

# Table of Contents

<b>LHCONE L3VPN.....</b>	<b>1</b>
How to connect.....	1
Active VRFs.....	1
Connected Research Computing Centers.....	3
BGP communities.....	8
VRF implementation recommendations.....	8
Monitoring.....	8
Operational model design.....	9

# LHCONE L3VPN

This page gives information about the LHCONE L3VPN service

## How to connect

You can find here some information about connecting to the L3VPN service

- [LHCONEconnectionguide-1.2.pdf](#): LHCONE Site Provisioning Guidelines V1.2

## Active VRFs

#	Name	AS	NOC	Peerings	Transit from	Status
1	ASGC (TW)	24167	noc@twgridNOSPAMPLEASE.org	CERNlight, GEANT, ESnet, TEIN, JGN, NORDUnet, Internet2, CANARIE, RU-VRF, SINET		Active
2	AARNET	7575		ESnet, CANARIE, Internet2		Active
3	CANARIE (CA)	6509	noc@canarieNOSPAMPLEASE.ca	ESnet, Internet2, GEANT, ASGC		Active
4	CENIC (US)	2153	noc@cenicNOSPAMPLEASE.org	TEIN4	TEIN4	Active
5	CERNet (CN)	23911	6noc@cernetNOSPAMPLEASE.edu.cn			
6	CERNlight (CH)	20641	noc@cernNOSPAMPLEASE.ch	ESnet, Pionier, NORDUnet, RU-VRF, ASGC		Active
7	CSTNet (CN)	7497	58812000@cstnetNOSPAMPLEASE.cn	CERNnet	CERNet	Active
8	DFN (DE)	680	noc@nocNOSPAMPLEASE.dfn.de		GEANT	Active
9	ESnet (US)	293	trouble@esNOSPAMPLEASE.net	GEANT, Internet2, CERNlight, RU-VRF, TransPPAC		Active
10	GARR (IT)	137	noc@garrNOSPAMPLEASE.it	RU-VRF	GEANT	Active
11	GEANT (EU)	20965	support@ocNOSPAMPLEASE.geant.net	ARNES, ASGC, CANARIE, CESNET, CSTNET, DFN, ESnet,		Active

				GARR, Internet2, JISC, RU-VRF, KREONET, NORDUnet, Pionier, RENATER, RNP, RedIRIS, RoEduNet, SINET, TEIN, URAN		
12	ING(US)	19782	noc@indianaNOSPAMPLEASE.gigapop.net	ESnet, Internet2	ESnet	Active
13	Internet2 (US)	11537	noc@netNOSPAMPLEASE.internet2.edu	ASGC, GEANT, ESnet, NORDUnet, CERNlight		Active
14	JGN (JP)	17934	inoc@jgn-xNOSPAMPLEASE.jp	ASGC, KREONET2, SINET		Active
15	KREONET	17579	noc@kreonet2NOSPAMPLEASE.net	ASGC, CERNlight, ESnet, GEANT, JGN-SINET, TEIN,		Active
16	NORDUnet (EU)	2603		GEANT, Internet2, ESnet, RU-VRF		Active
17	Pionier (PL)	8501	noc@manNOSPAMPLEASE.poznan.pl	GEANT, CERNlight, RU-VRF	GEANT	Active
18	RedCLARA (South America)				GEANT	Active
19	RedIRIS (SP)	766	noc@redirisNOSPAMPLEASE.es		GEANT	Active
20	Renater (FR)	2091	noc-renater@nocNOSPAMPLEASE.renater.fr		GEANT	Active
21	REUNA (CL)	11340	noc@reunaNOSPAMPLEASE.cl		RedCLARA	Active
22	RoEduNet (RO)	2614			GEANT	Active
23	RNP (BR)	1916	noc@rnpNOSPAMPLEASE.br		GEANT	Active
24	RU-VRF (RU)	57484	noc@computingNOSPAMPLEASE.kiae.ru	CERNlight, NORDUnet, ESnet, Internet2, ASGC, CANARIE, GARR, PIONIER,		Active

				SINET, KREONET, GEANT		
25	SINET (JP)	2907	ipnoc@sinetNOSPAMPLEASE.ad.jp	GEANT, ESnet, JGN, ASGC		Active
26	TEIN (Asia)	24490	helpdesk@nocNOSPAMPLEASE.tein.asia	GEANT		Active
27	ThaiREN (TH)	24475	noc@thairenNOSPAMPLEASE.net.th		TEIN	Active
28	TransPAC	22388	noc@transpacNOSPAMPLEASE.org	ESnet, JGN, TEIN		Active

## Connected Research Computing Centers

#	Site	AS number	Announce v4	Announce v6	
1	AGLT2	229	192.41.230.0/23 192.41.236.0/23 192.41.238.0/28	2001:48A8:68F7::/48	aglt2-noc@u
2	Alberta Univ (T2)		142.244.83.0/27 142.244.105.64/27		
3	ANL	683	140.221.68.0/24 140.221.69.0/24 140.221.96.0/24	2620:0:dc0:4800::/59	noc@anlNO
4	ASGC (T1+T2)	24167	117.103.96.0/20 202.169.168.0/22 202.140.160.0/19	2400:4500::/64 2400:4500:0:1::/64 2400:4500:0:2::/64	noc@twgrid
5	ASGC-2		140.109.102.0/24		
6	Australia ATLAS	AS7575	192.231.127.0/24 192.43.208.0/24		
7	BINP (T2)	59624	144.206.221.0/24	-	noc@compu
8	BNL (T1)	43	192.12.15.0/24 130.199.48.0/23 130.199.185.0/24 192.33.128.0/24 198.125.208.0/22	2620:0:210::/48	itd-net-1@br
9	Caltech (T2)	32361	192.84.86.0/24 198.32.43.0/24 198.32.44.0/24	2607:F380:A4F:63::/64	noc@ultraliq
10	CA-SCINET-T2	239	142.150.188.64/27		net-ops@no
11	CA-SFU-T2	271	206.12.24.224/27		noc@bcNO
12	CA-UVIC-T2	16462	206.12.48.136/29 206.12.48.224/27		netadmin@u
13	CBPF Brazil (T2)	2715	152.84.101.0/24		
14	CEA-IRFU (T2 GRIF)	777	see <a href="#">☞</a>		noc-renater@
15	CH-CERN (T1)	513,61339	128.142.0.0/16 188.184.128.0/17 188.185.48.0/20	2001:1458:301::/48	noc@cernN

LhcOneVRF < LHCONE < TWiki

			188.185.128.0/17		
16	CIEMAT (T2)	766	192.101.161.128/26 192.101.166.234/32	2001:720:42c:aace::/64	noc@ciemat
17	DE-KIT (T1)	58069	192.108.45.0/24 192.108.46.0/23 192.106.68.0/24	2A00:139C::/45	de-kit-noc@
18	DESY (T2)	AS1754	131.169.80.0/24 131.169.98.0/24 131.169.160.0/21 131.169.191.0/24 131.169.192.0/24 141.34.192.0/21 141.34.200.0/24	2001:638:700:1062::/64 2001:638:700:10a0::/64 2001:638:700:10bf::/64 2001:638:700:10c0::/64	noc@desyN
19	EELA-UTFSM	11340	146.83.90.0/25	2001:1310:3121:1112::/64	noc@reunaN
20	Estonia T2	AS number	193.40.150.192/26	2001:bb8:4004:ff::/64	grid@kbfiN
21	FNAL (T1)	3152	131.255.160.0/24 131.225.184.0/22 131.225.188.0/22 131.225.204.0/22	2620:6a:0:2::/64	wan@fnalN
22	Geant (VRF, Perfsonar)	20965	62.40.103.0/24		ncc@nocNC
23	GSI (T2)	680	140.181.2.0/24		
24	HEPLAB, University of Ioannina (T2)	8581	195.251.201.128/26	-	helpdesk@n
25	IGS Slovenia (T2)	AS	v4	v6	NOC
26	IHEP Beijing (T2)	3460	202.122.33.0/24	2401:de00:1:32::/64	noc@ihepN
27	IHEP Russia (T2)	2643	194.190.165.0/24	2001:678:7d8:2000::/52	noc@ihepN
28	IIHE (T2), Brussels	AS 2611	193.58.172.0/25	no IPv6 range	NOC?
29	Imperial College London UKI-LT2-IC-HEP (T2)	786	146.179.244.0/24 146.179.244.0/24 146.179.232.0/22	2a0c:5bc0:c8:2::/64	
30	French sites :  all up-to-date information is available here <a href="#">↗</a>				
31	IN2P3-CCIN2P3-LYON (T1 T2)	789	see <a href="#">↗</a>		noc@in2p3N noc-renater@
32	IN2P3-IPNL-LYON (T3)	789	134.158.83.0/24		noc@in2p3N noc-renater@
33	IN2P3-CPPM-MARSEILLE (T2)	789	see <a href="#">↗</a>		noc@in2p3N noc-renater@
35	IN2P3-IP-HCURIEN-STRASBOURG (T2)	789	see <a href="#">↗</a>		noc@in2p3N noc-renater@
36	IN2P3-LAL-ORSAY (T2 GRIF)	789	see <a href="#">↗</a>		noc@in2p3N noc-renater@
37	IN2P3-LAPP-ANNECY (T2)	789	see <a href="#">↗</a>		noc@in2p3N noc-renater@
38	IN2P3-LLR-PALAISEAU (T2 GRIF)	789	see <a href="#">↗</a>		

## LhcOneVRF &lt; LHCONE &lt; TWiki

					noc@in2p3M noc-renater@
39	IN2P3-LPC-CLERMONT-AUBIERE (T2)	789	see <a href="#">↗</a>		noc@in2p3M noc-renater@
40	IN2P3-LPNHE-PARIS (T2 GRIF)	789	see <a href="#">↗</a>		noc@in2p3M noc-renater@
41	IN2P3-LPSC-GRENOBLE (T2 GRIF)	789	see <a href="#">↗</a>		noc@in2p3M noc-renater@
42	IN2P3-SUBATECH-NANTES (T2)	789	see <a href="#">↗</a>		noc@in2p3M noc-renater@
43	INFN Bari (T2)	137	90.147.66.0/24 90.147.75.0/24 90.147.168.0/23 212.189.205.0/24	2001:760:4227::/48	noc@garrNC
44	INFN Catania (T2)	137	90.147.16.0/23 193.206.219.0/24	2001:760:420d:80::/64	noc@garrNC
45	INFN CNAF (T1)	137	131.154.128.0/17	2001:760:4205::/48	net@cnafNC noc@garrNC
46	INFN Frascati LNF (T2)	137	192.84.128.0/24		noc@garrNC
47	INFN Legnaro (T2)	137	193.206.93.0/24	2001:760:4229::/48	noc@garrNC
48	INFN Milano (T2)	137	192.135.14.0/24	2001:760:4224::/48	noc@garrNC
49	INFN Napoli (T2)	137	90.147.67.0/24	2001:760:422a:137::/64	noc@garrNC
50	INFN Pisa (T2)	137	192.135.9.0/24 193.205.76.0/23		noc@garrNC
51	INFN Roma1 (T2)	137	141.108.35.0/24 141.108.36.0/22	2001:760:422c:35::/64 2001:760:422c:36::/64 2001:760:422c:38::/64	noc@garrNC
52	INFN Torino (T2)	137	193.205.66.128/25 193.206.184.0/26		noc@garrNC
53	INFN LNGS (XENON)	137	192.135.35.224/27		noc@garrNC
54	INR (Troitsk) (T2)	58255	185.207.88.0/24	2a0e:e140::/64	serebr@troit
55	ITEP (T2)	2148	194.85.68.0/23 (T2) 194.85.66.0/24 (T2)	2001:67c:1bec:f069::/64	lublev@itep
56	JINR (T1)	2875	159.93.228.0/22	2a05:81c5:301:228::/64	noc@jinrNC
57	JINR (T2)	2875	159.93.39.0/24 159.93.224.0/22	2a05:81c5:302:224::/64	noc@jinrNC
58	KCMS-T2 KR	1237	210.117.209.0/25		
59	KEK (BelleII-T1)	2505	202.13.197.192/26 202.13.203.128/26 202.13.223.132/30	no v6	nwg@kekNC
60	Kharkov-KIPT-LCG2	35296		2a00:fc00:e009::/56	

## LhcOneVRF &lt; LHCONE &lt; TWiki

			193.239.180.128/27 193.239.180.208/29		
61	KISTI-T1 GSDC - KR	17579	134.75.125.0/24	2001:320:15:125::/64	
62	KNU-T2 KR	1237	155.230.20.0/22		
63	McGill (T2)	15318	132.206.245.224/27		
64	MIT (T2)	3	18.12.0.0/20		network@m
65	MWT2/IU (T2)	10680	149.165.224.0/24 149.165.225.0/24 149.165.236.64/29		noc@netNO
66	NCU-T2		140.115.32.0/24		
67	NET2 (T2)	111	192.5.207.0/24 192.12.185.0/24		noc@buNO
68	NTU-T2		140.112.101.0/24 140.112.102.0/24 140.112.104.0/24		
69	NDGF (T1)	39590	109.105.124.0/22		
70	NL-T1 (T1)	1162 (SARA)  1104 (NIKHEF)	145.100.17.0/28 (perfSONAR MP) 145.100.32.0/22 194.171.96.128/25	2001:610:108:203a::/64 2001:610:108:3017::/64	
71	Notre Dame Univ (T2 T3)	19782	149.165.243.0/24		neteng@ndN
72	Oklahoma University	25776	129.15.40.0/23		NOC
73	ORNL	50	192.12.68.0/24 192.188.182.0/24	2620:0000:2b3d:0100::/56 2620:0000:2b3d:0000::/56	ornl-esnet-op
74	PIC (T1) IFAE (T2)	43115	193.109.172.0/24	2001:67c:1148:200::/64 2001:67c:1148:201::/64 2001:67c:1148:202::/64 2001:67c:1148:301::/64	network@pi
75	Purdue CMS T2	17	128.211.128.0/19	2001:18e8:804::/48	ioc@listsNC
76	PNPI (T2)	29493	144.206.130.0/23	2001:67c:1bdc:100::/64 2001:67c:1bdc:101::/64 2001:67c:1bdc:102::/64 2001:67c:1bdc:200::/64 2001:67c:1bdc:201::/64	gulin@pnpi
77	PNU-T2 KR	1237	203.253.142.0/24		
78	prague_cesnet_lcg2 (T2)	2852	195.113.219.0/25		
79	RO-07-NIPNE, RO-11-NIPNE,RO-02-NIPNE, NIHAM	2614	81.180.86.0/24	-	noc@roeduN
80	RRC-KI (T1)	59624	144.206.224.0/24 144.206.236.0/24 144.206.255.128/26	2001:67c:1bec:224::/64 2001:67c:1bec:236::/64 2001:67c:1bec::255:0/112	noc@compu
82	RRC-KI (T2)	59624	144.206.237.0/24	2001:67c:1bec:237::/64	noc@compu
83	RWTH Aachen (T2)	680	134.61.24.0/22, 134.130.9.64/29		
84	SAMPA Brazil (T2)	28571	200.17.30.0/24		noc@rmpNC
85	Sarov (T2)	52146	185.141.124.192/27	2a07:a6c0:b:192::/64	noc@compu

## LhcOneVRF &lt; LHCONE &lt; TWiki

86	SFU Simon Fraser Univ (T2)	11105	206.12.24.0/25		
87	SLAC (T2)	3671	134.79.0.0/16, 192.68.191.0/24, 198.51.111.0/24		noc@slacNC
88	TIFR (T2)	2697	144.16.111.0/24 144.16.112.0/24		netops-mum
89	Tokyo T2	AS	v4	v6	NOC
90	Toronto Univ. (T2)	239	142.150.188.0/24		
91	TRIUMF (T1)	36291	206.12.9.64/28 206.12.1.0/24		
92	UAM Madrid (T2)	766	150.244.246.0/23		noc@redima
93	UChicago (T2)	160	192.170.224.0/19		neteng@uch
94	UBC University of British Columbia				
95	UCSB	131	128.111.120.96/28		noc@ucsbN
96	UCSD	26397	67.58.50.64/28 67.58.50.0/28 169.228.130.0/23	2607:F720:1700:1B30::/60	operations@
97	UFL Univ. Florida (T2)	6536	128.227.10.0/24 128.227.132.0/24 128.227.213.0/24 128.227.221.0/24 128.227.235.192/26 128.227.246.0/24 128.227.253.0/24 128.227.59.128/26 128.227.90.0/24 128.227.92.0/24		
98	UIUC University of Illinois ATLAS Midwest (T2)	38	72.36.81.64/26 72.36.96.0/24	2620:0:e01:4800::/56	support@ui-
99	UKI-SouthGrid-RALPP (T2)	786	130.246.44.0/22	2001:630:58:1c20::/64	
100	UNL	7896	129.93.182.0/23 129.93.239.128/26 129.93.244.192/26	2600:900:6:1101::1/64 2600:900:6:1102::1/64 2600:900:6:1103::/64 2600:900:6:1301::1/64 2600:900:6:1302::1/64	garhan.atted
101	U Wisc. Madison (T2)	59	128.104.227.0/24 144.92.180.0/23	2607:f388:101c:1000::/64	noc@doitNC
102	Victoria Univ (T2)	16462	142.104.21.0/25 206.12.48.224/27		
103	Vanderbilt University (T2)	7212	129.59.177.96/27 129.59.197.0/24 192.111.108.0/24	2607:8a00:17:736::/64	
104	Wuppertal Univ. (T2)	680	132.195.124.0/23		
105	Cyfronet AGH (T2)	8267	149.156.5.192/27		noc@cyfron
106	University of Warsaw ICM (T2)	8664	213.135.54.0/26		info@netNC



## BGP communities

- LHCONEBGPFilteringServiceDefinition.pdf: LHCONE BGP Filtering Service Definition
- CommunityFilterTestPlan.pdf: BGP Filtering Test Procedure

Community	Type	Meaning	Notes
65001:XXXX	Operational	prepend 1x to ASxxxx	Mandatory
65002:XXXX	Operational	prepend 2x to ASxxxx	Mandatory
65003:XXXX	Operational	prepend 3x to ASxxxx	Mandatory
65010:XXXX	Operational	do not announce to ASxxxx	Mandatory
65011:0000	Operational	do not announce to any Tier-1	withdrawn
65012:XXXX	Operational	do not announce except to ASxxxx	Optional
(tierx-org-as):65101	Informational	Prefix originated by a Tier-1	Optional, set by the VRF
(tierx-org-as):65102	Informational	Prefix originated by a Tier-2	Optional, set by the VRF
(tierx-org-as):65103	Informational	Prefix originated by a Tier-3	Optional, set by the VRF
(tierx-org-as):65151	Informational	Prefix originated by a TierX in Europe	Optional, set by the VRF
(tierx-org-as):65152	Informational	Prefix originated by a TierX in Asia	Optional, set by the VRF
(tierx-org-as):65153	Informational	Prefix originated by a TierX in America	Optional, set by the VRF
(tierx-org-as):65201	Informational	Tier-X supporting ALICE	Optional, set by the Tier-X
(tierx-org-as):65202	Informational	Tier-X supporting ATLAS	Optional, set by the Tier-X
(tierx-org-as):65203	Informational	Tier-X supporting CMS	Optional, set by the Tier-X
(tierx-org-as):65204	Informational	Tier-X supporting LHCb	Optional, set by the Tier-X
20641:65160	Informational	Prefix of TierX connected to CERNlight	
(transit-as):65111	Informational	Prefix learned over MANLAN	Optional
(transit-as):65112	Informational	Prefix learned over Starlight	Optional
(transit-as):65113	Informational	Prefix learned over Netherlight	Optional
(transit-as):65131	Informational	Prefix learned over Atlantic link x	Optional
(transit-as):65132	Informational	Prefix learned over Atlantic link y	Optional
(transit-as):65133	Informational	Prefix learned over Atlantic link z	Optional

- Informational Communities are set by the VRFs.
- Operational communities are set by the Sites, according to their policies.
- 32 bit AS numbers are not currently supported by this schema
- tierx-orig must be set according to the physical location of the TierX site and not to the VRF it connects to

## VRF implementation recommendations

- NSP to NSP peerings should not apply BGP prefix filters.
- NSPs will apply prefix and packet filters to site peerings.
- Do not filter by prefix length.
- Sites may control their own BGP prefix advertisements using LHCONE community based BGP filtering.

## Monitoring

- CERNlight: <https://netstat.cern.ch/monitoring/network-statistics/ext/?p=LHCOPN&q=Tiers2-LHCONE&mn=CERNlight->
- ESnet: <https://stats.es.net/graphite/> (choose the router aofa-sdn1 interface xe-7/1/0 and navigate the subinterface list using the VLAN IDs)
- ESnet LHCONE site metrics: <https://my.es.net/collaborations/lhcone>

- LHCONE-ESnet-Address-Filtering-Detail.pdf: LHCONE unroutable sources data March 2018
- LHCONE-Filterdata-10-2018.pdf: LHCONE unroutable sources data October 2018

## Operational model design

Here, you can find the different attempts to set-up an operational model that scales with the size of LHCONE

- a third version taking into account comments and remarks  
LHCONE\_VRF\_Operational\_Handbook-v0.7.pptx.
- LHCONE-RouterVisOct2017.svg: LHCONE Layer 3 map Oct. 2017
- LHCONE-RouterVisFeb2018.svg: LHCONE Visualization Feb. 2018
- LHCONE-RouterVisOct2018.png: LHCONE Visualization Oct. 2018

---

This topic: LHCONE > LhcOneVRF

Topic revision: r241 - 2019-10-30 - unknown



Copyright &© 2008-2019 by the contributing authors. All material on this collaboration platform is the property of the contributing authors.

Ideas, requests, problems regarding TWiki? Send feedback