Brazilian experience of connecting at 100 Mb/s and 1 Gb/s universities and research institutions in the interior of the country

UbuntuNet–Connect 2012, Kunduchi Hotel, Dar es Salaam, Tanzania, 15–16 November 2012

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• Brief Overview of the RNP
  – RNP’s metropolitan optical networks
  – RNP national backbone – Ipê network
  – RNP Services and R&D activities

• Brazilian National Broadband Plan

• Veredas Novas (New Paths) Initiative
  – Veredas Novas & National Broadband Plan

• Conclusions
Brief Overview of the RNP

• RNP – Rede Nacional de Ensino e Pesquisa
• Brazilian NREN
  – Created as a project in September 1989 by the Ministry of Science, Technology and Innovation (MCTI),
  – Became a non-profit institution in 1999
• Serves more than 300 organizations nationwide,
  – Over 130 public universities
  – Over 30 public and private research centers.
  – More than 800 campi
Campi served by RNP in 2012

Campi of universities and research centers served by RNP in 2012
Connections with Clients

- **High capacity** – 1 or 10 Gb/s - In Capitals and some major non-capital cities.
  - Done although **RNP’s own metropolitan optical networks**.
  - Reach around 150 campisi

- **Low capacity** – typically 4, 8 or 12 Mb/s - in the smaller, non-capital cities
  - Done although clear-channel circuits, from Telecom Companies
  - Around **50% of campi served by <= 12 Mb/s**
RNP’s own metro optical networks

- Example of RNP’s own metropolitan optical network: Metrobel
  - Belem, PA (North)
  - 30 km ring (48 fibers) + 12 km branch (36 fibers)
  - 32 campi belong to 12 institutions, and RNP backbone (PoP)
  - 1 Gb/s connection
RNP national backbone

- **RNP national backbone – Ipê network**
  - Current, deployed in 2011 (mostly 10 and 3 Gbps)
  - Uses links from Telecom Companies
  - Connects PoP’s in the state capitals + RNP’s metropolitan networks

- **2 new 1 Gbps links in 2012:**
  - Manaus (upgrade from 200 Mbps)
  - Belém (second protection link)
• **Links US + Europe**
  - RNP 1 X 10 G
  - RedClara 1 X 2.5G

• **New links L. America-US in 2013**
  - RNP: 2x 10G
    S Paulo – Miami
  - (W) direct (SAM)
  - (E) via Rio de Janeiro & Fortaleza (SAC)
    (+ redundant terrestrial )

• **RedCLARA:**
  - 1G link Panama – Miami (SAC)
  - 10G terrestrial link
    Santiago – Buenos Aires - S Paulo
RNP Services and R&D activities

• RNP services (examples):
  – Identity federation and Eduroam;
  – Web conference, videoconference and telepresence.
  – VoIP – Voice over IP;
  – Public key infrastructure for Research and Education
  – Internet Data Centre (IDC);
  – Service Desk
  – Video on demand

• RNP R&D activities:
  – Uses the Open Innovation Model in its innovation funnel
  – Finances R&D activities in universities and research centers, carried out by research groups under RNP coordination.
  – Two important initiatives
    – Working Groups programme (WG-RNP) and
    – Projects of advanced networks in which RNP participates or which it supports.
  – Many of these projects are developed in cooperation with other NRENs, integrating international alliances
(Brazilian) National Broadband Plan

• Launched in May 2010

• Aim
  – Provide mass Internet coverage at low prices by 2014.

• Targets:
  – Bring 11.9 million households online over the duration of the plan &
  – Promote the growth of the telecommunications infrastructure of the country

• Deployment
  – State-owned Telebrás – Telecomunicações Brasileiras,
  – Private sector telecommunications companies acting in a complementary manner.
  – Internet service provider (ISP). has important role in this plan
Telebrás Backbone

- Being built out using fibre assets from Petrobras and Eletrobrás companies (by 2014)
Veredas Novas (New Paths) Initiate

• Principal objective (“Challenge”):
  – Connect to the national Ipê backbone all institutions in the interior of the country, at:
    • Minimum capacities of 100 Mb/s (for secondary campi) and
    • 1 Gb/s (the main campus).

• Anchored in partnerships with
  – Telebrás (National Broadband Plan), at national level, and
  – State government IT companies, at state level,

• Capitalizes on the (Brazilian) National Broadband Plan
RNP – Telebrás Partnership

• Telebrás provides telecommunications access to cities where there is an R&E campus to be connected to the Ipê backbone.

• Through a tripartite agreement between Telebrás, RNP and local R&E institution,
  – Telebrás equipment is collocated on the campus
  – From the campus, Telebrás provides service in that locality,
  – At the same time, Telebrás provides a clear channel connection between this campus and the Ipê backbone network.

• Thus, universities and research institutes act as anchor institutions in the process of massification of broadband access.

• Through collocation of its equipment on the campus
  – Telebrás expands telecommunications infrastructure for that locality.
• Both radio link microwave and optical fiber technologies are used to provide access connection to institutions.
• In each location, an assessment is carried out to select the appropriate technology to be employed.
• Goals, until 2014

<table>
<thead>
<tr>
<th>Year</th>
<th>Locality</th>
<th>University/Research Institution campus</th>
</tr>
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<tbody>
<tr>
<td>2012</td>
<td>30</td>
<td>42</td>
</tr>
<tr>
<td>2013</td>
<td>100</td>
<td>136</td>
</tr>
<tr>
<td>2014</td>
<td>120</td>
<td>157</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>250</strong></td>
<td><strong>335</strong></td>
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• This partnership is important, but it doesn’t resolve all the demands for connections for Veredas Novas.
RNP – Telebrás Partnership

• Localities that will be connected through the RNP–Telebrás partnership, relative to the Ipê network
• RNP has established other partnerships, mainly with state government IT companies.
  – These companies have usually carried out digital inclusion and e-government programmes at state level
  – Some of them have deployed their own regional optical backbone networks.

• Prime example: Ceará state, in northeast Brazil.
  – ETICE – Ceará Government IT company has deployed a statewide backbone
   • Reaches practically all cities in that state, (Cinturão Digital do Ceará /Ceará Digital Beltway).
  – RNP & ETICE have established a agreement to use this state backbone to provide access to all RNP client institutions in the state,
   • Connections, at a minimum of 100 Mb/s, to the RNP PoP in Fortaleza, the state capital.
  – RNP is investing around US$ 3 million in last mile construction to provide access to around 30 institutions in 22 localities in that state

• Similar strategies in the other states (Espírito Santo, Federal District,…)

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State Gov IT companies Partnership
Localities not reached by partnership

• By 2014, Telebrás backbone should reach only around 1/3 (one third) of the total number of cities where RNP has client institutions.

• Few state government IT companies have their own optical backbones.
  – Most of them do not, although some of these are just now deciding to deploy their own backbones.

• About 1/2 (half) of the RNP demand must be met by
  – Traditional telecommunications carriers,
  – Internet Service Providers (ISPs) or
  – RNP’s own sub-networks of radio-links.

• In the case of use of traditional telecommunications operators or ISPs,
  – RNP is analyzing technological alternatives to clear-channel service, like Metro Ethernet and IP tunneling service.
Conclusions

• Veredas Novas is an ambitious initiative, with the objective of connecting all institutions in the interior of the country,
  – Minimum capacity of 100 Mb/s (secondary campi) and 1 Gb/s (main campus),
  – Many of the current low-capacity connections are, for example, of 4, 8 or 12 Mb/s.

• Main strategy adopted by RNP has been to “hitch a ride on” the National Broadband Plan,
  – By establishing a partnership with Telebrás.

• In addition, RNP is also “hitching a ride” on state government programmes of digital inclusion and e-government,
  – Carried out by the state government IT companies,
  – ..where they have their own optical backbones.
Conclusions

- Even with these partnerships, around ½ of campuses it will still be necessary to acquire connectivity from carriers and ISPs,
  - Solutions will probably involve, not only clear-channel, but also other alternatives, like Metro Ethernet and IP tunneling services.
- Nevertheless, it is also very important to bring universities and research institutes to participate in the National Broadband Plan as anchor institutions in the rollout process.
- By collocating its equipment on and providing external links to the campus, Telebrás:
  - Expands telecommunications infrastructure for that locality, providing faster and better Internet access for local government, local businesses and citizens
  - .. while simultaneously providing a minimum link of 100 Mb/s for RNP to its client institution.
Conclusions

• This strategy may be used as a model for other NRENs with similar difficulties to reach institutions in the interior of their countries.
  – National broadband plans and digital inclusion programmes are good to “hitch rides on” and benefit from.
Thank you! ("obrigado")

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