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# Dynamic Testbed Creation

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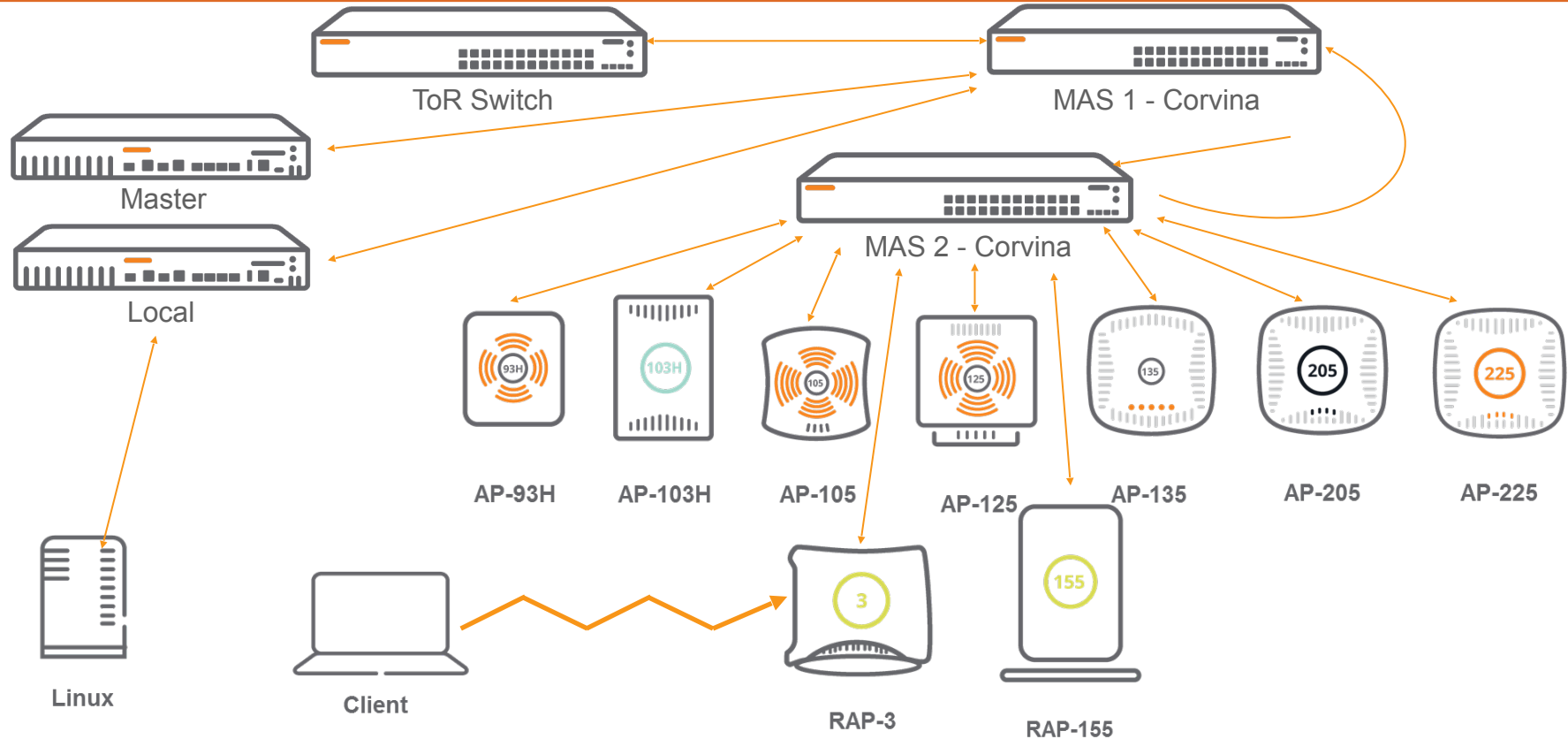
- **Problem**

- Needed a way to create testbeds on-the-fly
- Needed to optimize the use of devices

- **Project**

- Able to create any connections to any device, through the stack
- Given user input, create necessary files for running tests
- Get values from a database, and dynamically create the dev and cfg files

# Generic Smoke Testbed



What devices do you need?

L1 Switch Stack



**Controllers**  
≈250



**Switches**  
≈40



**APs**  
≈280



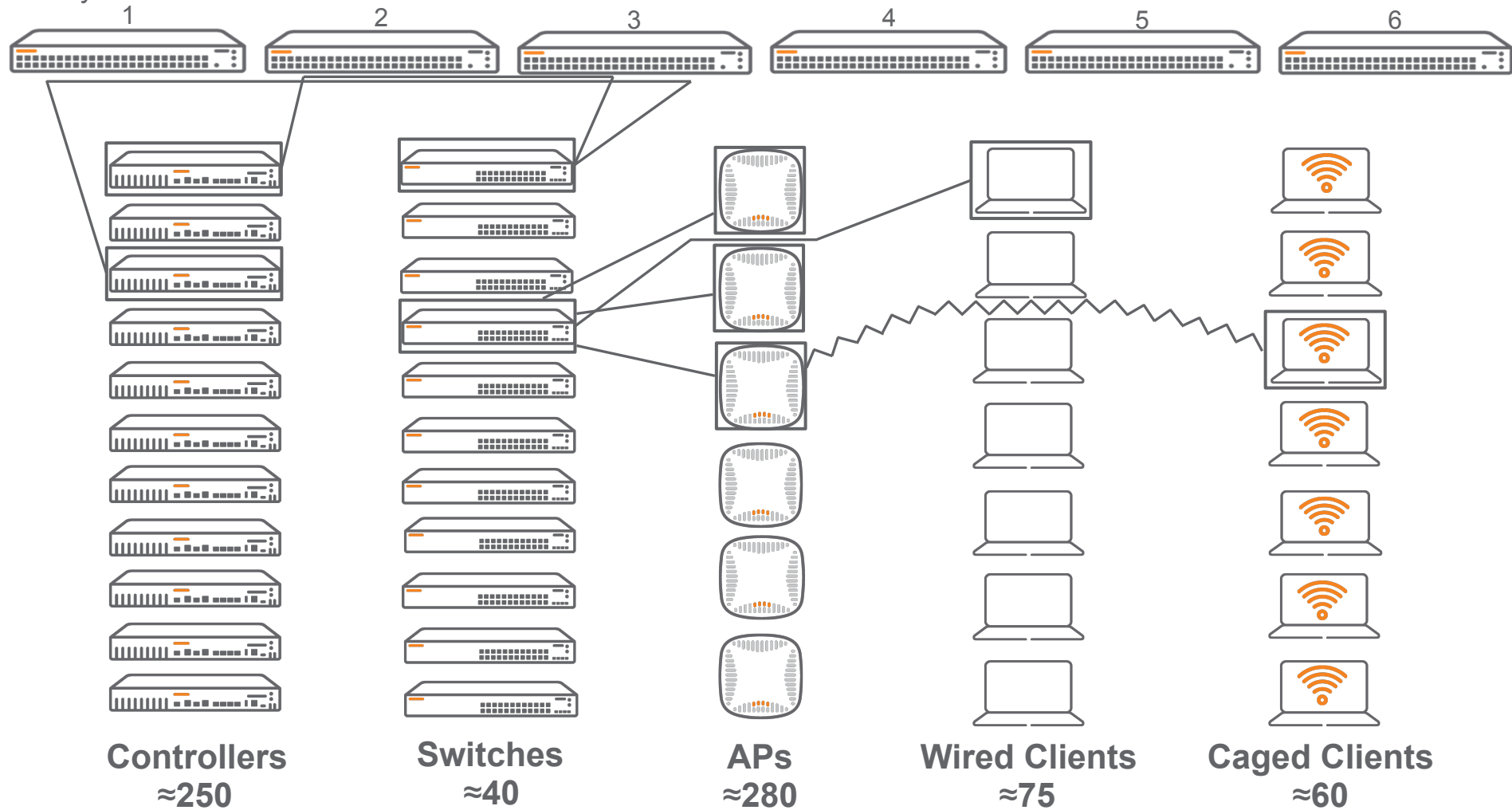
**Wired Clients**  
≈75



**Caged Clients**  
≈60

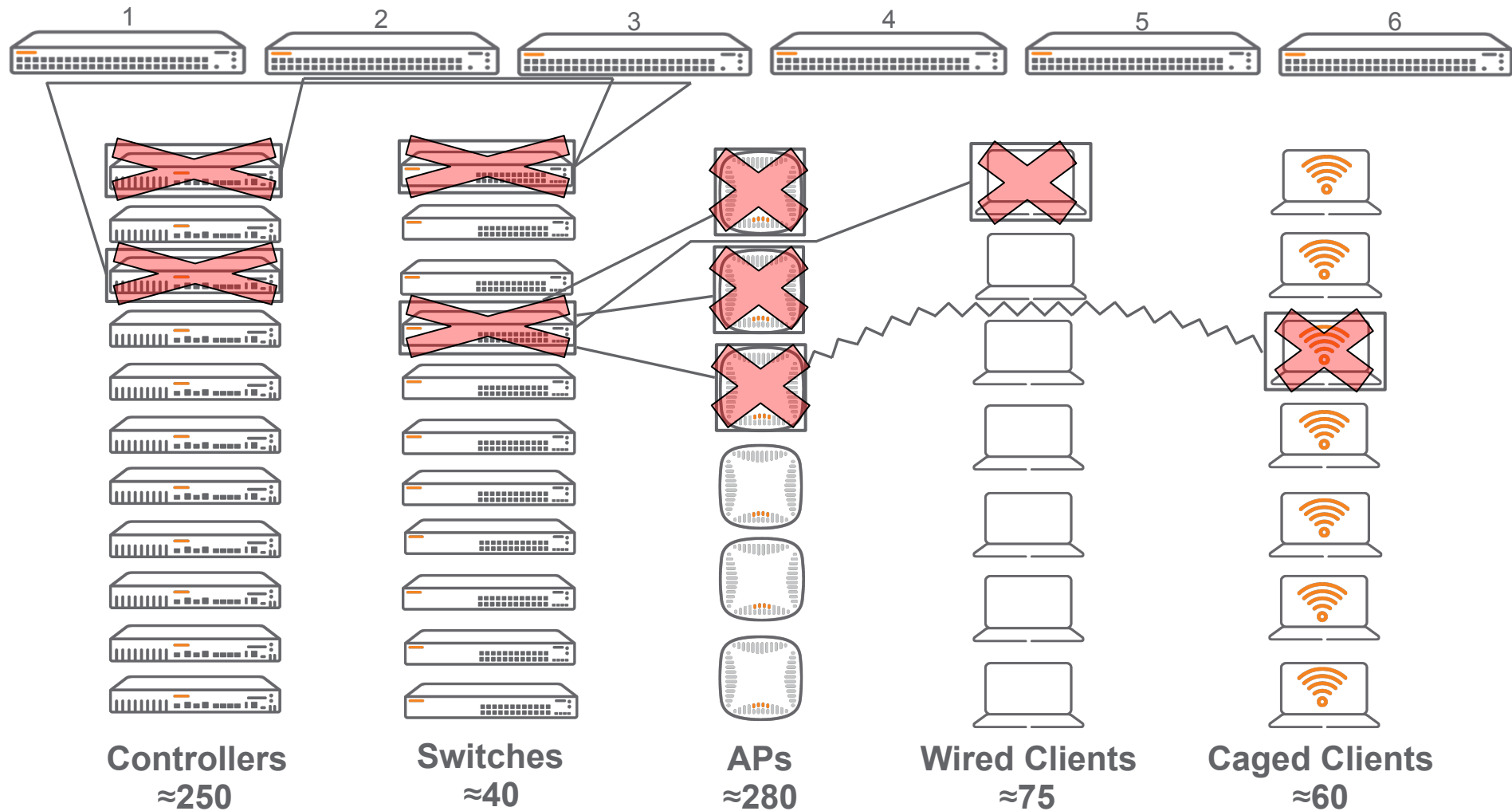
What you want...

L1 Switch Stack



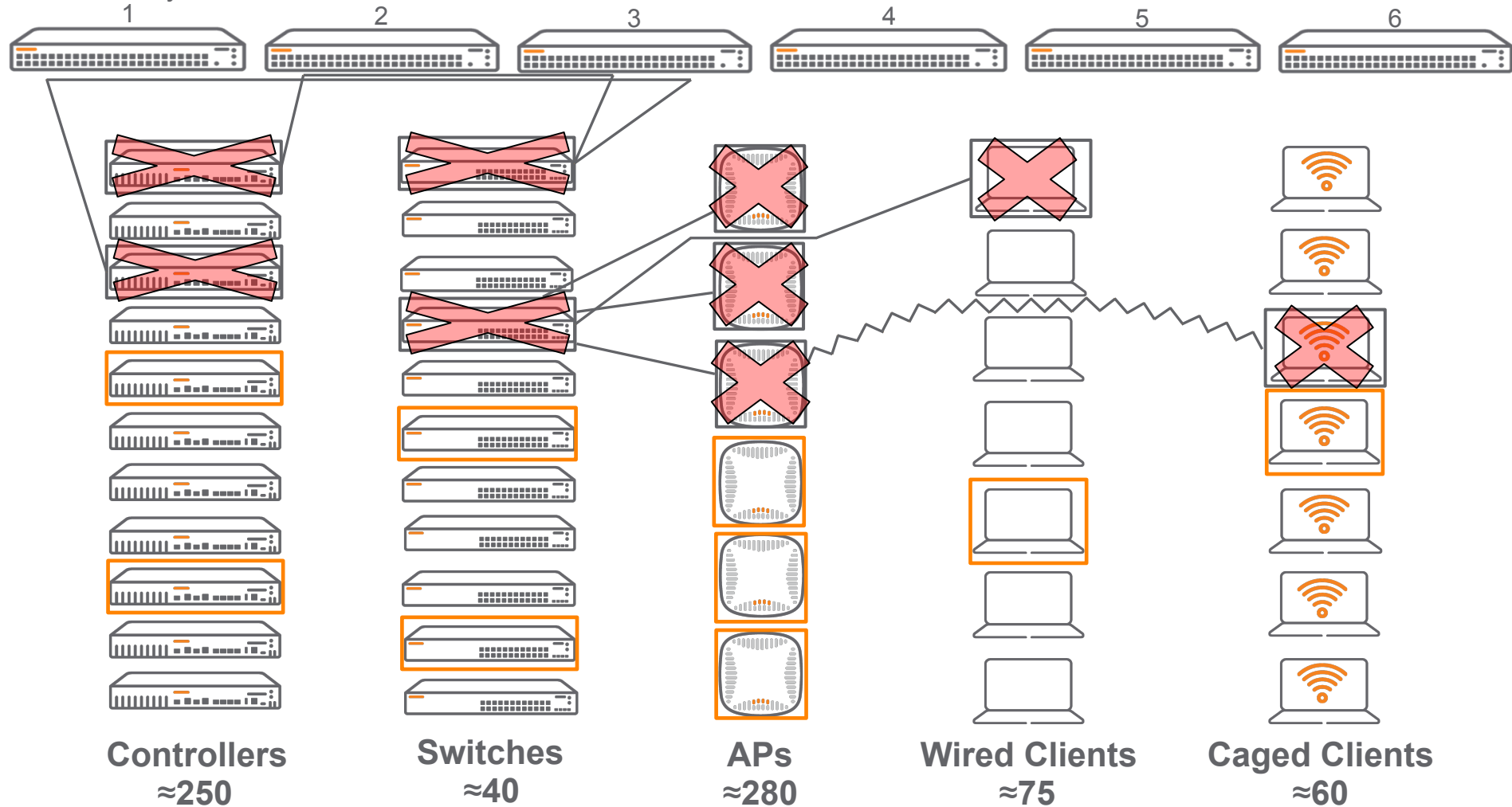
Well what's available?

## L1 Switch Stack



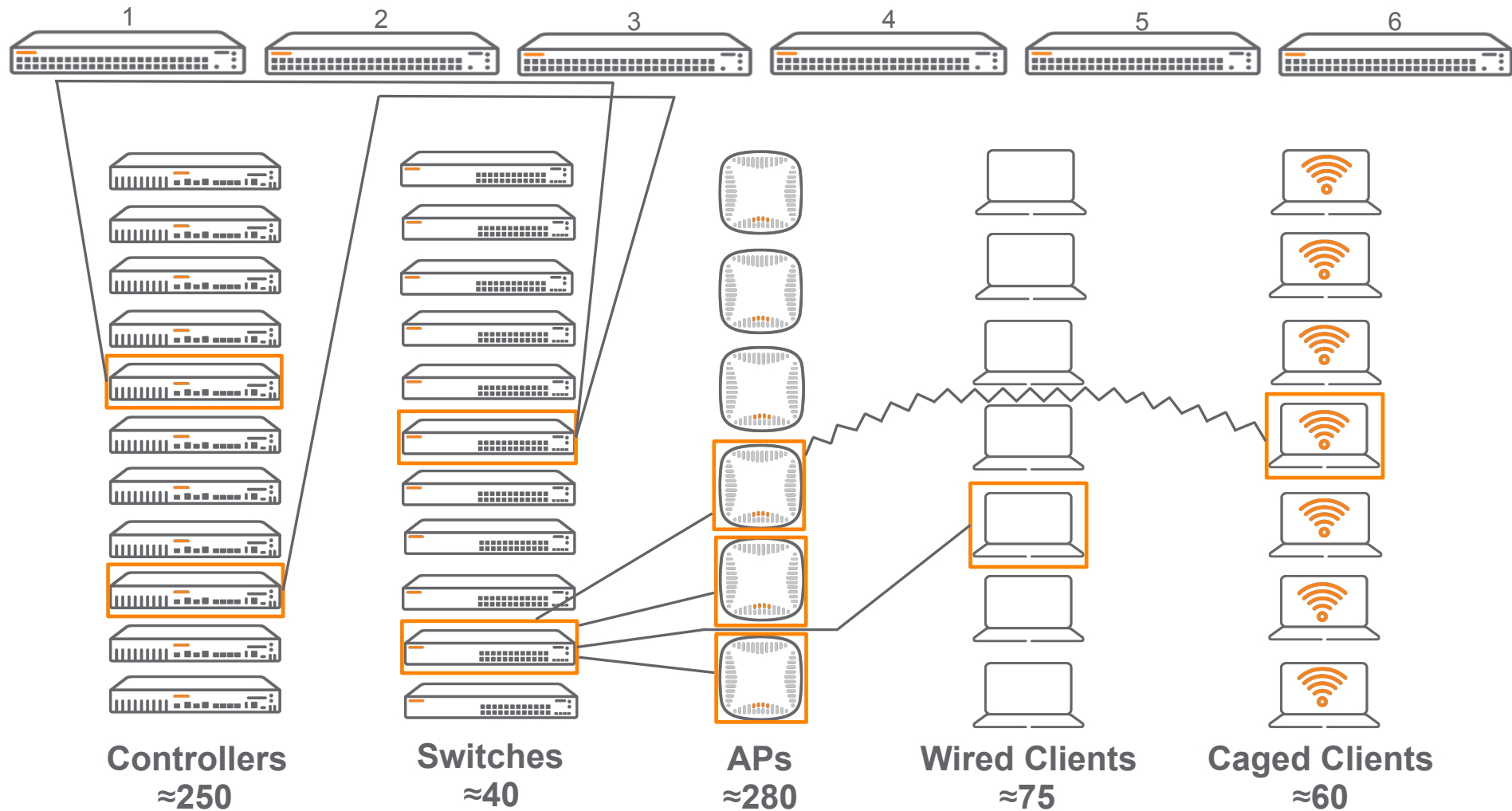
Are there any other devices?

L1 Switch Stack



This will work!

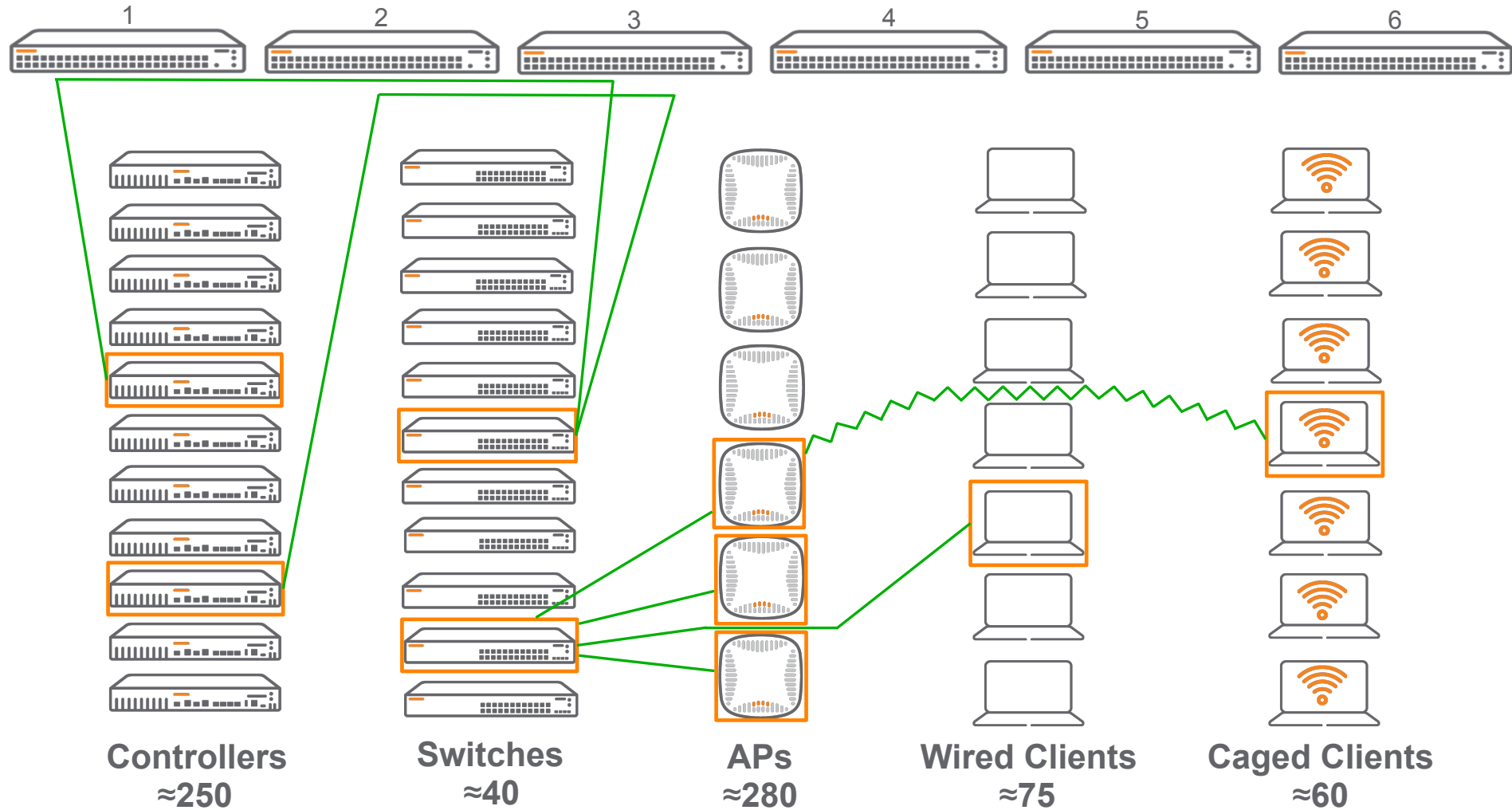
## L1 Switch Stack





Connections Set!

L1 Switch Stack



# How it's done

- **Job File**
- **Topo File**
- **Con File in JSON format**

# Topo File

```
"DEVTBLOCAL1": {  
  "DEVICE_INFO": [  
    {  
      "TYPE": "ARUBA7240,ARUBA7220,ARUBA7210,ARUBA7205",  
      "ROLE": "local"  
    }  
  ],  
  "CONNECTIONS": [  
    {  
      "MAS1": "ETH_GE",  
      "DEVTBLINUX": "ETH_GE",  
      "DEVTBVERIWAVE": "WLAN"  
    }  
  ],  
  "LMS": [  
    {  
      "AP_1_93_121000": "LMS1",  
      "AP_1_103_121001": "LMS2",  
      "AP_1_105_12RAP": "LMS3",  
      "AP_1_125_121005": "LMS4",  
      "AP_1_135_12RAP": "LMS5",  
      "AP_1_225_1210011": "LMS7",  
      "AP_1_RAP3_12RAP": "LMS8",  
      "AP_1_RAP155_12RAP": "LMS9"  
    }  
  ]  
},
```

- Holds the basic information that the user wants (Type, General Connection, Role)

```
{
  "6XSMOKE1": {
    "SUITE_DETAILS": [
      {
        "NAME": "development_smoke1.suite"
      }
    ],
    "TOPO_DETAILS": [
      {
        "NAME": "dummy.topo"
      }
    ]
  }
}
```

- Holds suite info, and topo info, can have many “subjobs” per file

# Con File in JSON format

```
"DEVTBLOCAL1": {
  "BANK_ID": 3,
  "CONNECTIONS": [
    {
      "DEVTBLINUX": [
        "gigabitethernet 0/0/3<=>3:32(11)<=>ETH_GE"
      ],
      "DEVTBVERIWAVE": [
        "WLAN1<=>DEVTBVERIWAVE<=>WLAN"
      ],
      "MAS1": [
        "gigabitethernet 0/0/1<=>3:30(11)<=>ETH_GE"
      ]
    }
  ],
  "DEVICE_INFO": [
    {
      "ROLE": "local",
      "TYPE": "ARUBA7240"
    }
  ],
  "ID": 155,
  "LMS": [
    {
      "AP_1_103_121001": "LMS2",
      "AP_1_105_12RAP": "LMS3",
      "AP_1_125_121005": "LMS4",
      "AP_1_135_12RAP": "LMS5",
      "AP_1_225_1210011": "LMS7",
      "AP_1_93_121000": "LMS1",
      "AP_1_RAP155_12RAP": "LMS9",
      "AP_1_RAP3_12RAP": "LMS8"
    }
  ],
  "NAME": "B3-7240-2"
},
```

- IDs, Type, Role, Connections, LMS specified
- Dynamically selected based on availability

# JSON to Dev File

```
{
  "ADEVLOCAL1": {
    "BANK_ID": 3,
    "CONNECTIONS": [
      {
        "CAT1": [
          "gigabitethernet 0/0/0<=>4:5(11)<=>ETH_GE"
        ],
        "DEVLINUXSERVER": [
          "gigabitethernet 0/0/2<=>4:7(11)<=>ETH_GE"
        ],
        "VERI": [
          "gigabitethernet 0/0/3<=>4:8(11)<=>ETH_GE",
          "WLAN1<=>VERI<=>WLAN"
        ],
        "WIN7CLIENT3": [
          "gigabitethernet 0/0/1<=>4:6(11)<=>ETH_GE"
        ]
      }
    ],
    "DEVICE_INFO": {
      {
        "ROLE": "local",
        "TYPE": "ARUBA7220"
      }
    ],
    "ID": 149,
    "LMS": [
      {
        "AP_1_115": "LMS3",
        "AP_1_125": "LMS4",
        "AP_1_215": "LMS2",
        "AP_1_225": "LMS1",
        "AP_1_RAP3": "LMS5"
      }
    ],
    "NAME": "B3-7220-4"
  },
}
```



```
array set :: DEVICES::ADEVLOCAL1 {
  ADMIN_IP      172.16.1.21
  CONFIG        cfg/hello1-local1.cfg
  POWER_CYCLER  10.4.76.252:20
  CONSOLE_IP    10.4.77.252:2018
  CONNECT
    0_0_0      CAT1.0_3
    0_0_1      WIN7CLIENT3.WIRED
    0_0_2      DEVLINUXSERVER.ETH1
    0_0_3      VERI.1_4
  WLAN1        VERI.2_1
  LMS1         AP_1_225.LMS
  LMS2         AP_1_215.LMS
  LMS3         AP_1_115.LMS
  LMS4         AP_1_125.LMS
  LMS5         AP_1_RAP3.LMS
}

INTERFACE.UPLINK.VMAN.NAME {hello1_ADEVLOCAL1_CAT1}
INTERFACE.UPLINK.VMAN.PORTS {4:5,3:9}
INTERFACE.WIN7.VMAN.NAME {hello1_ADEVLOCAL1_WIN7CLIENT3}
INTERFACE.WIN7.VMAN.PORTS {4:6,2:34}
INTERFACE.LINUX.VMAN.NAME {hello1_ADEVLOCAL1_DEVLINUXSERVER}
INTERFACE.LINUX.VMAN.PORTS {4:7,2:32}
INTERFACE.VERI.VMAN.NAME {hello1_ADEVLOCAL1_VERI}
INTERFACE.VERI.VMAN.PORTS {4:8,6:43}
INTERFACE.0_0_0.NAME {gigabitethernet 0/0/0}
INTERFACE.0_0_0.TYPE ETH_GE
INTERFACE.0_0_1.NAME {gigabitethernet 0/0/1}
INTERFACE.0_0_1.TYPE ETH_GE
INTERFACE.0_0_2.NAME {gigabitethernet 0/0/2}
INTERFACE.0_0_2.TYPE ETH_GE
INTERFACE.0_0_3.NAME {gigabitethernet 0/0/3}
INTERFACE.0_0_3.TYPE ETH_GE
INTERFACE.WLAN1.NAME WIRELESSPORT
INTERFACE.WLAN1.TYPE WIRELESS
INTERFACE.LMS1.NAME LMS1
INTERFACE.LMS1.TYPE LMS
INTERFACE.LMS2.NAME LMS2
INTERFACE.LMS2.TYPE LMS
INTERFACE.LMS3.NAME LMS3
INTERFACE.LMS3.TYPE LMS
INTERFACE.LMS4.NAME LMS4
INTERFACE.LMS4.TYPE LMS
INTERFACE.LMS5.NAME LMS5
INTERFACE.LMS5.TYPE LMS
SOFTWARE.CONSOLESERVER.NAME Cisco
SOFTWARE.AP.CONSOLESERVER.NAME Cisco
SOFTWARE.UPLINK.PORT {GE 0/0/0}
SOFTWARE.RPC.NAME CDU
SOFTWARE.MGMT.VLAN 0
```

# Key Tools in Completing Project

- **MySQLdb**
  - Used to access info from the database (dynamic)
- **Regex**
  - Used to determine which device is which
- **Dictionaries**
  - Used to store each devices information
- **Try-Except Blocks**
  - Used instead of many if-else statements
- **All in Python**

# MySQLdb



```
mysql> show tables;
```

Tables_in_dynamic
apsim_servers
ata_servers
banks
cage_aps
cage_clients
cage_clients_softwares
cages
connections
controllers
external_servers
extreme_switches
ixia_server_cards_ports
ixia_servers
pataservers
<u>testbedipaddress</u>
testvlan
veriwave_server_cards_ports
veriwave_servers
wired_clients
wired_clients_softwares
xconnect_switches

21 rows in set (0.00 sec)

```
mysql> select * from testbedipaddress;
```

id	rolename	startIp	endIp	startIpv6	endIpv6
1	master	172.16.1.1	172.16.1.10	2005:1:1:1::1	2005:1:1:1::10
2	local	172.16.1.21	172.16.1.100	2005:1:1:1::21	2005:1:1:1::100
3	vrrp	172.16.1.111	172.16.1.120	2005:1:1:1::111	2005:1:1:1::120
5	outsideXconnect1	172.16.1.253		2005:1:1:1::253	
6	insideXconnect1	172.16.1.252		2005:1:1:1::252	

5 rows in set (0.00 sec)



# Example of Accessing for Dev File

```
mysql> select startIp from testbedipaddress where rolename = "local";
```

```
+-----+
| startIp |
+-----+
| 172.16.1.21 |
+-----+
1 row in set (0.00 sec)
```

```
mysql> select power_cycle from controllers where id = 149;
```

```
+-----+
| power_cycle |
+-----+
| 10.4.76.252:20 |
+-----+
1 row in set (0.00 sec)
```

```
mysql> select console from controllers where id = 149;
```

```
+-----+
| console |
+-----+
| 10.4.77.252:2018 |
+-----+
1 row in set (0.00 sec)
```

```
mysql> select card_id, port_id from veriwave_server_cards_ports where id = 36;
```

```
+-----+
| card_id | port_id |
+-----+
| 1 | 4 |
+-----+
1 row in set (0.00 sec)
```

```
array set ::_DEVICES::ADEVLOCAL1 {
  ADMIN IP      172.16.1.21
  CONFIG        cfg/hello1-local1.cfg
  POWER CYCLER   10.4.76.252:20
  CONSOLE IP     10.4.77.252:2018
  CONNECT       {
    0_0_0        CAT1.0_3
    0_0_1        WIN7CLIENT3.WIRED
    0_0_2        DEVLINUXSERVER.ETH1
    0_0_3        VERI.1_4
  WLAN1         VERI.2_1
  LMS1           AP_1_225.LMS
  LMS2           AP_1_215.LMS
  LMS3           AP_1_115.LMS
  LMS4           AP_1_125.LMS
  LMS5           AP_1_RAP3.LMS
}
```

- **Learned basic PATA**
- **Experienced working with Testbeds**
  - Work with dev, tb, and cfg files
- **Learned Python, JSON, MySQLdb**
- **Current Status of Project: creates files for 6 generic topologies**



THANK YOU