

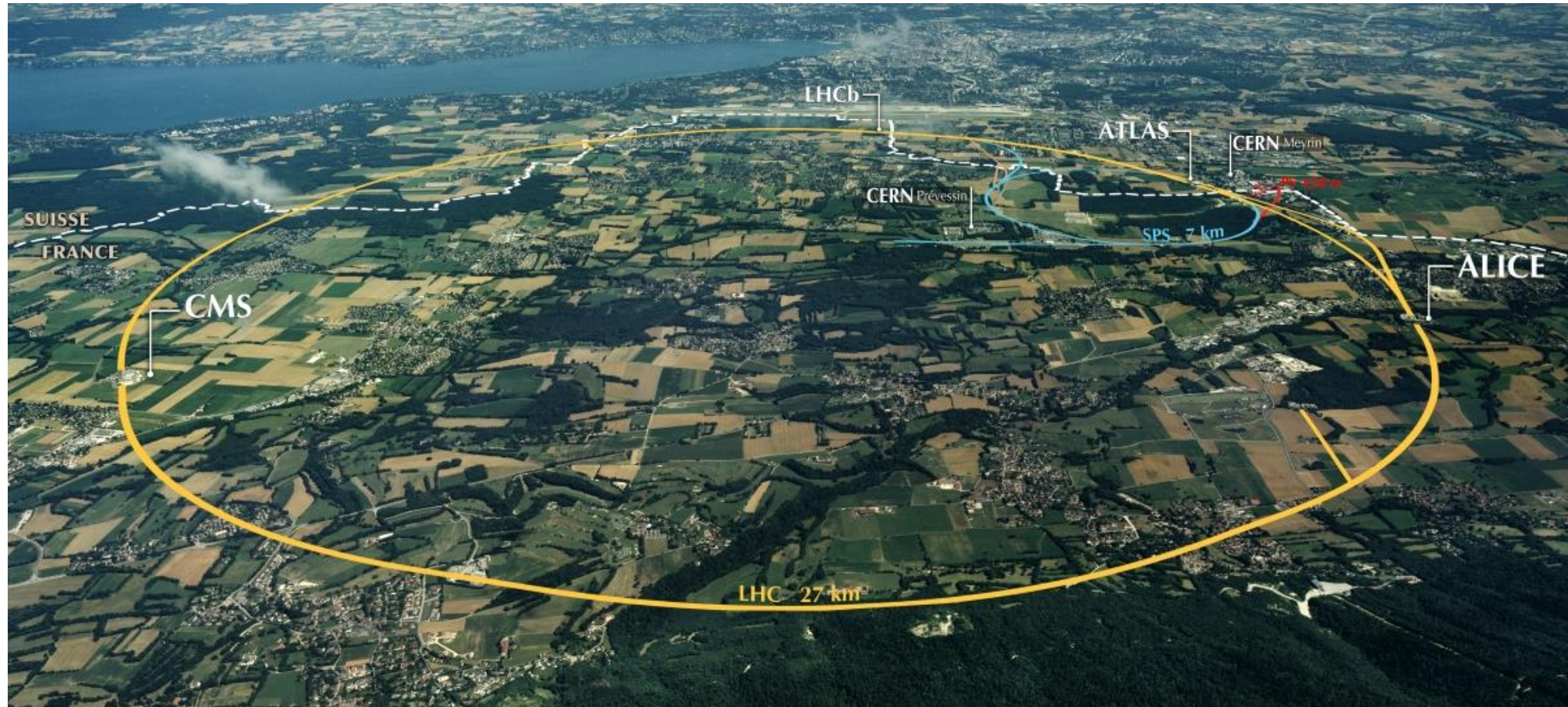
AI-ML for Network Problem Identification

Mentors:

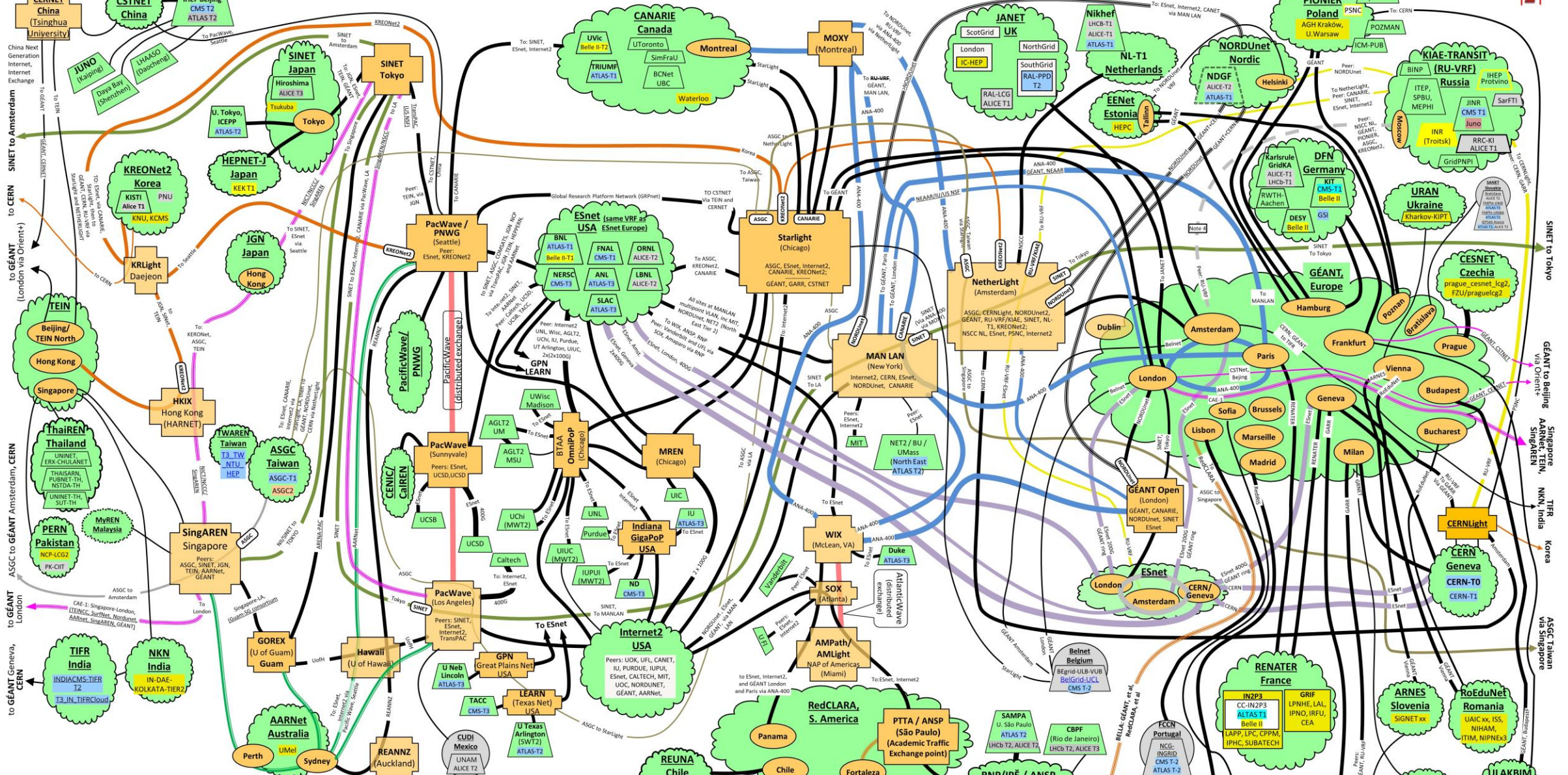
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LHC data generation



LHCONE L3VPN: A global infrastructure for High Energy Physics data analysis (LHC, Belle II, Pierre Auger Observatory, NOvA, XENON, JUNO)



LHCONE Map Ver. 6.0, 2022-11-15 – WEJohnston, ESnet, wej@es.net

Legend:

- Color-coded circles:** LHCONE VRF domain/aggregator - A provider network.
- Color-coded lines:** Connector network - provides, e.g., an L2 path between VRFs.
- Blue circles:** Provider network PoP router.
- Blue circles with dots:** WLCG sites that are not connected to LHCONE.
- Black lines:** NREN/site router at exchange point.
- Black lines with dots:** Communication links: $100G=1.5pt, 100G=4pt, 200G=5pt, 400G=6pt, 800G=7.5pt$
- Single dashed lines:** Underlined link information indicates link provider, not use.
- Double dashed lines:** Double dash outline indicates distributed site.
- Grey dashed lines:** Future site.
- Orange squares:** Exchange point.

International infrastructure by provider/collaboration

- Black line:** various
- Green line:** AARNet
- Blue line:** GEANT
- Red line:** SINET, Japan, global ring
- Orange line:** ASGC, Taiwan
- Purple line:** ESnet transatlantic, USA
- Light blue line:** NICT/NCCC/SingAREN
- Dark blue line:** SINET
- Light green line:** NORDUnet
- Yellow line:** KIAE, Russia
- Light orange line:** KREONet2, Korea
- Light purple line:** BELLA: GEANT, et al
- Light red line:** RedCLARA, et al
- Light blue line:** ANA-300/400 - Various links provided by CANARIE, ESnet, GEANT, Internet2, NORDUnet, SURFnet, SINET, IU/NSF

Site Abbreviations:

- LHCb-T1:** LHC ALICE or LHCb site
- CNAF-T1:** LHC Tier 1 ATLAS and CMS
- Uchi:** LHC Tier 2/3 ATLAS and CMS
- KEK:** Belle II Tier 1/2
- JUNO:** JUNO
- UUNL:** Sites that are standalone VRFs

NOTES

- ONLY links involved in LHCONE are shown
- LHCOPN links are not shown on this diagram
- For map explanation see "Interpreting the LHCONE Map" at <https://www.dropbox.com/sh/padfo88j01rjz/AA0B5K8RlSH9fCjA4eCtea7d1d?dl=0>
- GEANT and CANARIE have shutdown the peering between their VRF and KIAE, as a result of the Ukraine war.

Additional Site Information:

- RedIRIS Spain:** PIC-T1, CIEMAT-LCG2, UAM-LCG2
- GARR Italy:** INFN Bari, Catania, Frascati, Legnaro, Milano, Roma1, Torino
- RENATER France:** IN2P3, ALTAIS-T1, Belle II, LAPP, LPC, CPPM, IPHC, SUBATECH
- ARNES Slovenia:** SIGNET xx
- RoEduNet Romania:** UAIC xx, ISS, NIKIFAK, ITIM, NIKIFEX3
- ULAKBIM Turkey:** Tubitak ATLAS-T2
- GRNET Greece:** Ioannina CMS-T2
- BREN Bulgaria:** BGGS-SUGrid CMS-T3
- KAUST Saudi Arabia:** DTN1

Performance monitoring with perfSONAR



Image: Hosts location on the world map

Aggregating and analyzing the data

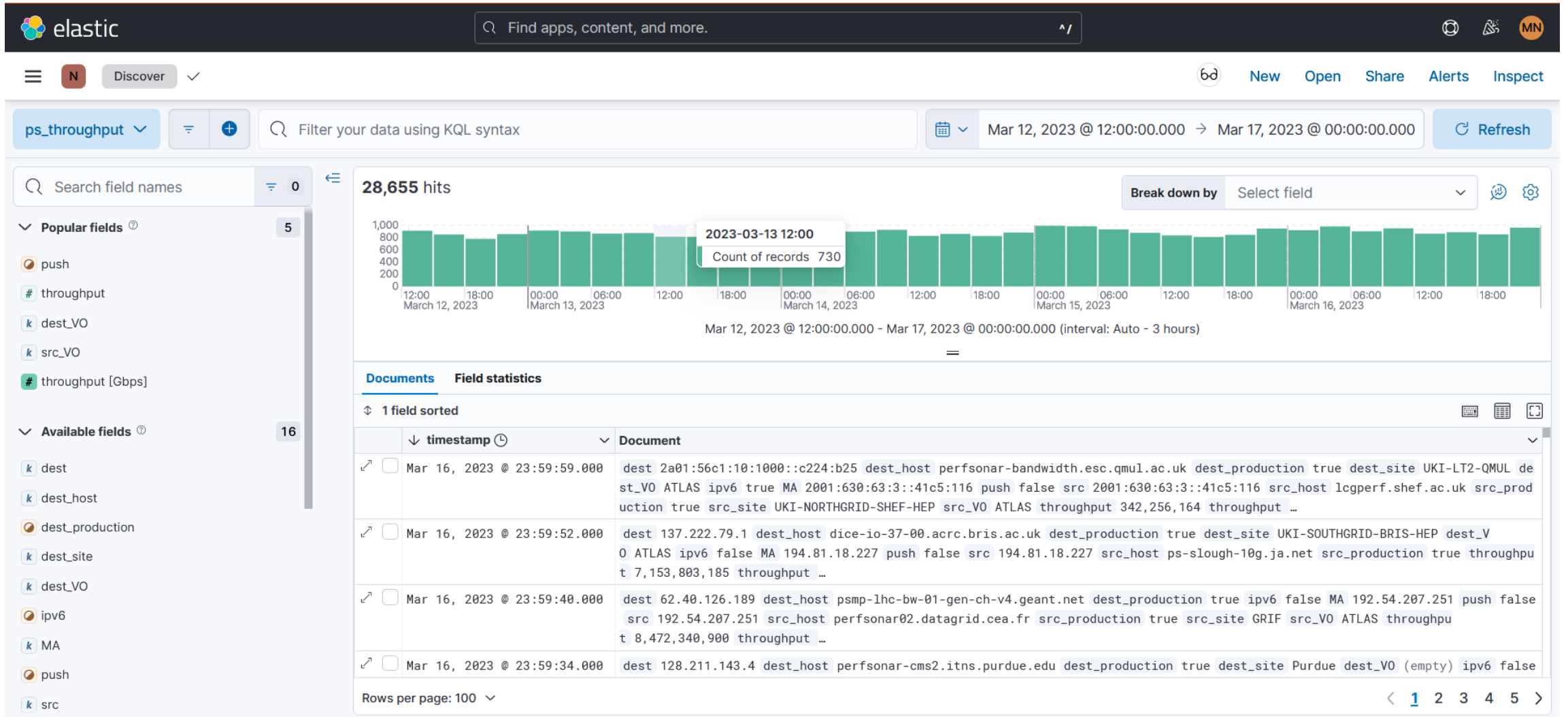
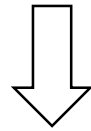


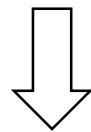
Image: Using Elasticsearch to monitor the status of the hosts

Project timeline

Learning about the existing analytics system, network measurement tools and associated data being archived into Elasticsearch



Exploration of various types of machine learning (ML) that could be suitable for analyzing the pre-created annotated datasets from the project



Training, tuning and evaluating one or more ML models to provide network event identification

Links

- LHCONE topology - <https://twiki.cern.ch/twiki/bin/view/LHCONE/LhcOneMaps>
- PerfSONAR stats - <https://stats.perfsonar.net/d/spFwAQi4z/perfsonar-public?orgId=2>
- Elasticsearch data - [link](#)

Extra slide - datasets

	push	MA	src	dest	src_host	dest_host	ipv6
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1	False	2400:4500:0:2::164c	2400:4500:0:2::164c	2001:67c:1bec:236::188	lhc-bandwidth.twgrid.org	btw-bw.t1.grid.kiae.ru	True
2	False	193.60.193.3	193.60.193.3	143.167.3.116	perfsonar.dur.scotgrid.ac.uk	lcgperf.shef.ac.uk	False

src_site	src_VO	src_production	dest_production	timestamp	throughput	dest_site	dest_VO	throughput_Mb	dt
PRAGUELCG2	ATLAS	True	True	1675105879000	3.162099e+09	None	None	3162.0	2023-01-30 19:11:19
TAIWAN-LCG2	ATLAS	True	True	1675107697000	4.840272e+08	RRC-KI-T1	ATLAS	484.0	2023-01-30 19:41:37
UKI-SCOTGRID-DURHAM	ATLAS	True	True	1675103389000	3.752229e+09	UKI-NORTHGRID-SHEF-HEP	ATLAS	3752.0	2023-01-30 18:29:49