

NSF-SCI: IRNC Translight/PacificWave

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International Task Force,
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SCI:IRNC: Translight/PacificWave (TL/PW)

- Cooperative Agreement [#0441119] under NSF IRNC Program
- PI John Silvester (USC); Co-PI Ron Johnson (UW)
- Other Key Partners
 - CENIC, Jim Dolgonas
 - PNWG, Jacqueline Brown
 - University of Hawaii, David Lassner
 - AARnet, George McLaughlin
- Approx \$1M per year for 5 years
- Awarded March 1, 2005
- Primary Objectives
 - Facilitate international R&E connections on US Pacific Coast
 - Build out PacificWave exchange capabilities to provide Engineering, Technical, and Operational support for International R&E networks participating in Pacific Wave Exchange
 - Assist in the termination of AARnet SXTransport links to SEA and LAX
 - Assist in buildout of Hawaii connectivity to Telescopes
 - Assist in operation of IEEAF link Tokyo-Seattle
 - Assist in operation and support of other International R&E networks participating in PW
 - Develop and operate advanced capabilities to support optical interconnect and exchange needs of R&E network



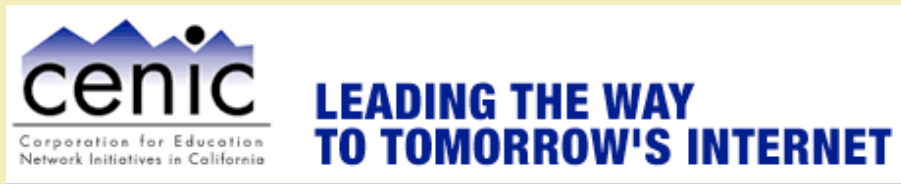
What is Pacific Wave?



- Pacific Wave is a state-of-the-art international peering facility designed to serve advanced research and education.
- Primary focus is interconnectivity among US R&E networks and International R&E networks from the Pacific Rim
- One of the objectives was the desire for all participants to be able to peer with each other which led to the “distributed exchange” design

Who Operates Pacific Wave?

A joint project of CENIC and Pacific Northwest Gigapop



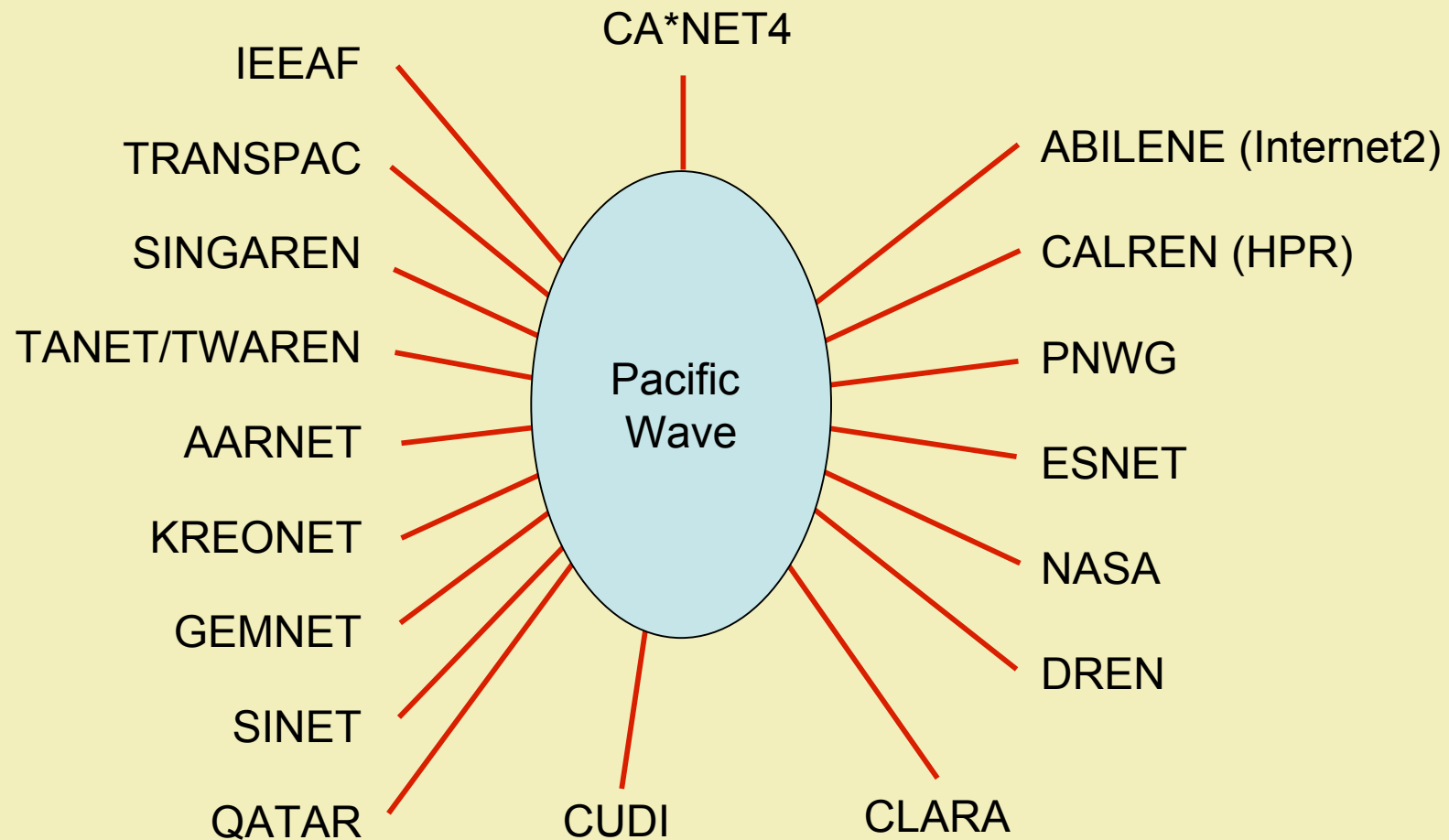
In collaboration with University of Southern California and University of Washington



Context of Pacific Wave

- The US States on the Pacific Coast [Alaska, Washington, Oregon, California, Hawaii] have collaborated in networking for several years. (e.g. US Pacific Consortium is an affiliate of APAN)
- Seattle, Los Angeles, and Sunnyvale are “natural” places for exchange points
- Many international links enter the US through Washington and California (and to a certain extent Hawaii although they tend to remain local there)
- Led to the development of Pacific Wave – a collaboration between CENIC and PNWG to build out exchange capabilities on West Coast.

“Layer 3” R&E Networks and Pacific Wave



Pacific Wave Layer 2 Exchange

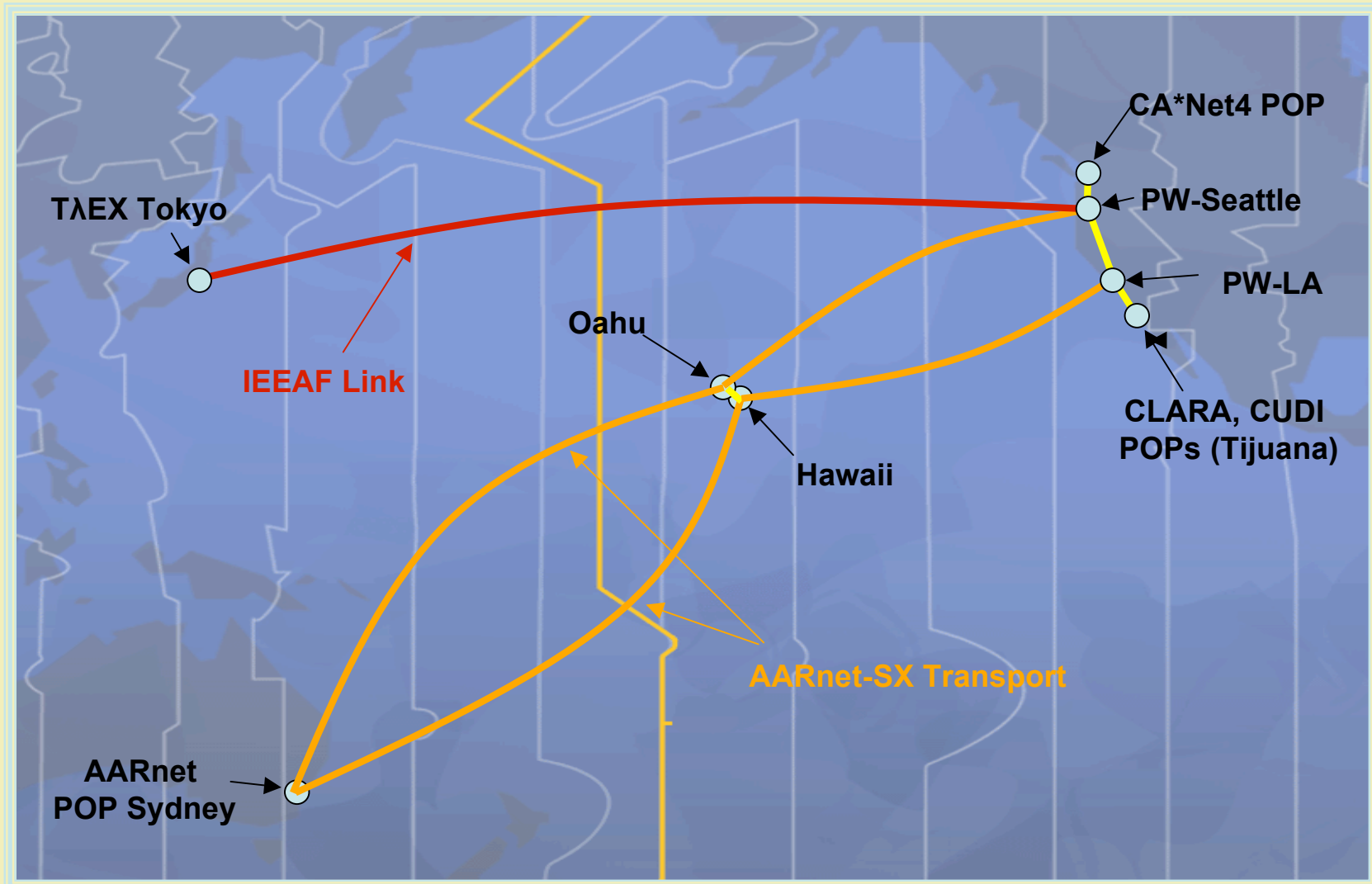


- Extensible peering exchange to allow layer 3 networks to peer easily over a layer 2 fabric
- Nodes (currently) in Seattle and Los Angeles Seattle, connected by a 10GbE wave provisioned over National LambdaRail (2,241 kilometers)
- AUP free
- Supports IPv4 and IPv6; multicast enabled
- Provides 24x7 NOC support.
- Priced consistently from node to node
- Allows participants to self-select their peering
- Allows participants to connect to one-location and access participants at all Pacific Wave nodes
- Supports advance applications
- Welcomes any research or development network that can meet the minimum network configuration requirements (connect with a router; support BGP; support jumbo-frames)

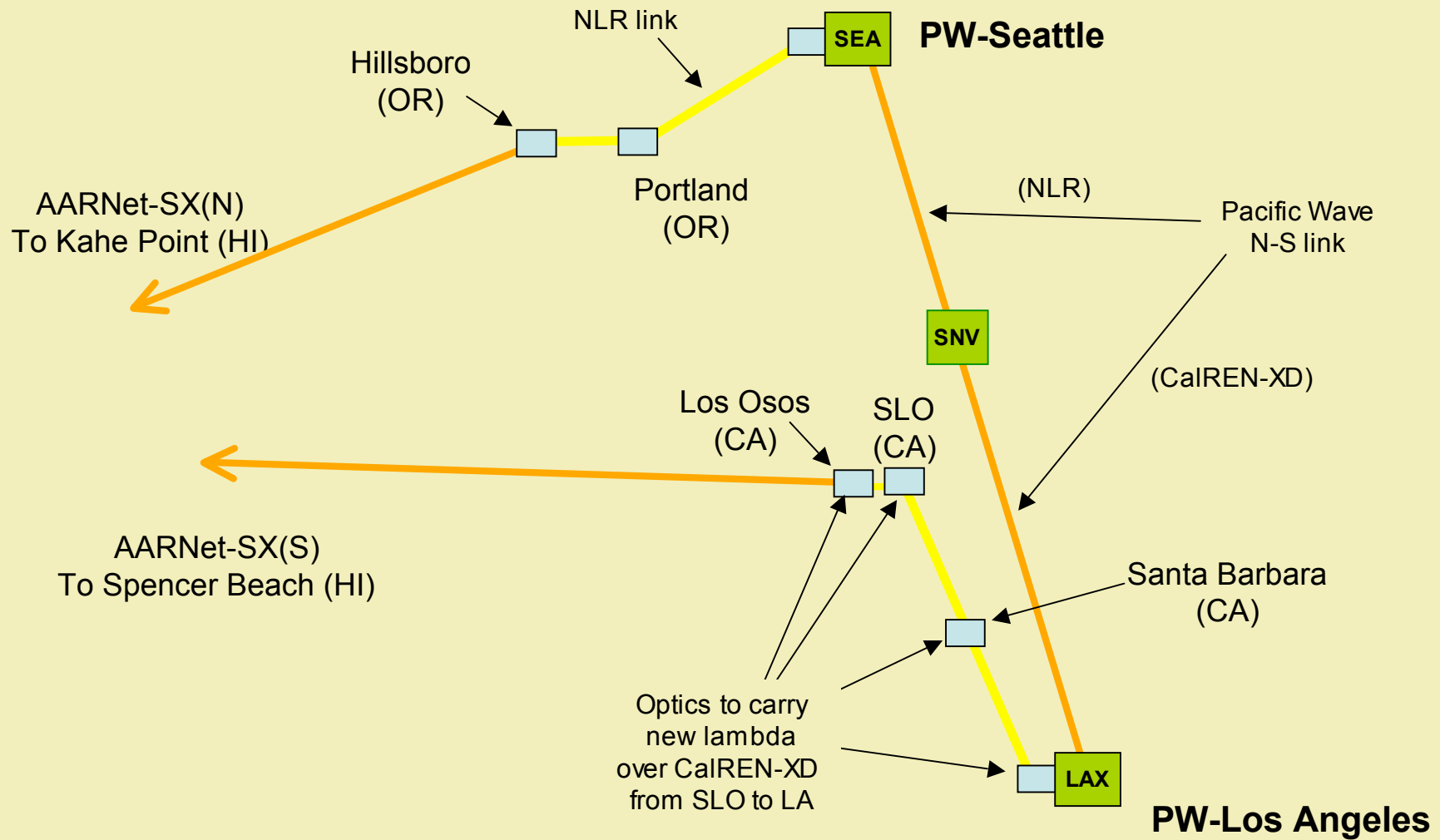
NSF-IRNC Grant [#0441119]

- Provides support [technical, engineering] for the enhancement of this model
- Provide support [equipment, backhaul, technical] to connect AARnet (SX-transport) to Pacific Wave in Seattle and Los Angeles
- Provides support for connecting Hawaii into SX-Transport links
- In out years, provides support for connection of other links (tbd)
- In out years, provides support for development of next generation [e.g. GLIF] capabilities in Pacific Wave

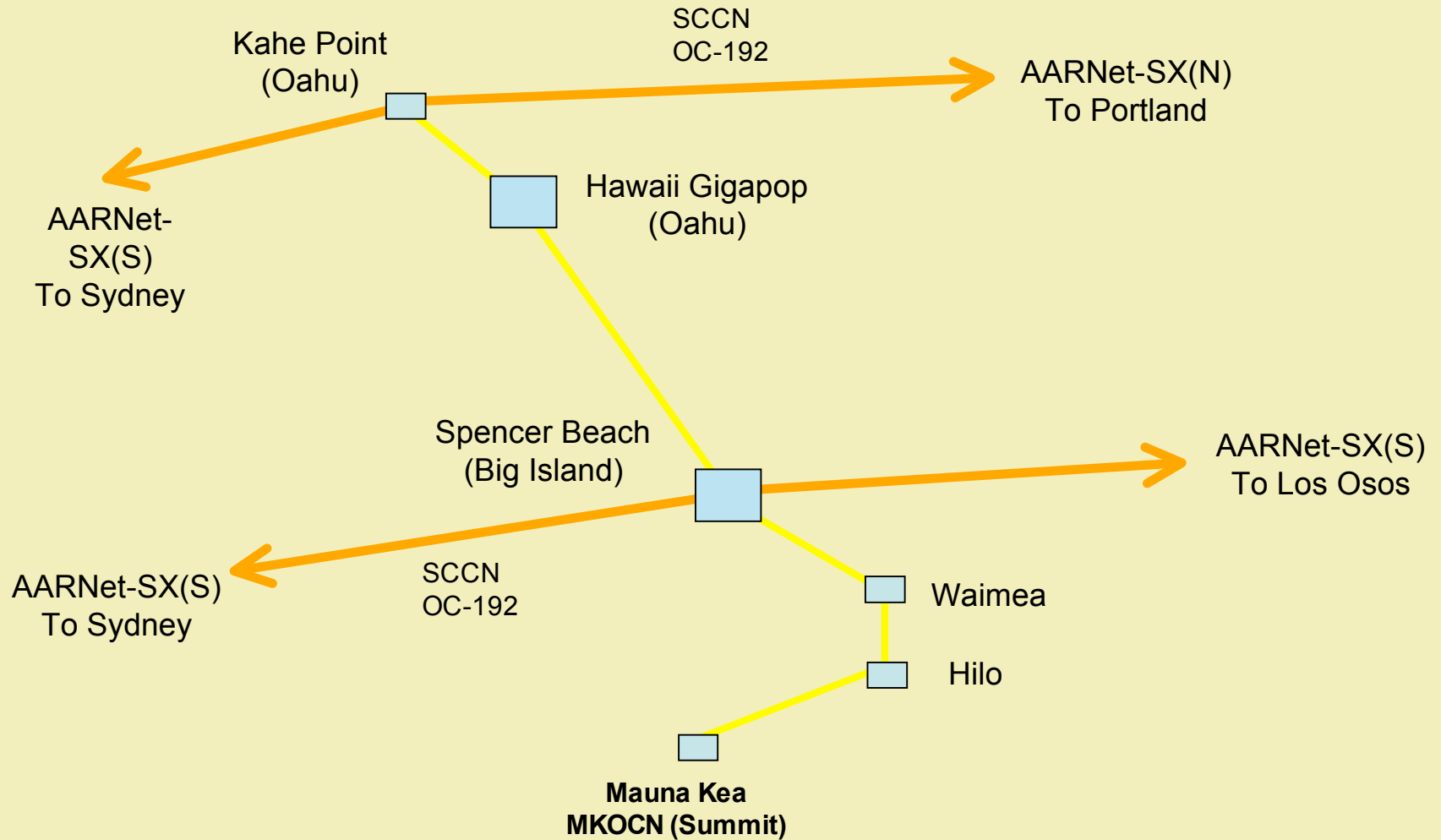
IRNC TL/PW 2005 Pacific Connections



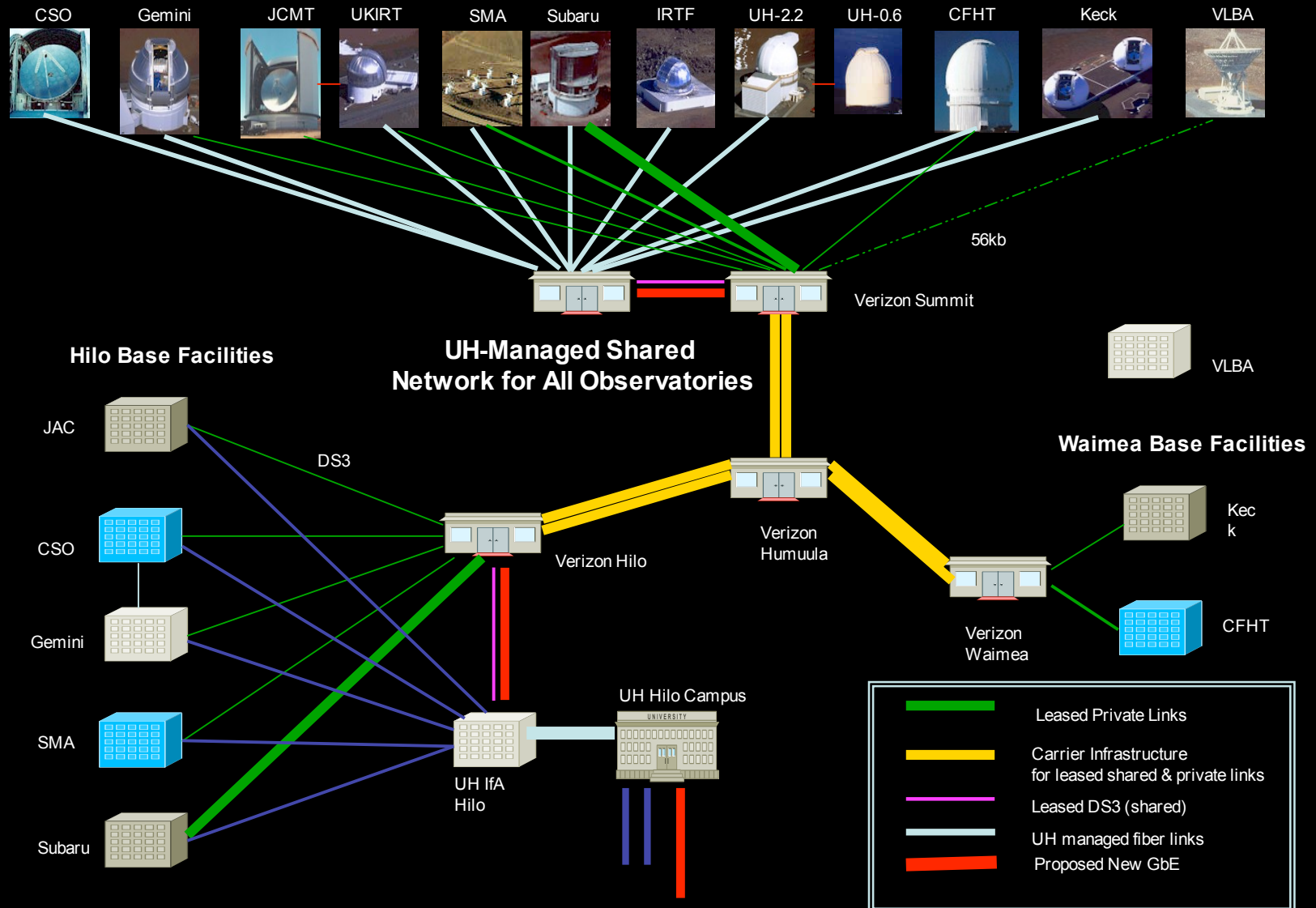
TL-PW – West Coast Detail



TL/PW – Hawaii Detail

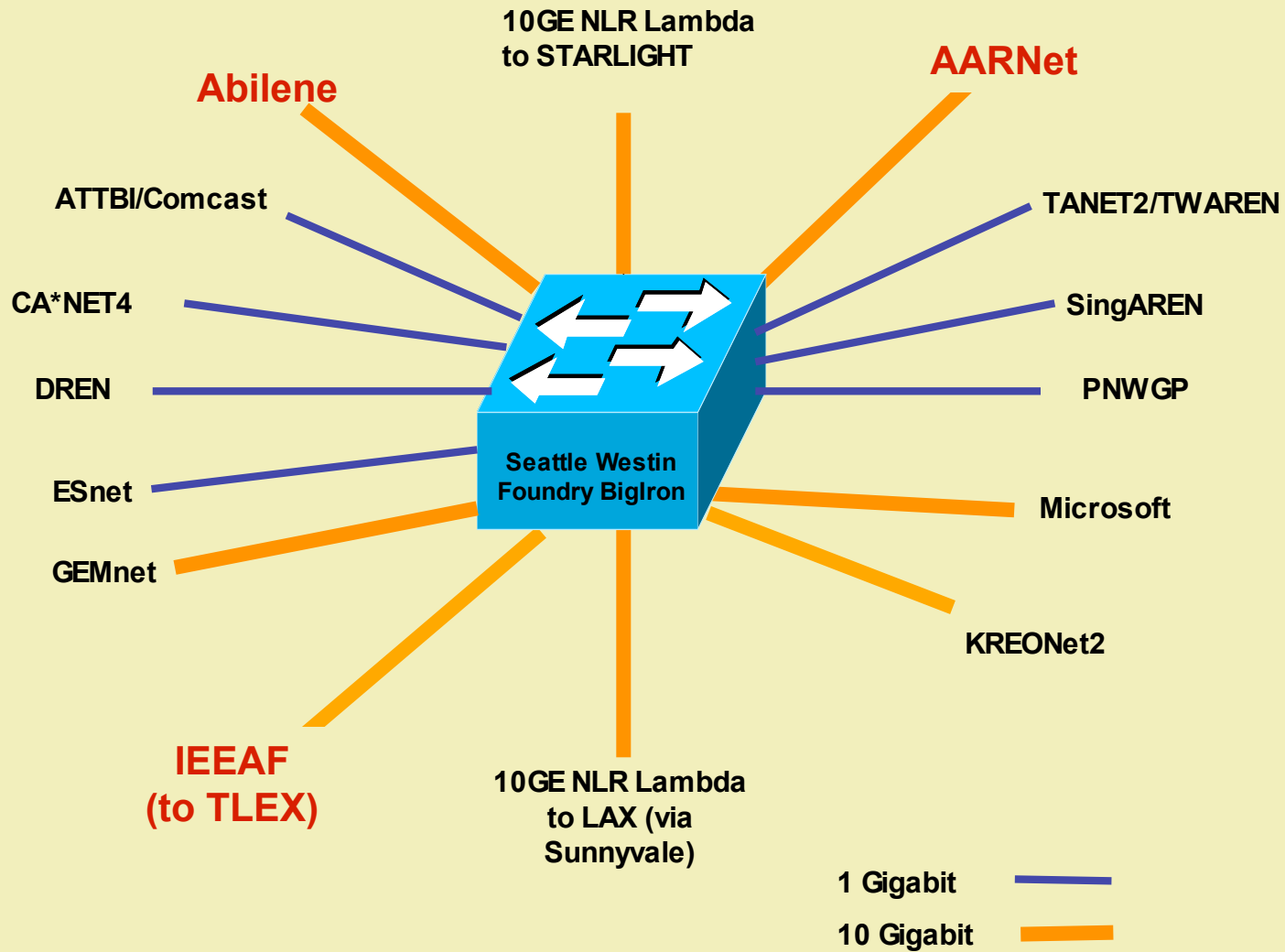


Mauna Kea Observatories Communication Network

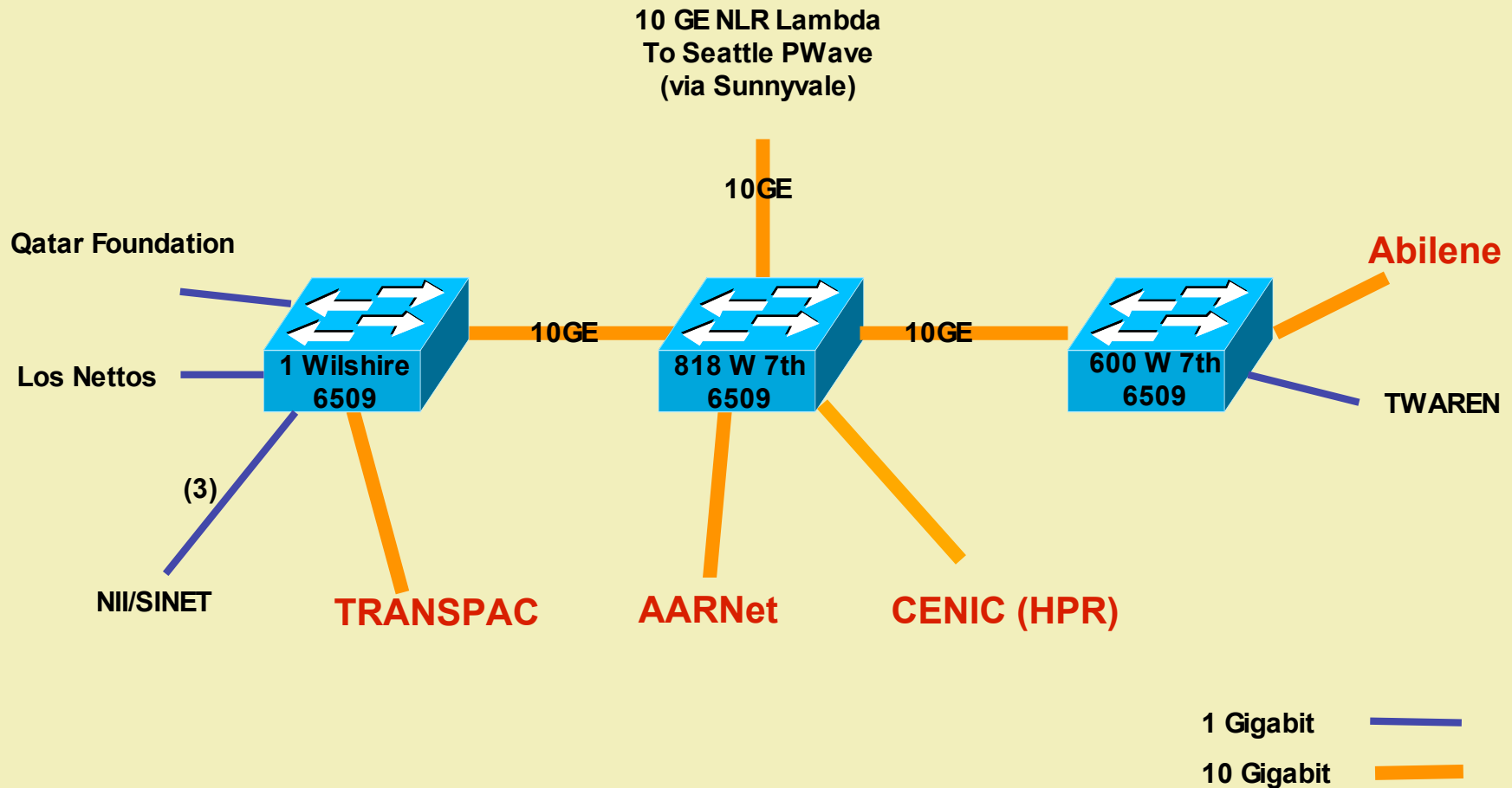


Internet2 Spring '05, International TF, 2005.04.02

Pacific Wave Seattle (expected by end of '05)



Pacific Wave Los Angeles (expected by end of '05)



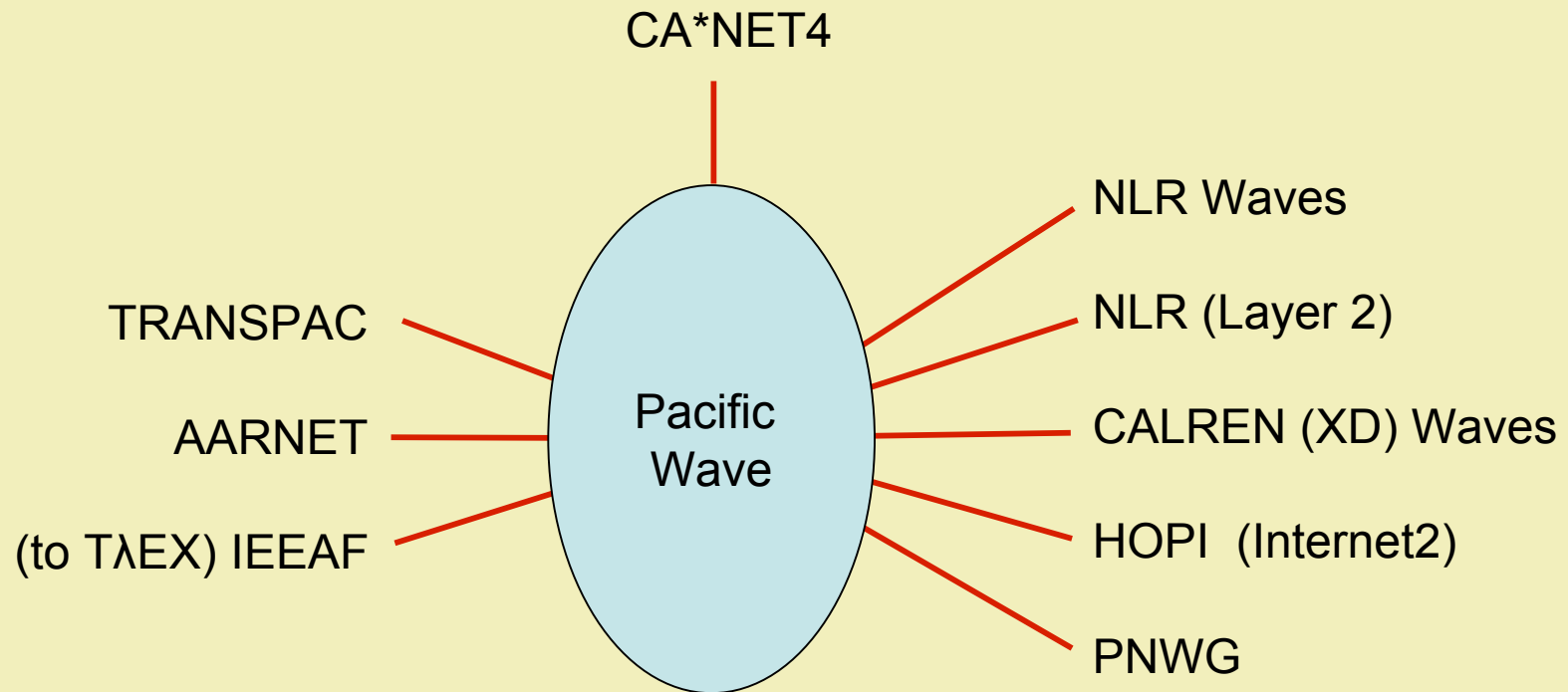
Status of TL/PW as of May '05

- Engineering and technical support through PNWG and CENIC for all International connections into Pacific Wave.
- Northern AARnet Link
 - Has been brought up on experimental basis using Procket Equipment
 - Hawaii linked in – some problems encountered, being resolved
 - Juniper routers in place for switchover once link is stabilized – est. May
- Southern AARnet Link
 - Plan is to backhaul from Los Osos through San Luis Obispo to PW-LA over CALREN as OC-192
 - Detailed configuration of Southern Link not finalized (in process)
 - Local challenges in Los Osos-SLO areas close to being resolved – estimated end of May
- Local connectivity in Hawaii.
 - Very limited resources available from this grant.
 - Ongoing negotiations with local players (David Lassner)

Pacific Wave and Layer 2 and Layer 1 Networks

- So far focus has been on Layer 3
- There is a lot of interest in Layer 2 (“lightpaths”) and Layer 1 (“waves” and “lambdas”) interconnect. [GLIF, etc]
- Most of the international “Layer 2” interconnect will likely actually occur at layer 1 (except for experiments)
- Pacific Wave participates in this GLIF community currently using patch-panel switching (!) Moving toward optical switching with nodes in SEA, SNY, and LA as financially possible.
- Links provisioned through Pacific Wave will be significant component of IGRID '05 (San Diego) and Supercomputing '05 (Seattle)

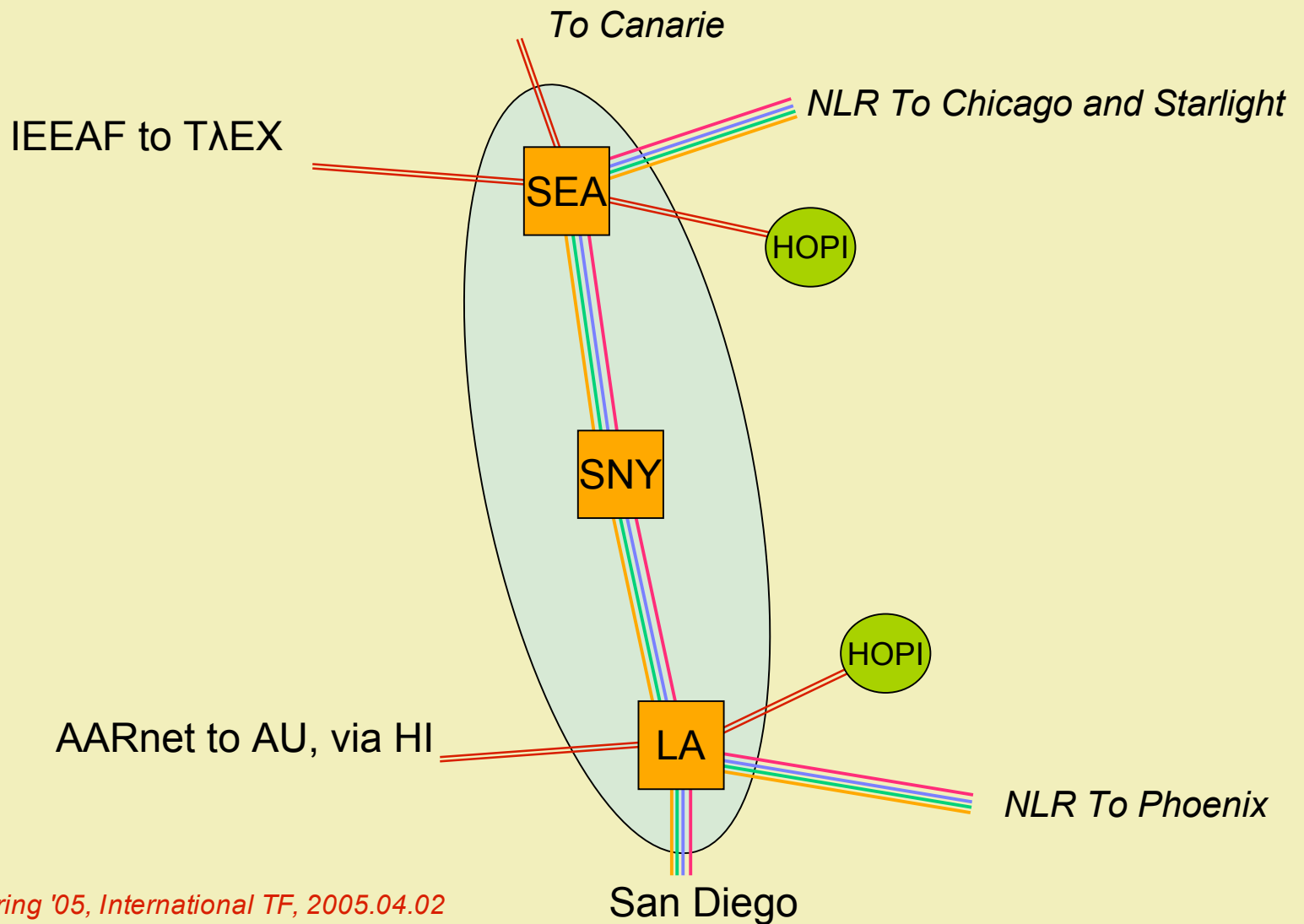
“Layer 2” and “Layer 1” Networks and PW



Many others in the
planning stages

Pacific Wave Lambda (Lightpath?) Exchange

Pacific WaLE ?



TRANSLIGHT/PACIFIC WAVE

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