



nic.br

Núcleo de Informação
e Coordenação do
Ponto BR

cgib.br

Comitê Gestor da
Internet no Brasil



registro.br cert.br cetic.br ceptro.br ceweb.br ix.br

The background of the entire image is a dark gray circuit board pattern with white lines representing traces and components. A central horizontal band is a solid medium gray color.

nic.br cgi.br

ceptro.br

The background of the slide features a dark gray circuit board pattern with white lines representing traces and components. The pattern is dense and covers the entire area, with a central white rectangular region containing the main text.

Curso BCOP

Exercícios: Plano de endereçamento

ceptro.br nic.br egi.br

1) Divida o prefixo IPv4 192.0.160.0/22 nos seguintes prefixos:

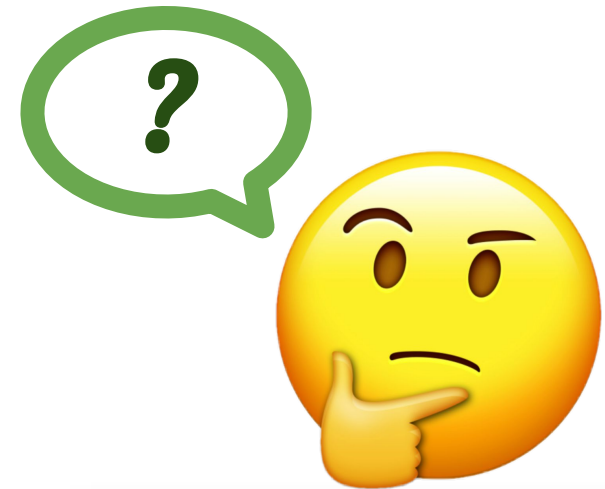
Ex: - /23

192.0.160.0/23

192.0.162.0/23

- /24

- /25



1) Exemplo: dividir o 192.0.160.0/22 em /23?

192.0.160.0/22

Posição Bit	17	18	19	20	21	22	23	24
Bits	<u>1</u>	<u>0</u>	<u>1</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
Valor	128	64	32	16	8	4	2	1
							0	0 -> 160
							1	0 -> 162

23 bits - 22 bits = 1 bit
 $2^1 = 2$ redes

Resposta:

192.0.160.0/23

192.0.162.0/23

1) Como dividir o 192.0.160.0/22 em /24?

192.0.160.0/22

Posição Bit	17	18	19	20	21	22	23	24	
Bits	<u>1</u>	<u>0</u>	<u>1</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	
Valor	128	64	32	16	8	4	2	1	
							0	0	-> 160
							0	1	-> 161
							1	0	-> 162
							1	1	-> 163

24 bits - 22 bits = 2 bit
 $2^2 = 4$ redes

Resposta:

192.0.160.0/24

192.0.161.0/24

192.0.162.0/24

192.0.163.0/24

1) Como dividir o 192.0.160.0/22 em /25?

192.0.160.0/22

Posição Bit	17	18	19	20	21	22	23	24	25
Bits	<u>1</u>	<u>0</u>	<u>1</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
Valor	128	64	32	16	8	4	2	1	128
							0	0	0
							0	0	1
							0	1	0
							0	1	1
							1	0	0
							1	0	1
							1	1	0
							1	1	1

25 bits - 22 bits = 3 bit

$2^3 = 8$ redes

Resposta:

192.0.160.0/25	192.0.160.128/25
192.0.161.0/25	192.0.161.128/25
192.0.162.0/25	192.0.162.128/25
192.0.163.0/25	192.0.163.128/25

2) Divida o prefixo IPv6 2001:DB8:FACA::/48
nos seguintes tamanhos:

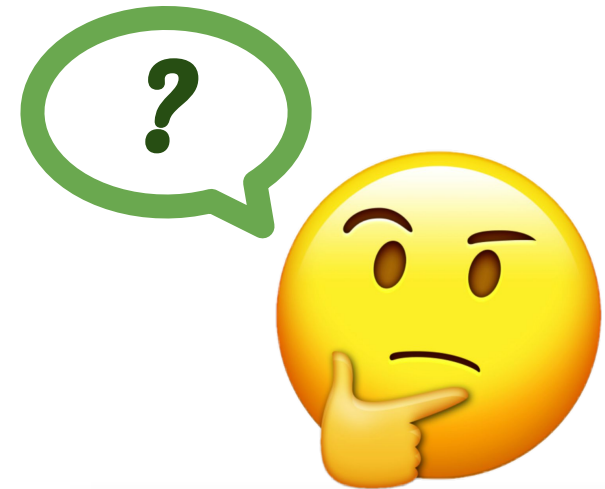
Ex: - /49

2001:DB8:FACA:0000::/49

2001:DB8:FACA:8000::/49

- /50

- /51



2) Exemplo: dividir o 2001:DB8:FACA::/48 em /49?

2001:0DB8:FACA:0000::/48

Posição Bit	45	46	47	48	49	50	51	52
Bits	<u>1</u>	<u>0</u>	<u>1</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
Valor	8	4	2	1	8	4	2	1
	A					0		

49 bits - 48 bits = 1 bit

$2^1 = 2$ redes

Resposta:

2001:DB8:FACA:0000::/49

2001:DB8:FACA:8000::/49

2) Como dividir o 2001:DB8:FACA::/48 em /50?

2001:0DB8:FACA:0000::/48

Posição Bit	45	46	47	48	49	50	51	52
Bits	<u>1</u>	<u>0</u>	<u>1</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
Valor	8	4	2	1	8	4	2	1
					0	0	->	0
					0	1	->	4
					1	0	->	8
					1	1	->	C

50 bits - 48 bits = 2 bit

$2^2 = 4$ redes

Resposta:

2001:DB8:FACA:0000::/50

2001:DB8:FACA:4000::/50

2001:DB8:FACA:8000::/50

2001:DB8:FACA:C000::/50

2) Como dividir o 2001:DB8:FACA::/48 em /51?

2001:0DB8:FACA:0000::/48

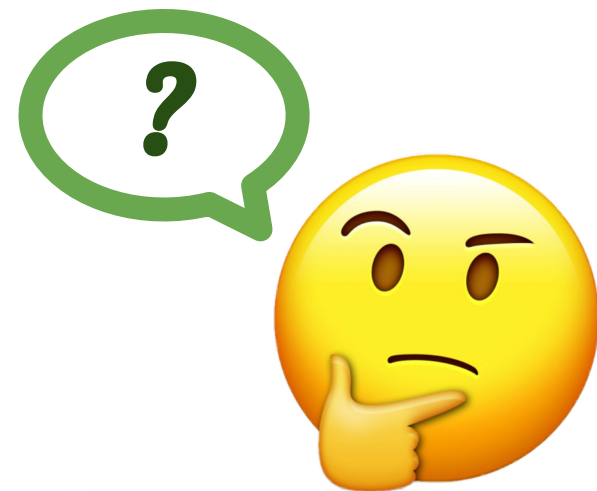
Posição Bit	45	46	47	48	49	50	51	52
Bits	<u>1</u>	<u>0</u>	<u>1</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
Valor	8	4	2	1	8	4	2	1
					0	0	0	-> 0
					0	0	1	-> 2
					0	1	0	-> 4
					0	1	1	-> 6
					1	0	0	-> 8
					1	0	1	-> A
					1	1	0	-> C
					1	1	1	-> E

51 bits - 48 bits = 3 bit

$2^3 = 8$ redes

- Resp: 2001:DB8:FACA:0000::/51
 2001:DB8:FACA:2000::/51
 2001:DB8:FACA:4000::/51
 2001:DB8:FACA:6000::/51
 2001:DB8:FACA:8000::/51
 2001:DB8:FACA:A000::/51
 2001:DB8:FACA:C000::/51
 2001:DB8:FACA:E000::/51

- 3) Quais endereços pertencem a rede 192.134.160.0/19?
- a) 192.134.32.13
 - b) 192.134.165.0
 - c) 192.134.192.24
 - d) 192.134.224.47
 - e) 192.143.160.92
 - f) 129.134.160.156
 - g) 192.134.161.212
 - h) 192.134.176.122
 - i) 192.134.159.255
 - j) 192.134.240.19
 - k) 192.134.128.55
 - l) 192.134.160.275
 - m) 192.134.161.0



3) Quais endereços pertencem a rede 192.134.160.0/19?

192.134.160.0/19

Posição Bit	17	18	19	20	21	22	23	24
Bits	<u>1</u>	<u>0</u>	<u>1</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
Valor	128	64	32	16	8	4	2	1

160

Qual o primeiro e o último endereço da rede?

3) Quais endereços pertencem a rede 192.134.160.0/19?

192.134.160.0/19

Posição Bit	17	18	19	20	21	22	23	24
Bits	<u>1</u>	<u>0</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>
Valor	128	64	32	16	8	4	2	1

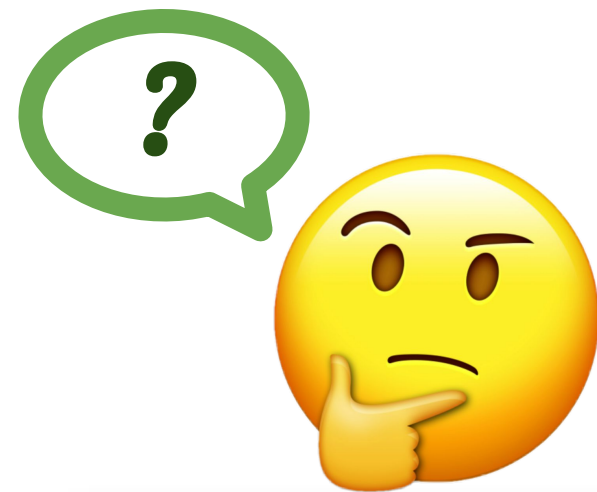
191

Qual o primeiro e o último endereço da rede?

Primeiro endereço: 192.134.160.0

Último endereço: 192.134.191.255

- 3) Quais endereços pertencem a rede 192.134.160.0/19?
- a) 192.134.32.13
 - b) 192.134.165.0
 - c) 192.134.192.24
 - d) 192.134.224.47
 - e) 192.143.160.92
 - f) 129.134.160.156
 - g) 192.134.161.212
 - h) 192.134.176.122
 - i) 192.134.159.255
 - j) 192.134.240.19
 - k) 192.134.128.55
 - l) 192.134.160.275
 - m) 192.134.161.0



3) Quais endereços pertencem a rede 192.134.160.0/19?

a) **192.134.32.13**

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c) 192.134.192.24

d) 192.134.224.47

e) 192.143.160.92

f) 129.134.160.156

g) 192.134.161.212

h) 192.134.176.122

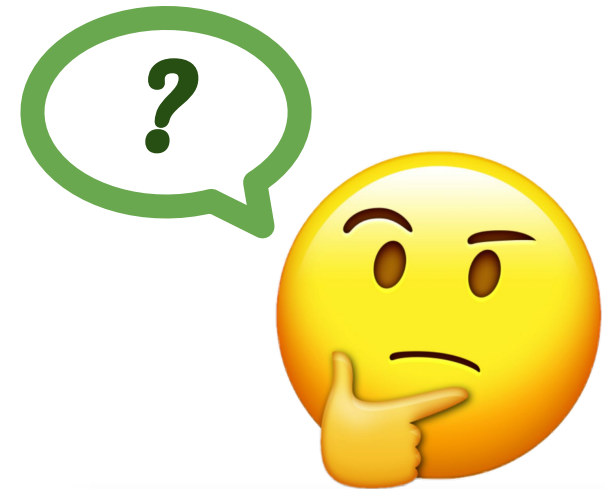
i) 192.134.159.255

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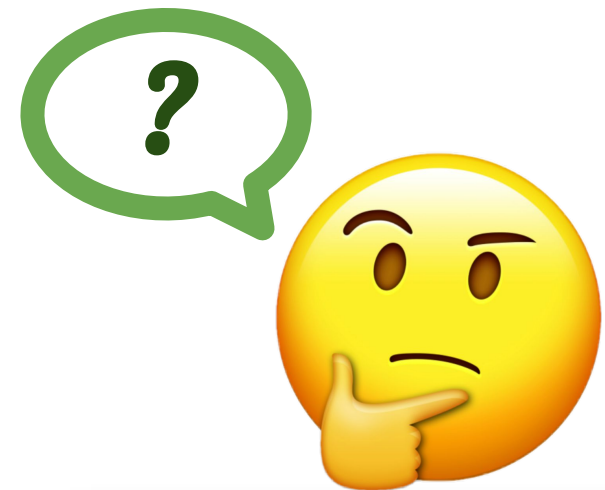
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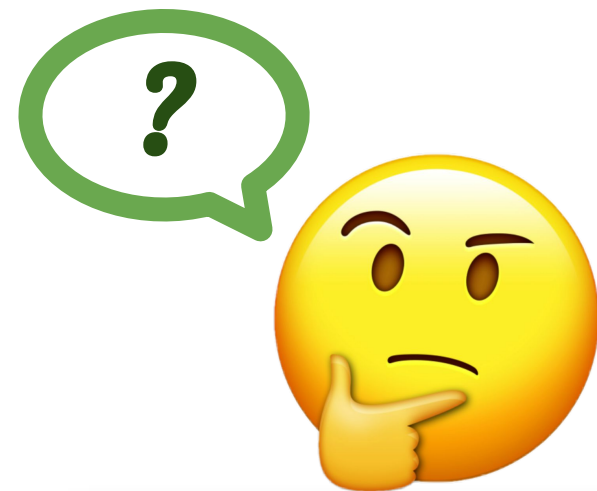
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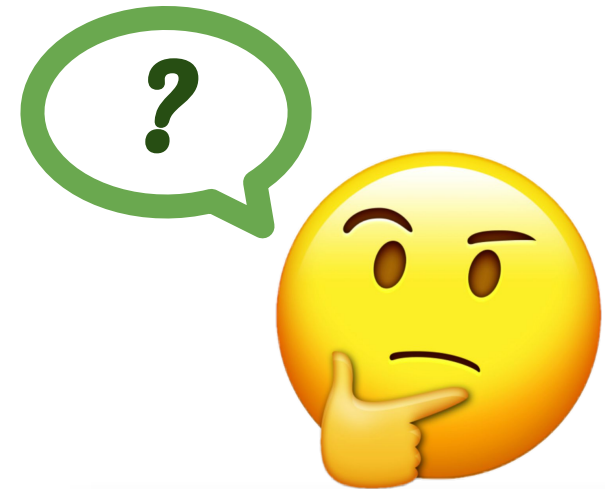
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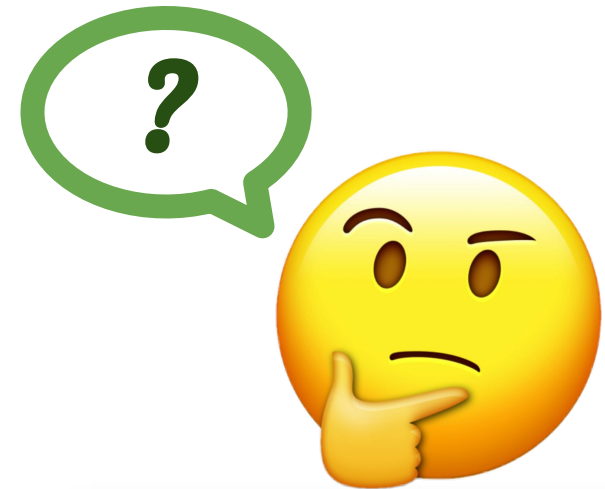
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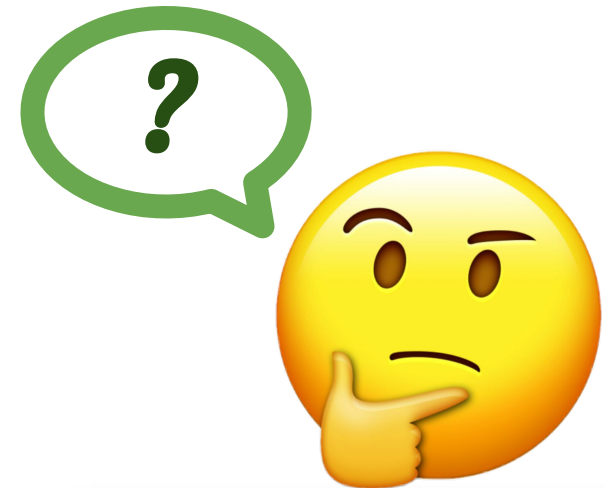
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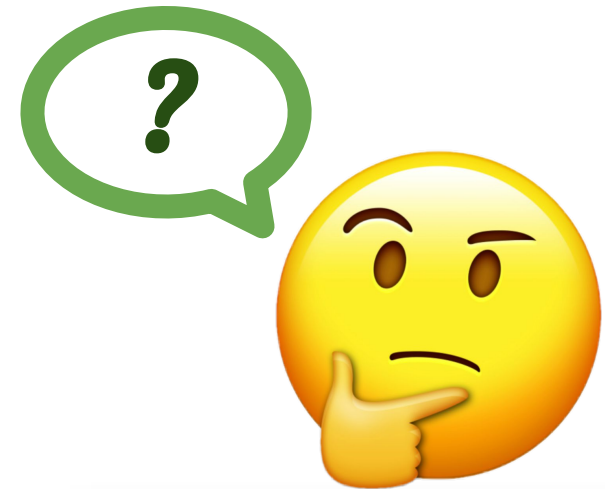
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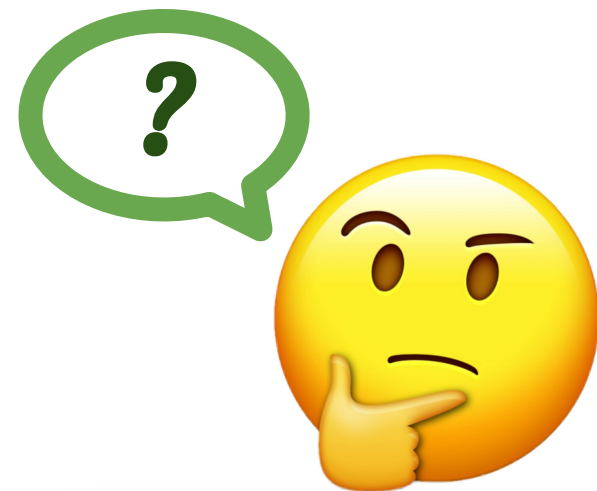
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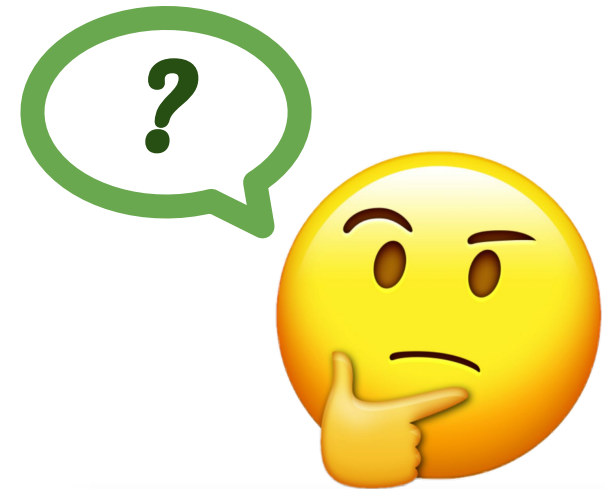
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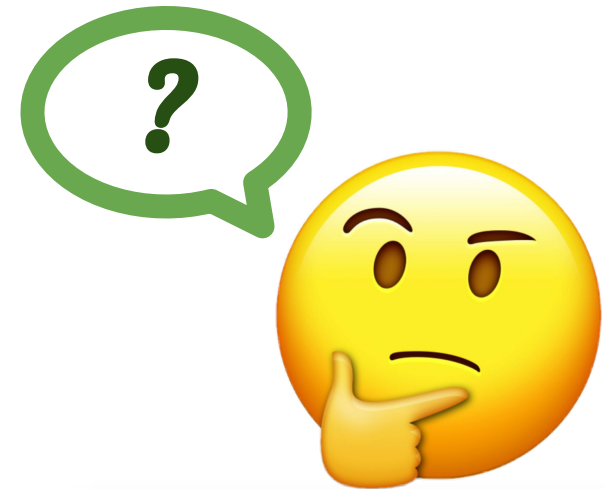
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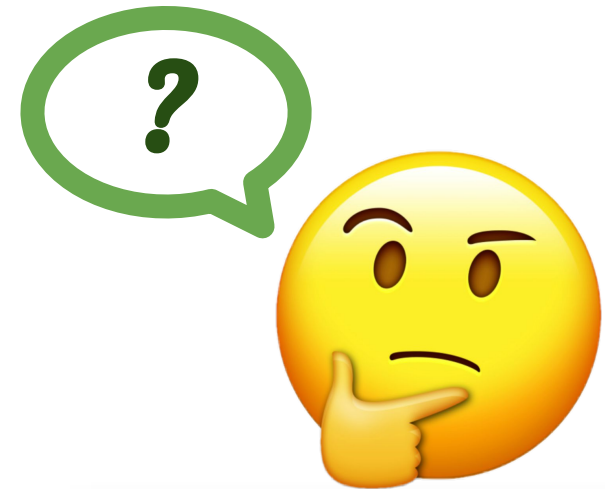
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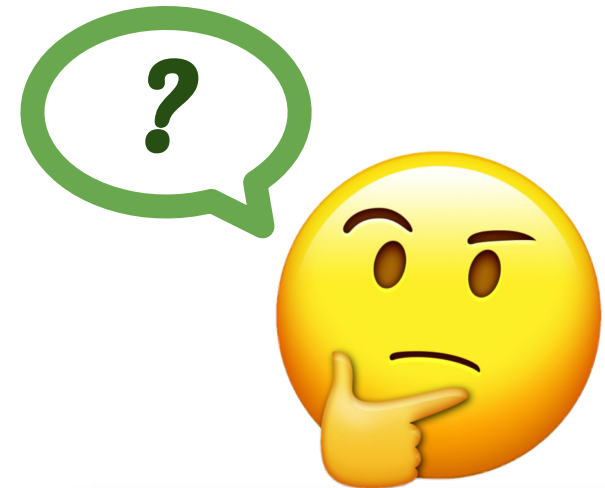
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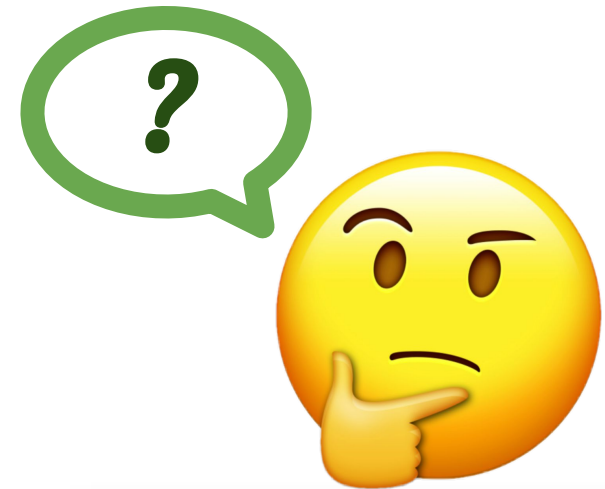


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- m) **192.134.161.0**



- 4) Quais endereços pertencem a rede 2001:db8:c800::/38?
- a) 2001:0db8:c810:0012:0034:0101:0000:1
 - b) 2001:db8:c810:12:34:101::1
 - c) 2001:db8:c8::1
 - d) 2001:db8:c800::1
 - e) 2001:db8:c710:12:34:101::1
 - f) 2001:db8:cc00::1
 - g) 2001:db8:ca10:12:34:101::1
 - h) 2001:db8:c815:12:34:101::1
 - i) 2001:db8:c910:12:34:101::1
 - j) 2001:db8:cbff:12:34:101::1
 - k) 2001:db8:b810:12:34:101::1
 - l) 2001:db9:c810:1:2:3::4
 - m) 2001:db8:cfad::1



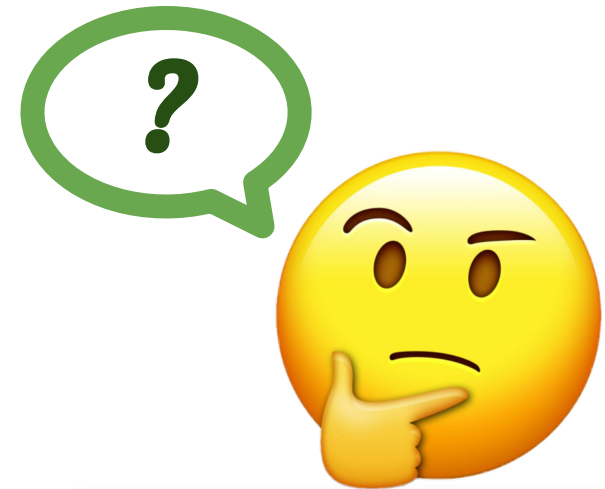
4) Quais endereços pertencem a rede 2001:db8:c800::/38?

2001:db8:c800::/38

Posição Bit	33	34	35	36	37	38	39	40	41	42	43	44
Bits	<u>1</u>	<u>1</u>	<u>0</u>	<u>0</u>	<u>1</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
Valor	8	4	2	1	8	4	2	1	8	4	2	1
	C				8				0			

Qual o primeiro e o último endereço da rede?

- 4) Quais endereços pertencem a rede 2001:db8:c800::/38?
- a) 2001:0db8:c810:0012:0034:0101:0000:1
 - b) 2001:db8:c810:12:34:101::1
 - c) 2001:db8:c8::1
 - d) 2001:db8:c800::1
 - e) 2001:db8:c710:12:34:101::1
 - f) 2001:db8:cc00::1
 - g) 2001:db8:ca10:12:34:101::1
 - h) 2001:db8:c815:12:34:101::1
 - i) 2001:db8:c910:12:34:101::1
 - j) 2001:db8:cbff:12:34:101::1
 - k) 2001:db8:b810:12:34:101::1
 - l) 2001:db9:c810:1:2:3::4
 - m) 2001:db8:cfad::1



4) Quais endereços pertencem a rede 2001:db8:c800::/38?

a) **2001:0db8:c810:0012:0034:0101:0000:1**

b) 2001:db8:c810:12:34:101::1

c) 2001:db8:c8::1

d) 2001:db8:c800::1

e) 2001:db8:c710:12:34:101::1

f) 2001:db8:cc00::1

g) 2001:db8:ca10:12:34:101::1

h) 2001:db8:c815:12:34:101::1

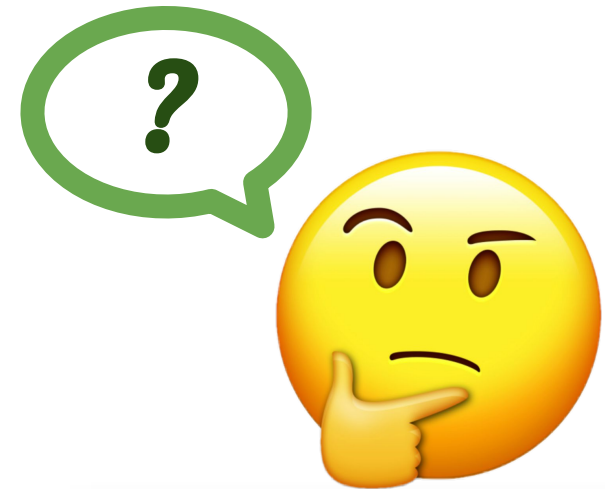
i) 2001:db8:c910:12:34:101::1

j) 2001:db8:cbff:12:34:101::1

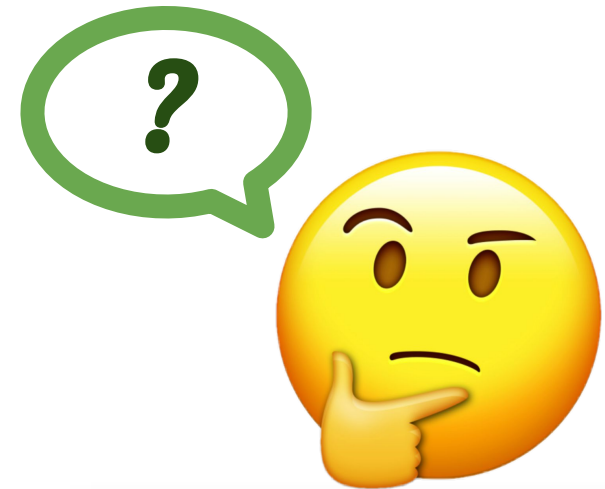
k) 2001:db8:b810:12:34:101::1

l) 2001:db9:c810:1:2:3::4

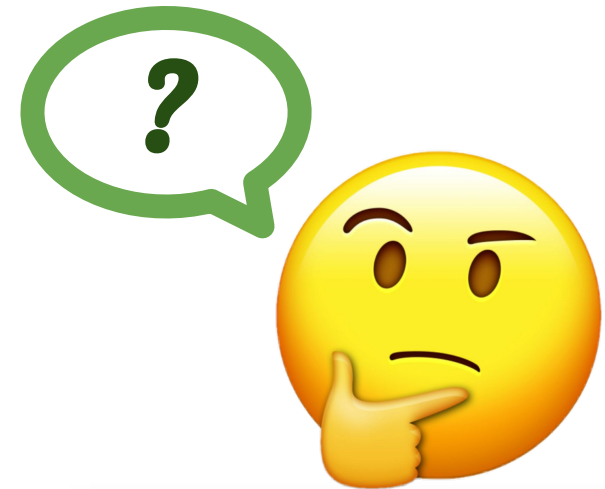
m) 2001:db8:cfad::1



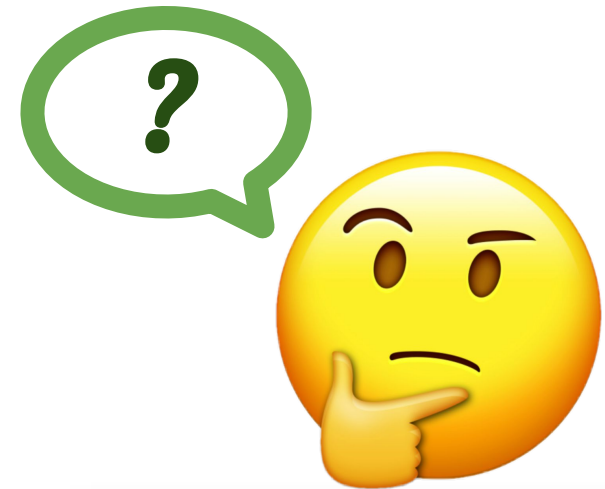
- 4) Quais endereços pertencem a rede 2001:db8:c800::/38?
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 - g) 2001:db8:ca10:12:34:101::1
 - h) 2001:db8:c815:12:34:101::1
 - i) 2001:db8:c910:12:34:101::1
 - j) 2001:db8:cbff:12:34:101::1
 - k) 2001:db8:b810:12:34:101::1
 - l) 2001:db9:c810:1:2:3::4
 - m) 2001:db8:cfad::1



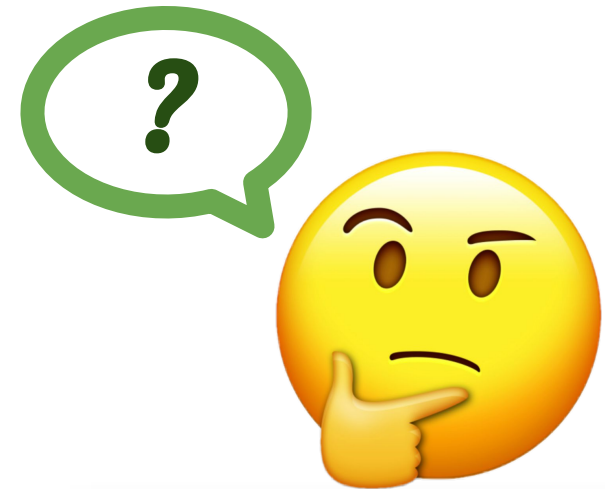
- 4) Quais endereços pertencem a rede 2001:db8:c800::/38?
- a) **2001:0db8:c810:0012:0034:0101:0000:1**
 - b) **2001:db8:c810:12:34:101::1**
 - c) 2001:db8:c8::1**
 - d) 2001:db8:c800::1
 - e) 2001:db8:c710:12:34:101::1
 - f) 2001:db8:cc00::1
 - g) 2001:db8:ca10:12:34:101::1
 - h) 2001:db8:c815:12:34:101::1
 - i) 2001:db8:c910:12:34:101::1
 - j) 2001:db8:cbff:12:34:101::1
 - k) 2001:db8:b810:12:34:101::1
 - l) 2001:db9:c810:1:2:3::4
 - m) 2001:db8:cfad::1



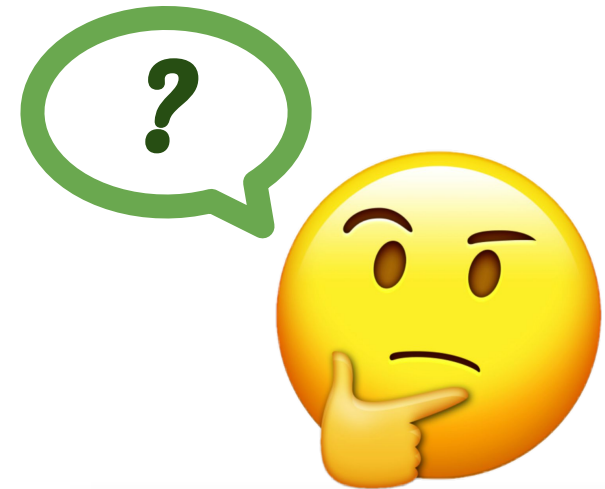
- 4) Quais endereços pertencem a rede 2001:db8:c800::/38?
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 - e) 2001:db8:c710:12:34:101::1
 - f) 2001:db8:cc00::1
 - g) 2001:db8:ca10:12:34:101::1
 - h) 2001:db8:c815:12:34:101::1
 - i) 2001:db8:c910:12:34:101::1
 - j) 2001:db8:cbff:12:34:101::1
 - k) 2001:db8:b810:12:34:101::1
 - l) 2001:db9:c810:1:2:3::4
 - m) 2001:db8:cfad::1



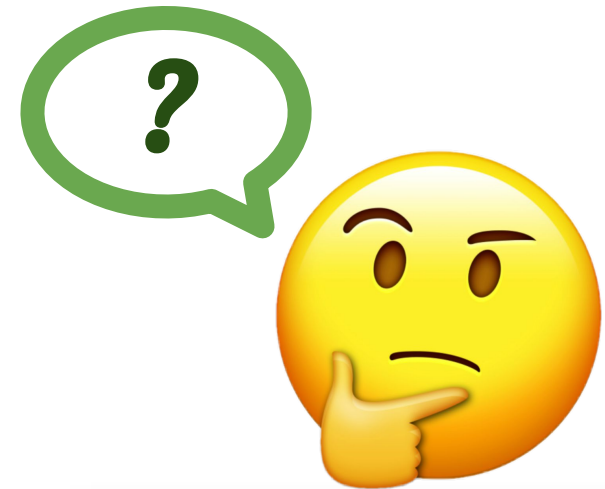
- 4) Quais endereços pertencem a rede 2001:db8:c800::/38?
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 - c) 2001:db8:c8::1**
 - d) **2001:db8:c800::1**
 - e) 2001:db8:c710:12:34:101::1**
 - f) 2001:db8:cc00::1
 - g) 2001:db8:ca10:12:34:101::1
 - h) 2001:db8:c815:12:34:101::1
 - i) 2001:db8:c910:12:34:101::1
 - j) 2001:db8:cbff:12:34:101::1
 - k) 2001:db8:b810:12:34:101::1
 - l) 2001:db9:c810:1:2:3::4
 - m) 2001:db8:cfad::1



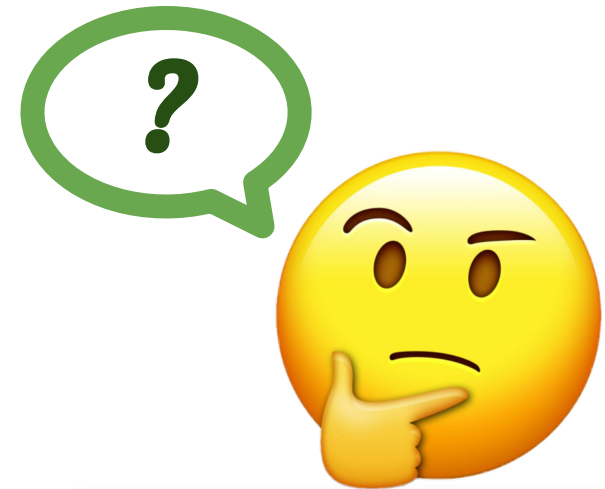
- 4) Quais endereços pertencem a rede 2001:db8:c800::/38?
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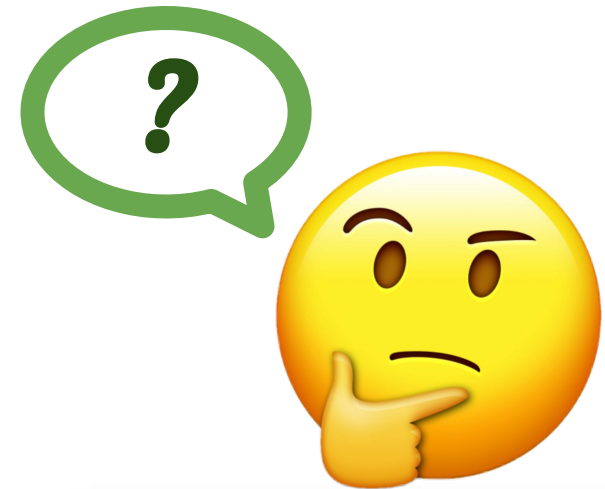
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 - l) 2001:db9:c810:1:2:3::4
 - m) 2001:db8:cfad::1



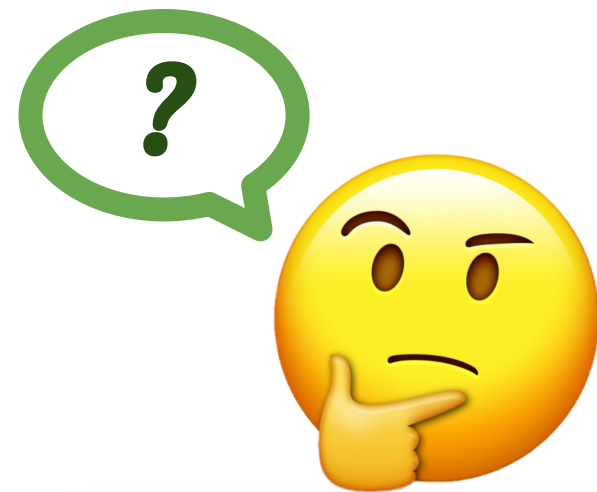
- 4) Quais endereços pertencem a rede 2001:db8:c800::/38?
- a) 2001:0db8:c810:0012:0034:0101:0000:1
 - b) 2001:db8:c810:12:34:101::1
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 - d) 2001:db8:c800::1
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 - h) 2001:db8:c815:12:34:101::1
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 - k) 2001:db8:b810:12:34:101::1
 - l) 2001:db9:c810:1:2:3::4
 - m) 2001:db8:cfad::1



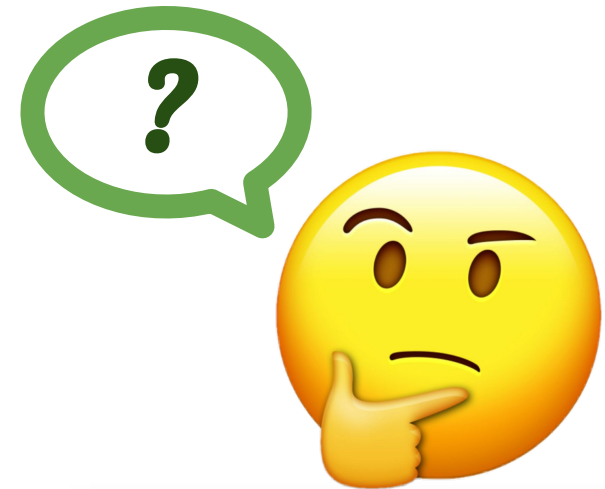
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 - m) 2001:db8:cfad::1



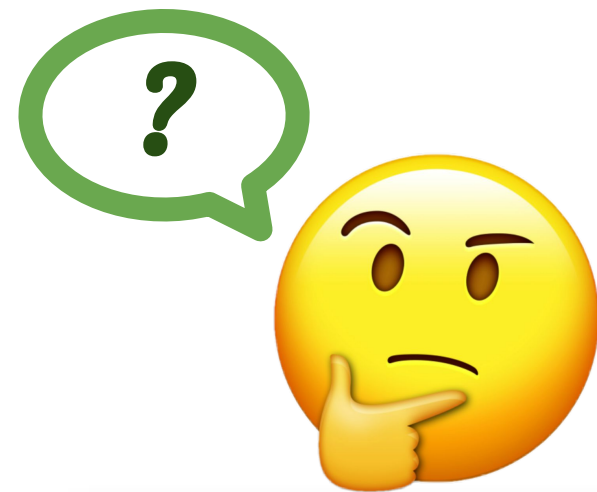
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- a) 2001:0db8:c810:0012:0034:0101:0000:1
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 - c) 2001:db8:c8::1**
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 - h) 2001:db8:c815:12:34:101::1
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- 4) Quais endereços pertencem a rede 2001:db8:c800::/38?
- a) 2001:0db8:c810:0012:0034:0101:0000:1
 - b) 2001:db8:c810:12:34:101::1
 - c) 2001:db8:c8::1**
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 - g) 2001:db8:ca10:12:34:101::1
 - h) 2001:db8:c815:12:34:101::1
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 - j) 2001:db8:cbff:12:34:101::1
 - k) 2001:db8:b810:12:34:101::1**
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 - m) 2001:db8:cfad::1



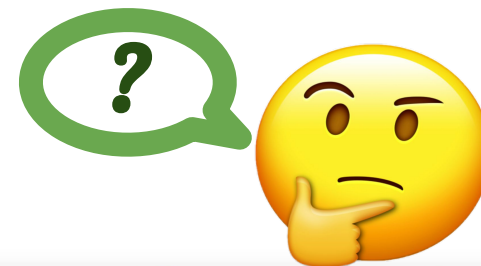
- 4) Quais endereços pertencem a rede 2001:db8:c800::/38?
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 - b) 2001:db8:c810:12:34:101::1
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 - j) 2001:db8:cbff:12:34:101::1
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 - l) 2001:db9:c810:1:2:3::4**
 - m) 2001:db8:cfad::1**



5) Divida o prefixo 2001:db8::/32

Divisão exata

Demanda	Bits necessários	Prefixo gerado	# subredes geradas	# redes /64
2				
18				
356				
1.500				
30.000				



5) Divida o prefixo 2001:db8::/32

Exemplo:

Para atender 2 subredes, quantos bits são necessários?

Divisão exata				
Demanda	Bits necessários (n)	Prefixo gerado (prefixo+n)	# subredes geradas (2^n)	# redes /64 $2^{(64-\text{prefixo gerado})}$
2				
18				
356				
1.500				
30.000				

5) Divida o prefixo 2001:db8::/32

Exemplo:

Com 1 bit, o prefixo das subredes será qual?

Divisão exata				
Demanda	Bits necessários (n)	Prefixo gerado (prefixo+n)	# subredes geradas (2^n)	# redes /64 $2^{(64-\text{prefixo gerado})}$
2	1			
18				
356				
1.500				
30.000				

5) Divida o prefixo 2001:db8::/32

Exemplo:

Quantos prefixos /33 podem ser gerados?

Divisão exata				
Demanda	Bits necessários (n)	Prefixo gerado (prefixo+n)	# subredes geradas (2^n)	# redes /64 $2^{(64-\text{prefixo gerado})}$
2	1	/33		
18				
356				
1.500				
30.000				

5) Divida o prefixo 2001:db8::/32

Exemplo:

Quantos prefixos /64 podem ser gerados de cada /33?

Divisão exata				
Demanda	Bits necessários (n)	Prefixo gerado (prefixo+n)	# subredes geradas (2^n)	# redes /64 $2^{(64-\text{prefixo gerado})}$
2	1	/33	2	
18				
356				
1.500				
30.000				

5) Divida o prefixo 2001:db8::/32

Exemplo:

Quantos prefixos /64 podem ser gerados de cada /33?

Divisão exata				
Demanda	Bits necessários (n)	Prefixo gerado (prefixo+n)	# subredes geradas (2^n)	# redes /64 $2^{(64-\text{prefixo gerado})}$
2	1	/33	2	$2^{(64-33)} = 2^{31}$
18				
356				
1.500				
30.000				

5) Divida o prefixo 2001:db8::/32

Exemplo:

Então para atender 18 subredes...

Divisão exata				
Demanda	Bits necessários (n)	Prefixo gerado (prefixo+n)	# subredes geradas (2^n)	# redes /64 $2^{(64-\text{prefixo gerado})}$
2	1	/33	2	2^{31}
18				
356				
1.500				
30.000				

5) Divida o prefixo 2001:db8::/32

Exemplo:

Então como fica para atender 18 subredes?

Bits	Subredes
1	2
2	4
3	8
4	16
5	32
6	64
7	128

Não tem como atender exatamente 18 subredes.

Pegar a opção mais próxima!

5) Divida o prefixo 2001:db8::/32

Exemplo:

Então para atender 18 subredes...

Divisão exata

Demanda	Bits necessários (n)	Prefixo gerado (prefixo+n)	# subredes geradas (2^n)	# redes /64 $2^{(64-\text{prefixo gerado})}$
2	1	/33	2	2^{31}
18	5	/37	32	$2^{(64-37)} = 2^{27}$
356				
1.500				
30.000				

5) Divida o prefixo 2001:db8::/32

Exemplo:

Então para atender 356 subredes...

Divisão exata				
Demanda	Bits necessários (n)	Prefixo gerado (prefixo+n)	# subredes geradas (2^n)	# redes /64 $2^{(64-\text{prefixo gerado})}$
2	1	/33	2	2^{31}
18	5	/37	32	2^{27}
356				
1.500				
30.000				

5) Divida o prefixo 2001:db8::/32

Exemplo:

Então como fica para atender 356 subredes?

Bits	Subredes
1	2
2	4
3	8
4	16
5	32
6	64
7	128
8	256

Bits	Subredes
9	512
10	1.024
11	2.048
12	4.096
13	8.192
14	16.384
15	32.768
16	65.536

5) Divida o prefixo 2001:db8::/32

Exemplo:

Então para atender 356 subredes...

Divisão exata

Demanda	Bits necessários (n)	Prefixo gerado (prefixo+n)	# subredes geradas (2^n)	# redes /64 $2^{(64-\text{prefixo gerado})}$
2	1	/33	2	2^{31}
18	5	/37	32	2^{27}
356	9	/41	512	$2^{(64-41)} = 2^{23}$
1.500				
30.000				

5) Divida o prefixo 2001:db8::/32

Exemplo:

Então para atender 1.500 subredes...

Divisão exata

Demanda	Bits necessários (n)	Prefixo gerado (prefixo+n)	# subredes geradas (2^n)	# redes /64 $2^{(64-\text{prefixo gerado})}$
2	1	/33	2	2^{31}
18	5	/37	32	2^{27}
356	9	/41	512	2^{23}
1.500				
30.000				

5) Divida o prefixo 2001:db8::/32

Exemplo:

Então como fica para atender 1.500 subredes?

Bits	Subredes
1	2
2	4
3	8
4	16
5	32
6	64
7	128
8	256

Bits	Subredes
9	512
10	1.024
11	2.048
12	4.096
13	8.192
14	16.384
15	32.768
16	65.536

5) Divida o prefixo 2001:db8::/32

Exemplo:

Então para atender 1.500 subredes...

Divisão exata

Demanda	Bits necessários (n)	Prefixo gerado (prefixo+n)	# subredes geradas (2^n)	# redes /64 $2^{(64-\text{prefixo gerado})}$
2	1	/33	2	2^{31}
18	5	/37	32	2^{27}
356	9	/41	512	2^{23}
1.500	11	/43	2.048	$2^{(64-43)} = 2^{21}$
30.000				

5) Divida o prefixo 2001:db8::/32

Exemplo:

Então para atender 30.000 subredes...

Divisão exata

Demanda	Bits necessários (n)	Prefixo gerado (prefixo+n)	# subredes geradas (2^n)	# redes /64 $2^{(64-\text{prefixo gerado})}$
2	1	/33	2	2^{31}
18	5	/37	32	2^{27}
356	9	/41	512	2^{23}
1.500	11	/43	2.048	2^{21}
30.000				

5) Divida o prefixo 2001:db8::/32

Exemplo:

Então como fica para atender 30.000 subredes?

Bits	Subredes
1	2
2	4
3	8
4	16
5	32
6	64
7	128
8	256

Bits	Subredes
9	512
10	1.024
11	2.048
12	4.096
13	8.192
14	16.384
15	32.768
16	65.536

5) Divida o prefixo 2001:db8::/32

Exemplo:

Então para atender 30.000 subredes...

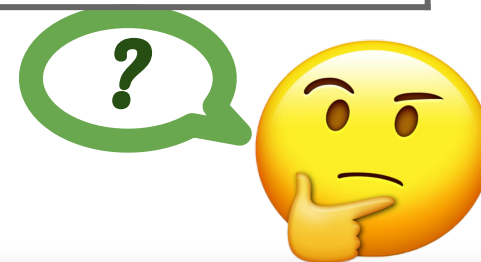
Divisão exata

Demanda	Bits necessários (n)	Prefixo gerado (prefixo+n)	# subredes geradas (2^n)	# redes /64 $2^{(64-\text{prefixo gerado})}$
2	1	/33	2	2^{31}
18	5	/37	32	2^{27}
356	9	/41	512	2^{23}
1.500	11	/43	2.048	2^{21}
30.000	15	/47	32.768	$2^{(64-47)} = 2^{17}$

6) Divida o prefixo 2001:db8::/32

Divisão em múltiplos de 4

Demanda	Bits necessários (n)	Prefixo gerado (prefixo+n)	# subredes geradas (2^n)	# redes /64 $2^{(64-\text{prefixo gerado})}$
2	4	/36	16	2^{28}
18	8	/40	256	2^{24}
356				
1.500				
30.000				



6) Divida o prefixo 2001:db8::/32

Bits	Subredes
1	2
2	4
3	8
4	16
5	32
6	64
7	128
8	256

Bits	Subredes
9	512
10	1.024
11	2.048
12	4.096
13	8.192
14	16.384
15	32.768
16	65.536

6) Divida o prefixo 2001:db8::/32

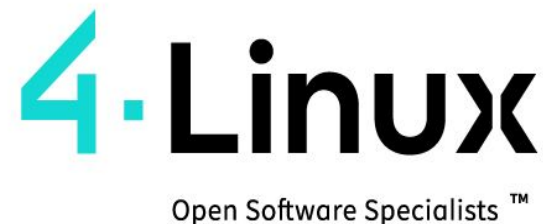
Divisão em múltiplos de 4

Demanda	Bits necessários	Prefixo gerado	# subredes geradas	# redes /64
2	4	/36	16	2^{28}
18	8	/40	256	2^{24}
356	12	/44	4.096	2^{20}
1.500	12	/44	4.096	2^{20}
30.000	16	/48	65.536	2^{16}

Dúvidas



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