

# Data Gathering in Optical Networks using the TL1 Toolkit

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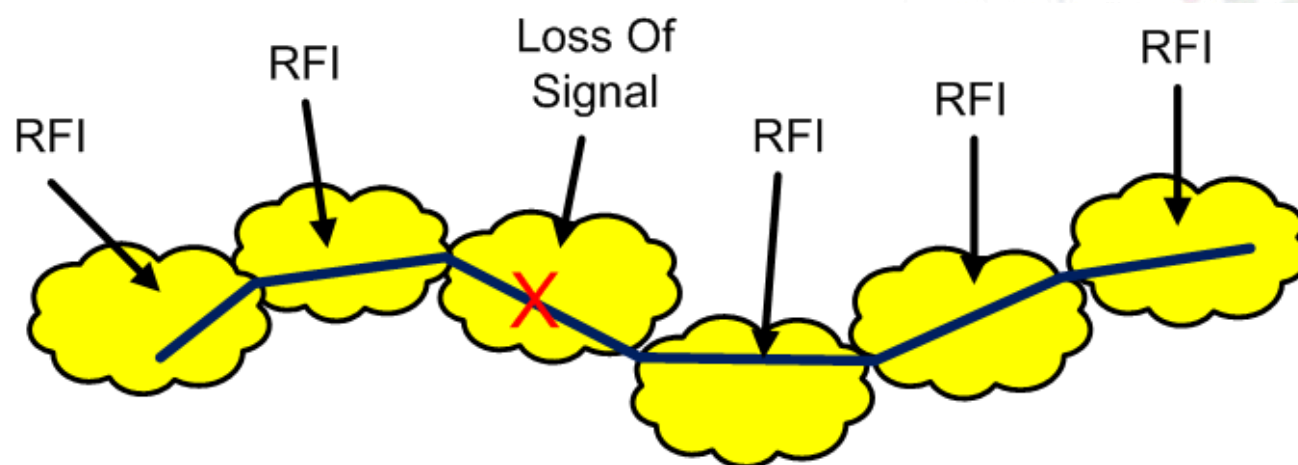


# Hybrid Networks

- ▶ Many NRENs are operating hybrid networks
- ▶ Hybrid networks have two parts:
  - ▶ Packet switched routed internet part
  - ▶ Circuit switched “lightpath” part
- ▶ Lightpaths are high bandwidth circuits with deterministic Quality of Service
  - ▶ Used for point-to-point connections and VPNs
  - ▶ Typically 1 to 10 Gbps
  - ▶ Deterministic QoS, so very low jitter
  - ▶ Implemented at SDH or DWDM layer
  - ▶ Customers get Ethernet interface
  - ▶ Dedicated (no sharing with other users)
- ▶ Lightpaths are often used for large data streams
  - ▶ Routing would be too costly
  - ▶ You do not want to compete with other traffic

# Hybrid Network Challenges

- ▀ NRENs now also operate (DWDM and SDH) transport layer
  - ▀ Different from operating IP networks
- ▀ Many “lightpaths” cross multiple management domains
  - ▀ Alarm in one domain causes alarms in all other domains
  - ▀ Joint distributed operations
  - ▀ Need to have access to monitoring info of other domains



# TL1 Toolkit

- ▶ **Optical equipment uses TL1 as CLI, little SNMP support**
- ▶ **TL1 is a user unfriendly interface**
- ▶ **Terse commands with arguments separated by colons:**
  - ▶ **RTRV-OM-ETH::ETH-1-6-3:42::;**
- ▶ **TL1 Toolkit Perl module makes writing TL1 scripts easy**
- ▶ **Vendor independent**
- ▶ **Can be used to extract status and performance info**
- ▶ **In use by several organisations:**
  - ▶ **BCnet**
  - ▶ **Canarie**
  - ▶ **HEAnet**
  - ▶ **British Telecom**
  - ▶ **Neuf Cegetel/SFR**
- ▶ **Open source (Apache 2 license)**
- ▶ **<http://nrg.sara.nl/TL1-Toolkit>**



# TL1 Toolkit MRTG Script

```
use TL1Toolkit;

my $tl1 = TL1Toolkit->new(
    hostname => $hostname, username => $username, password => $password
);

# connect and login
if ($tl1->open() == 0) {
    print STDERR "$0 Could not connect to $hostname\n";
    exit 1;
}
my $inoctets = $tl1->get_inoctets();
my $outoctets = $tl1->get_outoctets();

# logout and disconnect
$tl1->close();

# generate MRTG output
print "$inoctets\n";
print "$outoctets\n";
print "Unknown\n";
print "$hostname\n";
```



# Supported Functions

- ▶ `open()` – connect and login
- ▶ `close()` – logout and disconnect
- ▶ `get_swversion()` – get firmware release of equipment
- ▶ `get_inoctets(slot, port)` – get Ethernet inoctets
- ▶ `get_outoctets(slot, port)` – get Ethernet outoctets
- ▶ `get_alarms()` – get active alarms
- ▶ `cmd(command)` – execute any TL1 command





# Lightpath Operational Status

Lightpath Overview

http://noc.netherlight.net:8080/spotlight/

Status Alarms Inventory Capacity Mangement Network

Show [all](#) lightpaths.  
Show lightpaths that are [down](#) only.

	Status	Local ID	Global ID
1	UP	<a href="#">2111LE_Ui02-Asd01_SURFNET-FC(EXP-S15735)</a>	
2	UP	<a href="#">2161LE_Nh01-Asd01_SURFnet-UvA(NBD-HDPMnet)</a>	netherlight.net:2161LE
3	UP	<a href="#">5000LE_CNSHA-NLDGL(NBD-SHAO-JIVE)</a>	netherlight.net:5000LE
4	UP	<a href="#">5001LE_NLAMS-NOOSL(NBD-UiO-UvA-SNE)</a>	
5	UP	<a href="#">5002LE_TWHSZ-CZPRG_NL(NBD-TWAREN-CESNET)</a>	
6	UP	<a href="#">5003LE_INBOM-CHGVA(TJFR-CERN-LHCOPN)</a>	
7	UP	<a href="#">5004LE_CHGVA-CAVAN(TRIUMF-LHCOPN)</a>	dante.net:CERN-TRIUMF-LHCOPN-001
8	UP	<a href="#">5005LE_CZPRG-USCHI(NBD-Brookhaven-BNL)</a>	
9	UP	<a href="#">5006LE_NOTRD-KRSEL(NBD-Trondheim-Korea)</a>	
10	UP	<a href="#">5007LE_CZPRG-USCHI(NBD-ViLab/VINI)</a>	
11	UP	<a href="#">5008LE_CZPRG-KRSEL(NBD-A5net)</a>	
12	UP	<a href="#">5009LE_CZPRG-USCHI(NBD-IoP-FNAL)</a>	
13	UP	<a href="#">5010LE_NLAMS-DEFRA(SARA-Deisa)</a>	dante.net:SARA-FRA-DEISA-001
14	UP	<a href="#">5011LE_NLAMS-CHGVA(LHCOPN-SARA-CERN)</a>	dante.net:CERN-SARA-LHCOPN-001
15	UP	<a href="#">5012LE_USNYC-DKKT(NBD-GLIF-PerfSonar)</a>	canarie.ca:KISTI-UNINETT-GLIF-001
16	UP	<a href="#">5013LE_NLAMS-USCHI(NBD-IRNC-Ams-Chi)</a>	netherlight.net:5013LE
17	UP	<a href="#">5015LE_CAVAN-NLAMS(TRIUMF-SARA-LHC)</a>	dante.net:SARA-TRIUMF-LHCOPN-001
18	UP	<a href="#">5018LE_AUSYD-NLDGL(NBD-ATNF-JIVE)</a>	netherlight.net:5018LE
19	UP	<a href="#">5019LE_CHGVA-CAVAN(MANLAN-TRIUMF-5G)</a>	dante.net:CERN-TRIUMF-LHCOPN-002
20	UP	<a href="#">5020LE_NLAMS-GEJUE(NBD-Phosphorus-Viola)</a>	
21	UP	<a href="#">5021LE_NLAMS-ESBCN(NBD-Phosphorus-I2CAT)</a>	
22	UP	<a href="#">5025LE_USNYC-NLAMS(NBD-internet2-demo)</a>	netherlight.net:5025LE
23	UP	<a href="#">5026LE_CHGVA-NLAMS(Caltech-USLHCnet)</a>	dante.net:CERN-AMS-USLHCNET-001
24	UP	<a href="#">5027LE_USNYC-NLAMS(GEANT-I2Abilene-IRNC)</a>	
25	UP	<a href="#">5028LE_USNYC-NLAMS(SURFnet-MANLAN-IP)</a>	netherlight.net:5028LE
26	UP	<a href="#">5029LE_CAOTT-NLAMS(NBD-CRC-Phos)</a>	netherlight.net:5029LE
27	UP	<a href="#">5030LE_GBCOL-NLAMS(NBD-EssexU-Phos-GN2+)</a>	
28	UP	<a href="#">5031LE_PLPOZ-NLAMS(NBD-Phos-GN2+)</a>	
29	UP	<a href="#">5032LE_USCHI-ESBCN(NBD-IRNC-I2CAT-4K)</a>	
30	UP	<a href="#">5033LE_RUMOW-NLAMS(RIPN/Gloriad)</a>	
31	UP	<a href="#">5034LE_ESBCN-USCHI(NBD-HPDM-I2CAT)</a>	netherlight.net:5034LE
32	DOWN	<a href="#">5035LE_NLAMS-USCHI(EXP-HPDM-SARA)</a>	
33	UP	<a href="#">5036LE_NLAMS-USCHI(NBD-HPDM-UvA)</a>	netherlight.net:5036LE
34	UP	<a href="#">5040LE_Asd01-Gen01(NBD-LHCOPN-CERN-RIPN)</a>	
35	UP	<a href="#">5041LE_Asd01A-Asd01A(NBD-RIPN-Terraflow)</a>	

click on the lightpath name to get more information about the status/route and alarms for this specific lightpath.

**legenda**

- UP** The status of this lightpath is up.
- DOWN** The status of this production lightpath is down.
- DOWN** The status of this next business day lightpath is down.
- DOWN** The status of this experimental lightpath is down.

Done



# Lightpath Active Alarms

Alarm Overview

ALL show only active alarms? yes

Select from date: ALL Select to date: To: now

reset

Search result: From: 01-Apr-2008 10:52:32 UTC To: 01-Apr-2009 10:52:32 UTC  
sorted by: date desc

Alarm raised	Alarm description	Host	Interface	severity	impact	Alarm cleared	active	circuit	action
22-Mar-2009 13:55:59 UTC	Link down	Asd001a_tdm3	WAN-1-508-1-8-1	CR	SA	not cleared yet	yes	1	next business day support
06-Feb-2009 12:21:57 UTC	Ethernet loss of signal	Asd001a_tdm3	VLAN-2-SATT-D	MJ	SA	not cleared yet	yes	0	next business day support
06-Feb-2009 12:21:57 UTC	Ethernet loss of signal	Asd001a_tdm3	VLAN-2-SATT-C	MJ	SA	not cleared yet	yes	0	next business day support
20-Jul-2008 15:44:46 UTC	Equipment Low Rx power	Asd001a_tdm1	FAC-6-1	MN	NSA	not cleared yet	yes	1	next business day support

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**Alarm raised:** Time and date the alarm was raised on the network element (UTC time).  
**Alarm cleared time:** Time and date the alarm was last seen by the script. Normally this is the time the alarm has cleared.  
Please note that all times are in UTC



# Various Other Scripts

- ▶ **Extract performance data, like**
  - ▶ Ethernet statistics
  - ▶ SDH errored seconds
  - ▶ DWDM optical loss
- ▶ **Extract optical network resource usage**
  - ▶ Wavelengths in use
  - ▶ Timeslots in use
  - ▶ Slots/ports in use
- ▶ **Extracting parameters from all equipment in the network**
  - ▶ E.g. retrieve and compare settings



# Thank You

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