SDH Service Description

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NORDUnet A/S

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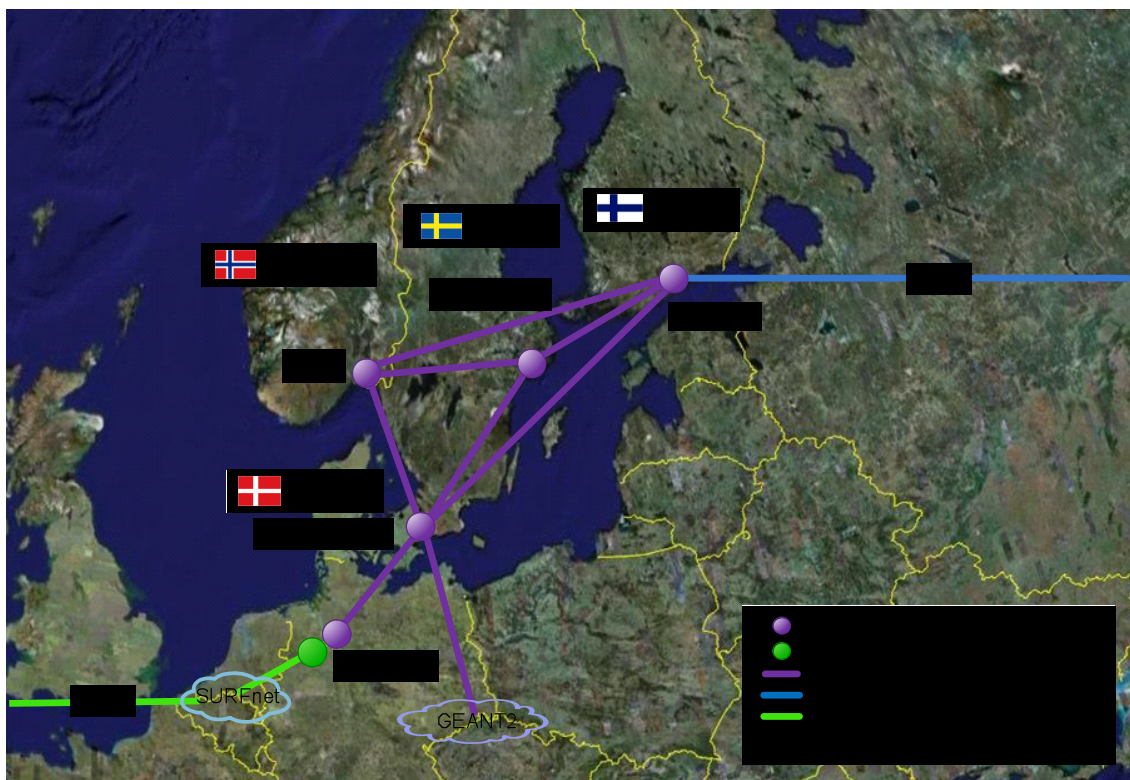
SDH Service Description

1 Introduction

Northern Light Optical Exchange SDH service provides seamless, high-performance capacity via NORDUnet's exceptionally resilient Nordic network.

This document highlights the benefits of SDH and outlines the offered SDH service between points of presence in the Nordic region and northern Germany. The service is accessible in Oslo, Stockholm, Copenhagen, Helsinki and Hamburg.

Beyond that NORDUnet offers connectivity to Europe, Russia, Asia and the US via partners. NORDUnet can also assist in the ordering of local tail in order to connect to the Nordic NREN or direct to a NORDUnet POP.

Northern Light Optical Exchange SDH service is outlined below

For further information about the NORDUnet network service please read NORDUnet Network Service Description.

2 Synchronous Digital Hierarchy - SDH

SDH originates from Synchronous Optical Network (SONET) in the US. It includes capabilities for bandwidth on demand and is also made up of multiples of E1.

SDH circuits provide enterprises, researcher and REN's with reliable and secure transmissions over their own dedicated connection that is always on.

SDH offer predicted availability targets up to 99.995 percent error-free seconds per year, to ensure that critical data, voice and multimedia transmissions are always delivered, round the clock.

SDH ability to carry multiple applications makes SDH suitable for:

- Constructing voice and data backbone networks
- Reservation systems
- Telephone banking and financial transactions
- Stock control, inventory and order information
- Linking mainframes for bulk data transfer
- Inherently flexible

SDH is a self-healing fibre optic technology that can re-route information in milliseconds if a transmission is interrupted.

It also enables network configuration and capacity to be controlled by software, so you as a customer ensure service continuity even if you need to increase allocated bandwidth:

- In response to business developments
- To prepare for anticipated surges in network traffic

By aggregating circuits, a number of lower bandwidth circuits can be provided on a single aggregated interface. In addition to this multiplexing makes it possible to derive many channels depending on the application from the SDH service, enabling you as a customer to carry data, voice and multimedia communications securely and reliably.

ITU Standard	Framing	Structure	Line Rate	Termination	Impedance
G.703 unstructured	E1	VC12	2,048 Mbps	Electrical	75/120 Ohm
G.704 structured	E1	VC12	2,048 Mbps	Electrical	75 Ohm
G.703	E3	VC-3	34 Mbps	Electrical	75 Ohm
G.703	DS3	VC-3	45 Mbps	Electrical	75 Ohm
G.703	STM-1	VC-4	155,52 Mbps	Electrical	75 Ohm
G.957	STM-1	VC-4	155,52 Mbps	Optical	
G.957	STM-4	VC-4-4c	622,02 Mbps	Optical	
G.957	STM-16	VC-4-16c	2,488 Gbps	Optical	
G.691	STM-64	VC-4-64c	9,953 Gbps	Optical	
G.693	STM-256	VC-4-256c	39,813 Gbps	Optical	

The benefits of SDH are:

- Different interfaces or different bandwidths can connect – G.708 and G.781
- Network topologies are more flexible
- There is flexibility for growth
- The optical interface is standard – G.957, G691 and G.693
- Network Management is easier to perform G.774 and G.784

3 Northern Light Optical Exchange SDH Service

The SDH services are offered as PoP-to-PoP in the Nordic region and northern Germany. The service is accessible in Oslo, Stockholm, Copenhagen, Helsinki and Hamburg.

The SDH Capacity can be delivered as outlined below, where other speeds are subject to availability.

ITU Standard	Framing	Line Rate
G.957	STM-1	155,52 Mbps
G.957	STM-4	622,02 Mbps
G.957	STM-16	2,488 Gbps
G.691	STM-64	9,953 Gbps
G.693	STM-256	39,813 Gbps

All interfaces from STM-4 can be delivered as standard concatenated signals:

Contiguous

- VC-4-4c
- VC-4-16c
- VC-4-64c
- VC-4-256c

NORDUnet can provide typical optical interface towards the Customer Equipment.

3.1 Resiliency

3.1.1 Single Link
Single Link is the SDH service which can be delivered as a point-to-point connection.

3.1.2 Protected Link
Protected Link is the SDH service with automatic protection to the alternative route within e.g. 50 ms in the event of failure.

3.1.3 Dual Link

Dual Link is the SDH service based on two diverse Single Links to the same destination providing extremely high availability.

3.2 Telecommunications Management Network TMN

From NORDUnet's international Network Operation Centre NUNOC the SDH services is remotely set up and manage between NORDUnet's various PoP's, ensuring timely deliveries and the highest levels of availability.

NORDUnet is supervising and managing the entire network using powerful Network Management solutions with flexible and scalable architecture.

4 NORDUnet

NORDUnet is the Nordic Infrastructure for Research and Education and provides the Nordic backbone to the Global Infrastructure for Research and Education.

NORDUnet has its roots in the NORDUNET programme which was financed by the Nordic Council of Ministers.

NORDUnet is a Danish limited company owned by the governments or government institutions in Denmark, Finland, Iceland, Norway and Sweden.

NORDUnet is based on next generation research network that provides the Nordic research and education community with a high bandwidth Optical Private Network, Northern Light Optical Exchange which is a part of the Global Optical Light Exchange and a Pan Nordic IP network. NORDUnet will ensure adequate capacity both for e-Science, e-Engineering, and e-Business requirements for the foreseeable future.

Further information can be found on http://www.nordu.net

The history of NORDUnet can be found on http://www.nordu.net/history

5 Glossary of Terms

DWDM	Dense Wavelength Division Multiplexing
E2E	End-to-end (a dedicated path over multiple network domains each segment comprising a P2P circuit)
End to End	An end-to-end circuit will use a point to point circuit pr single domain. The E2E circuit terminates with the responsibility of the customer demarcation point.
FSKnet	Forskningsnettet
FUNET	Finnish University Network
GbE	Gigabit Ethernet
Gbps	Gigabit per second
GFP	Ethernet is map into SDH framing by using GFP (Generic Frame Protocol, ITU-T G.7041)
GMPLS	Generalized Multiprotocol Label Switching

LAN	Local Area Network
LCG	LHC Computing Grid
LHC	Large Hadron Collider – A physics experiment at CERN, Switzerland.
MAN	Metropolitan Area Networks
MPLS	Multiprotocol Label Switching
NMS	Network Management System
NOC	Network Operations Centre
NORDUnet	Nordic University Network
NOX	Northern Light Optical Exchange
NREN	National research and education network
NSAP	Network Service Access Point som er en AESA
OAM	Operation, Administration, and Maintenance
ODR	Optical Distribution Rack
OPN	Optical private network
OSI	Open System Interconnection – seven layer model
OSS	Operation and Support System
OTH	Optical Transport Hierarchy
OTN	ITU Standard G.709 is commonly called Optical Transport Network (OTN) or digital wrapper technology. OTN is currently offered in three rates, OTU1,OTU2 and OTU3.
Point to Point	Point-to-point (a dedicated circuit configured between two points over a single network domain)
PoP	Point of presence
QoS	Quality of Service
RM/BM	Management software
SDH	Synchronous Digital Hierarchy
SNMP	Simple Network Management Protocol
STM-x	The STM-1 (Synchronous Transport Module) is the basic rate of transmission of the SDH ITU-T fiber optic network transmission standard. It has a bit rate of 155.52 Mbit/s. The other levels are STM 4, STM 16 and STM 64.
SUNET	Sweden University Network
T-MPLS	Transport Multiprotocol Label Switching
T-ROADM	Tuneable-ROADM
TT	Trouble Ticket
UBR	Unspecified Bit Rate
UNI	User Network Interface
UNINETT	University Network Norway
WAN	Wide Area Network

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