



# DEVNET

# How to be a Network Engineer in a Programmable Age

## Introduction to Network Programmability Basics

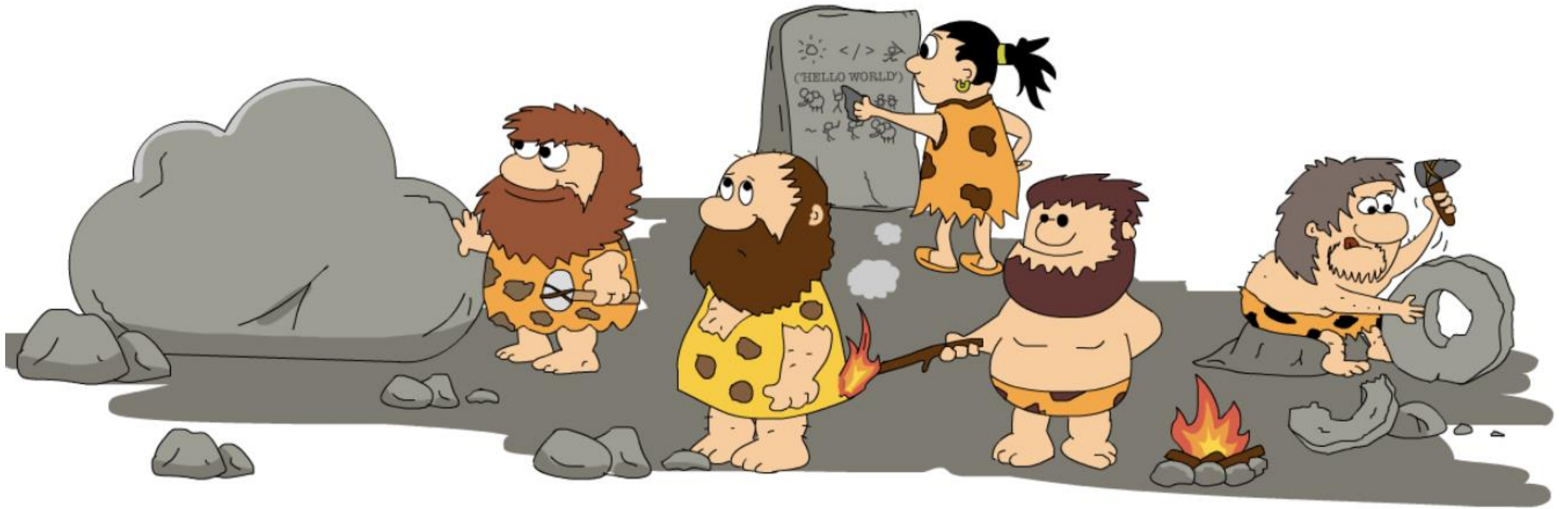
Hank Preston, ccie 38336  
Developer Evangelist  
@hfpreston 

# Topics to Cover

- The Network Engineer of Old
- The Four Ages of Networking
- Cloud to the Rescue
- Today's Network Engineer
- Network Programmability Basics Course

## The Network Engineer Evolves





The Network Engineer of Old

# Meet Carl the Network Engineer

## Programming Skills

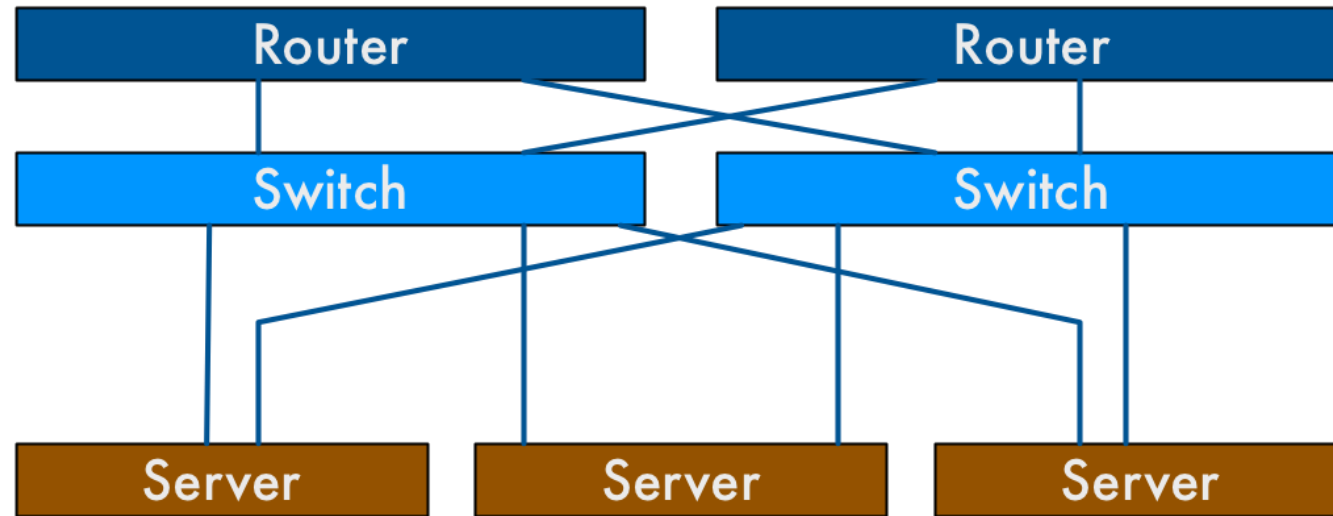
- TCL
- EEM
- Expect Scripts



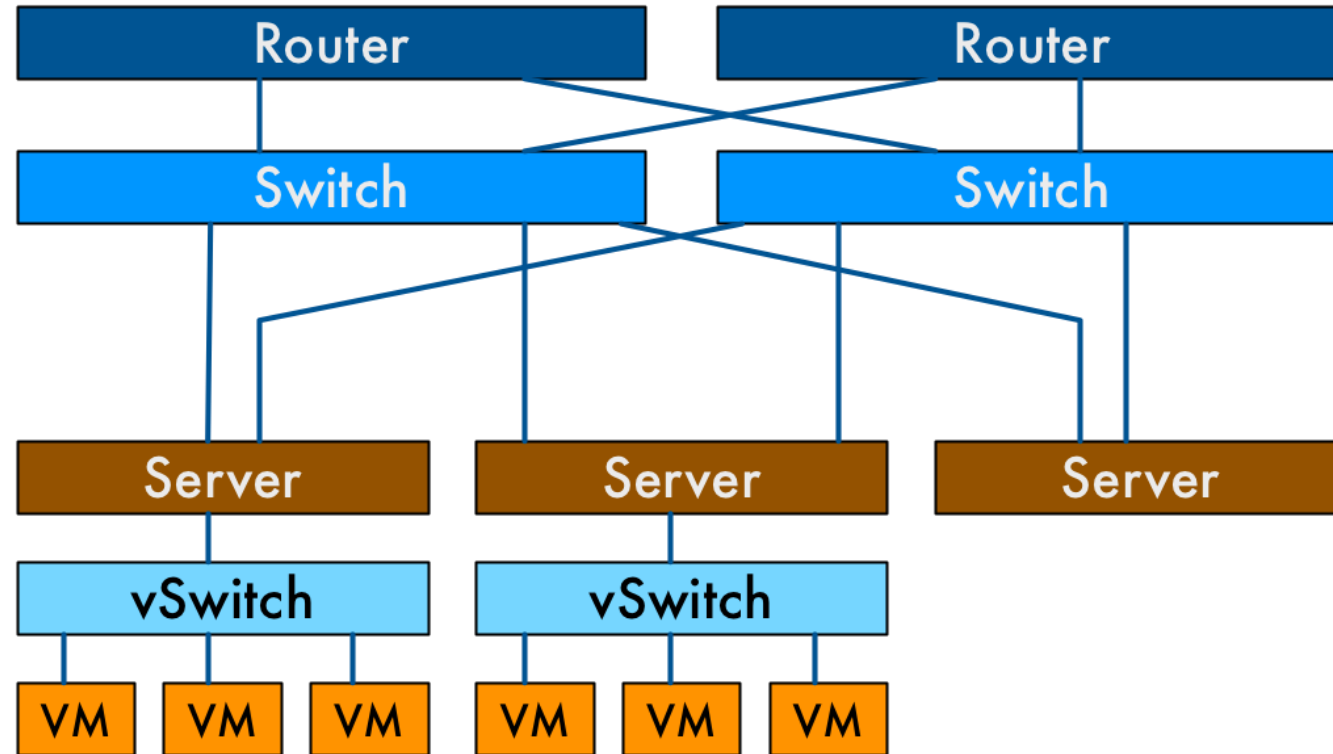
## Networking Skills

- Spanning-Tree
- Routing Protocols
- QoS
- VPN Design
- Spanning-Tree
- VOIP
- Fibre Channel
- Security Policy
- MPLS
- Spanning-Tree
- Did I mention Spanning-Tree?

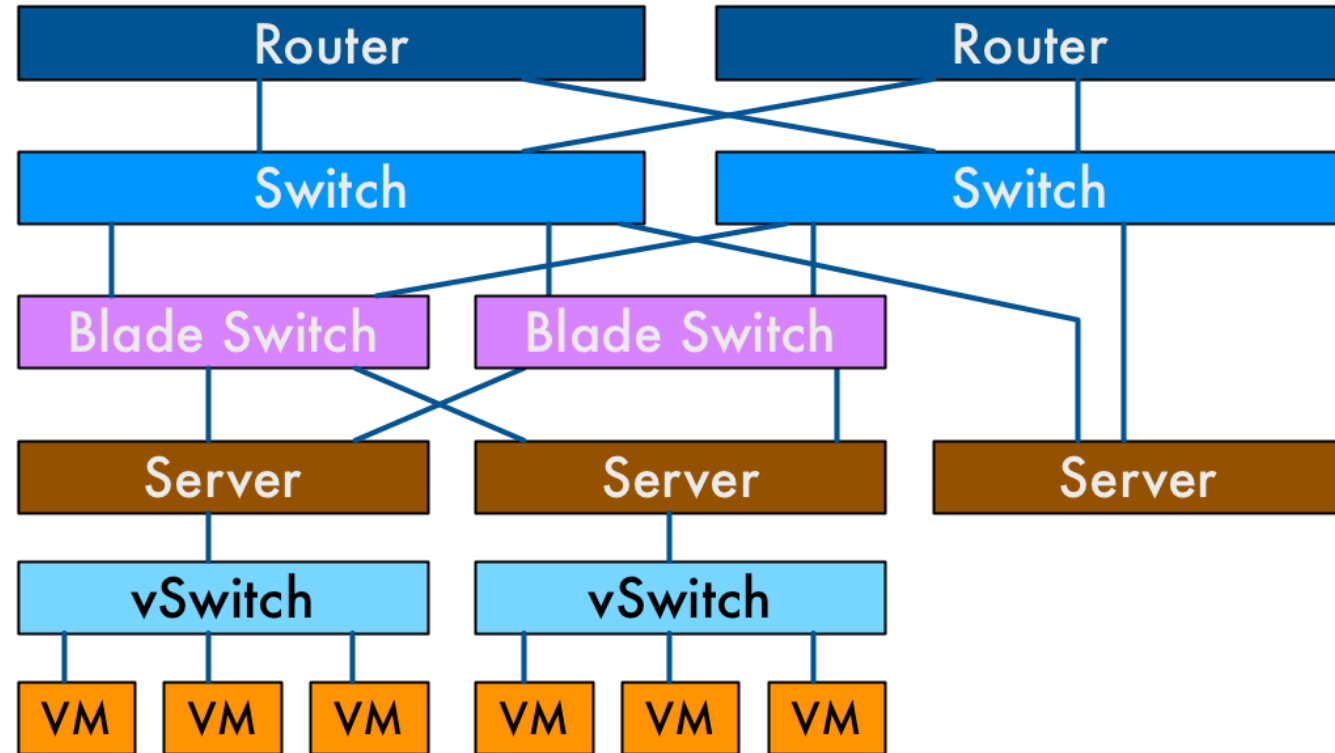
# The Network...



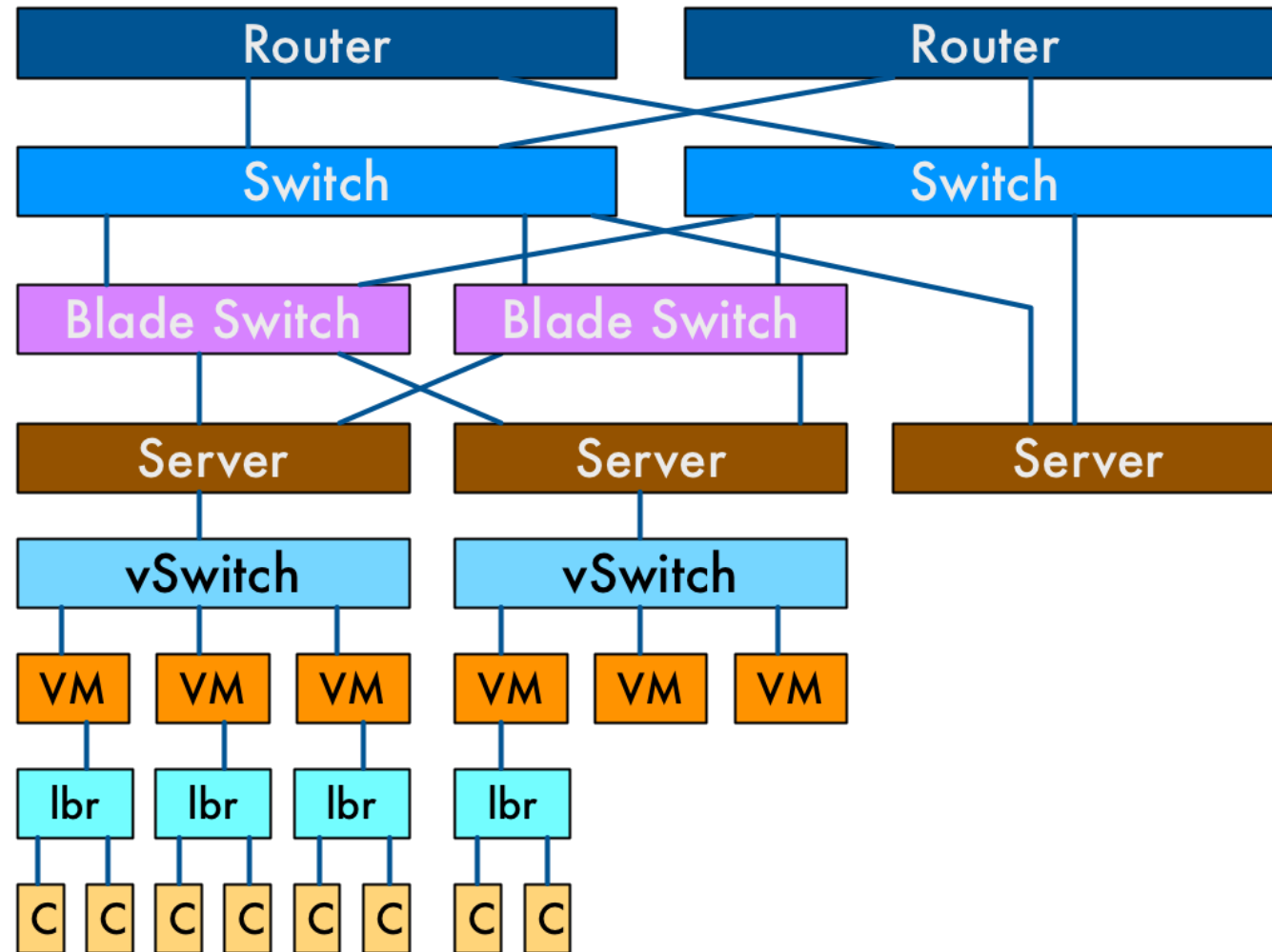
# The Network...



# The Network...

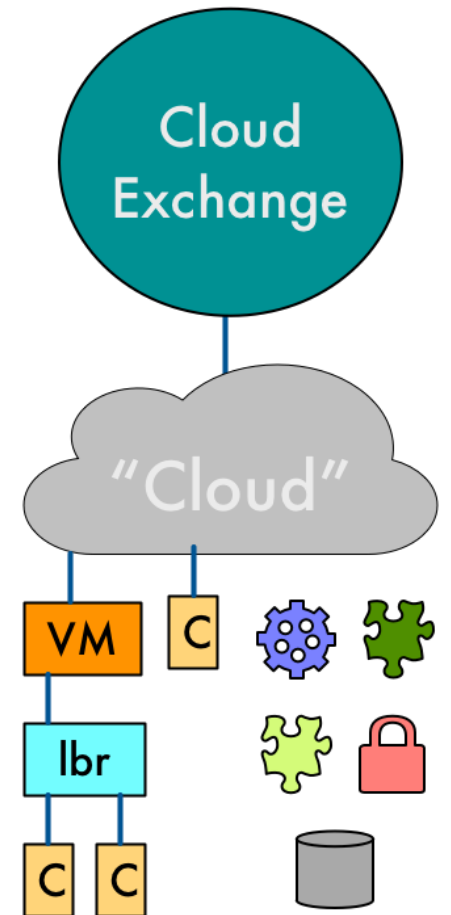
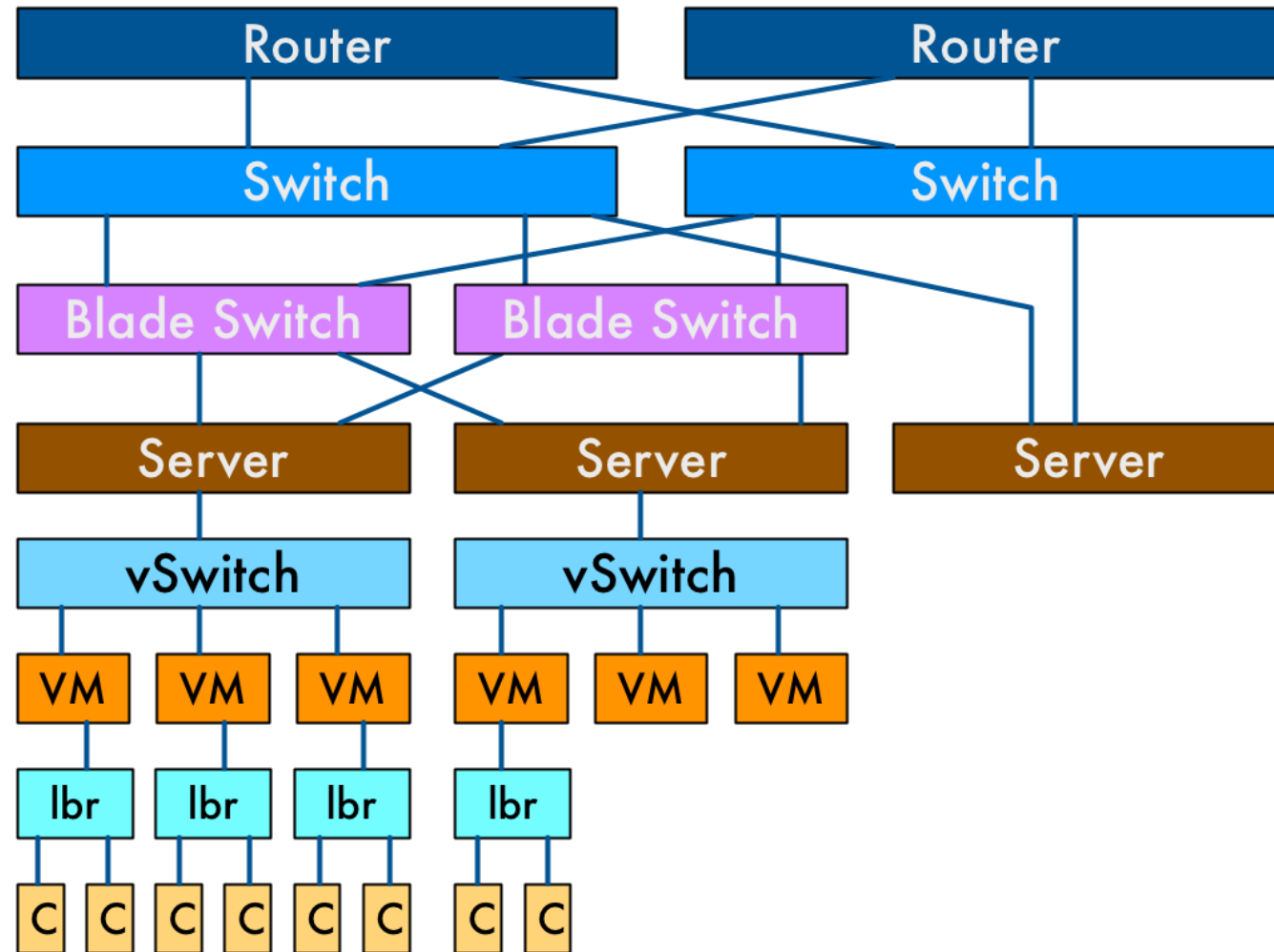


# The Network...

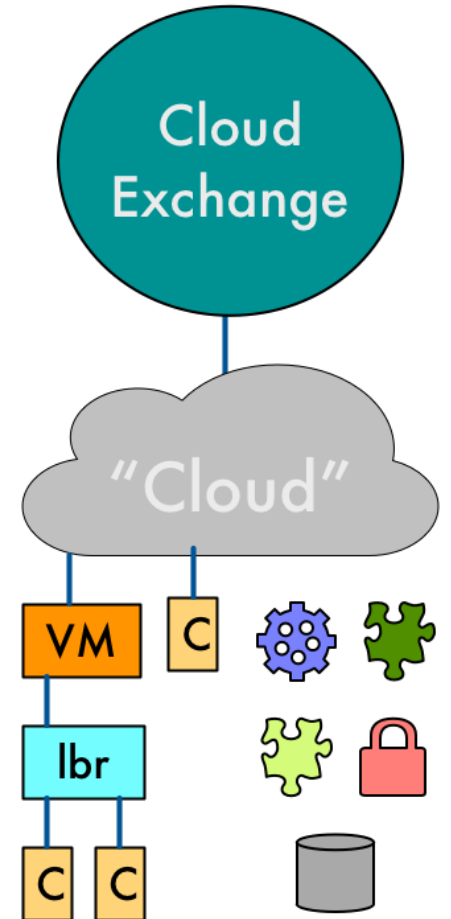
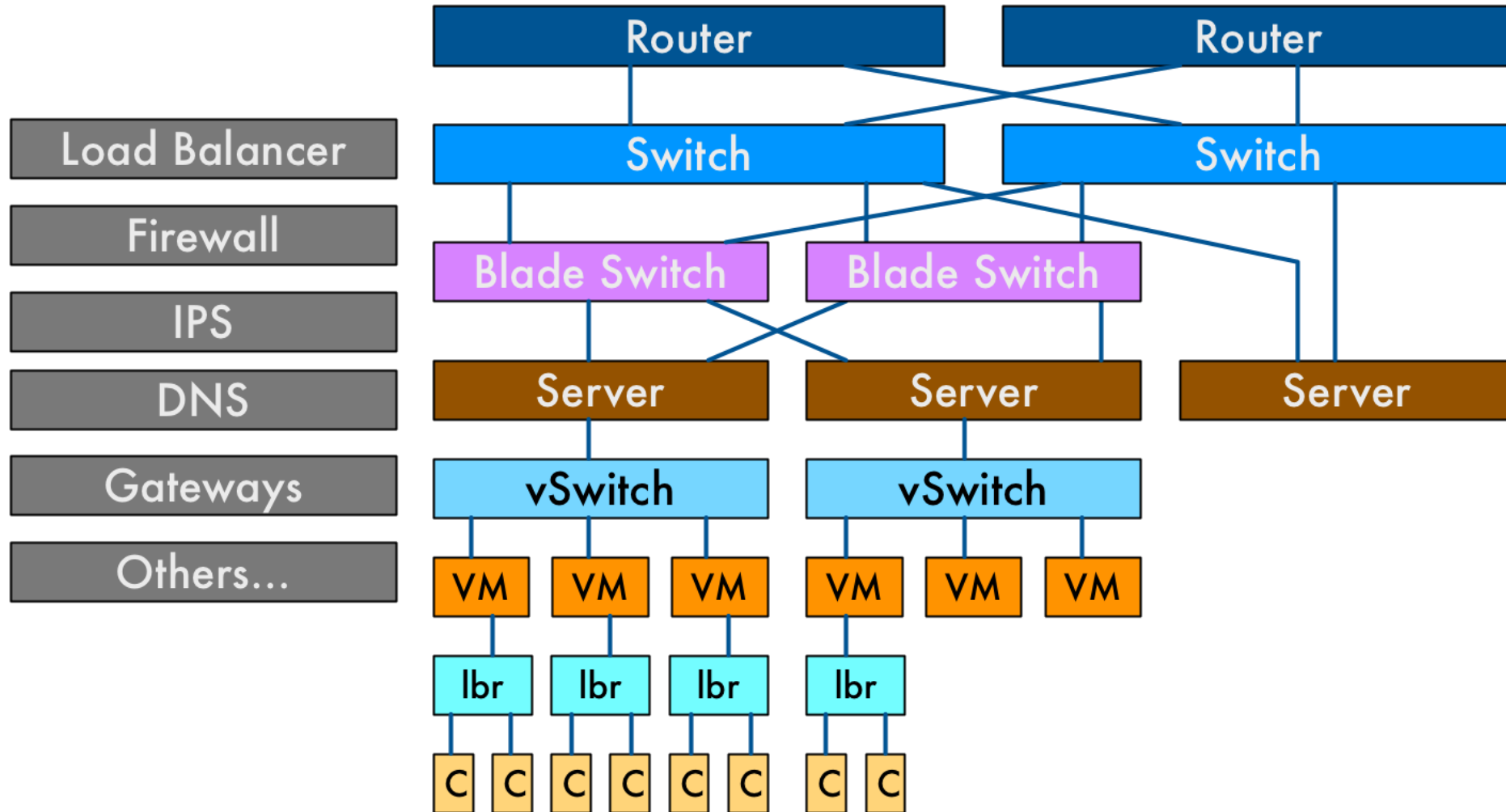




# The Network...



# The Network...



# The OSI Model of Networking...

Please don't ask  
about this...

L7: Application

L6: Presentation

L5: Session



L4: Transport

L3: Network

L2: Data Link

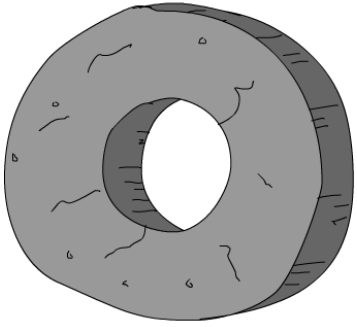
L1: Physical

Oh Yeah... We Got  
this

Black Magic



# The Four Ages of Networking

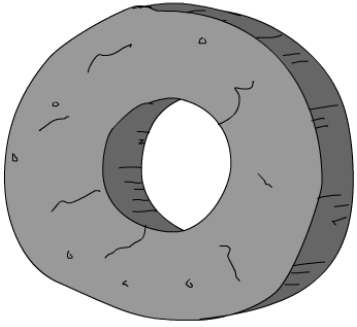


## Stone Age

Spanning Tree

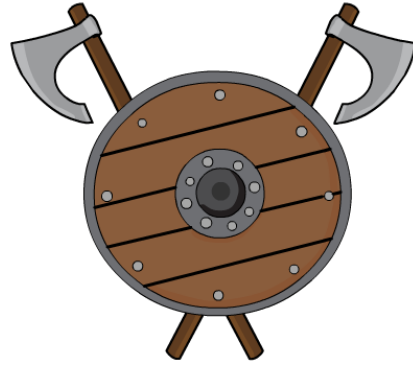
VLANs

# The Four Ages of Networking.....



## Stone Age

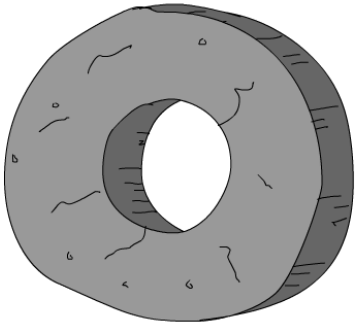
Spanning Tree  
VLANs



## Bronze Age

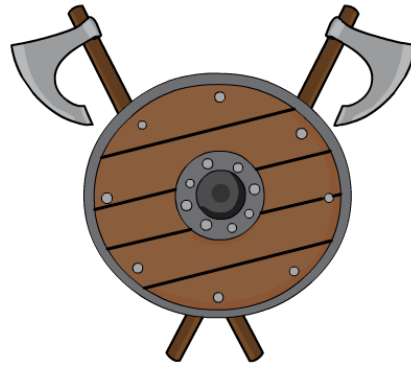
Routing Protocols  
WAN Design  
IP-magedon

# The Four Ages of Networking.....



## Stone Age

Spanning Tree  
VLANs



## Bronze Age

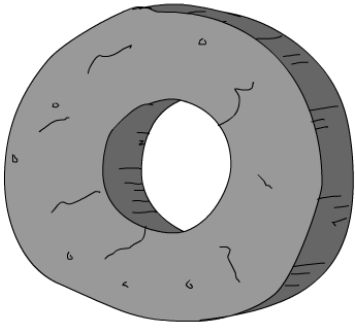
Routing Protocols  
WAN Design  
IP-magedon



## The Renaissance

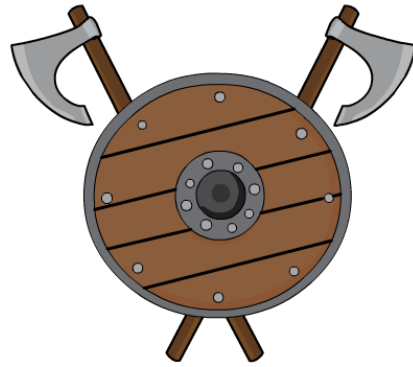
SDN  
OpenFlow  
Controllers  
Overlays  
MP-BGP  
VXLAN  
Micro-Segmentation  
White Box

# The Four Ages of Networking.....



## Stone Age

Spanning Tree  
VLANs



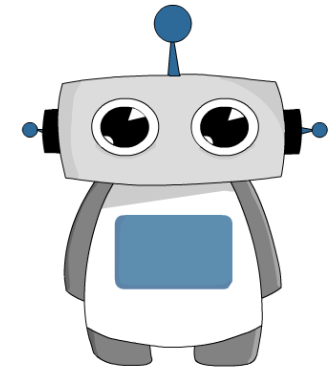
## Bronze Age

Routing Protocols  
WAN Design  
IP-magedon



## The Renaissance

SDN  
OpenFlow  
Controllers  
Overlays  
MP-BGP  
VXLAN  
Micro-Segmentation  
White Box



## Programmable Age

Cloud  
Python  
REST / APIs  
NETCONF / YANG  
“Fabrics”  
Network Function  
Virtualization (NFV)  
DevOps  
Containers

# The Four Ages of Networking.....

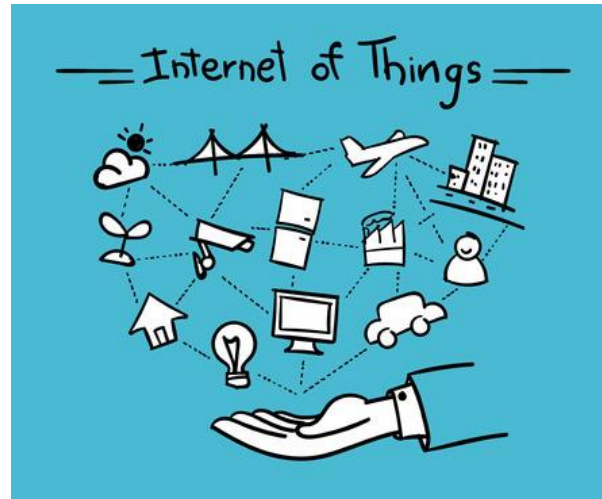


# App Economy



## User Expectations and Agility

# Internet of Things



If it isn't connected, don't bother...

# Tech Unicorns



Low barrier of entry for disruptors

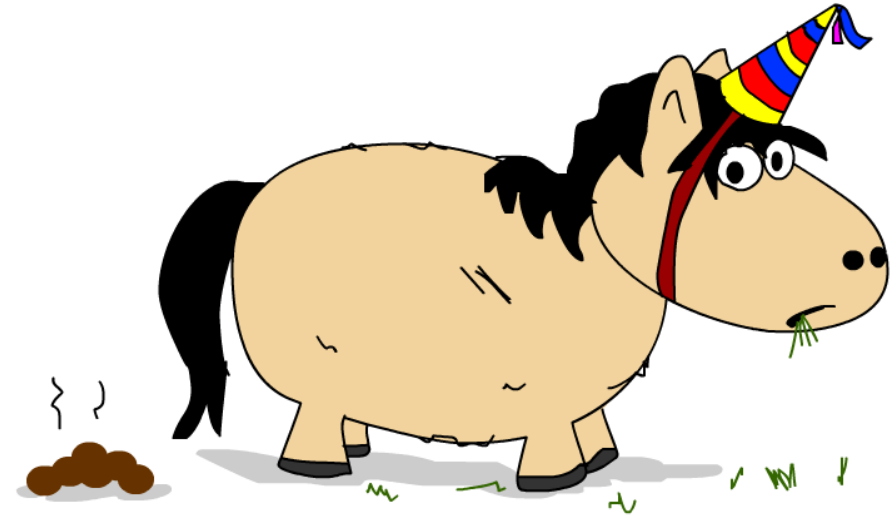
# ***CLOUD***



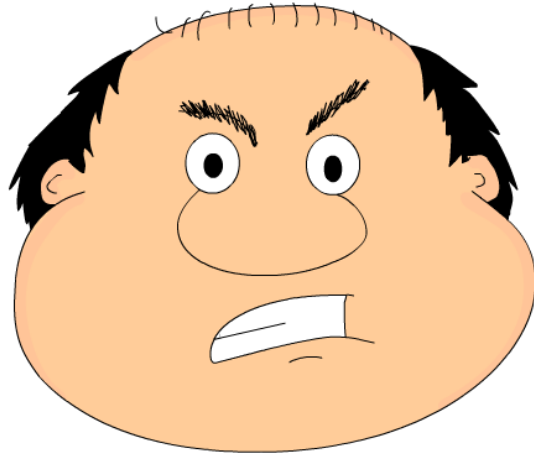
# The Cloud You Plan to Build 😊

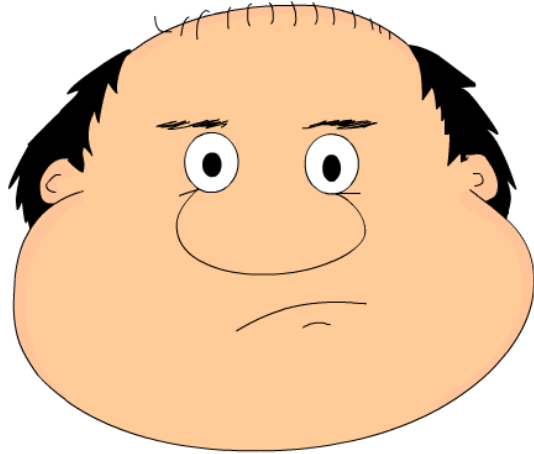


The Cloud You Plan to  
Build 😊



The Cloud You End  
Up With ☹️



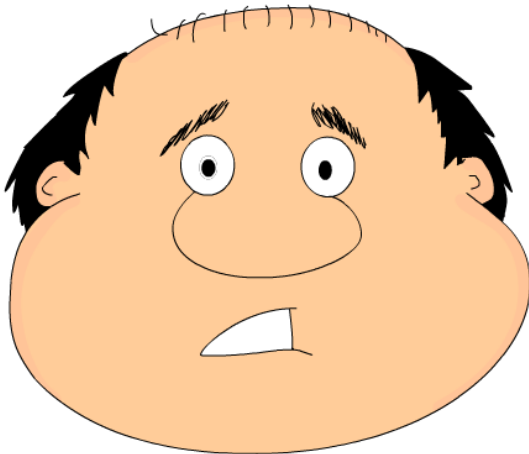


Denial

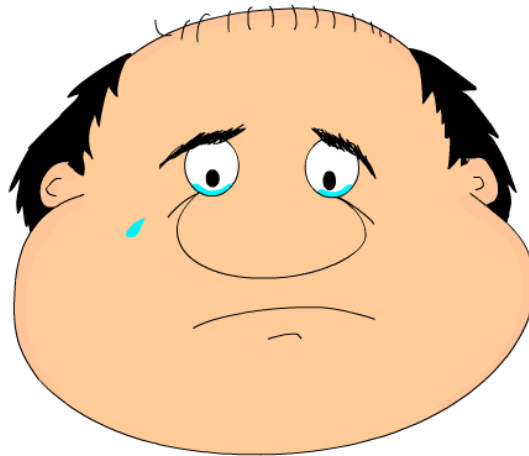


Anger

# 5 Stages of Grief



Bargaining



Depression



Acceptance

Today's Network Engineer

# Carl's 3 Step Approach to Network Programmability

## Phase 1

- Python
- REST APIs
- JSON/XML
- git/GitHub

## Phase 2

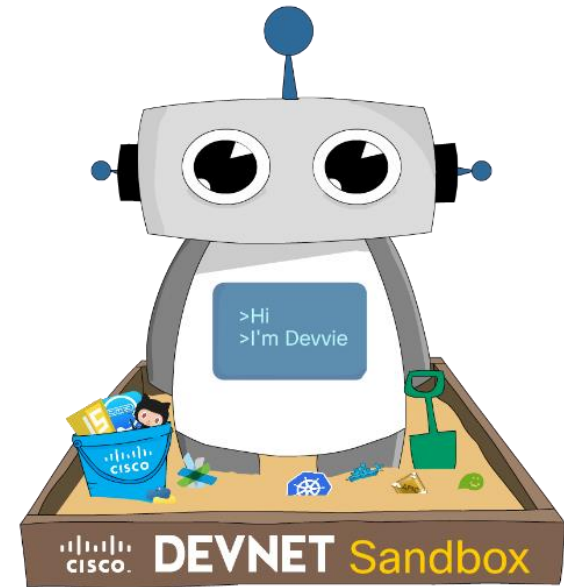
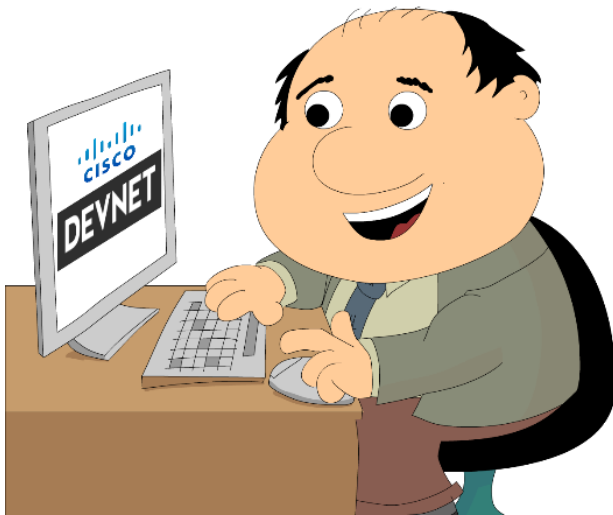
- Linux Skills
- Ansible
- Docker
- NETCONF/YANG

## Phase 3

- Linux Networking
- Container Networking
- NFV

## As Needed

- Network Controllers
- IOT Networking
- Cloud Networking
- NFV
- "DevOps"



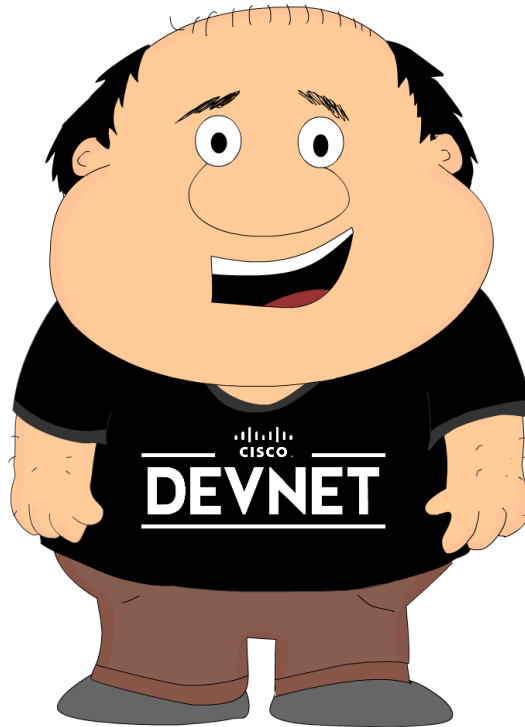


# Carl has Embraced Programmability!

(and got himself a new shirt ☺)

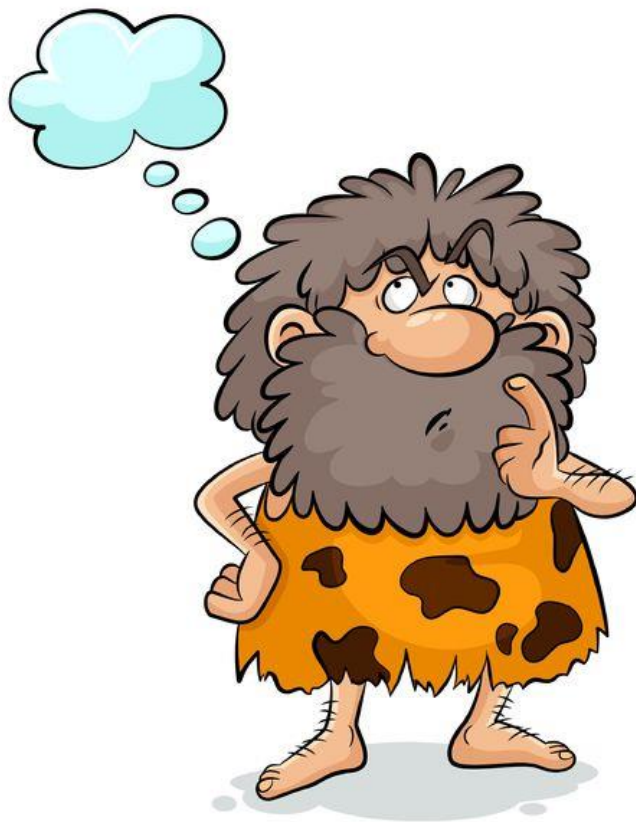
## Core Programming

- Python
- REST APIs
- JSON/XML
- Linux Skills
- Ansible  
(Puppet/Chef/etc)
- git/GitHub
- Docker
- "DevOps"



## "New" Networking Stuff

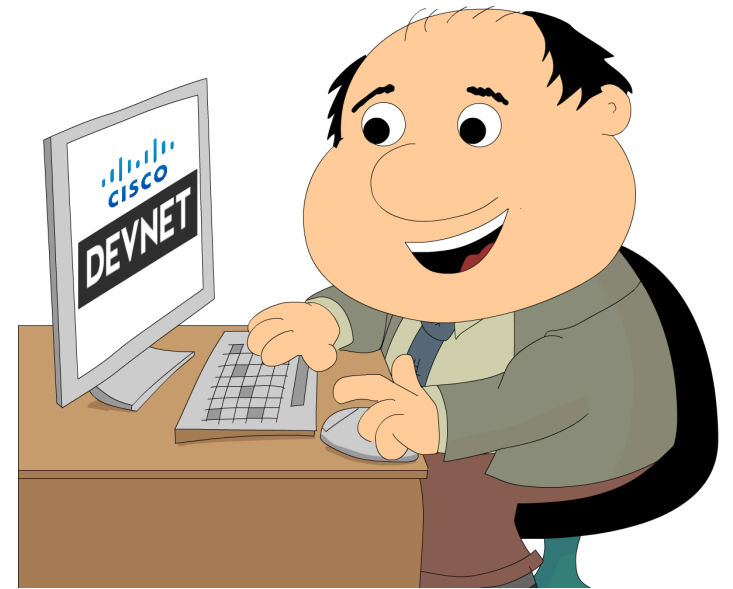
- Network Controllers
- NETCONF/YANG
- Container Networking
- Cloud Networking
- Linux Networking
- IOT Networking
- NFV



# Network Programmability Basics Course

# Network Programmability Basics Modules

- Introduction: How to be a Network Engineer in a Programmable Age
- Programming Fundamentals
- Network Device APIs
- Network Controllers
- Application Hosting and the Network
- NetDevOps



# Network Programmability Basics: The Lessons

## Module: Programming Fundamentals

- Data Formats: Understanding and using JSON, XML and YAML
- APIs are Everywhere... but what are they?
- REST APIs Part 1: HTTP is for more than Web Browsing
- REST APIs Part 2: Making REST API Calls with Postman
- Python Part 1: Python Language and Script Basics
- Python Part 2: Working with Libraries and Virtual Environments
- Python Part 3: Useful Python Libraries for Network Engineers

# Network Programmability Basics: The Lessons

## Module: Network Device APIs

- Getting the “YANG” of it with Standard Data Models
- Good by SNMP <hello> NETCONF!
- Learn to CRUD with GET, POST and DELETE using RESTCONF
- NX-API Part 1: Get Started with APIs and Nexus
- NX-API Part 2: Dive into the Nexus Object Model

# Network Programmability Basics: The Lessons

## Module: Network Controllers

- Program your own DNA with APIC-EM APIs
- Got SDN? Understanding the ACI Programmability Options
- Network Control in the Cloud - Developing with Cisco Meraki
- DNA APIs Part 1: Exploring APIC-EM Apps via API
- DNA APIs Part 2: Troubleshooting with APIC-EM Programmability
- ACI Programmability Part 1: The ACI Object Model
- ACI Programmability Part 2: Using the ACI Toolkit

# Network Programmability Basics: The Lessons

## Module: Application Hosting and the Network

- Cloud to Fog... Why Host Apps in the Network
- Linux at the Edge: Introduction to Guest Shell
- Python at the Edge: Super Charged Network Event Management
- Package, Deploy and Run Applications in the Network with IOx



# Network Programmability Basics: The Lessons

## Module: NetDevOps

- Configuration Management and the Network
- Ansible Part 1: What you need to Get Started
- Ansible Part 2: Using Ansible for Network Configuration
- Ansible Part 3: Your Network As Code

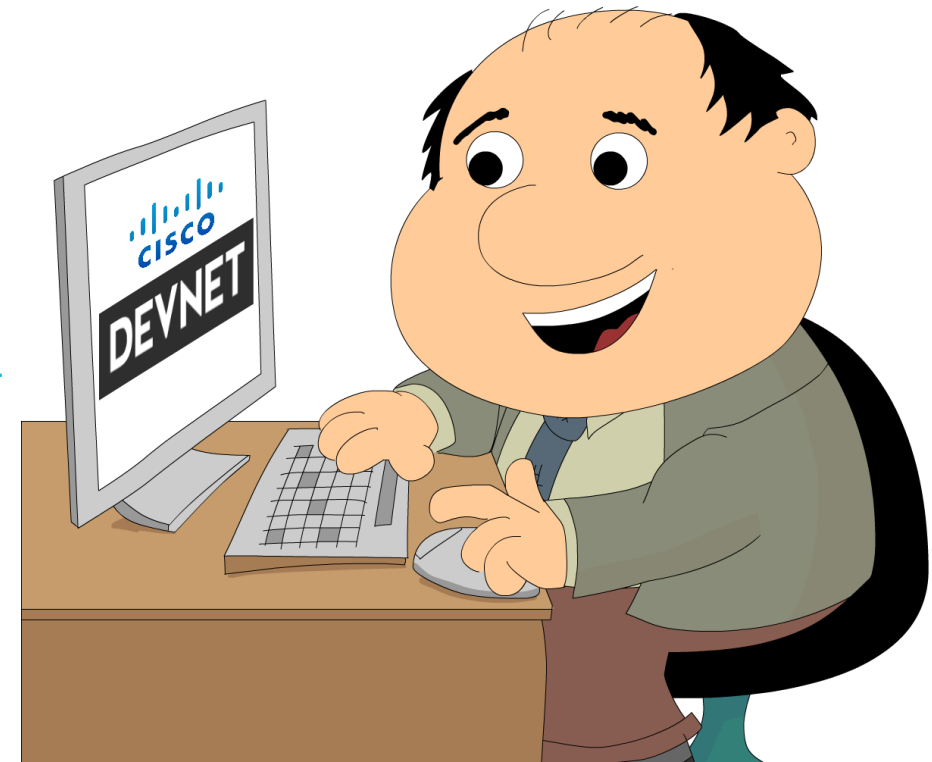
Summing up

# Review

- We looked back on the history of the network and network engineering
- Traveled through the Four Ages of Networking
- Talked about the impact “Cloud” has had on IT
- Considered the skills a network engineer needs today

# Call to Action!

- Complete the full **Network Programmability Basics** Course
- Get the Code!  
[github.com/CiscoDevNet/netprog\\_basics](https://github.com/CiscoDevNet/netprog_basics)
- Join [DevNet](#) for so much more!
  - [Learning Labs](#)
  - [Development Sandboxes](#)
  - Code Samples and API Guides



# Got more questions? Come find me!

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