MOIP Basics
IP addressing for AV

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‘At Merging if a customer or a business case involves third party devices or a complex IT system… it eventually ends up on my desk…’

Active participation in AES67 and ST2110 testing and development. Teacher, trainer, analyst, curious…

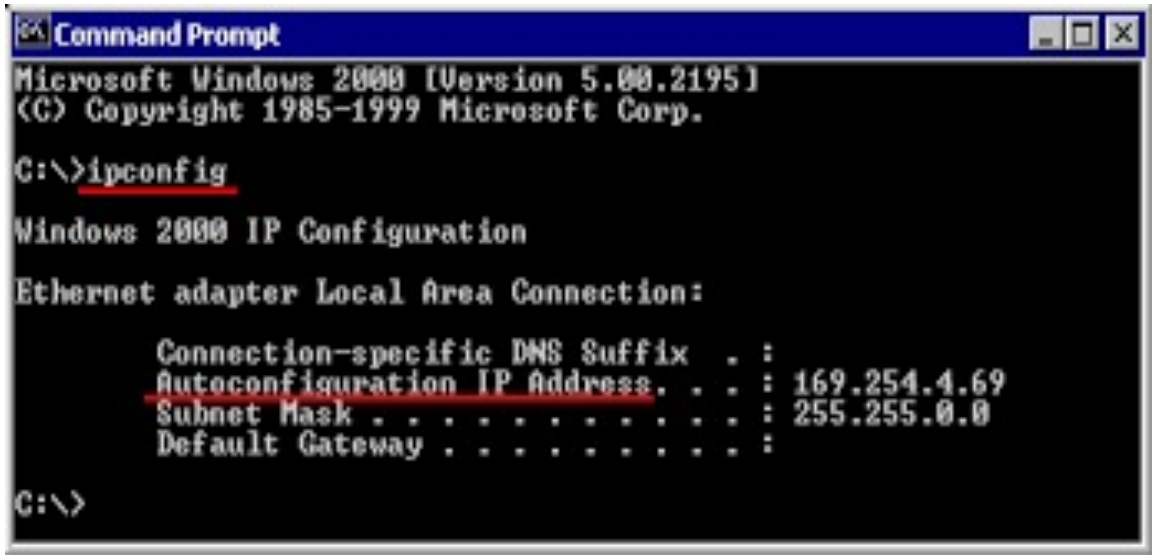
Steve Albini wanna be in the early 2000s, I guess it didn’t turn out as expected!

ENS Cachan – Paris Saclay university – DIGIGRAM

By default: Limited connectivity

Imagine my young self, trying to build a home made routeur to share our brand news 128kb/s cable internet !

Ohhh… wonderfull 90's..



Imagine older me discovering, 20 years later, that those addresses a commonly used by professional IP system, processing media for 10's of 1000's of people…

It’s all about Best practices

OSI model

Layer			Protocol data unit (PDU)	Function[24]
Host layers	7	Application	Data	High-level protocols such as for resource sharing or remote file access, e.g. HTTP.
	6	Presentation		Translation of data between a networking service and an application; including character encoding, data compression and encryption/decryption
	5	Session		Managing communication sessions, i.e., continuous exchange of information in the form of multiple back-and-forth transmissions between two nodes
	4	Transport	Segment, Datagram	Reliable transmission of data segments between points on a network, including segmentation, acknowledgement and multiplexing
Media layers	3	Network	Packet	Structuring and managing a multi-node network, including addressing, routing and traffic control
	2	Data link	Frame	Transmission of data frames between two nodes connected by a physical layer
	1	Physical	Bit, Symbol	Transmission and reception of raw bit streams over a physical medium

Source: Wikipedia

The components of an IP address

10.0.0.5

255.255.0.0 (10.0.0.0) /16

10.0.0.1

- The address of the node
  - A 32 bit value represented as four dot separated digits
  - It is unique
- The subnet mask
  - It allows computation of the network address
  - The CIDR notation uses one number between 0 and 32 appended to the node address with a /
  - To contact an address outside of the subnet, the gateway is used
- The gateway
  - The gateway sends and receives packets from/to other subnets
  - It uses routes {network address, subnet, next hop}

In binary

10.0.0.5	**00001010.00000000.00000000.00000101**
255.255.0.0 (10.0.0.0) /16	**11111111.11111111.00000000.00000000**
10.0.0.1	**00000101.00000000.00000000.00000001**

Routing and subnets

- One node can reach a node on an other subnet if… a route exists
- The internet is built like a gigantic mesh of routes between public subnets and IPs

```
➜  ~ traceroute www.google.com
traceroute to www.google.com (216.58.201.228), 64 hops max, 52 byte packets
 1  192.168.1.254 (192.168.1.254)  0.742 ms  0.384 ms  0.273 ms
 2  crefac103.crefac.com (194.149.169.101)  11.177 ms  11.190 ms  10.800 ms
 3  194.149.166.58 (194.149.166.58)  11.271 ms  11.643 ms  11.189 ms
 4  72.14.211.26 (72.14.211.26)  10.533 ms
    72.14.221.62 (72.14.221.62)  11.361 ms  11.039 ms
 5  * * *
 6  142.251.64.128 (142.251.64.128)  11.517 ms
    142.251.64.124 (142.251.64.124)  11.369 ms
    142.250.234.42 (142.250.234.42)  13.138 ms
 7  108.170.245.5 (108.170.245.5)  11.731 ms
    216.239.48.143 (216.239.48.143)  11.433 ms
    108.170.245.6 (108.170.245.6)  10.932 ms
 8  fra02s18-in-f4.1e100.net (216.58.201.228)  11.169 ms
    108.170.233.114 (108.170.233.114)  32.707 ms
    fra02s18-in-f4.1e100.net (216.58.201.228)  10.690 ms
➜  ~
```

Private addresses – they are not public

- The IP address are unique on the internet
- IPv4 use is close to full, this is partly why IPv6 is used now
- Some addresses are reserved for special use (e.g.: 224.0.0.0/4 for multicast)
- One of this special use is private network, not directly connected to the internet
- 99.99% of MOIP networks use private addresses

- 3 ranges of IP addresses exist:
  - 10.0.0.0/8
  - 172.16.0.0/12
  - 192.168.0.0/16

Good practice

- Always choose an address in a private IP range unless you have a good reason not to
- You probably do not have a good reason to choose something else

Giving addresses on the network

- Every node on the network needs at least one unique IP address
- To give this you can use:
- ZeroConf, automatic mode
- Manual mode
- Centralized mode, known as DHCP

APIPA, the p'n'p (Pray and Play)

- Address are randomly chosen in the 169.254.0.0/16 range
- There is a process for collision avoidance
- On 99,9% of devices, this is a degraded mode ! It is subject to the infamous "DHCP attack"
- Address collision avoidance does not really work with static addressing part of the system
- Why would I have static addresses in an APIPA network? Because APIPA is random of course

Static addressing, the spreadsheet kingdom

- The network administrator is responsible of giving a unique address to a node
- Other values, like gateways and dns server addresses also need to be given if used
- On a big network, documentation is necessary to avoid giving twice the same address
- Illusion of control, micromanagement, it is rarely the best solution always seems convenient.

DHCP: it was built for that you know…

- It is a service on the network to help the network administrator
- The server manages leases of addresses and other parameters given to devices that ask for it.
- You can easily spot parts of the network that are not connected: devices can not reach the server
- It is frequently mixed with static addressing and this is not bad (there is always one static address anyway)
- Addresses are leased, can change, but you can tie a device to an address

There is “one size fit all” solutions, but we can try to sum that up:

An IP address is unique

It always comes with a subnet mask or a CIDR suffix

If on a private network, use a private address

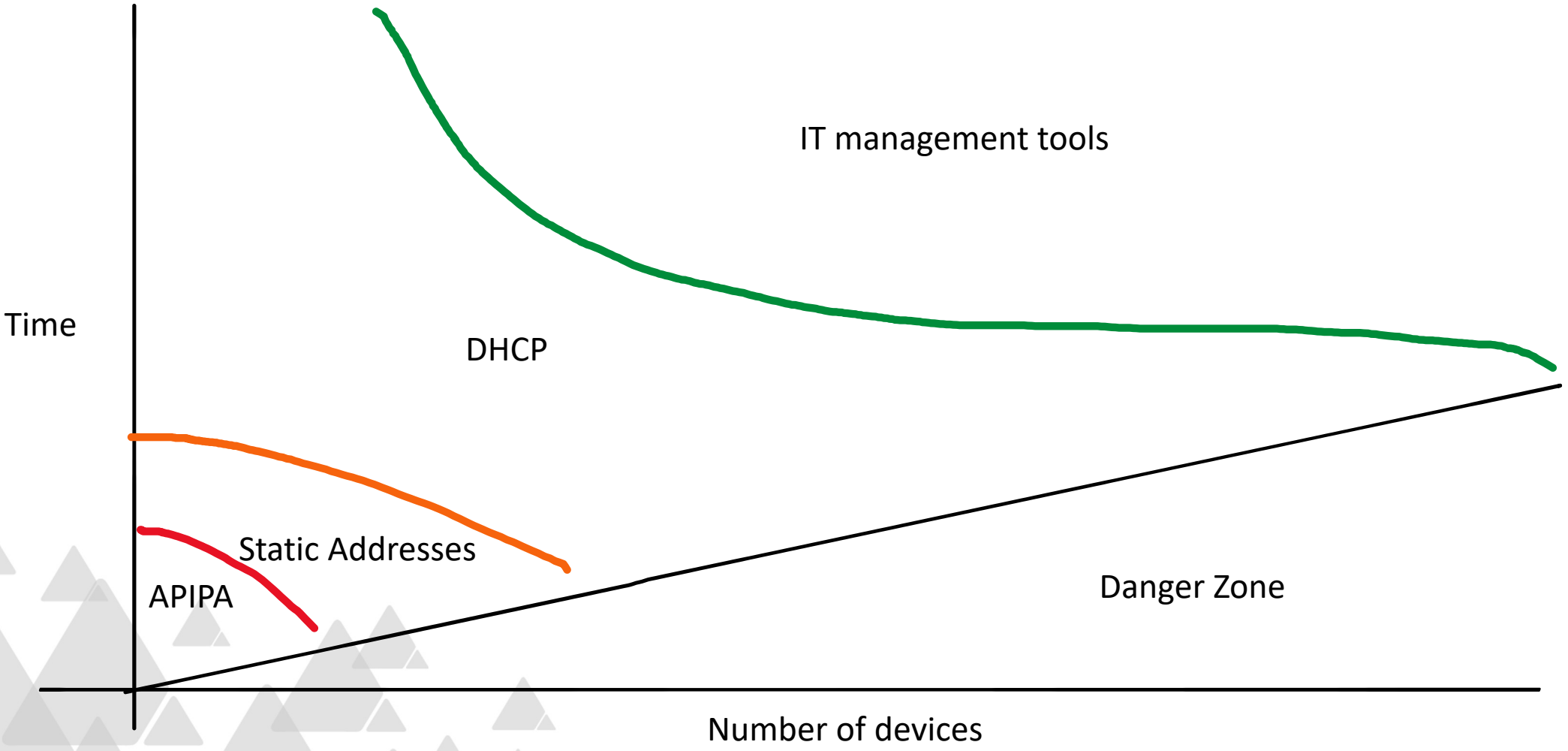
We have 2^24+2^20+2^16 addresses to choose from
More than 17000000 possibilities

169.254.X.X are unstable networks

A documentation is never maintained

DHCPs can have determinist addressing

Invest a proportional time in your network design compared to your project.


IT management tools
Time
DHCP
Static Addresses
APIPA
Danger Zone
Number of devices

Few devices, no time

- This is one of the rare case when APIPA might be ok
- Except if your computer it connected to more than 1 APIPA network
- Example: one control network and one AoIP…
- Then again you have few devices, manual IP config should not be too hard

More device in a very static setup

- Manual IP configuration is ok
- But care has to be taken to check connectivity, homogeneity, and consistance
- The hardest part: keeping your spreadsheet up to date.
- I am not the laziest, but even I have difficulties…

For everything else, consider DHCP

- Most administrable switches have one
- To check connectivity across the network just use a short lease time (1m, 10m)
- You can link MAC to IP in most of the DHCP servers
- You can reserve a subset of IP for manual config of some node

I it will never ha

st words…