# GLOBAL RESEARCH NETWORK OPERATIONS CENTER

The Global Research Network Operations Center (Global NOC) at Indiana University manages the international network connections from advanced research and education networks in the Asia/Pacific, Europe, Russia, and South America to the Science Technology and Research Transit Access Point (STAR TAP) and Abilene the leading US high performance research and education network.

Scientific research in many areas today is a collaborative activity that spans the globe. By interconnecting the research and education networks in the US with those in Asia/Pacific, Europe, Russia, and Latin America, access is provided for US scientists to scientific data, instruments, and expertise that would not otherwise be available. Thus the Global NOC will play a key role in ensuring the reliable provision of the persistent advanced networking infrastructure that will make these collaborations possible.

Examples of some of these collaborative global activities include:

- **Distributed particle physics research** - remote viewing and analysis of particle physics events
- **Advanced Networking for Telemicroscopy** - two online telemicroscopy systems, one in San Diego and one at Osaka, that use international research networks to provide interactive, remote control of high-power microscopes
- **ALIVE: Architectural Linked Immersive Environment** - used to evaluate the usability of collaborative virtual reality for architectural design
- **Data and Information Access Link (DIAL)** - a Web-based distributed system to search, access, and visualize satellite remote sensing data for Global Change research; 3D data is transferred from NASA to NASDA using TransPAC/APAN, processed and visualized for the Web
- **IGrid2000** - a global demonstration of high-performance computing and visualization applications in Yokohama Japan, in conjunction with the INET2000 conference

These international network connections are funded in part through the NSF's High Performance International Internet Services (HPIIS) program as well as funding agencies in the other countries. The HPIIS program funds a number of the Global NOC staff, network engineers, and applications engineers. The principal international connections managed by the Global NOC are:

- **TransPAC** - OC-3 connection between Tokyo and the STAR TAP in Chicago connecting Japan, Korea, Singapore, and Australia (www.transpac.org)
- **Euro-Link** - multiple high performance connections between The Netherlands, France, the Nordic countries, Israel, and CERN, and the STAR TAP (www.euro-link.org)
- **MIRnet** - connection between Russia and the STAR TAP (www.friends-partners.org/friends/mirnet/home.html)
- **AmPATH** - connection to various emerging education and research networks in Latin America (www.ampath.fiu.edu)

The Global NOC also provides NOC services to the NSF-funded Science Technology and Research Transit Access Point (STAR TAP - www.startap.net) in Chicago which provides infrastructure at which a number of these network connections and other international connections connect to the US higher education and research networks. NOC services provided for these connections include problem management, reporting, tracking and escalation, traffic report generation, security management, configuration management and, data/problem archiving. The NOC is the initial point of contact for all operational matters concerning these connections. The NOC provides services related to the connections continuously, 24 x 7 x 365, including all holidays.

The Global NOC is located at Indiana University's IUPUI campus in Indianapolis. It is co-located with the Internet2 Abilene NOC, the Indiana GigaPoP NOC, and the NOC for Indiana University's campus and state networks. This joint NOC will be a leading center for the management of high performance research and education networks.

INDIANA UNIVERSITY


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**Email: globalnoc@iu.edu Phone: 317-278-6630**

**Web Pages: http://globalnoc.iu.edu**

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Over the past several years, Indiana University has developed a prestigious reputation for providing quality network operations center services for a host of Internet2 networks and initiatives. With this in mind, IU has opened the Global Research Network Operations Center, a NOC dedicated to these services. With a solid and capable staff working 24 hours, 7 day a week, the Global Research NOC is in the position to help other I2 networks and projects with the day-to-day functioning of their network.

The Global Research NOC provides a host of services necessary for support of an international network in the burgeoning realm of worldwide peering. Providing 7x24 front-tier support, the NOC offers oversight of problem, configuration and change management, network security, performance and policy monitoring, reporting, quality assurance, scheduling, and documentation.

The Global NOC provides a structured environment that effectively coordinates operational activities with all partners, customers, and vendors related to the function of the network.

## About the Global Research Network Operations Center

Currently, the Global Research NOC supports the Abilene Internet2 network in the United States, the TransPAC network (I2 connectivity to Asian Pacific countries), the STAR TAP international peering point, Euro-Link (a consortium of European I2 networks), MIRnet (I2 connectivity to Russia), and AMPATH (an I2 consortium of South and Latin American networks). The Global NOC engineering staff has also made significant contributions to the Internet2 community with a host of engineering initiatives in the realms of IP multicast, QoS, IPv6, along with the development of a number of tools to display and report network traffic.

Housed at the Indianapolis campus, the tier-one support center is staffed by sixteen full-time employees. They work in conjunction with the Global NOC engineering staff of five full-time engineers, and a team of software and web developers, who work at the Bloomington or Indianapolis campuses.

The NOC produces public web pages devoted to its support of the network. At this web site, links to a host of network related tools and reports are available. This includes an animated “Traffic Map,” MRTG graphs, a BGP session monitor, a router proxy view into network routers, a router syslog tool, and a multicast route viewer.

Please see the following web sites:

http://www.abilene.iu.edu

http://www.transpac.org

http://noc.startap.net

http://noc.euro-link.org

http://noc.mirnet.org

http://noc.ampath.net

The Global NOC provides concise and up-to-date customer notifications for all network outages, both scheduled and unscheduled. Detailed reports of network availability and traffic analysis are also provided.

## NOC SERVICES

The Global NOC provides the following services:

- Problem Management
- Change Management
- Performance Management
- Configuration Management
- Security Management
- Scheduling and Allocation of Network Resources
- Quality Assurance
- Reporting
- Documentation

### Problem Management

Problem management is the process of identifying and resolving network problems. The goal of problem management is to maintain the highest standard of reliability and availability possible to a supported network. The following procedures are considered the main focus of the Global Research NOC's Network Operations Center's problem management services.

### Procedures

In the event of an unscheduled problem or outage in the network, the NOC follows an interwoven set of procedures to facilitate quick resolution. They are problem alert, paging, tracking, problem identification and isolation, notification, and troubleshooting. Many of these tasks are enacted simultaneously as the NOC utilizes its many resources to help resolve the problem. If action or resolution is not found within accepted time intervals, problem escalation is enforced to ensure that all available resources are utilized in the effort to restore the network.

### Problem Alert

The NOC has both proactive and reactive methods of identifying events affecting the performance of the network. NOC technicians are available twenty-four hours a day, seven days a week, at the dedicated Global NOC phone number of 317-278-6630, and via email. Problems are immediately logged as an incident in the trouble ticket system with event history, contact information, resolution details, and follow up procedures.

The trouble ticket system allows detailed information on each problem to be shared by NOC personnel. All team members maintain a general working knowledge of all open tickets even if their special technical concentration is not specifically involved. The NOC uses a nationwide paging system to ensure that any member of the team may be reached regardless of their location.

NOC technician assistance is also available via email or web page based submission forms. NOC email is checked continually day and night. Email submissions are either resolved with a direct response or developed into an incident for further follow up in the trouble ticket system. Web based submission forms are available at the NOC home page for specific network systems and are automatically converted into a trouble ticket. They are registered in the appropriate Network Operations job queue for immediate attention.

The Global NOC uses multiple tools and procedures in a front line, proactive approach towards the detection of potential network failures. The NOC employs multiple network monitoring programs running across several platforms. The variety and combination of programs helps insure strict and redundant monitoring of the network resources.

The redundant monitoring tools allow the NOC to properly perform its network responsibilities. Multiple graphic summaries of network status, and device specific detailed statistical information provide a built-in redundancy that facilitates both immediate and appropriate action by NOC personnel. NOC monitoring procedures provide accurate problem reporting, assistance in effective troubleshooting, and the development of procedures to anticipate and prevent future events affecting network availability.

Once the NOC is alerted to a problem on the network, it begins a highly structured set of procedures towards problem resolution.

## Problem Assignment and Paging

The NOC assigns problems to its engineering staff via a Round Robin method. In effect, the engineers are assigned problems when it is their turn, with each engineer getting the same number of turns. This system is used during normal business hours, Monday through Friday, 8:00 am to 5:00 pm (EST). After hours and on weekends, the problems are assigned to a designated on call engineer. This responsibility rotates between the engineers on a week-by-week basis. The NOC technicians page an engineer when assigning a problem to them.

The NOC employs a strict paging policy that is enforced and followed 24 hours a day, seven days a week. At the first determination of a problem within the network, a NOC technician will begin troubleshooting and page the designated on call engineer. At the same time, NOC technicians begin the tracking and notification processes, and assist the engineer in the problem identification and isolation process.

The paging procedure is:

1. Page primary on call engineer. If no response in 7 minutes, then...
2. Page primary on call engineer again. Also page secondary on call engineer. The first engineer to call in takes primary ownership of the problem.
3. If there is still no response in another 7 minutes, the problem is escalated to the Manager of Engineering, and the Manager of Operations.

Upon calling in, the engineer is informed of the problem or failure and is provided with all supporting information. At this point a strategy is decided upon and documented. It is required that engineers continually update the NOC technicians so timely and accurate status notifications can be sent to affected parties.

If the serious problem is not resolved within one hour, the Engineering Manager must be notified. At this time, it is the responsibility of the Engineering Manager to contact appropriate parties within the supported network administration, and with Indiana University.

## Tracking

At the onset of problem determination, a NOC technician opens a Trouble Ticket. This includes all relevant information relating to the problem. The intermediate steps of tracking include comprehensive updates of related information as it becomes available. This provides a detailed chronology of the problem, including coordination efforts, from start to finish. Upon resolution, an incident is only closed after all related information is compiled. This includes detailed problem solving and resolution summaries

from NOC engineers, related vendors, or personnel from within other parts of the network. Following closure, the incident is available as a future resource for similar problems. Closed incidents are reviewed on a weekly basis for training purposes and quality assurance.

### Problem Identification and Isolation

Once a network problem has been determined, the NOC technicians utilize their tools and network expertise to help identify and isolate the problem. Through the paging process, the NOC engineers take over primary problem identification and isolation responsibilities. In conjunction with the engineers, the NOC technicians continue to help in whatever manner necessary until the problem is identified.

### Notification

To ensure proper communication during network problems, the NOC utilizes several methods of information dissemination. Notification of the problem is sent via email to an appropriate listserv for users and affected parties of the supported network.

Notification is sent out in various phases. They are:

Initial Status Report: This is performed as soon as a problem has been reported, and a problem ticket is opened. Notification may not initially identify the cause or source of difficulty, but reports what network components are affected, the status of their functionality, and the scope of the outage in relation to the network as a whole.

Identification: This phase states the cause and source of the problem (if not already related in the Initial Status Report), and what course of corrective action is being followed. An estimated time of resolution is given, if at all possible.

Updates: Periodic updates are provided periodically until problem has been resolved. Any new information, milestones, or setbacks will be included.

Closure: Upon closure, a resolution synopsis is prepared and distributed immediately. This notice includes details regarding final resolution. Any other important pieces of information are also disclosed. Review of the completed Trouble Ticket will be available upon request.

### Troubleshooting

It is the primary responsibility of the NOC engineers to troubleshoot problems on the network. However, this is often a collaborative effort with vendor partners in support of the network. Joint problem solving and coordination procedures have been established with the related vendors. Each maintains their own Trouble Ticket system, with information shared between parties in a collaborative effort to resolve the problem. Once a Trouble Ticket is opened with a vendor, NOC technicians contact the appropriate engineers and support personnel throughout the supported network and inform them of the events and procedures relating to the problem.

### Escalation

Once a problem is recognized, and support personnel notified, a Trouble Ticket is created. At this time, the problem is assigned an appropriate criticality. This applies to any failure or degradation in service to any resource within the network. The incident is color coded to designate this criticality:

- Red (action needed within 0-59 minutes)
- Yellow (action needed within 1-48 hours)
- Green (action needed within 48-72 hours)
- Blue (no action is needed)

The NOC pays strict attention to the status designated to each open Trouble Ticket, and acts immediately as escalation is needed.

An incident designated code red is when the network, or a key network resource is down and unavailable. This is a serious problem and requires immediate action. The NOC notifies both an on call engineer and the Engineering Manager. If the problem is not acted upon within one hour and a status determined, the Engineering and Operations Managers must be notified. At this time, it is the responsibility of the Engineering Manager to contact the appropriate parties within the supported network administration and Indiana University.

A yellow designation assumes that the network or resource within is suffering from some sort of unacceptable degradation, but is not completely down. It is a matter given high priority, and requires action and status report within 48 hours. A yellow coded ticket is escalated to red if action has not been taken after this designated time frame.

A green coded ticket relates to a network problem or situation that does not have a major impact on the network as a whole. However, it is a matter that does demand action within two to three days. If appropriate action is not enacted within this time, or a status report given, it is escalated to code yellow.

Blue tickets are given this designation when there is no further action required in the problem resolution cycle. Most likely, it is still open to collect further information regarding the nature of the problem or resolution, or as a means of reminder to observe a newly repaired network resource, etc.

Tickets are de-escalated from one code to another as deemed appropriate via communication between NOC technicians, engineers, and support vendors, all within the problem resolution cycle.

## CHANGE MANAGEMENT

Change Management is the process by which the Global Network Operations Center coordinates network installations, maintenance, and enhancements on the supported network. These duties include change approval, scheduling, and notification. Proactive communication with customers, vendors, and engineers will allow minimal service disruption. Proposed network changes are tracked through the NOC's trouble ticket system. Change requests are collected and documented in the trouble ticket system via e-mail, telephone, or web forms. The audit trail for this process is available to authorized personnel via the Internet.

### Procedures

The NOC is responsible for facilitating all forms of Change Management. The purpose of Change Management is to insure that all the proper elements surrounding the change are in place. All associated parties need to be notified and trained (if necessary). The schedule for implementation is coordinated with all other activities on the network. It is an ongoing process of communication, coordination, scheduling, monitoring, and assessing change to network resources. The overriding goal is to provide a high level of availability and service to our customers.

The main features of Change Management are:

- Easy to use web form for change submittals
- Proper review and approval of all changes
- Comprehensive notification of changes to affected parties via e-mail and web pages
- Providing up to date chronology of change events via the world wide web
- Closure notification providing status of completed change as well as all other appropriate information

The NOC has the responsibility of insuring that necessary documentation, testing, notification, training (customers and staff), and recovery procedures are in place before the time of the requested change.

**Process**

A change can be submitted to the NOC via a web-based submission form on the NOC home page. This form provides a template of information to be filled out, for documentation and review purposes. The change form includes the following:

Platform or Network to change:

Date Planned:

Time Planned:

Change Request Submitted By:

Change Implemented By:

| | | | |
|---|---|---|---|
| Change Impact: | Low | Medium | High |
| Impact Disruption: | ___ No disruption to service | | |
| | ___ 50 msec hit (switch-hit) or less | | |
| | ___ greater than 50msec. | | |

If greater than 50msec, please explain:

| | | |
|---|---|---|
| Is Notification Required?: | No | Yes |
| Reboot Required: | No | Yes |
| Power Down Required: | No | Yes |

Hardware:

Application system:

System Software:

Software Taken Down/Up:

Description of Change:

Reason for Change:

Test Plan:

Potential Negative Impact:

Security Impact:

Fallback Procedure:

This information is automatically imported into the NOC queue in the trouble ticket system.

Change Management decisions are conducted in an online, virtual manner, soliciting the input of all necessary parties. Any NOC engineer, associated vendor, or engineer from a related part of the network, may introduce a change item. It is required that all changes be submitted five to seven days prior to requested date. The change will be thoroughly reviewed, and all factors and risks considered. Plans and time frames are made accordingly from the amassed information. Formal approval is then given, or the change may be modified or vetoed if it is deemed unacceptable.

Vendors who provide direct service to the supported network are required to participate in the Change Management process. Likewise, the NOC participates in the Change Management processes of each vendor when appropriate.

Once a change is reviewed, and any related concerns are negotiated, it is immediately posted to the online Change Management Agenda, found on the NOC home page. This allows all interested parties to review proposed changes ensuring that all changes are a matter of public record.

Notification of the change is sent three to five business days prior to its scheduled date. This is done via appropriate notification listservs, and through updates to the Change Management Agenda page on the web. Reminder notifications are sent on a periodic basis up to the date of the change. Major changes are given the utmost priority, with notification given months in advance.

Emergency changes are handled on a case-by-case basis. These are changes that need immediate attention for the health of the network as a whole. These changes are approved by the NOC under the same guidelines as scheduled maintenance. Emergency maintenance requires the standard notification policies, if at all possible.

Once a change has been enacted, notification is sent via email reporting closure, along with all other pertinent information. The web page is also updated reflecting this closure.

## PERFORMANCE MANAGEMENT

Performance management comprises the activities of measurement, tuning, debugging, and capacity planning. The NOC works with the engineering team, vendor partners, and the engineering community at large to identify and monitor appropriate performance variables, determine monitoring frequency, threshold levels, data and presentation formats, and other issues of data collection, reduction, and handling. Anomalies observed through routine monitoring, vendor reports, or other sources will be debugged and corrected in accordance with Change Management guidelines. Technical information relating to performance management is maintained on the NOC web pages.

The Global Research NOC possesses in-house expertise with a number of performance monitoring tools including Whatsup Gold, HP OpenView, CiscoWorks, MRTG, and other commercial packages providing web-accessible reachability status and history. Systems have been developed in-house which gather per-interface router data including error-rates, drops, and traffic levels and present them on the web, along with utilities that filter and summarize router log files, etc.

Performance and network monitoring tools currently employed by the Global NOC are:

**Animated Traffic Map** - View the current level of traffic on the supported network as displayed on a graphical map representing the topology of the network. One can also view the history of traffic on a link or at a core node, and you can view an animation of recent traffic.

http://hydra.uits.iu.edu/~abilene/traffic/

**MRTG Graphs –** The Multi Router Traffic Grapher (MRTG) is a tool to monitor the traffic load on network-links. MRTG generates HTML pages containing GIF images providing a live visual representation of this traffic.

http://monon.uits.iupui.edu/abilene/index.html

**Network Traffic Statistics -** These traffic graphs are based on high-resolution traffic data collected by a custom-written SNMP data collector located at Indiana University. This collector samples every link on the network backbone every three seconds. The graphs show this data summarized at five-minute intervals. Daily traffic patterns and historical patterns are both plotted.

http://waco.uits.iu.edu/abilene/

**Whatsup Gold –** View the current status of the network routers, the links on the network backbone, and related peering networks. This is an SNMP ping based program that is tied in with the NOC's paging and notification systems.

http://guest:@whatsup.abilene.iu.edu/

**BGP Session Monitor –** This program monitors the defined BGP sessions on the network routers. Failure alerts are tied in with the NOC's paging and notification systems.

http://monon.uits.iupui.edu/bgp-ping.html

**Router Proxy -** Submit show commands to a core node router. Select a core node, pick a command of your choice, and submit the form; the output of the command is displayed in another frame.

http://hydra.uits.iu.edu/~abilene/proxy/

**Syslog Monitor -** View and search the current and past syslogs from the router(s).

http://palpatine.ucs.indiana.edu/sysmon-abilene/

**Multicast Route View –** This tool maps the shortest-path tree of a given mroute tree across the network backbone.

http://palpatine.ucs.indiana.edu/mrview-abilene/

**MSDP Logger -** View and search a log of the MSDP SA messages received from the network backbone.

http://palpatine.ucs.indiana.edu/~msdpd/

## CONFIGURATION MANAGEMENT

Configuration management includes the services and infrastructure to securely access, configure, and document networking equipment. Configuration information is documented in detail. The NOC engineers perform the actual network element configuration activities. The NOC technicians work with the engineering staff to provide the structure and facilities for this activity.

## SECURITY MANAGEMENT

Security Management requires proactive network surveillance, detection of security vulnerabilities, incident tracking and reporting, and coordinated incident action.

The network is configured to prevent IP spoofing, IP-based denial of service attacks, and other IP-based vulnerabilities. The Indiana University Information Technology Security Office (ITSO) directly supports the NOC by facilitating inter-network security, network incident handling and reporting, and will incorporate the supported network into its incident tracking system. Secure notification procedures are established to alert all relevant parties of security breaches and vulnerabilities.

The NOC establishes standard security incident and alert reporting procedures that integrate and complement the existing procedures of the supported network.

## SCHEDULING AND ALLOCATION OF NETWORK RESOURCES

Prior to the implementation of QoS/CoS mechanisms in the network, scheduling and allocation of network resources will generally depend on social contract. The NOC provides a web-based forum for the registration of high-bandwidth projects and arbitrates the scheduling of network resource utilization.

## QUALITY ASSURANCE

Analysis and review procedures are built into the daily operational activities. Post-mortem review of problems and response to problems are conducted in conjunction with engineering staff and documented as a part of problem closure.

The monthly reports of statistics on problems, performance and availability along with a review of the actions of the NOC provide the basis for regular management review of NOC quality of service. Quarterly meetings of NOC, engineering and management staff to audit the last quarter performance and history with respect to problem, configuration, change, security and performance management activities provide the checkpoints to gauge NOC performance and make adjustments as required.

NOC personnel participate in regular on-the-job training programs including specific courseware and monthly meetings with engineering personnel.

## REPORTING

Reporting includes network data collection, reduction, processing, publishing, archiving, visualization and support for ad hoc retrieval.

The Global Research NOC supplies detailed weekly reports of network availability, and trouble ticket incident status. Scheduled and unscheduled network outages are thoroughly documented, and weekly network node downtime totals provided. A listing of all open and closed trouble tickets for a give week is also provided.

On a monthly basis the NOC provides public reports of statistics on network availability, utilization, traffic characterization, trend analysis, and a discussion of potential problems. On a quarterly basis, the NOC provides a summary of monthly reports and recommendations. The NOC, engineering, and management meet to audit the last quarter performance and history, with a special emphasis being placed on recurring problems and negative trend performance.

## DOCUMENTATION

The NOC provides ample documentation in support of network use, operation, monitoring and reporting. Web based information is maintained describing:

- Network architecture
- Service, connection, and resource scheduling request online forms
- Scheduled outage notification
- Description of the support structure, procedures, and resources
- News about network services
- Policy
- Network use considerations, routing, ATM PVC and performance issues
- Description of research applications utilizing the network
- Advanced networking projects and topics
- Mailing list including notification

**Promise Of Service**

Just as the networks the Global NOC supports are constantly changing, the NOC is changing as well. The NOC's goal is to continually improve by producing more responsive tools and reports, and deliver even better NOC services to our customers. The Global NOC makes this commitment to those we serve, whether they are in Tokyo, Japan, Europe, South America, or back home in Indiana.

For additional information, please contact Stephen Peck (speck@iu.edu), or call the NOC at 317-278-6630.


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# GLOBAL RESEARCH NOC STAFFING REPORT

The Global Research NOC consists of people from several key groups within the Indiana University staff.

Administration

24x7 Tier One Support Center

Network Engineering

Software Support

Web Development

## ADMINISTRATION

IU Vice President of IT and TransPAC Principal Investigator – Michael McRobbie

Global Networks Project Manager – Jim Williams

Associate Vice President of Telecommunications – Brian Voss

Director of Telecommunications Data/Video – Terry Usrey

Additional Administrative Support – Dave Jent

## 24x7 TIER ONE SUPPORT CENTER

The Global Research NOC provides a host of services necessary for support of an international network in the realm of worldwide peering. Providing 7x24 front-tier support, the NOC offers oversight of problem, configuration and change management, network security, performance and policy monitoring, reporting, quality assurance, scheduling, and documentation.

16 full time employees staff the Tier One Support Center.

**Staff List**

| | |
|---|---|
| Steve Peck | Manager |
| Camille Alfs | Lead Operations Analyst |
| Gregg Canary | Lead Operations Analyst |
| Jay Duncan | Lead Operations Analyst |
| Stacy Wenz | Lead Operations Analyst |

| | |
|---|---|
| Dennis Henderson | Network Operations Controller |
| (vacant) | Global Networks Analyst |
| (above position is in process of being created) | |
| Caroline Carver | Abilene Network Analyst |
| Bill Fulk | Senior Operations Technician |
| Kevin Hill | Senior Operations Technician |
| Tim Kendrick | Senior Operations Technician |
| Nate Legg | Senior Operations Technician |
| Jerome McMurray | Senior Operations Technician |
| Joe Beeson | Operations Technician |
| Nathan Lucas | Operations Technician |
| Easwaran Ramalingam | Operations Technician |

## NETWORK ENGINEERING

The Network Engineering staff at the Global NOC provides primary and secondary engineering support for the various networks. The staff consists of:

Grover Browning

Oleg Bulashov (principal MIRnet engineer)

Matthew Davy

Brent Sweeny

Steven Wallace

(vacant) (principal TransPAC engineer – currently being filled by Linda Winkler)

(vacant)

## SOFTWARE SUPPORT

The following people provide software support for NOC data collection and analysis efforts:

Damon Beals

Mark Meiss

Dennis Pund

Chris Robb

Richard Sammis

## WEB DEVELOPMENT

Roger Pingleton provides the Global NOC's web page development for TransPAC, STAR TAP, Euro-Link, MIRnet, and AMPATH. Roger is assisted by David Flannery.

# 24x7 Tier One Support Center Staffing Schedule

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 7:00 AM | Front | Front | Front | Front | M to F | | | | Back | Back | Back | Back |
| 8:00 AM | Days | Days | Days | Days | | M to F | M to F | | Days | Days | Days | Days |
| 9:00 AM | | | | | | | | | | | | |
| 10:00 AM | LOA | Abilene | Global | Campus | Cont. | | | | LOA | Abilene | Global | Campus |
| 11:00 AM | 7 to 7 | 7 to 7 | 7 to 7 | 7 to 7 | 8 to 4 | AB NA | GL NA | | 7 to 7 | 7 to 7 | 7 to 7 | 7 to 7 |
| 12:00 PM | | | | | | 9 to 5 | 9 to 5 | | | | | |
| 1:00 PM | | | | | | | | | | | | |
| 2:00 PM | | | | | | | | | | | | |
| 3:00 PM | | | | | | | | | | | | |
| 4:00 PM | | | | | | | | | | | | |
| 5:00 PM | | | | | | | | | | | | |
| 6:00 PM | | | | | | | | | | | | |
| 7:00 PM | Front | Front | | | | | | | Back | Back | | |
| 8:00 PM | Nights | Nights | | | | | | | Nights | Nights | | |
| 9:00 PM | | | | | | | | | | | | |
| 10:00 PM | LOA | Global | | | | | | | LOA | Global | | |
| 11:00 PM | Abilene | Campus | | | | | | | Abilene | Campus | | |
| 12:00 AM | 7 to 7 | 7 to 7 | | | | | | | 7 to 7 | 7 to 7 | | |
| 1:00 AM | | | | | | | | | | | | |
| 2:00 AM | | | | | | | | | | | | |
| 3:00 AM | | | | | | | | | | | | |
| 4:00 AM | | | | | | | | | | | | |
| 5:00 AM | | | | | | | | | | | | |
| 6:00 AM | | | | | | | | | | | | |

**Front Half Of the Week:** Works every Sunday, Monday, Tuesday, and every other Wednesday.

**Back Half Of the Week:** Works every other Wednesday, and every Thursday, Friday, Saturday.

## NOC STAFF DUTIES

**Manager:** Provides overall direction and support to the whole staff.

**LOA (Lead Operations Analyst):** Shift coordinator and "go to person" for all NOC activities on that shift. Assists and guides NOC staff with responsibilities for Global Networks, Abilene and IU Networks.

**Cont. (Network Operations Controller):** In-house programmer, tool developer, network maps, and internal web page person. "Jack of all trades" software and hardware resource and technical person. Assists with other NOC responsibilities as needed.

**GL NA (Global Networks Analyst):** Liaison between the Global NOC and the supported networks. Compiles connection and engineering information, along with data traffic analysis. Assists with other NOC responsibilities as needed.

**AB NA (Abilene Network Analyst):** Liaison between Abilene NOC, UCAID, connectors, participants, and peering networks. Facilitates and helps coordinate customers connection to the Abilene Network. Compiles connection and engineering information, along with data traffic analysis. Assists with other NOC responsibilities as needed.

**Global (Technician):** Primarily provides front line support of the Global networks. Assists with other NOC responsibilities as needed.

**Abilene (Technician):** Primarily provides front line support for the Abilene network. Assists with other NOC responsibilities as needed.

**Campus (Technician):** Primarily provides front line support for Indiana University networks. Assists with other NOC responsibilities as needed.


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# TransPAC / STAR TAP Network Management Station

http://missinglink.transpac.org

The network management station is a general purpose Unix-based system installed at the STAR TAP for the purpose of management, testing and analysis of TransPAC and STAR TAP advanced international networking services. Public tools and information are detailed on this web page. User accounts on the management station are provided to engineering staff of networks which peer or transit at the STAR TAP.

It provides the following options:

**Technical and policy documentation and tools available to interactive accounts**

**Traceroute server**

The traceroute server allows to you conduct a standard traceroute between missinglink.transpac.org (206.220.240.234) and the host you specify.

**Reverse traceroute server**

Traceroute from missinglink.transpac.org (206.220.240.234) to (xxx.xxx.xxx.xxx).

**mSD Current MBone Sessions**

**PingER HEP Network Monitoring Project**

This is a test form to retrieve ping data from missinglink.transpac.org. There are similar retrieval scripts running elsewhere. Most of the time the data will be retrieved by automated scripts. This form is only used as a way of testing installations and looking at up-to-the-minute data.

*To obtain an account on missinglink.transpac.org, please contact the TransPAC NOC at noc@transpac.org.*

Email: globalnoc@iu.edu Phone: 317-278-6630

Web Pages: http://globalnoc.iu.edu

# GLOBAL NETWORKS ANALYSIS

## JANUARY 01, 2000 THRU SEPTEMBER 30, 2000

## TOTAL TROUBLE TICKETS CREATED

| | |
|---|---|
| Abilene | 641 |
| TransPAC | 37 |
| STAR TAP | 191 |
| Euro-Link | 42 |

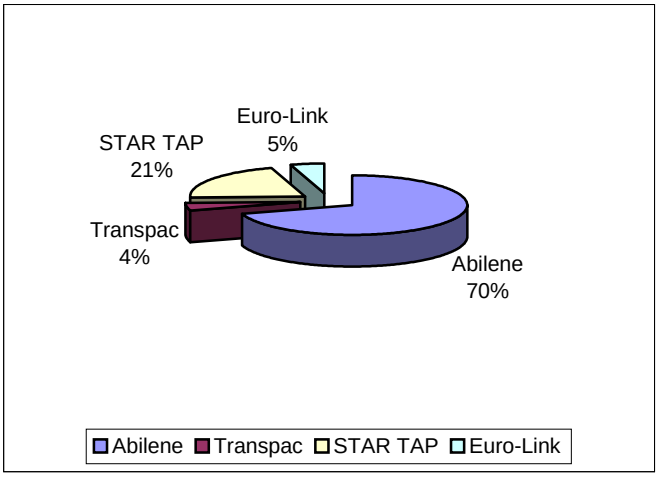



**Figure 1a**

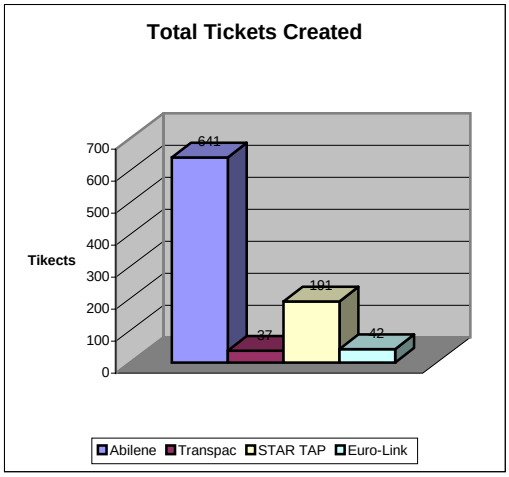



**Figure 1b**

# GLOBAL NETWORK TROUBLE TICKETS

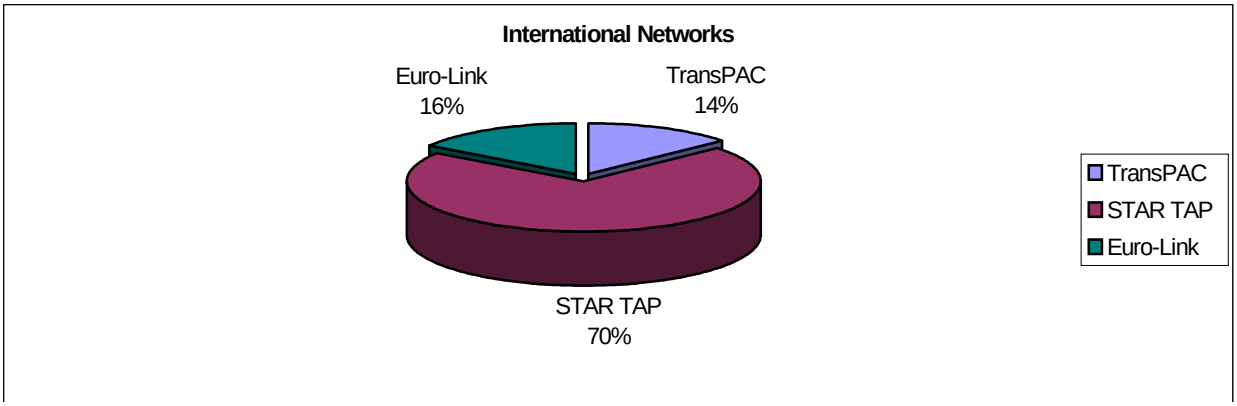



**Figure 1c**

**BREAKDOWN OF WHAT TYPE OF TROUBLE TICKETS WERE CREATED BY NETWORK**

**TransPAC:**

| | |
|---|---|
| H (Hardware) TransPAC Routers and Switches | 4 |
| S (Software) TransPAC Routers and Switches | 8 |
| LD (Long distance carrier or circuit) | 2 |
| N (Network Peer related) | 20 |
| I (Information) | 3 |
| Total Tickets: | 37 |

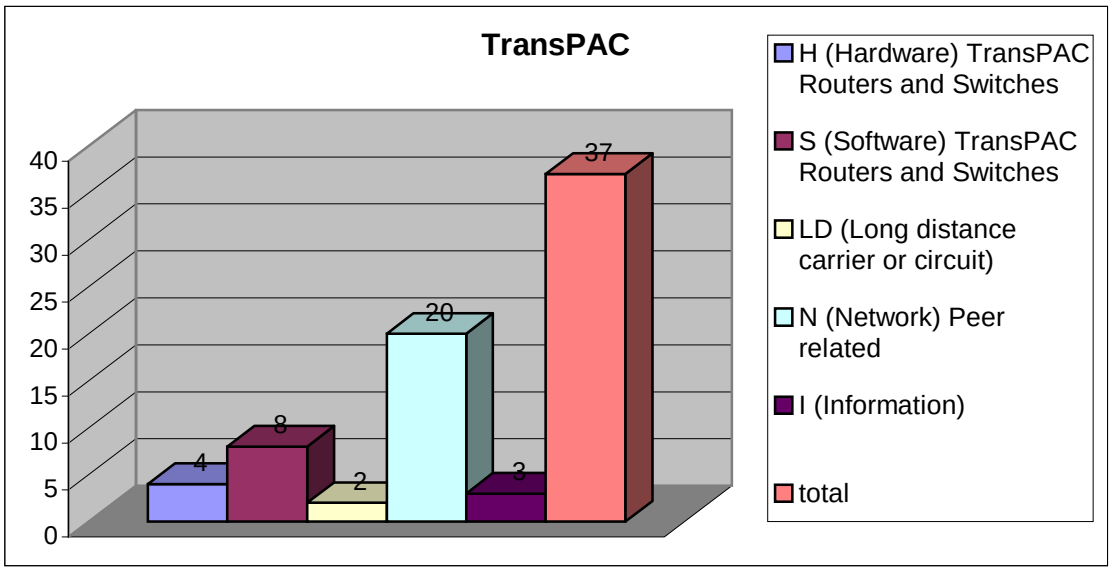



**Figure 2a**

**STAR TAP:**

| | | |
|---|---|---|
| H (Hardware) STAR TAP Router and Switch | | 22 |
| S (Software) STAR TAP Router and Switch | 19 | |
| LD (Long distance carrier or circuit) | | 12 |
| N (Network Peer related | | 102 |
| I (Information) | | 36 |
| Total Tickets: 191 | | |

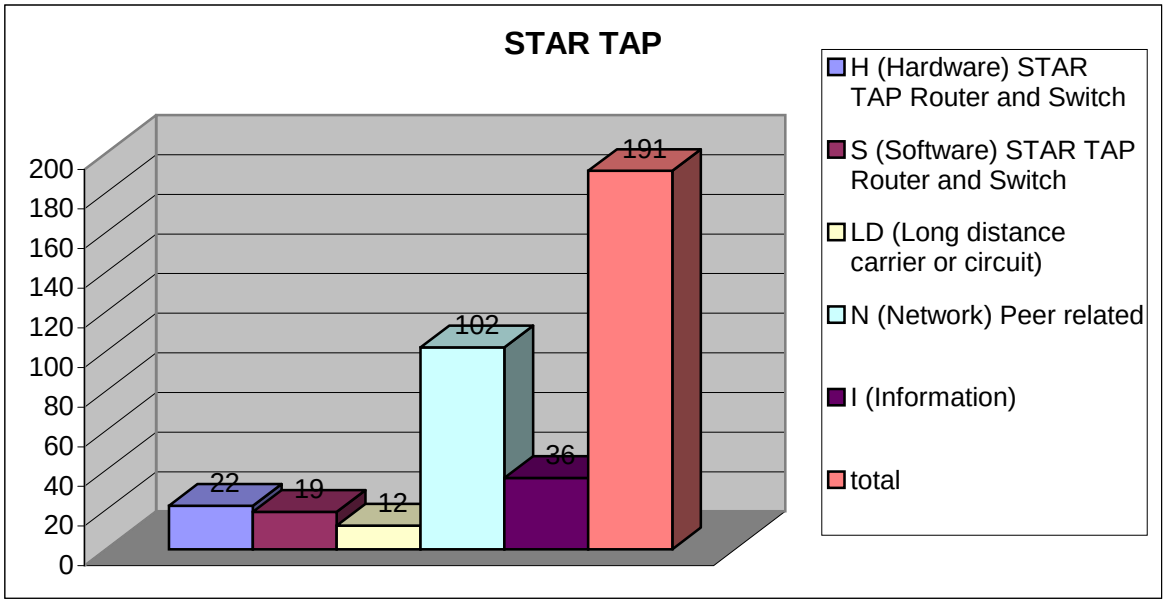



**Figure 2b**

**Euro-Link:**

| | | |
|---|---|---|
| H (Hardware) STAR TAP Router and Switch | | 2 |
| S (Software) STAR TAP Router and Switch | 3 | |
| LD (Long distance carrier or circuit) | | 5 |
| N (Network Peer related) | | 25 |
| I (Information) | | 7 |
| Total Tickets: 42 | | |

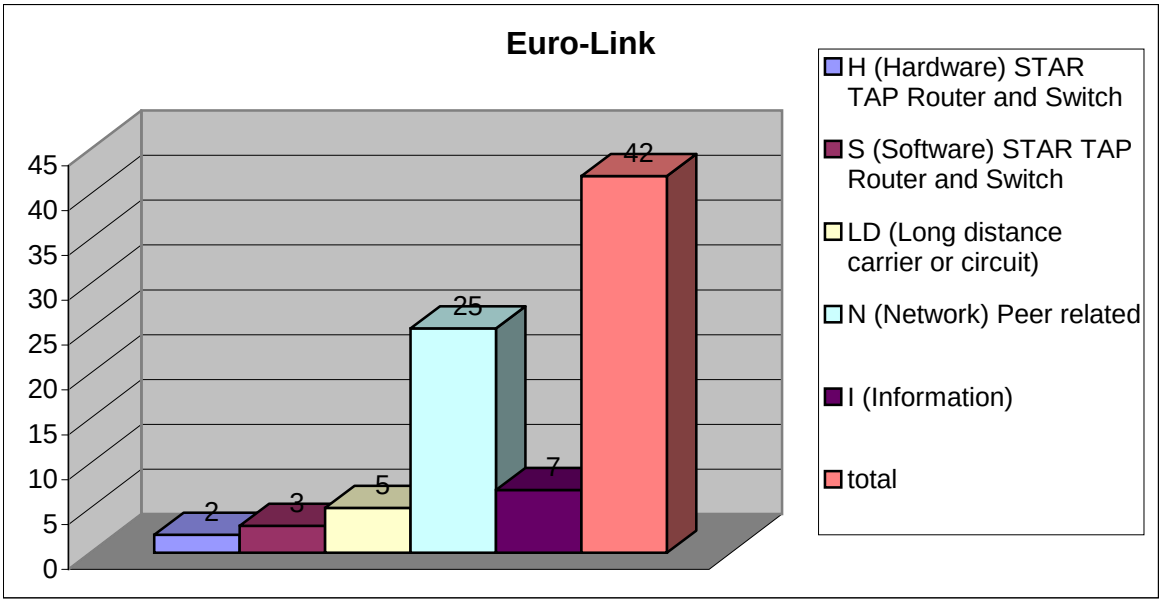



**Figure 2c**

## Total Statistics of Global NOC Trouble Ticket generation

| | |
|---|---|
| Total tickets for Global Networks Combined (minus Abilene): | 270 |
| Hardware Problems for Global Networks Combined: | 28 |
| Software Problems for Global Networks Combined: | 30 |
| Problems with carrier or circuit for Global Networks Combined: | 19 |
| Network peer networks problems for Global Networks Combined: | 147 |
| Informational tickets for Global Networks Combined: | 46 |

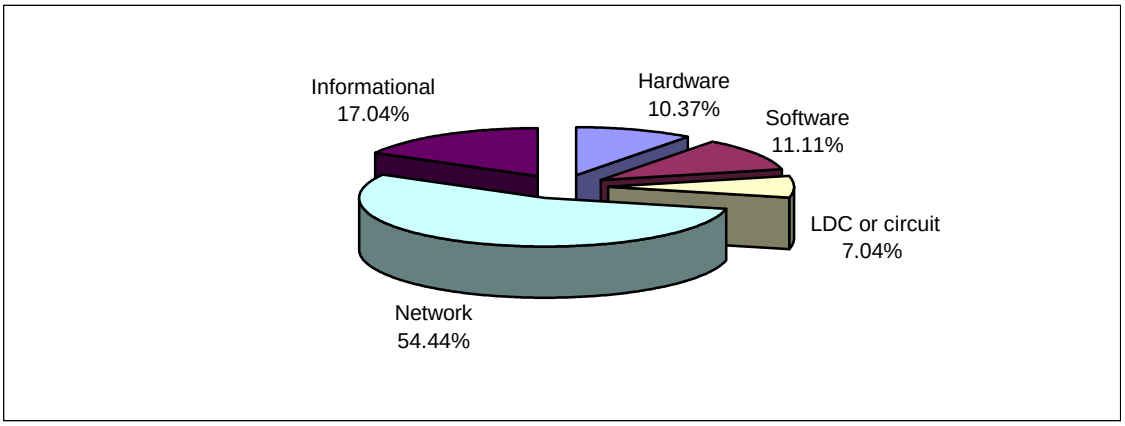



**Figure 2d**

**TOTAL NUMBER OF SCHEDULED AND UNSCHEDULED OUTAGES**

(Including peer network outages)

Scheduled:

TransPAC: 21

STAR TAP: 56

Euro-Link: 27

Unscheduled:

TransPAC: 17

STAR TAP: 93

Eurolink: 26

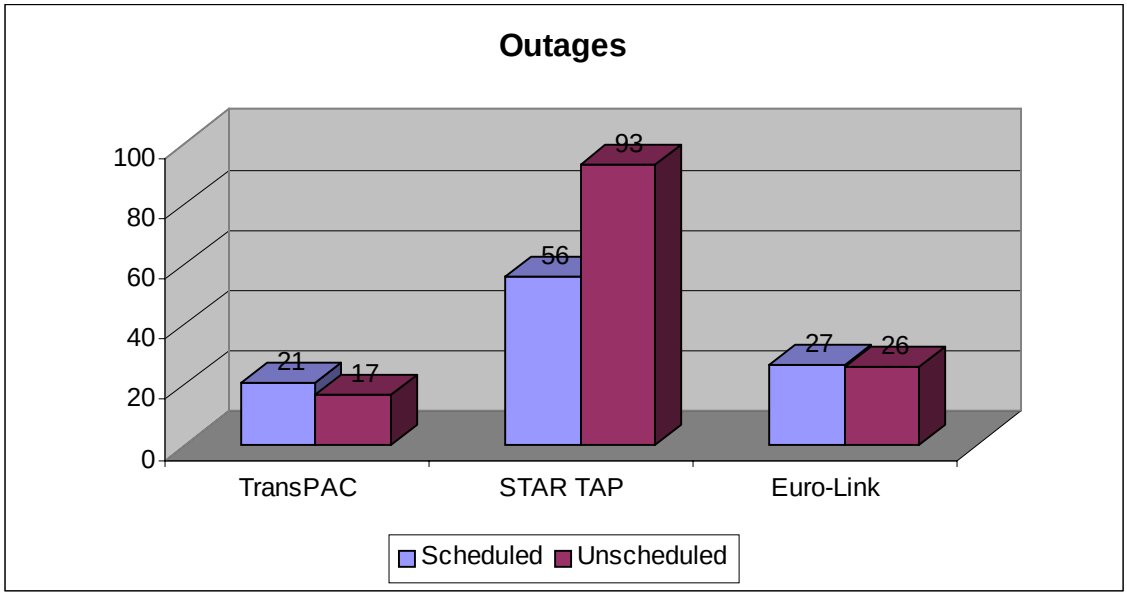



**Figure 3a**

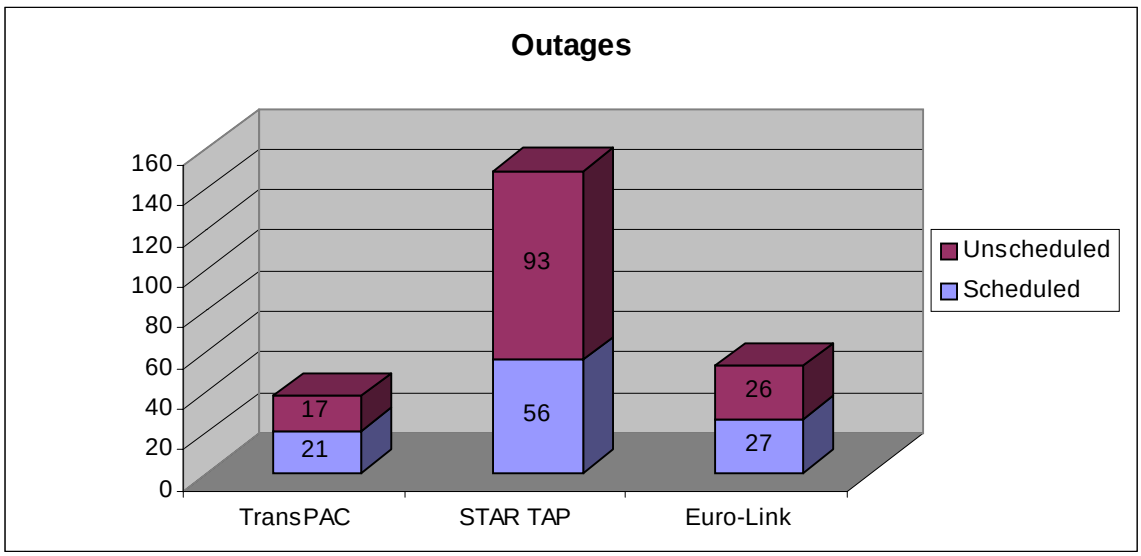



**Figure 3b**

# Total Statistics of Global NOC
# Scheduled / Unscheduled Outages Combined

Number of Scheduled Outages for Global Networks Combined: 104

Number of Unscheduled Outages for Global Networks Combined: 136

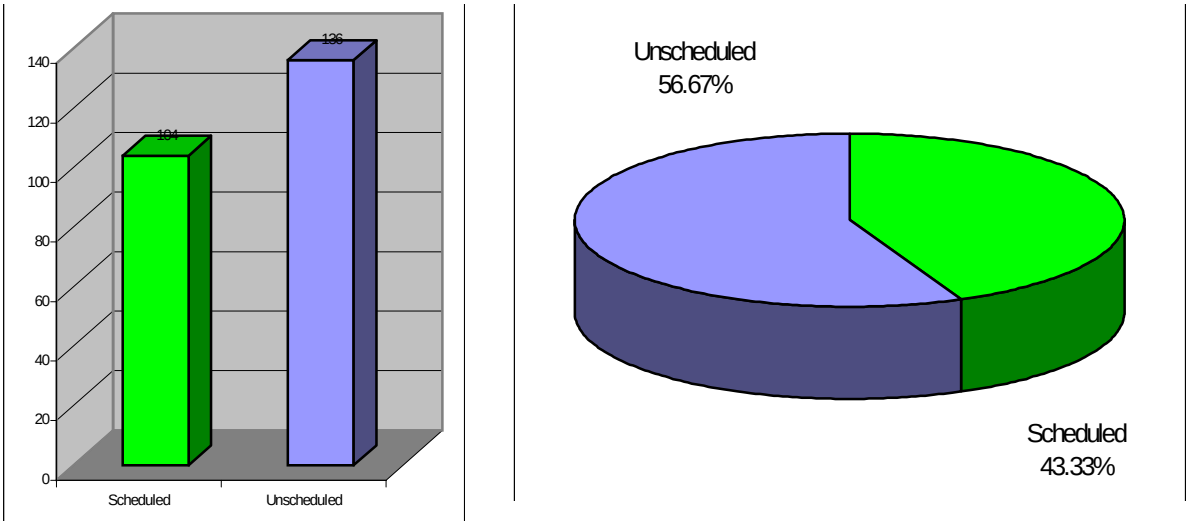



**Figure 3c**

**Hardware/Software Percentages of Unscheduled Outages (including peer networks)**

| | | | |
|---|---|---|---|
| TransPAC: | | | |
| | Hardware: | 6 | 4.41% |
| | Software: | 11 | 8.09% |
| STAR TAP: | | | |
| | Hardware: | 33 | 24.26% |
| | Software: | 60 | 44.12% |
| Euro-Link: | | | |
| | Hardware: | 11 | 8.09% |
| | Software: | 15 | 11.03% |

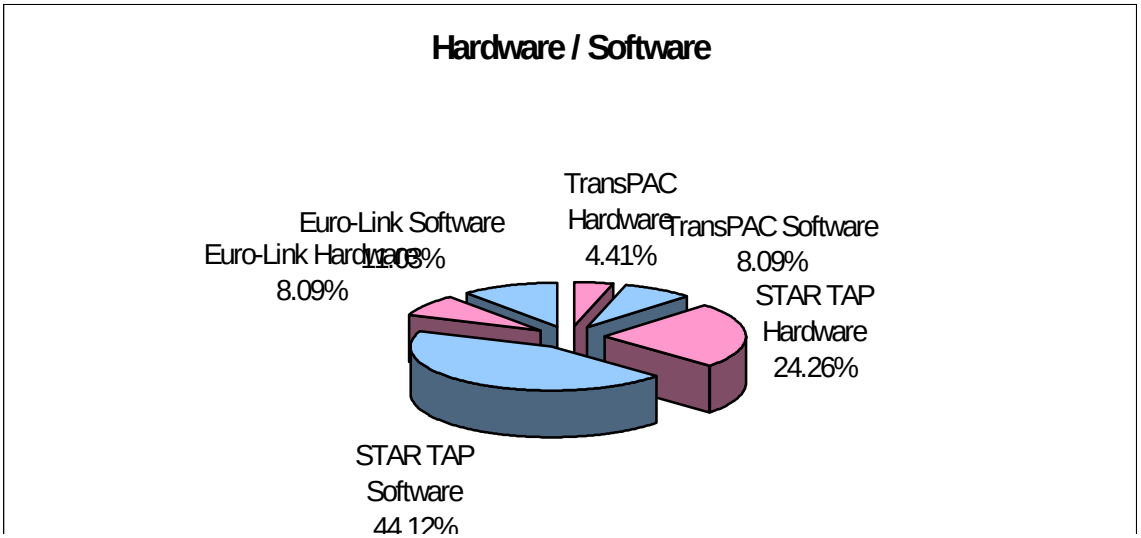
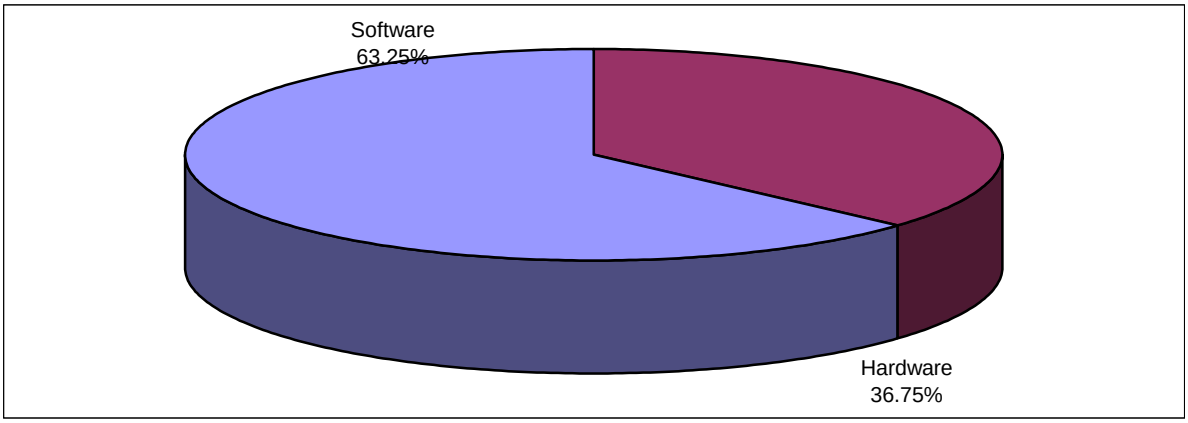



**Figure 3d**

## Total Percentage of Global NOC Hardware/Software Problems Combined (including peer networks):

| | |
|---|---|
| Total hardware percentage for Global NOC Combined: | 36.75% |
| Total software percentage for Global NOC Combined: | 63.25% |



**NETWORK DOWNTIME TOTALS (as seen from STAR TAP) – 2/1/00 through 9/30/00**

| | TOTAL | |
|---|---|---|
| | **Hours** | **Minutes** |
| **Routers/Switches** | | |
| TPR/ST Router | 1hr | 33mins |
| TPR/ST Switch | 0 | 0 |
| APAN/Tokyo Router | 3hrs | 21mins |
| **Peer Networks** | | |
| CERN(Euro-Link) | 59hrs | 13mins |
| IUCC(Euro-Link) | 9hrs | 4mins |
| NORDUnet(Euro-Link) | 1hr | 4mins |
| Renater2(Euro-Link) | 30hrs | 41mins |
| SURFnet(Euro-Link) | 67hrs | 46mins |
| Abilene | 0 | 40mins |
| APAN | 2hrs | 8mins |
| Argonne Labs | 2hrs | 39mins |
| CA*net3 | 7hrs | 18mins |
| CERnet | 0 | 23mins |
| DREN | 0 | 12mins |
| Esnet | 0 | 16mins |
| GEMnet | 147hrs | 59mins |
| MIRnet | 39hrs | 51mins |
| NII | 20hrs | 21mins |
| Northwestern University | 1hr | 22mins |
| NREN | 0 | 26mins |
| OSU | 0 | 42mins |
| REUNA | 7hrs | 0mins |
| SingAREN | 75hrs | 21mins |
| TANet2 | 6hrs | 13mins |
| University of Chicago | 0 | 25mins |
| UIC | 1 hr | 18 mins |
| UIUC | 29hrs | 5mins |
| University of Iowa | 4hrs | 17mins |
| University of Iowa St. | 6hrs | 31mins |
| University of Wisc-Madison | 2hrs | 19mins |
| vBNS | 15hrs | 6mins |

# GLOBAL NOC TROUBLE TICKET EXAMPLE #1

## Iowa State tracert to 216.218.202.95 from 129.186.171.124

This ticket shows the seamless interaction between the Global NOC and the STAR TAP engineers in helping to troubleshoot and resolve a problem with a STAR TAP peering network.

Incident Number: 646.205

Username- OPERATIONS, STAR TAP NETWORK

Client Name- OPERATIONS, STAR TAP NETWORK

Department Code- UITS

Department Name- UITS

Building/Room- UL 1170

Status- STAFF

Phone- 317 278-6630

Email- NOC@STARTAP.NET

Campus- IUPUI

Originator: Ramalingam, Easwaran

Creation Date: Sep 05 2000 07:56

## Description of Problem

***Mail from Adam Ryan at Iowa State:***

Date- Tue, 5 Sep 2000 07-45-49 -0500

From- Adam M Ryan <aryan@iastate.edu>

To- noc@nap.net

Cc- noc@startap.net

Subject- tracert to 216.218.202.95

Here is a trace to 216.218.202.95 from 129.186.171.124

4 <10 ms <10 ms <10 ms b31br5.gw.iastate.edu [192.245.179.134]

5 <10 ms 16 ms 15 ms dng-vbns.gw.iastate.edu [192.245.179.250]

6 16 ms 15 ms 16 ms 204.147.136.2

7 16 ms 15 ms 16 ms st-vbns.startap.net [206.220.240.193]

8 * 172 ms * na165.nap.net [207.227.0.165]

9 * * 94 ms p2-1.chcgil1-ba1.bbnplanet.net [4.24.6.101]

0 * 125 ms 172 ms 4.24.5.230

9 * * 94 ms p2-1.chcgil1-ba1.bbnplanet.net [4.24.6.101]

0 * 125 ms 172 ms 4.24.5.230

1 110 ms * * p2-2.chicago1-nbr1.bbnplanet.net [4.0.5.233]

2 * 140 ms 110 ms p11-0-0.chicago1-br2.bbnplanet.net [4.0.5.57]

3 * * 140 ms f1-0.chicago2-cr3.bbnplanet.net [4.0.48.84]

4 * * 140 ms above-bbn-45Mbps.ord.above.net [209.133.31.5]

5 * 140 ms * core1-chicago-1.ord.above.net [209.249.0.129]

6 172 ms * * sjc-ord-oc12.sjc2.above.net [207.126.96.118]

7 * * * Request timed out.

8 * 234 ms 235 ms mae-west-core1-oc3-2.maew.above.net
[209.133.31.2]

9 * * 172 ms 100tx-f6-1.mae-west.he.net [207.126.96.98]

0 * * 187 ms gige-g9-0.gsr12012.sjc.he.net [216.218.130.1]

1 * * * Request timed out.

2 187 ms 203 ms 172 ms 216.218.202.95

trace complete.

Please take a look at this and see if there is a problem.

Thanks,

Adam

***(Problem has been reported to the NOC.)***

**eramalin Sep 5, 2000 8.01**

Date- Tue, 5 Sep 2000 08-00-02 -0500 (EST)

From- STAR TAP NOC <noc@startap.net>

To- mpd@iu.edu

Subject- Iastate Tracert

Matt you have been assigned to this ticket via round robin.

646.205 - iastate tracert to 216.218.202.95 from 129.186.171.124.

Matt Davy HAS BEEN ASSIGNED TO THIS TICKET..

updated incident log.

***(Ticket has been assigned to a Global NOC engineer.)***

**eramalin Sep 5, 2000 9.25**

Date- Tue, 5 Sep 2000 09-20-05 -0500

From- Matthew Davy <mpd@indiana.edu>

Reply-To- Technical Discussion for Star Tap Network <STARTAP-ENG-L@LISTSERV.INDIANA.EDU>

To- STARTAP-ENG-L@LISTSERV.INDIANA.EDU

Subject- [support@iupui.edu- Inc. 646.205, iastate tracert to 216.218.202.95 from 129.186.171.124]

It looks like the vBNS is receiving NAPnet routes from the STAR TAP router and reannouncing those to their customers. I'd say this is because of the

empty "route-map APAN-out permit 4" stanza that you added yesterday afternoon.

```
Is this the correct routing policy??
Thanks !
- Matt
neighbor 206.220.240.194 peer-group USNRN
neighbor 206.220.240.194 description VBNS
neighbor USNRN peer-group nlri unicast multicast
neighbor USNRN next-hop-self
neighbor USNRN peer-group nlri unicast multicast
neighbor USNRN next-hop-self
neighbor USNRN send-community
neighbor USNRN soft-reconfiguration inbound
neighbor USNRN route-map From-USNRN in
neighbor USNRN route-map APAN-out out
route-map APAN-out permit 4
!
route-map APAN-out permit 20
 match as-path 24
!
route-map APAN-out permit 30
 match as-path 20
!
route-map APAN-out permit 40
 match community 11
!
Mon Sep 4 18-57-17 2000
206.220.240.205
206.220.240.205
lwinkler
tty2
146.137.172.121
stop
task_id=1131
start_time=968111838
timezone=CDT
service=shell
priv-lvl=15
cmd=route-map APAN-out permit 4 <cr>
```

***(Global NOC engineer engages STAR TAP engineer.)***

**eramalin Sep 5, 2000 9.30**

Date- Tue, 5 Sep 2000 09-20-55 -0500

From- Linda Winkler <winkler@MCS.ANL.GOV>

Reply-To- Technical Discussion for Star Tap Network <STARTAP-ENG-L@LISTSERV.INDIANA.EDU>

To- STARTAP-ENG-L@LISTSERV.INDIANA.EDU

Subject- Re- [support@iupui.edu- Inc. 646.205,

iastate tracert to 216.218.202.95 from 129.186.171.124]

no that is an error.

I have removed that line from the config

lw

***(STAR TAP engineer resolves problem.)***

**eramalin Sep 5, 2000 9.37**

Date- Tue, 5 Sep 2000 09-31-56 -0500

From- Matthew Davy <mpd@indiana.edu>

To- noc@startap.net

Subject- [winkler@MCS.ANL.GOV- Re- [support@iupui.edu- Inc. 646.205,

iastate tracert to 216.218.202.95 from 129.186.171.124]]

Please verify with Iowa State that the path no longer goes through the STAR TAP router. If not, the incident should be closed.

Thanks !

- Matt

**eramalin Sep 5, 2000 9.38**

Date- Tue, 5 Sep 2000 09-41-21 -0500 (EST)

From- STAR TAP NOC <noc@startap.net>

To- Adam M Ryan <aryan@iastate.edu>

Subject- Re- tracert to 216.218.202.95

Adam,

Can please verify that Iowa State path no longer goes through the

STAR TAP router. Thank you.

Easen

STAR TAP Network Operations Center

Indiana University

**eramalin Sep 5, 2000 9.57**

Date- Tue, 5 Sep 2000 09-48-35 -0500

From- Adam M Ryan <aryan@iastate.edu>

To- STAR TAP NOC <noc@startap.net>

Subject- RE- tracert to 216.218.202.95

Yes this is correct, here is the current trace.

1 <10 ms <10 ms 16 ms 10.10.184.254

2 <10 ms <10 ms <10 ms b31gb1-lan254-128.tele.iastate.edu [129.186.254.131]

3 <10 ms <10 ms <10 ms b31br4.gw.iastate.edu [192.245.179.130]

4 <10 ms <10 ms <10 ms ICN-ISU-oc3.icn.state.ia.us [205.221.255.5]

5 <10 ms <10 ms <10 ms 172.30.1.1

6 15 ms <10 ms 16 ms 204.6.118.253

7 47 ms 16 ms 15 ms rc1.nc.us.psi.net [38.1.26.161]

8 266 ms 187 ms 250 ms leaf.net228.psi.net [38.1.10.7]

9 94 ms 109 ms 94 ms pb-nap.he.net [198.32.128.59]

10 93 ms 110 ms 109 ms he.net [216.218.186.2]

Thanks,

Adam

***(Global NOC staff confirms problem has been resolved with customer.)***

**eramalin Sep 5, 2000 10.17**

Closing Ticket.

# GLOBAL NOC TROUBLE TICKET EXAMPLE #2

## TransPAC APAN Tokyo/STAR TAP downtime (unscheduled)

***This ticket shows the standard high level of cooperation between the Global NOC and other NOCs around the world to help resolve problems. The proactive vigilance and problem resolution procedures used by the Global NOC is apparent in this ticket.***

Incident Number: 626.43

Username- OPERATIONS, TRANSPAC NETWORK

Client Name- OPERATIONS, TRANSPAC NETWORK

Department Code- UITS

Department Name- UITS

Building/Room- UL 1170

Status- STAFF

Phone- 317 278-6630

Email- NOC@TRANSPAC.ORG

Campus- IUPUI

Originator: Duncan, Jay

Creation Date: Jun 14 2000 21:35

Description of Problem

I originally thought this was related to the maintenance a few days ago, but now I am not so sure. So I am creating a new incident.

From Whatsup Gold (monitoring system)

TPR-Tokyo down at 2122

Up at 2124

To - "Transpac-Ops-L List (APAN and US)" <transpac-ops-l@listserv.indiana.edu

Cc -

Attchmnt-

Subject - TransPAC APAN Tokyo Outage (Unscheduled)

----- Message Text -----

SUBJECT- TransPAC APAN Tokyo Outage (Unscheduled)

SCOPE- TransPAC peering with STAR TAP and Abilene

REASON- APAN Tokyo router failure.

START TIME- Thursday, June 15, 2000, 1-22 AM (0122) GMT

END TIME- Thursday, June 15, 2000, 1-24 AM (0124) GMT

DESCRIPTION- APAN Tokyo experienced a brief outage during this time. The cause is currently under investigation.

TICKET NO.- 623.487

NOTIFICATION COUNTER- Message #1

If you have questions, please contact the TransPAC Network Operations Center (NOC).

***(The NOC monitors a problem and sends customers outage notification.)***

**jrduncan Jun 14, 2000 21.46**

down again at 2144

up at 2149

OK, it looks like this one is flapping.

**jrduncan Jun 14, 2000 22.15**

Date- Wed, 14 Jun 2000 22-13-38 -0500 (EST)

From- STAR TAP NOC <noc@startap.net>

To- ops@jp.apan.net

Cc- STAR TAP NOC <noc@startap.net>

Subject- APAN connection to STAR TAP Unstable

Hello,

The STAR TAP connection to APAN seems to have started flapping up and down at approximately 0007 GMT and ending at approximately 0055 GMT. Are you aware of a reason for such activity? Please let us know if you have any news or if we can be of assistance in any way.

Thank you very much,

Jay Duncan

STAR TAP Network Operations Center

***(The NOC contacts the APAN NOC to inquire about the problem.)***

**jrduncan Jun 14, 2000 22.34**

To - StarTap-ops-l <startap-ops-l@listserv.indiana.edu>

Cc -

Attchmnt-

Subject - TransPAC APAN Tokyo Instability(Unscheduled)

----- Message Text -----

SUBJECT- TransPAC APAN Tokyo Outage (Unscheduled)

SCOPE- TransPAC peering with STAR TAP

REASON- Undetermined

START TIME- Thursday, June 15, 2000, 1-07 AM (0107) GMT

END TIME- Thursday, June 15, 2000, 1-55 AM (0155) GMT

DESCRIPTION- The APAN Tokyo connection to STAR TAP was unstable during this time. The connection has stabilized. We continue to look for the cause.

TICKET NO.- 623.487

NOTIFICATION COUNTER- Message #2

If you have questions, please contact the TransPAC Network Operations Center (NOC).

***(More outage notification is sent.)***

**jrduncan Jun 15, 2000 2.05**

Date- Thu, 15 Jun 2000 13-28-31 +0900

From- kitaji@kddlabs.co.jp

To- trouble-ticket@jp.apan.net

Subject- BGP session flap (Unscheduled) on core router in APAN Tokyo XP

Trouble Ticket

No. -000614/01

Ticket Summary -Flap of BGP session peering with all neighbors

Published from -kitaji@kddlabs.co.jp

State -Available

Date -

Occurrence time -2000/June/14 11-00 JST (GMT +9)

End time -2000/June/14 12-00 JST (GMT +9)

While debugging DVMRP on TPR2 (Core router) in APAN Tokyo XP, because the routing daemon became unstable, all the BGP session had been flapping in this time frame.

If you have any questions, please contact APAN Tokyo XP network operation centers- ops@jp.apan.net

From- STAR TAP NOC <noc@startap.net>

To- STARTAP-OPS-L@LISTSERV.INDIANA.EDU

Subject- TransPAC APAN Tokyo Instability(Unscheduled)

SUBJECT- TransPAC APAN Tokyo Outage (Unscheduled)

SCOPE- TransPAC peering with STAR TAP

REASON- Unstable Routing Daemon

START TIME- Thursday, June 15, 2000, 1-07 AM (0107) GMT

END TIME- Thursday, June 15, 2000, 1-55 AM (0155) GMT

DESCRIPTION- The APAN Tokyo connection to STAR TAP was unstable during this time. While debuging DVMRP on TPR2(Core router) in APAN Tokyo XP, the routing daemon became unstable, causing the BGP sessions to flap.

TICKET NO.- 623.487

NOTIFICATION COUNTER- Message #3

I think we should leave this ticket open for a while, until they get the bugs worked out.

***(The KDD NOC responds with a response to the problem. The Global NOC notifies its customers of what the problem was.)***

**nlegg Jun 15, 2000 8.02**

Flagging blue and waiting. Let's just see if it happens again.

***(Problem de-escalated.)***

**jrduncan Jun 21, 2000 3.05**

Started happening again today at 1-47am to approximately 2-51. Upgrading to Yellow.

From- STAR TAP NOC <noc@startap.net>

To- ops@jp.apan.net

Cc- STAR TAP NOC <noc@startap.net>

Subject- APAN/STAR TAP Link Flapping

Hello,

We saw the circuit from the STAR TAP to APAN tpr-Tokyo flapping again from approximately 1-47am (GMT -5) to 2-51 (GMT -5). A similar incident occurred on 6/14 and your trouble ticket on that instance was 000614/01. Is the cause of the current circuit flapping known?

Thank you very much,

Jay Duncan

STAR TAP Network Operations Center

Notification sent.

***(Six days later, the same symptoms reappear. The APAN NOC is notified again. Customers notified.)***

**jrduncan Jun 21, 2000 4.03**

Date- Thu, 22 Jun 2000 02-51-43 +0900

From- ikob <ikob@koganei.wide.ad.jp>

To- noc@startap.net

Cc- ops@jp.apan.net
Subject- Re- APAN/STAR TAP Link Flapping
Hello,
Its flapping might be caused by configuration changing in M20.
We are trying to estabilsh DVMRP tunnel on JUNOS. Unfortunately,
just after starting the DVMRP router of the tunnel opposite,
JUNOS routing daemon stops with core dump.
Sorry, making inconvenience.

***(Cause of problem identified by APAN NOC.)***

**wfulk Jun 21, 2000 14.21**

moving to blue leave open a while to see if they have this fixed.

***(Due to stability of the connection, problem has been de-escalated.)***

**cdavisal Jun 23, 2000 4.18**

Date- Fri, 23 Jun 2000 16-58-15 +0800
From- "[big5] ?o?1/4??" <jonathan@apol.com.tw>
To- STAR TAP NOC <noc@startap.net>
Cc- noc <noc@tanet2.net.tw>
Subject- Re- Update on STAR TAP Instability
Dear Sir-
Sorry for late response.The problem was caused by peering with APAN via STARTAP.Because TANet2 and TANet have many connect institutions which keep both connections.Network both advertised by TANet2 and TANet BGP.The routing originated from two ASs flow to each other and caused instability situation.Now the problem is fixed.Thanks for your kindly caring and reminding.
Regards,
jonathan
noc@tanet2.net.tw
Notification sent.

***Final resolution from TANet2 NOC. Customers notified, incident closed.)***

**nlegg Jun 24, 2000 12.25**

Closing. This one is resolved.

# GLOBAL NOC TROUBLE TICKET EXAMPLE #3

## STAR TAP 206.220.240.241 / Routing Loop

***This ticket illustrates a typical, non-outage problem resolved by the Global NOC.***

Incident Number: 654.468
Username- OPERATIONS, STAR TAP NETWORK
Client Name- OPERATIONS, STAR TAP NETWORK

Department Code- UITS

Department Name- UITS

Building/Room- UL 1170

Status- STAFF

Phone- 317 278-6630

Email- NOC@STARTAP.NET

Campus- IUPUI

Originator: Ramalingam, Easwaran

Creation Date: Oct 03 2000 15:59

**Description of Problem**

***Mail from Yvonne Hines about routing problems:***

Date- Tue, 03 Oct 2000 13-45-39 -0700

From- yhines@es.net

To- noc@startap.net

Cc- trouble@es.net

Subject- TTS # 6772 SLAC -> 206.220.240.241 Routing Loop

Hi,

One of our users at SLAC is unable to access the host at 206.220.240.241. There seems to be a routing loop. Thanks for looking into this problem.

Regards,

Yvonne Hines

ESnet

traceroute 206.220.240.241

traceroute to 206.220.240.241 (206.220.240.241)- 1-30 hops, 38 byte packets

1 twc-lc1-1.es.net (198.128.4.5) 0.977 ms 0.977 ms 0.0 ms

2 lbl2-twc.es.net (134.55.21.130) 13.6 ms 12.7 ms 12.7 ms

3 chicago1-atms.es.net (134.55.24.17) 67.4 ms 67.4 ms 66.4 ms

4 a3-0-10.chcgil1-ba1.bbnplanet.net (4.24.146.37) 67.4 ms 67.9 ms 67.3 ms

5 p10-0-0.nchicago1-core0.bbnplanet.net (4.24.6.114) 69.2 ms 69.2 ms 69.2 ms

6 na166.nap.net (207.227.0.166) 69.2 ms (ttl=252!) 70.2 ms (ttl=252!) 73.1 ms (ttl=252!)

7 6tap-router.startap.net (206.220.240.226) 71.1 ms (ttl=252!) 69.2 ms (ttl=252!) 69.8 ms (ttl=252!)

8 v4chicago-6tap.es.net (198.124.254.158) 78.0 ms (ttl=253!) 225 ms (ttl=253!) 284 ms (ttl=253!)

9 a3-0-10.chcgil1-ba1.bbnplanet.net (4.24.146.37) 71.2 ms (ttl=252!) 77.1 ms (ttl=252!) 70.2 ms (ttl=252!)

10 p10-0-0.nchicago1-core0.bbnplanet.net (4.24.6.114) 78.0 ms (ttl=251!) 73.7 ms (ttl=251!) 70.2 ms (ttl=251!)

11 na166.nap.net (207.227.0.166) 76.1 ms (ttl=252!) 77.1 ms (ttl=252!) 71.2 ms (ttl=252!) (ttl=252!) 75.1 ms (ttl=252!)

13 v4chicago-6tap.es.net (198.124.254.158) 182 ms (ttl=253!) 231 ms (ttl=253!) 72.8 ms (ttl=253!)

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14 a3-0-10.chcgil1-ba1.bbnplanet.net (4.24.146.37) 73.2 ms (ttl=252!) 73.2 ms
(ttl=252!) 72.2 ms (ttl=252!)

15 p10-0-0.nchicago1-core0.bbnplanet.net (4.24.6.114) 79.1 ms (ttl=251!) 78.1
ms (ttl=251!) 76.2 ms (ttl=251!)

16 na166.nap.net (207.227.0.166) 74.2 ms (ttl=252!) 72.2 ms (ttl=252!) 74.2
ms (ttl=252!)

17 6tap-router.startap.net (206.220.240.226) 74.2 ms (ttl=252!) 75.2 ms
(ttl=252!) 73.2 ms (ttl=252!)

18 v4chicago-6tap.es.net (198.124.254.158) 74.8 ms (ttl=253!) 74.2 ms
(ttl=253!) 74.1 ms (ttl=253!)

19 a3-0-10.chcgil1-ba1.bbnplanet.net (4.24.146.37) 78.0 ms (ttl=252!) 75.0 ms
(ttl=252!) 75.0 ms (ttl=252!)

20 p10-0-0.nchicago1-core0.bbnplanet.net (4.24.6.114) 86.7 ms (ttl=251!) 75.0
ms (ttl=251!) 76.0 ms (ttl=251!)

21 na166.nap.net (207.227.0.166) 76.0 ms (ttl=252!) 76.0 ms (ttl=252!) 77.0
ms (ttl=252!)

22 6tap-router.startap.net (206.220.240.226) 78.0 ms (ttl=252!) 75.6 ms
(ttl=252!) 78.9 ms (ttl=252!)

23 v4chicago-6tap.es.net (198.124.254.158) 83.9 ms (ttl=253!) 77.1 ms
(ttl=253!) 80.0 ms (ttl=253!)

24 a3-0-10.chcgil1-ba1.bbnplanet.net (4.24.146.37) 86.8 ms (ttl=252!) 78.0 ms
(ttl=252!) 78.0 ms (ttl=252!)

25 p10-0-0.nchicago1-core0.bbnplanet.net (4.24.6.114) 77.1 ms (ttl=251!) 79.0
ms (ttl=251!) 81.0 ms (ttl=251!)

26 na166.nap.net (207.227.0.166) 80.0 ms (ttl=252!) 81.0 ms (ttl=252!) 85.4
ms (ttl=252!)

27 6tap-router.startap.net (206.220.240.226) 78.0 ms (ttl=252!) 79.0
ms(ttl=252!) 79.0 ms (ttl=252!)

28 v4chicago-6tap.es.net (198.124.254.158) 82.9 ms (ttl=253!) 79.0
ms(ttl=253!) 79.0 ms (ttl=253!)

29 a3-0-10.chcgil1-ba1.bbnplanet.net (4.24.146.37) 79.0 ms (ttl=252!) 81.9 ms
(ttl=252!) 81.0 ms (ttl=252!)

30 p10-0-0.nchicago1-core0.bbnplanet.net (4.24.6.114) 88.8 ms (ttl=251!) 81.0
ms (ttl=251!) 86.4 ms (ttl=251!)

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Yvonne Hines Phone- (510) 486-8642

Energy Sciences Network (ESnet) Fax - (925) 373-9198

Network Engineering Services Group Email- yhines@es.net

Lawrence Berkeley National Laboratory URL - http-//www.es.net/

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***(The NOC is notified of a problem.)***

**eramalin Oct 3, 2000 16.00**

***Assigning to Brent Sweeny via Round Robin.***

***(A Global NOC engineer is assigned the trouble ticket.)***

**eramalin Oct 3, 2000 16.56**

From- Brent Sweeny <sweeny@indiana.edu>

To- yhines@es.net, trouble@es.net, noc@startap.net

Cc- Linda Winkler <lwinkler@anl.gov>, nickless@anl.gov

Subject- Re- Inc. 654.468, TTS # 6772 SLAC -> 206.220.240.241 Routing Loop

hi, Yvonne and other ESnet folk-

as far as I can tell from looking at the Startap router, there *is* no host 206.220.240.241, at least active at the moment, and the 6tap router is proxy-answering for it (as well as several other inactive host addresses on that /27 subnet--see the arp table below) and once it gets there is probably getting into a default-route loop, I'm guessing, from you to BBN and back to us etc.

Here's the arp table from startap; note all of the host ip addrs for whom .226 (6tap) is the mac address-

tpr-startap>sho arp

Protocol Address Age (min) Hardware Addr Type Interface

Internet 206.220.240.226 99 0050.54b4.0638 ARPA FastEthernet0/0/0

Internet 206.220.240.227 0 Incomplete ARPA

Internet 206.220.240.225 - 0080.1c97.3c00 ARPA FastEthernet0/0/0

Internet 206.220.240.230 106 0090.2791.94c7 ARPA FastEthernet0/0/0

Internet 206.220.240.231 126 0040.05a0.77a9 ARPA FastEthernet0/0/0

Internet 206.220.240.234 1 0090.2787.7d8a ARPA FastEthernet0/0/0

Internet 206.220.240.232 100 0010.073b.6100 ARPA FastEthernet0/0/0

Internet 206.220.240.233 41 0010.832e.1980 ARPA FastEthernet0/0/0

Internet 206.220.240.238 1 00b0.d025.d443 ARPA FastEthernet0/0/0

Internet 206.220.240.239 9 0001.42b5.7a50 ARPA FastEthernet0/0/0

Internet 206.220.240.242 72 0050.54b4.0638 ARPA FastEthernet0/0/0

Internet 206.220.240.243 0 00c0.4826.2891 ARPA FastEthernet0/0/0

Internet 206.220.240.240 97 0050.54b4.0638 ARPA FastEthernet0/0/0

Internet 206.220.240.241 50 0050.54b4.0638 ARPA FastEthernet0/0/0

Internet 206.220.240.246 97 0050.54b4.0638 ARPA FastEthernet0/0/0

Internet 206.220.240.247 97 0050.54b4.0638 ARPA FastEthernet0/0/0

Internet 206.220.240.244 1 00c0.4826.28d4 ARPA FastEthernet0/0/0

Internet 206.220.240.245 79 0050.54b4.0638 ARPA FastEthernet0/0/0

Internet 206.220.240.250 73 0050.54b4.0638 ARPA FastEthernet0/0/0

Internet 206.220.240.251 73 0050.54b4.0638 ARPA FastEthernet0/0/0

Internet 206.220.240.248 97 0050.54b4.0638 ARPA FastEthernet0/0/0

Internet 206.220.240.249 73 0050.54b4.0638 ARPA FastEthernet0/0/0

Internet 206.220.240.254 73 0050.54b4.0638 ARPA FastEthernet0/0/0

Internet 206.220.240.252 73 0050.54b4.0638 ARPA FastEthernet0/0/0

Internet 206.220.240.253 73 0050.54b4.0638 ARPA FastEthernet0/0/0

we should probably all have proxy arp off, right? (it's ON at startap).

***(The Global NOC engineer identifies the problem and suggests a course of resolution to the customer.)***

**eramalin Oct 3, 2000 17.02**

Date- Tue, 03 Oct 2000 15-01-56 -0700

From- Yvonne Hines <yhines@es.net>

To- Brent Sweeny <sweeny@indiana.edu>

Cc- yhines@es.net, trouble@es.net, noc@startap.net, Linda Winkler <lwinkler@anl.gov>, nickless@anl.gov, yhines@blueskies.es.net

Subject- Re- Inc. 654.468, TTS # 6772 SLAC -> 206.220.240.241 Routing Loop

Hi Brent,

Oops, we have turned off proxy arp and clear the arp table, please clear the arp table on yourside, thanks.

-Yvonne

***(The Customer responds.)***

**eramalin Oct 3, 2000 17.17**

Date- Tue, 3 Oct 2000 17-13-34 -0500

From- Brent Sweeny <sweeny@indiana.edu>

To- Yvonne Hines <yhines@es.net>

Cc- trouble@es.net, noc@startap.net, Linda Winkler <lwinkler@anl.gov>, nickless@anl.gov, yhines@blueskies.es.net

Subject- Re- Inc. 654.468, TTS # 6772 SLAC -> 206.220.240.241 Routing Loop

ok, i also turned off proxy-arp and cleared arp on the startap router.

thanks/ brent

***(Problem resolved.)***

**jrmcmurr Oct 4, 2000 19.34**

Closing Oct. 5th pending no further problems.

**cdavisal Oct 5, 2000 3.51**

Closed.