Twelve years of IPv6 in Mexico: Challenges, Experiences and Perspectives. Case UNAM.

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IPv6 Forum, Mexico Chapter

IPv6 Working Groups in CUDI and CLARA

National Autonomous University of Mexico, UNAM

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UNAM Data

- 305,969 university students.
- 35,057 academics.
- Installations in more than 2 million 317 thousand constructed m^2, 2,901 buildings.
- Extension schools in 24 Mexican states, as well as in the US (California, Illinois and Texas), Canada and Spain.

UNAM Data

- More than 50 thousand computers.
- More than 15 thousand telephone lines.

IPv6 BACKGROUND

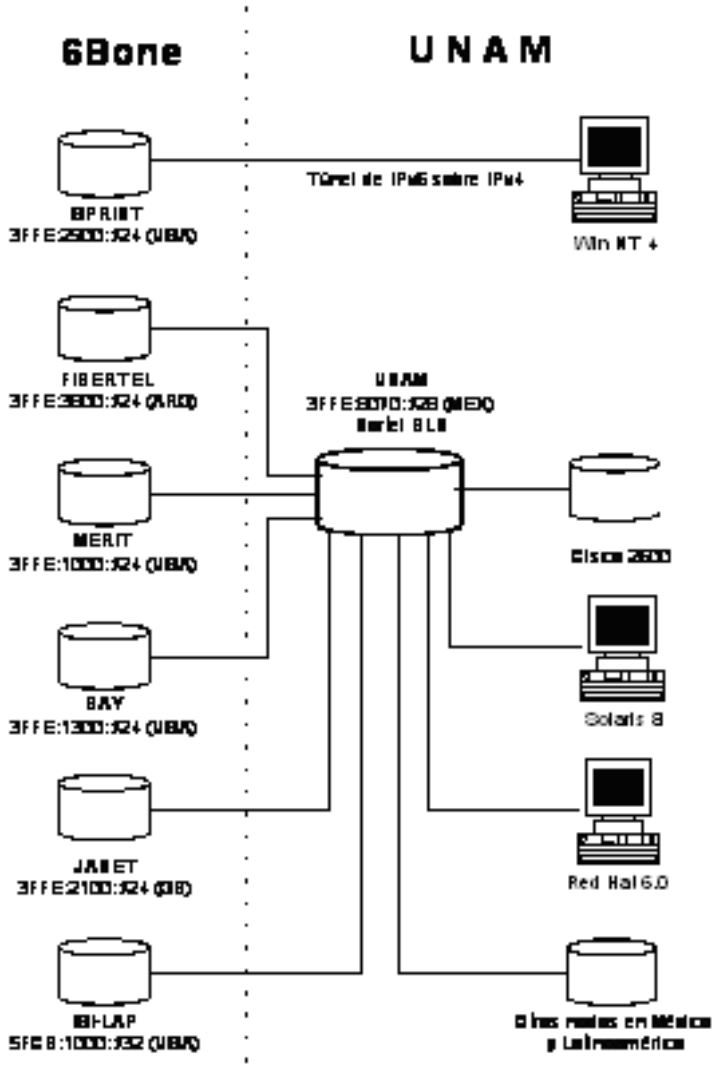
- During the last twelve years the IPv6 Project (Now IPv6 WG) of the National Autonomous University of Mexico (UNAM), has continued performing a series of tests with different IPv6 operating systems, equipments and applications.

- Offering the firsts IPv6 connections to some countries and institutions around the world mainly from Latin America and Mexico.

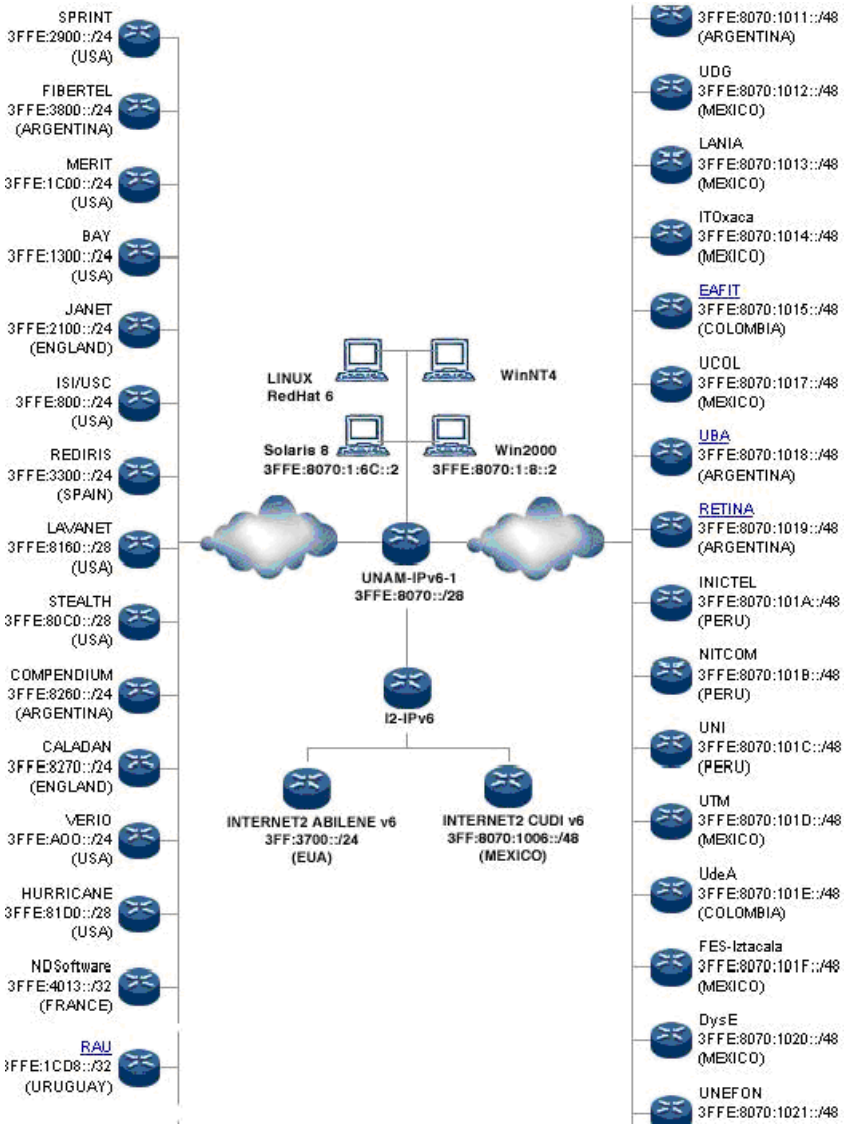
IPv6 BACKGROUND

- To perform IPv6 tests it was constructed an IPv6 experimental network segment (RedUNAMv6), based on hosts using different operating systems, routers of some vendors and it reached almost 80 IPv6 connections with 6Bone participants.

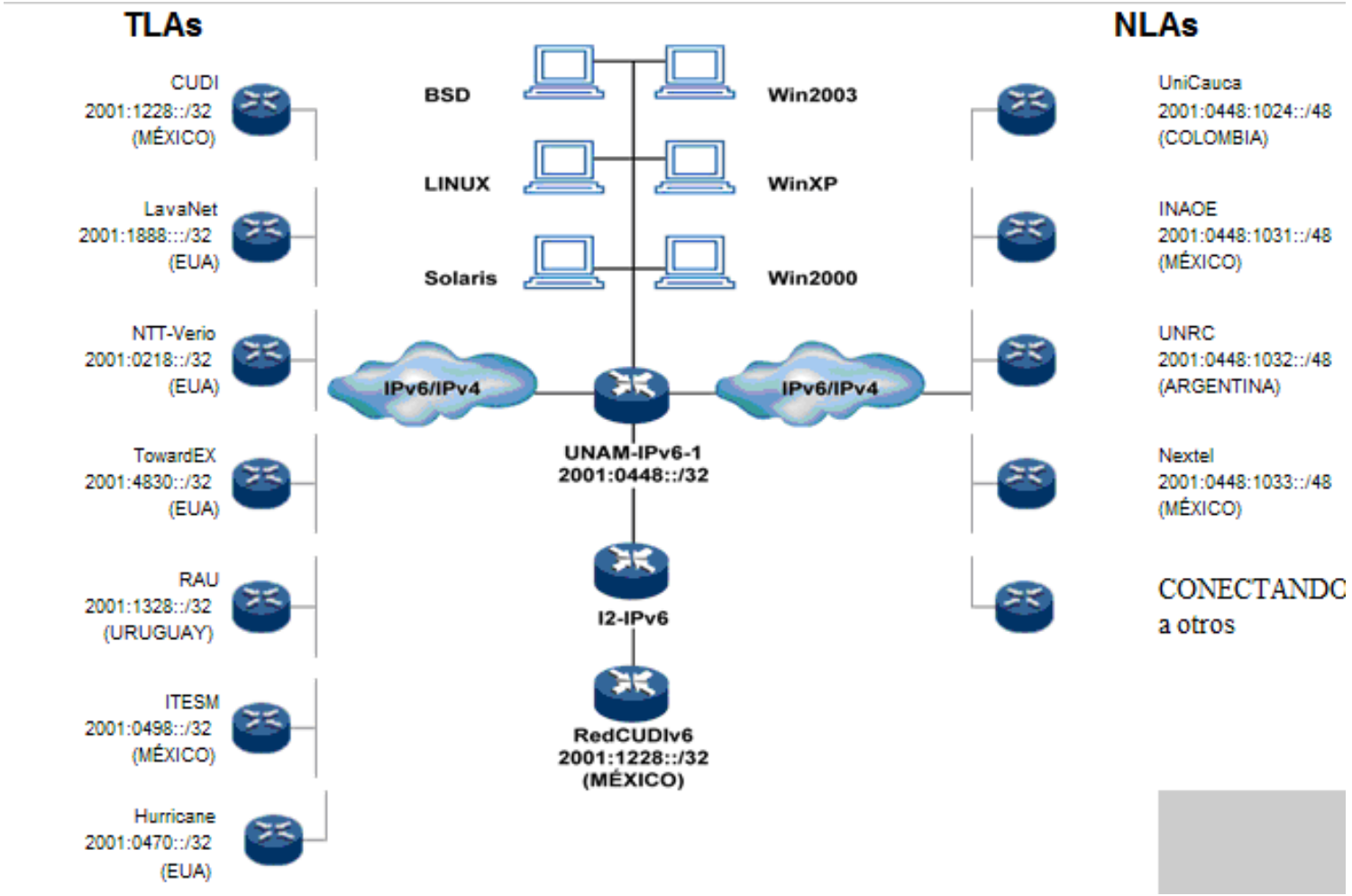
UNAM IPv6 Evolution (1)



UNAM IPv6 Evolution (2)



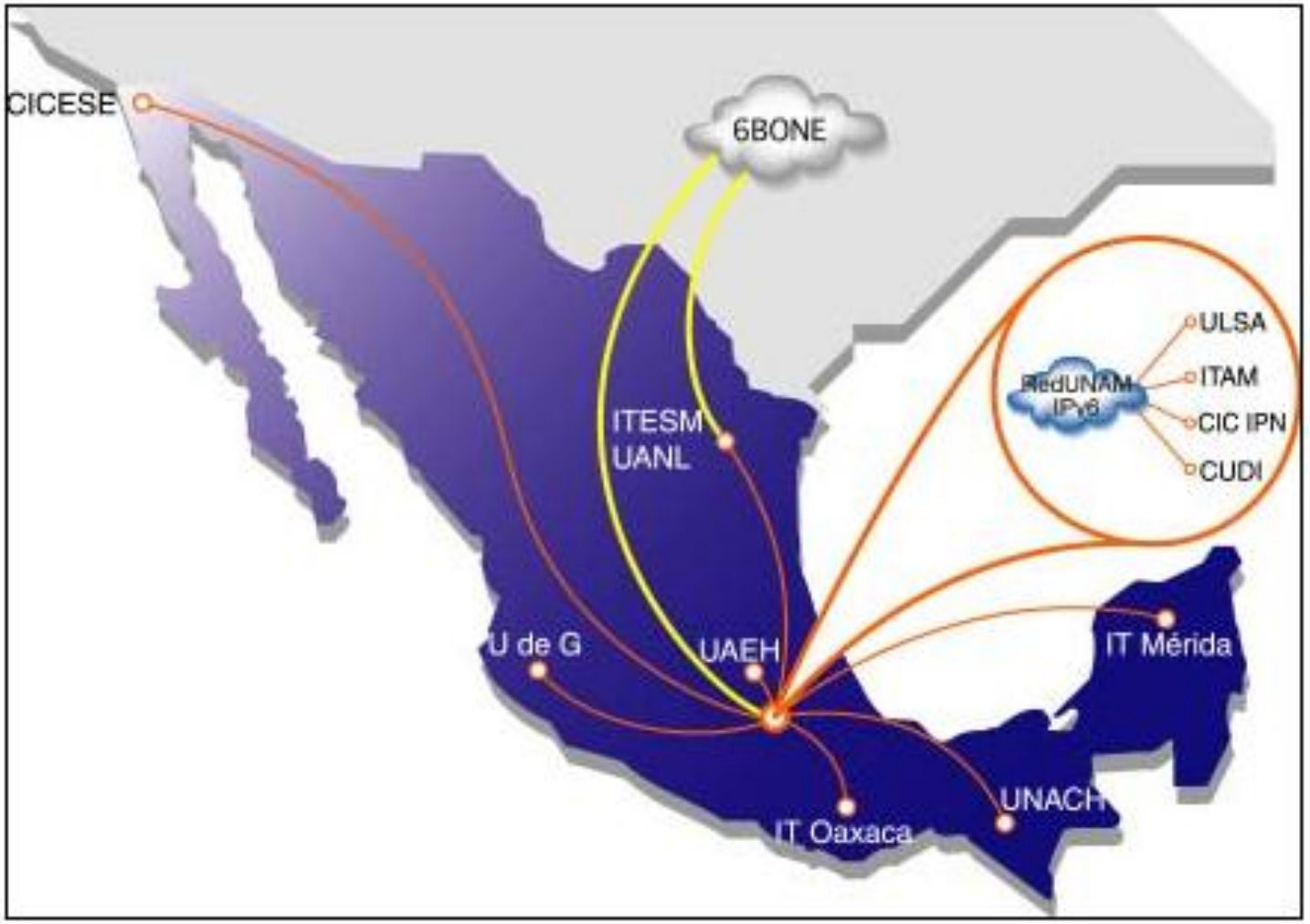
UNAM IPv6 Evolution (3)



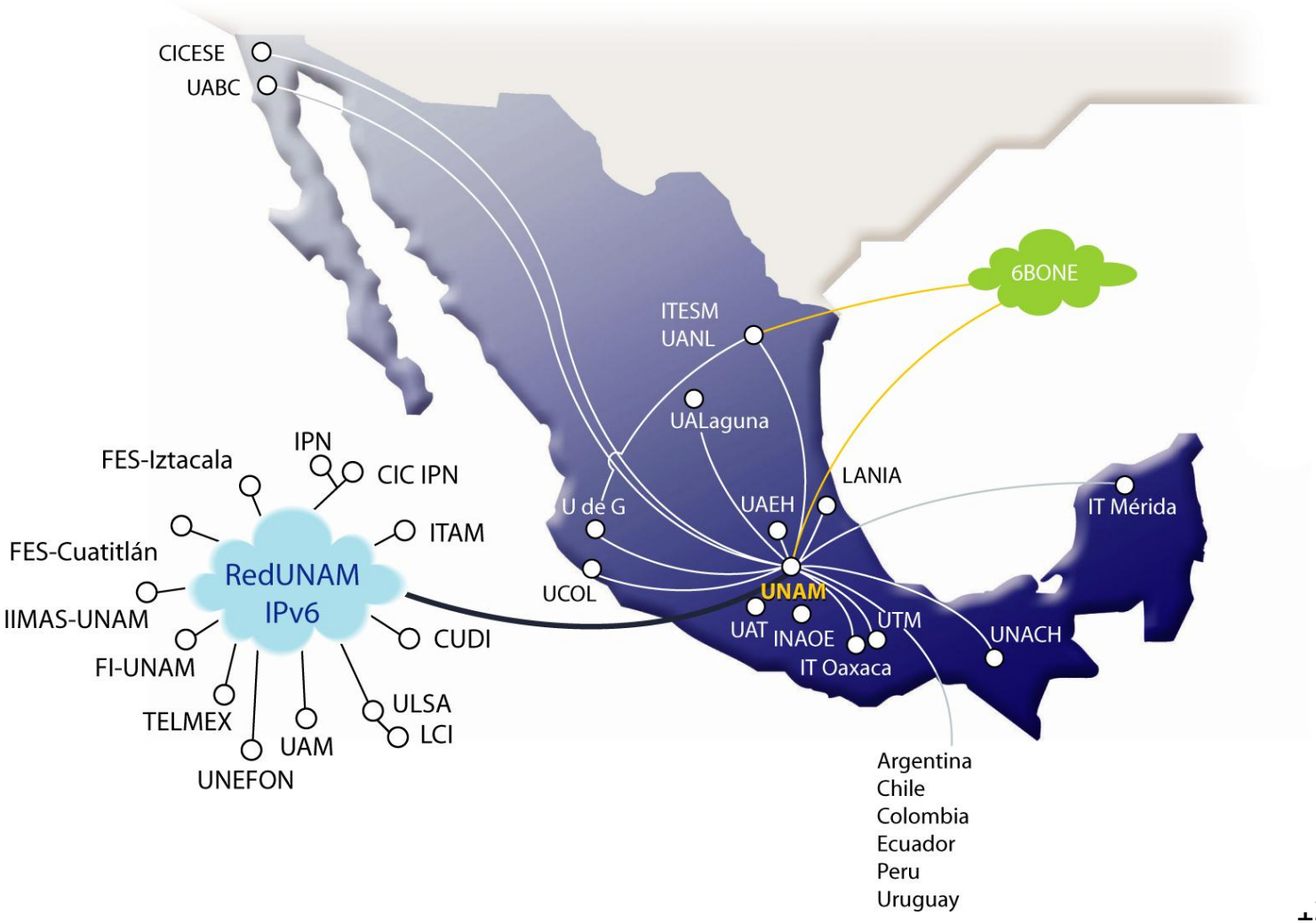
Objectives: IPv6 PROJECT of the UNAM

- Research, test and implement IPv6 in the main campus of the university.
- Investigate, test, and implement IPv6 in the Integral Telecommunications Network of the UNAM.
- Participate in the development of national and international IPv6 projects.
- Participate in the fortification and promotion of IPv6 and its applications.
- Provide IPv6 services in Mexico and Latin America.

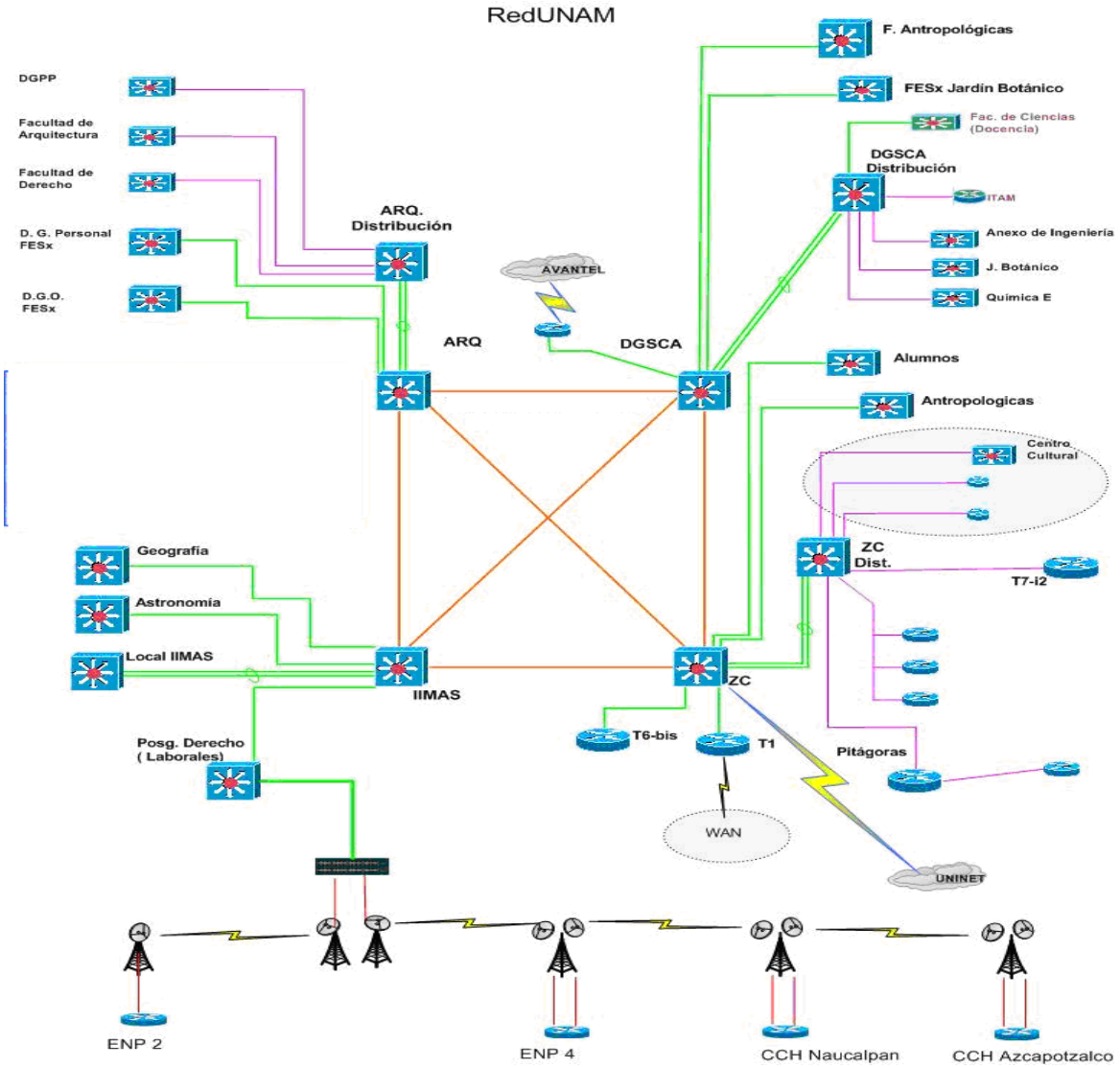
IPv6 in Mexico (in 6BONE before 2006)



IPv6 in Mexico (in 6BONE until 2006)



UNAM Network (RedUNAM)

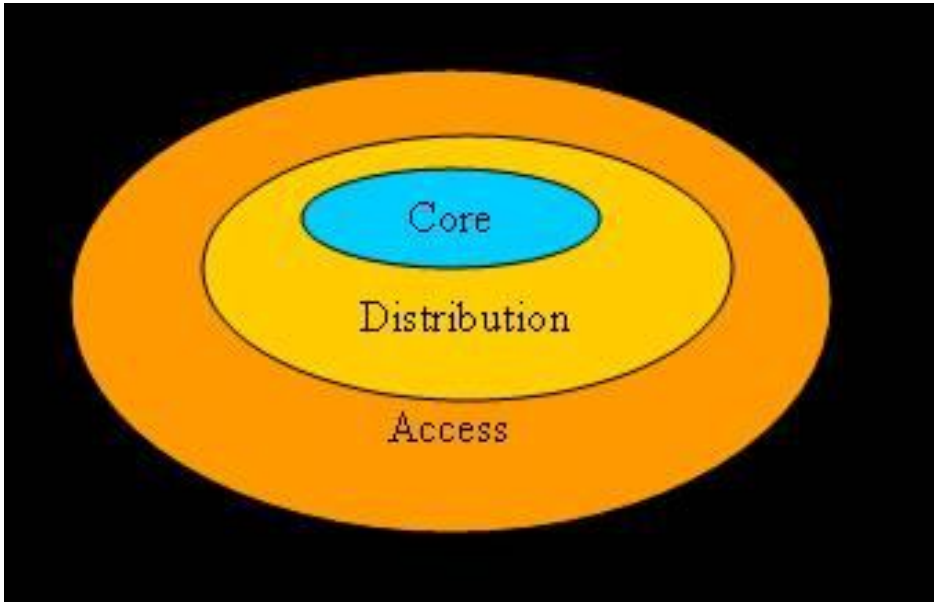


Current IPv6 Status in the UNAM network

- This year native and almost complete IPv6 support in new Backbone equipments of the UNAM network (RedUNAM).
- First native IPv6 connection with an ISP.
- More recent IPv6 support in access and distribution equipments.
- Some new tests are currently planned in 2012.

IPv6 Deployment Options

Current IPv6 Plan

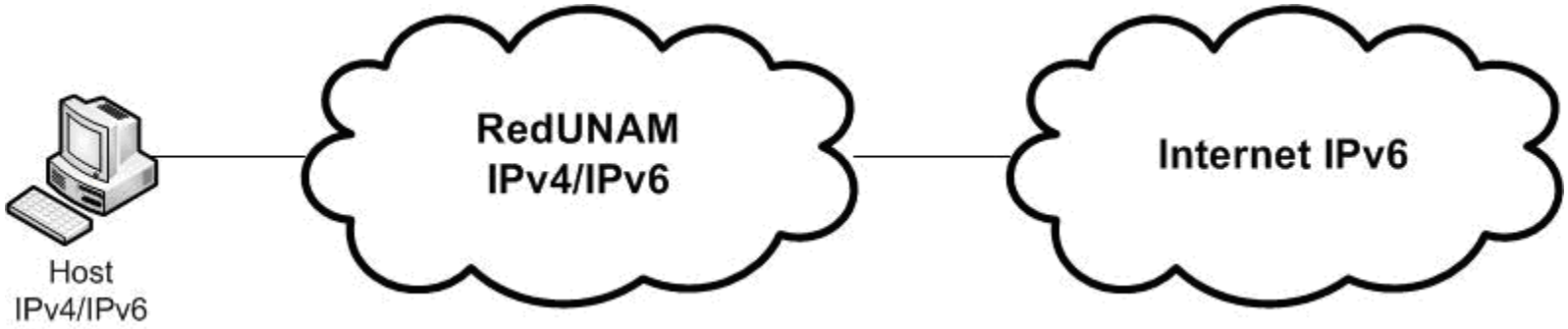


Original IPv6 Plan

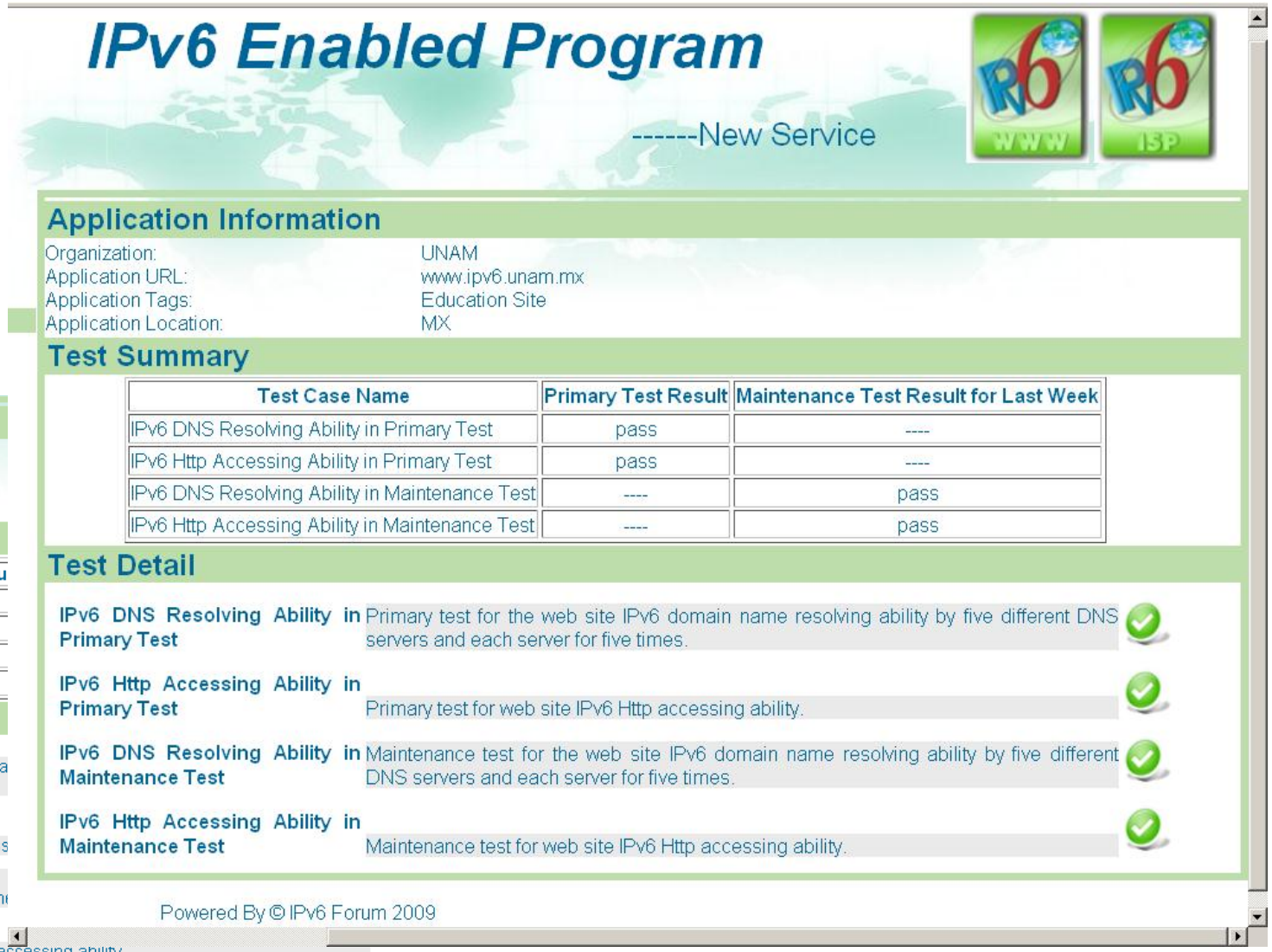
Current IPv6 Services in the UNAM campus

- Local servers and services:
  - Manual IPv6 tunnel connections.
  - Automatic 6to4 tunnel connections.
  - IPv6 over PPP support.
  - Teredo Server.
  - Tunnel Broker.
  - Some common services: Web, DNS, VC, others.
  - Helpful scripts (network staff)
  - Transparent connections to common users.

Transition options in RedUNAM



UNAM IPv6 Web pages



IPv6 Enabled Program

------New Service

Application Information

Organization:	UNAM
Application URL:	www.ipv6.unam.mx
Application Tags:	Education Site
Application Location:	MX

Test Summary

Test Case Name	Primary Test Result	Maintenance Test Result for Last Week
IPv6 DNS Resolving Ability in Primary Test	pass	----
IPv6 Http Accessing Ability in Primary Test	pass	----
IPv6 DNS Resolving Ability in Maintenance Test	----	pass
IPv6 Http Accessing Ability in Maintenance Test	----	pass

Test Detail

IPv6 DNS Resolving Ability in Primary Test — Primary test for the web site IPv6 domain name resolving ability by five different DNS servers and each server for five times.

IPv6 Http Accessing Ability in Primary Test — Primary test for web site IPv6 Http accessing ability.

IPv6 DNS Resolving Ability in Maintenance Test — Maintenance test for the web site IPv6 domain name resolving ability by five different DNS servers and each server for five times.

IPv6 Http Accessing Ability in Maintenance Test — Maintenance test for web site IPv6 Http accessing ability.

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IPv6 Forum Chapter Mexico
www.ipv6forum.com.mx
IT Site
MX

e Name	Primary Test Resu
y in Primary Test	pass
y in Primary Test	pass
y in Maintenance Test	----
y in Maintenance Test	----

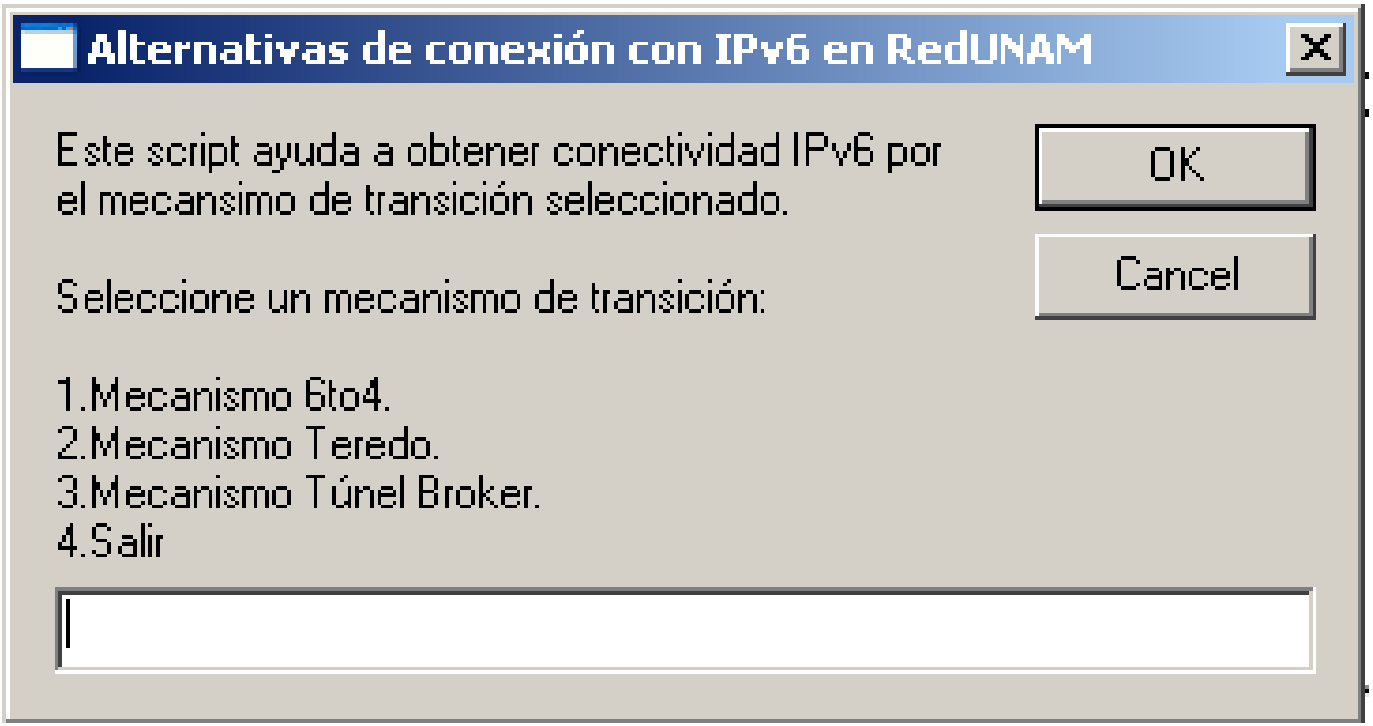
in Primary test for the web site IPv6 doma servers and each server for five times.

in Primary test for web site IPv6 Http access

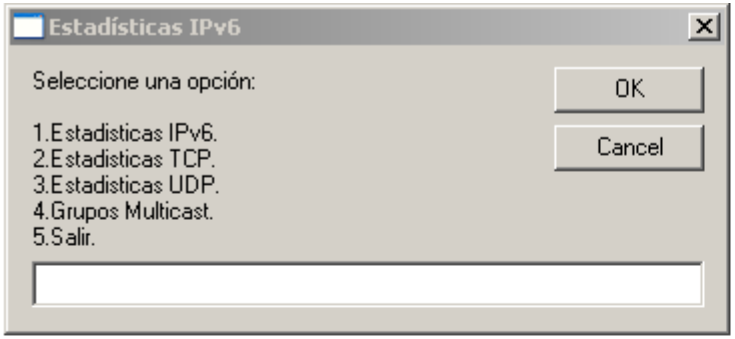
in Maintenance test for the web site IPv6 DNS servers and each server for five tim

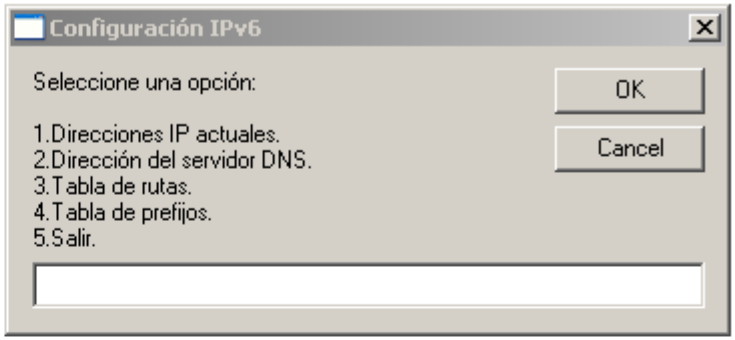
in Maintenance test for web site IPv6 Http accessing ability.

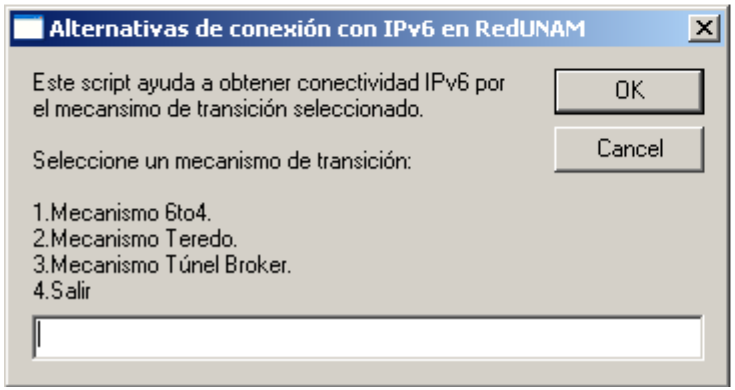
IPv6 connection's options script

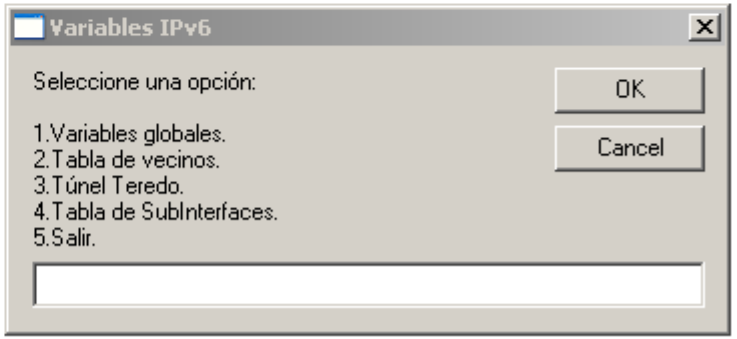


More scripts examples

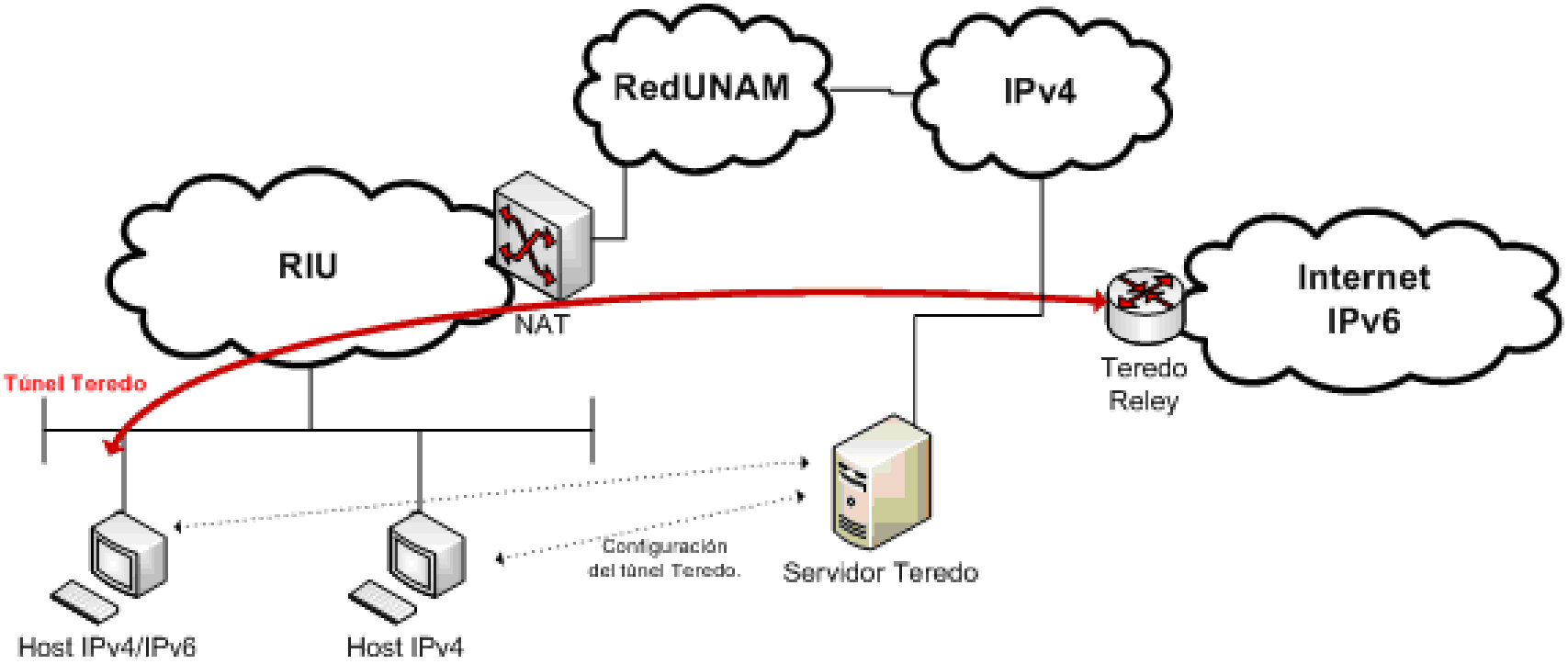








Local Teredo Service



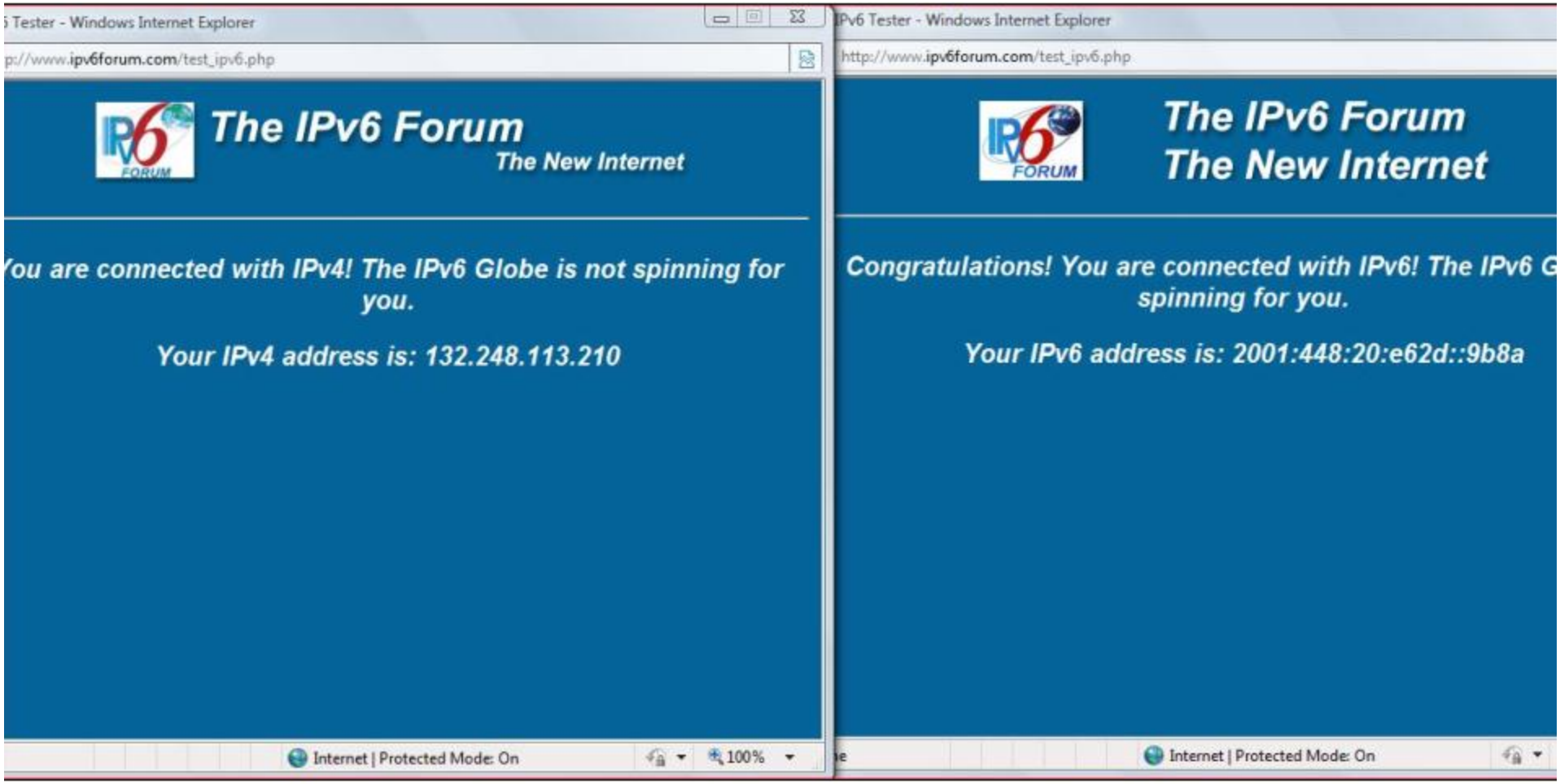
Tunnel Broker Server

Tunnel Broker Server visual results

Tunnel Broker Server visual results

Initial IPv4 Connection

Successful IPv6 Connection



Next IPv6 Services in the UNAM campus

- More local servers and services with IPv6-IPv4 support:
  - Main production servers.
  - DSL connections.
  - VPNs.
  - Native IPv6 wireless and mobile connections.
  - UNAM's Radio and TV station.
  - IPv6 / WDM links.
  - IPv6 in Grids.
  - Environmental monitoring (volcanic).
  - VoIPv6 or SIP with IPv6.
  - And many others.

IPv6 current status in Latin America and the Caribbean

BACKGROUND

- Since 1998, academic institutions of Brazil (RNP) and Mexico (UNAM) began research and first tests with IPv6.

BACKGROUND

- Since 2000 academic institutions, and later the first ISPs got their own production prefixes from ARIN.

- Later on, with the creation of LACNIC in 2002, the number of allocations has grown, in 2005 it duplicated.

IPv6 in LATIN AMERICA (until 2006)
Test bed Networks (Within 6Bone Project)

- **56** Nodes (1485 worldwide, i.e. 3.77%).
  - 11 in Argentina (14)
  - 13 in Brazil
  - 3 in Chile
  - 6 in Colombia
  - 1 in Cuba
  - 3 in Dominican Republic
  - 16 in **Mexico**
  - 2 in Peru
  - 0 in Uruguay (1)

Countries with IPv6 nodes in 6Bone (until 2006)

Source: Web page of the UNAM's IPv6 Project

First Chapters of the IPv6 Forum (OneWorld WG)

- Australia.
- Korea.
- Spain.
- India.
- Mexico. (Since 2000)
- Russia.
- Singapore.
- Taiwan.

IPv6 in LATIN AMERICA

- Only in some countries like Cuba exists a strong IPv6 Promotion Policy. In two of them Brazil and **Mexico**, the pioneers of IPv6 research in the region, exist an IPv6 Forum Chapter. In others, such as Argentina, Brazil, Colombia, Cuba, Panama and Peru, IPv6 Task Forces operate following the objectives of LACIPv6TF.

IPv6 in LATIN AMERICA
Production Networks (22 countries)

Position	Country	Visible	Allocated	Visible Percentage
1	Brazil	17	68	8.02%
2	**Mexico**	**8**	**23**	**3.77%**
3	Argentina	8	20	3.77%
4	Venezuela	6	14	2.83%
5	Chile	5	13	2.36%
6	Uruguay	7	11	3.30%
7	Colombia	2	9	0.94%
8	Peru	0	7	0.00%
9	Equador	3	7	1.42%
10	Nether Antillen	2	5	0.94%
11	Cuba	3	5	1.42%
12	Panama	1	4	0.47%
13	Bolivia	0	4	0.00%
14	Costa Rica	2	4	0.94%
15	Dominican Rep	1	4	0.47%
16	Guatemala	2	4	0.94%
17	Nicaragua	0	2	0.00%
18	Trinidad &Tobag	1	2	0.47%
19	Paraguay	0	2	0.00%
20	Haiti	1	2	0.47%
21	Honduras	0	1	0.00%
22	El Salvador	1	1	0.47%

Source: SixXS Ghost Route Hunter

IPv6 in CUDI

CUDI

- CUDI (University Corporation for the Development of Internet) – is the NREN of Mexico, it has IPv6 support since 2001.

IPv6 Working Group

- The IPv6 Working Group started in April 2000.
- It is coordinated by the UNAM.

History of IPv6 in CUDI

- **April 2000.**

IPv6 Working Group was created.

- **April 2001.**

First IPv6 over IPv4 tunnel by Internet2 between CUDI in Mexico and Abilene in the USA.

- **December 2001.**

Native IPv6 implemented in the Backbone in four of the five existing POPs: Mexico City, Guadalajara, Monterrey and Tijuana.

- **June 2002.**

First IPv6 native connection between the academic networks of Mexico and the USA.

History of IPv6 in CUDI

- **April 2003.**
  Bigger IPv6 prefix.
- **February 2004**
  IPv6 Virtual Day.
- **2010**
  Challenge CUDI IPv6.
- **2011**
  World IPv6 Day.

PROJECTS and TESTS

- IPv6 Applications development.
- VoIPv6 or SIP with IPv6.
- Videoconference with IPv6
- Remote control of devices.
- Multicast IPv6 (Opera Oberta):

  (Gran Teatre del Liceu de BarcelonaGran Barcelona)
  - High Definition
  - IPSec+ IPv6 Multicast
- M6Bone
- Open Student Television Network (OSTN)

Summary of IPv6 Activities in Mexico

- First National IPv6 seminaries in 1999 and 2000 organized by the Mexican Chapter of the IPv6 Forum.

- Each year since 2002, ISOC Mexico has organized IPv6 roundtables, in its annual meetings.

- 2005: IPv6 Tour organized by LACNIC, NIC-Mexico.
- 2006: First formal IPv6 presentation in SCT office.
- 2009:
  - IPv6 Workshop in ICANN 34 Meeting, in March.
  - IPv6 Observatory Web page launched. (e-Mexico)

Summary of IPv6 Activities in Mexico

- 2011:
  - World IPv6 Day.

- 2012:
  - World IPv6 Launch

Current IPv6 STATUS in Mexico

- Almost ready ISPs with native IPv6 offer.
- Not yet native IPv6 DNS queries (sooner than later)

References

REFERENCES

- www.6bone.net
- www.ipv6.unam.mx
- www.ipv6.unam.mx/Internet2/
- www.ipv6forum.com.mx
- www.ipv6forum.com/ipv6_enabled/

REFERENCES

- www.cudi.edu.mx
- www.redclara.net

www.ipv6.unam.mx

English Version

Esta página puede ser visualizada con IPv4 y con IPv6

Esta usando IPv6 desde (2001:1218:1:6:b90e:7994:d597:1cf1).

La "Internet Engineering Task Force" (IETF) creó el proyecto IPng: **Internet Protocol for Next Generation**, también llamado **IPv6**.

Esta versión del Protocolo de Internet (IP) ya está conviviendo y sustituyendo en algunos casos progresivamente a IPv4, ya que brinda mejores características entre las que destacan: espacio de direcciones prácticamente infinito; posibilidad de autoconfiguración de varios dispositivos con puertos de red (computadoras, ruteadores, agendas electrónicas, teléfonos inteligentes, etc.); mejor soporte para seguridad, computación móvil, calidad de servicio; un mejor diseño para el transporte de tráfico multimedia en tiempo real, aplicaciones para anycast y multicast; así como diversos mecanismos de transición gradual de IPv4 a IPv6 y de comunicación entre equipos de ambas versiones.

Pasado miércoles 8 de Junio !!!

NOTICIAS

Se publica entrevista "Internet para Todos IPv6 " en el suplemento de los mártes "UNAMirada a la Ciencia", en el periódico la Prensa.
México, 13 de septiembre de 2011

Se participa en el programa de radio "Hoy por Hoy en la Ciencia" de la Dirección General de Divulgación de la Ciencia de la UNAM, en W Radio, con el tema de IPv6.
México, 30 de julio de 2011

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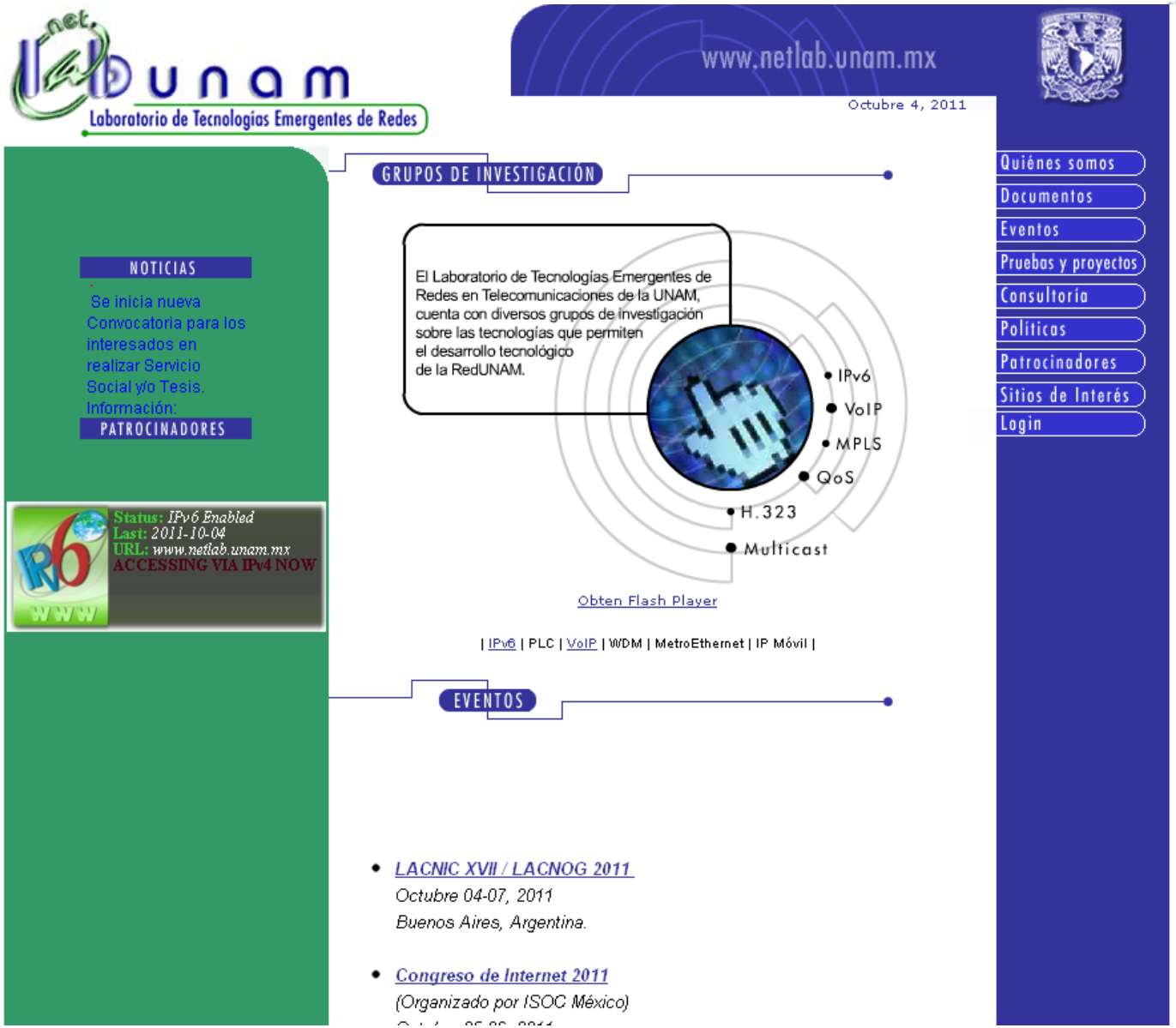

IPv6 WG WIKI in CLARA

http://wiki-gtipv6.reuna.cl/wiki/index.php

Thanks for your attention !

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Gracias !

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