

National Wireless Provider Packet Data Network Monitoring and Management Analysis and Recommendation

**Phil Marasco
Employer Networks**

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Purpose

The purpose of the assessment is to perform a gap analysis on National Wireless Provider's existing monitoring, management, and alert notification practices. The assessment is based on the NOC visit and various hands-on workshop sessions held at National Wireless Provider. Upon completion of the assessment, Phil Marasco Employer will provide to National Wireless Provider's Engineering and Operations group a detailed set of recommendations regarding the tools, methodologies, process, and procedures for monitoring, reporting, and problem resolution. When it comes to delivering service to end user customers, Phil Marasco' Employer adheres to a strict three-step process: Network Containment, Service Assurance, and End-user Performance and Trending.

Network Containment – Network operation process Monitoring and Management

Service Assurance – End user or product effecting application monitoring metrics

End-User Performance and Trending – Comprehensive reporting and forecasting structures

Phil Marasco Employer analyzed the following areas within National Wireless Provider:

Overall Network

Current Network health issues

Fault management

Internal Escalation procedure

Reporting procedure (internal and external end user customer)

Outage notification (internal and external end user customer)

Engagement Process

As part of the Two Week assessment, Phil Marasco Employer is providing National Wireless Provider Communications a with a set of recommendations for defining a number of process, procedures, and rule sets relating to the current operations of the National Wireless Provider packet data network. This includes monitoring, reporting, trouble analysis, and escalation process and procedures. There are four areas which Phil Marasco Employer will concentrate the efforts:

- Baseline configuration and monitoring of the National Wireless Provider Packet Data Network
- Requirements definition
- Gap analysis of existing rule sets (Process and procedures)
- Recommendations and actions

Phil Marasco Employer will provide National Wireless Provider with a three phase implementation approach. It is important that each phase be completed prior to defining and implementing the next phase. The three phases are:

- Network Containment
- Service Assurance and reliability
- User performance and trending

Phil Marasco Employer is starting with the following facts and assumptions from the initial workshop and prior engagements:

1. Consolidation of network monitoring elements needs to be focused for operations on one primary collection system for network events and performance. At this time Netcool has been identified to be the final presentation tool and repository of monitoring information. Netcool will be supported by several downstream collector elements that provide more customizable element event filtering and visibility.
2. Clarify—one of the existing ticket systems—will be used to provide:
 - Historical trending of events and network availability reports
 - Visibility of outage status across the organization
 - Establishment of chronic issue tracking capabilities
 - Automated alert notification across the organization
3. Initial focus on core master elements (element names that may have multiple components) that have service impact on all or many data clients:
 - Uplink, DNS, AAA, PIX Firewalls, HA/FA, MDG, OMC, ONR, ONSw, IMG, Big IP, and core including IGX/MGX/BPX and CAT5500s

Proposed Next Steps

Phase I
Network Containment

1. Finalize list of service(s) affecting elements within the packet data Network.

It is estimated that there are currently eighteen major service elements existing and affecting the packet data network. These elements need to be broken down into the various components which make up the

overall network. Phil Marasco Employer will identify each service affecting element, its current code versions (hardware and Software), and how it is currently managed.

1.1 National Wireless Provider Deliverables to Phil Marasco Employer:

Phil Marasco Employer will need access to the NOC and individuals who are responsible for the monitoring and managing all of the elements within the packet data network. The information that needs to be provided by National Wireless Provider is device hardware and software versions, IP addresses, and topology/configuration of all current elements.

2. Identify and document fault management capabilities of each element and supporting tools.

Phil Marasco Employer will identify and document information regarding each service element affecting the packet data network. This includes but is not limited to hardware and software versions, MIBs for current code versions, alarm monitoring capabilities within each element, and any planned code or version upgrades to bring the element up to latest revision.

Additionally, Phil Marasco Employer will identify element capabilities with Object IDs (OIDs) and groupings based on information classification, supporting system monitoring tool capabilities that provide upstream event messaging, if not directly reporting to Netcool, System Edge, iWatch, InfoVista, Insight Manager, and ITO. As well, Phil Marasco Employer will identify application specific monitoring hooks.

2.1 National Wireless Provider Deliverables to Phil Marasco Employer:

National Wireless Provider will need to provide access to individuals who manage the IT system infrastructure for upstream event messaging systems, current configuration of systems and specifications, planned element changes of code updates for the 18 major elements identified. As well as, provide a road-map for code updates over the next six months.

3. Define fault management rules within Netcool for each element and recommendation on downstream reporting platform use.

Phil Marasco Employer will work with the National Wireless Provider operation groups to confirm that its proposed business rules meet the desired operations management requirements. Phil Marasco Employer will document the current MIB walks for all planned code upgrades within six months. Obviously, this is limited to the availability of new and future MIBs from vendor(s.) Perform logical breakdown of OID's and Traps that will not be monitored and provide brief reasoning. Provide National Wireless Provider IT with rules sets and element requirements for both Traps and OID poles, including traps and OIDs per element, severity of each event or result of each event, vendor specific information on the Trap or OID for "online advisor", and documentation for Netcool implementation for IT on the Traps and OID per element.

Phil Marasco Employer will validate and document supporting system monitoring tool requirements that provide upstream event messaging for devices not directly reporting to Netcool. (Certain systems may be identified for retirement if other common systems can provide the same capability.) I.e. System Edge, iWatch, InfoVista, Insight Manager, and ITO.

3.1 National Wireless Provider Deliverables to Phil Marasco Employer:

National Wireless Provider will provide an IT primary point of contact that will identify current rule sets implemented as well as current work load and capabilities. Someone from the IT organization will need to confirm (or provide formatting of) information that Phil Marasco Employer VX shall provide for rule-set implementation within Netcool, and Provide rule-set deliverables for Phil Marasco Employer.

National Wireless Provider shall provide a primary point of contact within each operation's organization for sign-off on the group's business rules

4. Define and document standard business rules for service outages and alert notification processes.

Phil Marasco Employer will identify service outage and thresholds within business definitions as they apply to network elements and services supplied by these elements for automated alert notification, including:

Defined manual and automated alert notification process for operational organization

4.1 National Wireless Provider Deliverables to Phil Marasco Employer:

Access to individuals within each operational group who can act as the point of contact for alert notification requirements. (This information will be gathered in conjunction with the establishment of business rule-sets from the previous function.) Create NMS operation dashboard(s) format for presentation to internal National Wireless Provider organizations, including rule-sets for presentation.

Phil Marasco Employer shall establish an information access strategy for operational organizations, including Netcool views for each organization. In addition, Phil Marasco Employer will clarify standard report views for each organization and document how these reports can be modified as devices and sites are added or changed over time.

5.1 National Wireless Provider Deliverable to Phil Marasco Employer:

National Wireless Provider shall provide access to individuals within each operational group who can act as the point of contact for requirements validation. (This information will be gathered in conjunction with the establishment of business rule-sets from the previous function.)

5. Define and document information exchange requirements for the gateway between Netcool and Clarify, including: analysis and requirements definitions of additional fields, standard use, and Netcool-to-Clarify data exchange requirements.

Phil Marasco Employer will provide additional research and requirements definition through additional NOC visits to define the requirements for informational fields within Clarify. These additional fields include format of information (text, number, date, and length of field), what organization, or data source (Netcool, System Edge, manual) the information will come from for population. Phil Marasco Employer will provide recommendation on standardization of use across National Wireless Provider packet data network. As well, define auto-ticket creation requirements with tie-in to Netcool event classification. At the same time, document changes for system users to inform them of new fields and use.

5.1 National Wireless Provider Deliverables to Phil Marasco Employer:

National Wireless Provider shall provide access to individuals within each operational group who can act as the point of contact for information requirements. (This information will be gathered in conjunction with the establishment of business rule-sets from the previous function.)

Also, Phil Marasco Employer will need access to NOC and NOC personnel for additional information gathering on existing Clarify fields and use.

6. Create basic reports (approximately 10) for the NOC Data group.

Phil Marasco Employer will create basic reports for National Wireless Provider NOC personnel to include

- Shift turnover (All exchange of information is currently manual and has no checks.)
- Continuity (All exchange of information is currently manual and has no checks.)
- Escalation reports (No automated escalations exist.)
- Closure validation (All are performed manually today.)
- Chronic problems alert (No chronic reporting or ticket correlation exists. Ticket system is currently incapable of this function until new fields are created.)
- Creation and tracking of flashes (Performed manually with no acknowledgement capabilities.) Tier 2 report (Processed manually and use of ticket queuing does not exist.)
- Additional reports to be defined

- Documentation of new reports and practical applications by operational organization and NOC

7.1 National Wireless Provider Deliverable to Phil Marasco Employer:

National Wireless Provider shall provide access to individuals within each operational group who can act as the point of contact for information requirements. (This information will be gathered in conjunction with the establishment of business rule-sets from the previous function.)

7. Create basic reports (approximately five) for Tech Support

Phil Marasco Employer will identify and document basic reports for the tech support organization to include Reports that allow views into chronic problems, typical response times, mean time to repair, and root causes. Phil Marasco Employer will provide recommendations and process guidelines for reports that allow National Wireless Provider to generate and modify on-going business rule inputs.

8.1 National Wireless Provider Deliverable to Phil Marasco Employer:

Access to individuals within Tier 2 support organization for better understanding of existing process and procedures. Examples of typical escalation process are current trending of events that are escalated.

Phase II**Service Assurance and Reliability**

The next phase/engagement will be to implement or create a service template for existing network elements and applications. This consists of defined business rule sets for monitoring all aspects of the service itself. This will include a creation of a Service Level Statement according to metrics and deliverables defined by the service template. Some examples might be correlating root cause, network events, and service metric impacts to establish service impacting event matrices, SLA thresholds within existing network elements. Apply the baseline service metrics to validate service template and use this to implement procedures for alert notification to existing National Wireless Provider organizations.

Phase III**End-User Performance and Measurement**

- Measure network element metrics against service metrics
- Define customer impacts for average service impacting event
- Measure events in terms of customers impacted
- Measure markets in terms of number of service impacts
- Measure root causes in terms or customers impacted
- Establish Service Level agreements with internal support agencies that relate to service impacts
- Correlate root cause, service metrics, markets, and customer coverage to generate service risk templates

Methodology

Phil Marasco Employer has leveraged its standard Network Operations Methodology for this workshop and assessment. This approach will lead to increased service availability and operational efficiencies by enhancing and optimizing monitoring and management capabilities. The guiding principle behind the methodology is to establish and maintain the flow of necessary information to the appropriate organizations. Metrics established in the initial stages will ensure that deliverables track the project goals and meet the defined business objectives. Overall, this will result in streamlined processes, full utilization of technological capabilities, and an increase in the efficiency of the organization.

We have logically divided this effort into four primary areas: *Evaluation of Current Network Operations; Baseline Comparison against Classical Network Operations Methodology; Establishment of Short-, Medium-, and Long-Term Objectives; and Development of an Action Plan.*

The evaluation phase mainly consists of determining the systems, managed elements, configuration, and capabilities of the existing National Wireless Provider Operations infrastructure. During the next phase we will establish the baseline and compare the operations capabilities to the Classical Network Operations Methodology. Based on this, we will establish objectives for the short-, medium-, and long-term areas of focus. In conclusion, we will recommend an action plan for accomplishing the stated objectives. Highlights of each of the areas within the methodology are covered below:

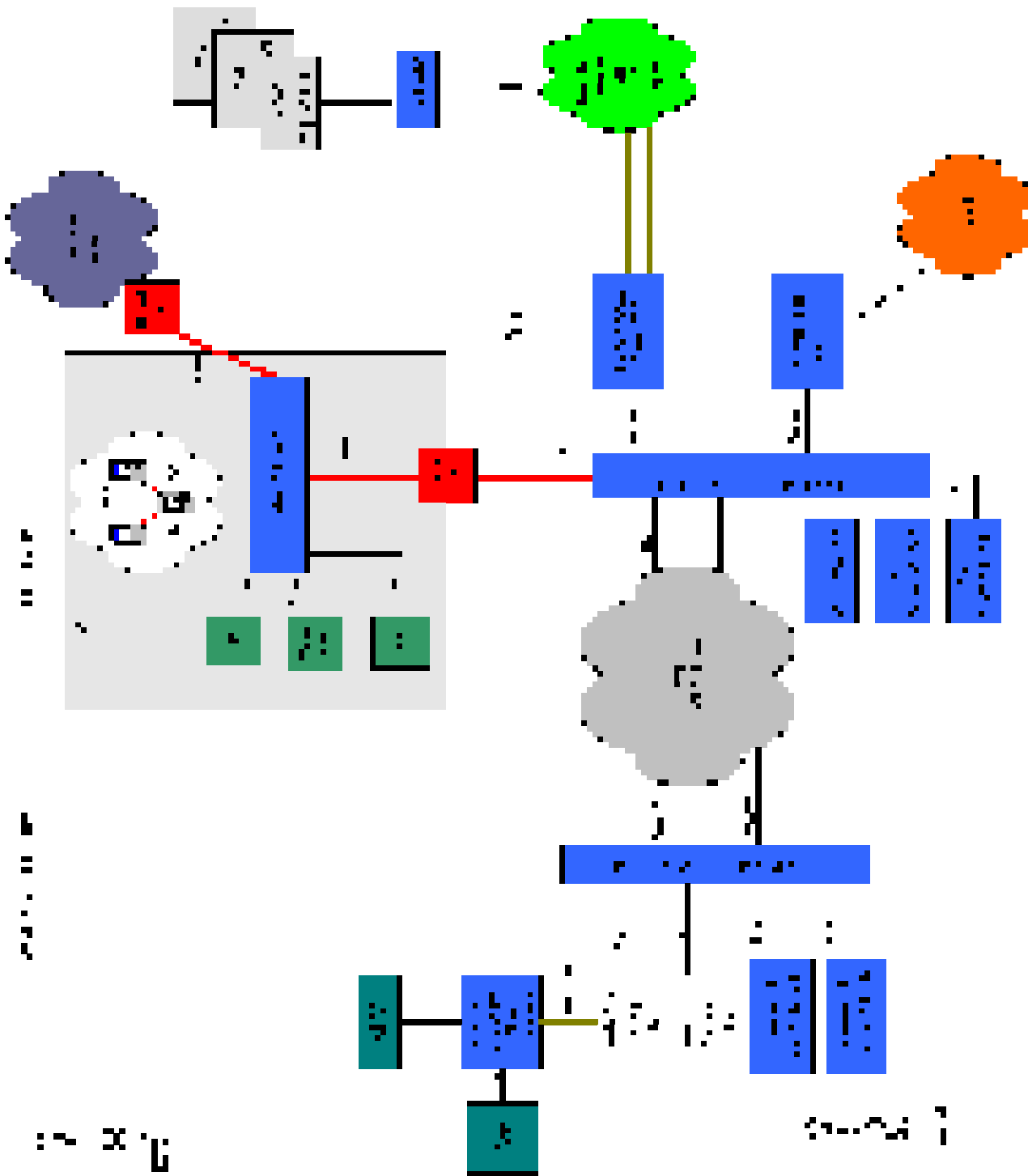
- **Evaluate Operational Management of the Network**
 - Topology and configuration of National Wireless Provider's Network
 - Packet data and packet data client services
 - National Wireless Provider's Network Operations plan
 - Current monitoring, ticketing, alert notification, and tools in place
 - Equipment capabilities to be monitored and managed
- **Baseline Comparison against Classical Network Operations Methodology**
 - Network Containment
 - Service Assurance and Monitoring
 - End-User Performance and Trending
- **Establish Objectives for Short, Medium, Large**
 - Short-Term – What can be fixed/improved immediately over 3 months
 - Medium-Term – What can be fixed/improved over the next 6 months
 - Long-Term – What fixes and improvements will likely take 6-12 months or more
- **Develop Action Plan**
 - Short-term "Get-Well" requirements and tactical activities
 - Medium-term targeted requirements
 - Long-term functional and strategic requirements

Current National Wireless Provider Network Element Monitoring

	MONITORING TOOLS					
	IT-OPS	ENG/OPS	IT-OPS	ENG/OPS	ENG/OPS	ENG/OPS
NETWORK ELEMENTS	iWatch	SysEdge	ITO	NetCool	HP OpenView	Cisco WAN Manager
Uplink	Yes	Yes	Yes		Yes	
EMC	Yes					
DNS Sun E2 Solaris		Yes	Yes	Yes		
Cisco PIX firew all					Yes	
Cisco Internet Router 7204					Yes	
Cisco Home Agent 7204 VXR					Yes	
Cisco NAT Routers 7204 VXR					Yes	
Cisco 3rd Party Routers 7204					Yes	
Cisco Catalyst 5500 w /RSM TACACS+ AAA 2 Sun E450s Solaris/Oracle		Yes	Yes			
Cisco IGX/WAN						Yes
MPS (IGX, MGX, BPX)						Yes
MDG				Limited		
OMC		Yes				
ONR					Yes	
ONSw						
IMG		Yes				
Big IP						

Basic National Wireless Provider Network Topology

The chart below reflects National Wireless Provider's network elements and monitoring tools deployed within the Packet Data Network. Today there are two organizations responsible for managing and monitoring the network elements. Monitoring, management, and notification responsibilities are based on the network element.



Definition of Baseline Standards

Phil Marasco Employer follows traditional Network Operations Practices in order to accomplish the mission of end-to-end management of the total customer experience. As indicated in the Process subsection of this document, Phil Marasco Employer utilizes a three-step process for this: Network Containment, Service Assurance, and End-user Performance and Trending. The following paragraph describes the objective of each of these steps while the subsequent bullets provide the detailed description and definition.

The first phase of this process, *Network Containment*, is designed to accomplish the basic blocking and tackling aspect of network operations: effective monitoring of network elements and expeditious resolution of network faults.

The second phase of this process, *Service Assurance*, is designed to correlate the services that ride on top of network to the managed elements defined in the Network Containment phase. This allows the operations group to monitor the customer experience and “assure” the service is operational.

The third phase of this process, *End-User Performance and Measurement*, is designed to take the underlying capabilities of Network Containment and Service Assurance to allow measurement of overall performance against defined metrics and proactively determine “risk” areas in the network.

A more detailed definition on each of these is as follows:

- **Network Containment**
 - Put all Nodes into a centralized Network Monitoring System
 - Implement established business rules to govern notification and escalation
 - Gather statistics for reporting and trend analysis
 - Automate ticket creation to track all events – no matter how short lived
 - Establish root cause tracking in ticket system
 - Establish event timing and repair timetables in ticket system
 - Map customers to markets to enable notification
 - Map services to markets to enable tracking and event impacts
- **Service Assurance**
 - Use all unique service effecting network elements to create a service template
 - Create monitors and business rules built onto the service template
 - Apply baseline service metrics to validate service template
 - Add template and business rules to Network Monitoring System
 - Create Service Level Statement according to metrics and deliverables defined by service template
 - Correlate root cause, network events, and service metric impacts to establish service impacting event matrices
- **End-User Performance and Measurement**
 - Measure network element metrics against service metrics
 - Define customer impacts for average service impacting event
 - Measure events in terms of customers impacted
 - Measure markets in terms of number of service impacts
 - Measure root causes in terms or customers impacted
 - Establish Service Level agreements with internal support agencies that relate to service impacts
 - Correlate root cause, service metrics, markets, and customer coverage to generate service risk templates

High-Level GAP Analysis Summary

Through various meetings, information gathering exercises, and facility walk-throughs, Phil Marasco Employer has come to the following conclusions:

- **Personnel**
 - National Wireless Provider maintains a staff of motivated and highly competent personnel.
 - Personnel have no time to create proactive processes and are in reactive mode.
 - Personnel have limited viability into other groups within National Wireless Provider.
 - Training cycles are longer than required due to multiple tools, monitoring agents, and non-standard implementations.
 - Personnel churn could eliminate all institutional knowledge fairly quickly.

- **Data Infrastructure**
 - National Wireless Provider has one of the most redundant infrastructures in place, as compared to its competitors in the industry.
 - The infrastructure has been overbuilt, from a capacity perspective, and transport utilization seems to be an unlikely short-term concern.
 - Many of the supporting applications (DNS, AAA, Uplink, etc) have no sizing rules in place and limited defined capacity planning rules.
 - There are multiple network monitors in place monitoring the same equipment; without full overlap this results in monitoring gaps.

- **IT Infrastructure**
 - National Wireless Provider has significant technology resources in place. Numerous system components may be repetitive and some consolidation is necessary.
 - IT has the know-how to implement the systems themselves, yet lacks the input on the business rule-sets necessary based on services and network elements.
 - The National Wireless Provider Clarify ticketing system is capable but not implemented to facilitate full information flows.
 - Not all groups (frontline personnel in the data pod and customer care) have access to the clarify ticket system used by the NNOC and technical support.
 - Lack of defined procedures for escalation from NNOC to technical support

- **Primary GAPS**
 - Personnel to implement proactive processes, procedures, and SLAs.
 - Knowledge base of reporting capabilities and threshold standards for most elements.
 - Development needed to monitor services and end-user experience.
 - Lack of formal information sharing of goals and plans.
 - Lack of having all groups working towards the same goals and limited to no objective sharing between groups.
 - New product support training is fragmented
 - No service metrics actively monitored in real time or other.
 - No connection between event scope and customer bases.
 - No correlation between customer impacts and root causes.
 - No single point of metric correlation and reporting.
 - No internal portal for network and/or service health.

Recommendations

Many of the recommendations outlined are logical and appear to be simple and apparent; however, for various reasons have not been implemented within the National Wireless Provider environment to date. The lack of implementing the more obvious issues is primarily due to the lack of communication between groups, lack of resources to perform proactive activities, and lack of knowledge of the capabilities of devices and/or management tools. A significant amount of research and planning must be performed to adequately implement the functionalities of the devices and of the Network Management Systems that National Wireless Provider has in place. Two underlying assumptions, based on feedback from each organization, create critical dependencies for the success of this project: (1) National Wireless Provider has the IT resources to properly implement the recommendations made in this document and (2) National Wireless Provider is committed to the changes necessary to improve the operational effectiveness and efficiencies of the organization.

The **Network Containment** phase takes the apparent problems that National Wireless Provider has today and solves them through the logical process of corrective actions on a device-by-device basis. The initial steps of a Corporate Informational sharing program are also implemented. An aggressive three-month plan has been outlined that assumes National Wireless Provider will make the appropriate resource commitments to implement each recommendation.

The second phase, **Service Assurance**, takes the next logical step of monitoring and managing the network to a service level versus a device level. Parts of Phase II are implemented in Phase I to ensure a rapid improvement in responding to service impacting events. In addition, coordination of cross organizational activities and access to information is finalized with each group and event reporting to the National Wireless Provider client base is finalized.

The third phase, **End-User Performance and Trending**, encompasses collecting statistics and events in real-time as they are experienced by the client base of National Wireless Provider. It also includes taking the information currently generated from Phases I and II and using it to predictably take steps in response to correlated network events and statistics that allow for end-user service SLA modeling.

Network Containment

As previously stated, the **Network Containment** phase takes the apparent problems that National Wireless Provider has today and solves them through the logical process of corrective actions on a device-by-device basis. The initial steps of a Corporate Informational sharing program are also implemented. An aggressive three-month plan has been outlined that assumes National Wireless Provider will make the appropriate resource commitments to implement each recommendation.

1. REQUIREMENT	Monitor all network elements
CURRENT NATIONAL WIRELESS PROVIDER INFRASTRUCTURE	Many elements have basic monitoring (up/down) using multiple systems identified in matrix with significant gaps. For server based applications, the hardware and OS being monitored, but limited database and application monitoring is in place. Currently no integrated cross-platform view is available to the corporation. Select groups have some visibility into the network on a component by component basis. All personnel are in response mode and have little time to develop proactive monitoring capabilities.
ISSUE	Multiple monitoring platforms with multiple views and not all network elements are being properly monitored.
ANALYSIS	Phil Marasco Employer has spent a significant amount of time understanding the existing infrastructure, including the components, how they interact, and the

	<p>basic services that run across the infrastructure. This includes interacting with several operations groups to understand their current understanding, use, monitoring and management of said infrastructure. There are currently 18 master elements that have been identified that need to have their monitoring and management functional capabilities improved to allow National Wireless Provider to receive provide their client base a higher level of services.</p> <p>The 18 Master elements include:</p> <ul style="list-style-type: none"> • Uplink • DNS • Firewalls (Cisco Pix) • Core ATM infrastructure • Catalyst facility infrastructure • Home Agent/Foreign Agent • Cisco NAT Routers • AAA • MPS • MDG • MDG to MPS connectivity • OMC • ONR • ONSw • IMG • Big IP • Third Party Access • Third Party Routers
<p>RECOMMENDATION</p>	<p>Ensure that all elements are being monitored to include all events status (events pushed from a device or application) and polling (statistics that must be pulled from the device) are established so that the majority of service impacting events are captured. The next steps in completion of this task include:</p> <ul style="list-style-type: none"> • Finalize list of service(s) affecting elements within the packet data Network. 18 master elements exist that Phil Marasco Employer and National Wireless Provider have focused on. • Breakdown elements into the components that make up the overall element. For example, the Uplink consists of numerous servers running several applications. • Once the final element list is agreed upon, the tedious step of researching and documenting the fault management capabilities of each element, code version, and supporting tools must be completed. • Document any planned code or version upgrades. • Collect device information, including MIBs for current code version; and identify monitoring capabilities within those elements, including both Trap and polled elements. Document element capabilities with Object IDs (OIDs) and groupings based on information classification. • Document supporting system monitoring tool capabilities that provide upstream event messaging, if not directly reporting to Netcool. Including the application specific monitoring hooks provided by (System Edge, iWatch, InfoVista, Insight Manager, and ITO)
<p>NATIONAL WIRELESS PROVIDER SUPPORT</p>	<p>Access to individuals who currently provide management of each of the 18 elements, and any additional elements identified, and who will provide:</p> <ul style="list-style-type: none"> • Network access to elements or a summary of equipment, including: <ul style="list-style-type: none"> • Element device model name and code version • IP address of device

	<ul style="list-style-type: none"> • Topology of the device’s local environment <p>Access to individuals who:</p> <ul style="list-style-type: none"> • Manage IT system infrastructure for upstream event messaging systems, and will provide: <ul style="list-style-type: none"> • Current configuration of systems • Planned changes • Current system specifications • Have ownership for code updates for the 18 master elements identified, and will provide: <ul style="list-style-type: none"> • Road-map for code updates over the next six months
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2. REQUIREMENT	Develop business rules and threshold monitoring standards; train operations
CURRENT NATIONAL WIRELESS PROVIDER INFRASTRUCTURE	Minimal rules and threshold definitions have been established. Current monitoring focus is on device up/down status and critical events generated by the elements. Limited visibility between departments.
ISSUE	Some existing elements that are not configured properly for monitoring or appropriately monitored.
ANALYSIS	Over time new devices and services have been introduced into the National Wireless Provider packet data network with minimal documentation on capabilities, required monitoring, and/or services that the device might impact. When baseline requirements were defined they were not updated as the devices code and capabilities were changed. Over time multiple applications have been introduced to manage each device without consideration of the other tools that were available that could perform similar functionality. This has resulted in numerous monitoring and management tools in the environment and minimal understanding of the requirements and capabilities of the devices.
RECOMMENDATION	<p>Implement quality assurance standards within the network monitoring tools that institute threshold monitoring consistency. Update policies and procedures to fully utilize the intelligence of the NMS systems and the reporting capabilities of the elements. Steps for accomplishing this include:</p> <ul style="list-style-type: none"> • Define fault management rules within Netcool for each element and recommendation on downstream reporting platform use. • Work with Operation Groups to confirm that proposed business rules meet desired operations management requirements; and confirm that information not reacted to be provided as an improper alert level. • Document current MIB walks for all planned code upgrades within six months—limited to availability of new MIBs from vendor(s.) • Perform logical breakdown of OID’s and Traps that will not be monitored and provide brief reasoning. Provide summary for operations so they are aware of other available information that is available from the devices. • Provide National Wireless Provider IT with rules sets and element requirements for both Traps and OID poles, including: <ul style="list-style-type: none"> • Traps and OIDs per element • Severity of each event or result • Vendor specific information on the Trap or OID for “online advisor” • Documentation for Netcool implementation for IT on the Traps and OID per element.

	<ul style="list-style-type: none"> Validate and document supporting system monitoring tool requirements that provide upstream event messaging for devices not directly reporting to Netcool. (Certain systems may be identified for retirement if other common systems can provide the same capability.) Including System Edge, iWatch, InfoVista, Insight Manager, and ITO
NATIONAL WIRELESS PROVIDER SUPPORT	<ul style="list-style-type: none"> IT Primary point of contact who will: <ul style="list-style-type: none"> Identify current rule sets implemented Identify current work load and capabilities for IT implement rule-sets Confirm, or provide formatting of, information Phil Marasco Employer shall provide for rule-set implementation within Netcool Provide rule-set deliverables for Phil Marasco Employer Primary point of contact within each operation’s organization for sign-off on the group’s business rules

3. REQUIREMENT	Documentation and communications between ITO/Engineering/NOC
CURRENT NATIONAL WIRELESS PROVIDER INFRASTRUCTURE	No formal service level statements (e.g., Rules, Practices and Handoffs) are in place to establish the expectations between the operational groups within National Wireless Provider. No procedures are documented that provide formal lines of communications between groups.
ISSUE	Communications between ITO/Engineering/NOC are not fully documented and informally managed
ANALYSIS	Communications between the operations groups are on an as-need basis. Usually the communications is a result of an issue in which an operations group needs to engage another operations group to perform a task. Limited to no visibility of performance, focus, projects, or information is available between the groups.
RECOMMENDATION	<p>Develop a formal processes and procedures for communications between groups and establish internal service level statements. Specifically for the following areas of activity:</p> <ul style="list-style-type: none"> Introduction or termination of technology Development or termination of service Changes in device and Network Management System functionality and capabilities Changes in organization Changes in processes within an organization Addition of new classification of clients Support of “non-standard” client scenarios Marketing & Sales activities that create an imbalance or change in the projected network traffic
NATIONAL WIRELESS PROVIDER SUPPORT	Primary management point of contact within each operation’s organization for discussion on the group’s current processes, procedures and short-term objectives. Also someone with authority to implement and enforce new processes and procedures.

4. REQUIREMENT	Automate processes
CURRENT NATIONAL WIRELESS PROVIDER INFRASTRUCTURE	Currently minimal automation exists between element monitoring and trouble ticket generation.
ISSUE	Minimal automation of processes that leverage the investment in tools that has the inherent capabilities to automate much of the manual work that is performed today.
ANALYSIS	As noted in item 2, over time new devices and services have been introduced into the National Wireless Provider packet data network with minimal documentation on capabilities, required monitoring, and/or services that the device might impact. Over time multiple applications have been introduced to manage each device without consideration of the other tools that were available that could perform similar functionality. This has resulted in numerous monitoring and management tools in the environment and minimal understanding of the requirements and capabilities of the devices. Thus, automation of the most basic business rules that exist today cannot be implemented.
RECOMMENDATION	<p>Develop automated processes that support defined business rules for element monitoring, outage notification, and trouble ticket generation. Once these are established, automated rules will be developed to create screen views, tickets and auto-escalation of tickets within the appropriate groups. In addition, a process will be created that also takes these baseline rules and requirements and modifies them as new devices are introduced, as well as when devices code and capabilities are changed. Steps to implement this recommendation include:</p> <ul style="list-style-type: none"> • Creation of automated processes that support defined business rules • Create NMS operation dashboard(s) format for presentation to internal National Wireless Provider organizations, including rule-sets for presentation. <ul style="list-style-type: none"> • Establish information access strategy for operational organization, including: <ul style="list-style-type: none"> • Netcool views for each organization • Clarify standard report views for each organization and document how these reports can be modified as devices and sites are added or changed over time • Create basic reports (approximately 10) for the NOC Data group. <ul style="list-style-type: none"> • Creating of reports to provide for: <ul style="list-style-type: none"> • Shift turnover (All exchange of information is currently manual and has no checks.) • Continuity (All exchange of information is currently manual and has no checks.) • Escalation reports (No automated escalations exist.) • Closure validation (All are performed manually today.) • Chronic problems alert (No chronic reporting or ticket correlation exists. Ticket system is currently incapable of this function until new fields are created) • Creation and tracking of flashes (Performed manually with no acknowledgement capabilities.) • Tier 2 report (Processed manually and use of ticket queuing does not exist.)

	<ul style="list-style-type: none"> • Additional reports to be defined • Documentation of new reports and practical applications by operational organization and NOC • Create basic reports (approximately five) for Tech Support <ul style="list-style-type: none"> • Reports that allow views into: <ul style="list-style-type: none"> • Chronic problems typical response times • Mean time to repair times for problems • Root causes • Recommendations and process guidelines for reports that allow National Wireless Provider to generate and modify on-going business rule inputs. • Define information exchange for the gateway between Netcool and Clarify, including: analysis and requirements definitions of additional fields, standard use, and Netcool-to-Clarify data exchange requirements. <ul style="list-style-type: none"> • Define the need for additional informational fields within Clarify, including: <ul style="list-style-type: none"> • Format of information (text, number, date, and length of field) • What organization, or data source (Netcool, System Edge, manual) the information will come from for population • Recommendation on standardization of use across National Wireless Provider • Define auto-ticket creation requirements with tie-in to Netcool event classification • Document changes for system users to inform them of new fields and use
<p>NATIONAL WIRELESS PROVIDER SUPPORT</p>	<p>Success of this recommendation is dependent on the following:</p> <ul style="list-style-type: none"> • Access to individuals within each operational group who can act as the point of contact for requirements validation. (This information will be gathered in conjunction with the establishment of business rule-sets from the previous function.) • Access to individuals within each operational group who can act as the point of contact for information requirements. (This information will be gathered in conjunction with establishment of business rule-sets from previous function.) • Access to NOC and NOC personnel for additional information gathering on existing Clarify fields and use.

<p>5. REQUIREMENT</p>	<p>Implement Service Monitoring</p>
<p>CURRENT NATIONAL WIRELESS PROVIDER INFRASTRUCTURE</p>	<p>Service Monitoring capabilities are not in place. Rely on element monitoring or customer trouble calls to infer “service” outage.</p>
<p>ISSUE</p>	<p>No existing service monitoring in use</p>
<p>ANALYSIS</p>	<p>Current monitoring processes only address the equipment or broader application health of the network. Services using that network are ignored. Although issues</p>

	that result in failure of network nodes or monitored applications give an indication of service issues for end users, conditions of application hanging or congestion will be overlooked.
RECOMMENDATION	<p>Monitoring service verse components demands a holistic view of the network and how components interact. Several steps are critical in ensuring that the initial creation of a service monitoring program are properly implemented.</p> <ul style="list-style-type: none"> • Document all user services that are provided to the National Wireless Provider client base • Document network location of service approval and provisioning (internal or external) • Document data flow of top destinations outside of National Wireless Provider’s environment • Document service flow architecture over existing element infrastructure. • Develop business rules and automated processes for service monitoring, outage notification, and trouble ticket generation.
NATIONAL WIRELESS PROVIDER SUPPORT	<p>Success of this recommendation is dependent on the following:</p> <ul style="list-style-type: none"> • Access to individuals within each operational group who can act as the point of contact for information requirements. (This information will be gathered in conjunction with establishment of business rule-sets from previous function.) • Access to the IT organization for script development and rule-set implementation

6. REQUIREMENT	Outage notification Process
CURRENT NATIONAL WIRELESS PROVIDER INFRASTRUCTURE	Primarily reactive to network events and customer notification of outages. In many cases, clients are aware of problems before National Wireless Provider. Outage notification, once a failure is detected, is manual through “Flash” notification through short text messaging and email.
ISSUE	Outage notification and escalation process is manual and inconsistent based on the interpretation of each person working within the existing processes and procedures.
ANALYSIS	All processes dealing with notification are based upon human intervention. Issues that escape the attention of NNOC and tech support are dropped. Timeframes for notification are hard to enforce and measure and customers cannot depend on National Wireless Provider to deliver the notifications in a timely manner or at all.
RECOMMENDATION	<p>Institute standardized post outage procedures that include proper classification of outage triggers for automated alert notification throughout the appropriate groups within National Wireless Provider.</p> <ul style="list-style-type: none"> • Define and document standard business rules for service outages and alert notification processes. <ul style="list-style-type: none"> • Identify service outage and thresholds within business definitions

	<p>as they apply to network elements and services supplied by these elements for automated alert notification, including:</p> <ul style="list-style-type: none"> • Defined manual and automated alert notification process for operational organization
NATIONAL WIRELESS PROVIDER SUPPORT	<p>Access to individuals within each operational group who can act as the point of contact for alert notification requirements. (This information will be gathered in conjunction with the establishment of business rule-sets from the previous function.)</p>

7. REQUIREMENT	Root Cause Analysis and quantification process
CURRENT NATIONAL WIRELESS PROVIDER INFRASTRUCTURE	There are currently no standardized post outage procedures that include proper classification of outage triggers and resolutions. No trending capabilities built into the ticketing system.
ISSUE	Root Cause Analysis and quantification process does not exist
ANALYSIS	Root cause analysis occurs on a case by case basis for large issues. Small recurring issues that consistently impact customers are not measured individually or long term. This takes away a powerful quantification tool from National Wireless Provider management and makes full network event classification impossible. The by product of this is that the ability to measure best practices and effective troubleshooting methodologies is seriously curtailed.
RECOMMENDATION	<ul style="list-style-type: none"> • Institute standardized post outage procedures that include proper classification of outage triggers and resolutions. • Creation of basic correlation of element to service failure • Creation of service failure to element map • Regionalize failure of elements and service to geographical localities • Document manual processes for root cause analysis
NATIONAL WIRELESS PROVIDER SUPPORT	<ul style="list-style-type: none"> • Access to individuals within each operational group who can act as the point of contact for information requirements. (This information will be gathered in conjunction with establishment of business rule-sets from previous function.) • Access to NOC and NOC personnel for additional information gathering on existing use of defined processes and procedures • Access to IT group to <ul style="list-style-type: none"> • Validate formatting of requirements documentation • Validate they can implement desired changes and implementation timeframes • Access to individuals within Tier 2 support organization for: <ul style="list-style-type: none"> • Better understanding of existing process and procedures • Examples of typical escalation process • Current trending of events that are escalated

Service Assurance

Service Assurance takes the next logical step of monitoring and managing the network at a service level versus a device level. Parts of Phase II are being implemented in Phase I to ensure a rapid improvement in responding to service impacting events. Coordinated cross organizational activities and access to information are finalized with each group and event reporting to the National Wireless Provider client base is finalized.

1. REQUIREMENT	Monitor Data Service performance metrics.
CURRENT NATIONAL WIRELESS PROVIDER INFRASTRUCTURE	Assuming Requirement 5 of the Network Containment section is complete, the next step is more detailed service performance monitoring.
ISSUE	No data service performance metrics currently being monitored. No baseline performance targets have been established.
ANALYSIS	National Wireless Provider does not have anyway to measure the end user experience in a form usable by the NNOC or tech support. All NNOC and tech support resources are dedicated to network state and network application monitoring. No events in the monitoring system warn of current or impending end user impacting events. National Wireless Provider does not have any service health indicators that are independent of network element health. Independent confirmation of the health of the National Wireless Provider wireless packet data product rests only with the National Wireless Provider subscriber.
RECOMMENDATION	In order to effectively monitor performance at a service level, the following actions need to be taken: <ul style="list-style-type: none"> • Completion of Recommendation 5 under Network Containment as defined above. • Creation of baseline performance metrics for each service. • Develop baseline monitoring metrics and implement a standardized testing module application for each service. • Institute standardized testing module in the NMS.
NATIONAL WIRELESS PROVIDER	Success of this recommendation is dependent on the following: <ul style="list-style-type: none"> • Access to individuals within each operational group who can act as the point of contact for information requirements. (This information will be gathered in conjunction with establishment of business rule-sets from previous function.) • Access to the IT organization for script development and rule-set implementation

2. REQUIREMENT	Service to market mapping
CURRENT NATIONAL WIRELESS PROVIDER	<ul style="list-style-type: none"> • Level of documentation undetermined. No mapping could be identified.

INFRASTRUCTURE	
ISSUE	<ul style="list-style-type: none"> No service to market mapping
ANALYSIS	<ul style="list-style-type: none"> While National Wireless Provider does have a complete cell site and market device deployment, they do not have an overlay of packet data services available across all markets. This has a two fold effect. <ol style="list-style-type: none"> No information is shared with data pod group for showing existing packet data services that might be effected by general wireless issues No way to map packet data customers in packet data served markets. This means visibility for the data pod and their customers is limited and increased liability for late or no notification. Quantifying customer impacts at a later date is an additional dilemma.
RECOMMENDATION	<ul style="list-style-type: none"> Document all service supplying elements to local markets.

3. REQUIREMENT	Customer to market mapping
CURRENT NATIONAL WIRELESS PROVIDER INFRASTRUCTURE	Level of documentation undetermined. No mapping could be identified.
ISSUE	No customer to market mapping could be identified.
ANALYSIS	Although the network inherently keeps track of users through the use of the Home Agent and Foreign Agent information exchange, no reporting supports the ongoing troubleshooting of services.
RECOMMENDATION	Correlate all customers using service elements to local markets mapping process. Primary action is to establish testing to emulate customer scenarios where data user is outside of their home Local Area.
NATIONAL WIRELESS PROVIDER SUPPORT	<p>Success of this recommendation is dependent on the following:</p> <ul style="list-style-type: none"> Access to individuals within each operational group who can act as the point of contact for requirements validation. (This information will be gathered in conjunction with the establishment of business rule-sets from the previous function.) Access to individuals within each operational group who can act as the point of contact for information requirements. (This information will be gathered in conjunction with establishment of business rule-sets from previous function.) Access to NOC and NOC personnel for additional information gathering on existing Clarify fields and use.

4. REQUIREMENT	Quantification of Outages
CURRENT NATIONAL WIRELESS	<ul style="list-style-type: none"> Outages are presented on an element basis and there is no indication on magnitude and extent. No ways to trend outages or create historical or

PROVIDER INFRASTRUCTURE	chronic alerts.
ISSUE	<ul style="list-style-type: none"> No way to quantify outages
ANALYSIS	<ul style="list-style-type: none">
RECOMMENDATION	<ul style="list-style-type: none"> Connect all service/customer maps to ticket tracking system(Clarify)
NATIONAL WIRELESS PROVIDER SUPPORT	Access to individuals within each operational group who can act as the point of contact for alert notification requirements. (This information will be gathered in conjunction with the establishment of business rule-sets from the previous function.)

5. REQUIREMENT	Definition and measurements of internal SLAs
CURRENT NATIONAL WIRELESS PROVIDER INFRASTRUCTURE	<ul style="list-style-type: none"> SLAs not defined or implemented. Formal communications processes established between internal groups on an ad hoc basis; all manual processes. Defined corporate information sharing based on critical events only. No automation or filtering of information to specific groups.
ISSUE	<ul style="list-style-type: none"> Measurements of internal SLAs does not exist
RECOMMENDATION	<ul style="list-style-type: none"> Create a internal service level statement and institute monitoring of service levels
ANALYSIS	<ul style="list-style-type: none">

6. REQUIREMENT	Real-time reporting or network health “dashboard”
CURRENT NATIONAL WIRELESS PROVIDER INFRASTRUCTURE	<ul style="list-style-type: none"> No reporting capabilities to determine network health beyond up-down status. Service trouble ticket and problems status isolated to NOC with limited view capabilities or report generation within NOC or by other groups.
ISSUE	<ul style="list-style-type: none"> No real time reporting or network health “dashboard”
RECOMMENDATION	<ul style="list-style-type: none"> Use Netcool reporter to report on all monitored elements and services. Create reports for NOC and Tech Support for views into problem status and historical issues and resolution.
ANALYSIS	<ul style="list-style-type: none">

End-User Performance and Trending

End-User Performance and Trending encompasses collecting statistics and events in real-time as they are experienced by the client base of National Wireless Provider. It also includes taking the information now being generated due to Phases I and II and using it to predictably take steps in response to correlated network events and statistics that allow for end-user service SLA modeling.

1. REQUIREMENT	Comprehensive reporting structure
CURRENT NATIONAL WIRELESS PROVIDER INFRASTRUCTURE	<ul style="list-style-type: none"> Baseline infrastructure is in place with Netcool, System Edge and Clarify modules. The most basic capabilities have not to date been implemented. Advanced capabilities have not been developed.
ISSUE	<ul style="list-style-type: none"> No comprehensive reporting structure
RECOMMENDATION	<ul style="list-style-type: none"> Connect Netcool reporter module and Clarify reporting modules.
ANALYSIS	<ul style="list-style-type: none">

2. REQUIREMENT	Online portal for internal or external use
CURRENT NATIONAL WIRELESS PROVIDER INFRASTRUCTURE	<ul style="list-style-type: none"> Baseline infrastructure in place using access to Clarify and customized Netcool screens. No capabilities have been developed.
ISSUE	<ul style="list-style-type: none"> No Online portal for internal or external use
RECOMMENDATION	<ul style="list-style-type: none"> Use Netcool or database driven portal to connect people to reports in real time.
ANALYSIS	<ul style="list-style-type: none">

3. REQUIREMENT	Real time trend tools
CURRENT NATIONAL WIRELESS PROVIDER INFRASTRUCTURE	<ul style="list-style-type: none"> Baseline infrastructure in place using Clarify, Netcool, and/or Crystal Reports to access metrics in real time. Capability has not been developed.
ISSUE	<ul style="list-style-type: none"> No real time trend tools
RECOMMENDATION	<ul style="list-style-type: none"> Use Clarify, Netcool, or Crystal Reports to access metrics in real time.
ANALYSIS	<ul style="list-style-type: none">

4. REQUIREMENT	Projection analysis process or procedure
CURRENT NATIONAL WIRELESS PROVIDER INFRASTRUCTURE	<ul style="list-style-type: none"> Baseline infrastructure in place using OSS projection tools and Netcool or Crystal Reports to coordinate growth and sales projections in real time. Capability has not been developed.
ISSUE	<ul style="list-style-type: none"> No projection analysis process or procedure
RECOMMENDATION	<ul style="list-style-type: none"> Use OSS projection tools and Netcool, or Crystal Reports to coordinate growth and sales projections in real time.
ANALYSIS	<ul style="list-style-type: none">

5. REQUIREMENT	End-user Service Level Agreements
CURRENT NATIONAL WIRELESS PROVIDER INFRASTRUCTURE	<ul style="list-style-type: none"> End-user SLAs have not been formalized.
ISSUE	<ul style="list-style-type: none"> No end-user Service Level Agreements
RECOMMENDATION	<ul style="list-style-type: none"> Baseline definition and content of a National Wireless Provider End-User SLA. Develop User Service Level Statements and monitoring metrics; implement into business rules.
ANALYSIS	<ul style="list-style-type: none">

6. REQUIREMENT	OSS/NMS/Billing interconnections
CURRENT NATIONAL WIRELESS PROVIDER INFRASTRUCTURE	<ul style="list-style-type: none"> These platforms exist today with no interconnections.
ISSUE	<ul style="list-style-type: none"> No OSS/NMS/Billing interconnections
RECOMMENDATION	<ul style="list-style-type: none"> Connect OSS/NMS/Billing directly; use a data bus, or a database to coordinate all three.
ANALYSIS	<ul style="list-style-type: none">

Objectives

Short-Term – within 3 Months

Objective: Establish basic operational management capabilities to enable effective understanding of *current* operational status of network.

- **Network Containment**
 - Introduce a two function network operations process: Monitoring and Management.
 - Reduce toolset to smaller subset and four primary activities (Message generators, Netcool [collector], Notification, and Management Systems.)
 - Establish monitoring coverage across all service impacting elements.
 - Integrate cross-platform monitoring views and dedicated views on critical elements.
 - Formalize view of client services riding across network elements.
 - Establish overall capability for alert notification of system errors, with a minimum criteria set to alert the same time the client base becomes aware.
 - Analyze and define data exchange requirements for Clarify, including additional fields, standard use, and Netcool interface recommendations.
 - Create basic report package for NOC data group covering the following areas: escalation reports, closure validation, chronic problems, tracking of flashes, Tier 2 report, and shift turnover continuity.
 - Create basic report package for tech support covering the following areas: view of chronic problems, typical response times, typical repair times, root cause, and business rules input.
 - Create root cause list based on current practices and tickets
 - Develop maps of services to markets to narrow down event impacts
 - Develop customer to market maps to quantify network event impacts
- **Service Monitoring and Assurance**
 - Monitor all service applications (i.e. databases, DNS, AAA, etc)
 - Establish basic corporate and partner information sharing, rules, practices, and handoffs
 - Establish “new service” introduction process
 - Create service monitor report views
- **End-User Performance and Trending**
 - Establish monitoring of all client services with dedicated views

Medium-Term – within 6 Months

Objective: Establish effective monitoring of services and create basic network “proactive” capabilities with effective information sharing.

- **Network Containment**
 - Fully adopt a two function network operations process: Monitoring and Management.
 - Finalize toolset use (Message generators, Netcool [collector], Notification, and Management Systems) and eliminate legacy applications
 - Establish monitoring coverage across all network elements with integrated cross-platform monitoring views and dedicated views on critical elements. Establish initial business rules and basic data correlation.
 - Develop fully functional views of site specific client services riding across network elements.

- Move to initial capabilities of proactive Network management and operations; and establish device specific thresholds.
- Finalize root cause lists and implement into ticketing system for Root cause tracking and analysis
- **Service Monitoring and Assurance**
 - Monitor all service applications (i.e. databases, DNS, AAA, etc) and establish application specific thresholds.
 - Establish effective corporate and partner information sharing, rules, practices, and handoffs.
 - Coordinate network events and customer maps to create network event risk maps
 - Create service impact reports that tie service outages, customers and root causes
- **End-User Performance and Trending**
 - Establish monitoring of all client services with dedicated views
 - Establish baseline SLAs and internal reporting capabilities
 - Create Service Level Statement
 - Start long-term reporting matrices that cover network events, average repair cycles, and service impacts

Long-term – 6 to 12 Months and Ongoing

Objective: Establish effective monitoring of services and create basic network “proactive” capabilities with effective information sharing.

- **Network Containment**
 - Fully integrated two function network operations process: Monitoring and Management using a mature suite of toolsets (Message generators, Netcool [collector], Notification, and Management Systems.)
 - Establish monitoring coverage across all network elements, including application level, with integrated cross-platform monitoring views and dedicated views on critical elements.
 - Institute best practice monitoring via MTTR and root causes.
 - Incorporate best practices into employee training manuals.
- **Service Monitoring and Assurance**
 - Develop proactive network management and operations; and establish advanced device specific thresholds.
 - Implement mature monitoring of all service applications (i.e. databases, DNS, AAA, etc) and establish application specific advanced thresholds and mature rules for data correlation.
 - Create a fully functional view of site specific client services riding across network elements with correlated event occurrence.
 - Establish effective corporate and partner information sharing
 - Add third-party service monitoring to standard service monitoring in order to normalize the customer experience
- **End-User Performance and Trending**
 - Establish monitoring of all client services with dedicated views.
 - Implement full support of SLAs and established supporting reports (internal and client.)
 - Share network information with end-user data clients.

Phil Marasco Employer's Proposed Initiatives

- Phil Marasco Employer's *Technology Solutions Group*TM will provide National Wireless Provider with qualified individuals who will help document and develop an integrated cross-platform monitoring view with appropriate standards, documentation, and processes to enable comprehensive network monitoring as part of the Network Containment effort. In order to provide an appropriate level of expertise for guiding the conversations, Phil Marasco Employer's *Technology Solutions Group*TM is tailored to meet the specific needs of National Wireless Provider. This engagement will result in a clearly defined roadmap for improved network monitoring and alert notification processes.
- Finalize list of service affecting elements within the packet data Network.
- Identify fault management capabilities of these elements and supporting tools.
 - Collect Device information including MIBs.
 - Identify supporting system monitoring tool upstream event messaging if not directly reporting to Netcool.
 - Identify application specific monitoring hooks.
- Develop standard business definition for service outages and alert notification processes.
- Develop fault management rules within Netcool for each element.
- Create NMS operation dashboard(s) format for presentation to internal National Wireless Provider organizations including rule-sets for presentation.
- Establish gateway between Netcool and Clarify, including: analysis and requirements definitions for additional fields, standard use, and Netcool-to-Clarify data exchange requirements within Clarify.
- Build alert rules for ticket and alert notification
- Create basic reports (approximately 10) for NOC Data group that provide for shift turnover continuity, escalation reports, closure validation, chronic problems, tracking of flashes, Tier 2 report, and others.
- Create basic reports (approximately five) for Tech Support allowing views into: chronic problems, typical response and repair times for problems, root causes, and business rule inputs.
- Establish test procedures for using test handsets in different markets.

Action Plan

- **Short-term “Get-Well” requirements and Tactical Activities**
Phil Marasco Employer will present GAP Analysis and Recommendations to National Wireless Provider Engineering, NOC and Capacity Planning business units based on assessment findings. The goal of the action plan is to provide National Wireless Provider with a solution to proactively monitor and manage network elements within the Packet Data Network
 - Phil Marasco Employer Network deliverables to National Wireless Provider will be defined in a step by step process.
 - Phil Marasco Employer will provide recommended activities that National Wireless Provider can integrate into their packet data “get-well” plan
 - Deliver SOWs containing work and deliverables to be accomplished by Phil Marasco Employer and deliverables that can be accomplished internal within National Wireless Provider.
- **Medium-term targeted requirements**
Phil Marasco Employer goal is to provide National Wireless Provider with a define migration path, that helps National Wireless Provider to monitor services and create basic network “functionalities with effective information sharing for the next 6 months
 - Introduce a two function network operations process: Monitoring and Management.
 - Reduce toolset to smaller subset and four primary activities (Message generators, Netcool [collector], Notification, and Management Systems.)
 - Establish monitoring coverage across all service impacting elements.
 - Integrate cross-platform monitoring views and dedicated views on critical elements.
 - Formalize view of client services riding across network elements.
 - Establish overall capability for alert notification of system errors, with a minimum criteria set to alert the same time the client base becomes aware.
 - Analyze and define data exchange requirements for Clarify, including additional fields, standard use, and Netcool interface recommendations.
 - Create basic report package for NOC data group covering the following areas: escalation reports, closure validation, and chronic problems, tracking of flashes, Tier 2 report, and shift turnover continuity.
 - Create basic report package for tech support covering the following areas: view of chronic problems, typical response times, typical repair times, root cause, and business rules input.
 - Create root cause list based on current practices and tickets
 - Develop maps of services to markets to narrow down event impacts
 - Develop customer to market maps to quantify network event impacts
- **Long-term functional and strategic requirements**
Phil Marasco Employer goal is to provide National Wireless Provider with a strategic path, which enhances services to the end user customer internal and external within the Packet Data Network.
 - **Network Containment**
 - Fully integrated two function network operations process: Monitoring and Management using a mature suite of toolsets (Message generators, Netcool [collector], Notification, and Management Systems.)
 - Establish monitoring coverage across all network elements, including application level, with integrated cross-platform monitoring views and dedicated views on critical elements.
 - Institute best practice monitoring via MTTR and root causes.

- Incorporate best practices into employee training manuals.
- **Service Monitoring and Assurance**
 - Develop proactive network management and operations; and establish advanced device specific thresholds.
 - Develop baseline monitoring metrics and implement a standardized testing module applicable to the packet data network.
 - Institute standardized testing module in the NMC
 - Measure the number or location of users impacted by performance problems
 - Create an automatic alert process when users complain about performance
 - Define a process to identify performance bottlenecks
 - Measure the performance of each node/element during Phil Marasco Employer and non-Phil Marasco Employer usage
 - Implement a proactive notification during congestion periods
 - Document all service supplying elements to local market
 - Map all services to applications within the packet data network
 - Define the application performance metric
 - Measure the performance of the application through the network
 - Recommend the QOS metric for delivering services
 - Correlate all customers using service elements to local market
 - Define the process to map all end users to service
 - Define the service performance metric
 - Measure the performance of the service through the network
 - Recommend the QOS metric for delivering services
 - Connect all service/customer maps to ticket tracking system Clarify
 - Map all nodes to customers thru Clarify
 - Map all services to the service thru Clarify
 - Map all applications to the service thru Clarify
 - Define notification process thru Clarify for customers detailing nature of outage
 - Create an internal service level statement and institute monitoring of service levels
 - Use Netcool reporter to report on all monitored elements and services.
 - Create reports for NOC views into problem status and historical issues and resolution.
 - Create reports for Tech support views into problem status and historical issues and resolution
 - Create reports for customers views into problem status and historical issues and resolution
- **End-User Performance and Trending**
 - Establish monitoring of all client services with dedicated views.
 - Implement full support of SLAs and established supporting reports (internal and client.)
 - Share network information with end-user data clients.
 - Connect Netcool report module and Clarify reporting
 - Validate the implementation of the connection between Netcool gateway and Clarify
 - Validate the implementation of the connection between Clarify and database for reporting
 - Validate the rules set to map Netcool events to Clarify

- Define a process to populate the Clarify ticket system with all pertinent event information
- Define automatic Clarify ticket notification as a result of a Netcool event

*Use Netcool or database driven portal to connect people to reports in near real time based on service and application

Create a portal view that provides NMC, NOC, Sales and End user customer to:
Near real time reports
Historical reports
Trending
Trouble Ticket history

*Use Clarify, Netcool, or Crystal Reports to access metrics in near real time

Define the procedure to collect near real time reports on access performance based on service
Define the procedure to collect near real time reports on access performance based on application
Define the procedure to collect near real time reports on the end user experience

*Use OSS projection tools and Netcool, or Crystal Reports to coordinate growth and sales projections in near real time

Create near real time reports that provides sales the in sight into end user experience Phil Marasco Employer and non Phil Marasco Employer
Create near real time reports that provides sales the in sight into service usage Phil Marasco Employer and non Phil Marasco Employer
Create near real time reports that provides sales the in sight into application usage Phil Marasco Employer and non Phil Marasco Employer
Create near real time reports that provides sales the in sight into the performance of the network Phil Marasco Employer and non Phil Marasco Employer

*Baseline definition and content of a National Wireless Provider End-User SLA. Develop User Service Level Statements and monitoring metrics; implement into business rules

*Connect OSS/NMS/Billing directly, use a data bus, or a database to coordinate all three