facility, which incorporates the value of resilient network design. For these situations, NetWolves supplies a device (such as the WolfPac™) at the facility to serve as the internal probe target. In addition to network availability, NetWolves also monitors response times to the device or facility from our Network Command and Control Center (NC²) located in Tampa, Florida. All monitored statistics are stored on our redundant NMS (Network Management System) clusters for one year.

Network Node Performance

Network Node Performance (NNP) includes operational metrics that are captured and recorded for a specific node. The following metrics are sampled under the NNP category:

- Average CPU utilization
- Average memory utilization
- Network backbone interface errors
- Network backbone interface packet drops

Storing and analyzing this information in real-time provides NetWolves with the data necessary for advanced troubleshooting and issue resolution at the device level. These metrics are gathered via SNMP, and all statistics are stored on our redundant Network Management Systems (NMS) for one year.

Utilization

Utilization is primarily based on WAN circuit utilization, which is typically the throughput bottleneck on a network. All primary transport path (backbone) interfaces are monitored. The following metrics are sampled and recorded on each monitored interface:

- Maximum transmitted bits per second (bps)
- Maximum received bps
- Average transmitted bps
- Average received bps

The frequency in which these metrics are polled is dictated by the WAN circuit type, as described previously in the Network Availability section. These metrics are obtained via SNMP, and all statistics are stored on our redundant Network Management Systems for one year.

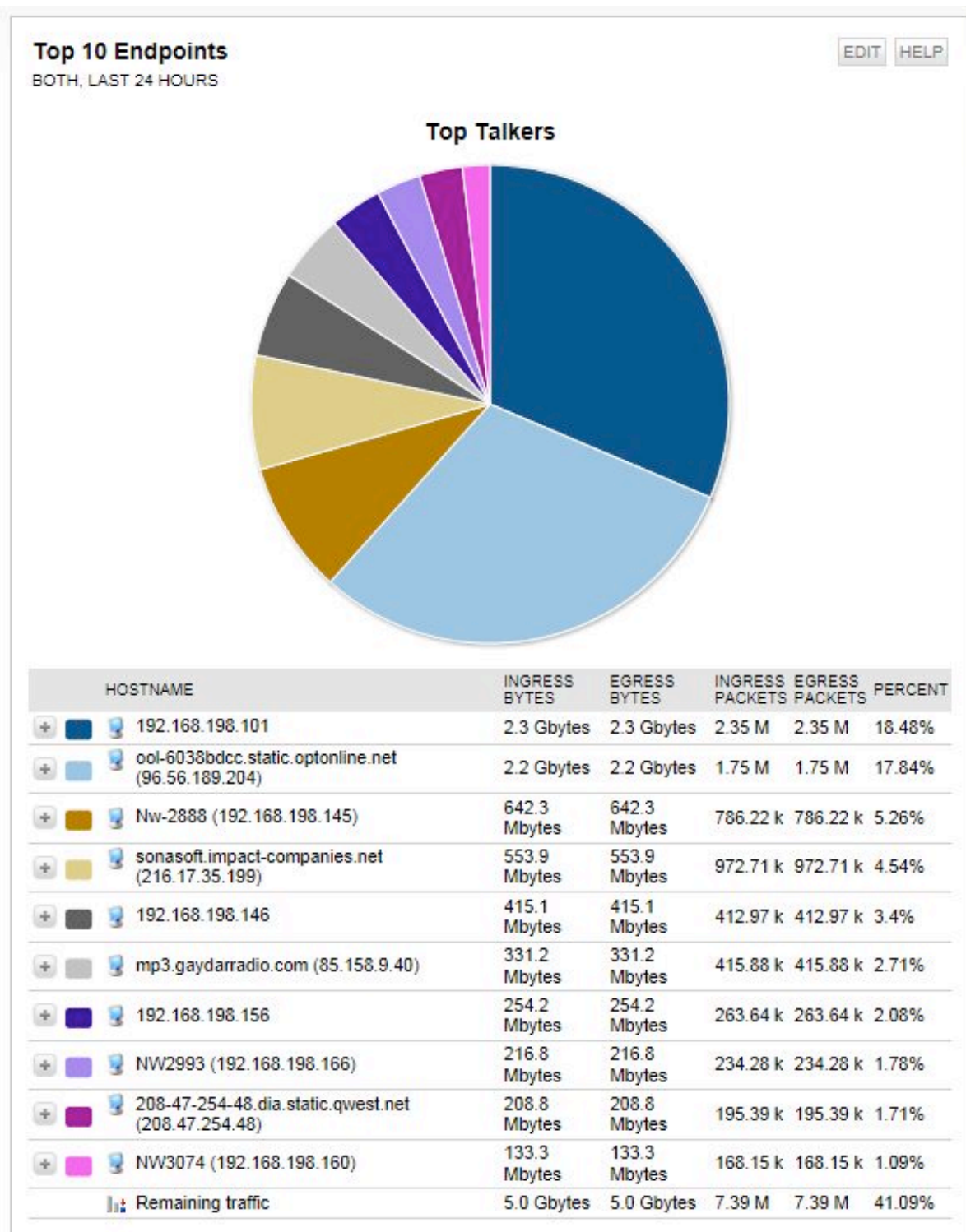
User Behavior

User behavior is what a network device is accessing over the WAN. NetWolves' proprietary WolfPac™ device is used to monitor and report on these metrics. The WolfPac™ can be deployed in one of three ways:

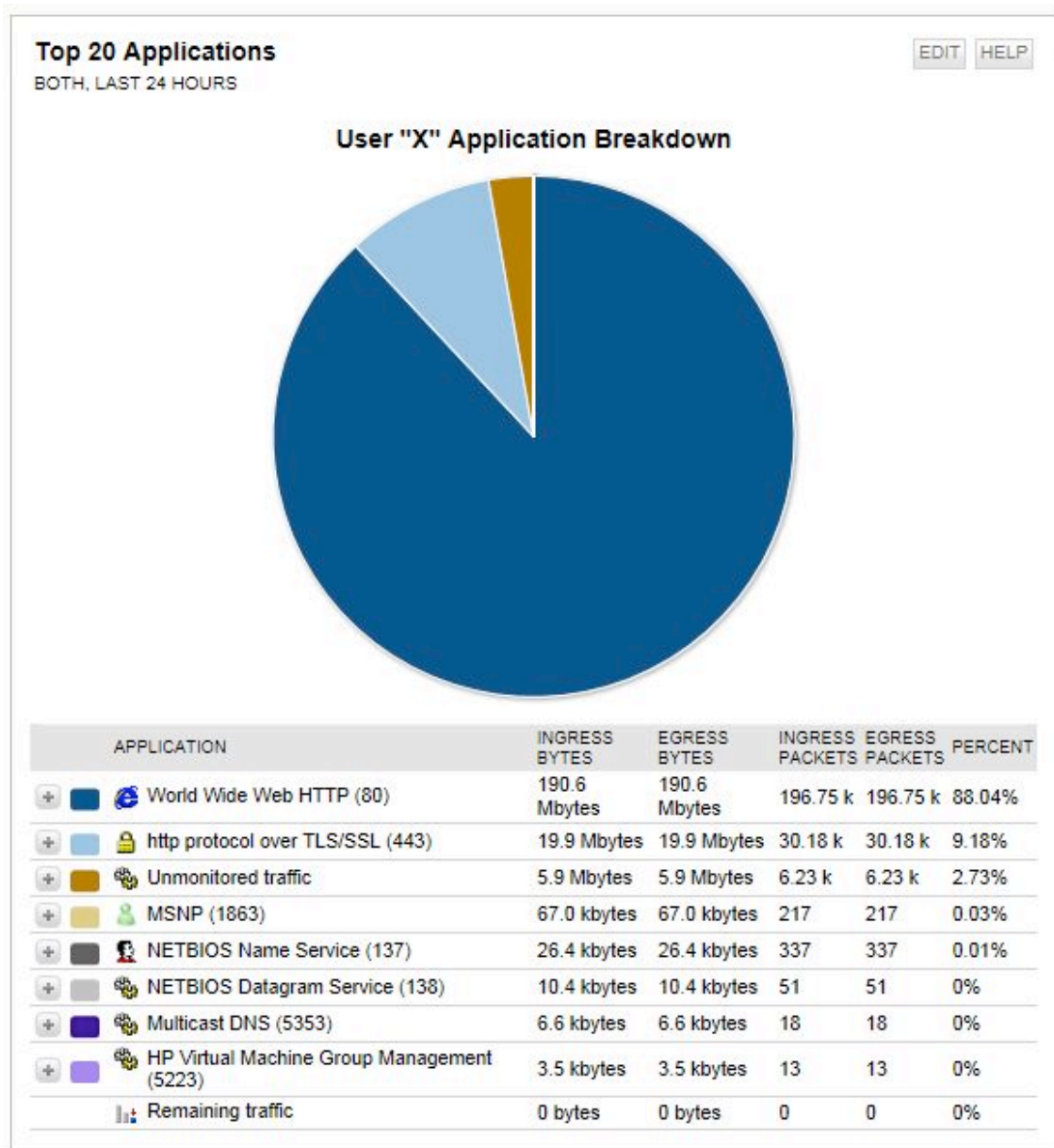
- In-line: The WolfPac™ is placed in-line between the facility edge router provided by NetWolves and the LAN layer 2/3 device. This configuration routes all traffic through the WolfPac™. In this deployment style, the WolfPac™ is configured for bypass and permits traffic to flow in the event of a power failure.
- Span: The WolfPac™ is connected to the facility main/core layer 2/3 device. This deployment method depends on span capabilities in the core.
- VLAN bridge: When the core device is not span capable, the WolfPac™ can act as a bridge between two VLANs. All traffic is routed between the LAN and the facility edge router through the WolfPac™.

Each of these deployment scenarios captures all IP traffic that traverses the WAN. The WolfPac™ records this traffic and categorizes it using the network user's NetBIOS name. Additionally, the WolfPac™ stores the traffic type (HTTP, email, VoIP, etc.) and the quantity of each type in bytes that each network user is accessing.

The following image provides a view of the ten heaviest network users or “top talkers,” and the amount of data that is traveling to and from the network endpoints.



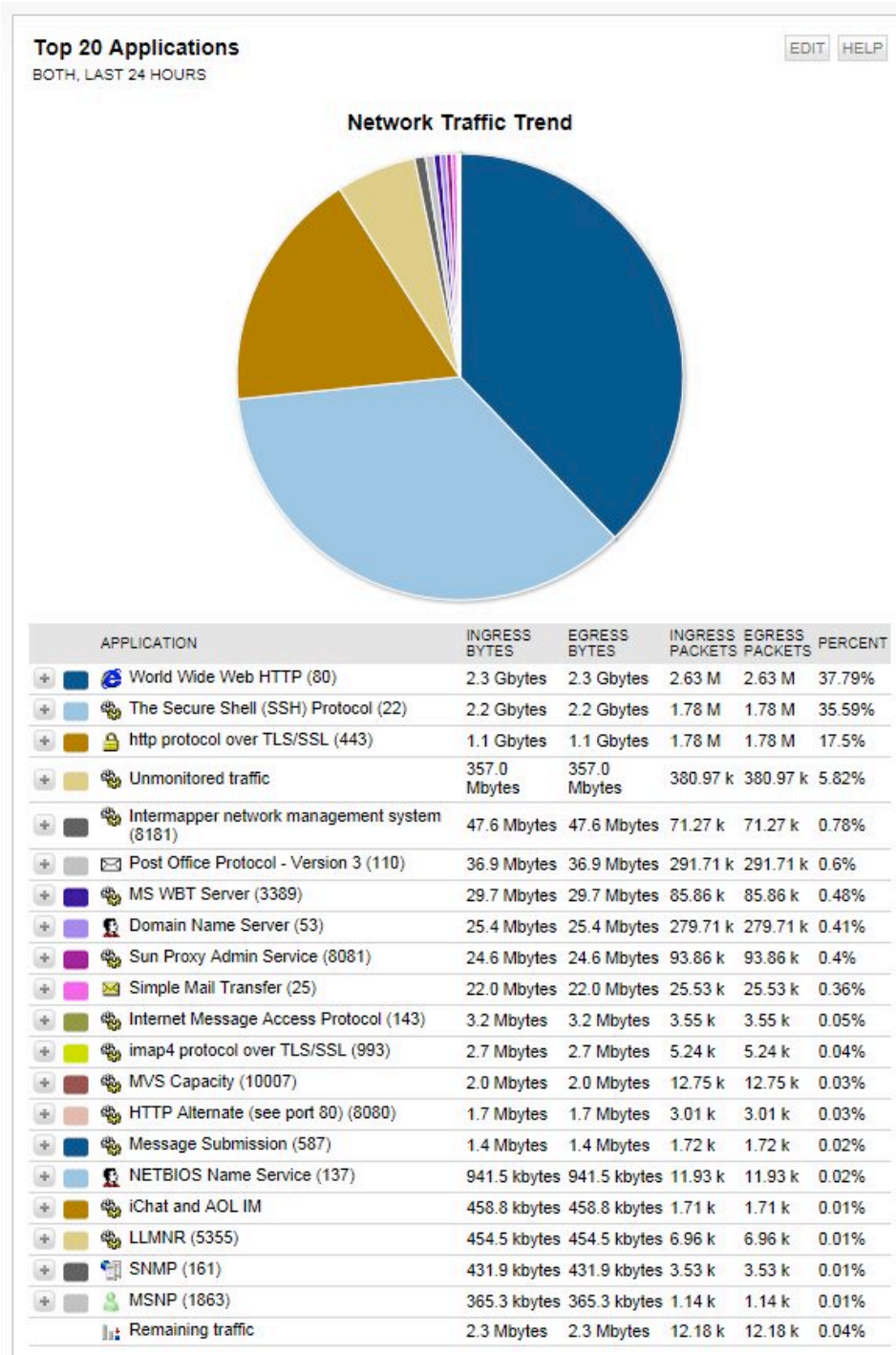
The following image illustrates a particular user, in this case the network's top talkers and what applications they have accessed in the last 24 hours. It also shows the amount of each application process, both to and from this particular node on the IP network.



Traffic Trending

Traffic trending answers the question, *what is going on in my network?* NetWolves can aggregate and classify all the traffic that traverses costly WAN circuits, and measure the quantity of each traffic type in order to improve capacity planning.

The following image shows an aggregated view of the top 20 applications and their quantities traversing a particular customer data center core.



Powerful Monitoring Options

NetWolves' Managed Network Offering provides several network monitoring options for you to choose from based on your operational requirements. Each option corresponds directly to the NetWolves Network Holistic Quality categories, and provides flexibility as required by your business needs. All metrics being monitored are managed around the clock at NetWolves' Network Command and Control Center (NC²), and can be provided to our customers at any time.

NHQ Category	Silver	Gold	Platinum
Network Availability	✓	✓	✓
Network Node Performance		✓	✓
Utilization		✓	✓
User Behavior			✓
Traffic Trending			✓

Silver Level Monitoring

This service offers basic up or down monitoring per circuit, or a single device. NetWolves pings the remote sites every minute. If the site fails to respond after three attempts, an alert is sent to the NetWolves Network Command and Control Center (NC²) triggering the appropriate standard operating procedure for the customer and circuit. The device is considered to be operating normally when it responds to our monitoring system for five consecutive minutes. NetWolves can monitor most circuit types terminated on a device that is capable of responding to a ping request. Broadband circuits may require a device in addition to Telco provided CPE that is capable of responding to a ping request.

Gold Level Monitoring

This service offers more robust monitoring of network CPE. NetWolves monitors interface statistics along with CPU and memory utilization. All the devices being monitored and provided by NetWolves or the customer must be accessible from our network command and control center. The information being monitored and recorded is gathered by the local device, and then retrieved every minute by NetWolves' polling systems. If our systems fail to connect to a device, they will reattempt every 60 seconds. The device is considered down until connectivity is restored.

In addition to availability and connectivity, NetWolves monitors interface errors and packet drops. An alert occurs if any backbone interface reports 5% packet loss over the span of five minutes, or 500 errors are received within five minutes. NetWolves will follow the appropriate standard operating procedure for the alert when this occurs. NetWolves also monitors real-time and historical utilization for all network backbone interfaces and circuits, as well as round-trip response times between our management system and each monitored device. Alerts are triggered when an interface reaches 90% utilization for five minutes, and when a device's response time exceeds two seconds for more than five minutes.

All NetWolves or CPE monitored devices must be SNMP V2 capable, and accessible from our Network Command and Control Center (NC²). All non-NetWolves provided Customer Provided Equipment (CPE) requires approval from NetWolves. Equipment provided by NetWolves is available at an additional charge.

Platinum Level Monitoring

This service offers all the functionality of our Gold Level Monitoring plus the added benefit of using our proprietary WolfPac™ monitoring device. The WolfPac™ can capture, record, and validate nearly anything on your network.

Service	Features
Security	<ul style="list-style-type: none">• Scanning can detect over 25,000 different potential security risks on a particular host. Providing a vulnerability report is a very demanding exercise and will be evaluated on a case by case basis.• The detection of a full or partial list of variables is available on certain devices. By analyzing the results of a network device scan, NetWolves can develop a list of supported Management Information Bases (MIBs) and obtain full descriptions of the variables and possible values.
Traffic Trending Applications	<ul style="list-style-type: none">• A web browser is available to analyze traffic information in order to obtain network usage, including:<ul style="list-style-type: none">○ Sort network traffic according to several protocols and criteria.○ Determine traffic statistics.○ Identify the identity of computer users (email address).○ Passively identify the host operating system (without sending probe packets).○ Determine IP traffic distribution among various protocols.○ Analyze and sort IP traffic by source/destination.○ Determine the IP traffic subnet matrix (who's talking to who).○ Report IP protocol usage sorted by protocol type.• Netflow export:<ul style="list-style-type: none">○ All network traffic analytics can be exported to a third party application.• Real-time network traffic capturing and displaying of packet headers for all network interfaces or a particular interface.• Traffic counter and estimator that keeps a log of network traffic for the selected interface(s):<ul style="list-style-type: none">○ Throughput statistics.○ Monitor multiple interfaces at once.○ Several output options including summary, hourly, daily, monthly, weekly, and top 10 days, as well as optional image output.○ Months can be configured to follow a billing period.
Network Performance Applications	<ul style="list-style-type: none">• Throughput testing tool for creating data streams and measuring the throughput of a network.

The following table summarizes the monitoring levels offered by NetWolves.

Option	Silver	Gold	Platinum
Basic up/down monitoring of device or circuit (ICMP)	✓	✓	✓
Monitoring of most circuit types (DSL, cable, Ethernet, T1, T3, etc.)	✓	✓	✓
Proactive network management through performance thresholds		✓	✓
SNMP monitoring		✓	✓
Monitoring of interface status, CPU and memory utilization for network nodes		✓	✓
Monitoring of circuit quality (error detection and availability)		✓	✓
Real-time monitoring of circuit bandwidth utilization, reporting and archiving		✓	✓
Customized reports on a weekly, monthly, and annual basis		✓	✓
Offsite node configuration backup		✓	✓
On-demand vulnerability reporting			✓
On-demand packet capture capability			✓
Onsite node configuration backup			✓
Real-time traffic flow statistics			✓
NetWolves WolfPac [™] with proprietary SRM ^{2™} monitoring platform			✓
On-demand throughput testing between sites			✓

Reporting Options

The NetWolves Managed Network Services (MNS) reporting options include the following:

- Weekly WAN circuit utilization report.
- Quarterly Managed Services Report (QMSR).

NetWolves also offers an SRM²™ portal for our MNS customers (see the Managed Network Options below). This portal provides you with real-time access to all monitored information via the Internet.

The Weekly WAN circuit utilization report is automatically generated from our SRM²™-S monitoring system. The report is provided to you every Monday before 12:00 PM EST, and summarizes maximum and average circuit utilization during your business hours.

Our MNS customers receive the Quarterly Managed Services Report. The details of this report will depend on which monitoring level you select. It will include the following sections:

- Executive Summary: Provides a copy of your Statement of Work with NetWolves.
- Managed Services: Summarizes your NetWolves services.
- NHQ: Provides both a summary and details of your network design.

Managed Network Options

In addition to monitoring and reporting, our Managed Network Offering provides these other major services:

- Incident Management
- Time To Repair
- Critical Problem Review
- Reviews, Moves, Adds, and Changes
- Existing Client Project

Incident Management

Incident Management (IM) includes the processes and procedures that NetWolves uses to identify, analyze, and correct current and potential issues affecting our customers in order to minimize down-time. The extent of these processes and procedures are tied to the level of monitoring included in the customer contract, however any/all levels of troubleshooting are available to any customer on a time and material basis. Incident tickets are created to troubleshoot and track customer outages or issues from inception to resolution. These tickets are the primary method of communication to our customers regarding the status of their outage or issue. NetWolves recognizes three levels of severity when managing customer issues.

Level	Description
Urgent	Site is down without connectivity or failover. NetWolves or the customer declares an emergency.
High	Site is in a degraded state and failed over to backup circuit, but operating in a limited capacity.
Moderate	Site is in a degraded state or experiencing an intermittent issue, for example slowness, packet loss, or circuit bounced.

Time To Repair

Time To Repair (TTR) is the length of time from event notification by NetWolves monitoring or customer to issue resolution, as verified by the customer and NetWolves.

Critical Problem Review

Critical Problem Review (CPR) is for critical production outages affecting multiple customer sites for two or more hours. A CPR can be generated by NetWolves or requested by the customer, and provides the following:

- Detailed description of the outage including a timeline of events.
- Actions performed by NetWolves to resolve the issue.
- List of personnel involved in the outage and resolution.

Reviews, Moves, Adds, and Changes

Reviews, Moves, Adds, and Changes (RMAC) includes any requests that must be completed, and estimated to require up to eight (8) hours for NetWolves to design and implement for an existing customer with operational managed devices. For example, a customer with Platinum Level Monitoring requests a bandwidth report for the top user at one location. NetWolves evaluates the request and determines it will take approximately four hours to provide the information. This work effort is classified as an RMAC, scheduled, and executed.

RMACs do not require any project management or a statement of work. RMACs do require two business days for scheduling (if required) and can be executed between 6:00 a.m. and 12:00 a.m. EST, Monday through Friday. Off-hour exceptions may be scheduled with approval from the NetWolves resource manager. All RMAC estimates are tracked by the NetWolves account manager.

Existing Client Project

Existing Client Project (ECP) includes any changes that must be completed, and estimated to take more than 8 hours for NetWolves to design and implement for an existing customer. ECPs require a dedicated project manager, lead engineer, and account manager. All ECPs also require a signed Statement of Work between NetWolves and the customer.

Levels of Service for Every Need

NetWolves offers three standard levels of network management ranging from basic transport to a fully managed, zero-touch network infrastructure. All levels can be further customized as necessary to fit your requirements.

Basic Management

This service offers an entry level solution for businesses with simple connectivity needs, and includes a convenient pay as you go cost structure. The Basic Management service comes standard with Silver Level Monitoring and Internet access configuration support for NetWolves provided equipment. In addition, you get around the clock Incident Management (IM) services for identifying, analyzing, and resolving network issues.

Advanced Management

This service provides the next level of management for organizations with more complex connectivity and security requirements. The Advanced Management service includes Gold Level monitoring with the option to step up to Platinum Level monitoring, and access to the SRM²TM-S portal with self-service and weekly bandwidth reporting capabilities. In addition, you get full configuration support for all NetWolves provided equipment and around the clock Incident Management services. This service also includes up to four Review, Move, Add, and Change (RMAC) executions per calendar month as well as Critical Problem Review (CPR).

Enterprise Management

This service is targeted for large organizations with a high change rate. The Enterprise Management service comes standard with all MNO services including uncapped RMAC execution, Existing Client Project (ECP) execution with up to 500 project hours per calendar year, and both in-scope and on-demand CPR. In addition, you get NetWolves' top of the line Platinum Level Monitoring, and access to the SRM²TM-S portal with self-service and weekly bandwidth reporting capabilities. Configuration support for all equipment provided by NetWolves and a Quarterly Managed Services Report (QMSR) completes this offering.

Service	Features
Basic	<ul style="list-style-type: none">• Silver Level monitoring.• Basic Internet access configuration support for NPE.• Around the clock (24 x 7 x 365) IM services.• All other Managed Network Services are billable.
Advanced	<ul style="list-style-type: none">• Gold Level monitoring.• SRM²TM-S portal with self-service reporting and auto generated weekly bandwidth reporting.• Full feature set configuration support for all equipment provided by NetWolves.• Around the clock IM services.• Four (4) RMAC executions per calendar month.• In scope CPR (out of scope CPRs are billable).• All other MNO services are billable.
Enterprise	<ul style="list-style-type: none">• Platinum Level monitoring.• SRM²TM-S portal with self-service reporting and auto-generated weekly bandwidth reporting.• Full feature set configuration support for all equipment provided by NetWolves.• Around the clock IM services.• Uncapped RMAC execution.• ECP execution up to 500 project hours per calendar year.• Both in-scope and on demand CPR.• QMSR execution.