



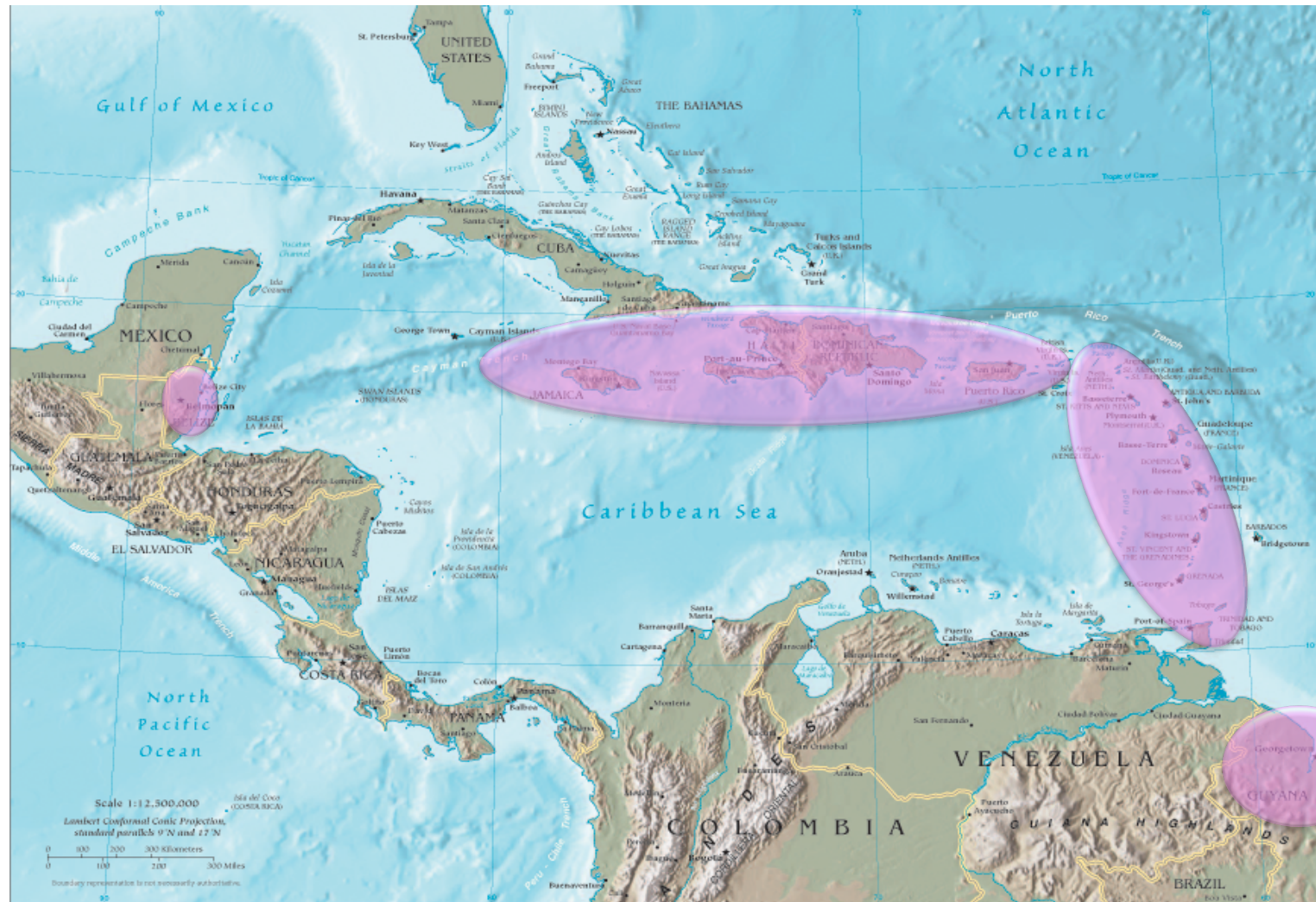
# **R&E NETWORKING in the CARIBBEAN**

13 July 2010 JET Meeting

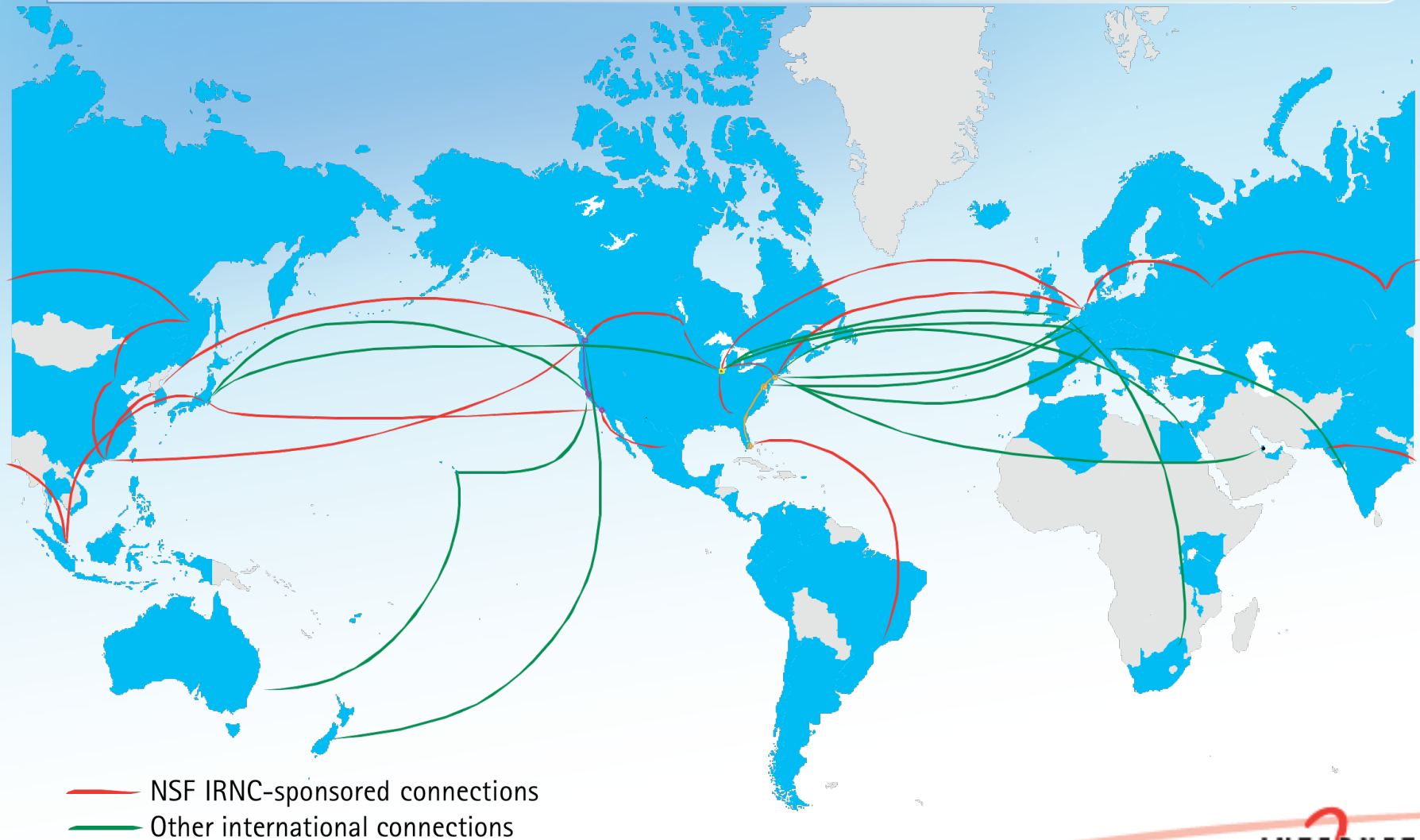
Jocelyn Gerich, Internet2

Ernie Rubi, AMPATH/Florida International University

# Large Geographic Space With Small Island States



# The International Reach of the Internet2 Network



# Current Networks Reachable

## AFRICA

Algeria (ARN)  
Kenya (KENET)  
Malawi (MAREN)  
Morocco (MARWAN)  
South Africa (TENET)  
Tanzania (TERNET)  
Tunisia (CCK)  
Uganda (RENU)

## AMERICAS

Argentina (INNOVA|RED)  
Brazil (RNP2/ANSP)  
Canada (CANet 4)  
Chile (REUNA)  
Colombia (RENATA)  
Costa Rica (RedCONARE)  
Ecuador (CEDIA)  
El Salvador (RAICES)  
Guatemala (RAGIE)  
Mexico (CUDI)  
Panama (RedCyT)  
Peru (RAAP)  
Trinidad (Univ. of the West Indies)  
Uruguay (RAU2)  
Venezuela (Reacciu2)

## ASIA and PACIFIC

Australia (AARNET)  
China (CERNET, CSTNET, NSFCNET)  
Fiji (USP-SUVA)  
Hong Kong (HARNET)  
India (ERNET)  
Indonesia (ITB)  
Japan (SINET, WIDE, JGN2)  
Korea (KOREN, KREONET2)  
Malaysia (MYREN)  
New Zealand (KAREN)  
Pakistan (PERN)  
Philippines (PREGINET)  
Singapore (SingAREN)  
Taiwan (TANet2, ASnet)  
Thailand (UniNet, ThaiSARN)  
Vietnam (VinaREN)

## CENTRAL & SOUTHWEST ASIA

Armenia (ASNET-AM)  
Azerbaijan (AzRENA)  
Georgia (GRENA)  
Kazakhstan (KazRENA)  
Kyrgyz Republic (KRENA)  
Tajikistan (TARENA)  
Turkey (ULAKBIM)  
Turkmenistan (TuRENA)  
Uzbekistan (UzSciNet)

## EUROPE

Albania (ASA/INIMA)  
Andorra (Univ. of Andorra)  
Austria (ACOnet)  
Belarus (BASNET, UNIBEL)  
Belgium (BELNET)  
Bosnia-Herzegovina (BIHARNET)  
Bulgaria (ISTF)  
Croatia (CARNet)  
Cyprus (CyNET)  
Czech Republic (CESnet)  
Denmark (Forskningsnettet)  
Estonia (EENet)  
Finland (Funet)  
France (RENATER)  
Germany (X-WiN)  
Greece (GRNET)  
Hungary (NIIF/HUNGARNET)  
Iceland (RHnet)  
Ireland (HEAnet)  
Italy (GARR)  
Latvia (LATNET)  
Lithuania (LITNET)  
Luxembourg (RESTENA)  
Macedonia (MARNet)  
Malta (UofM/RicerkaNet)  
Moldova (RENAM)  
Montenegro (MREN)  
Netherlands (SURFnet)

## EUROPE cont'd

Norway (UNINETT)  
Poland (PIONIER)  
Portugal (FCCN)  
Romania (RoEduNet)  
Russian federation (RBnet, RUNNET)  
Serbia (AMRES)  
Slovakia (SANET)  
Slovenia (ARNES)  
Spain (redIRIS)  
Sweden (SUNET)  
Switzerland (SWITCH)  
Ukraine (URAN)  
United Kingdom (JANET)

## MIDDLE EAST

Egypt (EUN/ENSTINET)  
Israel (IUCC)  
Jordan (JUNet)  
Palestinian Territories (Birzeit Univ./Al-Quds Open Univ.)  
Qatar (Qatar FN)  
Syria (HIAST)  
United Arab Emirates (ANKABUT)

## MULTINATIONAL NETWORKS

APAN  
GEANT2  
NORDUnet  
redCLARA  
UbuntuNet



# Regional Interest Group

- Objectives
  - Stimulate discussion
  - Encourage collaboration between organizations in the region
  - Facilitate development of infrastructure and NRENs in the Caribbean
- Led by Heidi Alvarez, Florida International University
  - Home Page - <https://wiki.internet2.edu:443/confluence/x/3gY>
  - Spring Member Meeting 2010 focused on Haiti and the role of technology in earthquake relief and recovery
  - Presentations from the meeting are posted here:  
<https://wiki.internet2.edu:443/confluence/x/3xhG>

# Connected Sites

- University of Puerto Rico
  - <http://www.upr.clu.edu/>
  - Member of Internet2 since 1998
  - Connected via AMPATH since 2001
  - GigE circuit
- University of the West Indies
  - Trinidad campus connected to Internet2 via AMPATH
  - STM-1 circuit
  - They are working to connect Barbados and Jamaica campuses as well
  - <http://uwi.edu/>

# Connected Sites cont'd

- University of the Virgin Islands
  - Two campuses (St. Thomas & St. Croix) with approximately 2500 students
  - Heavy reliance on videoconferencing
  - Information & Technology Services is responsible for faculty technology training
  - STM-1 circuit connected via AMPATH
  - [www.uvi.edu](http://www.uvi.edu)
- Caribbean Knowledge and Learning Network
  - <http://ckln.org/>
  - Supported by OAS, World Bank, European Union, and Canadian International Development Agency
  - Launched by Caricom and OECS in 2004

# CARIBBEAN KNOWLEDGE AND LEARNING NETWORK PROJECT

## What is CKLN?

An **Intergovernmental Agency** financed and owned by the governments of the CARICOM Community that implements development projects with assistance of grant funds.

## IMPLEMENTING C@ribNET

- Phase 1 – Design of the network
- Phase 2 – Connectivity procurement
- Phase 3 – Hardware procurement
- Phase 4 – Deployment of the network



## Phase 1 – Design of the network (June, 2010)

- Definition of the topology and placement of the main nodes (backbone nodes); estimates of active equipment required, bandwidth and connectivity, etc.

## Phase 2 – Connectivity procurement (September, 2010)

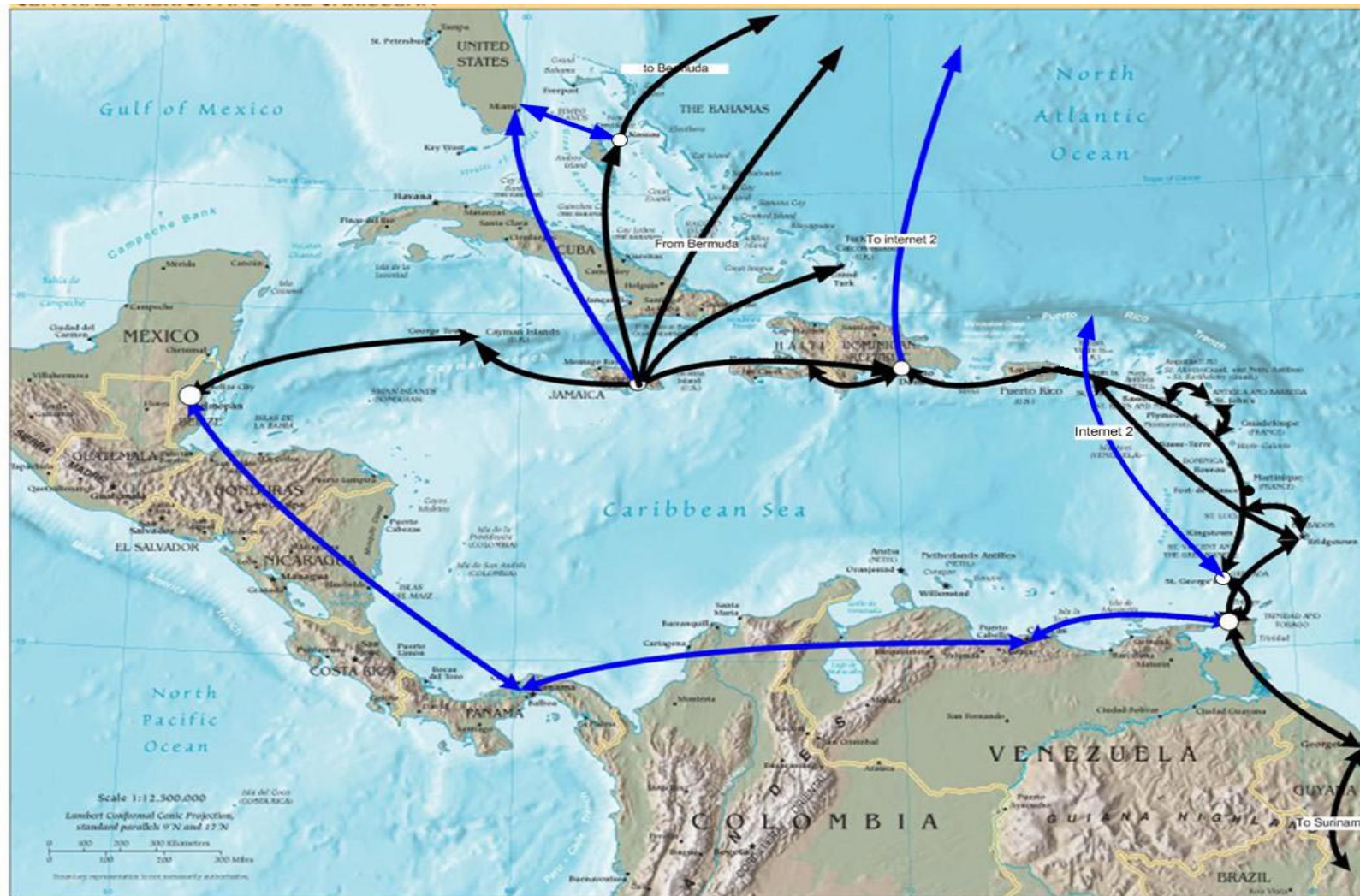
- The design phase will drive tenders to acquire the digital data transmission capacity between endpoints and the network and associated equipment required plus NOC services.
- The tender will establish the providers in the region for the main links of the backbone

## Phase 3 – Hardware procurement (December, 2010)

- The topology is anticipated to have two tiers:
  - core – nodes comprising the backbone
  - distribution – nodes for aggregation of institutions
- Every country/member will have a distribution node, and only the backbone selected countries will have core nodes

## Phase 4 – Deployment of the network (Q1, 2011)

# Proposed Caribbean Educational Knowledge and Research Network (C@ribNET)







# National Academy of Sciences

- Program on Digital Knowledge Resources and Infrastructure for Research and Education in Developing Countries
  - Organized under the InterAcademy Panel (IAP) on International Issues and managed by the U.S. National Academy of Sciences, in collaboration with other Science Academies and organizations
  - Initial geographic focus is on sub-Saharan Africa, Central America and the Caribbean
  - Program's objectives are implemented by two international Task Groups
    - Digital knowledge resources focus (content)
    - Digital knowledge infrastructure focus (information and communication technologies)
  - Term of the Program is 2008-2011, with the possibility of renewal
  - <http://www.interacademies.net/CMS/Programmes/4704.aspx>



# Americas LightPaths (AmLight)



- AmLight aims to enhance research and education in the Americas through the operation of production infrastructure in support of U.S. and western hemisphere science and engineering research and education communities



- AmLight consortium partners: FIU-AMPATH, CENIC, LEARN, AURA, CLARA, FAPESP, RNP, CUDI, REUNA, PacificWave, AtlanticWave



# AmLight Links

- AmLight East:
  - Miami- Sao Paulo;  
2x10G
- AmLight West:
  - Tijuana-Los Angeles  
2x1G
- AmLight Andes:
  - Sao Paulo-Santiago;  
1G
- AmLight Central:
  - El Paso-Ciudad  
Juarez; 1G



# Resources and Credits

- Internet2 International webpages
  - <http://www.internet2.edu/international/>
- Emerging NREN SIG Information
  - <https://wiki.internet2.edu:443/confluence/x/fxl>
- CKLN
  - <http://ckln.org/>
- CLARA
  - <http://redclara.net/>
- ALICE2
  - <http://alice2.redclara.net/index.php/en/project>
- Special thanks to Heidi Alvarez, Carlton Samuels and Florencio Utreras for their input



## R&E NETWORKING IN THE CARIBBEAN

13 July 2010

For more information, please visit us at [www.internet2.edu/international](http://www.internet2.edu/international)

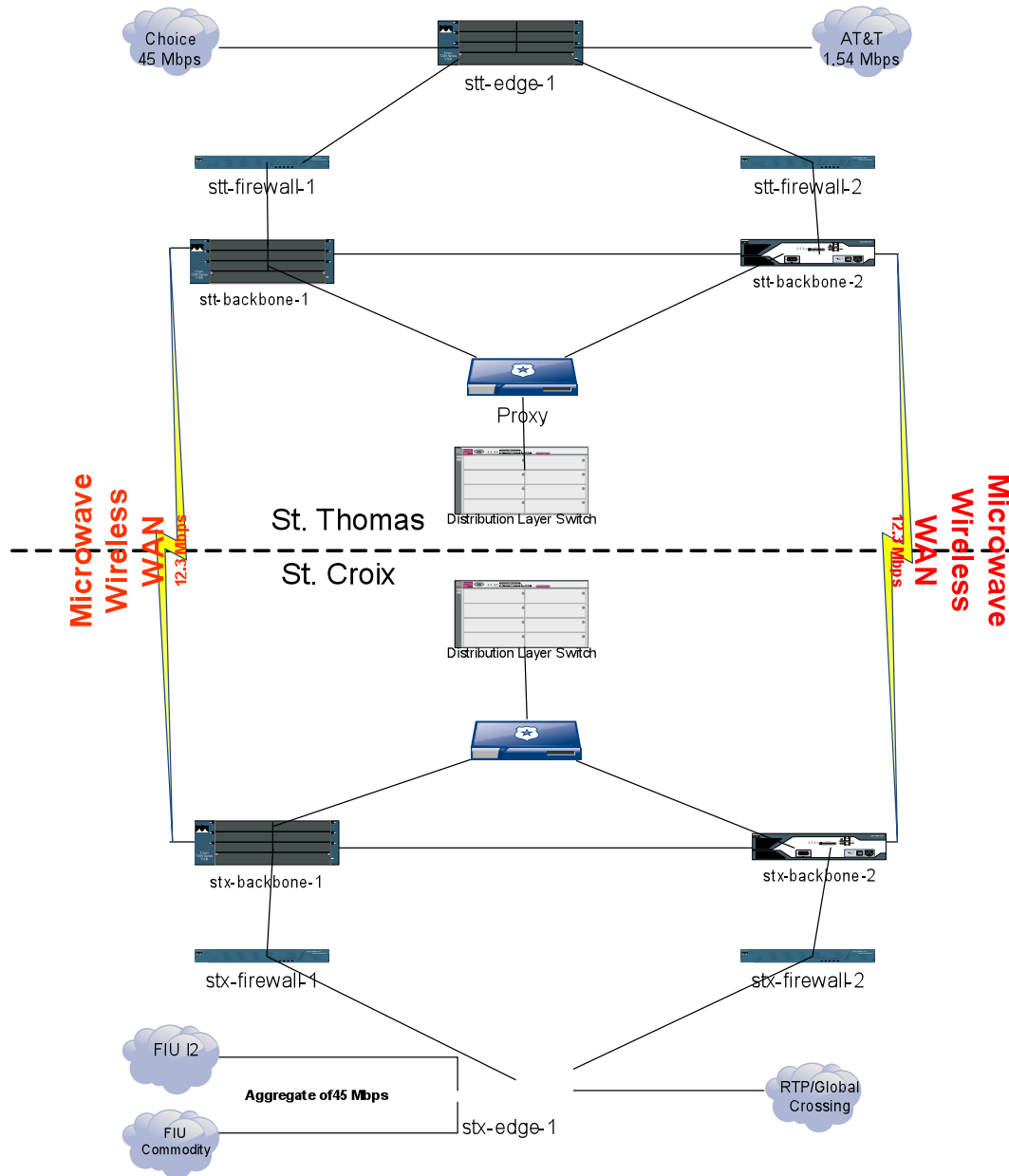
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# New UVI Backbone I2 Topology



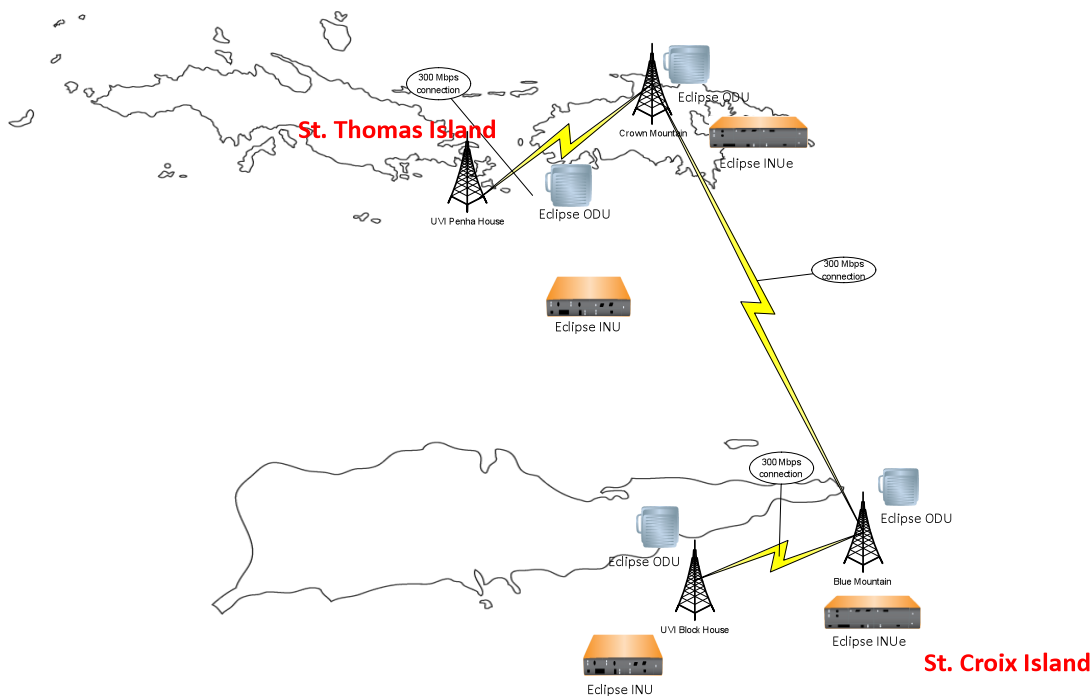


## New UVI Backbone I2 Topology

- Upgraded the Cisco 7206 routing equipment
- Added Cisco 2821 routers as a redundant path
- Implemented Border Gateway Protocol (BGP) to support multi-homing to multiple ISPs
- Upgraded Cisco system software to support BGP and configuration to support I2 routing
- Restructured backbone architecture to create uniformity on both Islands in preparation for multi-homing



## Microwave Wireless WAN 300 Mbps





## Microwave Wireless WAN 300 Mbps

- Installation in May 2010
- Increase WAN bandwidth from 12.3 Mbps to 300 Mbps to accommodate I2 traffic
- Carrier-grade Eclipse wireless backhaul solution from Aviat Networks, formally Harris Stratex
  - Highly scalable software design
  - Optimized wireless nodes that support multi-outdoor units (ODUs)
  - Efficient Terminal Options solutions for transport of OC3 data
  - Scalable Capacity Architecture that supports smooth network upgrades
  - High speed data transport and QoS features
  - Advance Network control through Java-based management tools