

Networking Programmability 101

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What's The Problem?

- Network is CRITICAL. Places enormous emphasis on stability above ALL
- Inconsistent configuration and firmware versions cause lots of issues
- Results in fragility, complexity, and getting buried in repetition
- Fear of automation due to lack of testing (MANUAL == GOOD)

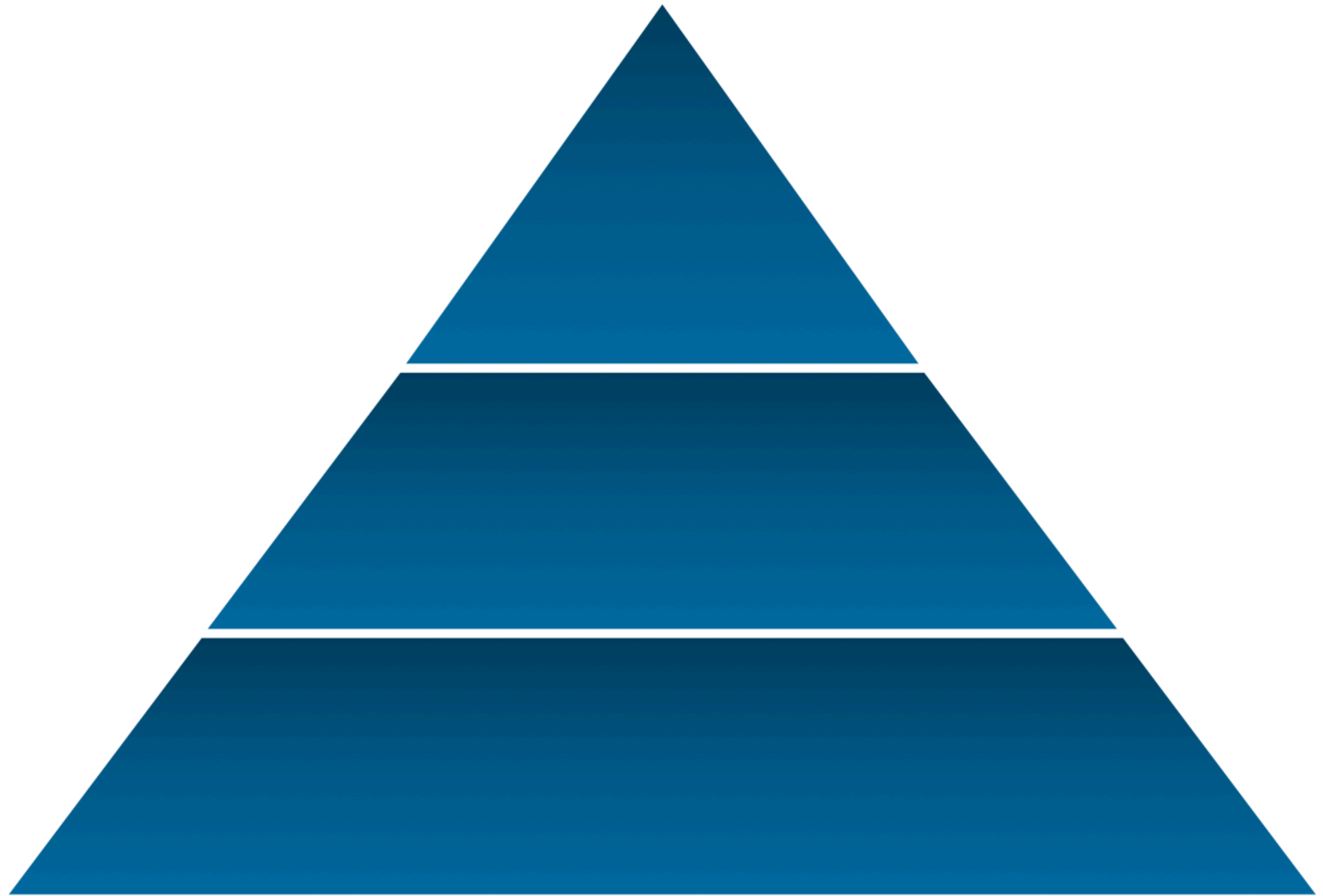




Program

Provision

Configure



Phase 1 - The Configured Network

- Per-box Mentality
- Perceived relationship to other boxes is in brain-space
- Box = administrative domain
- Here, changes should be tracked (version control) and tied to business purpose
 - Single Source of Truth



```
<version>0.1</version>
<sid>eoc</sid>
<outputs>
  <output>
    <body>
      <TABLE_vrf>
        <ROW_vrf>
          <vrf-name-out>default</vrf-name-out>
          <TABLE_addrf>
            <ROW_addrf>
              <addrf>ipv4</addrf>
              <TABLE_prefix>
                <ROW_prefix>
                  <ipprefix>10.255.255.0/24</ipprefix>
                  <ucast-nhops>1</ucast-nhops>
                  <mcast-nhops>0</mcast-nhops>
                  <attached>>true</attached>
                  <TABLE_path>
                    <ROW_path>
                      <ipnextop>10.255.255.2</ipnextop>
                      <ifname>Vlan500</ifname>
                      <uptime>P27DT21H52M4S</uptime>
                      <pref>0</pref>
                      <metric>0</metric>
                      <clientname>direct</clientname>
                      <ubest>>true</ubest>
                    </ROW_path>
                  </TABLE_path>
                </ROW_prefix>
                <ROW_prefix>
                  <ipprefix>10.255.255.1/32</ipprefix>
                  <ucast-nhops>1</ucast-nhops>
```

What is an API?

- CLI is a Human Interface
- API is a Machine Interface
- Proper APIs should require less, simpler code

Phase 2 - The Provisioned Network

- Scale necessitates automation
- "Low-hanging fruit" at first (SNMP, passwords, VLANs, etc.)
- Standard build process created in Phase I slowly converted to code
- Goal is to eliminate fear



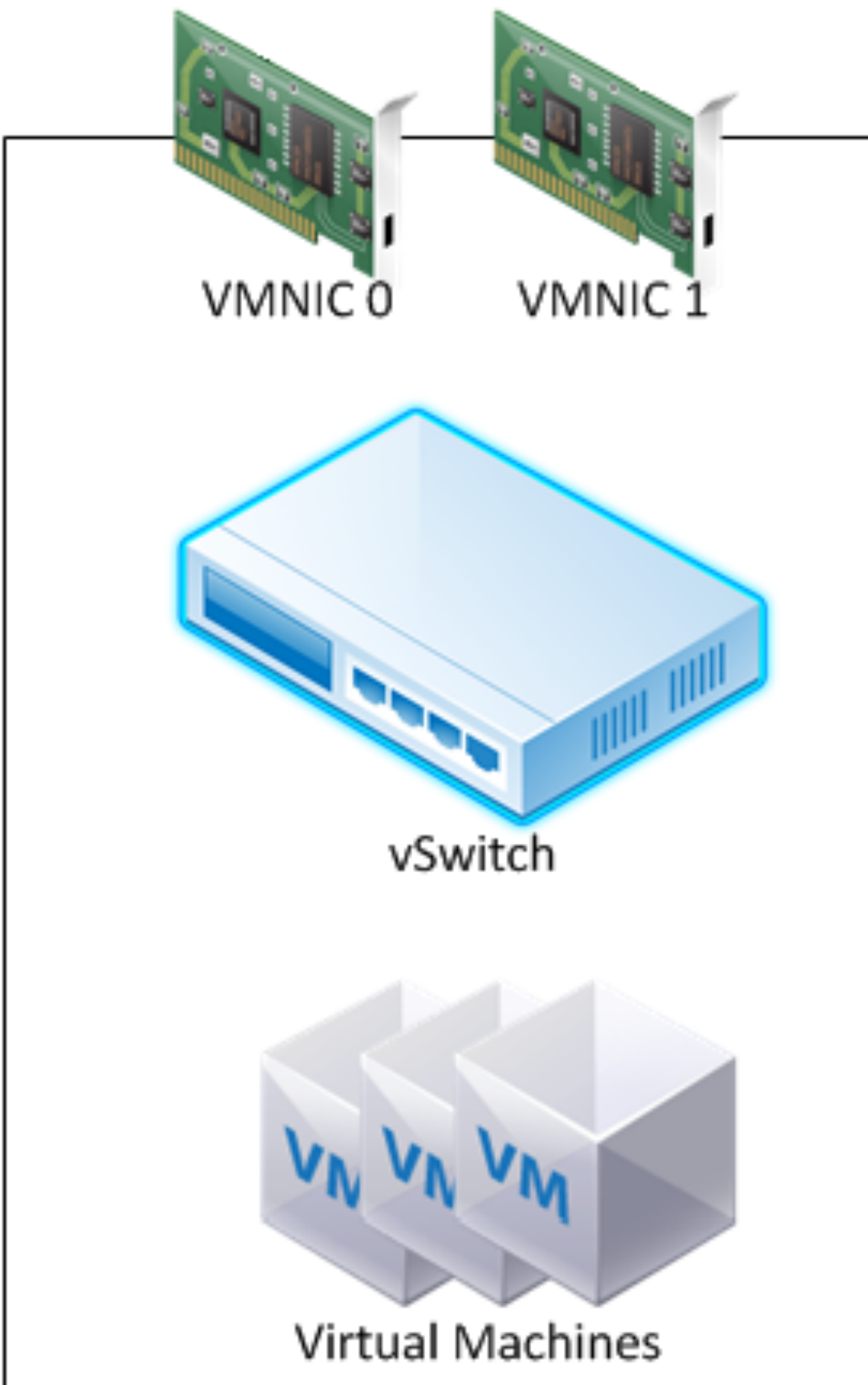
Network Templates (Jinja2)

```
{% for id, name in configDict|dictsort -%}  
vlan {{ id }}  
    name {{ name }}  
{% endfor %}
```


Network Templates (Python)

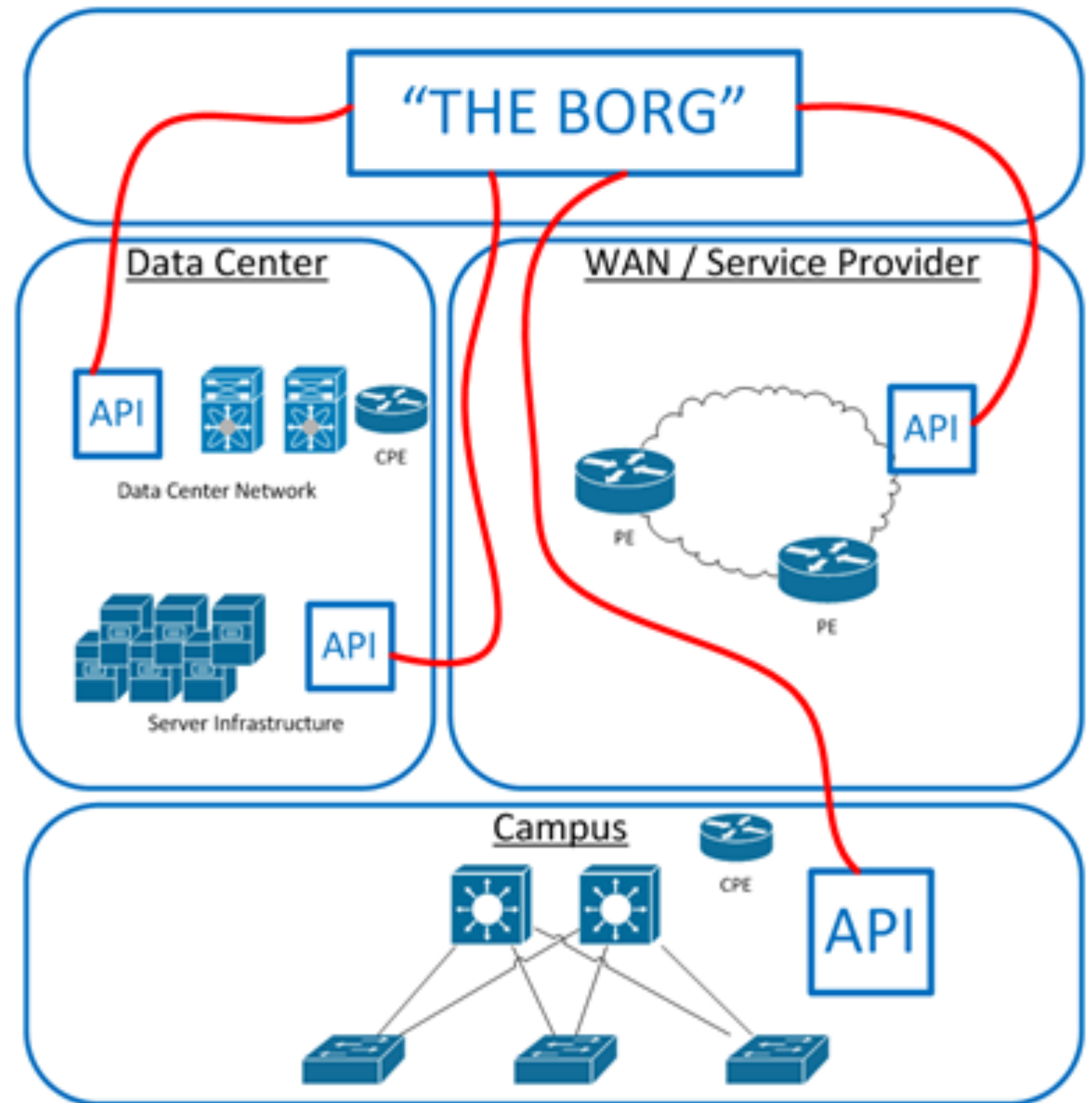
```
configDict = dict()
configDict[123] = 'VLAN_123'
configDict[234] = 'VLAN_234'

template = ENV.get_template(snippet)
template.render(config=configDict)
```



Phase 3 - The Programmed Network

- The network becomes a consumable resource
- Ability to focus on the "what" not the "how"
- Proactive vs Reactive
- Network is viewed holistically



Network Automation or
SDN?

Four Important Factors

- Tenet 1: Abstraction
- Tenet 2: Centralization
- Tenet 3: Feedback
- Tenet 4: Proactive

Do I Need To Be A
Programmer?

In closing...

- Focus on skillset intersections
- Technology is a tool, not a weapon
- The goals of the business must come first