Organizing a Network Operation Centre on Campus

Best Practice Document

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1   Introduction

This document discusses Network Operation Centres from the perspective of Funet member organisations relative to the Funet NOC. The document includes a brief description of what a Network Operation Centre is and presents models on how to organize a NOC. The document also discusses commonly used tools that are essential to NOC operations and how to use them. Network monitoring tools are not included in the scope of this document.

2   What is an NOC?

A Network Operation Centre (NOC) is responsible for the monitoring of information networks and acts as the contact point for all network-related service requests, maintenance situations and troubleshooting. The scope of its tasks is thus relatively wide and responsible. A majority of the functions of the organisations exist in networks; this makes it of paramount importance to ensure their functionality and quick troubleshooting.

Each Funet organisation must define the limits of what is covered by its NOC and what is not; at a minimum, all data communications network related issues should be covered by the NOC. In other words, the data communications equipment and cabling infrastructure. In addition to these, things that could be the responsibility of the NOC include the server room

infrastructure, cabling, uninterruptible power supply (UPS), and services and servers essential to network operations such as DNS and DHCP.

With regard to Funet, the responsibilities of the NOC include at a minimum issues related to Funet connections and other Funet network services used by the Funet member organisation.

3 Tasks of the Network Operation Centre

3.1 Reception of fault notifications and detection of malfunctions

The on-call person at the NOC is responsible for the contacts made to the contact point are taken into processing. The on-call person also uses network monitoring tools to detect malfunctions and make an assessment of the situation.

3.2 Providing information during outages

One of the on-call person's most important duties is to provide information. Users affected by faults in the information network must be informed. When the on-call person actively provides information, it decreases the number of received inquiries, leaving more time for correcting the malfunction, coordinating or monitoring.

Communication channels that can be used include mailing lists, intranet and web pages and other suitable channels. If the malfunction is shown in Funet network monitoring, the NOC must contact Funet NOC. Depending on the severity of the malfunction, contact is made via

e-mail or by phone. During outages, you must also remember to provide information on the progress of repairs according to possibilities.

A notification on planned maintenance work is given in advance. If maintenance work is performed on the organisation's network, and that work could affect the operation of, for example, the Funet connection, you must remember to send an advance notification to Funet NOC. Otherwise, the on-call person at Funet NOC will needlessly begin to investigate the matter as a possible malfunction. Depending on the extent of the outage, Funet NOC will provide information on malfunctions and future maintenance downtime either to the contact address of an individual Funet member organisation or on the general outage mailing list tl-katko(at)postit.csc.fi. Every person involved in NOC operations should subscribe to the tl-katko mailing list. If an organisation has a separate e-mail address for the NOC, subscribing it to the mailing list is sufficient. You can find instructions from the Funet member site at info.funet.fi.

Message templates can be created for different situations, for example for maintenance downtime and fault notices, allowing you to try to automate communications, thus making informing the required parties quicker. You do not have to write everything by hand every time; it is enough to fill in and modify the required entries.

3.3 Coordination

One important task is to coordinate various things, for example troubleshooting and repairs. The on-call person at the NOC receives fault notifications and processes them in the appropriate manner. The on-call person will be in contact with the relevant parties as required by the situation. Additionally, he/she must remember to keep the users affected by the outage up to date of the progress of the repairs.

3.4 Service point

The NOC can have a reception desk where users can come to tell their problems to the on-call person. This is a good option, if personnel and time resources are sufficient. Many things are solved more easily and quickly when you can talk with the user face to face. However,

the resources are not always sufficient for this solution; in such cases, telephone, e-mail and other tools are used.

On the other hand, if the network environment's tools allow, network monitoring can be done from almost anywhere as long as it is possible to establish a secure network connection to, for example, the monitoring server or systems important to the operation of the network.

3.5 Service hours

Service hours form one aspect of organising the NOC. Network services are often expected to be available 24/7, but the service hours of the NOC are often more limited. Users and partners must be aware of the NOC's service hours during which the on-call person can be reached. You should also have a contact channel outside service hours. This is important, particularly to organisations with a lot of network activity around the clock.

4 Tools in general

Regardless of the size of the organisation, we recommend using tools allowing NOC operations to be automated as much as possible. A separate BPD document on network monitoring tools is available on Funet's member site, and they are therefore not discussed in this document. Instead, as one of the most important tasks of the NOC is to act as a contact point, communication tools must be in order.

We recommend using so-called portable tools for network monitoring, which allows the monitoring tools to be available even if the on-call person is participating in meetings or goes out for a moment. For example, remote login to the network management server over a VPN

connection could likely be allowed, allowing the on-call person to see the network status or access the tickets, for example.

4.1   Telephone

The most important communication tool is the telephone, because its operation is not usually dependent on the user organisation's computer network and it therefore works even if there are network problems. When a telephone is used, two-way real-time interaction takes place, reducing misunderstandings better than with other tools.

It would be good if the NOC had its own service number instead of using an individual person's telephone number as the contact number. Should the person or telephone subscription change, notifying all partners of the new number can cause a lot of work. It is, of course, possible to use a so-called hunt group: if one number does not answer, the call is transferred to the next number. The upside is that someone should always be reachable, but keeping the hunt group up to date could be a downside. For example, one of the persons in the hunt group could be travelling abroad or on a sick leave, meaning that he/she cannot be on call. In such a case, that person's number should be temporarily removed from the hunt group and added back in when the person is once again available.

Contact information that is important to the on-call person should be stored independently of the network so that it is available in all situations.

4.2   E-mail

E-mail is another important tool. The NOC should have its own contact address, for example noc@organisation.fi, that is easy to remember. It can be a ticket queue or a mailing list into which all persons involved in NOC operations are subscribed. The upside of a mailing list is that it is maintained by the user organisation itself, allowing the easy addition and removal of list recipients. Persons in the NOC circle can therefore be easily replaced without having to notify partners of changes in the contact information.

4.3   Ticket system

Many Funet organisations utilise a ticket system used by e-mail. The upside of a ticket system is that it is easy to see which issues are open, requiring follow-up and actions. Additionally, old cases can be searched from the system, which could help solve a malfunction.

Usage rights to the system are granted to all persons involved in NOC operations, allowing everyone to access the tickets when necessary. Compare this to a personal e-mail conversation, where the messages remain in the user's own e-mail inbox with no-one else being able to access them. Should that person be away, his/her deputy can be unaware of an open, urgent matter that should be handled.

Clear rules and responsibilities should be established for the ticket handling procedure. For example, the on-call person processes new tickets and assigns them to others, if he/she is unable or too busy to handle them. However, the on-call person should follow up on the ticket to ensure that the matter is taken care of. You must also agree how on-call shift changes are made so that following up on tickets is not interrupted. Exchange of information between the different parties also requires separately agreed arrangements: is it taken care of with mailing lists or in another way?

There are both commercial and free support ticket systems on the market.

5   Organizing

NOC operations should be organized in such a manner that a sufficient amount of human and working time resources are available. How the NOC is organized is affected by the size of the organisation and the size, structure and target level of service of the network environment. Different levels of organisation could be divided into at least three categories:

1. **Light**. Matters are handled as lightly as possible
2. **Basic**. Shared tools, for example a ticket system, are used
3. **Standardised**. The operations are standardised into processes, for example according to ITIL

The choice of level depends on the extent and goals of the operations. The division is based on the JHS 174 recommendations [JHS].
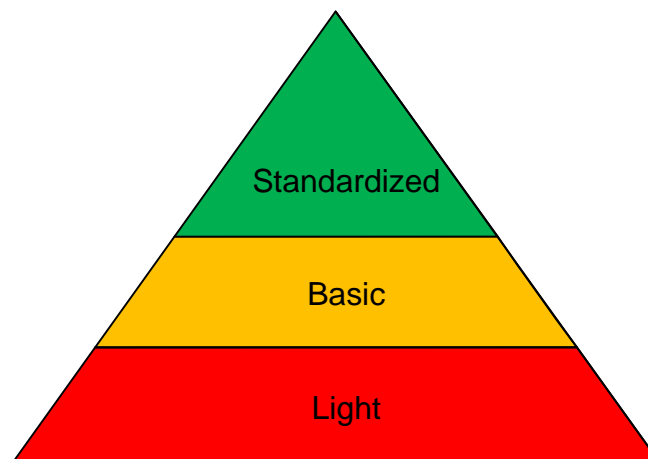
Figure 1. Organizing levels

5.1 Light level

- Personnel: 2 to 3 persons
- Tools: e-mail (noc@org.fi) and telephone
- Service hours: weekdays 8 a.m. to 4 p.m., office hours

In small environment, it may be enough when primarily one person handles the task in addition to his/her other duties, but this person must also have a deputy in case of absences, for example. In other words, at least two persons must be up to date on the things happening in the information network. In small organisations, persons involved in NOC operations must usually both do and coordinate things.

E-mail and telephone are suitable tools, as the persons interact closely.

Office hours constitute sufficient service hours insofar as network outages or disruptions do not cause the unit's operations to halt and the on-call person does not need to be reached. In other words, should a network outage occur outside office hours, the organisation's contact persons cannot be reached, and it is not possible to confirm that the outage is caused by the organisation's network or that the connection works again after the outage.

5.2 Basic level

- Light level
- Personnel: 3 to 5 persons
- Tools: ticket system
- Service hours: 8 a.m. to 4 p.m., possibly also on weekends

The Basic level includes everything that the Light level has.

In larger and more complex network environments more personnel are required. If the NOC has wide responsibilities, we recommend agreeing on areas of responsibility for each person and who will act as deputies.

We also recommend agreeing on the hierarchy: is there one person who is primarily on call or is the duty rotated in shifts of, for example, one week. This is important as it has to be known who is responsible for the operations at which time and is the primary person reacting to telephone calls and e-mails. In other words, who is on call.

The role of the on-call person may be hands-on, or the on-call person may also just coordinate things and handle communications between the different parties.

In addition to e-mail and telephone, a ticket system is used as a tool. NOC usually has a service desk where the on-call person can be reached.

The service hours are more extensive than in the Light level. The on-call person can therefore be reached on weekends as well, and possibly outside office hours.

5.3 Standardised level

- Basic level
- Personnel: 5+
- Tools: standardised tools according to the process
- Service hours: 7 a.m. to 7 p.m., also on weekends. Possibly 24/7.

The Standardised level includes everything that the Basic level has.

In large and complex network environments several persons are required. Areas of responsibility have been divided between several persons, and procedures have been standardised into processes suiting the environment. ITIL recommendations [ITIL], for example, are used as assistance for the procedures and processes.

The role of the on-call person may be hands-on, or the on-call person may also just coordinate things and handle communications between the different parties. The NOC has a fixed service desk that is constantly manned during office hours. A person may also be on call during evenings and weekends.

6   Recommendations

We recommend using the following in NOC operations:

- At least two persons
- Service addresses
- A telephone number dedicated to the NOC
- Standard service hours
- A support ticket system

Small and medium Funet member organisations should have at least the Light level, but we recommend using the Basic level. Depending on the network environment and the size of the organisation, the Standardised level may also be considered.

References

[ITIL]   Wikipedia: "Information Technology Infrastructure Library"

http://en.wikipedia.org/wiki/Information_Technology_Infrastructure_Library

ary

[JHS]   Advisory Committee on Information Management in Public

Administration, Recommendations for ICT Service Level, JHT 174,

version 1.3, (document is only Finnish)

http://docs.jhs-suositukset.fi/jhs-

suositukset/JHS174_liite1/JHS174_liite1.pdf

Glossary

DHCP   Dynamic Host Control Protocol

DNS   Domain Name System

ITIL   Information Technology Infrastructure Library

NOC   Network Operation Centre

UPS   Uninterruptible Power Supply

VPN   Virtual Private Network

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