IX.PR
Internet Exchange Puerto Rico
“ In Peer We Trust ”

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Appendix

• The research
• The results
• Why IX.PR?
• Examples..
• The Real Problems
• How IX.PR was founded?
• How IX.PR is supported?
• Membership
• PR Internet
• Caribbean Internet
The Research

• Six months of NetFlow statistics from several of Puerto Rico’s large networks (>50Mbps).
  – University of Puerto Rico
    • One of the largest American universities.
    • Arecibo Observatory (SETI@HOME) is attached to this network.
  – A large ISP Serving Puerto Rico and the Dominican Republic
    • Large corporate and governmental customers, and %35 of the island’s residential market via cable.
  – Smaller ISPs
    • These ISPs usually offer business services including VoIP, and hosting.
The Results of the Research

• As much as %50 of Puerto Rican ISPs’ traffic leaves Puerto Rico before returning to another ISP on the island.
• Prior to the establishment of IX.PR, there was no peering on-island. All ISPs were peering in Miami.
• Very high demand of local communication tools that require a lot of bandwidth such as;
  – Peer to Peer Applications
  – Online Games
  – Voice / Video Conference
  – VoIP
Why IX.PR?

• The amount of bandwidth & fiber that’s being wasted due to high demand of local communication and not having peering between service providers.

• High Latency between the networks.

• Let’s see some examples...
A Large ISP to Government Site
A Cable Internet to University of PR
Two Large ISPs in Puerto Rico
The real problems:

• Some ISPs don’t understand Internet economics and are afraid that their competitors will gain disproportionately.

• Many ISPs are dependent upon senior engineers who work remotely from the mainland U.S. or Europe, and are out-of-touch with the situation on the ground. Conversely, when local engineers gain experience, they often emigrate.

• There’s a general misconception that most content consists of web pages hosted overseas, while in reality, local applications like peer-to-peer file sharing, VoIP, and online gaming consume a far larger share of bandwidth.
The real problems:

• Both ISPs and customers in the Caribbean market tend to place a higher priority on reducing costs than on increasing reliability.
  • All the campuses of the University of Puerto Rico are single-homed through one OC-3 to a single ISP.

• Monopoly control is still prevalent in both local loop and international bandwidth, throughout the Caribbean. (Excluding PR)
How was IX.PR founded?

- Hosted by the Gauss Research Laboratory of the University of Puerto Rico
  - Dr. Oscar Moreno, the founder & director of Gauss Research Laboratory
    - Puerto Rican Internet pioneer
    - Connected UPR to Internet2
    - Provided institutional sponsorship for the IX.PR
  - Mehmet Akcinc, manager of the Internet Exchange of Puerto Rico.
    - Developed and promoted the IX.PR
    - Day-to-day technical management of the exchange
Organizational Chart of IX.PR

- Gauss Research Laboratory
  - Board of Trustees
  - Board of Peers
  - Board of Co-location facilities
How is IX.PR supported?

• Not-for-profit organization.
• Core location and power are provided by University of Puerto Rico, Rio Piedras Campus, College of Natural Sciences, at no cost
  • A specially designed datacenter
  • Backup power to support two weeks of non-stop operation
  • Main and two backup air conditioning systems
  • Monitoring and alarm system
• Core Equipment was donated by Packet Clearing House (PCH)
  • 24-ports 10/100/1000Mbps Ethernet switch
• Monitoring servers donated and hosted by .PR ccTLD registry
  • E-mail Server
  • Web & Database Servers
• Labor, organizational assistance, and continuity are provided by Gauss Research Laboratory, the institutional sponsor.
Membership

- Currently no membership fees
- NIC.PR ccTLD registry covering initial expenses
- Future costs to be shared among the members

• The fee for monthly payments and joining fee will be decided by the members.
• Everybody will be paying the membership fee even if they have joined earlier.
• Fee will be based on the amount of the source they are using, definately not for profit. Just for being able to operate the Internet Exchange daily operations properly.
Participants

- Largest Puerto Rican ISPs are currently participating. (Or declared their intention of participating)
- Universities are in the process of connecting
- This will create a de-facto island-wide research & education network
- Those universities will also be able to get Internet2 access after making appropriate agreements with HPCF
IX.PR Founding Members

- University of Puerto Rico – Biggest non-ISP network in Caribbean/PR
- Ultracom – The Company that owns %80 of fiber-optic cable which land to Puerto Rico
- Centennial – Large ISP
- Caribe.Net – Mid-Large ISP
- Prepa – The Power Company of Puerto Rico which will connect the government to the IX via fiber.
Members in Process of Connecting

- Inter American University of Puerto Rico – 2nd largest University
- Sagrado Corazon University - University
- Polytechnic University – 2nd large Latin American Engineering University in US
- University of Metropolitan – Another University
- Puerto Rico Telephone Company – Largest PR ISP, Telephone Company
- Adelphia Communications – Large Cable TV/Internet Company
- Liberty Cable TV – Large Cable TV/Internet Company
- University of Phoenix – a well known university
- Banco Popular – The largest PR Bank, as well as largest PR Company
- Ice Networks – A medium size ISP
- Nustream Communications – A medium size ISP
- Telefonica España – Who doesn’t know them?
- San Juan Cable, LLC – Medium Size ISP
- Sprint – do I need to explain? 😊
- Neptuno – A medium size ISP

- some small networks who are in the process of getting their AS numbers, and establishing links to us.
Planned Services

• Route-server
• Looking-glass
• Measurement and instrumentation
• Network Time Protocol
• Web cache parent
• News server
• Root server mirror
• Software Mirrors
  – SourceForge
  – Linux Mirrors.
Puerto Rican Internet

- Three main companies operate fiber networks:
  - PRTC
  - Centennial
  - PrePA

- High speed Internet is ubiquitous:
  - 120K + DSL Customers (2005 est.)
  - 80K + Cable Internet Customers (2005 est.)

- All schools, kindergarten through university, have computer laboratories with high speed Internet connections.

- More than 80% of students age 13 and up have e-mail and check it at least once per week.

- 1 Million Internet users in a total population of 4 million.
Top 10 Networks Serving PR

1. NTT America [AS 2914]
2. Centennial [AS 11992]
3. UUNET [AS 701]
4. Level 3 [AS 3356]
5. University of Puerto Rico [AS 5786]
6. Sprint [AS 1239]
7. New World Network [AS 23520]
8. Qwest [AS 209]
9. San Juan Cable [AS 36423]
10. Telefonica [AS 12956]

Wondering how you can get these statistics for your country? Look for a guy!
Puerto Rico in the Caribbean

- Statistics show Puerto Rico and Jamaica as the largest Caribbean Internet users. Jamaica has had tremendous growth in 2003-2005.
- More than 1 million Internet users in a total population of 4 million
  - More Internet users than some European countries: Lithuania, Slovenia, Latvia, Estonia, Moldova.
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<td>Anquilla</td>
<td>13,155</td>
<td>3,000</td>
<td>22.8 %</td>
<td>0.1 %</td>
<td>226.4 %</td>
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<td>Antigua &amp; Barbuda</td>
<td>71,823</td>
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<td>0.5 %</td>
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<td>Aruba</td>
<td>70,102</td>
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<td>0.6 %</td>
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<td>Bahamas</td>
<td>330,602</td>
<td>93,000</td>
<td>28.1 %</td>
<td>2.2 %</td>
<td>609.9 %</td>
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<td>Barbados</td>
<td>266,731</td>
<td>150,000</td>
<td>56.2 %</td>
<td>3.5 %</td>
<td>2,400.0 %</td>
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<td>British Virgin Islands</td>
<td>21,998</td>
<td>4,000</td>
<td>18.2 %</td>
<td>0.1 %</td>
<td>0.0 %</td>
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<td>Cayman Islands</td>
<td>48,859</td>
<td>9,909</td>
<td>20.3 %</td>
<td>0.2 %</td>
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<td>Cuba</td>
<td>11,326,354</td>
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<td>1.3 %</td>
<td>3.5 %</td>
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<td>Dominica</td>
<td>71,369</td>
<td>18,500</td>
<td>25.9 %</td>
<td>0.4 %</td>
<td>825.0 %</td>
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<td>Dominican Republic</td>
<td>9,119,149</td>
<td>800,000</td>
<td>8.8 %</td>
<td>18.6 %</td>
<td>1,354.5 %</td>
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<td>Grenada</td>
<td>100,429</td>
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<td>0.2 %</td>
<td>95.1 %</td>
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<td>Guadeloupe</td>
<td>453,877</td>
<td>79,000</td>
<td>17.4 %</td>
<td>1.8 %</td>
<td>887.5 %</td>
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<td>Haiti</td>
<td>8,301,478</td>
<td>500,000</td>
<td>6.0 %</td>
<td>11.6 %</td>
<td>8,233.3 %</td>
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<td>Jamaica</td>
<td>2,692,569</td>
<td>1,067,000</td>
<td>39.6 %</td>
<td>24.8 %</td>
<td>1,678.3 %</td>
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<td>Martinique</td>
<td>397,928</td>
<td>107,000</td>
<td>26.9 %</td>
<td>2.5 %</td>
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<td>Monserrat</td>
<td>4,798</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>n/a %</td>
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<td>Netherlands Antilles</td>
<td>185,002</td>
<td>2,000</td>
<td>1.1 %</td>
<td>0.0 %</td>
<td>0.0 %</td>
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<td>Puerto Rico</td>
<td>3,966,468</td>
<td>1,000,000</td>
<td>25.2 %</td>
<td>23.3 %</td>
<td>400.0 %</td>
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<td>St. Kitts &amp; Nevis</td>
<td>39,487</td>
<td>10,000</td>
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<td>400.0 %</td>
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<td>St. Vincent &amp; the Grenadines</td>
<td>124,776</td>
<td>8,000</td>
<td>6.4 %</td>
<td>0.2 %</td>
<td>128.6 %</td>
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<td>Santa Lucia</td>
<td>167,642</td>
<td>55,000</td>
<td>32.8 %</td>
<td>1.3 %</td>
<td>1,733.3 %</td>
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<tr>
<td>Trinidad &amp; Tobago</td>
<td>1,320,383</td>
<td>160,000</td>
<td>12.1 %</td>
<td>3.7 %</td>
<td>60.0 %</td>
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<tr>
<td>Turks &amp; Caicos Islands</td>
<td>32,337</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>n/a %</td>
</tr>
<tr>
<td>Virgin Islands (US)</td>
<td>112,320</td>
<td>30,000</td>
<td>26.7 %</td>
<td>0.7 %</td>
<td>150.0 %</td>
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<tr>
<td>TOTAL the Caribbean</td>
<td>39,239,636</td>
<td>4,298,409</td>
<td>11.0 %</td>
<td>100.0 %</td>
<td>668.4 %</td>
</tr>
</tbody>
</table>
Caribbean-Wide Issues

• Many years ago companies made long term agreements with small island governments.
• They already offer the service that country needs. Usually in small Caribbean countries;
• Phone company = wireless company = cable TV company, and most of the time, they are the only provider in the country.
  • No real business growth possibility when you consider the population and market are quite small relative to other regions of the world
  • Many Caribbean countries still have anti-competitive regulatory regimes
Thanks!

- Bill Woodcock @ PCH for his support in every step for the project.
- Todd Underwood @ Renesys for some statistics used in this presentation.
Questions