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## **Design and Implementation of Service Level Agreements at HEAnet**

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## Background

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Delivery of quality network services by National Research and Education Networks is a long success story but has traditionally been primarily a technological issue. Significant effort goes into designing, deploying and measuring high speed, high capacity backbones. Significant effort also goes in to operating contracts from providers to these networks to specific service levels. However, despite the evident quality of services offered, few NRENs appear to offer formal guarantees to their own users.

Trends identified by the Terena Task Force on Life-Cycle and Portfolio Management show that users of NRENs indicate that it may be no longer enough to know that the network infrastructure is good – it must be demonstrated how good and specific service levels committed to.

HEAnet has developed and introduced Service Level Agreements (SLAs) to clients in Q1 2007 as part of the implementation of HEAnet's Strategic Plan<sup>1</sup>. The strategic objective of this work was to monitor service levels to ensure excellence.

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<sup>1</sup> [http://www.heanet.ie/about/HEAnet\\_Strategic\\_Plan\\_2004.pdf](http://www.heanet.ie/about/HEAnet_Strategic_Plan_2004.pdf)

## Overview

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The specific requirements of HEAnet's Strategic Objective to monitor service levels to achieve excellence were:

- Benchmark operational performance on an ongoing basis.
- Identify an appropriate set of operational benchmarks and service metrics to measure performance for clients.
- Benchmark against other NRENs.

To achieve these requirements at HEAnet, we examined our current methods, procedures and plans in each of these areas and evaluated them with a view to formalizing service level offerings into SLAs with committed minimum values. We also engaged in research into what our client requirements were, evaluation of possible competing services, consultation with other NRENs as part of the Terena Task Force on LifeCycle and Portfolio Management, and studies of Best Practice procedures and methodologies.

Specific tasks carried out included:

- Identification of key services.
- Identification of key service metrics for existing services.
- Identification of key service metrics for new services.
- Identification and deployment of appropriate measurement and management tools.
- Identification of actions in the case of failure to meet service levels.
- Development and deployment of supporting procedures across technical and administrative organisational areas.

Factors influencing the identification of services included:

- Client expectations.
- Commercial sector offerings.
- Company strategic direction.

- Inter-domain co-operation.
- Service maturity.

Factors influencing the identification of metrics included:

- Client expectations.
- Commercial sector offerings.
- Service specifications.
- Existing performance data.
- Tolerance for non-compliance.
- Scope for improvement.
- Dependent contracts.

The final results of the objective were:

- Initial SLA figures and responses for IP connectivity, Hosting, Point to Point services and Operational Support.
- Upgrade of existing Nagios/Netsaint monitoring tool.
- Operational procedures incorporated into staff training and performance management systems.
- Process and Templates for design and operation of future SLAs.

At all stages, the aims were to keep processes and documents simple and clear and to integrate them with existing workflows, documents and contacts whenever possible.

## Solution

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HEAnet's issue and maintenance of SLAs on an ongoing basis has two elements – the processes used to design, issue and operate the service level agreements and the templates used in these three stages.

### Processes

Two types of process were identified, administrative and operational. Administrative processes focus on the design and issue of SLAs and are carried out by both technical and non-technical staff. Operational processes are concerned with the day-to-day maintenance of the SLA.

#### *Administrative Processes*

##### Issuing SLAs

- SLAs will be provided to HEAnet Clients in the following conditions:
  - On initial provision of an SLA eligible service by HEAnet.
  - Annually, as part of the Client Service Agreement Process.
- The procedure for issuing SLAs is as follows:
  - Determine services used by clients.
  - Check if the service has an SLA by reviewing SLAServiceTerms descriptions.
  - Create a named and dated per-client SLA Document.
  - List the specific services and service categories taken up by the client where SLAs apply e.g. Hosting-Co-location or Hosting Hot-Standby.
  - Attach the service terms from the individual SLAServiceTerms documents.

##### Updating SLAs

- SLAs will be updated in the following conditions:
  - Existing SLA Terms **must** be reviewed and signed off in the quarter before the Client Service Agreements are to be issued.

- SLA scope and terms *may* be reviewed given a significant change in the way a service is provided.
- The procedure for review of existing SLA Terms is as follows:
  - For availability figures, select the most recent quarter.
    - For each service, create a distribution graph with actual availability figures for each month for each client, where available.
    - Decide what percentage of the total clients it is acceptable to be below the SLA threshold and remove them.
    - Set the SLA availability as the lowest remaining figure.
  - For response time figures:
    - Check the average, max and min time to first ticket update (if available).
    - Check the average, max and min start and end time for NOC tickets.
  - To introduce new SLA Terms:
    - Determine the Service Description, Indicators and Limitations of the new SLA-eligible Service.
    - If production or pre-production measurements exist, follow the procedure for reviewing SLAs.
    - If no measurements exist, determine suitable indicators and thresholds based on the following:
      - The Service Specification for the service.
      - Contracts or SLAs contributing to the service.
      - Client quality expectations.
    - Determine if the service fits into any of the existing SLA categories:
      - If yes, update the Service Description, Indicators, Limitations and Exceptions for the individual ServiceTerms.
      - If no, create a new named ServiceTerms based on the SLAServiceTermsTemplate.

Note: Although it was tempting have multiple SLA terms based on fine distinctions between services, this was determined to be unwieldy to manage and operate so it was found to be preferable to either use existing categories or introduce new broad categories when introducing a new SLA. These categories should match internal portfolio categories and website information where available.

### *Operational Processes*

#### General Procedures

- When the SLA terms are signed off for each year, the Network Operations Manager will communicate the terms to NOC, in terms of percentage and absolute time, where relevant.
- For each case where services are outsourced, the outsourced party is responsible for monitoring and enforcement.
- For each case where services are managed directly, the Network Operations Manager will ensure monitoring exists and that the impact on the SLA figures for that period is checked for each outage/event.
- SLA figures are to be explicitly taken into account for risk analysis on work.
- Reporting on SLA performance is automated quarterly as part of client service reports.

#### Response Procedures

- When the service is in breach of SLA, an RFO is produced and issued to affected clients based on the RFO Template and within a timeframe indicated by the SLA Service Terms.
- The RFO is composed of the following:
  - Information contained in the relevant ticket.
  - Information provided by Network Management Tools.
  - Provider RFO reports.
  - Interviews, notes and reports by the responsible engineers.

Note: Due to the way in which HEAnet is funded, it was not considered appropriate at this time to give financial penalties in the event of non-compliance.

## **Templates**

Three main templates are used to design and operate service level agreements.

### *SLA Service Terms Template*

This document provides a template for the content and layout of any SLA to be issued by HEAnet. The document contains the following information:

- 1 Title**
- 2 Service description.**

This describes in formal terms the service the SLA is being offered on and how this is defined.
- 3 Indicators.**

Conditions determining success or failure of the objective, expressed as concisely as possible.
- 4 Limitations.**

There may be limitations—for example, scheduled maintenance—that may affect the SLA. These limitations should be noted so that the expectation of the service is practical.
- 5 Problem Management.**

Provide the contacts, escalation points and escalation conditions for the service.
- 6 Reporting.**

What reports will be run to support the SLA, when, by whom, how will the reports be distributed, and what indicators will be measured?
- 7 Reviews.**

Define the review period and the process for any informal changes and reviews—for example, who must agree in order for a change to be made to the SLA.

## **8 Exclusions.**

Any variations to the general service that render it ineligible for an SLA or particular part of SLA e.g. ISDN backup does not equate to service resilience.

The document is identified by Title, Year, and Revision number.

*<servicename>SLAServiceTerms*

Based on the SLAServiceTermsTemplate, an individual service terms is produced for each service offering to have an SLA. These documents provide the actual SLA terms and measures for a given service type in a given time period. As a guideline, each should be no more than one page long and the language used concise and precise. The idea behind this is to ensure the information is easily referenced and shared by the client technical staff.

In order to keep the processes simple and the paperwork level low, multiple variations in service can be identified in one document e.g. an IP Connectivity SLA Service Terms document contains metrics for both resilient and non-resilient offerings, though the client only avails of one. An added advantage of combining multiple service instances into one category of SLA is that it makes the clients aware of variations and improvements of service that can be made available to them.

An example document may look as follows:

### **Example IP Connectivity Service Level Agreement**

#### **Service description**

The IP Connectivity Service is described as the ability to successfully to transfer data in both directions between the client institution and defined measurement points on the NREN Backbone. This document describes the service level terms for the IP connectivity service to NREN clients.

#### **Indicators**

- 99.99% 24x7 availability per month NREN-Client with path and equipment resilience
- 99% 24x7 availability per month NREN-Client without both path and equipment resilience
- 99.99% 24x7 availability per month NREN-Geant2 with path and equipment resilience
- RFO reports issued within 5 working days if the indicated figure is not met.

## Limitations

The following conditions are outside the scope of the service terms:

- Scheduled maintenance by NREN/parties contracted by NREN
- Scheduled maintenance by the client
- Events or omissions local to the client institution, such as site power failures
- Force Majeure

## Problem Management

To make a query, report or escalate a problem or notify maintenance on this service, please use the following contact information:

Contact	Role/Name	Telephone	e-mail
1 <sup>st</sup> Contact	Helpdesk	+xxx x xxxxx	helpdesk@example.tld
1 <sup>st</sup> Escalation (2 hours)	NOC Manager	+xxx x xxxxx	mgr@example.tld
2 <sup>nd</sup> Escalation (8 hours)	CTO	+xxx x xxxxx	cto@example.tld
3 <sup>rd</sup> Escalation (24 hours)	CEO	+xxx x xxxxx	ceo@example.tld

## Reporting

Availability will be reported quarterly, as part of a comprehensive Client Service Report.

## Reviews

Agreements will be reviewed annually.

Agreement will be reviewed on upgrade to resilient service, applying to the next measurement period.

## Exclusions

Service, or part of service delivered over wireless, satellite or ISDN is ineligible for this Agreement and are subject to Best Effort service.

The document is identified by Title, Year, and Revision number.

## *RFOTemplate*

This document provides the framework for issuing reports to clients in the event of non-compliance with SLA terms. The document is identified with the client name and date for issue. The body of the document is in the following format, with angled brackets indicating information to be substituted:

## **1 Introduction**

This report provides an account of the reasons for loss of service to <client> <type of service> on <date> between <time> and <time> as detailed in ticket <ticketno><ticket URL> and a description of measures put in place to prevent a recurrence of this event.

For more details regarding the <NREN> network or any of the managed services please refer to the <NREN> web site <<http://www.example.tld>>, alternatively, phone the Network Operations Centre (NOC) at <+xxx-x-xxxxxx> or email [noc@example.tld](mailto:noc@example.tld).

## **2 Summary of Outage**

### *2.1 Impact*

<Description of pre-fault conditions.>

<Description of fault conditions.>

<Description of impact of fault conditions on impacted client>

### *2.2 Actions*

<List, date/time and description of all actions, successful or not, by NREN and 3rd parties to remedy the issue>

## **3 Resolution**

<Description of conditions for restoration of service>

## **4 Identification of Preventive Measures**

<Analysis of outage and identification of preventive measures, explicitly listed by responsible party>

## Conclusions

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The HEAnet case study indicates that implementation of Service Level Agreements towards the NREN's connected clients and/or towards their sponsoring/funding bodies can be implemented on both existing and new services, and can match and exceed those levels offered by the commercial sector. Existing NREN network management tools and procedures can even be used to operate these SLAs with little alteration. The most significant challenge is making informed judgement calls on the levels committed to and it is to be expected that this will be refined over time and with more experience of operating SLAs.

Far from being considered an operational overhead, Service Level Agreements can be used by a NREN to encourage the uptake of better quality services e.g. resilient connectivity by demonstrating the benefits in terms of quality. They can also be used to highlight new services that are offered. Other important benefits are the differentiation of priorities on a day-to-day basis for support, ensuring ongoing availability of key services is protected and managing expectations for clients on the setup of new services and the ability to more accurately identify areas for improvement.

In face to face meetings with clients, HEAnet find that clients have been very satisfied with the existing quality of core services. In particular, the quality of support was already at very aggressive levels compared to the commercial sector. However, Service Level Agreements are considered a positive and timely commitment to the delivery of quality and are also of value to clients internally in providing a benchmark to demonstrate competitiveness and to ensure funding and investment in research and education networking.

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