
CISCO
You make possible

I want to code

But what language should I use

Patrick Riel – Software Engineer

cisco Live!
Barcelona | January 27-31, 2020

Session ID

Agenda

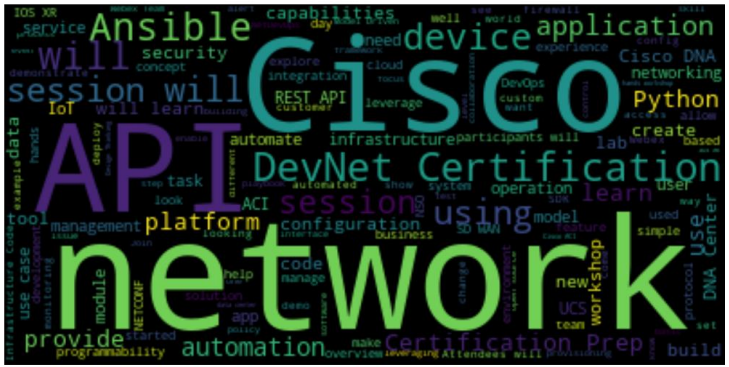
- Introduction
- Navigating the Programming Landscape
- Trends in Open Source
- Languages
- Developer Tools
- Conclusion

Introduction

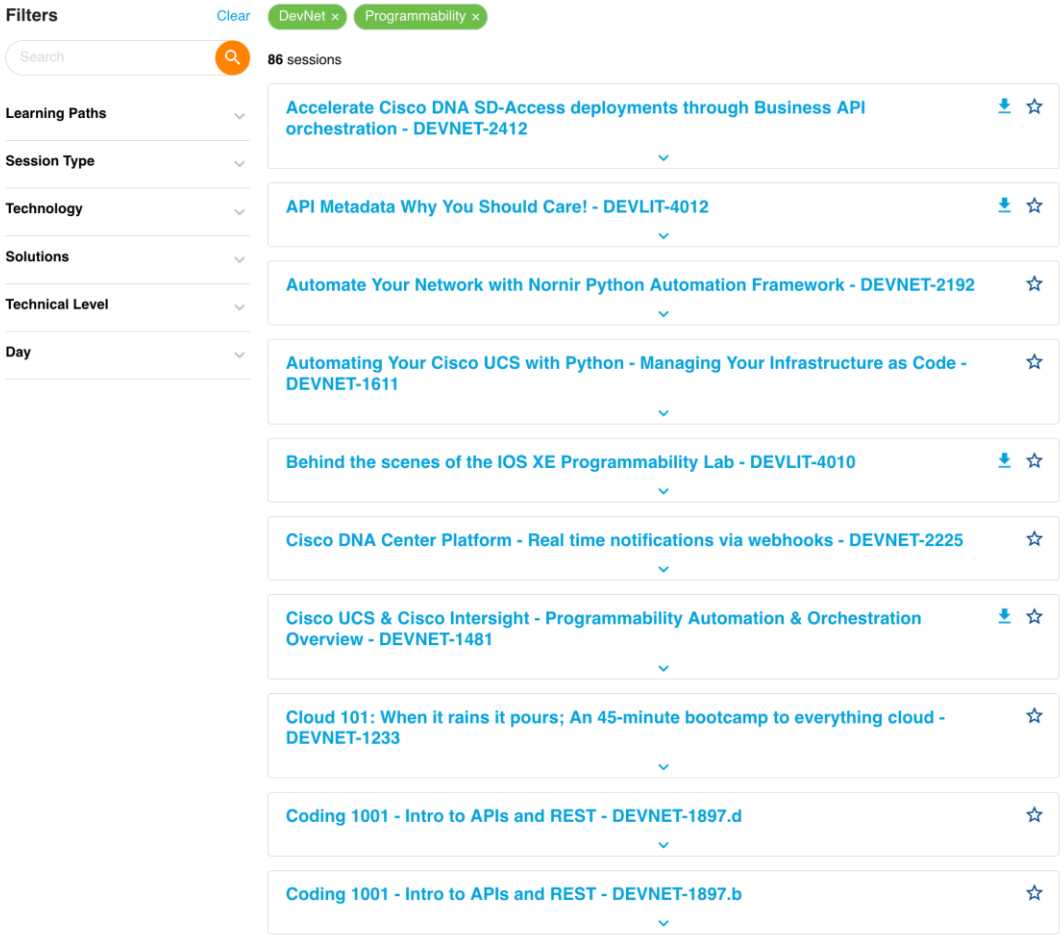
Introduction

- Software Engineer with Cisco DevNet
- Enjoys writing code in a variety of programming languages
- Believes coding should be fun (love what you do)
- Have had the opportunity to present at multiple Cisco Live events
- Luckily enough to work on quite some interesting projects over the course of 3+ years at Cisco

Navigating the Programming Landscape



https://github.com/amueller/word_cloud



There are only two kinds of programming languages: those people always _____ about and those nobody uses.

Bjarne Stroustrup

C++

Descriptions of Languages

- Functional
- Imperative
- Declarative
- Compiled
- Interpreted

Functional

- Higher Order Functions
- Immutable Data
- Lisp, Haskell, Clojure, Erlang

Imperative

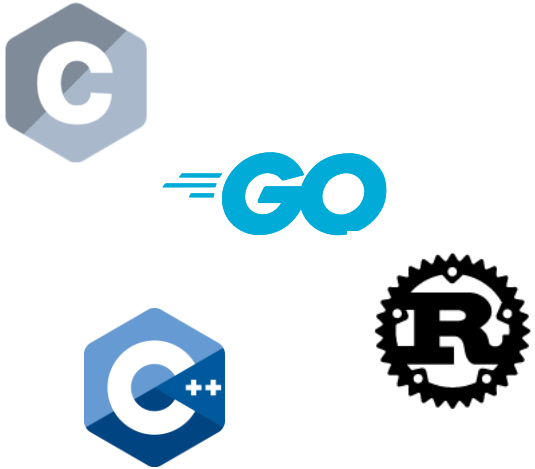
- Statements to change state
- Focuses on describing *HOW* a program operates

Declarative

- Contrasts with Imperative
- *WHAT* the program must accomplish

Compiled

- In theory, all languages can be compiled.
- Source Code -> Machine Code
- Typically faster to execute
- Catching errors at compile time



hello.go

go > hello > hello.go > ...

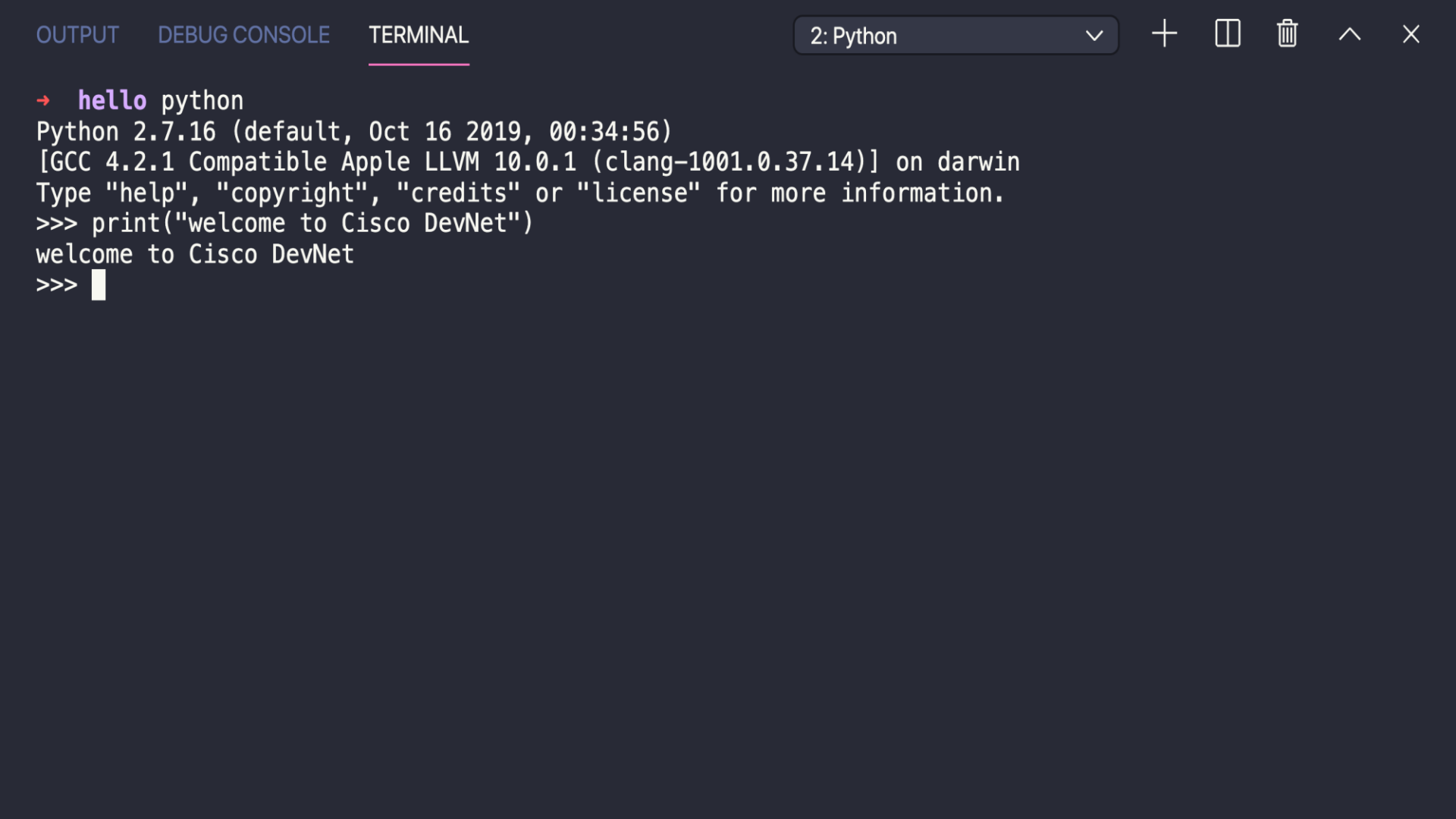
```go
package main

import "fmt"

func main() {
    fmt.Println("Hello World!")
}
```

OUTPUT DEBUG CONSOLE TERMINAL 2: zsh

```
→  hello go build .
→  hello ll
total 4144
-rwxr-xr-x  1 localadmin  staff   2.0M Jan 30 04:44 hello
-rw-r--r--  1 localadmin  staff    73B Jan 24 19:10 hello.go
→  hello ./hello
Hello World!
→  hello
```

Interpreted

- Executes code directly
- Software processed (Virtual Machine or emulator)
- Can have smaller execution binary


OUTPUT
DEBUG CONSOLE
TERMINAL
2: Python
→ hello python
Python 2.7.16 (default, Oct 16 2019, 00:34:56)
[GCC 4.2.1 Compatible Apple LLVM 10.0.1 (clang-1001.0.37.14)] on darwin
Type "help", "copyright", "credits" or "license" for more information.
>>> print("welcome to Cisco DevNet")
welcome to Cisco DevNet
>>>

Trends in Open Source

Trends in Open Source

NUMBER OF CONTRIBUTORS TO OPEN SOURCE PROJECTS

01	microsoft/vscode	19.1k	TypeScript
02	MicrosoftDocs/azure-docs	14k	Powershel
03	flutter/flutter	13k	Dart
04	firstcontributions/first-contributions	11.6k	Markdown
05	tensorflow/tensorflow	9.9k	C++/Python
06	facebook/react-native	9.1k	JavaScript, Java, Objective C, C++
07	kubernetes/kubernetes	6.9k	Go
08	DefinitelyTyped/DefinitelyTyped	6.9k	TypeScript
09	ansible/ansible	6.8k	Python
10	home-assistant/home-assistant	6.3k	Python

https://octoverse.github.com/

Trends in Open Source

CHANGE IN CONTRIBUTIONS TO OPEN SOURCE PROJECTS

01	aspnet/AspNetCore	346%
02	flutter/flutter	279%
03	MicrosoftDocs/vsts-docs	264%
04	istio/istio	194%
05	aws-amplify/amplify-js	188%
06	helm/charts	184%
07	ValveSoftware/Proton	182%
08	gatsbyjs/gatsby	179%
09	storybookjs/storybook	178%
10	cypress-io/cypress	178%

C#

Dart

Markdown

Go

TypeScript

Go

C++/Scala

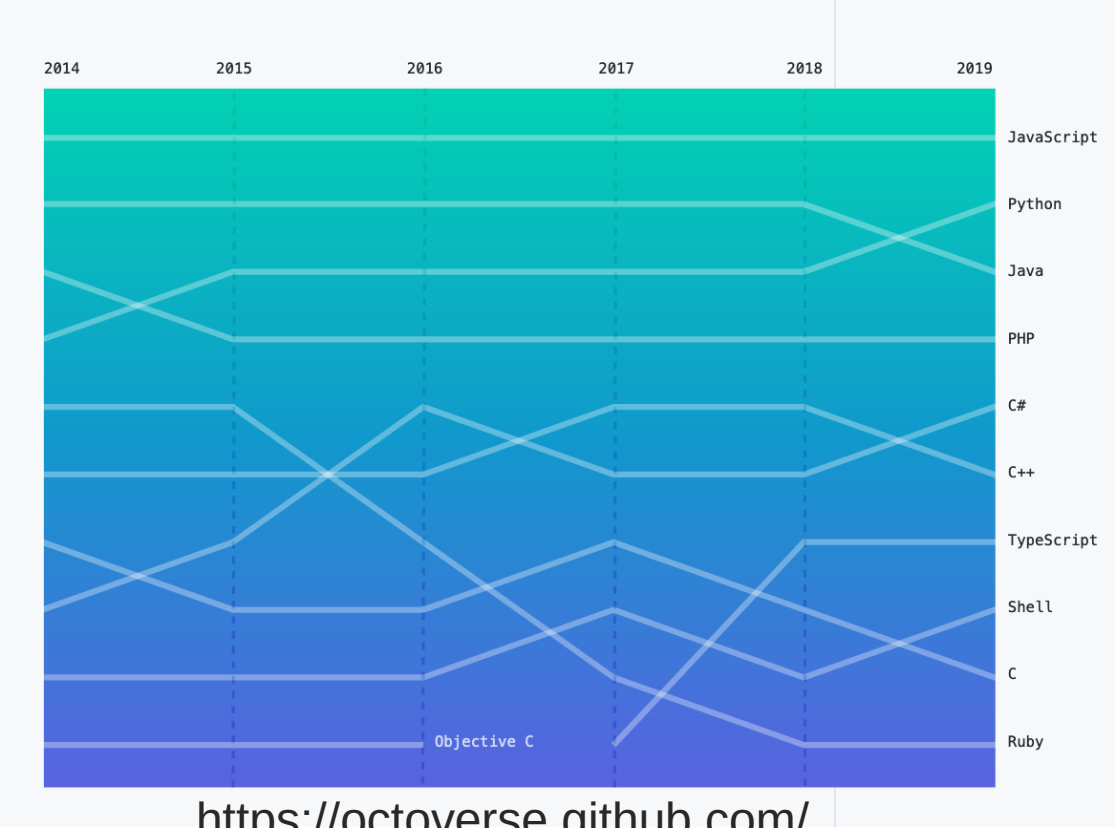
JavaScript

TypeScript

JavaScript / CoffeScript

https://octoverse.github.com/

Trends in Open Source



https://octoverse.github.com/

Trends in Open Source

CHANGE IN PROGRAMMING LANGUAGE USE, 2018–2019

01	Dart	532%
02	Rust	235%
03	HCL	213%
04	Kotlin	182%
05	TypeScript	161%
06	PowerShell	154%
07	Apex	154%
08	Python	151%
09	Assembly	149%
10	Go	147%

https://octoverse.github.com/

Languages

Rust - Hello World

```
fn main() {
    println!("Hello World!");
}
```

```
for x in 0..10 {
    println!("{}", x); // x: i32
}
```

```rust
/// Returns the relevant CPU features enabled at compile time.
fn compile_cpu_features() -> Vec<&'static str> {
    let mut features = vec![];
    if cfg!(feature = "simd-accel") {
        features.push("+SIMD");
    } else {
        features.push("-SIMD");
    }
    if cfg!(feature = "avx-accel") {
        features.push("+AVX");
    } else {
        features.push("-AVX");
    }
    features
}
```

Rust – Why?

- Performance
- Reliability
- Productivity
- Memory Safety

Rust – Good Use Cases

- Command Line Tools
- WebAssembly
- Networking
- Embedded
- https://github.com/rust-unofficial/awesome-rust

Python – Hello World

```
print("Hello World!")
```

```
def hello_world(count):
    for i in range(count):
        print("hello world")

hello_world(5)
```

```
class Channel(ClosingContextManager):
    """
    A secure tunnel across an SSH `.Transport`.  A Channel is meant to behave...
    """

    def __init__(self, chanid):
        #: Channel ID
        self.chanid = chanid
        #: Remote channel ID
        self.remote_chanid = 0
```

Python – Why?

- Friendly and Easy to Learn
- Powerful
- Fast
- Expressive
- Great Libraries

Python – Good Use Cases

- Web and Internet Development
- Scientific and Numeric computing
- Education, great for teaching programming
- DevOps Tools
- Networking

Go – Hello World

```go
package main

import "fmt"

func main() {
    fmt.Println("Hello World!")
}
```

```go
import "fmt"

func main() {

    kvs := map[string]string{"a": "apple", "b": "banana"}
    for k, v := range kvs {
        fmt.Printf("%s -> %s\n", k, v)
    }
}
```

```go
// TODO: Unit tests for this code, we can spin up a test SSH server with instructions here:
// https://godoc.org/golang.org/x/crypto/ssh#ServerConn
type sshTunnel struct {
    Config  *ssh.ClientConfig
    Host    string
    SSHPort string
    client  *ssh.Client
}

func makeSSHTunnel(user string, signer ssh.Signer, host string) (*sshTunnel, error) {
    config := ssh.ClientConfig{
        User:            user,
        Auth:            []ssh.AuthMethod{ssh.PublicKeys(signer)},
        HostKeyCallback: ssh.InsecureIgnoreHostKey(),
    }
    return &sshTunnel{
        Config:  &config,
        Host:    host,
        SSHPort: "22",
    }, nil
}
```

Go – Why?

- Productivity
- Portable
- Performance
- Concise
- Concurrency
- Compile Time!

Go – Good Use Cases

- Server/Web Development
- Command Line Tools
- Networking
- Databases

JavaScript – Hello World

```
console.log('Hello World!');
```

```
// First one is the good old forEach loop
const array = [1, 3, 5, 8, 12];

array.forEach(number => {
  console.log(number);
});
```

```
/**
 * @param {object} nativeEvent Native browser event.
 * @return {string} Normalized `key` property.
 */
function getEventKey(nativeEvent: KeyboardEvent): string {
  if (nativeEvent.key) {
    // Normalize inconsistent values reported by browsers due to
    // implementations of a working draft specification.

    // FireFox implements `key` but returns `MozPrintableKey` for all
    // printable characters (normalized to `Unidentified`), ignore it.
    const key = normalizeKey[nativeEvent.key] || nativeEvent.key;
    if (key !== 'Unidentified') {
      return key;
    }
  }

  // Browser does not implement `key`, polyfill as much of it as we can.
  if (nativeEvent.type === 'keypress') {
    const charCode = getEventCharCode(nativeEvent);

    // The enter-key is technically both printable and non-printable and can
    // thus be captured by `keypress`, no other non-printable key should.
    return charCode === 13 ? 'Enter' : String.fromCharCode(charCode);
  }
  if (nativeEvent.type === 'keydown' || nativeEvent.type === 'keyup') {
    // While user keyboard layout determines the actual meaning of each
    // `keyCode` value, almost all function keys have a universal value.
    return translateToKey[nativeEvent.keyCode] || 'Unidentified';
  }
  return '';
}
```

JavaScript – Why?

- Productivity
- The Scripting Language for the Web
- Fast
- Frontend/Backend
- It’s everywhere
- Expressive

JavaScript – Good Use Cases

- Visualizations
- Server/Web Development
- GUIs
- Mobile Development

C – Hello World

```c
#include <stdio.h>

int main()
{
    printf("Hello World!");
}
```

```c
#include <stdio.h>
int main() {
  int i;
  for (i = 1; i < 11; ++i)
  {
    printf("%d ", i);
  }
  return 0;
}
```

```c
#include <linux/completion.h>
#include "internal.h"

LIST_HEAD(crypto_alg_list);
EXPORT_SYMBOL_GPL(crypto_alg_list);
DECLARE_RWSEM(crypto_alg_sem);
EXPORT_SYMBOL_GPL(crypto_alg_sem);

BLOCKING_NOTIFIER_HEAD(crypto_chain);
EXPORT_SYMBOL_GPL(crypto_chain);

static struct crypto_alg *crypto_larval_wait(struct crypto_alg *alg);

struct crypto_alg *crypto_mod_get(struct crypto_alg *alg)
{
   return try_module_get(alg->cra_module) ? crypto_alg_get(alg) : NULL;
}
```

C – Why?

- Peformance (FAST!)
- Highly Portable
- System Programming
- Closer to the Hardware
- Direct access to memory

C – Good Use Cases

- Embedded
- Operating Systems
- Networking
- Anything where performance is a top priority

Java – Hello World

```
class HelloWorld  {

    public static void main(String args[])
    {
        System.out.println("Hello, World");
    }
}
```

```
class HelloWorld  {
    public static void main(String args[])
    {
        printHelloWorld(5);
    }
    public static void printHelloWorld(Integer count) {
        for (int i = 0; i < count; i++) {
            System.out.println(i);
        }
    }
}
```

```java
@Override
public Generator opts(ClientOptInput opts) {
    this.opts = opts;
    this.openAPI = opts.getOpenAPI();
    this.config = opts.getConfig();
    this.templatingEngine = this.config.getTemplatingEngine();

    String ignoreFileLocation = this.config.getIgnoreFilePathOverride();
    if (ignoreFileLocation != null) {
        final File ignoreFile = new File(ignoreFileLocation);
        if (ignoreFile.exists() && ignoreFile.canRead()) {
            this.ignoreProcessor = new CodegenIgnoreProcessor(ignoreFile);
        } else {
            LOGGER.warn("Ignore...file");
        }
    }

    if (this.ignoreProcessor == null) {
        this.ignoreProcessor = new CodegenIgnoreProcessor(this.config.getOutputDir());
    }

    return this;
}
```

Java – Why?

- Highly Portable
- Flexible
- Good community support
- Teaching/Education
- Android

Java – Good Use Cases

- Big Data
- Enterprise Applications
- Android
- Web/Server Programming

Data Transports

Data Interchange Formats

- JSON
- XML
- Protobuf

JSON

- Built to be human readable…
- Built on two primary structures…
- A collection of name/value pairs (an object, record, struct, dictionary, hash table)
- An ordered list of values (array, vector, list, or sequence)
- MOST general-purpose programming languages provide DEFAULT standard libraries and tools for interacting and using JSON within that programming language.

```
{
  "id": "",
  "emails": [
    "priel@cisco.com"
  ],
  "phoneNumbers": [
  ],
  "displayName": "Patrick Riel",
  "nickName": "Patrick",
  "firstName": "Patrick",
  "lastName": "Riel",
  "orgId": "",
  "created": "",
  "lastActivity": "",
  "status": "active",
  "type": "person"
}
```

XML

- Built to be human readable…]
- Extensible Markup Language that also functions as a *data interchange format.*
- MOST general-purpose programming langauges provide DEFAULT standard libraries and tools for interacting and using XML within that programming language.

```
<?xml version="1.0" encoding="UTF-8"?>
<serv:message
 xmlns:serv="http://www.webex.com/schemas/2002/06/service"
 xmlns:com="http://www.webex.com/schemas/2002/06/common"
 xmlns:ep="http://www.webex.com/schemas/2002/06/service/ep"
 xmlns:meet="http://www.webex.com/schemas/2002/06/service/meeting">
   <serv:header>
      <serv:response>
         <serv:result>SUCCESS</serv:result>
         <serv:gsbStatus>PRIMARY</serv:gsbStatus>
      </serv:response>
   </serv:header>
   <serv:body>
      <serv:bodyContent xsi:type="ep:getAPIVersionResponse"
       xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
         <ep:apiVersion>WebEx XML API V11.0.0</ep:apiVersion>
</serv:bodyContent>
   </serv:body>
</serv:message>
```

Protobuf

- Mechanism for serializing structured data – SIMILAR to XML
- Support generated code in Java, Python, Objective-C and C++
- Proto3 (latest version of the protocol) also supports Dart, Go, Ruby, and C#

```
syntax = "proto2";

package tutorial;

option java_package = "com.example.tutorial";
option java_outer_classname = "AddressBookProtos";

message Person {
  required string name = 1;
  required int32 id = 2;
  optional string email = 3;

  enum PhoneType {
    MOBILE = 0;
    HOME = 1;
    WORK = 2;
  }

  message PhoneNumber {
    required string number = 1;
    optional PhoneType type = 2 [default = HOME];
  }

  repeated PhoneNumber phones = 4;
}
```

https://developers.google.com/protocol-buffers/docs/javatutorial

Developer Tools

Developer Tools

- Developer tools are an integral part of Software Development
- Makes our lives as software developers EASIER

Developer Tools - IDEs

- Visual Studio Code https://code.visualstudio.com/
- Atom https://atom.io/
- Android Studio https://developer.android.com/studio
- Xcode https://developer.apple.com/xcode/
- Eclipse https://www.eclipse.org/ide/

Developer Tools – The Terminal

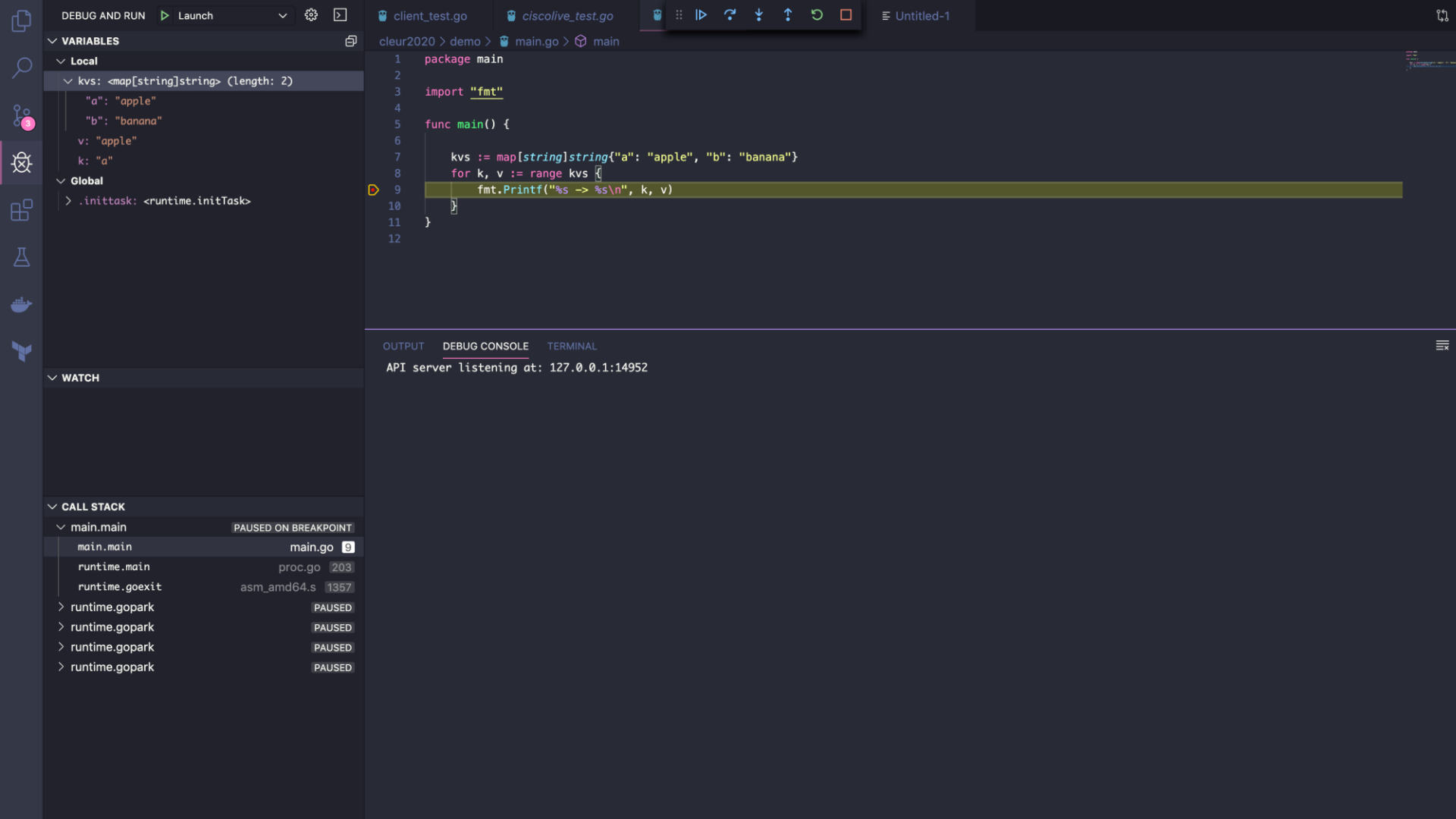
- iTerm 2
- terminal
- cmd
- Powershell


images
dmz.txt
old
cleur2020
googleglass-demo.mov
cleur2020.pptx
terminal
TOP HITS
Terminal
terminal-notifier — ibm-openhorizon
APPLICATIONS
terminal-notifier — meraki
DEFINITION
terminal
OTHER
terminal
terminal_windows.go
terminal_test.go
terminal_other.go
terminal.go
DEVELOPER
terminal.py
terminal_server.py
Terminal
Version: 2.9.5
Kind Application
Size 10.1 MB
Created 10/4/18
Modified 8/22/19
Last opened 11/22/19


Terminal Shell Edit View Window Help
Thu 9:45 AM
localadmin — localadmin@PRIEL-M-84RQ — ~ — -zsh — 80×24
Last login: Tue Jan 28 20:44:18 on ttys001
l='ls -lah'
➜ ~ pwd
/Users/localadmin
➜ ~ date
Thu Jan 30 09:45:27 CET 2020
➜ ~
old
cleur2020
googleglass-demo.mov
cleur2020.pptx
Presentation
Terminal
67

Developer Tools - Debuggers

- Great tool to understand the flow of programs
- Help find bugs in your code
- Extremely useful
- Most languages come with debuggers


DEBUG AND RUN
Launch
VARIABLES
Local
kvs: <map[string]string> (length: 2)
"a": "apple"
"b": "banana"
v: "apple"
k: "a"
Global
.inittask: <runtime.initTask>
WATCH
CALL STACK
main.main PAUSED ON BREAKPOINT
main.main main.go 9
runtime.main proc.go 203
runtime.goexit asm_amd64.s 1357
runtime.gopark PAUSED
runtime.gopark PAUSED
runtime.gopark PAUSED
runtime.gopark PAUSED
client_test.go
ciscolive_test.go
Untitled-1
cleur2020 > demo > main.go > main
1 package main
2
3 import "fmt"
4
5 func main() {
6
7 kvs := map[string]string{"a": "apple", "b": "banana"}
8 for k, v := range kvs {
9 fmt.Printf("%s -> %s\n", k, v)
10 }
11 }
12
OUTPUT
DEBUG CONSOLE
TERMINAL
API server listening at: 127.0.0.1:14952

Developer Tools - Containers

- Lighter than VMs
- Docker - https://www.docker.com/
- Additional Learning https://developer.cisco.com/learning/lab/containers-101/step/1

```
➜  cleur2020 docker ps
CONTAINER ID        IMAGE                     COMMAND                  CREATED             STATUS              PORTS                                                                                NAMES
f90d23d7d392        chrono_config             "/entrypoint.sh chro…"   7 days ago          Up 7 days           0.0.0.0:8888->8888/tcp                                                               icube-release_chronograf_1
9ba9720d4f56        telegraf                  "/entrypoint.sh --de…"   7 days ago          Up 7 days           8092/udp, 8125/udp, 8094/tcp, 0.0.0.0:9273->9273/tcp                                 icube-release_telegraf_1
43b3fb6a4815        kapacitor                 "/entrypoint.sh kapa…"   7 days ago          Up 7 days           0.0.0.0:9092->9092/tcp                                                               icube-release_kapacitor_1
fe2e9873a10e        icube-release_icube       "/scripts/wait-for.s…"   7 days ago          Up 7 days           0.0.0.0:8100-8101->8100-8101/tcp, 0.0.0.0:8103->8103/tcp                             icube-release_icube_1
21cfb4811c2d        cassandra:3.10            "/docker-entrypoint.…"   7 days ago          Up 7 days           7000-7001/tcp, 0.0.0.0:9042->9042/tcp, 7199/tcp, 0.0.0.0:9160->9160/tcp              icube-release_cassandra_1
514547ee48f1        influxdb                  "/entrypoint.sh infl…"   7 days ago          Up 7 days           0.0.0.0:8082->8082/tcp, 0.0.0.0:8086->8086/tcp, 0.0.0.0:8089->8089/udp               icube-release_influxdb_1
eb3085d479b2        icube-release_scripts     "tail -f /scripts/wa…"   7 days ago          Up 7 days                                                                                        icube-release_scripts_1
2732ad6a68ea        nrf-journey_backend       "docker-entrypoint.s…"   2 weeks ago         Up 2 weeks          4001/tcp, 0.0.0.0:4001->80/tcp                                                       nrf-journey_backend_1
86f2844bc6cf        nrf-journey_mongodb       "docker-entrypoint.s…"   2 weeks ago         Up 2 weeks          27017/tcp                                                                            nrf-journey_mongodb_1
fb445e2a7b61        redis                     "docker-entrypoint.s…"   3 weeks ago         Up 12 days          0.0.0.0:6379->6379/tcp                                                               webexglass_redis_1
➜  cleur2020
```

Developer Tools - curl

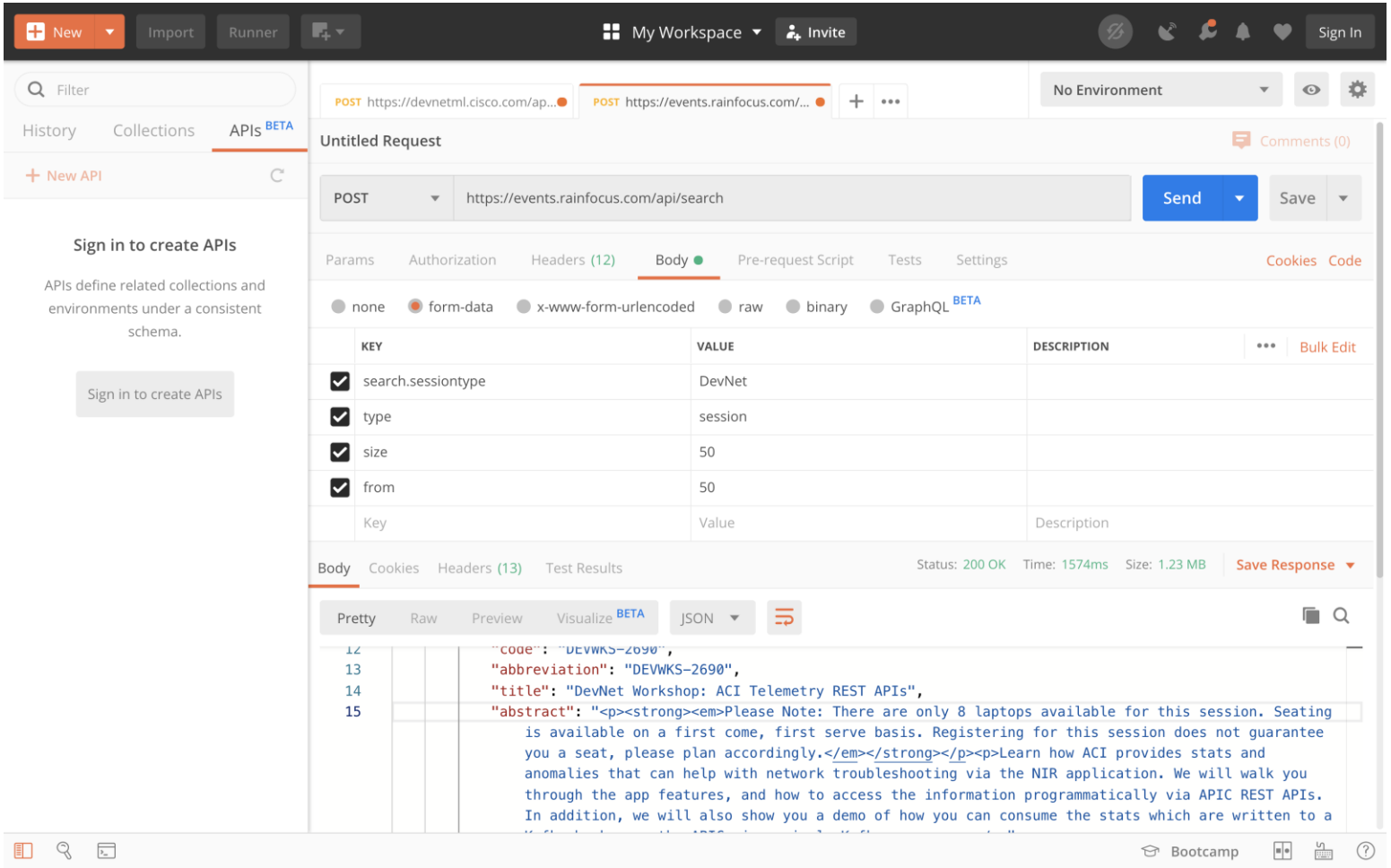
- Command Line Tool for transferring DATA https://curl.haxx.se/
- It supports a LONG list of protocols

DICT, FILE, FTP, FTPS, Gopher, HTTP, HTTPS, IMAP, IMAPS, LDAP, LDAPS, POP3, POP3S, RTMP, RTSP, SCP, SFTP, SMB, SMBS, SMTP, SMTPS, Telnet and TFTP. curl supports SSL certificates, HTTP POST, HTTP PUT, FTP uploading, HTTP form based upload, proxies, HTTP/2, cookies, user+password authentication (Basic, Plain, Digest, CRAM-MD5, NTLM, Negotiate and Kerberos), file transfer resume, proxy tunneling and more.

```
curl   --location \
       --request POST 'https://devnetml.cisco.com/api/v1/jobs/listing' \
       --header 'Content-Type: application/json' \
       --header $DEVNET_ML_AUTH_HEADER \
       --data-raw '{
            "data": "software engineer"
       }'
```

Developer Tools - Postman

- A collaboration platform for API development. https://www.getpostman.com/
- But primarily an API Client, which allows you to quickly and easily send REST, SOAP, and GraphQL directly within Postman



Developer Tools - Packer

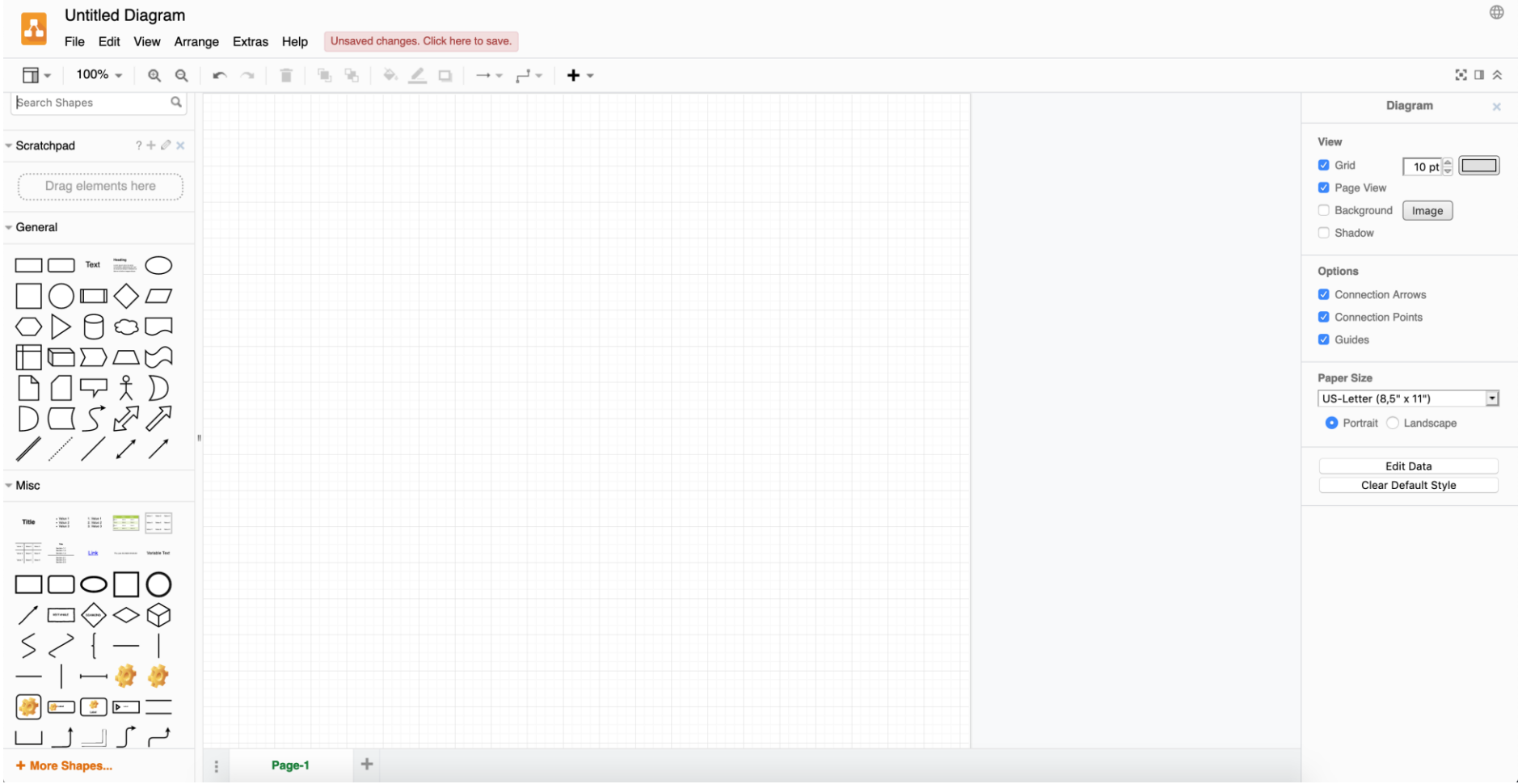
- Tool for creating identical machine images for multiple platforms from a single source configuration.
- Not a configuration management tool (Like Ansible, Chef, Puppet)
- Able to create machine images for a variety of formats
  - AMIs, VMDK/VMX , OVF etc.
- https://www.packer.io/

Developer Tools - Ansible

- App deployment, Configuration management, Workflow orchestration tool
- https://www.ansible.com/
- Additional Learning - https://developer.cisco.com/learning/lab/ansible-03_ansible-hands-on/step/1

Developer Tools – Draw.io

- Open source Diagramming Tool. https://www.draw.io/
- Great for Mockups and Diagrams



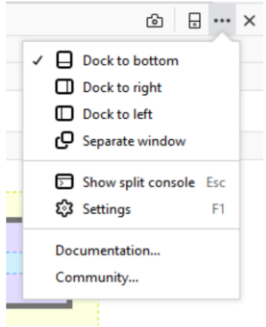
Developer Tools – Browsers!

- Browsers have built in developer tools
- Great for building and debugging Web Applications
- https://developer.mozilla.org/en-US/docs/Tools

The Core Tools

You can open the Firefox Developer Tools from the menu by selecting *Tools* > *Web Developer* > *Toggle Tools* or use the keyboard shortcut `Ctrl` + `Shift` + `I` or `F12` on Windows and Linux, or `Cmd` + `Opt` + `I` on macOS.

The ellipsis menu on the right-hand side of Developer Tools contains several commands that let you perform actions or change tool settings.



This button only appears when there are multiple iframes on a page. Click it to display a list of the iframes on

Inspector | Console | Debugger | Network | Style Editor | Performance | Memory | Storage | Accessibility | What's New | Components | Profiler

Search HTML

```
<!DOCTYPE html>
<html class="" dir="ltr" lang="en"> event scroll
 <head prefix="og: http://ogp.me/ns#">…</head>
 <body> event
  <script>…</script>
  <div id="react-container" data-component-name="SPA">…</div>
  <script>…</script>
  <!--site js-->
  <script defer="" type="text/javascript" src="/static/build/js/react-main.20ac4d089bb0.js" charset="utf-8"></script>
  <script defer="" type="text/javascript" src="/static/build/js/react-bcd-signal.089b16e429d6.js" charset="utf-8"></script>
 </body>
</html>
```

Filter Styles :hov .cls

```
element { inline
}
body { react-mdn.95bdccfb6682.css:1
  line-height: 1.6;
  font-family: Arial,x-locale-body,sans-serif;
  letter-spacing: -.00278rem;
  font-size: 18px;
  font-size: 1rem;
  -webkit-font-smoothing: antialiased;
  -moz-osx-font-smoothing: grayscale;
}
a, abbr, address, article, aside, audio, b, blockquote, body, canvas, caption, react-mdn.95bdccfb6682.css:1
cite, code, dd, del, details, dfn, div, dl, dt, em, fieldset, figcaption,
figure, footer, form, h1, h2, h3, h4, h5, h6, header, hgroup, hr, html, i, iframe, img, ins, kbd, label,
legend, li, mark, menu, nav, object, ol, p, pre, q, samp, section, small, span, strong, sub, summary, sup,
table, tbody, td, tfoot, th, thead, time, tr, ul, var, video {
  margin: 0;
  padding: 0;
```

Conclusion

- There are many languages out there, learn multiple
- Languages are not inherently bad
- https://developer.cisco.com/startnow/
- https://developer.cisco.com/learning/devnet-express/dnav3-track/dev-setup/dev-what/step/1

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How

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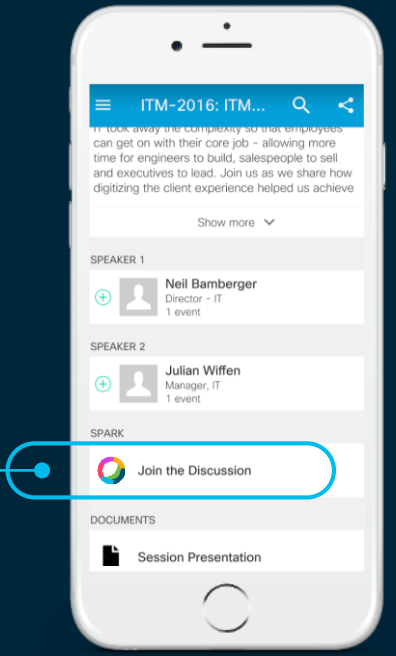
4. Enter messages/questions in the team space



cs.co/ciscolivebot#

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Thank you

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