StarLight SDX

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La Jolla, California
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Selected Applications

GENI
www.geni.net

GLEON
www.gleon.org

USGS EROS
www.usgs.gov/
centers/eros

NEON
www.neonscience.
org

Open Storage Network
www.openstorage
network.org

OSiRIS
www.osris.org

XSEDE
www.xsede.org

Blue Waters
bluewaters.ncsa.
illinois.edu

PRAGMA
www.pragma-
grid.net

CENTRA
www.global
centra.org

OSG
www.openscience
grid.org

GRP
theglobalresearch
platform.net/

PRP
pacificresearch
platform.org

CHASE-CI
www.calit2.net/
newsroom/artic
le.php?id=2910

SAGE2
sage2.sagecommons.
org

Polar Geospatial Center
www.pgc.umn.edu

IceCube
icecube.wisc.edu

Chameleon
www.chameleon
cloud.org

Jetstream
www.jetstream-
cloud.org

Genomic Science Program
genomicscience.
energy.gov

LSST
www.lsst.org

Pierre Auger Observatory
www.auger.org

Belle II
www.belle2.org

**LBNF/DUNE/
ProtoDUNE**
lbnf.fnal.gov

NASA

ISS
www.nasa.gov/
station

SKA
www.skatelescope.
org

XENON
xenon.astro.
columbia.edu

NOvA
novaexperiment.
fnal.gov

Virgo
www.virgo-gw.eu

LIGO
www.ligo.caltech.
edu

Chameleon

SDSS
www.sdss.org

ALMA
www.alma
observatory.org

LHC
home.cern/science/
accelerators/large-
hadron-collider

LHCONE
twiki.cern.ch/twiki/bin
/view/LHCONE/
WebHome

LHCOPN
twiki.cern.ch/twiki/bin
/view/LHCOPN/
WebHome

IVOA
www.ivoa.net

Compilation by Maxine Brown and Joe Mambretti

STARLIGHT

International Federated Testbeds As Instruments for Computer Science/Network Science

- **The StarLight Communications Exchange Facility Supports ~ 25-30 Network Research Testbeds (Instruments For Computer Science/Networking Research)**

- **Software Defined Networking Techniques Are Used To Segment ("Slice") Distributed Virtual Environments**

- **StarLight Supports Two Software Defined Exchanges (SDXs), An NSF IRNC SDX & a Network Research GENI SDX (Global Environment for Network Innovations)**

- **The GENI SDX Supports National and International Federated Testbeds**

STARLIGHT SM

StarLight SDX Overview

- **This IRNC StarLight SDX Initiative Is Designing, Implementing, and Operating New Services For Global Data Intensive Sciences, Based On Emerging Next Generation Architecture and Technolgies, Including Virtualization, Orchestration, Segmentation (Slicing), Software Defined Resources, Programmability and Customization.**

- **These Macro Trends Enable Exchanges To Be Agile Platforms For Dynamic Services Provisioning, Real-Time Responsiveness, and Distributed Control Over Core Resources, Including By Applications, Edge Processes and Devices.**

This Project Is Transitioning Network Exchanges To

Open Innovation Platforms

STARLIGHT

StarLight – "By Researchers For Researchers"

StarLight: Experimental Optical Infrastructure/Proving Ground For Next Gen Network Services
Optimized for High Performance Data Intensive Science
Multiple 100 Gbps (60+ Paths)
StarWave
100 G Exchange
World's Most
Advanced Exchange
Multiple First of a Kind
Services and Capabilities

View from StarLight

Abbott Hall, Northwestern University's Chicago Campus

iCAIR

ST★RLIGHT℠

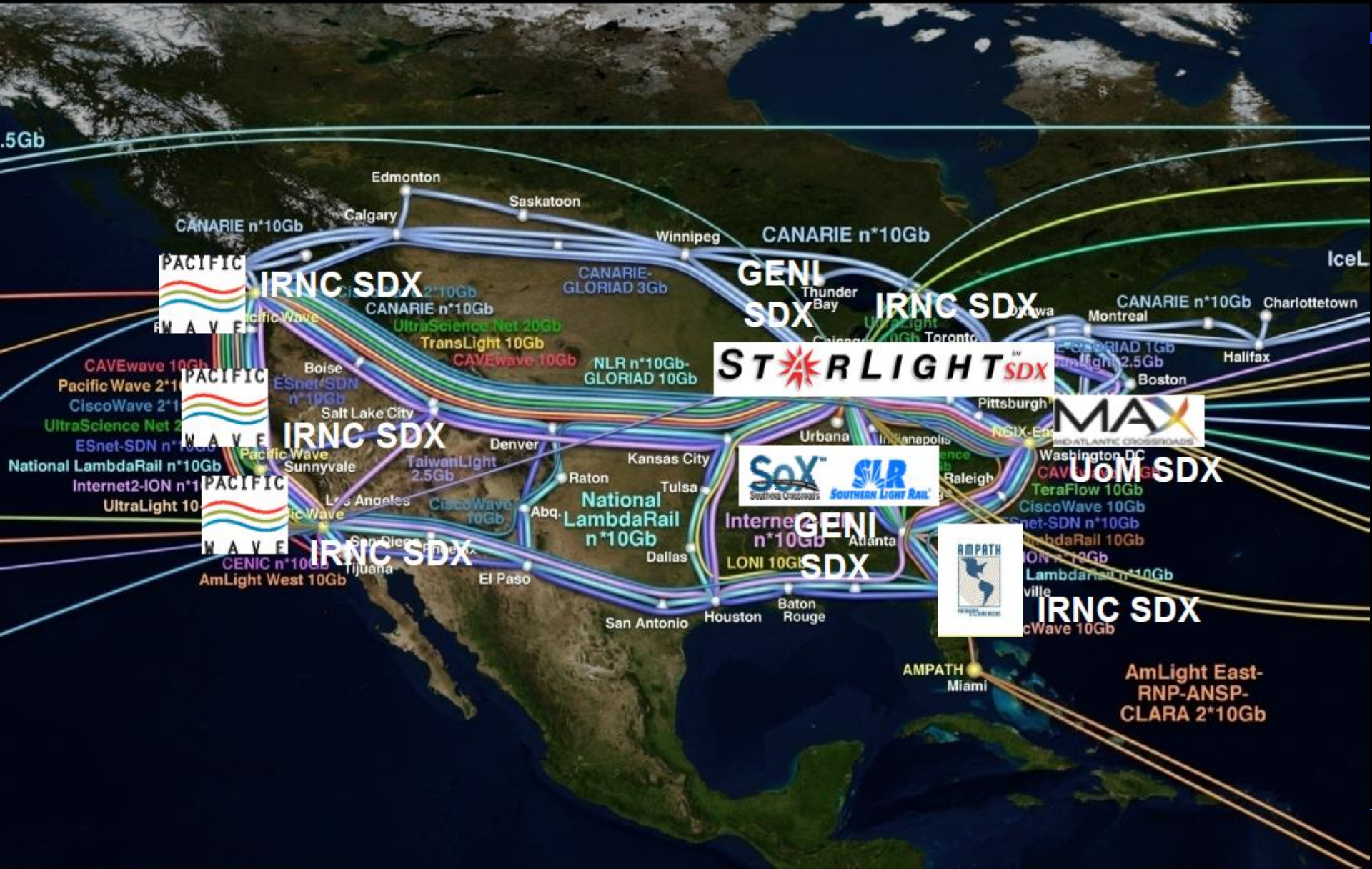# Global Research Platform: Global Lambda Integrated Facility Available Advanced Network Resources

iCAIR

www.glif.is

STARLIGHT

Emerging US SDX Interoperable Fabric

GLIF Automated GOLE Fabric 2018

LHC
(Chicago)

Research On Demand Network
(Chicago)
(Ottawa)
(Hanover)

NEAAR
(New York)
(London)

Geant Open
GÉANT
(London)

LHCOPN
(Chicago)

JGN
ICT Testbed Research and DevelopmentPromotion Center
(Japan)
(Los Angeles)

SINET5
SINET
(Japan)
(Los Angeles)

TransPAC
AMERICA CONNECTS TO ASIA
PACIFIC WAVE
(Tokyo)
(Seattle)

2X100G

CERN
(Geneva)

ESnet
Energy Sciences Network
(Chicago)

Montreal Open
canarie
(Canada)
(Chicago)

2X 100G

man LAN
(New York)

40G

NL Light
(Amsterdam)

NX100G

International SDN Networks & Testbeds
(Chicago)

CERNET
(China)
(Los Angeles)

10G

PACIFIC WAVE
(Chicago)
(Seattle)
(Los Angeles)
(Sunnyvale)

2x100G

NX100G

MAX
MID-ATLANTIC CROSSROADS
MAX/WIX
(D.C.)

SingAREN
(Singapore)
(Los Angeles)

GRPNet
(Chicago)
(Seattle)

STARLIGHT
The Optical STAR TAP
SDX Switches
(Chicago)

2X100G 3X100G 2X100G

NX100G

2X100G

INTERNET2
(Chicago)

NORDUnet
Nordic Infrastructure for Research and Education
(Nordic)
(Chicago)

2x10G

University of Hawaii
(Honolulu)
(Mauna)

REANNZ
(New Zealand)
(Auckland)

2x10G

ASGC
(Taiwan)
(Chicago)

2x10G

TWAREN
(Taiwan)
(Chicago)

KRE NET
(S. Korea)
(Chicago)

10G

CSTNET
中国科技网
China Science & Technology Network
(China)
(Chicago)

10G

OpenTransits Network
(France)
(Chicago)

AtlanticWave
(Miami)
(Atlanta)
(D.C.)
(New York)

SouthernLight
RNP
(Brazil)
(Sao Paulo)

aarnet
(Australia)
(Seattle)
(Los Angeles)

Federal Agency Networks, Regional Network
State Wide Networks, University Neworks, Testbed Networks
(Chicago)

ANA300

ESNet

Overlay Network

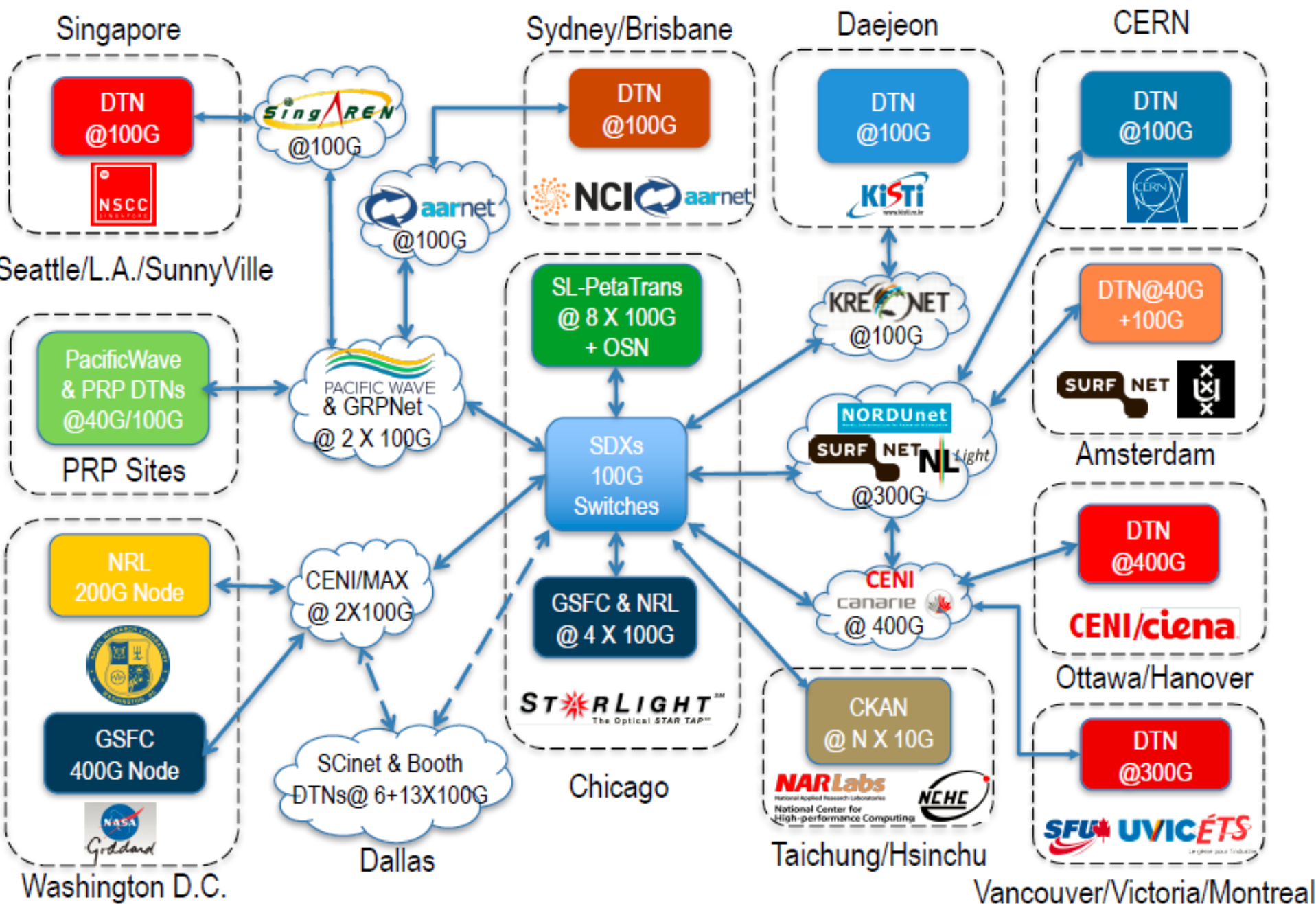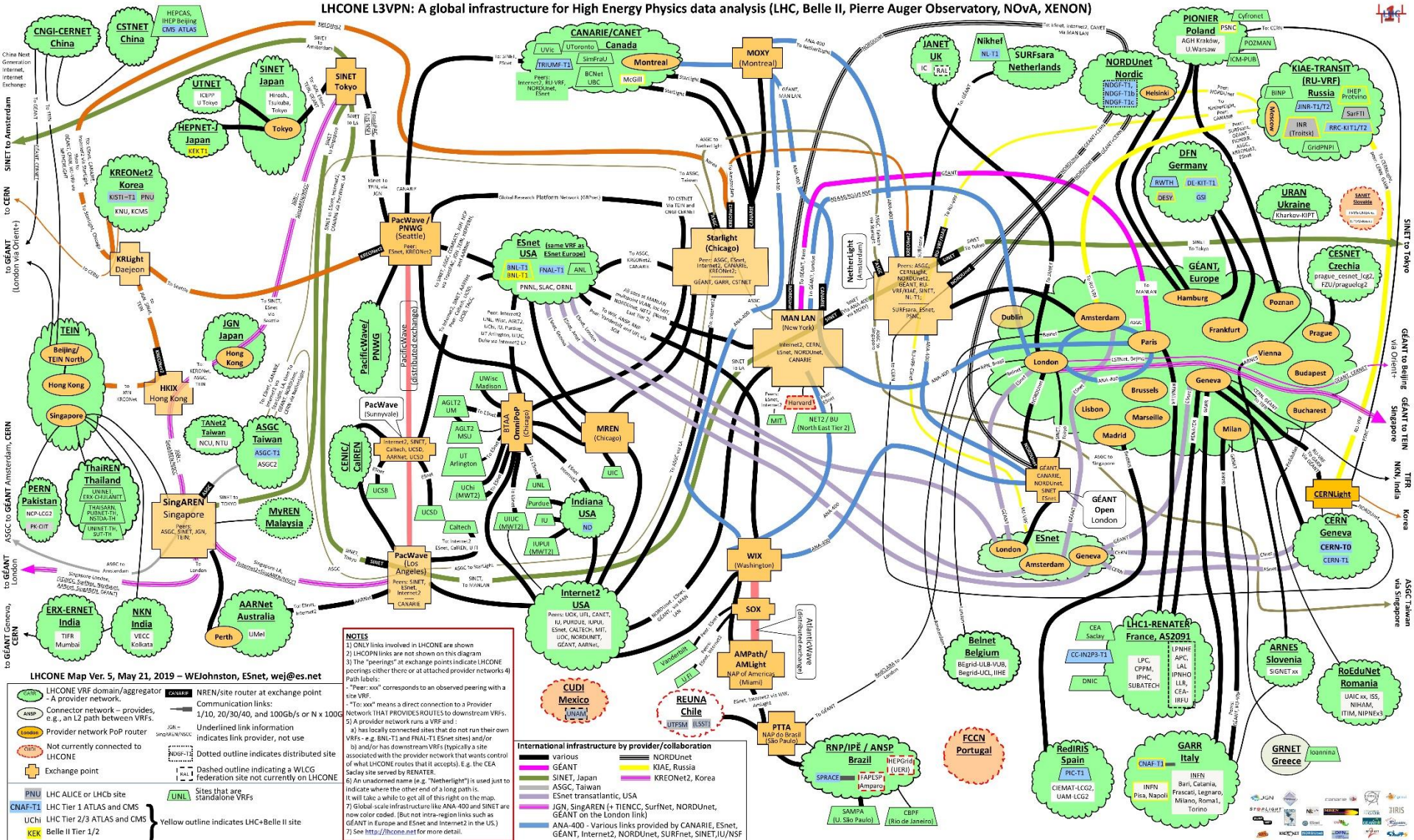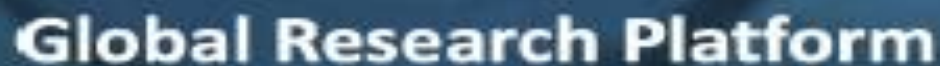100G If Not Specified

PetaTrans: Petascale Sciences Data Transfer

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

LHCONE Map Ver. 5, May 21, 2019 – WEJohnston, ESnet, wej@es.net

Next Generation Distributed Enviroment For Global Science

Global Research Platform

**Thanks to the NSF, DOE, NASA,
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STARLIGHT