OPTICAL NETWORK TESTBEDS WORKSHOP 3 (ONT3) Overview

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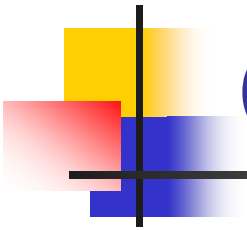
with Tomonori Aoyama, Keio University and NICT

Global Lambda Grid Consortium Annual Meeting –
Global Lambda Integrated Facility (GLIF)
Tokyo, Japan
September 11-13, 2006



ONT3

- Overview
- Goals
- Structure
- Research Directions
- Future Research Plans

Sponsorship

- Co-Sponsored by the US and Japan
- US: Department of Energy (DOE), National Science Foundation (NSF).
- Japan: National Institute of Information and Communications Technology (NICT)
- Co-Chair Was Tomonori Aoyama, Keio University and NICT
- Organized in cooperation with the Federal Large Scale Networking Coordination Group (LSN).
- NASA Ames Research Center Is Hosting the Web Site

Optical Services And Technologies

- The Basic Focus of ONT Workshop Focus Is On Optical Communications Services And Technologies L1, Lightpath Based (Wavelength-Based) Services,
- Not L3 or Other Networking Technologies, e.g., Wireless, Satellite, etc
- Optical Technology Has Been Widely Recognized As A Key Enabler Of a Wide Range of New Capabilities
- New R&D Continues to Make Advances By Discovery of New Methods
- This Area of Research Investigation Is A Key Initiative Related to Fundamental Reconceptualization of Basic Network Theory, Design, and Implementation

Optical Services and Technology Topics

- Topics (Structure) Within a Range of Time Horizon Perspectives
  - Future Research Plans (5-15 Year Horizon)
  - Basic Research and Experimentation (3-5 Year Horizon)
  - Early Prototypes (2-3 Year Horizon)
  - Early Pre-Production Implementations (1-2 Year Horizon)
  - Production Implementations (Current)
- International Issues
  - Services
  - Facilities
  - Exchange Points
  - Technologies

Workshop Organizational Background

- Workshop Is Being Organized To Build On Prior Workshops: the September 2005 Workshop on Optical Network Testbeds (ONT-2) and the 2004 ONT-1
- ONT-1 Provided An Overview of Directions in Optical Communications and Recommendations
- Ref:http://www.nren.nasa.gov/workshop7
- **ONT-2 Was Designed As a Forum That Could Assist In Creating the Means to Transition the Community and Its Networking Infrastructure to Leading Edge, Next Generation Optical Networks.**
- ONT-2 Developed Specific Frameworks for Community Actions In the Context of 5 Year Roadmaps
- ONT-2 Presented These Roadmaps Within Categories of Development, From Basic Research Testbeds to Early Implementations to Initial Production
- Ref: http://www.nren.nasa.gov/workshop8

ONT-3 Workshop Objectives

- ONT-3 Was Designed
  - To Continue the Efforts Initiated Through ONT-2
  - Emphasize the Theme of Next Generation International Optical Communications
  - Indicate the Contribution of These Concepts To the Wider Networking Context, e.g., Next Generation Designs and Experimental Testbeds
  - Drivers: New Applications, New Services, New Disruptive Optical Technologies
  - GENI/NICT New Generation Network/Distributed Facility Concepts

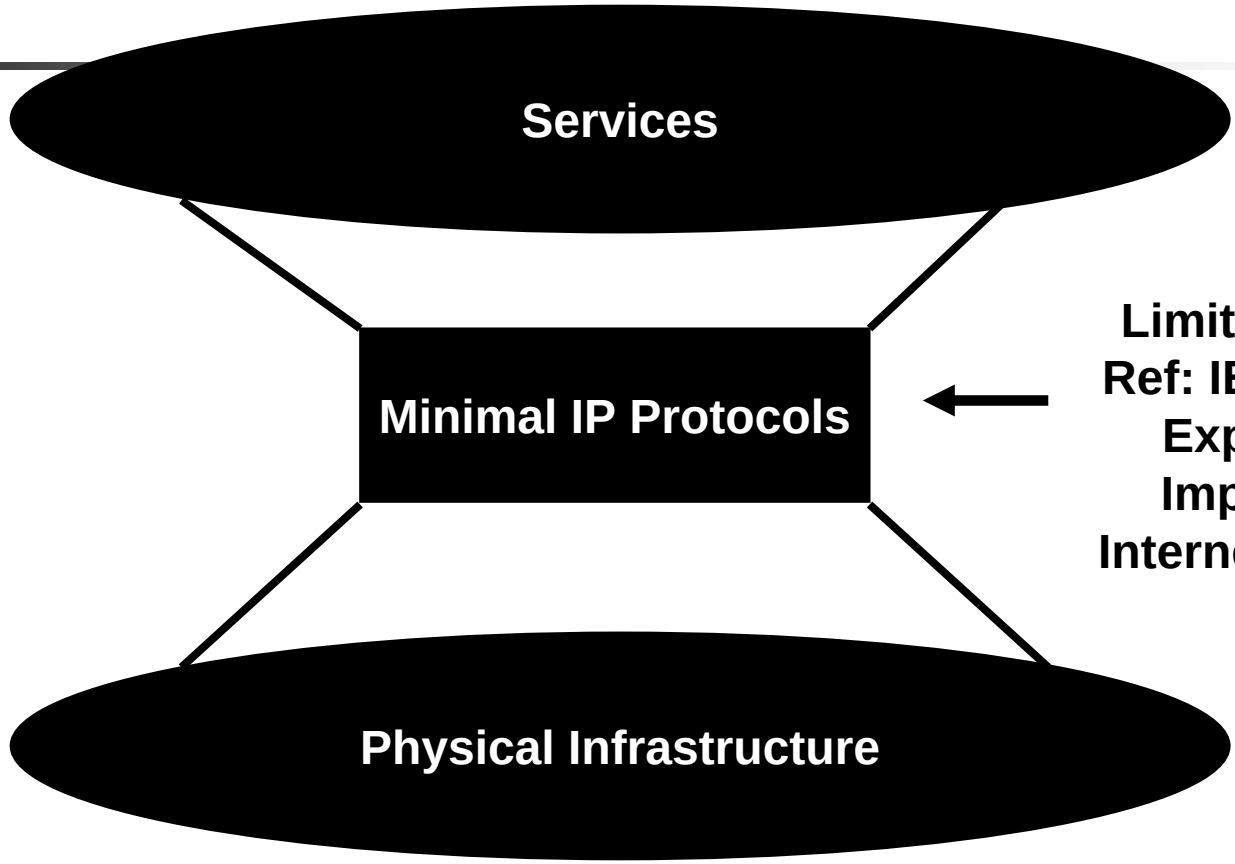
ONT-3 Workshop Objectives

- The Forum Presented – In an **International Context**
  - Progress Has Been Made This Year In Moving Toward
    - Long and Near Term Objectives
    - In Achieving Roadmap Milestones
  - Progress Made This Year In Establishing Mechanism for Continuing to Achieve Key Goals and Continuing to Ensure Momentum
  - Much Has Been Accomplished in This Area Over the Last Year, Demonstrations, Prototype Services, Early Implementations, New Testbeds
  - Multiple Publications Have Appeared

A New Architecture

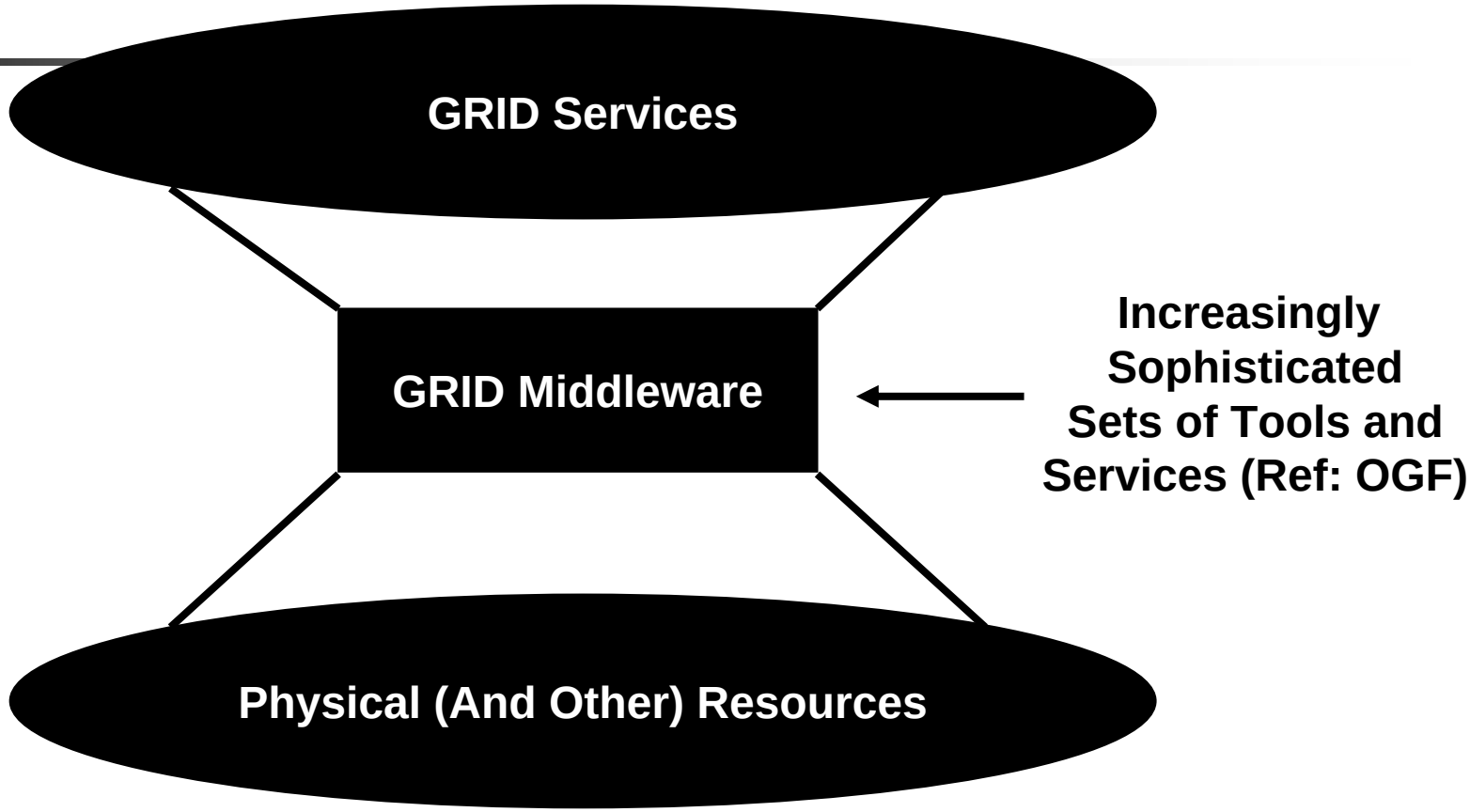
- The Traditional Network Is Being Replaced
- A New Architecture Will Provide For New Communication Services Based on a New Foundation
- A Major Challenge To Advancement Is the Installed Base, Which Is A Barrier To Innovation
- For example, the Current Traditional Internet Constitutes a Barrier To Its Improvement
- The New Environment Must Provide Capabilities for Both On-Going Production and New Innovation
- The New Architecture Provides For Not a “Network” Design But Instead For A Large Scale Highly Distributed Facility That Can Change Instantaneously In Response To Changing Requirements
- Also, Distribution Not Only of Resources But Also Control and Management Functions

Internet “Hour Glass” Design

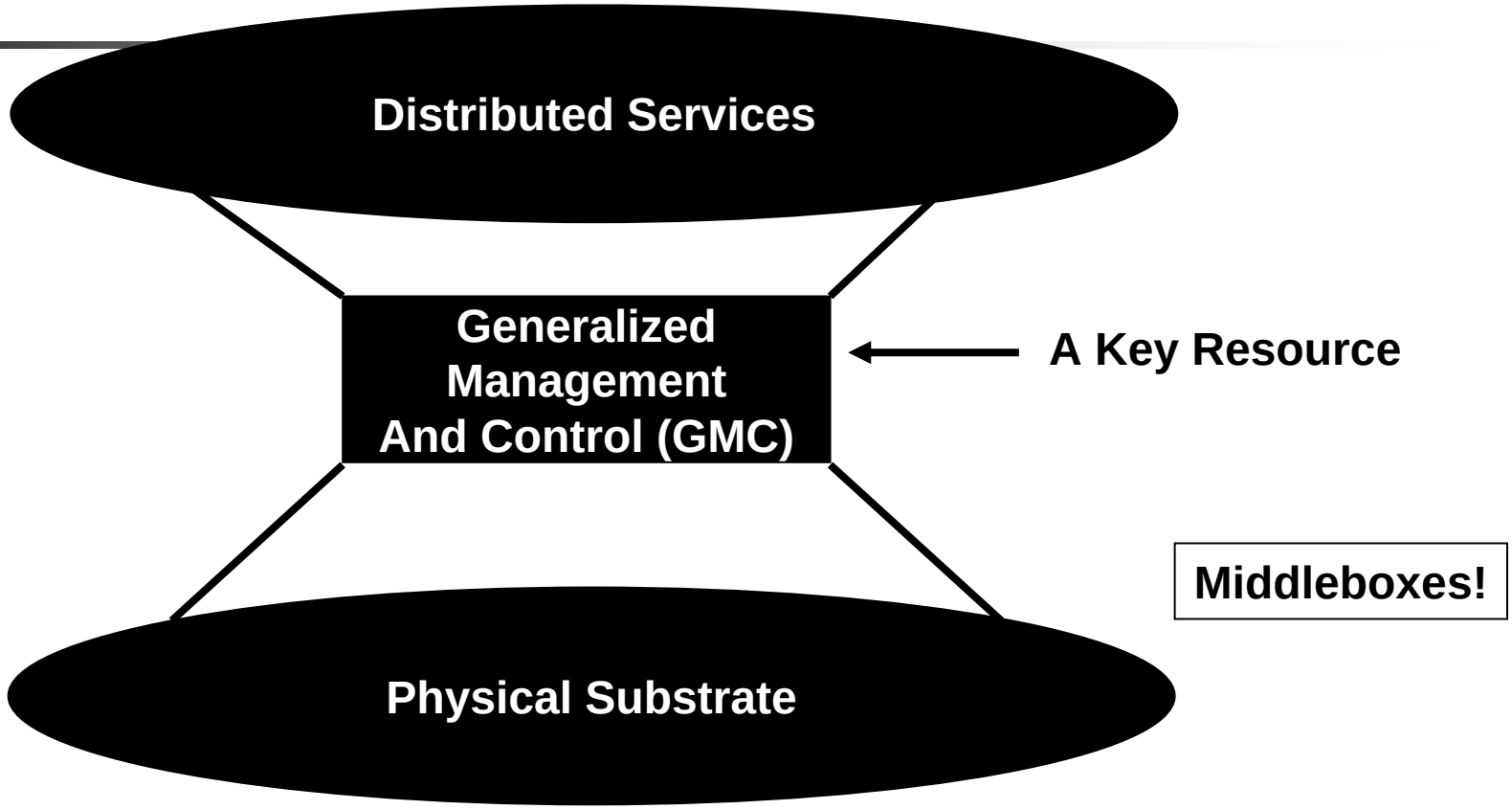


Limited By Design
Ref: IETF RFC 2768, Exploration of Implications of Internet Middleware

GRID “Hour Glass” Design

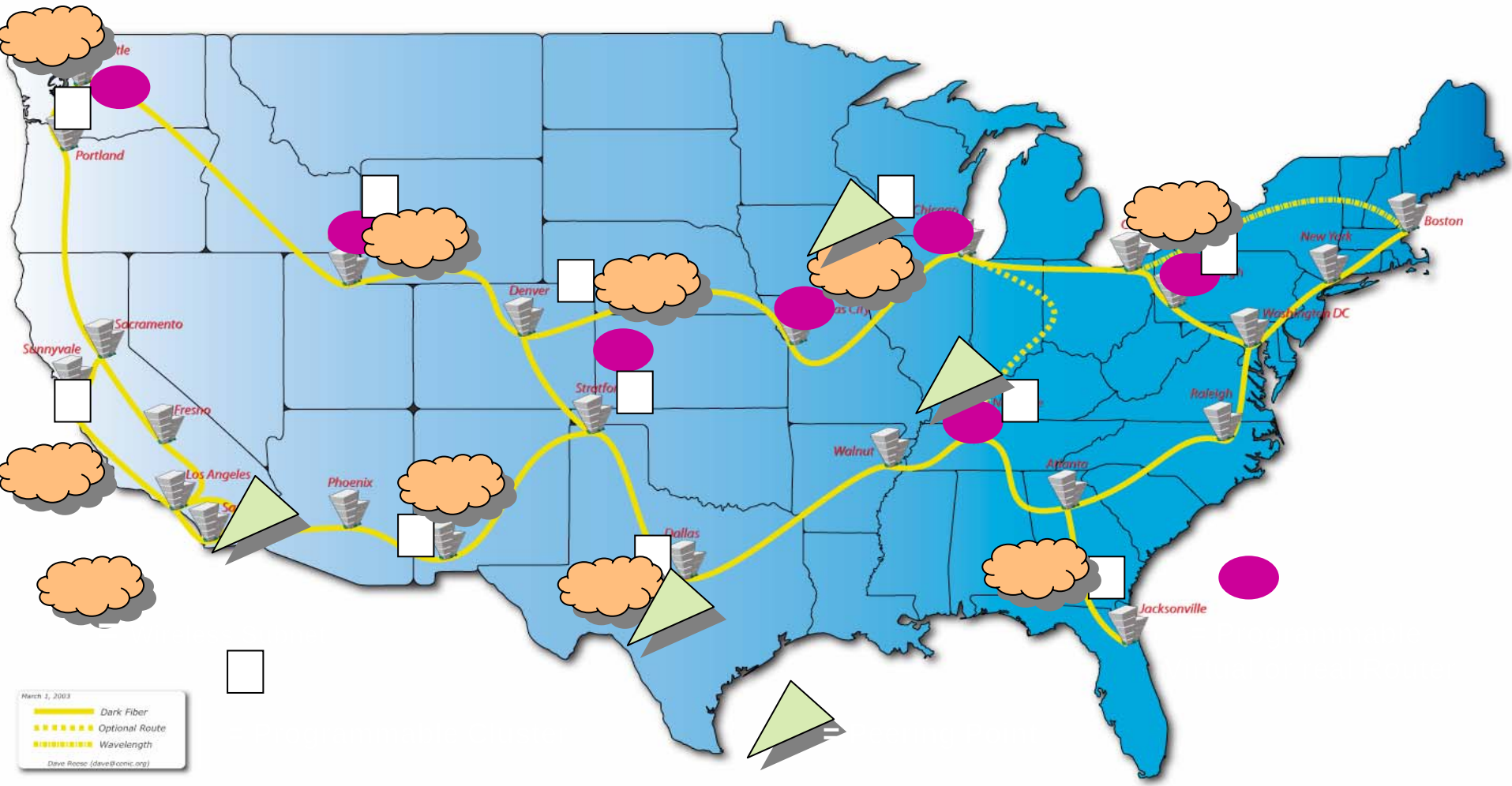


GENI (Global Environment for Network Innovation)



GMC = name space for users, slices, resources, interfaces, access channels etc

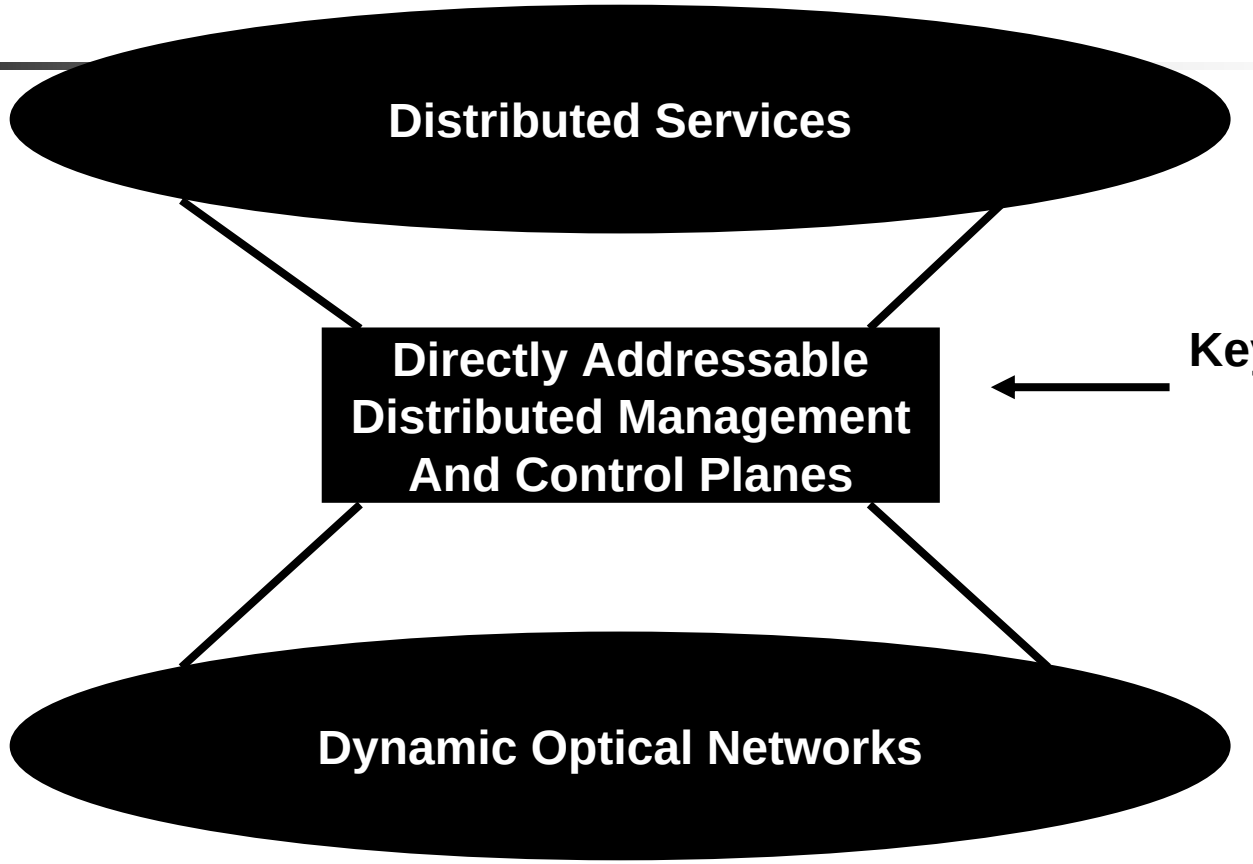
GENI+National Lambda Rail



Implications for Optical Networks

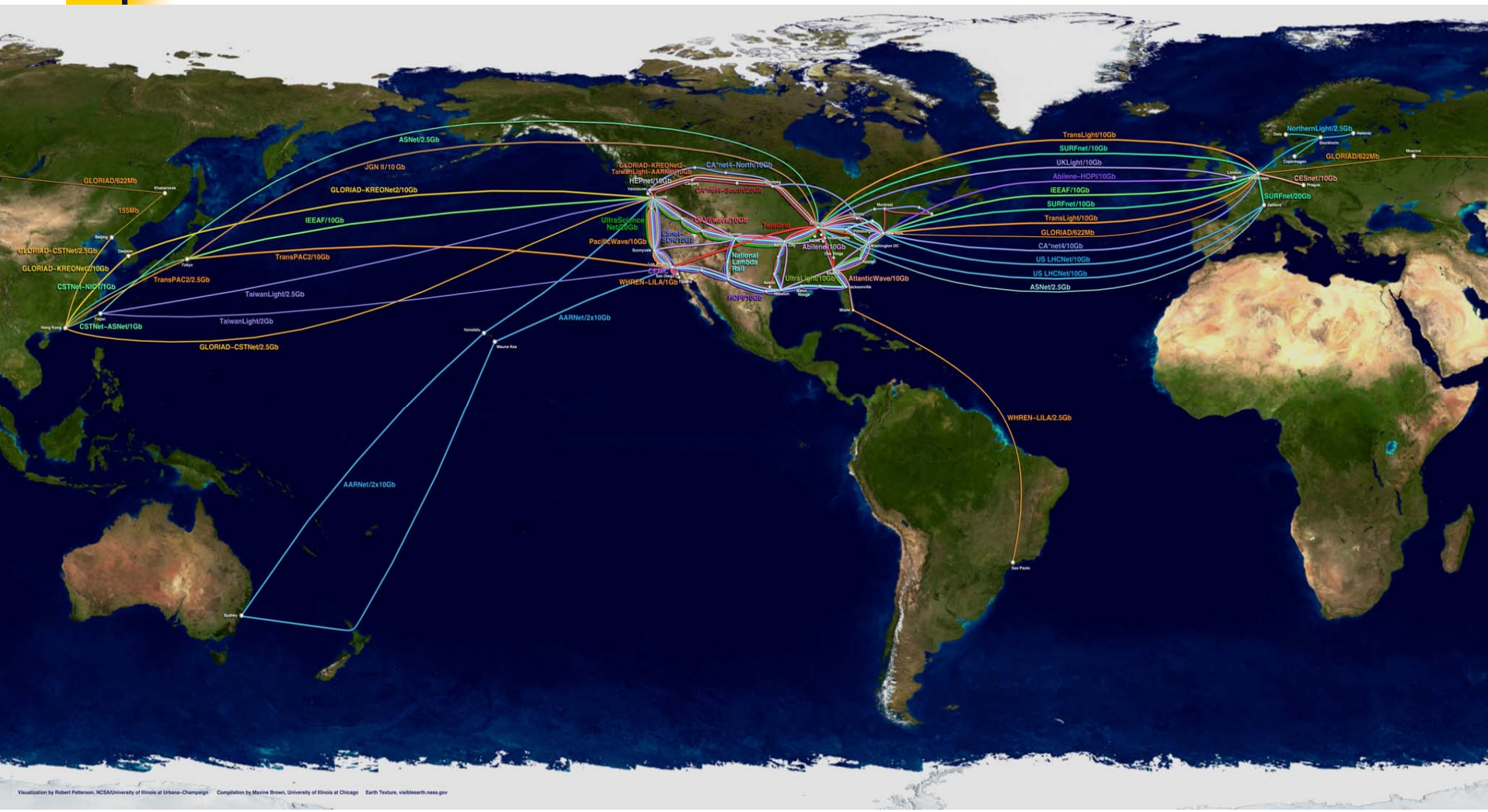
- Facilities Exist Today Which Reflect These Principles
- These Facilities Reflect the Future of Communication Services
- A Highly Distributed Facility ("Lambda Grid") Is Being Designed To Support Multiple Networks With Different Characteristics Each Supporting Multiple Highly Differentiated Services
- The Core of This Facility Will Be Based On Next Generation Agile "Intelligent" Optical and Photonic Technologies
- These Innovations Are Being Driven By Advanced Optical/Photonic Research Networking Organizations In Response To Application Demand and By New Innovations In Optics and Photonics
- The Future is Light!

Global Lambda Integrated Facility



DMCP = “Facility Intelligence”

Global Lambda Integrated Facility (GLIF)



www.glif.is

Visualization courtesy of
Bob Patterson, NCSA.

For Further Information, Ref:

- The ONT3 Report Will Be Published on the Workshop Web Site In Approximately 3 Months
- The ONT3 Presentations Should Be on the Site After September 18th.
- The ONT2 Report Is Available From The Workshop Web Site As Are the ONT2 Presentations
- www.nren.nasa.gov/workshop9
- (ONT3)
- www.nren.nasa.gov/workshop8
- (ONT2)
- www.nren.nasa.gov/workshop7
- (ONT1)

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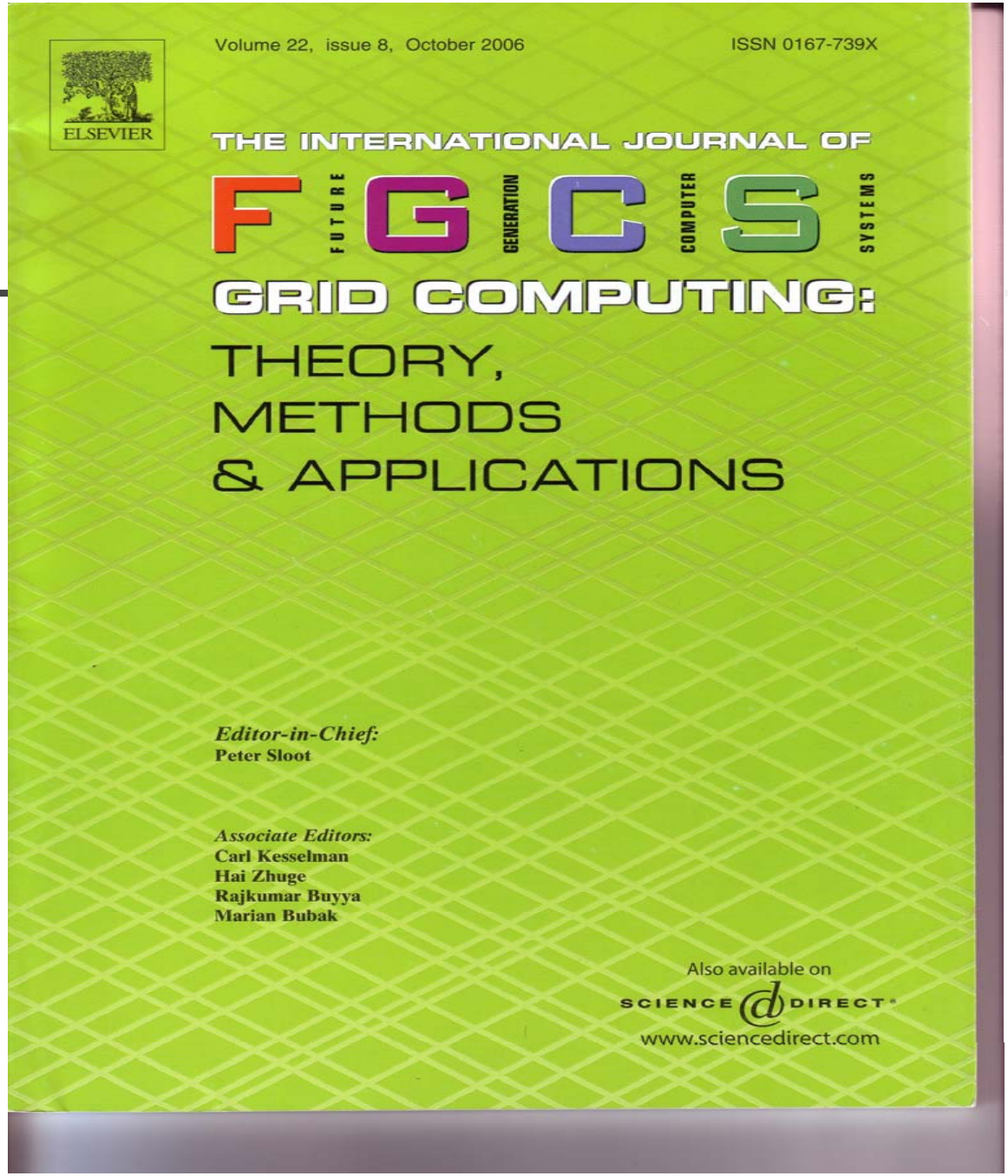
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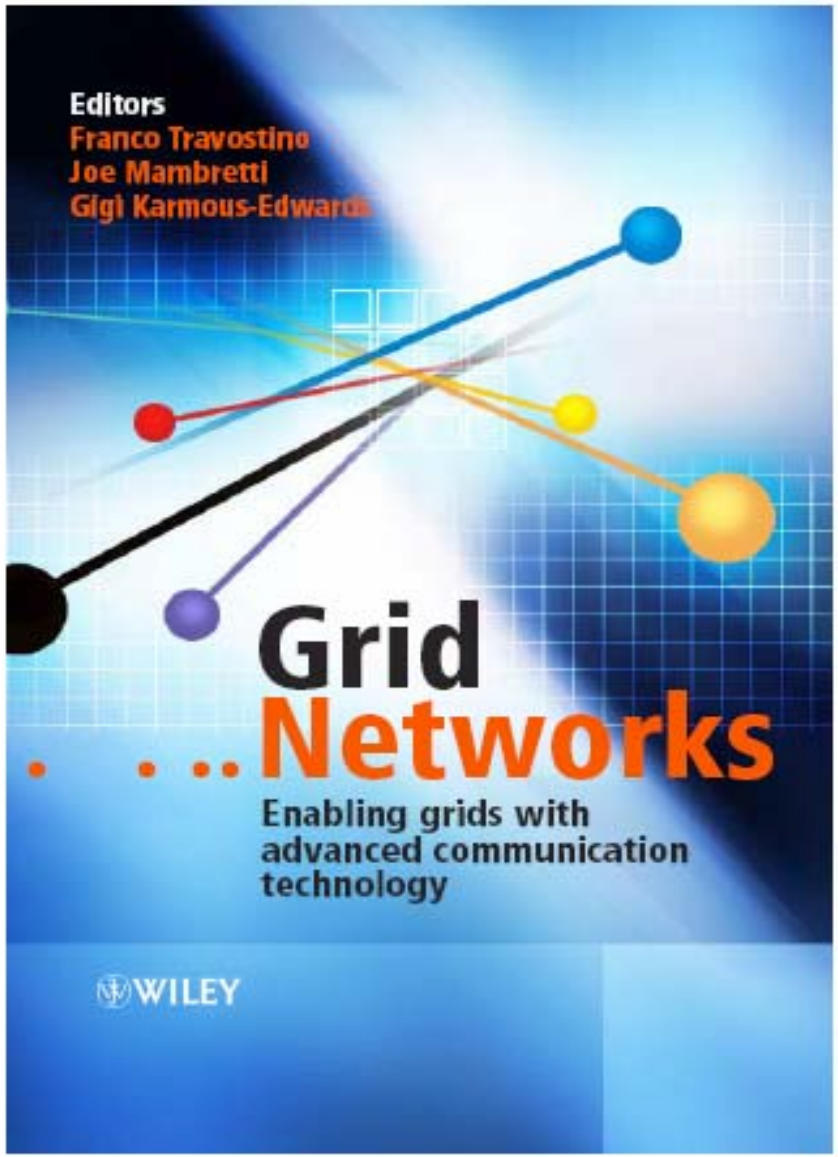
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