An Advanced International Distributed Programmable Environment for Experimental Network Research: "Slice Around the World" Demonstration

A Demonstration and Presentation By the Consortium for International Advanced Network Research

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Boston, Massachusetts

Introduction

- **A Basic Goal of The International Consortium Is To Create A Large Scale Distributed Environment for Basic Network Science Research, Experiments, and Demonstrations.**

- **This Initiative Is Designing and Implementing An International Highly Distributed Environment (at Global Scale) That Can Be Used for Advanced Next Generation Communications and Networking.**

- **The Environment Is Much More Than "A Network" – Other Resources Include Programmable Clouds, Sensors, Instruments, Specialized Devices, and Other Resources.**

- **This Environment Will Be Based On Interconnections Among Major Network Research Centers Around the World**

- **=> *The Initial Concept for the "Slice Around the World" Demonstration Was Suggested By Chip Elliott!***

Initiative Motivation

- **This Project Is Inspired By Multiple Innovative Network Research Initiatives Around the World**
  - **The National Science Foundation Funded Global Environment for Network Innovations (GENI)**
  - **The European Union Future Internet Research Environment (FIRE)**
  - **The Japanese New Generation Network (NGN)**
  - **The Korean Future Internet Initiatives**
  - **G-Lab At Kaiserslautern**
  - **And Many Others.**

Next Step: Implementation of Initial Environments and Staging Demonstrations

- **A Major Goal of This Initiative Is To**
    - **A) Implement An Initial Environment With Wide Range of Resources Around the World That Can Be Discovered, Integrated, Programmed, Utilized for Experiments, etc**
    - **B) Design and Stage a Series of Demonstrations That Can Illustrate a The Advantages of This Highly Distributed Environment At Global Scale - That Can Showcase Next Generation Communications.**

- **Three Major Components To the Demonstrations**
    - **Applications/Services**
    - **A Highly Distributed, Highly Programmable Communications Environment, In Part, Based On OpenFlow**
    - **International Foundation Facilities**

Current Organizational Participants and Leads

- *ANSP, São Paulo, Luis Fernandez Lopez*
- *Applied Research Center for Computer Network at Skolkovo, Moscow, Ruslan Smeliansky*
- *Centro de Pesquisa e Desenvolvomento de Telabras, São Paulo, Marcos Rogerio Salvador*
- *Canadian Communications Research Centre, Ottawa, Scott Campbell**
- *Computer Network Information Center, Chinese Academy of Sciences, Beijing, Jungling You**
- *Duke University, Durham, Jeff Chase*
- *Electronic and Telecommunications Institute, Daejeon, Myung-Ki Shin*
- *HP Research Labs, Palo Alto, Rick McGeer**
- *International Center for Advanced Internet Research, Northwestern University, Chicago, Joe Mambretti, Jim Chen**
- *Korea Institute of Science and Technology Information, Daejeon, Dongkyun Kim*
- *National Center for High-Performance Computing of Taiwan, Tainan, Te-Lung Liu**
- *National Cheng-Kung University, Tainan, Chu-Sing Yang**

Current Participants

- *National Institute of Information and Communications Technology, Tokyo, Aki Nakao **
- *National Kao Hsiung University of Applied Science, Kaohsiung, Mon-Yen Lou**
- *NICTA, Australia, Max Ott*
- *Princeton University, Princeton, Andy Bavier*
- *Rede Nacional de Ensino e Pesquisa, Brazil, Michael Stanton*
- *Renaissance Computing Institute (RENCI), Chapel Hill, Ilia Baldine*
- *SARA, Amsterdam, Ronald van der Pol**
- *Technische Universitat Kaiserslautern, Kaiserslautern, Paul Muller**
- *University of Amsterdam, Cees de Laat*
- *University of Essex, Colchester, Martin Reed**
- *University of Tokyo, Tokyo, Aki Nakao **
- *University of Utah, Salt Lake City, Rob Ricci*#*

- * Indicates Participants in the First Demonstrations
- # Ref Rob Ricci's InstaGENI Presentation Earlier in Plenary

The Global Lambda Integrated Facility (GLIF)
Provides Advanced Resources and Facilities for Research

Applications/Services For The Initial Demonstration

- **Initial Application Parameters: It *Must*:**
  - **1) Have Striking Visuals (i.e., Not Just Showing Performance Graphs Highlighting Bit Flows)**
  - **2) Reflect the Potentials of a Truly *Global* (World-Wide) Environment**
  - **3) Closely Integrate Programmable Networking and Programmable Compute Clouds**
  - **4) Show Capabilities Not Possible to Accomplish With the General Internet or Standard R&E Networks**
  - **5) Highlight the Power of Programmable Networks, Especially Customization at the Network Edge.**
  - **6) Show a Potential for Resolving Real Current Issues vs Showing Advanced Technology -- Although The Platform Is Oriented to Providing Suites Of Capabilities**

Selected Application: Scientific Visualization For Nanotechnology –Viewing Scope For Invisible Objects

- Creating A Viewing Scope for Invisible Objects

- Based on Ad Hoc Networking Provisioning and Use

- Dynamic Change Including for Rendering in Real Time (e.g., Incorporates Real-Time Data Viewing/Steering)

- Demonstrates Capabilities Not Possible to Accomplish Today Using the General Internet or Standard R&E Networks

- Customizable Networking Specific To Application Requirements -- at Network Edge.

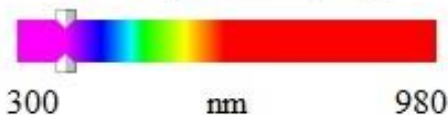- Resolves A Real Current Challenge, Although The Platform Is Oriented to Providing Suites Of Capabilities

Photonic Band Gap

↑ 9 7 6 0 nanometers ↓

← 11140 nanometers →
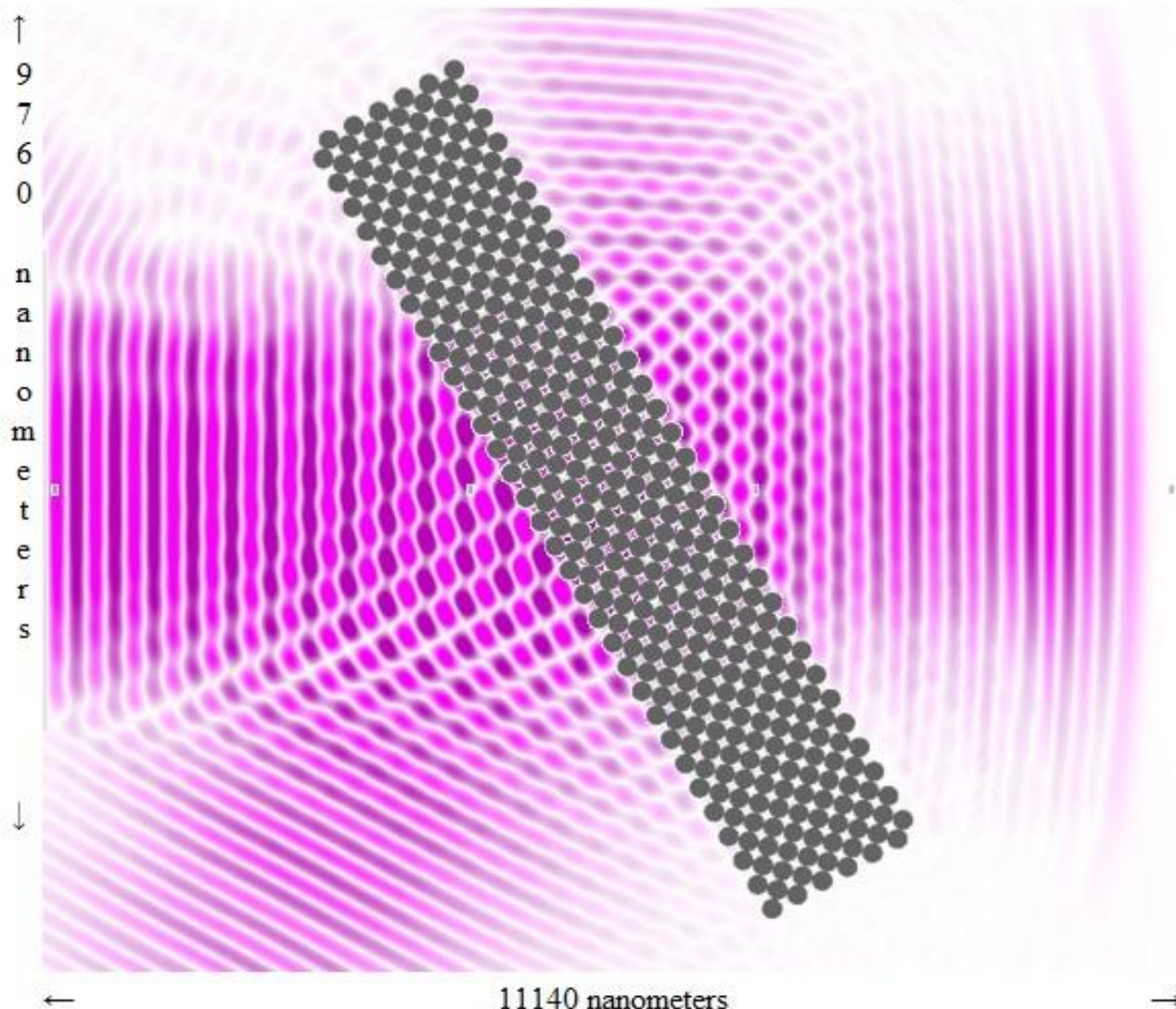
Click the picture to zoom in (picture will appear in a new window)

Frame # 13 , time is 39 fs

1   15

1. Choose the color of light source. Wavelength appears in nm

Violet (380 **nm**)

300   nm   980

Magnitude

-    0   +

2. Choose particle size in nanometers

particle size is 200 **nm**

200   nm   380
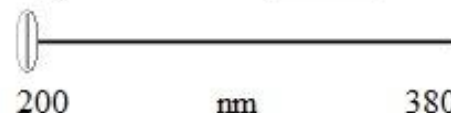
3. Choose incident angle in degrees
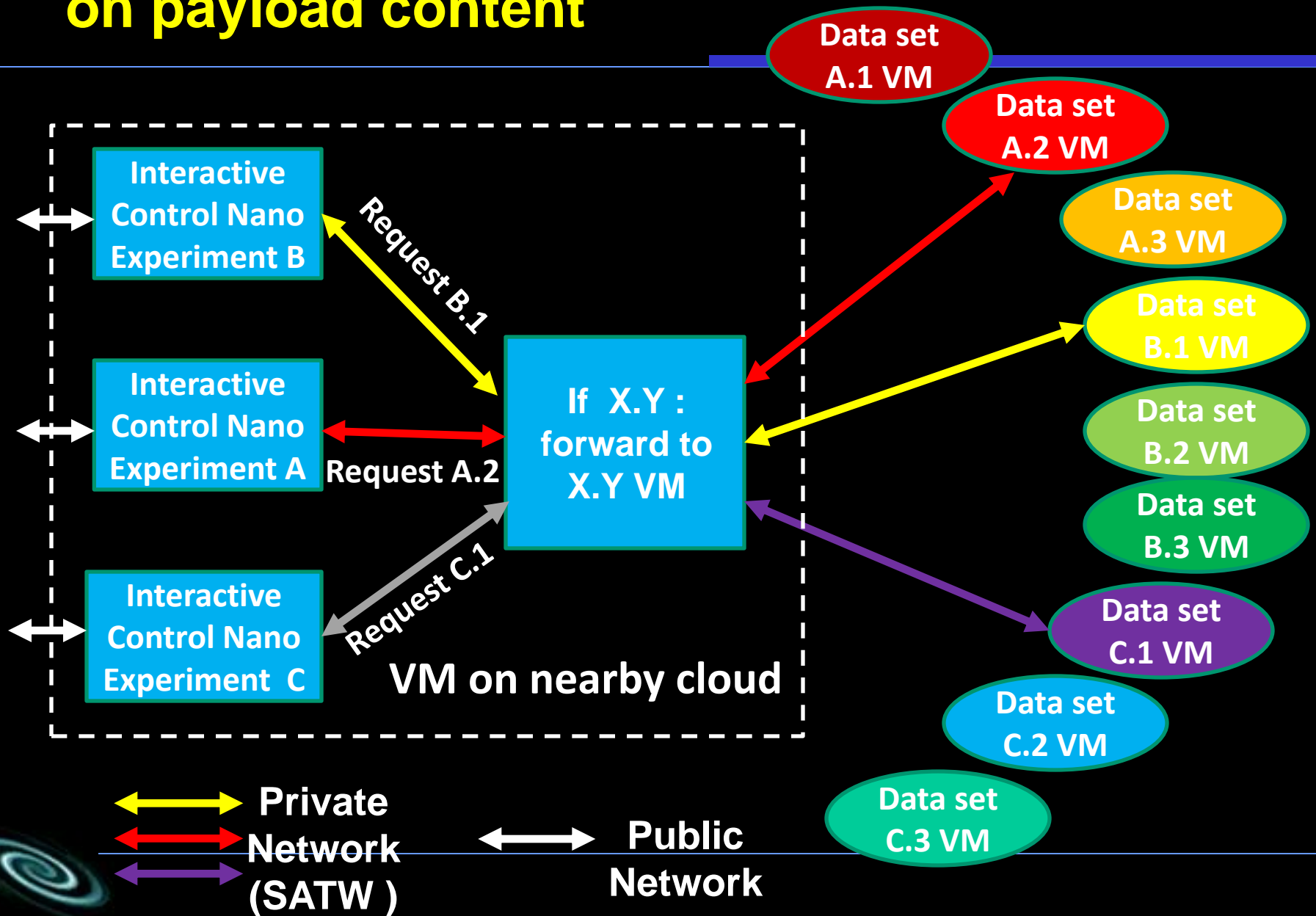
Incident angle is 30 °

0   °   45
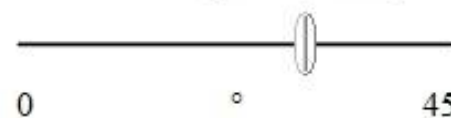
Preview

4. Watch the animation

> ||

Slice Using forwarding rules base on payload content

Demonstration

- **Live Demonstration of Application Enabled By International Distributed Research Environment**

Initial Demonstration Schedule

- The 14th GENI Engineering Conference (GEC 14) July 9-11 in Boston Massachusetts
- EuroView2012 the 12th Würzburg Workshop on IP: ITG Workshop "Visions of Future Generation Networks" July 23-24 in Würzberg, Germany, Co-Hosted By G-Lab (Paul Muller)
- The 1st Federated Clouds Workshop and the 7th Open Cirrus Summit Co-Located With the International Conference on Autonomic Computing on September 21in San Jose, California
- The Global LambdaGrid (GLIF) Workshop in Chicago on October 10-12, co located with the IEEE e-Science Conference , the Microsoft e-Science Conference and the Open Grid Forum (OGF),
- The 15th Annual GENI Engineering Conference (GEC 15) In Oct in Houston, Texas
- The SC12 International Supercomputing Conference on November 10-16 in Salt Lake City. Utah.

Conclusion: The Future Is Based On Programmable Networks

- **Thanks!!**
- **Questions?**
- **Comments?**

Boston Harbor