



Practical Intro to Network Programmability

Jason King, CSA
Chris Hocker, CSE

“Programming is for software developers. I’m a network engineer!”

You Have a Choice



Objectives

At the end of this session, you should be able to:

- Identify key concepts and tools used in network programmability
- Setup a development environment
- Impress your friends with your new geek credentials

in·flec·tion point

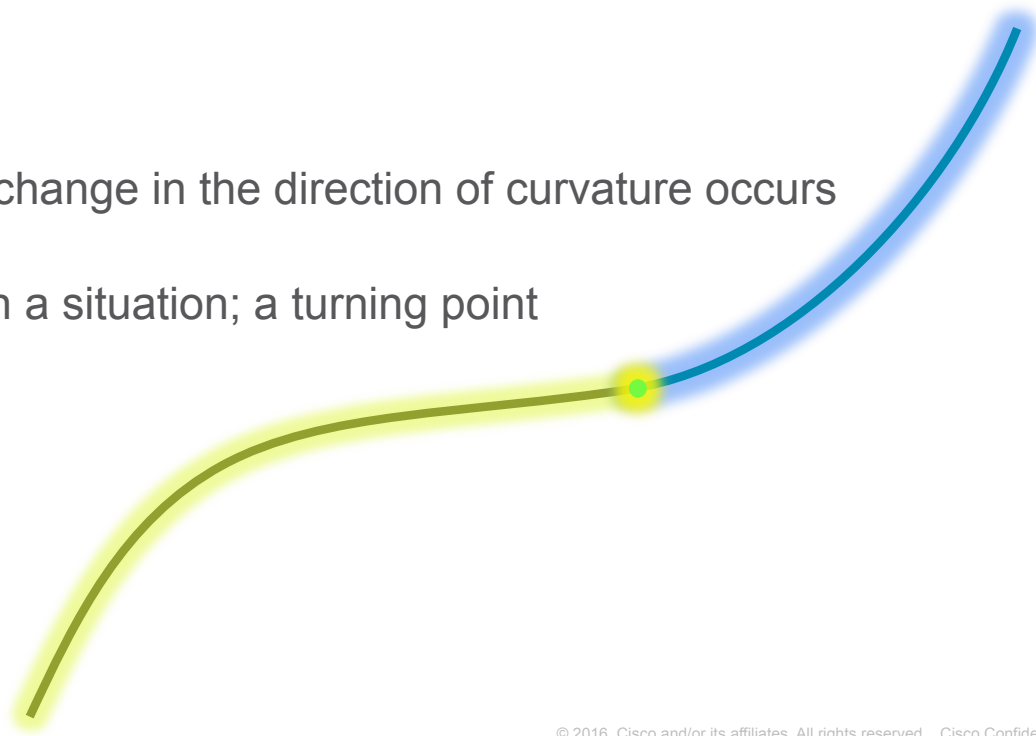
Noun

1. MATHEMATICS

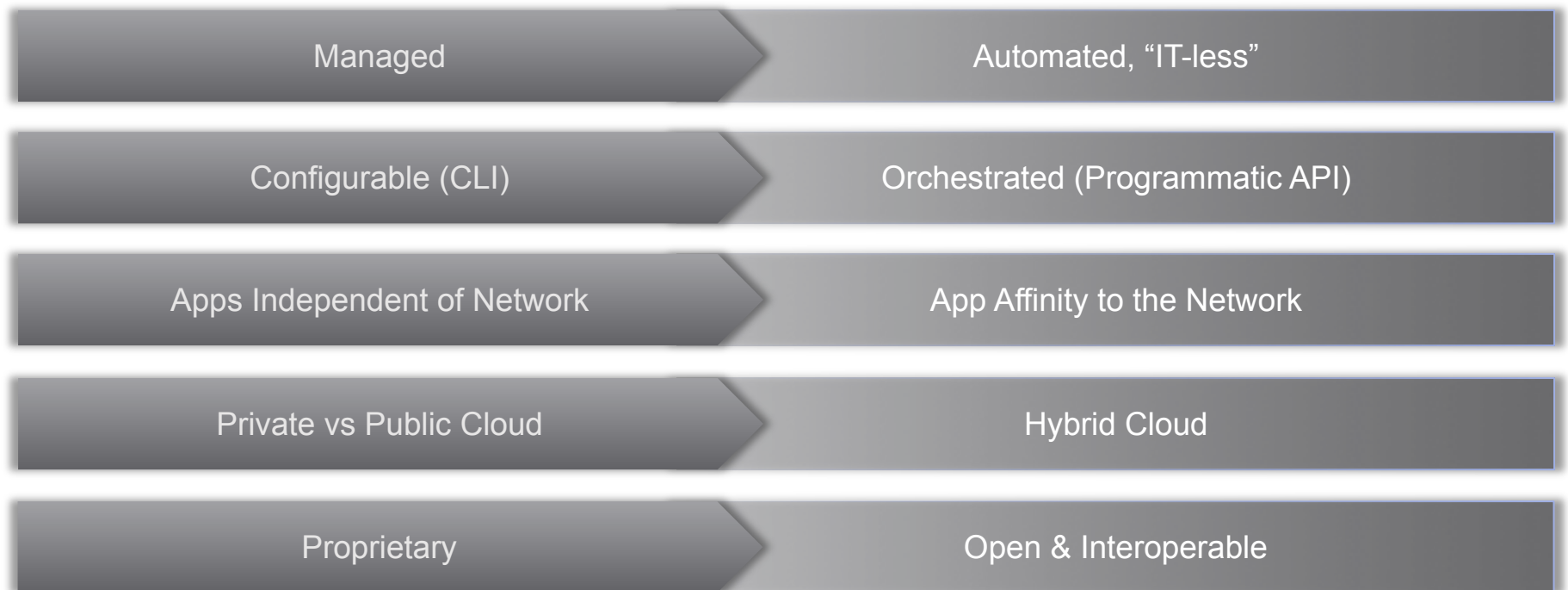
a point of a curve at which a change in the direction of curvature occurs

2. BUSINESS

a time of significant change in a situation; a turning point



Infrastructure And Operations Are Evolving



Development Environment

Development Environment Options

- Linux VM
 - Vagrant
 - Docker Machine
- Native Windows
- Native Mac

Linux VM

- Linux powers the cloud, mobile devices and most network devices
- Linux shell and utilities are becoming ubiquitous (e.g. they are even being exposed in Cisco network operating systems)
- Vagrant – easily automate VM creation/access
- Bash – bourne-again shell
- Package Management (python, pip, ncclient)

Text Editors

- Know how to use at least one shell-based text editor (i.e. non-GUI)
 - vi, vim, nano, etc.
- Use a more advanced text editor for actual coding
- Important Features
 - Syntax highlighting
 - Line numbering
 - Auto-indent w/tabs or spaces
 - Remote file editing via SSH/FTP

Demo

REST API Fundamentals

- Built on the concepts behind HTTP
- Uses “verbs” (e.g. PUT, POST, GET, DELETE)
- Uses URIs (e.g. <http://doghouse.com/dogs/fido>)
- Sandboxes are commonly available
- Postman
- Curl

REST API Data Formats

JSON

```
{
  "prefixes": [
    {
      "prefix": 1.1.1.1,
      "prefix-length": 32
    }
    {
      "prefix": 2.2.2.2,
      "prefix-length": 32
    }
  ]
}
```

XML

```
<prefixes>
  <prefix>
    <address>1.1.1.1</address>
    <mask>32</mask>
  </prefix>
  <prefix>
    <address>2.2.2.2</address>
    <mask>32</mask>
  </prefix>
</prefixes>
```

Demo

Python

- High-level, general purpose, interpreted programming language
- Popular language for network automation
- Extensible via python packages that usually installed via PIP
- Can be run interactively or via python scripts
- Modules available to allow easy parsing of JSON and XML
- Named after Monty Python

Demo

Git

- Extremely popular open-source distributed version control system
- Heavily used in collaborative projects
- Used to provide large scale public repositories (e.g. Github) or private repositories (e.g. gitlab.cisco.com)
- Useful for everything from small shell scripts to large scale software development projects (e.g. Linux kernel)

Demo

Practical Uses

- Automated security policy enforcement
- Integrating existing systems
- Automating manual configuration tasks
- Flow steering
- Creating web front-end for common workflows

Next Steps

- DevNet
- Programming and Automating Cisco Networks – Cisco Press
- Git Repo
<https://github.com/chrishocker/se-all-hands-demo>

Closing Thoughts



Lieutenant: I think we can handle one little girl...

Agent Smith: No lieutenant, your men are already dead.

Don't be the lieutenant



NETCONF/YANG

- YANG is a structured data representation of a device configuration
- Devices expose a YANG model of their configuration
- NETCONF is a protocol used to read/write configuration data to/from the device
- RESTCONF is a REST interface to the YANG model
- Supported in various flavors IOS-XR & IOS-XE