

1Pv4
+1Pv6

Rede nota 10!!

Adilson Aparecido Florentino
Network Specialist

Who am I???



Adilson Aparecido Florentino
Especialista em Redes de Computadores

- Technologist in Data Processing by Mackenzie University and Specialist in Computer Networks by FASP - Faculdades Associadas de São Paulo.
- Cisco CCSI Instructor, 4X CCNA (Routing & Switching, Security, Wireless & Voice), CCDA CCAI CCNP since 1999 at SENAC São Paulo.
- University Professor in several Teaching Institutions such as FATEC, IFSP, UNICID, FIAP and IBTA.
- Author of IPv6 in Practice book - first book in Portuguese on the subject.
- Independent consultant acting in several companies in Network Projects and training. Instructor of the NIC.br (autonomous) in the BCOP course (Good Operational Practices) configuring BGP in Cisco, Juniper and Mikrotik routers.

Agenda

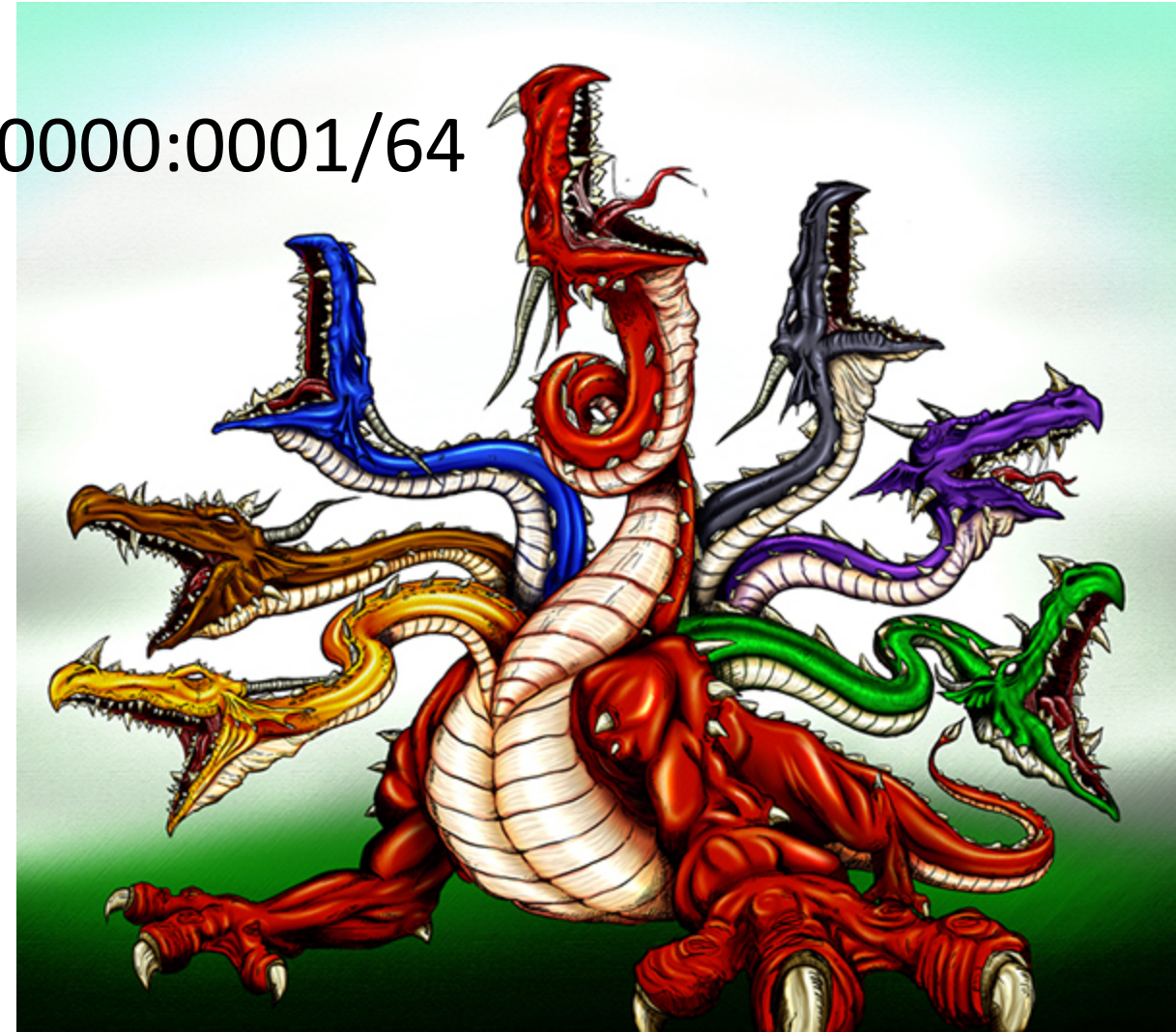
- Introduction to the new internet protocol
- Reasons for IPv4 Address Shortage
- Transition Techniques for Stack-Dual Deployment (IPv4 + IPv6)
- Use of CG-NAT - Benefits and Disadvantage
- IPv6 Networking and IPv6 Routing Services
- Current scenario of the use of IPv6 in Brazil



A Brief Introduction to IPv6

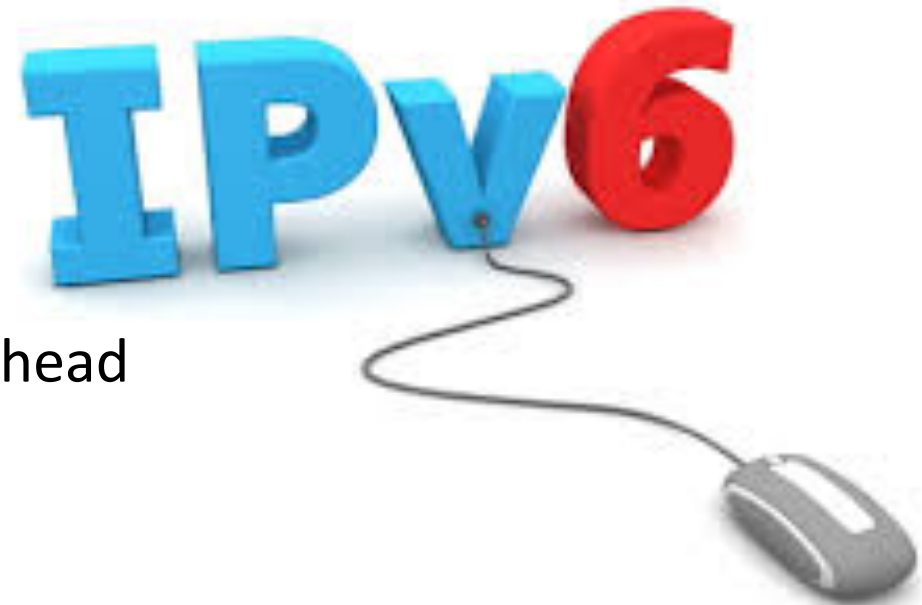
2001:0DB8:FACA:B01A:0007:CC1E:0000:0001/64

A monster of 128 heads ???



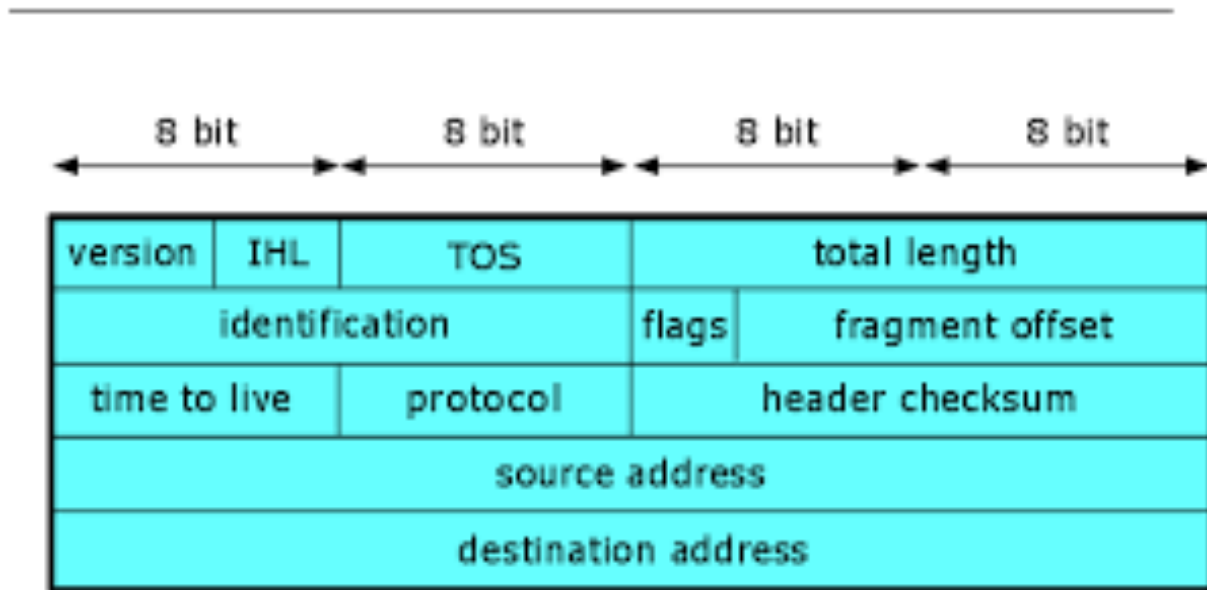
Introduction to the new internet protocol

- Paradigm Shift - Prefixes and no more Addresses
- Management of Abundance X Management of Misery
- A New Protocol on the Internet - But Not So Much!
- IPv4 versus IPv6 - Transition Until when ???
- Opportunities and Challenges
 - Need IPv6 Experts
 - The world is still basically IPv4 - too much work ahead

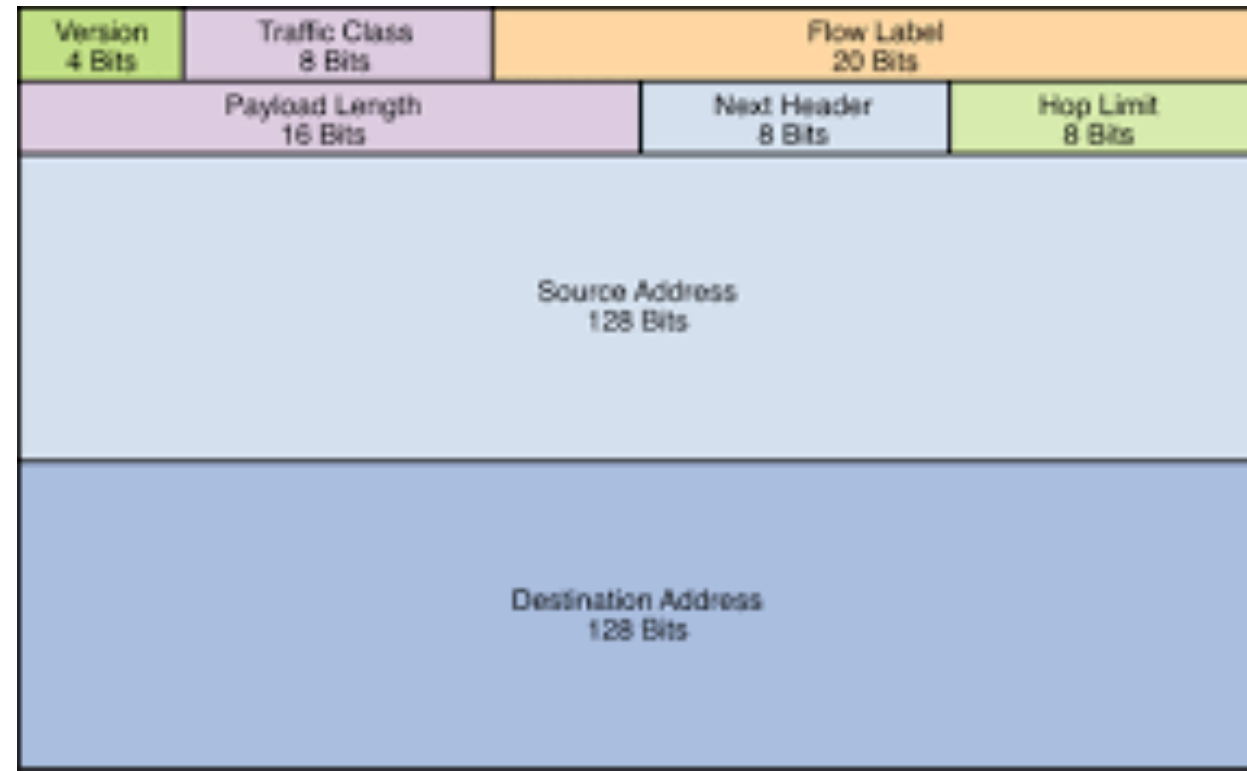


New Header - New Implementations

IPv4



IPv6



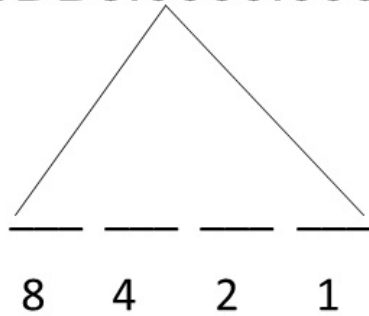
Most Relevant Changes

- Gigantic Number of Addresses: 2^{128} - More than 340 undecons
- Extension Headers: allow new features to be entered without changing the basic header
- Support for packets up to 4 Gb in size
- ICMPv6 - Protocol takes over functions of the ARP, RARP and IGMP protocols (in addition to all functions already supported in IPv4)
- IPv6 security - native support for IPSec - New Best Practices need to be Created

A Brief Introduction to IPv6

Tomando bits emprestados

- 2001:0DB8::/32
- 2001:0DB8:0000:0000:0000:0000:0000:0000/32



Hexadecimal → 16 elementos
 0 1 2 3 4 5 6 7 8 9 A B C D E F

Regra Básica: $16 / \langle \text{valor do bit} \rangle = \text{numero de blocos}$

Valores Posicionais

	8	4	2	1	
0	0	0	0	0	→ 0
0	0	0	0	1	→ 1
0	0	0	1	0	→ 2
0	0	0	1	1	→ 3
0	1	0	0	0	→ 4
0	1	0	0	1	→ 5
0	1	1	0	0	→ 6
0	1	1	1	1	→ 7
1	0	0	0	0	→ 8
1	0	0	0	1	→ 9
1	0	1	0	0	→ A
1	0	1	1	1	→ B
1	1	0	0	0	→ C
1	1	0	1	1	→ D
1	1	1	0	0	→ E
1	1	1	1	1	→ F

What prefixes to use ...

- Home User: from / 56 to / 64
- Simple Applications: at least one / 64
- Companies: / 48
- Point to Point Link: / 126
- Loopback: / 128

In Management of Misery: Deliver a single Address / 128 - and dynamic - to do to render more !!!





ipv4 acabou

IPv4 is over! And now ???

Sign in

All Videos Images News Shopping More Settings Tools

About 33,600 results (0.40 seconds)

O estoque de endereços IPv4 no Brasil acabou | Tecnoblog

<https://tecnoblog.net/158099/ipv4-brasil-america-latina-esgotado/> Translate this page

Depois de Ásia e Europa, América Latina e Caribe esgotam estoque de IPv4.

A tabela de IPv4 terminou de ser alocada hoje. E agora? | Tecnoblog

<https://tecnoblog.net/.../a-tabela-de-ipv4-terminou-de-ser-alocada-h...> Translate this page

Não corram, ainda não é o apocalipse. Apesar da tabela de IPv4 ter terminado de ser alocada hoje, a internet não parou, a Skynet ainda não despertou das tr.

É oficial, endereços IPv4 estão esgotados na América do Norte

meiobit.com/.../arin-eenderecos-ipv4-esgotados-estados-unidos-can... Translate this page

E aconteceu: não há mais endereços IPv4 disponíveis nos Estados Unidos e Canadá; protocolo de 32 bits não suporta mais do que 4,29 bilhões de ...

Hangout: o IPv4 acabou, e agora? - IPv6.br

ipv6.br/post/hangout-o-ipv4-acabou-e-agora/ Translate this page

Jun 10, 2014 - Fique calmo. A Internet não vai parar. Os IPs que já estão sendo usados, continuarão funcionando. E há ainda uma pequena reserva ...

Estoque de endereços IPv4 acaba na América Latina - Internet

<https://corporate.canaltech.com.br/.../Estoque-de-enderecos-IPv4-a...> Translate this page

Jun 11, 2014 - Os estoques de IPv4 chegaram ao fim na América Latina e Caribe e o Núcleo de Informação e Coordenação do Ponto BR deu início à ...

Activate Windows
Go to PC settings to activate Windows.

Reasons for IPv4 Address Shortage

- IPv4 was an Experimental Project that Gave It Right!
- IPv6 was the definitive version that until today companies push with the belly its adoption
- With the commercial use of the Internet from the second half of the 90's, IP began to be lacking
- In the time of the "Fat Cows" the Blocks IPs were very poorly distributed
- Techniques to extend IPv4 Lifespan (mainly NAT) gave the false sense that "Ips would never end !!!"

IPv4 is over! And now ???

- "IPocalypse" has been occurring at various levels over the years:
 - IANA - Regional Offices - Autonomous Systems
- Phase 3 at LACNIC - Only new ASNs can request new Blocks
 - Restrictive Politics - It is the fault of those who did not vote!
- The Internet still does not know to walk only with IPv6
 - The Egg and Chicken Dilemma
- Two paths to follow:
 - blessing or curse? Heaven or hell ? IPv6 or CG-NAT?

IPv4 is over! And now ???

- IPv4 and IPv6 were not designed to "talk" to each other
- 3 Options to establish the dialog:
 - Dual-Stack
 - Tunneling
 - Translation (NAT-PT)
- Whenever possible, implementing Dual-Stack is the best option

IPv4 is over! And now ???

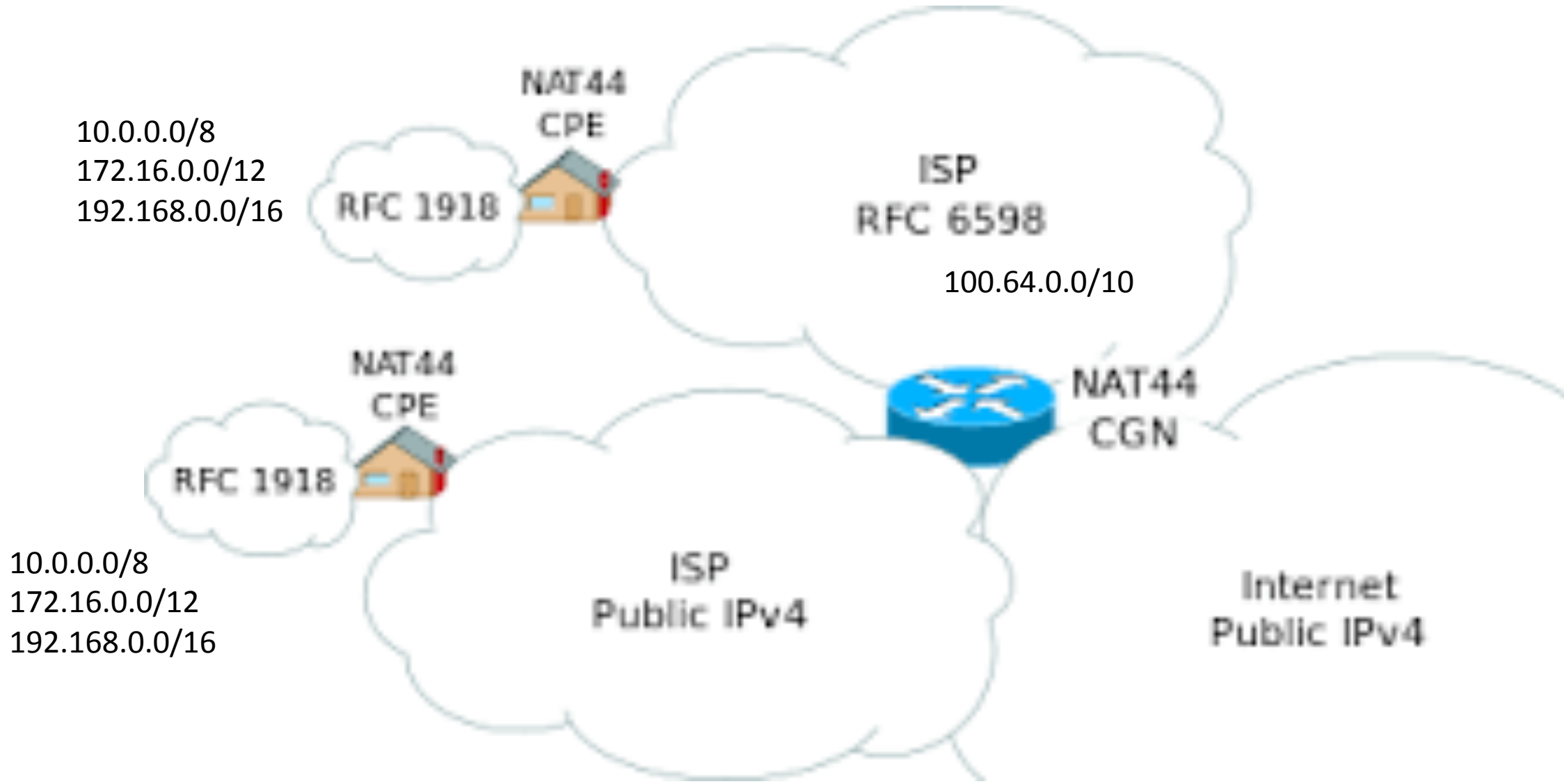
- Is it worth a NAT in the hand of what flying IPv6 ???
 - You'll have to use NAT, yes! But if you do not implement IPv6 in parallel, this will never end!
- If a NAT bothers a lot of people, NAT444 bothers, bothers, bothers much more!
 - IPv6 will still have to walk alongside IPv4 for quite a while
- HTML5 can stop the rampant consumption of ports and a survival to the NAT
- Old IPv4 Blocks Are Being Recovered and Reused
 - Beware of second-hand IPs!

There are already people wanting to earn money with IP !!!

- The IPv4 and IPv6 Blocks are granted in Brazil by NIC.br and companies must justify via Form their need.
- If they no longer need them, they must return the blocks.
- It is proven to transfer or "sell" the direct use in the LACNIC region
- In other regions Commerce is allowed, some companies are already specializing in "renting blocks" at prices well above those practiced by IANA and its regional offices

IP TRADE

Use of CG-NAT



CG-NAT - Mapping Example

1 valid IP = 32 users
with 2048 ports each.

IP PÚBLICO	IP Privado (/27)	Faixa de Portas	
166.237.148.1	100.64.0.0	0	2047
166.237.148.1	100.64.0.1	2048	4095
166.237.148.1	100.64.0.2	4096	6143
166.237.148.1	100.64.0.3	6144	8191
166.237.148.1	100.64.0.4	8192	10239
166.237.148.1	100.64.0.5	10240	12287
166.237.148.1	100.64.0.6	12288	14335
166.237.148.1	100.64.0.7	14336	16383
166.237.148.1	100.64.0.8	16384	18431
166.237.148.1	100.64.0.9	18432	20479
166.237.148.1	100.64.0.10	20480	22527
166.237.148.1	100.64.0.11	22528	24575
166.237.148.1	100.64.0.12	24576	26623
166.237.148.1	100.64.0.13	26624	28671
166.237.148.1	100.64.0.14	28672	30719
166.237.148.1	100.64.0.15	30720	32767
166.237.148.1	100.64.0.16	32768	34815
166.237.148.1	100.64.0.17	34816	36863
166.237.148.1	100.64.0.18	36864	38911
166.237.148.1	100.64.0.19	38912	40959
166.237.148.1	100.64.0.20	40960	43007
166.237.148.1	100.64.0.21	43008	45055
166.237.148.1	100.64.0.22	45056	47103
166.237.148.1	100.64.0.23	47104	49151
166.237.148.1	100.64.0.24	49152	51199
166.237.148.1	100.64.0.25	51200	53247
166.237.148.1	100.64.0.26	53248	55295
	100.64.0.27	55296	57343
166.237.148.1	100.64.0.28	57344	59391
166.237.148.1	100.64.0.29	59392	61439
166.237.148.1	100.64.0.30	61440	63487
166.237.148.1	100.64.0.31	63488	65535

One / 24 would serve
8,192 customers

CG-NAT - Important define:

- How many Private IPs will be mapped to each Public IP ???
- How many ports will be mapped to each Private IP ???

- It depends a lot on the need !!!

CG-NAT - Usage Examples

- HotSpot - Restaurant (Target: cell phones)
 - 1 IP Valid - 260 users with 250 ports each -> 65000 ports
- Event - Meeting Providers (Target: Cellphones, Tablets and Notebooks)
 - 11 valid IPs: 1440 users with 500 ports
- Residential Client (delivering v6 along with client)
 - (Target: Cellphones, Tablet, Notebooks, etc.)
 - 1 valid IP = 32 users with 2048 ports each

CG-NAT - Important Notes

- CG-NAT can increase CPU consumption
- Allow Private End 100.64.0.0 in DNS if you use a Private Server (if you use Google, you do not have to!)
- Rules for TCP and / or UDP? TCP, in most cases
- Creating rules for the two doubles the number of rules
- Create a Scalable CG-NAT - make it available at least twice as much as you currently need.
- Preserve Load Balancing - separate IPs that are samples of the different advertised blocks

Guard of Records: Important Notes

- The Civil Registry only regulates identification of the originating port for ASNs.
- The Civil Registry only regulates identification of the originating port
 - And who is not?
- How long to save the Log?
 - Anatel could also require ...
 - How long to suggestion Log? the Civil Framework
 - 6 months - suggestion of the Civil Framework
 - 3 to 5 years - suggestion of NIC.br

- Many old CPEs installed
- The Ombudsman often does not have remote management of the
 - Some national manufacturers have not yet embraced the IPv6 cause

Services

some years

- HTTP, FTP, DNS, POP3, SMTP, etc.
- Have a Testing Environment - Do not Make Your Customers Guinea Pigs!
- GNS3, Unetlab-EVE, Packet Tracer
- When I have the Service implemented in v4 and v6, who answers first?
- Depends on Implementation

IPv6 Routing on

- All modern routing protocols
OSPFv3, Multi-Protocol BGP, RIPvng, etc. support IPv6
- Work on Stack-Dual - Routing
• Double Work: Two Stack-Dual - Routing Management, Two Troubleshoots
Stack-Dual - Routing V4 + v6 = Network Note 10
Networks, Two Management, Two Troubleshoots
- extra attention!
your router support IPv6? What do you
you mean by
- Capability : IPv4 x IPv6 Support?
 - What Prefixes Are Announced in IPv4 and IPv6? / 20- / 24 or / 32- / 48

Examples of IPv4 and IPv6 Disaggregation

In IPv4:

1 /20

In IPv4:

1 /20

2 /21

4 /22

80 /24 prefixes

From /20

In IPv6:

In IPv6:

1 /32

2 /33

4 /34

65536 /48, 000 possible

Prefixes
From /32 to

Current scenario of the use of IPv6 in Brazil

Current scenario of the use of IPv6 in Brazil

- From the point of view of the Operators and Internet Providers:
 - From the point of view of the Operators and Internet Providers:

Thank

you

Adilson Aparecido Florentino

55 11 4871 4149

22 11 21510 2401

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