



Ganador Reto IPv6 - 1 Edición 2021

Universidade Estadual de Campinas - UNICAMP – Brasil

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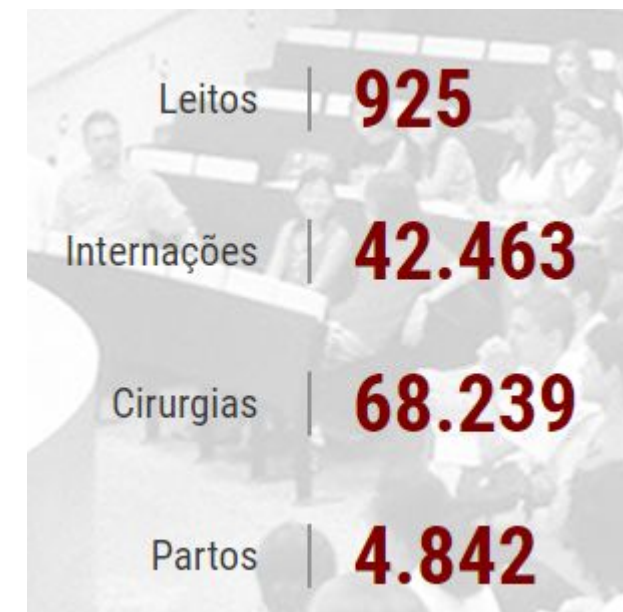
Founded in 1966, the Public University of São Paulo State - Unicamp - is recognized as:

- One of the three best Universities in Latin America.
- One of the Top 100 Universities in emerging economies.
- Top Brazilian University in number of patents.

Non-Academic and Academic Staff



Health Services

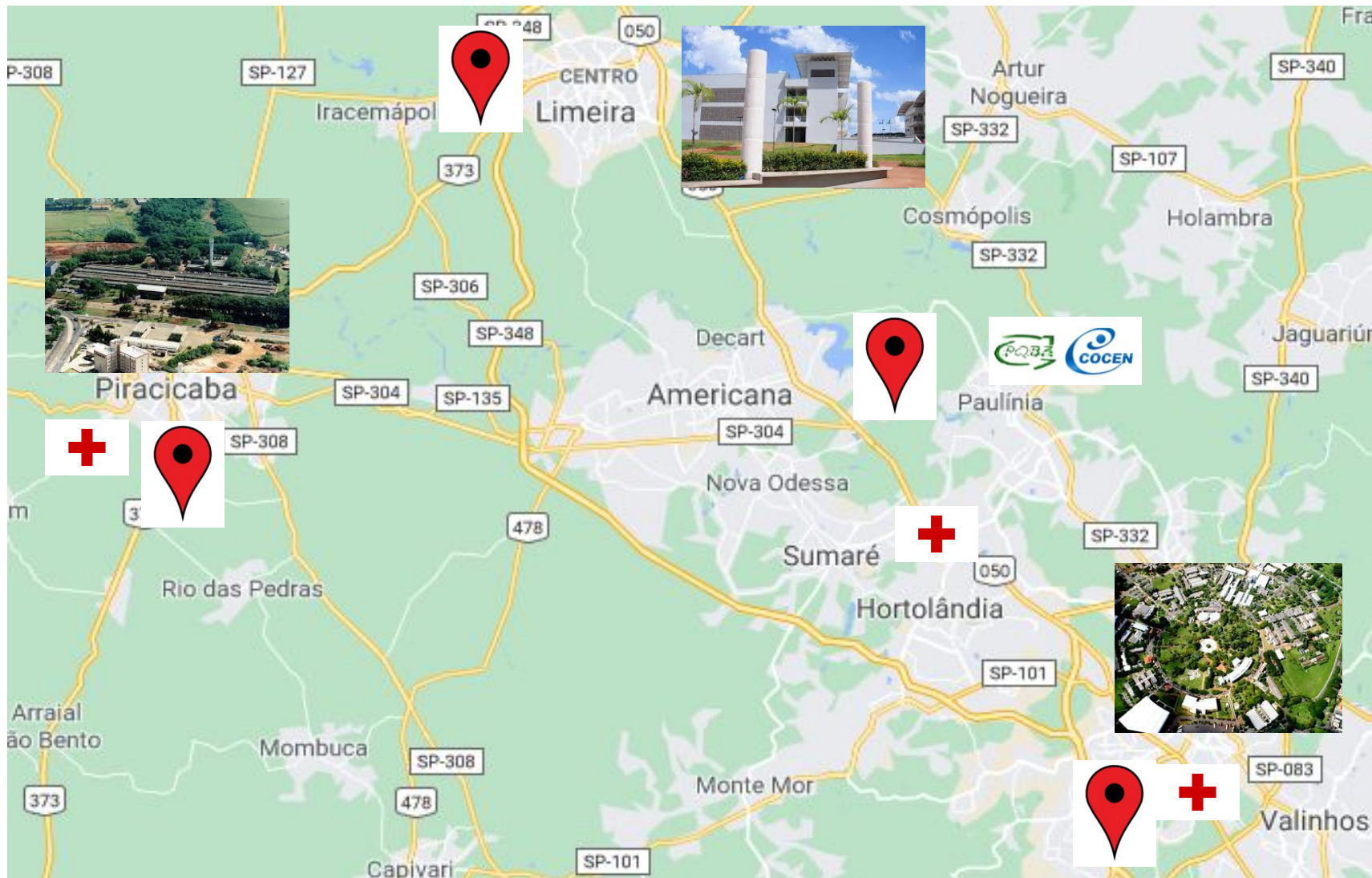


Patents



Undergraduate





Structured by a total of 90 University Divisions, including Schools, Institutes, Research Centers, Hospitals and Administrative Area. It serves a population of about 5 million people distributed in more than 90 neighboring cities.

Created by google maps.

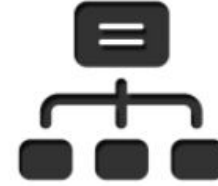
<https://www.aeplan.unicamp.br/anuario/anuario.php>

Timeline IPv6 Unicamp

ASN 53187 (2801:8a::/32)



The Unicamp network



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- Used daily by ~ 60,000 users.
 - Students, teachers, employees, and visitors.
 - 20,000 devices (LAN), plus 30,000 mobile devices.
 - Internet links is provided by RNP (Rede Nacional de Ensino e Pesquisa).
 - Logical connectivity with RNP's backbone, with the ANSP network, and the IX.BR exchange point in São Paulo and Campinas.

IPv6 infrastructure and services



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- BGP sessions in IPv6: RNP (AS1916), ANSP (AS1251), IX.BR route servers (AS26162) and bilateral exchange on IX infrastructure.
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- Several services: DNS, NTP, WEB, SSH, RDP, Database, Firewalls, IPS, Active Directory, Translation 6to4, DHCPv6, OSPFv3 routing
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- Wi-Fi networks with dual-stack in the Eduroam project and with 464XLAT. GPON networks with IPv6. VoIP telephony only with IPv6, initially 10 schools (~ 8,000 extensions across campus).

Routers



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- Challenge: Emergency Router Replacement.
 - The limitation of current routers in dealing with the increase in route tables, both in IPv4 and IPv6, due to the reduced size of TCAM memory.
 - When the TCAM tables are exhausted, new routes are not learned, generating routing instability.
 - Investment was made to purchase new routers.



Legacy Systems

- An effort was made to update academic systems:
 - Migrating legacy physical to virtualized environments, hosted in the cloud with x86 platform and preferably using open-source solutions.
- However, there are still systems that have literal IPv4 addresses in their codes and compromise the operation via IPv6-only.

Private Cloud



- Limitations of Cloudstack
 - The version in use has limitations regarding IPv6 network orchestration. This limitation prevents Unicamp's cloud client divisions from having their services running on IPv6, such as websites, for example.
- Cloud Unicamp: 640 vCPUs, 1.37 TB of RAM, and 128 TB of storage.

VoIP

- Brought many challenges and opportunities, including adopting IPv6 on devices.
- Some schools already had the IPv6 protocol configured and deployed in their LAN:
 - Gastro, HC, FCM, IQ, IC, FEEC, CCUEC, FCA, NIPE, Cotuca.
- Firmware update required for some vendors, to deal with DHCPv6.



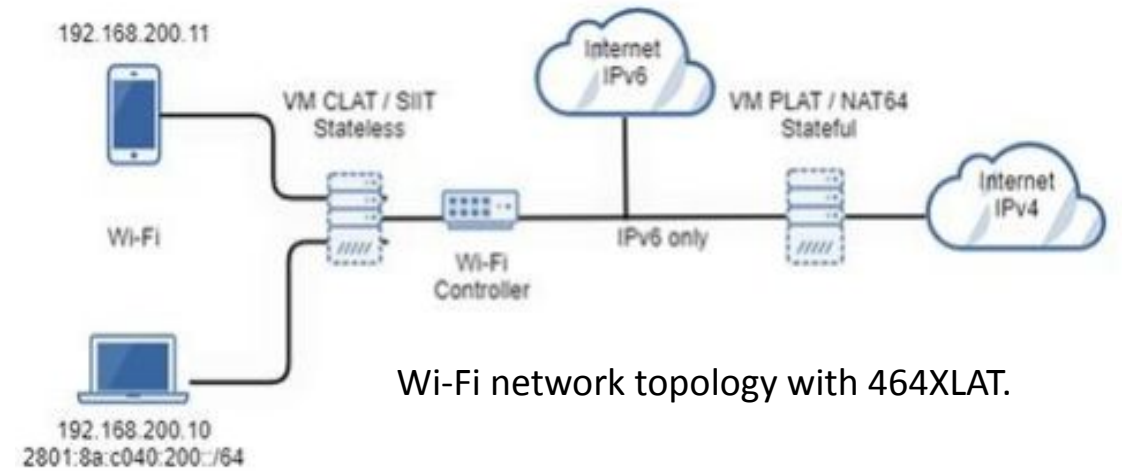
VoIP device with IPv6-only

Wi-Fi

- The traffic at main Unicamp Campus, reached the highest volume of IPv6 traffic at the University (900 Access Points):
 - In 2020 with 28,677 Unicamp user's and 15,069 visitors.
 - In 2019, 37,043 Unicamp user's and 34,486 visitors.
- Dual-stack and constantly demanded allocation of more and more classes of IPv4 address.
 - Android older than 4.0 version does not support IPv6.
- IPv6 assignments are done through SLAAC only (Android does not support DHCPv6).

IPv4aaS

- The use of the 464XLAT transition mechanisms in the School of Applied Sciences (FCA) has been successfully implemented. The Wi-Fi network with Jool can reach a total of around 3,000 people that circulate daily in the Limeira Campus.



GPON

- We were able to expand the data network and advance the implementation of the IPv6 protocol for the end-user. For this purpose 2 OLTs and 50 ONUs were recently acquired to serve two research laboratories of the School of Applied Sciences.



OLT installed on School of Applied Sciences.

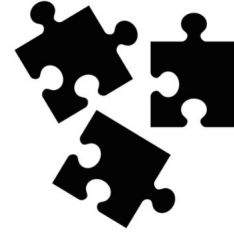
Remote access



- With the COVID-19 pandemic and the increasing home office needs our daily work changed. Remote access to research equipment in laboratories, computer labs, and internal systems was necessary.
- Apache Guacamole in IPv6 was implemented as a solution to provide remote access to desktops, systems, and servers. Also, as a solution to enable tablets and smartphones access.



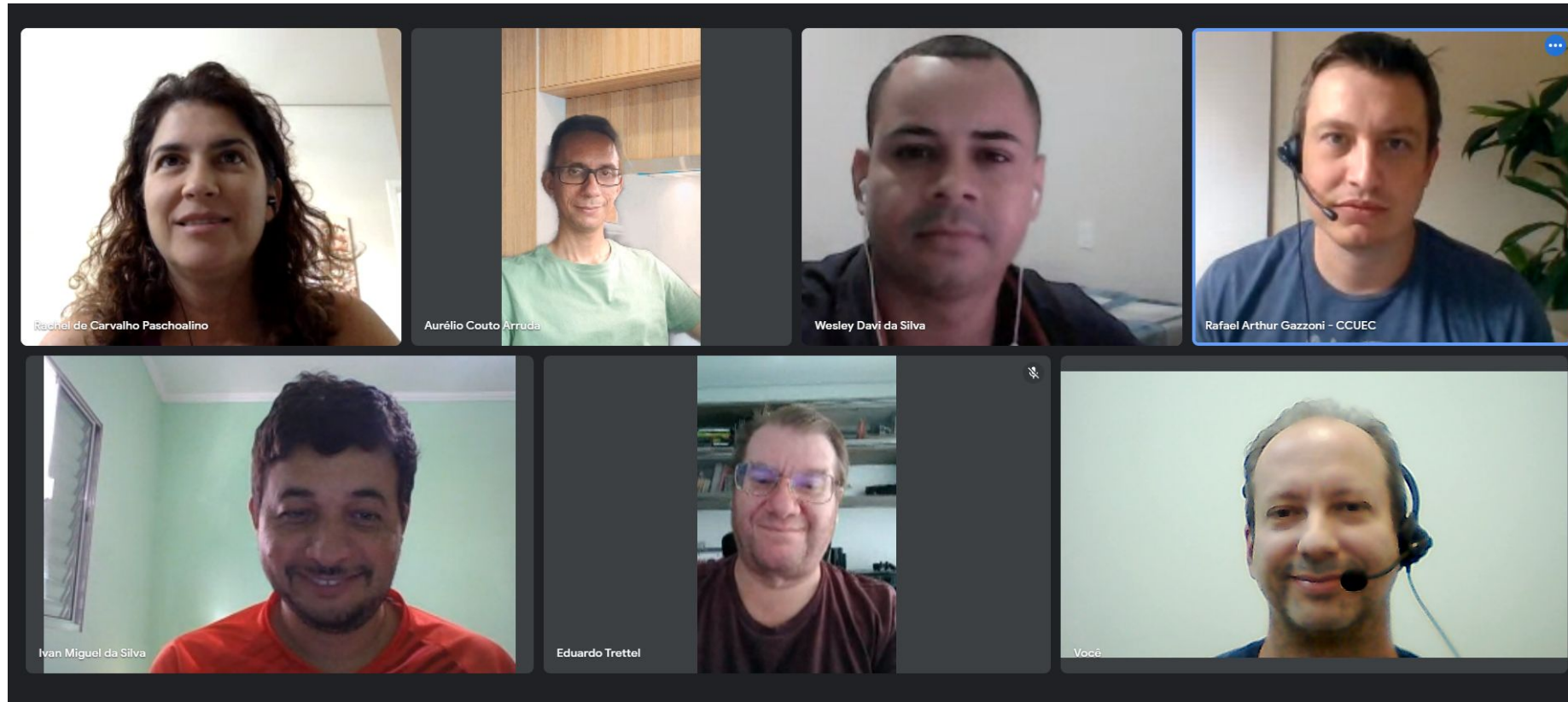
About the IPv6 Challenge



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- We encourage everyone to participate.
 - As an opportunity to get to know and document all the IPv6 projects that we currently have and sometimes inattention.
 - An opportunity to advance IPv6 deployment and learning, contributing to the development of the Internet.
 - Always available to help other institutions, sharing the best practices and promoting greater IPv6 adoption.
 - The challenge brought visibility in the University and international community, highlighting the use of IPv6.



Team



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