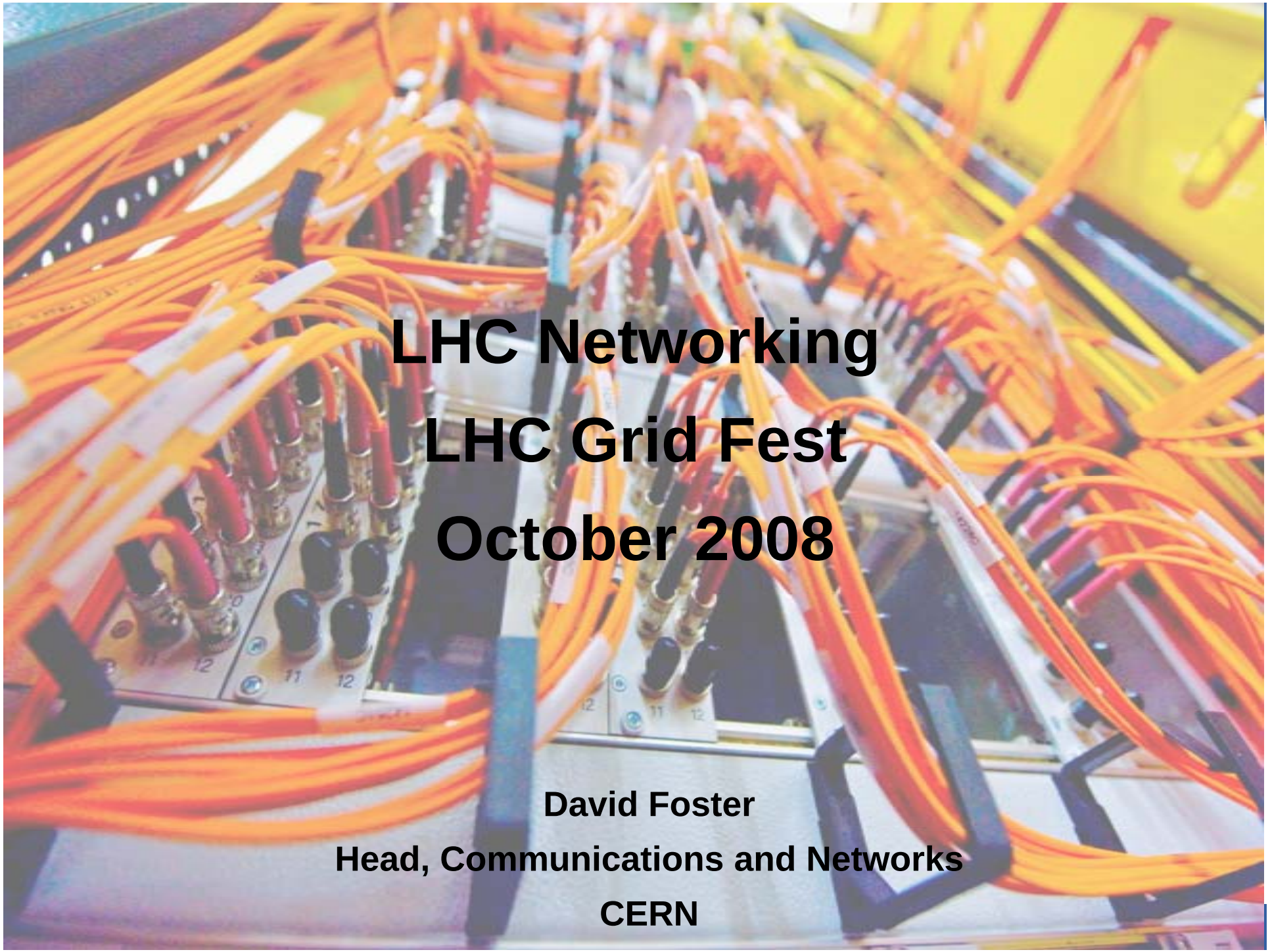
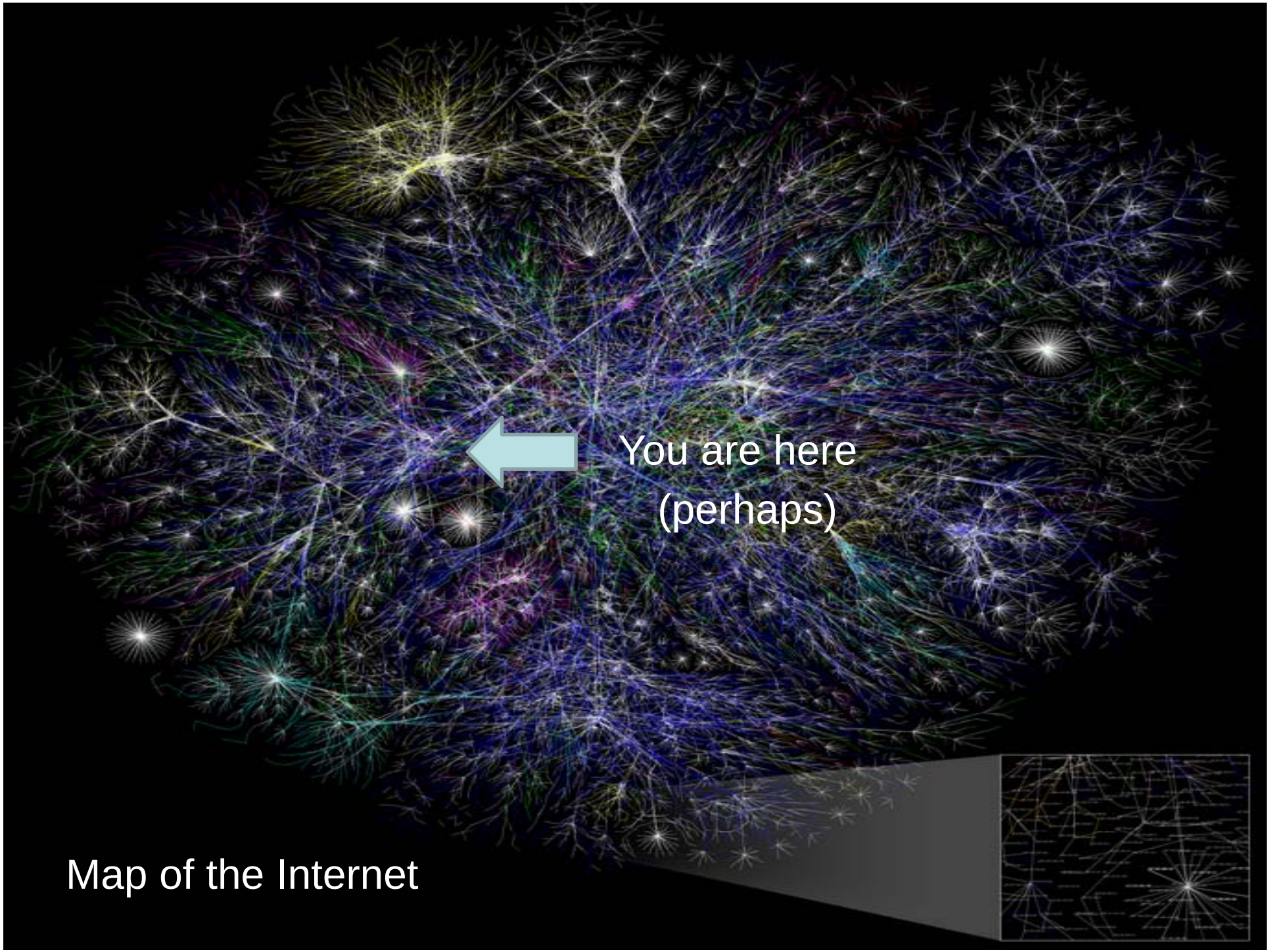


LHC Networking
LHC Grid Fest
October 2008

David Foster

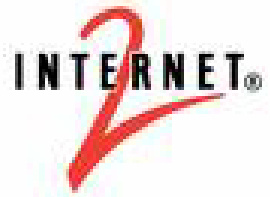
Head, Communications and Networks

CERN

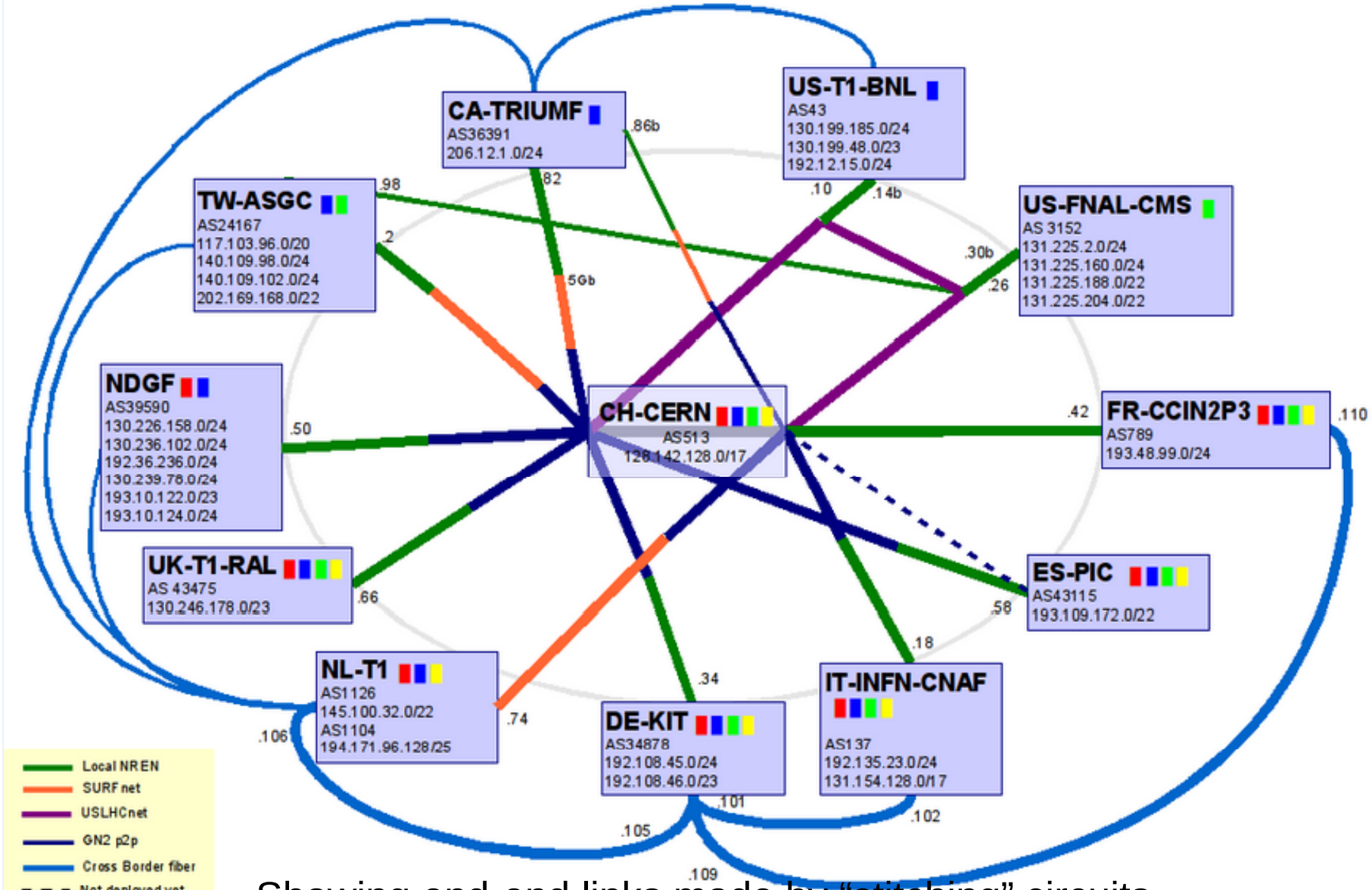


Map of the Internet

LHC Tier0-Tier1 Network Contributors



LHCOPN – current status

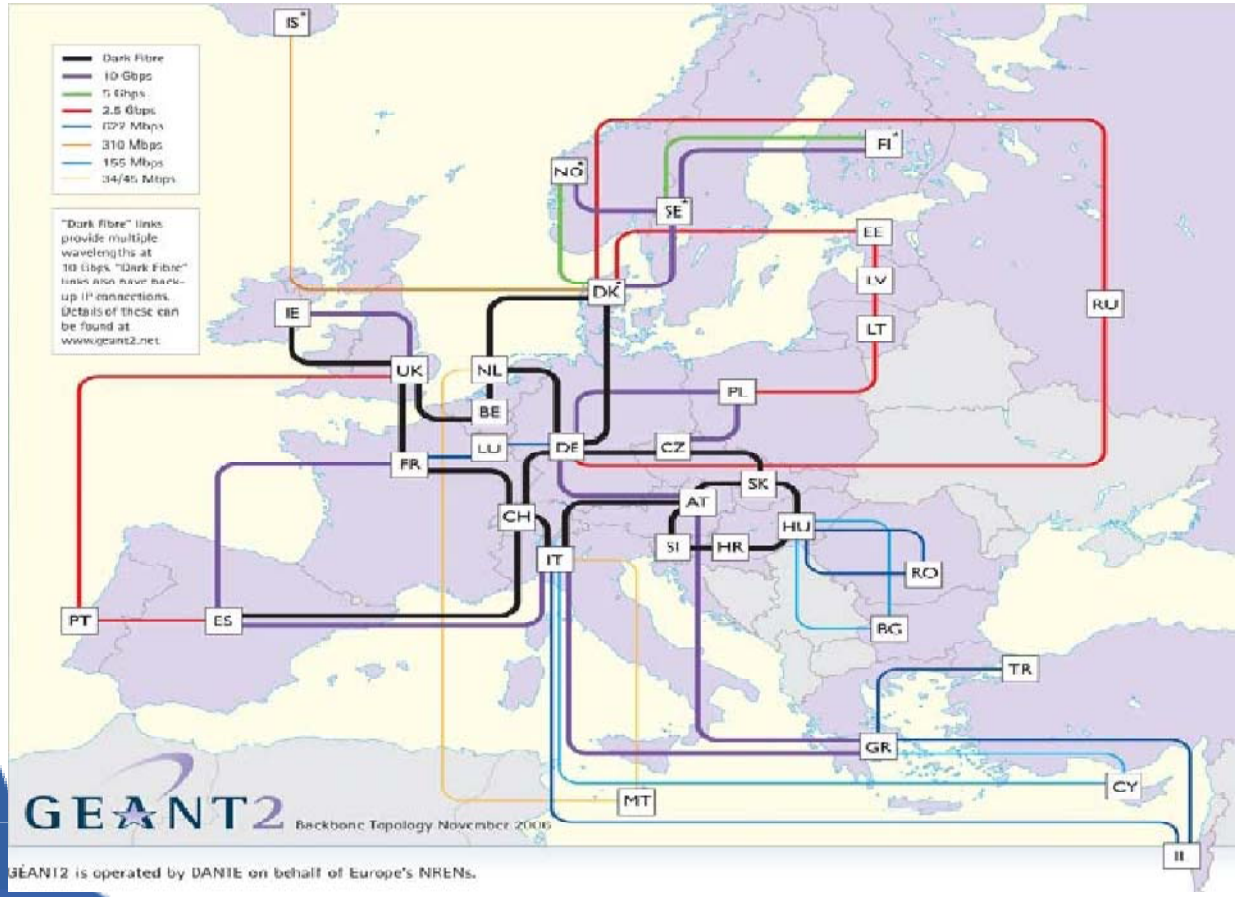


Showing end-end links made by “stitching” circuits together from different contributors and backup links for resiliency

edoardo.martelli@cern.ch 20080708

GÉANT2:
Consortium of 34 NRENs

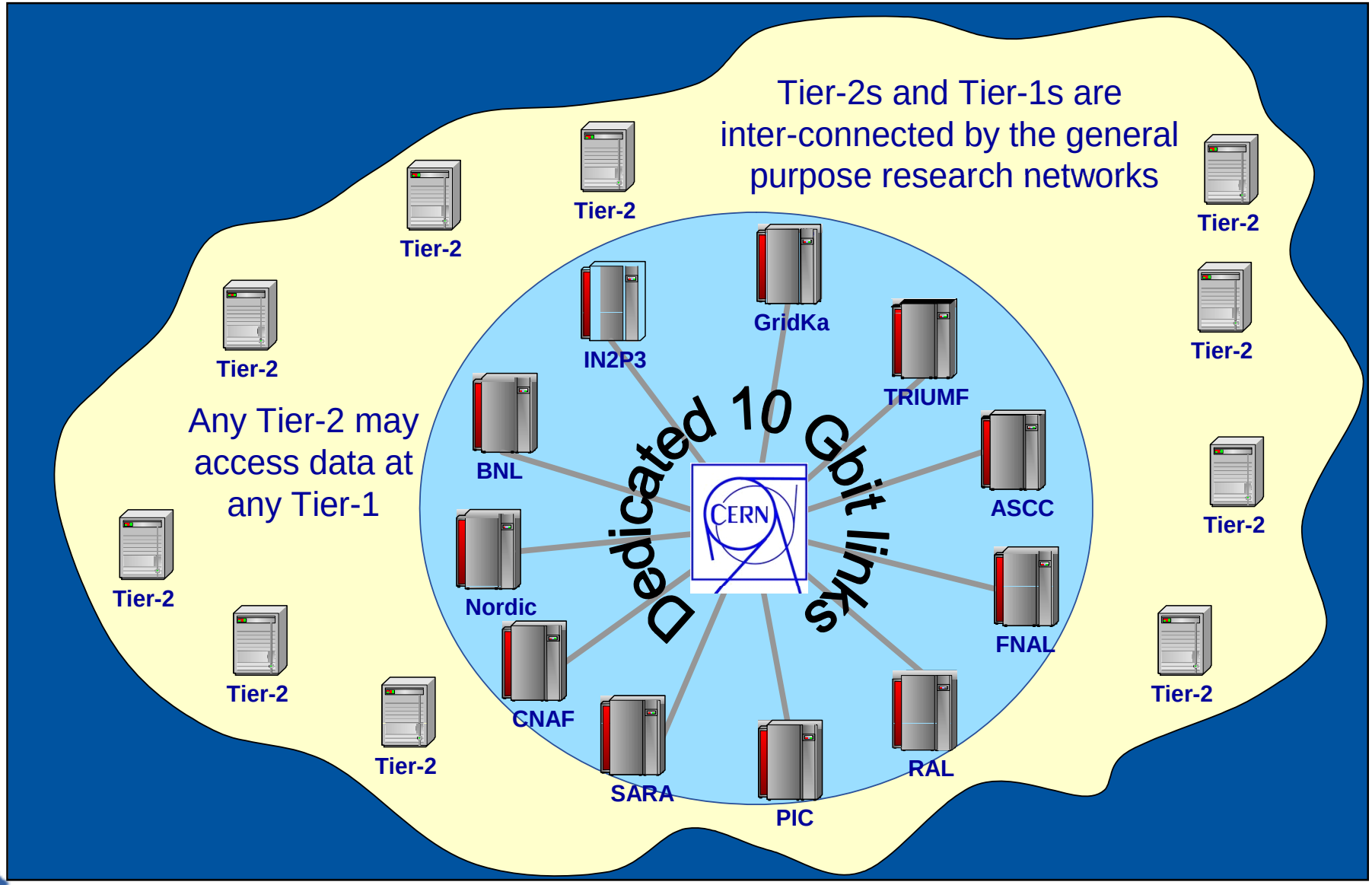
22 PoPs, ~200 Sites
38k km Leased Services, 12k km Dark Fiber
Supporting Light Paths for *LHC, eVLBI*, et al.



Dark Fiber Core Among
16 Countries:

- Austria
- Belgium
- Bosnia-Herzegovina
- Czech Republic
- Denmark
- France
- Germany
- Hungary
- Ireland
- Italy,
- Netherland
- Slovakia
- Slovenia
- Spain
- Switzerland
- United Kingdom

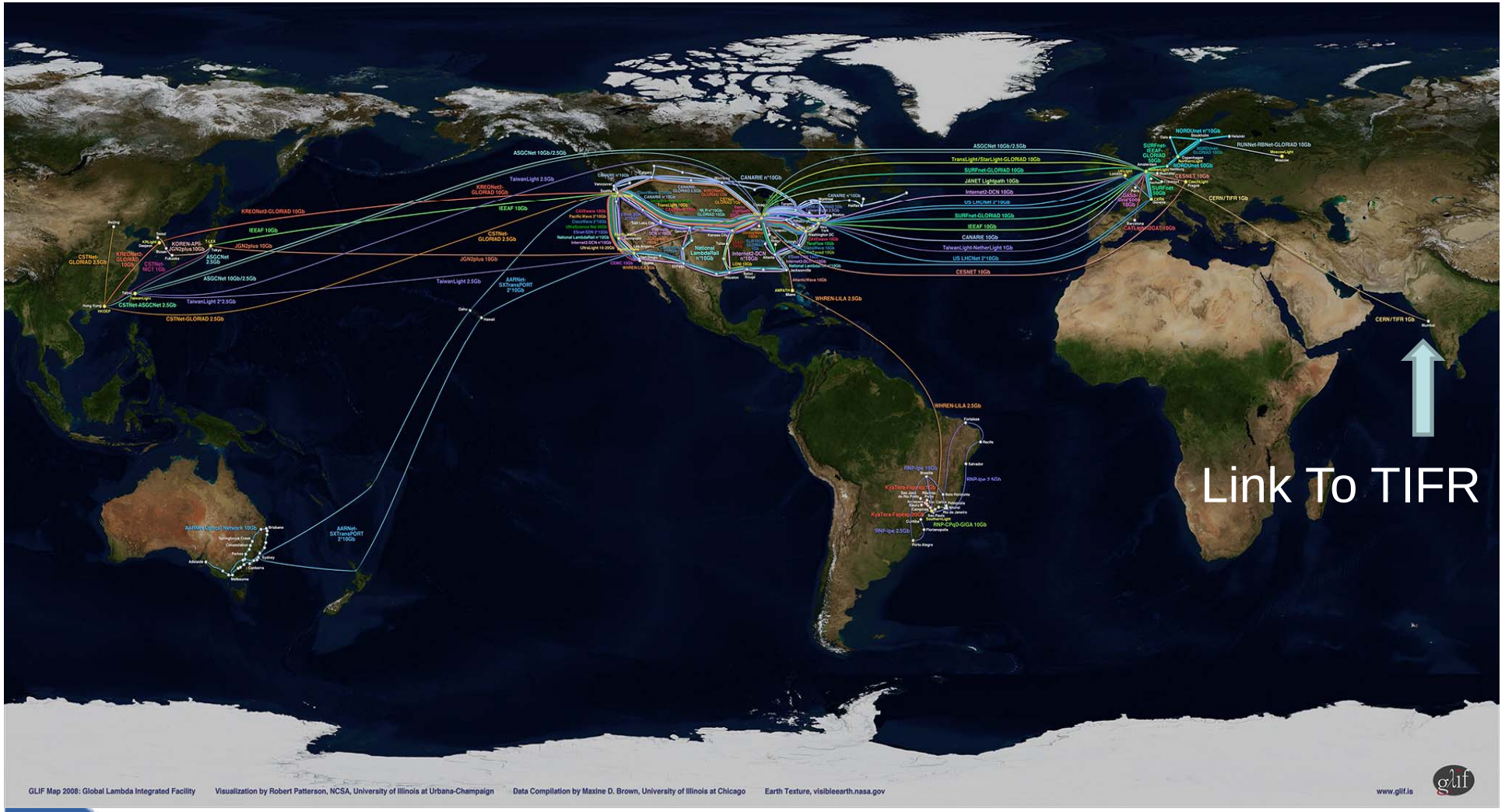
LHC OPN Architecture



Global Lambda Integrated Facility

World Map – May 2008

www.glif.is



Visualization courtesy of Bob Patterson, NCSA/University of Illinois at Urbana-Champaign.
Data compilation by Maxine Brown, University of Illinois at Chicago. Earth texture from NASA.

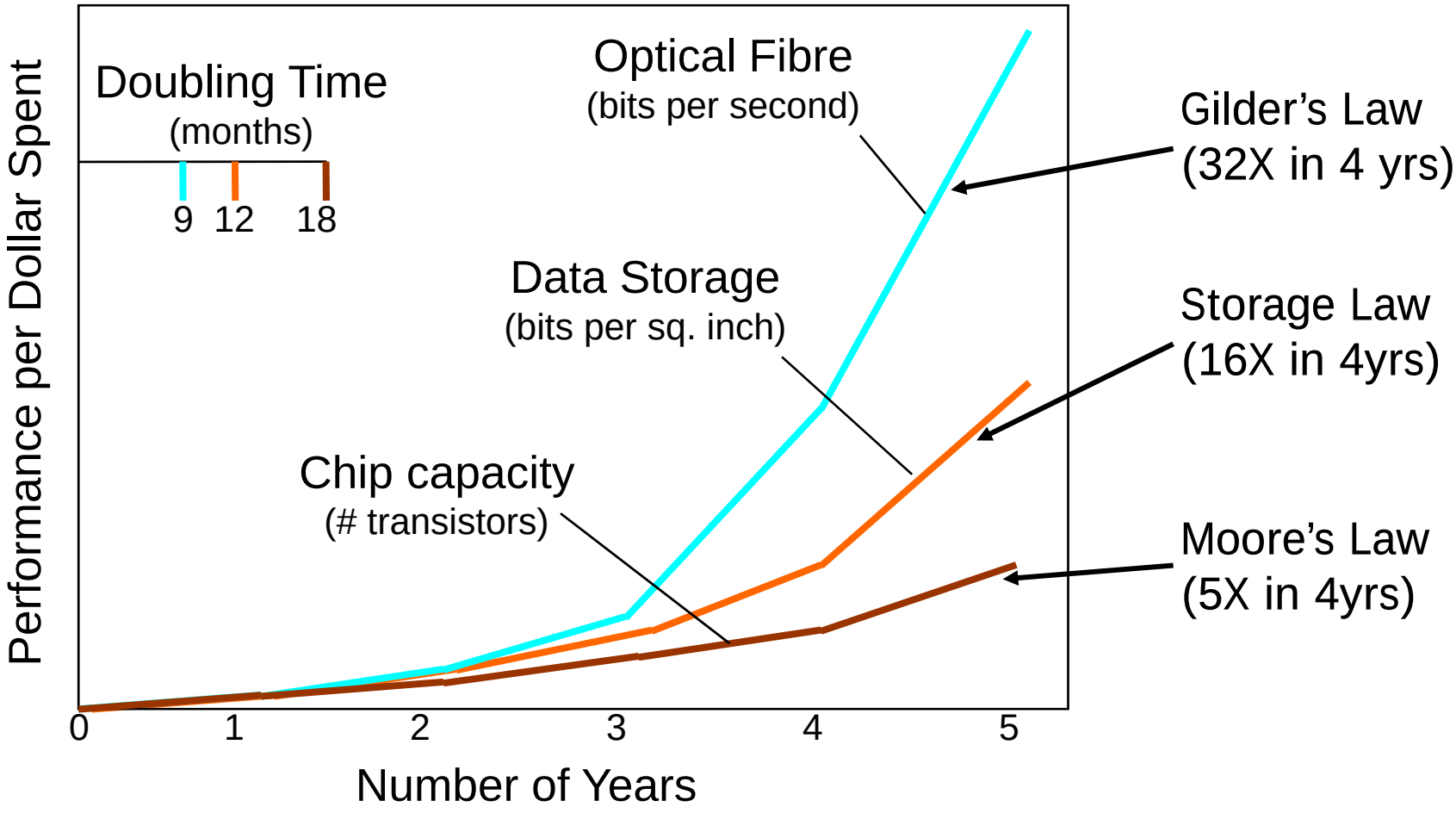
Harvey Newman

HEP Bandwidth Roadmap for Major Links (in Gbps): USLHCNet Example

Year	Production	Experimental	Remarks
2001	0.155	0.622-2.5	SONET/SDH
2002	0.622	2.5	SONET/SDH DWDM; GigE Integ.
2003	2.5	10-20	DWDM; 1 + 10 GigE Integration
2005-6	10-20	2-10 X 10	λ Switch; λ Provisioning
2007-8	3-4 X 10	~10 X 10; 100 Gbps	1st Gen. λ Grids
2009-10	6-8 X 10	~20 X 10 or ~2 X 100	100 Gbps λ Switching
2011-12	~20 X 10 or 2 X 100	~10 X 100	2nd Gen λ Grids Terabit Networks
2013-5	~Terabit	~MultiTbps	~Fill One Fiber

Paralleled by ESnet Roadmap for Data Intensive Sciences

Exponential Growth



Triumph of Light – *Scientific American*. George Stix, January 2001