



SURFnet Service Level Specification

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1 Introduction

1.1 Goal

This Service Level Specification (SLS) provides the institutions connected to SURFnet with a reference point for the services provided by SURFnet. In this regard, the SLS is a further elaboration of the SURFnet User Agreement entered into by the institution with SURFnet. In this SLS, SURFnet has described the services it provides in as transparent and measurable a manner as possible.

1.2 Structure of the document

Chapter 2 describes the services and their associated performance indicator or indicators. Chapter 2.20 describes the fault handling process, and chapter 4 deals with maintenance. Chapter 5 deals with the procedure for establishing and modifying the SLS and describes an escalation procedure in case the service levels specified are not realized.

1.3 What will you not find in this document?

1.3.1 Reports

Reports on the performance indicators for the services can be accessed via SURFdashboard: <https://www.surf.nl/en/services-and-products/surfdashboard/index.html>. The performance indicators for fault processing (see Chapter 3) are not reported on as a matter of standard procedure. If requested, SURFnet will provide insight into how a specific fault or malfunction was dealt with.

1.3.2 Requesting, modifying, and cancelling services

If you wish to request, modify, or cancel a service, please use the self-service forms in SURFdashboard, or contact the SURFnet adviser for your institution via adviseurs@surfnet.nl.

1.3.3 Conditions

The Conditions of Service can be found in the SURFnet User Agreement.

2 Services

2.1 On the concept of availability

Availability is one of the performance indicators used to measure the performance of a service. The following applies to all services with the exception of SURFinternet and SURFlichtpaden: if a fault occurs due to an interruption of network connectivity, the service is available but not accessible. In this case, the fact that the service is not accessible therefore has **no** effect on the availability percentage of the service.

2.2 SURFinternet

2.2.1 Description of the service

A description of the SURFinternet service can be found at <https://www.surf.nl/en/services-and-products/surfinternet/index.html>.

2.2.2 Performance indicators

SURFnet works with the following performance indicators for the SURFinternet service:

- availability
- packet loss
- round trip time (RTT)
- jitter (variation in RTT)

Availability

The availability of the IP connection is a performance indicator for the SURFinternet service. The availability is divided into availability of the SURFnet IP network (IP connectivity within the SURFnet network) and external availability (IP connectivity to destinations outside the SURFnet network).

A number of factors have an immediate impact on the actual availability of the IP connection. Chapter 2.20 and Chapter 4 explain the impact that fibre breakage, electrical power supplies, and the SURFnet Maintenance window can have on the availability performance indicator.

Availability percentage of IP connection for the institution

The availability of the SURFnet IP network is determined by the following components: the institution's router, the access network, and the SURFnet network IP routed core. In this regard, measurements are carried out to the institution's router from SURFnet measuring equipment located in a LAN that is connected directly to the SURFnet network routed core in Amsterdam.

Availability of SURFnet network IP connectivity	Value on an annual basis
Availability of IP connectivity for the institution	99.9%

Measurements of ping accessibility are used to measure the availability. In contrast to commercial Internet providers, the accessibility of the institution's router at the site of the institution is part of the availability percentage. However, SURFnet is not responsible for this institutional router.

Each institutional router is pinged once every 5 minutes with a series of several pings to measure the availability. A precondition for carrying out these measurements is that the institution in question allows ping measurements from the SURFnet network.

External IP connectivity availability percentage

The external availability applies to the IP connectivity with the rest of the world. The external availability can be divided into three components:

- external connectivity within the international research domain: the European research network GÉANT;
- external connectivity via the link between SURFnet and the Amsterdam Internet Exchange (AMS-IX);
- external connectivity via two international transit providers.

Availability of external IP connectivity	Value on an annual basis
Availability of external IP connectivity via International Research Networks	99.95%
Availability of external IP connectivity via the AMS-IX	99.95%
Availability of external IP connectivity via Global Internet Connectivity	99.95%

This availability is also determined on the basis of ping accessibility measurements. The routers of external peering and transit partners are pinged once every 5 minutes with a series of several pings from the measurement systems described above.

Packet loss, round trip time, and jitter of the round trip time

In addition to availability, SURFnet also uses the following performance indicators for the IP connectivity service:

Indicators within the SURFnet network	Value
Packet loss	Less than 0.1%
Round trip time (RTT)	Less than 10 ms
Jitter in RTT	Less than 3 ms

Packet loss and jitter in RTT are reported as absolute values. RTT is presented as an average value. In order to obtain reports on packet loss, RTT, and jitter for its own connection, the institution must install a meter within its own network.

For external connectivity, SURFnet contracts only international providers who can guarantee equivalent performance levels with regard to packet loss.

SURFnet has a permanent measurement installation in place for the SURFnet network that measures the performance indicators packet loss, RTT, and jitter for IPv4 and IPv6 with regard to unicast as well as multicast IP traffic.

2.3 SURFlichtpaden

2.3.1 Description of the service

A description of the SURFlichtpaden service can be found at <https://www.surf.nl/en/services-and-products/surflichtpaden/index.html>.

2.3.2 Performance indicator

SURFnet uses the following performance indicator for SURFlichtpaden: availability. A number of factors have an immediate impact on the actual availability of SURFlichtpaden. Chapter 2.20 and Chapter 4 explain the impact that fibre breakage, electrical power supplies, and the SURFnet Maintenance window can have on the availability performance indicator.

Availability and availability percentage

For availability, SURFnet uses the percentage of the time that the light path is available between two endpoints. The availability is determined over the entire year. The non-availability of SURFlichtpaden is measured in UAS.¹ For on-demand light paths, UAS is measured only at the moment when the light path is activated by the planning application.

Performance indicator	Value on an annual basis
Availability of unprotected light path	99.5%
Availability protected light path	99.9%
Availability redundant light path	99.95%
Availability and functioning of planning application for on-demand light paths	99.5%

Packet loss, RTT, and jitter of the round trip time

In addition to availability, SURFnet also uses the following performance indicators for the SURFlichtpaden service:

Indicators within the SURFnet network	Value
Packet loss	Less than 0.01%
RTT	Less than 10 ms
Jitter	Less than 1 ms

The above values are the maximum values, based on the longest route for a light path within the SURFnet network. Accordingly, the values for a specific light path will in any case be lower than or equal to those in the above table and will be made available upon request.

¹ UAS stands for 'unavailable seconds'. This counter is read from the network equipment and is then converted into the availability percentage. This is exclusive of the planning application.

Availability and availability percentage of international light paths

International light paths can be set up globally. For this purpose, SURFnet cooperates with research and education networks abroad. Participating networks transport each other's light paths on the basis of reciprocity and mostly via open exchanges.

SURFnet has various connections to other networks for international light paths. Via a Cross Border Fiber (CBF), the SURFnet network is connected to networks in Germany, Belgium, France, the United Kingdom, and Switzerland. International light paths can also be set up via the pan-European network GÉANT and NetherLight. SURFnet chooses the optimum route, in consultation with the requesting party.

For availability, SURFnet uses the percentage of the time that the light path is available between the Dutch endpoint and the point where the light path connects to the foreign network or open exchange. The availability is determined over the entire year. The non-availability of international light paths is measured in UAS¹.

Performance indicator	Value on an annual basis
Availability of single-path international light path	99.0%

2.4 SURFdomeinen

2.4.1 Description

A description of the SURFdomeinen service can be found at <https://www.surf.nl/en/services-and-products/surfdomeinen/index.html>.

2.4.2 Performance indicators

Performance indicator	Value on an annual basis
Availability of SURFdomeinen web portal	99.5%
Availability of Authoritative DNS (primary and secondary)	99.9%
Availability of DNS resolvers	99.9%

2.5 SURFinternetpinnen

2.5.1 Description

A description of the SURFinternetpinnen service can be found at <https://www.surf.nl/en/services-and-products/surfinternetpinnen/index>.

2.5.2 Performance indicator

Performance indicator	Value on an annual basis
Availability of SURFinternetpinnen	99.9%

2.6 eduroam

2.6.1 Description of the service

A description of the eduroam service can be found at <https://www.surf.nl/en/services-and-products/eduroam/index.html>. The eduroam Visitor Access (eVA) service and the eduroam Monitoring System (eMS) service are available as modules with the eduroam service.

2.6.2 Performance indicator

The eduroam service makes use of the eduroam infrastructure. SURFnet uses one performance indicator for eduroam: availability.

Performance indicator	Value on an annual basis
Availability of eduroam infrastructure	99.95%
Availability of eduroam Visitor Access portal	99.5%
Availability of eduroam Visitor Access authentication	99.9%
Availability of eduroam Monitoring System	99.5%

2.7 SURFcertificaten

2.7.1 Description of the service

A description of the SURFcertificaten service can be found at <https://www.surf.nl/en/services-and-products/eduroam/index.htm>.

2.7.2 Performance indicator

One performance indicator is used for the SURFcertificaten service: availability. The availability applies to the DigiCert portals where the requests must be submitted and the server-codesigning and/or personal certificates can be picked up.

Performance indicator	Value on an annual basis
Availability of DigiCert web portals	99.5%

2.8 SURFconext

2.8.1 Description of the service

A description of the SURFconext service can be found at <https://www.surf.nl/en/services-and-products/surfconext/index.html>. The SURFconext Strong Authentication service is available as a module with the SURFconext service. A description of the SURFconext Strong Authentication service can be found at <https://www.surf.nl/en/services-and-products/surfconext/what-is-surfconext/surfconexts-strong-authentication/index.html>.

2.8.2 Performance indicator

SURFnet uses one performance indicator for the SURFconext service and the SURFconext Strong Authentication service: availability.

Performance indicator	Value on an annual basis
Availability of SURFconext login (SAML)	99.9%
Availability of SURFconext API for group information	99.9%
Availability of SURFconext Teams	99.5%
Availability of SURFconext Dashboard	99.5%
Availability of SURFconext Strong Authentication login (SAML)	99.9%
Availability of SURFconext Strong Authentication RA Portal	99.5%
Availability of SURFconext Strong Authentication SelfService Portal	99.5%
Tiqr authentication server	99.5%
SMS (Messagebird) authentication server	99.5%
YubiKey (Yubico) authentication server	99.5%

2.9 SURFcert incident response

2.9.1 Description of the service

A description of the SURFcert service can be found at <https://www.surf.nl/en/services-and-products/surfcert/index.html>.

2.9.2 Performance indicator

This service does not lend itself to defining and using performance indicators.

2.10 SURFaudit

2.10.1 Description of the service

A description of the SURFaudit service can be found at <https://www.surf.nl/en/services-and-products/surfaudit/surfaudit.html>.

2.10.2 Performance indicator

This service does not lend itself to defining and using performance indicators.

2.11 SURFacademy

2.11.1 Description of the service

A description of SURFacademy can be found at <https://www.surf.nl/en/services-and-products/surfacademy/index.html>.

2.11.2 Performance indicator

SURFacademy does not lend itself to defining and using performance indicators.

2.12 Consultancy

2.12.1 Description of the service

A description of consultancy can be found at <https://www.surf.nl/en/services-and-products/consultancy/index.html>

2.12.2 Performance indicator

Consultancy does not lend itself to defining and using performance indicators.

2.13 Vulnerability Scanning

2.13.1 Description of the service

You can purchase the Outpost24 vulnerability scanning tool via SURFmarket. SURFnet delivers the infrastructure (virtual machine). You can purchase the service via 'My SURFmarket': <https://sts.surfmarket.nl/dfs/ls/?wa=wsignin1.0&wtrealm=urn>.

2.13.2 Performance indicator

Performance indicator	Value on an annual basis
Availability of virtual machine	99.5%

2.14 Cybersave Yourself (CSY)

2.14.1 Description of the service

A description of the Cybersave Yourself (CSY) service can be found at <https://www.surf.nl/en/services-and-products/cybersave-yourself/index.html>

2.14.2 Performance indicator

Performance indicator	Value on an annual basis
Availability of CSY toolkit in Edugroepen	99.0%
Availability of www.cybersaveyourself.nl	99.9%

2.15 SURFdashboard

2.15.1 Description of the service

A description of the SURFdashboard service can be found at <https://www.surf.nl/en/services-and-products/surfdashboard/index.html>.

2.15.2 Performance indicator

Performance indicator	Value on an annual basis
Availability of SURFdashboard	99.5%
Availability of SURFnet Authorisation Management	99.9%

2.16 SURFmailfilter (including MX-Fallback)

2.16.1 Description of the service

A description of the SURFmailfilter can be found at <https://www.surf.nl/en/services-and-products/surfmailfilter/index.html>.

The MX-Fallback service is part of the SURFmailfilter service. The service levels that apply to the availability of SURFmailfilter also apply to MX-Fallback.

2.16.2 Performance indicator

Performance indicator	Value on an annual basis
Availability of SURFmailfilter	99.9%

2.17 SURFopzichter

2.17.1 Description of the service

A description of the SURFopzichter service can be found at <https://www.surf.nl/en/services-and-products/surfopzichter/index.html>.

2.17.2 Performance indicator

Performance indicator	Value on an annual basis
Availability of SURFopzichter	99.5%

2.18 SURFdrive

2.18.1 Description of the service

The SURFdrive service is a collective service provided by SURFsara and SURFnet. A description of the SURFdrive service and a detailed SLS can be found at <https://wiki.surfnet.nl/display/SURFdrive/SLS>.

2.18.2 Performance indicator

Performance indicator	Value on an annual basis
Availability of SURFdrive	99.5%

2.19 SURFfilesender

2.19.1 Description of the service

A description of the SURFfilesender service can be found at <https://www.surf.nl/en/services-and-products/surffilesender/index.html>.

2.19.2 Performance indicator

Performance indicator	Value on an annual basis
Availability of SURFfilesender	99.5%

2.20 SURFwireless

2.20.1 Description of the service

A description of the SURFwireless service is available at <https://www.surf.nl/en/surfwireless>.

2.20.2 Performance indicator

SURFnet uses the following performance indicator for SURFwireless: availability.

Performance indicator	Value on an annual basis
SURFwireless availability	99,9%

Availability and availability percentage

For each location, SURFnet uses a percentage of the time that access points work and that meets the minimum quality criteria in order to ensure the availability of SURFwireless. Quality is continuously measured via spot checks.

The quality of SURFwireless is defined as follows:

- Average data rate of five minutes (at application level) for each client: 10 Mbit/s
- RTT: <15 ms
- Jitter in RTT: <15 ms
- Suitable for speech: the MOS (Mean Opinion Score) for clients on the 5GHz band from the highest QoS class is at least 3.8 for both upstream and downstream processing

One or more monitor sensors are embedded in order to monitor the quality of the service via spot checks.

The waiting time for the institution to take measures is not accounted for when calculating the response and recovery times.

2.21 SURFcumulus

2.21.1 Description of the service

A description of the SURFcumulus service is available at www.surf.nl/en/surfcumulus.

Reports about the characteristics of SURFcumulus are published on the SURFdashboard. Service-specific statistics, logging, troubleshooting information and reports are made available to the institution via specific SURFcumulus reports.

2.21.2 Performance indicator

SURFnet uses the following performance indicator for SURFcumulus: availability.

Performance indicator component Provisioning	Value on an annual basis
Availability of SURFcumulus CMP (provisioning and monitoring)	99,9%

Performance indicator component Operation	Value on an annual basis
SURFnet virtualisation platform – VMs on Open-E storage	99.9%
SURFnet virtualisation platform – VMs on Netapp storage	99.95%
Public IaaS services via SURFcumulus	According to individual SLAs

Availability is defined as the availability of the VM, not including maintenance windows and network access to the institution. For major upgrades to the SURFnet virtualisation platform, it is possible that an additional maintenance window will be used from 00:00 to 07:00 on Thursday. As is customary, institutions will be informed in good time when interruptions to the service are expected to occur during a maintenance window.

The current SLAs from the public IaaS providers are available here:

- Microsoft Azure SLA <http://azure.microsoft.com/en-us/support/legal/sla/>

SLAs from other public providers used in SURFcumulus will be added in Q3 and Q4 2016.

3 Faults/malfunctions

3.1 The SURFnet Helpdesk

SURFnet has set up a helpdesk to deal with faults. It registers, coordinates, and monitors the fault resolution process. The SURFnet helpdesk is available 24/7 to registered persons calling in for assistance. You can report a new fault or ask about the status of an existing fault by telephone: 088 7873 638 or via e-mail: helpdesk@surfnet.nl.

The helpdesk starts dealing with faults reported by telephone immediately, and within 30 minutes for faults reported by email.

For reporting and dealing with faults, SURFnet uses a ticket system to log all actions taken with regard to a fault. When a fault is reported or detected, the helpdesk generates a ticket, communicates the number of the ticket to the reporting person, and refers the fault to the management partner. When a ticket is registered as resolved by the management partner, the SURFnet helpdesk will, if relevant, contact the reporting person to ask whether the fault was resolved satisfactorily.

The 24/7 availability of the helpdesk is 99.9% on a monthly basis.

3.2 Fault resolution for the SURFinternet and SURFlichtpaden network services

3.2.1 Performance indicators

Introduction

The performance indicators for fault resolution with regard to the SURFinternet and SURFlichtpaden network services relate to the transparency of the fault resolution process and supply of information.

The following performance indicators are registered:

- the time that elapses between the creation of the fault ticket and the first feedback from SURFnet, i.e. the response time;
- periodic update on the resolution of the fault;
- fault recovery times.

In the case of network faults, the fault is referred by the SURFnet helpdesk to the Network Operating Centre (NOC) of SURFnet. The NOC itself can also detect faults and create a ticket. Third parties (management partners other than the NOC), the Network Services department of SURFnet, and SURFcert can also report a fault. The NOC assigns a priority to the fault: a fault can be critical or noncritical. The priority assigned determines the supply/flow of information and the recovery times.

Network fault	Description
Critical	A fault is critical if loss of connectivity is discovered at one or more institutions.
Noncritical	A fault is noncritical if there is an increased risk of loss of connectivity or reduced network performance for one or more institutions.

If an institution does not agree with the priority assigned by the NOC, it can contact its SURFnet adviser via adviseurs@surfnet.nl. If the institution requests it, SURFnet will explain the priority choice to the institution by email.

The following are not taken into account in calculating the response times and recovery times:

- the time that elapses while waiting for the institution to take action;
- the waiting time for obtaining the necessary access.

Response times

Maximum response time	Critical	Noncritical
The time that elapses before a notification is sent to the party reporting the fault and all the affected institutions, measured from the moment when the ticket is created	30 minutes	60 minutes

Periodic updates

From the moment when the ticket is created until the moment when the ticket can be closed, all new information about the fault that is relevant for the institution concerned will be immediately communicated to the institution.

Recovery times

Maximum recovery time	Critical	Noncritical
70% of all tickets:	60 minutes	4 hours
95% of all tickets:	120 minutes	6 hours
99.9% of all tickets:	180 minutes	1 working day

The technical maintenance of the SURFnet network is outsourced to the Industry partner for the SURFnet network, who will repair or replace equipment on site if necessary. If on-site support from the Industry partner is required to resolve the fault, the maximum recovery time is increased by a maximum of 240 minutes for all recovery times shorter than one working day.

3.2.2 Exceptions in case of fibre breaks, power disruption, and force majeure

Wherever possible, network connections are installed redundantly at the level of fibre links. Most fibre breaks therefore have no impact on the availability of the network services provided. However, in a limited number of situations, such as a so-called double fibre break or a fibre break in a so-called flat ring network, fibre breaks can significantly affect the recovery time.

Fibre breaks in such situations are excluded from consideration in the performance indicators specified in this SLS. Single-path lines occur almost exclusively and to a very limited degree in the outermost branches of the network leading to the site of the institution, the so-called access line. This is one of the reasons why double fibre breaks are very rare.

A fibre break may have a maximum impact of 17 hours on the recovery time. SURFnet has entered into agreements with the fibre providers in this regard. The provider can use alternative fibre pairs or

an alternative route in order to comply with recovery times. If a temporary solution is applied, a definitive solution will be realised in the Maintenance window.

Equipment at the major sites in the SURFnet network is supplied with a so-called A and B feed: a power supply via the electrical power grid and an emergency backup power supply. For the major sites in the network, SURFnet demands that the emergency power supply must be able to function as a backup for at least 8 hours.

In case of force majeure, for example if a SURFnet Point-of-Presence is destroyed by fire, the above recovery times cannot be realised. In such cases, SURFnet will do everything in its power to reduce the recovery time to a minimum.

3.3 Fault resolution for other services

3.3.1 Performance indicators

The performance indicators that apply to fault resolution for the other services are response time and recovery time.

SURFnet has to deal with different management partners for the different services, which is why various agreements have been made with regard to fault resolution for the management partner. The aim is to ensure that the fault resolution process for all management partners is as uniform as possible so that the same response times and recovery times apply to all SURFnet services.

Faults are differentiated according to the priority of the fault. The priority is determined on the basis of the impact and degree of disruption that the fault has on the service. The impact is a measure of how many users are affected by the fault. The disruption is a measure of the degree to which functionalities of the service are not available.

The following priorities are differentiated:

Description	
Priority 1	The service is not functioning at all
Priority 2	Limited functionality for most or all users of the service
Priority 3	Limited functionality for a limited number of users of the service

Response times

The response time is the time that elapses between the creation of the fault ticket after a fault has been reported or discovered and the first report back to the institution that reported the fault and, when relevant, to the institutions that are also negatively impacted by the fault. The response times vary depending upon the priority of the fault. The response times specified apply on working days between 9 am and 5 pm.

Maximum response time	Priority 1	Priority 2	Priority 3
95% of all faults	1 hour	2 hours	4 hours

Recovery times

The recovery time is the time that elapses between the creation of the fault ticket after a fault has been reported or discovered and the moment when the service becomes available again. The recovery times vary depending upon the priority of the fault. The recovery times specified apply on working days between 9 am and 5 pm.

Maximum recovery time	Priority 1	Priority 2	Priority 3
95% of all faults	4 hours	1 working day	3 working days
99.9% of all faults	8 hours	2 working days	4 working days

The above times do not take into account any time that elapses while waiting for action or information from the institution that is needed to resolve the fault.

3.4 Different procedure for large-scale faults

In addition to the standard procedure described above, SURFnet also has a procedure in place with regard to providing information in case of a large-scale fault. SURFnet can classify a problem as a large-scale fault if, in any case, the following applies:

- loss of network connectivity lasting more than 30 minutes for more than one institution as a result of the same fault;
- non-accessibility for more than 30 minutes for all SURFnet DNS resolvers;
- loss of connectivity for more than 30 minutes with one of the SURFnet service LANs at Radboud University Nijmegen, the Nikhef, the University of Tilburg, the University Medical Centre of Utrecht, Teletcity 2, or Vancis;
- a fault lasting more than 30 minutes where SURFconext is completely unavailable for (the users of) more than one Identity Provider or more than one Service Provider;
- non-accessibility for more than 30 minutes of the SURFnet helpdesk via email and telephone;
- non-accessibility for more than 30 minutes of the SURFnet website.

If a large-scale fault occurs on the network and it affects a small number of institutions, emails are sent from IMS (Information Management System) only to the institutions affected. If a main PoP fails, all institutions are informed via the subscribers of the SNETMAN e-mail list (SNM, SURFnet Network Management) via snetman@list.surfnet.nl, and this is followed by more information via IMS.

If communication is not possible via the snetman list, SURFnet informs the institutions concerned during office hours by telephone with regard to the nature and expected duration of the fault.

Information about a fault is also published on the SURFnet website. If the SURFnet web server is not operational, an alternative web server is used with the following address:
<https://grotesting.surfnet.nl/>.

3.5 End-user helpdesk

For the SURFconext service, an end-user helpdesk (first line) is available via help@surfconext.nl. End-users can ask this helpdesk questions about the service or report problems.

In contrast to the SURFnet helpdesk, which is available only to registered contact persons, the end-user helpdesk is available to every user via email.

All incoming mail at the above address is registered in a ticket system. On working days, questions submitted to the helpdesk are answered within 24 hours. If necessary, the helpdesk escalates the ticket to the second line and informs the person concerned of any progress made.

4 Maintenance

4.1 Introduction

SURFnet regularly carries out scheduled maintenance activities in order to improve the services provided and keep faults to a minimum. This is explained further in the following paragraphs with regard to the network services and other services.

4.2 Maintenance for SURFinternet and SURFlichtpaden network services

All work activities for the network services that require an interruption of service are carried out in the network services Maintenance Window, on condition that these activities can be carried out within the timeframe of the Maintenance Window. A service interruption of the network services is defined as follows: both paths of a protected and/or redundant SURFlichtpad or IP connection are not available or a single-path IP connection is not available.

The Maintenance Window for the SURFinternet and SURFlichtpaden network services is between 5 am and 7 am every Tuesday morning.

The work activities can take place outside the Maintenance Window if:

- the maintenance activities are expected to take longer than the time allowed for by the Maintenance Window; or
- if three or fewer institutions are involved.

In that case, whenever possible, the work activities are scheduled in consultation with the institutions concerned.

All maintenance activities that require an interruption of service are made known at least five working days in advance.

4.3 Maintenance for the SURFdrive service

All maintenance activities that require an interruption of service take place during the maintenance window. The maintenance window for SURFdrive is between 6 pm and midnight every Friday evening. SURFdrive reserves the right to make use of several successive maintenance windows.

In some cases, work activities can take place outside the maintenance window. This may be the case if the maintenance activities are expected to take longer than the time allowed for by the maintenance window or it is needed to restore the availability of the service or there are other compelling reasons for doing so. In such cases, whenever possible, the work activities are scheduled in consultation with the institutions concerned.

Scheduled maintenance activities are made known at least 5 working days in advance. Public notice is given of maintenance activities beforehand via <https://www.surfdrive.nl/en> and via Twitter (@surfdrive_nl). Notification is also given via the announce mailing list, which contact persons and helpdesk employees of institutions can subscribe to.

4.4 Maintenance for other services

All work activities for the other services that require an interruption of service are carried out in the Maintenance Window for the other services, on condition that these activities can be carried out within the timeframe of the Maintenance Window. A service interruption of the other services is defined as follows: one or more of the service components specified in this SLS are not functioning or not functioning as they should.

The Maintenance Window for other services is from 5 am to 7 am every Tuesday morning and from 5 am to 7 am every Thursday morning. A service may make use of a maximum of one Maintenance Window per week.

The work activities can take place outside the Maintenance Window if:

- the maintenance activities are expected to take longer than the time allowed for by the Maintenance Window; or
- if three or fewer institutions are involved.

In that case, whenever possible, the work activities are scheduled in consultation with the institutions concerned.

All maintenance activities that require an interruption of service are made known at least five working days in advance.

4.5 Non-availability during Maintenance Window

Non-availability is not taken into account for the availability percentage if it occurs:

- during maintenance activities carried out in the Maintenance Window; or
- during maintenance activities scheduled outside the Maintenance Window as described in sections 4.3 and 4.4.

However, for the above to apply, the work activities must have been made known at least five working days beforehand.

If the non-availability is a result of actions taken by the member institution or a failure to take action, the resulting non-availability is not taken into account in calculating the availability percentage. This includes situations in which SURFnet cannot obtain access or timely access to the location of the institution.

5 Status of SLS, monitoring, and escalations

5.1 Establishing and making changes to the SLS

The SLS is a 'living' document so that the most recent insights can be included in it. The most recent version, including the change history, is available at www.surf.nl/en/surfnet-sls

Additions and changes are implemented via a transparent process.

- Substantive changes are implemented a maximum of two times per year.
- Changes are communicated to the member institutions in a timely and transparent fashion to ensure that possible objections and suggestions can be taken into account.

5.2 Escalations

If an institution is of the opinion that a service level described in the SLS is not realised by SURFnet, it can inform its SURFnet-adviser accordingly via adviseurs@surfnet.nl. SURFnet investigates the report and informs the institution of its findings within 10 working days. It should be noted that SURFnet always reports failures to realise service levels to the institution or institutions in question, accompanied by an explanation.

Appendix I List of terms used

Term	Explanation
Availability	The degree to which a service is accessible and usable for users in accordance with the service specifications. The availability is expressed as a percentage. Unless specified otherwise, the service is assumed to be available on a 24/7 basis.
Double fibre break	Simultaneous fibre breaks at different locations in the network, as a result of which the primary as well as backup connection of one or more institutions is not operational.
Fault recovery time	The time that elapses between the creation of the ticket and the resolution of the fault.
Industry Partner	The Industry partner for the SURFnet network is selected via a European tender process and provides the optical and ethernet equipment as well as the core routers and border routers and the facilities for network management. The Industry partner is also responsible for the installation on site and the maintenance of the hardware installed at the institutional locations.
Annual basis	On an annual basis means per calendar year.
Jitter	Irregularity in the delay in receiving data packets. This effect can be corrected on the receiving side. However, this will have an effect on the delay of the data flow as a whole and the buffer usage of equipment.
Office hours	From 9 am to 5 pm on working days.
Maintenance window	Period during which planned maintenance, preventive or otherwise, of systems and applications can be carried out that may result in a loss of availability or reduced availability of the SURFnet services.
NOC	The Network Operating Centre (NOC) is responsible for the operational management of the SURFnet network. SURFnet has final responsibility for the SURFnet network.
Packet loss	The loss of data packets during transport. Packet loss can be corrected by sending the packet again.
Response Time	The time that elapses between the creation of the ticket and the sending of a notification to the reporting party and all affected institutions.
Round Trip Time (RTT)	RTT is the time that elapses between the start of the transmission of the packet and the start of the receipt of the packet by the same host after another host has returned the packet.
Service LAN	The LAN to which the servers are connected that are used for the SURFnet services.
Fault	A situation in which there is a loss of connectivity and/or reduced network performance.

SURFstat	SURFstat is the real-time IP reporting service of SURFnet. This application provides insight into the line load of the connection of the institutions participating in SURFnet to the SURFnet network.
Working days	Calendar days with the exception of Saturdays, Sundays, and generally recognised public holidays in the Netherlands.

Appendix II Overview of changes in the SLS

Changes to version 9.0 (March 2015) included in version 10.0 (October 2016)

- The SURFwireless service has been added.
- The SURFcumulus service has been added.
- Availability and availability percentage of international light paths. The reference to GLIF is from the service description. SURFnet cooperates with research and education networks abroad to establish international light paths. Participating networks transport each other's light paths on the basis of reciprocity and mostly via open exchanges. This is not done specifically via GLIF alone.

Changes to version 8.0 (March 2015) included in version 9.0 (March 2016)

- The SURFconext Strong Authentication service has been added.
- For SURFcertificaten, the value of the performance indicator, 'Availability of DigiCert web portals', has been changed to 99.5%. This value had previously been 99.9% when SURFcertificaten were still being provided by Comodo (until 1 July 2015).
- For the SURFdrive service, a detailed Service Level Specification has been added for registered contact persons via the link <https://wiki.surfnet.nl/display/SURFdrive/SLS>.
- The targeted redundant setup for SURFdrive (mid-2015) has not been realised. Due to the relatively high cost, it was decided to increase the availability in other ways.
- SURFlichtpaden: 'availability of the light path implemented redundantly (only for fixed light paths)' changed to 'availability of light path implemented redundantly'
- SURFnet has various connections to other networks for international light paths. The SURFnet network is connected to networks in Germany, Belgium, France, and Switzerland via a Cross Border Fiber (CBF). The following was added here: United Kingdom
- For the SURFdashboard service, the performance indicator, 'Availability of SURFnet Authorisation Management', has been added.

Changes to version 7.0 (February 2013) included in version 8.0 (March 2015)

- The services, SURFaudit, Vulnerability Scanning, Cybersave Yourself, SURFdrive and SURFfilesender, have been added.
- The modular services associated with eduroam, namely eduroam Visitor Access and eduroam Monitoring System, have been added.
- The performance indicator, 'Availability Radius', was increased from 99.9% to 99.95%. The performance indicator, 'Availability Radius', was renamed eduroam infrastructure.
- The performance indicator, 'Availability of SURFconext Teams', has been added.
- The performance indicator, 'Availability of SURFconext Dashboard', has been added.
- Section 3.4 was changed as follows: the working procedure with regard to sending emails in case of a large-scale network fault has been updated for the new situation.
- The new link to the document is www.surf.nl/en/surfnet-sls.

Changes to version 6.0 (March 2012) included in version 7.0 (February 2013)

- The services, SURFgroepen, SURFmedia and SURFcontact, were removed due to the discontinuation of these services as of 1 January 2013.
- The SURFfederatie service was removed due to the integration of this service into SURFconext.
- Section 2.2.2 was changed as follows: the two international transit providers are presently KPN and Intelliquent (previously: Tinet and Tata communications).
- Two additional performance indicators have been included in section 2.8.2: availability of SURFconext API for group information and availability of Group Management Application (previously: SURFteams).
- In section 2.3.2, the value of the 'Jitter' indicator has been changed from 'negligible' to 'less than 1 ms'.
- Section 3.4 contained a reference to the PCD of Kennisnet. This was part of the backbone of SURFmedia. The reference has been removed, as it is no longer applicable.
- A provision with regard to SURFconext has been included in section 3.4.
- A number of SURFnet service LANs have been added to section 3.4.
- The performance indicator, 'Availability of SURFconext', has been increased from 99.5% to 99.9%.
- The term 'dynamic' light paths has been changed to 'OnDemand' light paths.
- The telephone number of the SURFnet helpdesk has been updated.
- The terms 'jitter' and 'packet loss' have been added to the list of terms used.

Changes to version 5.0 (April 2011) included in version 6.0 (March 2012)

- The SURFconext service has been added. The SURFteams service is part of this service and is therefore no longer listed separately.
- Various performance indicators were changed:
 - SURFinternet: the availability of external IP connectivity was increased from 99.9% to 99.95%.
In updating the values for external connectivity, our aim was to adjust these more closely to the real world. In 2010 and 2011, we scored 100% for this KPI each month. Accordingly, the SLS value for external connectivity was increased to 9.95%.
 - SURFinternet: the round-trip time was changed from less than 20 to less than 10 ms.
 - SURFinternet: the jitter was changed from less than 5 to less than 3 ms.
- Performance indicators with regard to packet loss, RTT, and round-trip jitter were included for the SURFlichtpaden service.
- A section has been added (3.5) on the end-user help desk for SURFconext, SURFfederatie and SURFteams.
- The phase-out date for SURFmedia, SURFgroepen and SURFcontact has been included.

Changes to version 4.0 (June 2009) included in version 5.0 (April 2011)

- New, more simplified chapter structure
- Terminology and names used with regard to themes and service names have been updated in line with the 2011 SURFnet service portfolio.

- In addition to the regular Maintenance window, an additional Maintenance window was introduced for the non-network services on Thursday morning between 5 am and 7 am.
- Terminology with regard to the parameters of the network services provided has been made more exact.
- URLs to services have been updated.
- The services SURFopzichter , SURFdomeinen, SURFinternetpinnen and SURFdashboard have been added.
- An availability percentage has been added for OnDemand and international SURFlichtpaden.
- Various availability percentages were changed:
 - SURFmailfilter was changed from 99.5 to 99.9%;
 - SURFfederatie was changed from 99.5 to 99.9%;
 - SURFcertificaten was changed from 99.5 to 99.9%.
- The SURFgroepen service was divided into two components (SharePoint/Adobe Connect).
- Several security services were discontinued (SURFids, SURFflow, SURFadvisories, SURFairt, PACT). A number of security services are still being offered as a tool via SURFcert.
- The SURFmailinglijsten service has been discontinued.
- The definition of a large-scale fault was changed: the SURFfederatie has been added.
- A number of so-called building block services were deleted from the SLS. This concerns the following building block services: NTP, Radius, secondary nameserving and IP addresses.

Changes to version 3.0 (June 2008) included in version 4.0 (June 2009)

- The services Videoconferencing, SURFnet TV, Videoconferencing and Mirrors were removed.
- The SURFcontact and SURFmedia services have been added.
- URLs to reports have been updated.
- Due to the elimination of the GigaPort User Board meetings, these meetings were removed as a possible platform where SURFnet can be held accountable for the manner in which the SLS is structured and dealt with.

Changes to version 2.0 (1 May 2007) included in version 3.0 (June 2008):

- The News and SURFDetective services were eliminated from the SLS. These services have been phased out.
- The availability percentage for the SURFflow service has been added.
- URLs to reports and service descriptions have been updated.

Changes to version 1.0 (1 December 2006) included in version 2.0 (1 May 2007):

- Chapter 2 was modified to include the network services: Domain names, Secondary Nameserving, NTP service and IP addresses.
- Chapter 3 'Security services' has been added.
- Chapter 4 'Authentication and authorisation services' has been added.
- Chapter 5 'Group communication services' has been added.
- Chapter 6 'Content Delivery services' has been added.
- Chapter 7 'Other services' has been added, including the fault handling process.

- The URL that provides access to the reporting process on the availability of the IP connection has been added to chapter 2.
- In Chapter 2, the date on which the availability of light paths and external IP connectivity are reported on has been updated.