Welcome!

WWCode San Francisco - Backend Study Group

Feb 9th 2022

- We'll start in a moment :)
- We are **RECORDING** tonight's event
- We may plan to take screenshots for social media
- If you are comfortable, turn the video ON. If you want to be anonymous, then turn the video off
- We'll introduce the hosts & make some time for Q&A at the end of the presentation
- Feel free to take notes
- Online event best practices:
    - Don't multitask. Distractions reduce your ability to remember concepts
    - Mute yourself when you aren't talking
    - We want the session to be interactive
    - Use the 'Raise Hand' feature to ask questions
- **By attending our events, you agree to comply with our Code of Conduct**

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http://localhost:4025

Introduction & Agenda

• Welcome from WWCode!
• Our mission: Empower diverse women to excel in technology careers
• Our vision: A tech industry where diverse women and historically excluded people thrive at any level
• About our Backend Study Group

Harini Rajendran
Host
Senior Software Engineer, Confluent
Lead, WWCode SF

Ashwini Vasanth
Instructor
Architecture & API Platform, Devrev

Roles in Software Engineering:

- Why learn about the different roles?
- What are the roles?
  - Infrastructure Engineering
  - Frontend Engineer
  - Systems Software Engineer
  - Firmware Engineer
  - Full Stack Engineer
  - QA/Automation engineer
  - DevOps Engineer
  - Security Engineer
- How do I start exploring the roles?
- Q & A

Disclaimer:
• Sessions can be heavy!
• Lots of acronyms
• Instructors don't know everything

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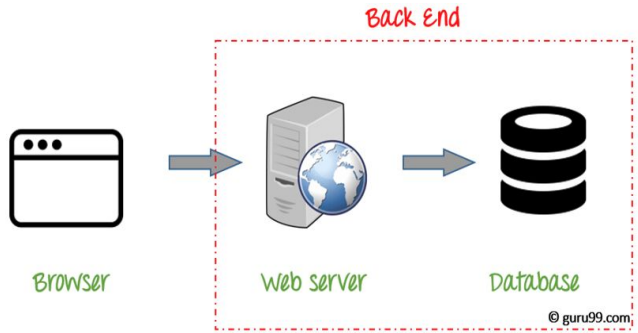
Backend Engineering

- Design, build and maintain server-side web applications

- Common terms: Client-server architecture, networking, APIs, web frameworks, platform, micro-service, databases, web fundamentals, operating systems, etc.



- Tech Stack: Java, PHP, .NET, C#, Ruby, Python, REST, AWS, Node, SQL, NoSQL, etc.

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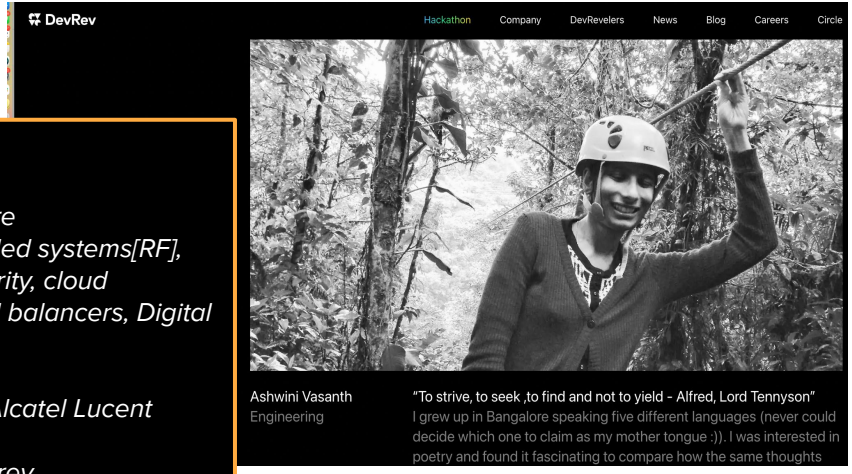
About Me

My left brain: Engineering

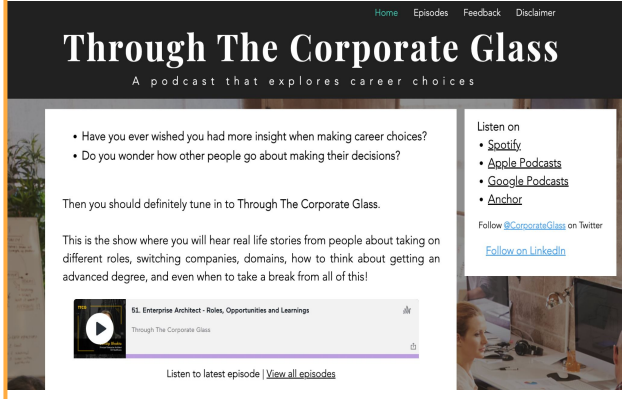
- *Product Ideation and Architecture*
- *Software Development: Embedded systems[RF], on-prem infrastructure and security, cloud networking, API Gateways, Load balancers, Digital Video Recorders*
- *19 years experience across ..*
  - *Big companies: Nokia, Alcatel Lucent*
  - *Mid-size: Nutanix*
  - *Early stage startup: Devrev*

My left & right brain :)

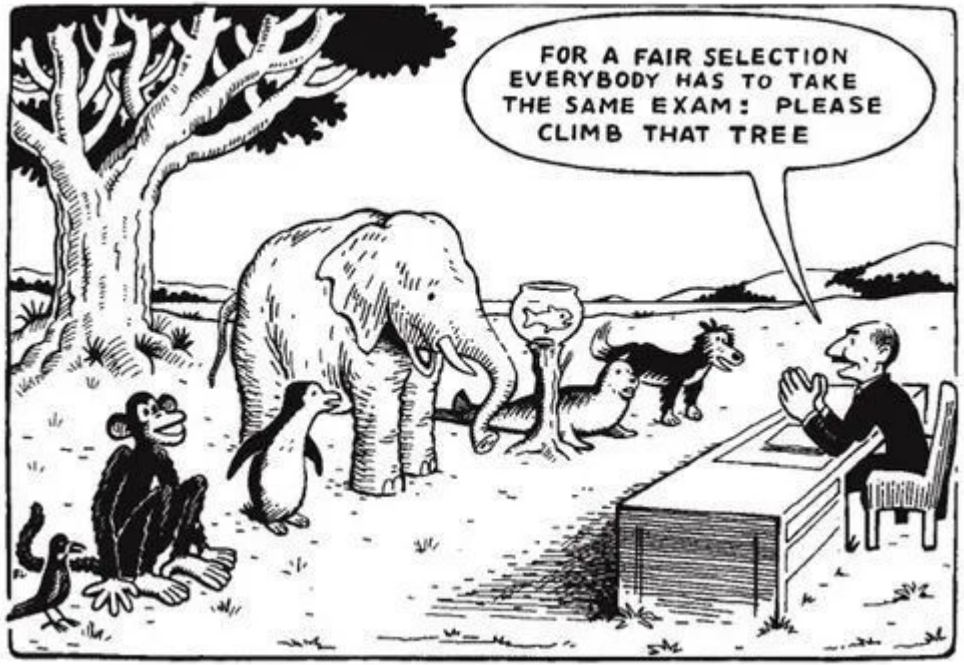


My right brain: Poetry

Our podcast on career choices



Why learn about the roles?



Credit: https://artplusmarketing.com/equality-equity-freedom-55a1d675b5d8

Each role has different challenges & requires different skills.

Choose a role based on your interests.

The different roles map to different layers of the product stack

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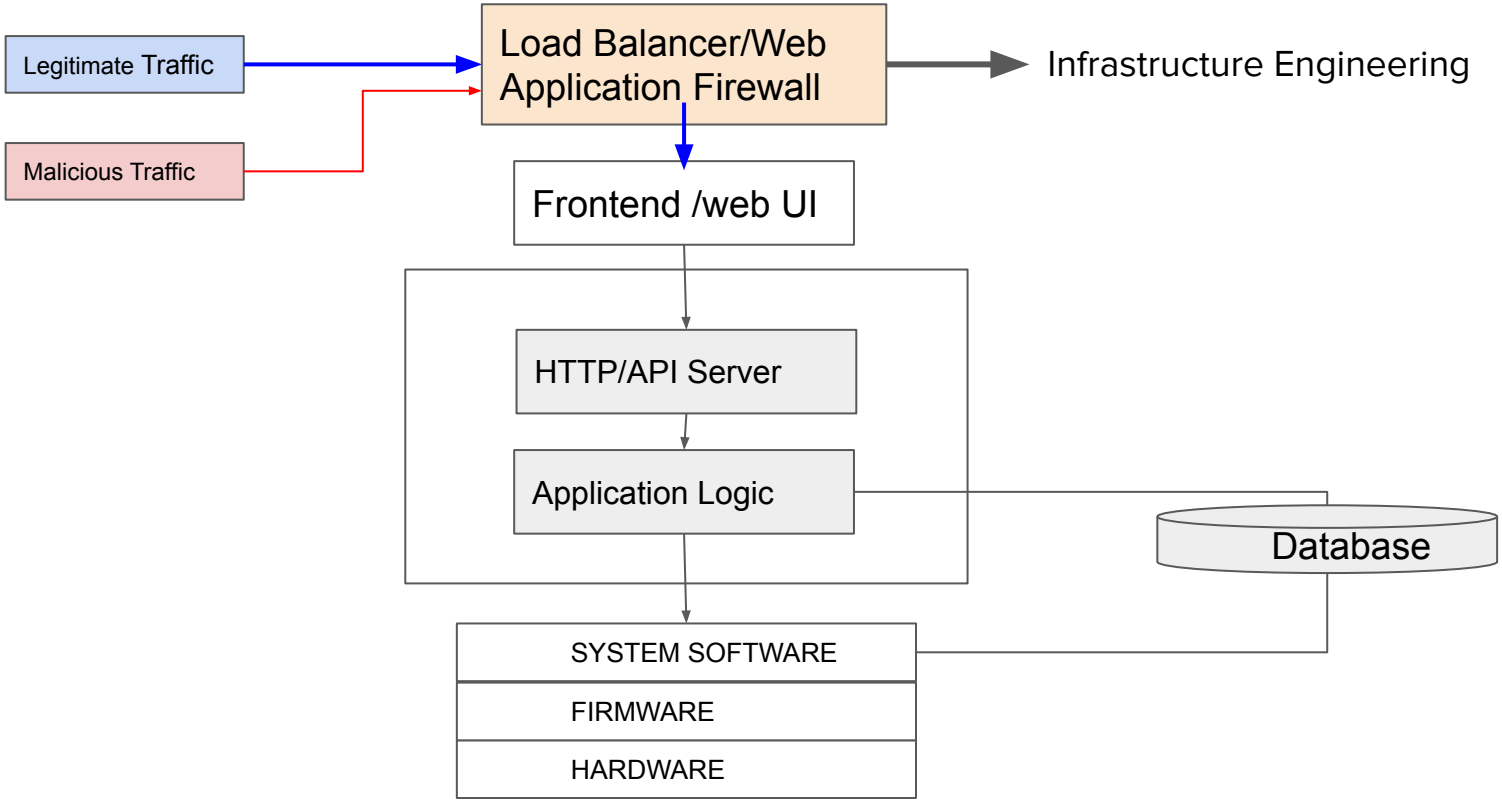
Roles based on Architecture



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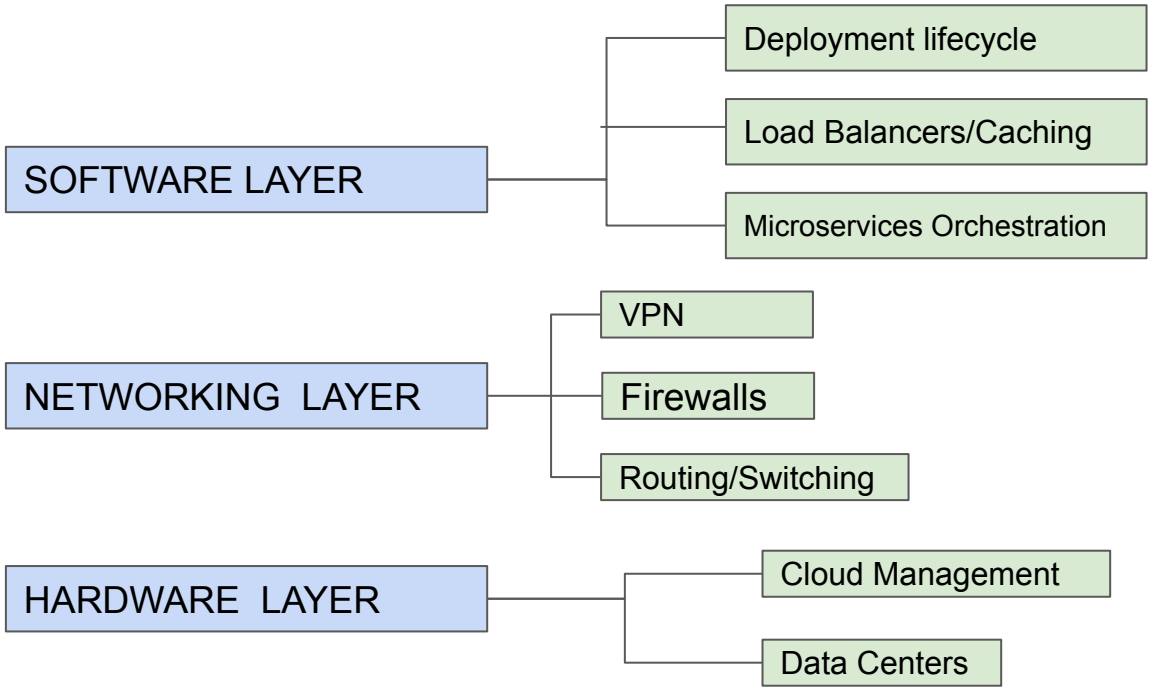
Infrastructure Engineering

An **infrastructure engineer** is a person who designs, builds, coordinates, and maintains the IT environment companies need to run internal operations, collect data, develop and launch digital products,



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INFRASTRUCTURE EXPERT CAREER PATHS

	Role name	Proven skills	Education and previous jobs
Mehran Safizadeh 	Infrastructure Engineer	✓ Linux and Windows ✓ Virtualization ✓ Network administration, security, and troubleshooting ✓ Python, PowerShell, Bash ✓ Data backup solutions ✓ AWS, Microsoft Azure services	✓ BS in Computer Engineering ✓ MS in Cybersecurity ✓ AWS Certified Cloud Practitioner 1. System/ server admin at University of Evansville (4 years)
Kevin Schmidt Google	Cloud Infrastructure Engineer	✓ Software development ✓ Web design ✓ DevOps ✓ Docker ✓ Linux ✓ JavaScript, PHP, PowerShell ✓ API management ✓ AWS, Microsoft Azure services	✓ MS in Information Systems ✓ Professional Cloud Architect (Google Cloud) 1. Web developer at Image Matters (10 months) 2. Cloud platform engineer at ExxonMobil (2+ years)
Matthew Clark Spotify	Senior Backend Infrastructure Engineer	✓ Agile and DevOps methodologies ✓ Software engineering ✓ Python, Java, C#, Scala, Go ✓ Docker, Kubernetes ✓ AWS services	✓ BEng in Computer Science 1. Associate software engineer at CyberSource (2+ years) 2. Developer at Financial Times (3+ years) 3. Senior Engineer at Spotify (3 months)
Libin Roy 	Cloud Infrastructure Architect	✓ Windows, Linux ✓ System engineering ✓ Databases, SQL ✓ Java, PHP, C, C++, JavaScript ✓ AWS services ✓ Oracle VM ✓ Ansible, CloudFormation ✓ Docker	✓ MS in Information Technology ✓ AWS Certified SecurityDevOps Engineer 1. System administrator at NueMd (3+ years) 2. Senior site reliability engineer at AdvancedMD (1+ years)

Source of information – LinkedIn

altexsoft

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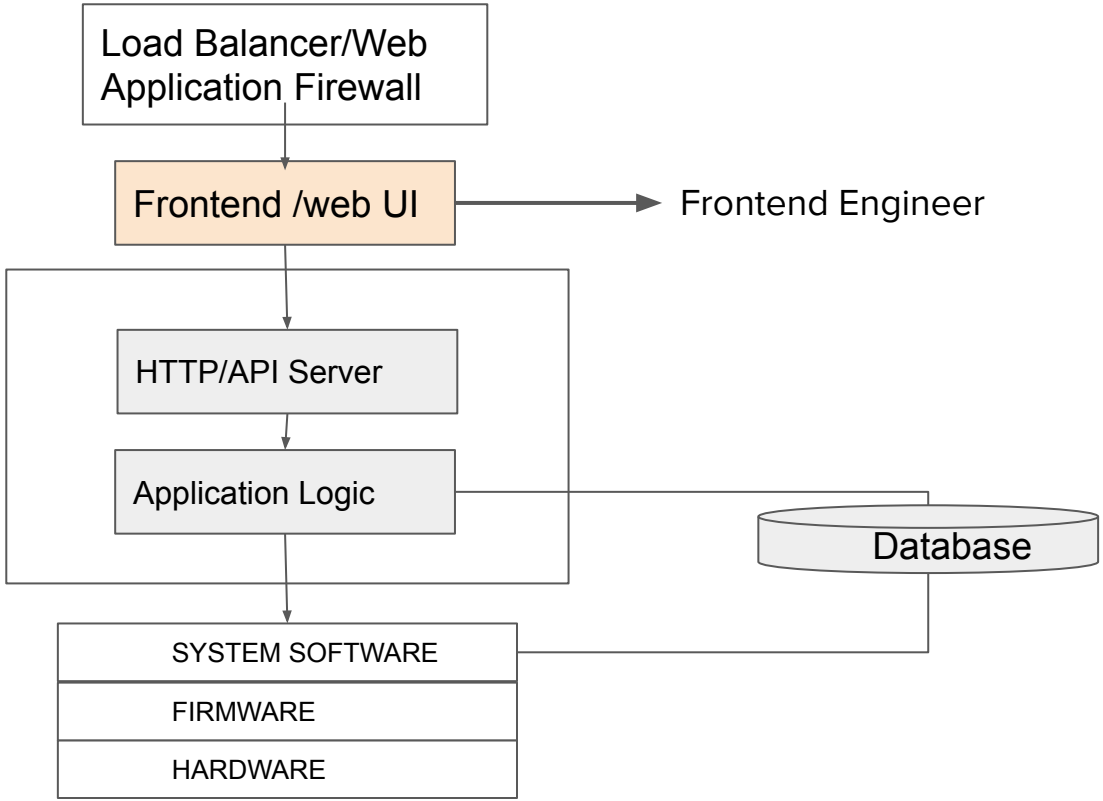
Roles based on Architecture



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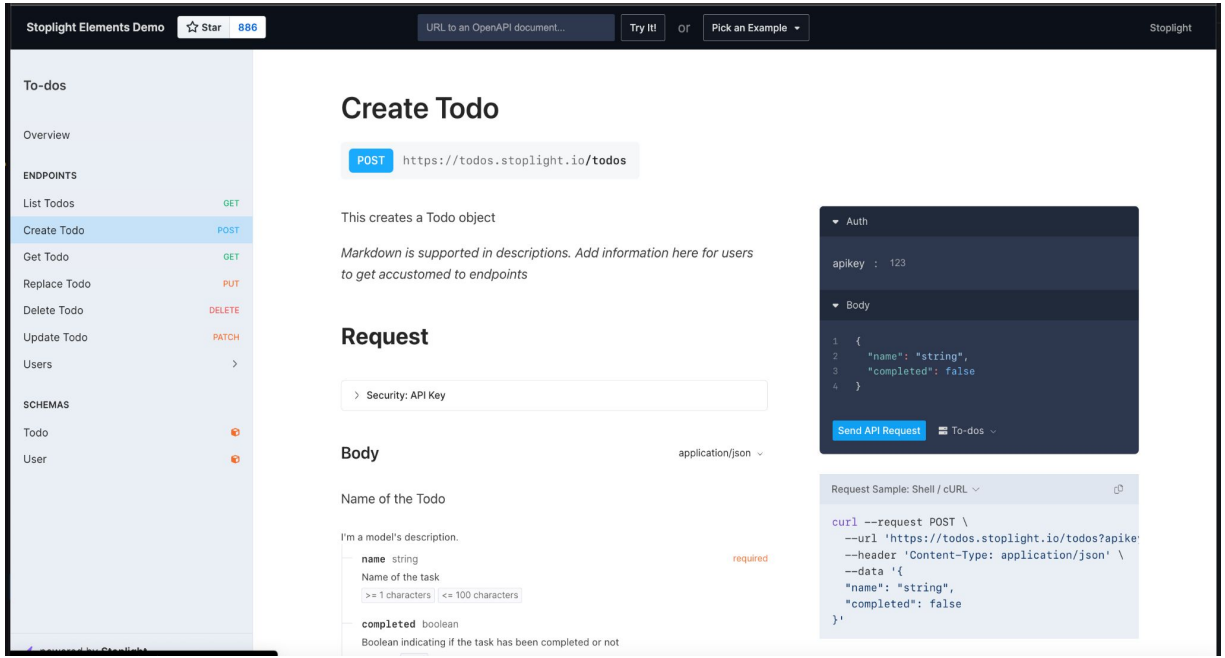
Frontend Engineer

Frontend Engineer builds websites, designs applications and ensures overall user accessibility



Open source Code which generates this: https://github.com/stoplightio/elements

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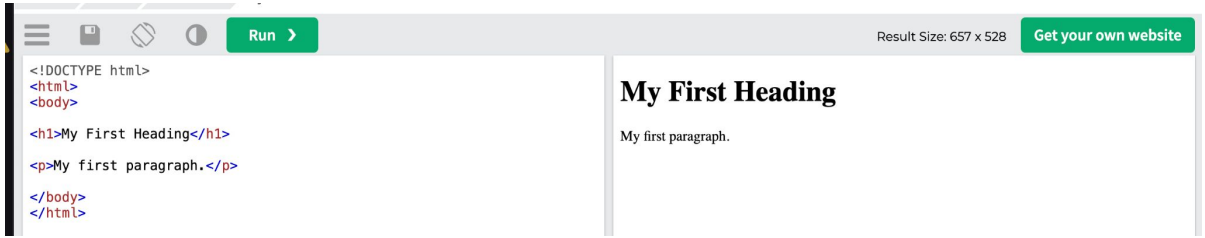
Frontend Engineer

HyperText Markup Language [HTML] - A language used to build websites



Try HTML

Cascading Style Sheets [CSS] is used to format the layout of a webpage. It is used to control the color, font, the size of text, the spacing between elements,what background images or background colors are to be used, different displays for different devices and screen sizes, and much more

Try CSS

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Frontend Engineer

What does a frontend engineer do?

- Designing, installing and testing a website's user interface elements
- Focusing on a website's functionality and the look of a website
- Monitoring websites to ensure they continue to run properly and make modifications as needed
- Ensuring that web design is smartphone capable

Interview Corner

- Knowledge of how websites and applications are structured and should perform
- Understanding of HTML and CSS
- Coding in Javascript, Python, React

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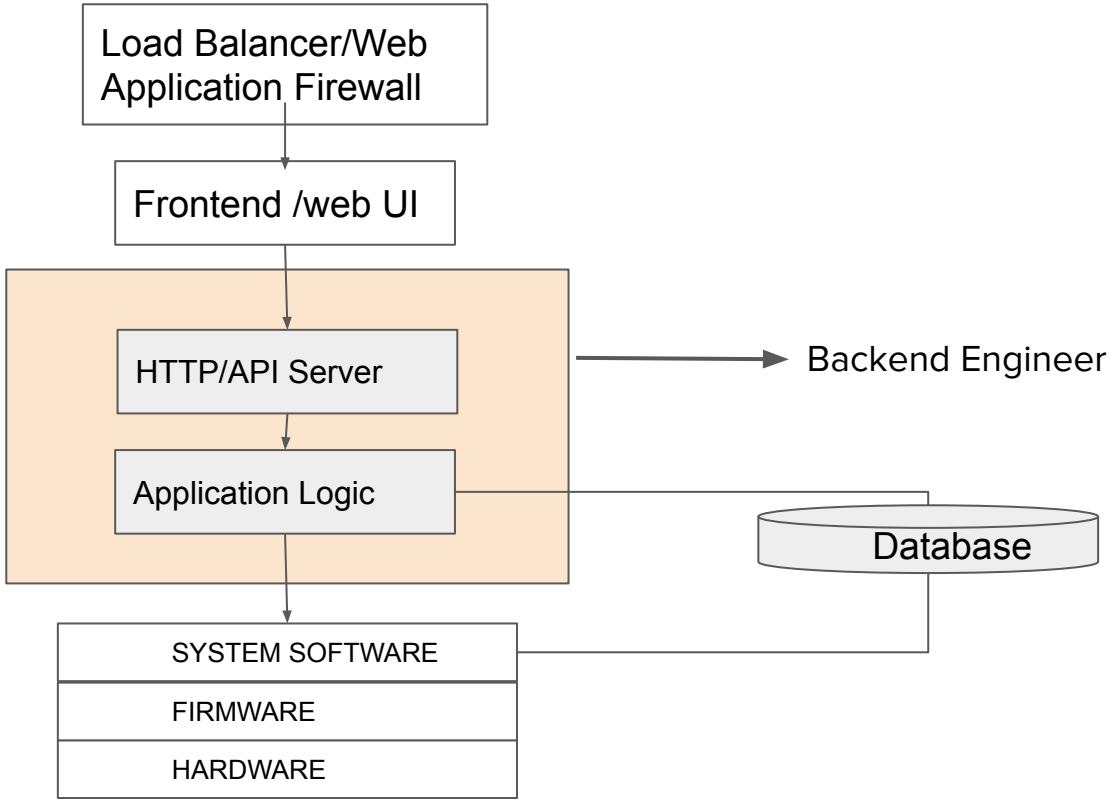
Roles based on Architecture



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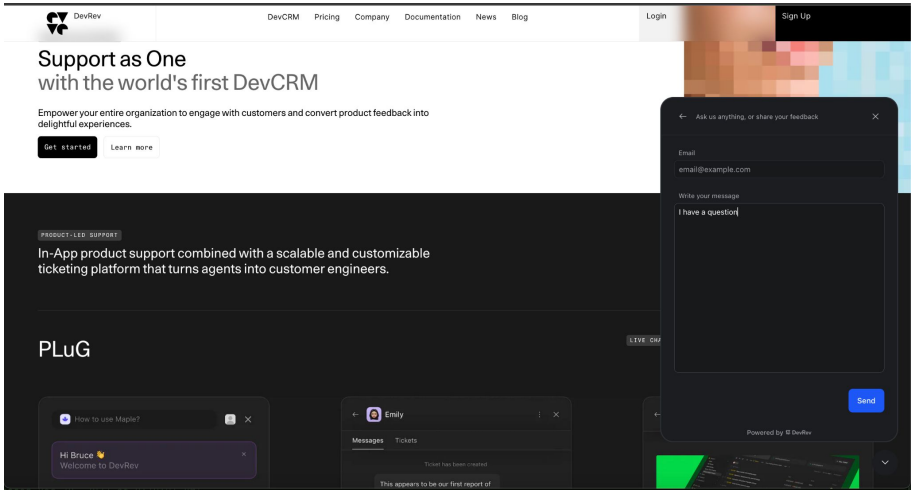
Backend Engineer

Backend Engineers build servers to expose applications via interfaces calls APIs. They also build the application logic to satisfy the features exposed on a website.

Server Example

```
func (s HttpServer) start() error {
	log.Println("API Docs Server started")
	fileServer := http.FileServer(http.Dir("./static"))
	http.Handle("/", fileServer)
	http.ListenAndServe(s.port, nil)
	return nil
}
func main() {

	port := flag.String("port", "8090", "Port to listen to")
	flag.Parse()

	listeningPort := ":" + *port
	log.Println("Starting up Test Server")
	log.Println(listeningPort)

	httpServer := NewHttpServer(listeningPort)

	if err := httpServer.start(); err != nil {
		log.Fatal("could not open httpServer", err)
	}
}
```

Chat Application example



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Backend Engineer

What does a frontend engineer do?

- Build robust and scalable software
- Design and create services and applications for your projects, and contribute and provide feedback to other team members.
- Unit Testing and Functional Testing
- Work with the product and design teams to understand end-user requirements, formulate use cases, and then translate that into a pragmatic and effective technical solution.

Interview Corner

- Knowledge of HTTP and server development
- Understanding of databases
- Understanding of operating systems concepts
- Coding: Java, PHP, .NET, C#, Ruby, Python, REST, AWS, Node

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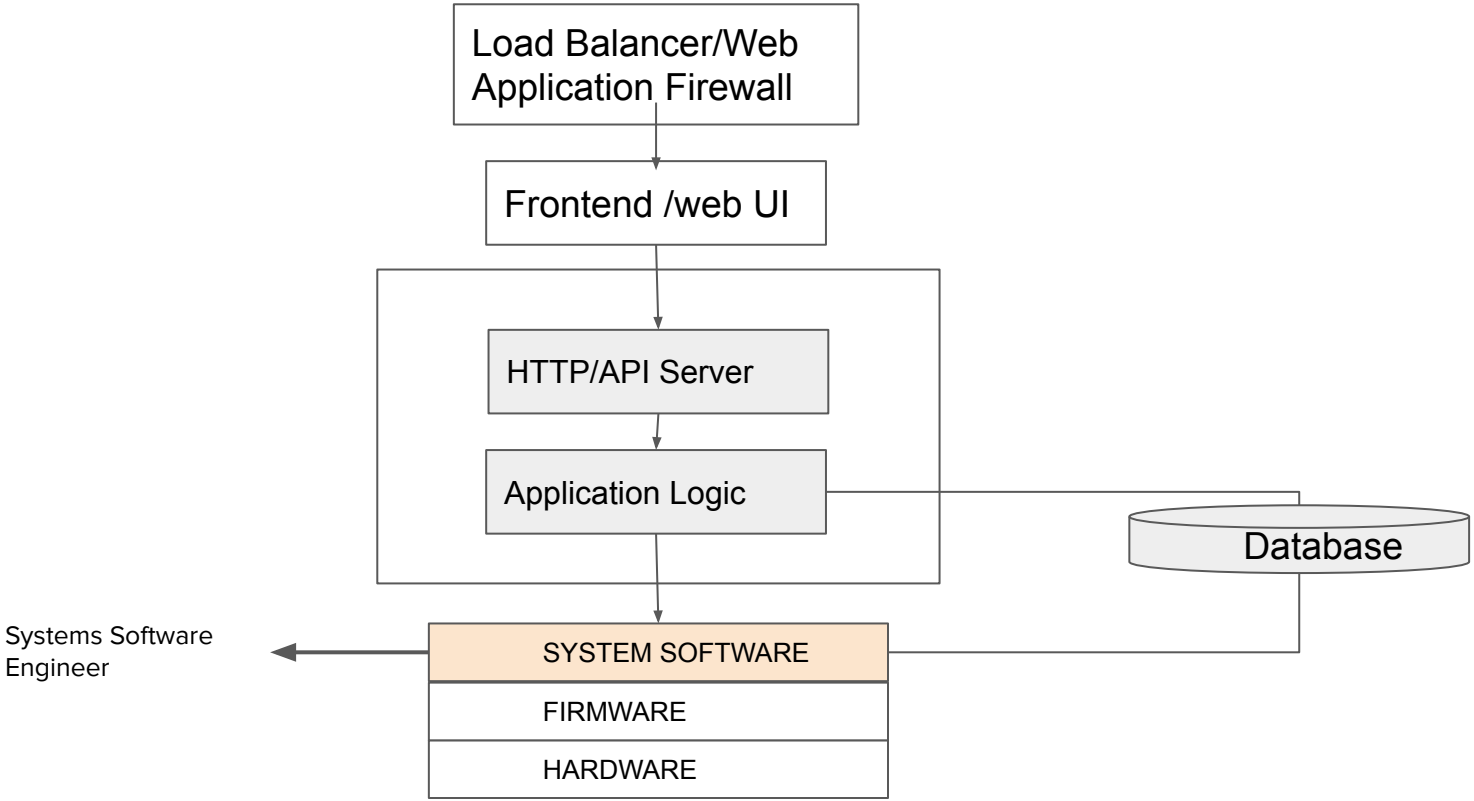
Roles based on Architecture



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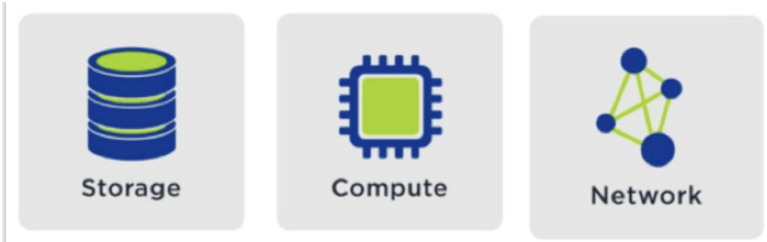
Systems Engineer



Credit: https://www.techzine.eu/blogs/infrastructure/47436/what-is-nutanix-and-how-it-conquers-the-hybrid-and-multi-cloud-world/

- File Systems
- Caching
- Read/Write Performance

- Optimize performance
- Process Scheduling

- Connectivity
- Bandwidth optimization

Interview Corner

- *Understanding of computer architecture*
- ***Operating systems:*** *Memory management, virtualization*
- ***Network Protocols***
- ***Coding:*** *C++/Java*

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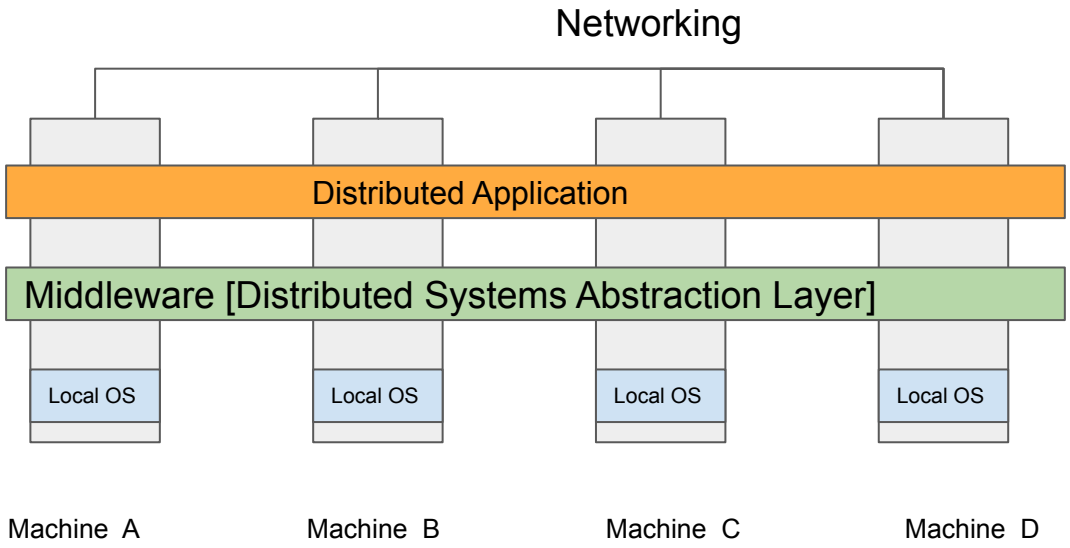
Distributed Systems Engineer



Interview Corner

- ***Consistent Hashing*** - Which machine/server must handle the user request to ensure load balancing/performance.
- ***Consensus Protocols*** - ensures that a distributed system makes the correct decision even if one or more processes have failed
- ***Read/Write Consistencies*** : Trade off between consistency & availability
- ***Network Protocols***
- ***Coding:*** *C++/Java*

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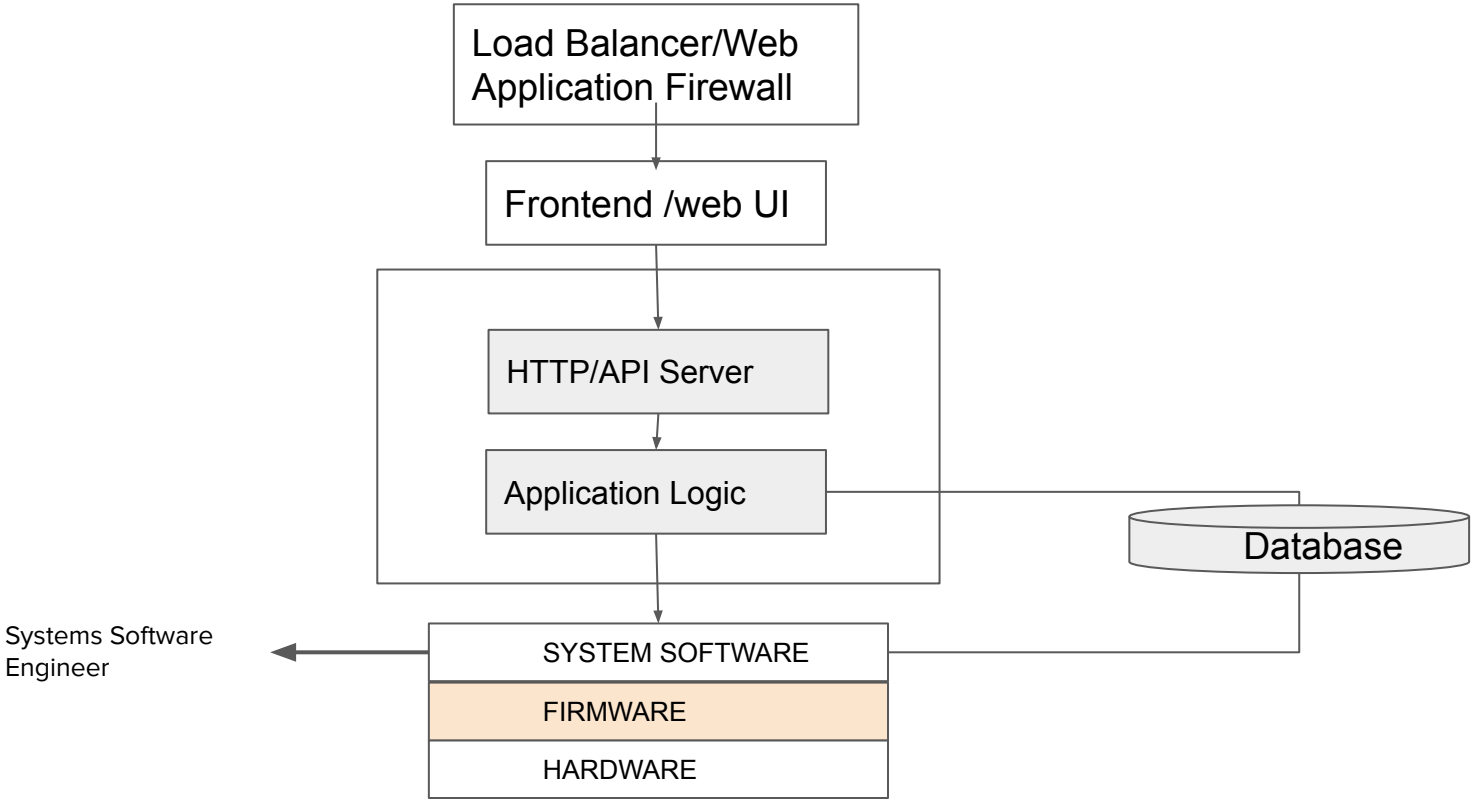
Roles based on Architecture



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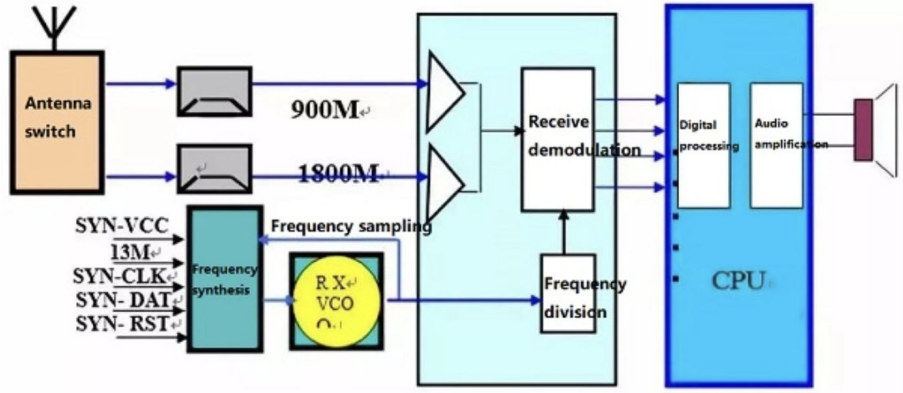
Firmware Engineer

Cellular Modem, RF Device Drivers



https://www.utmel.com/blog/categories/rf/everything-you-need-to-know-about-rf-chip

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Firmware Engineer

Firmware Engineers write the algorithms, or rules, that tell a device how to behave.

What does a firmware engineer do?

- Device Driver design & development
- Board bringup and upgrades

Examples:

- Cellular Modem software for phones to implement the 5G protocol.
- Internet of Things: Firmware to control the functioning of a thermostat.

Copyright: https://www.fastcompany.com/3063656/the-real-reasons-the-iphone-7-ended-up-with-an-intel-chip-inside

Interview Corner

- Understanding of both hardware and software
- Programming in C/C++
- Good grasp of computer architecture
- Real Time Operating Systems

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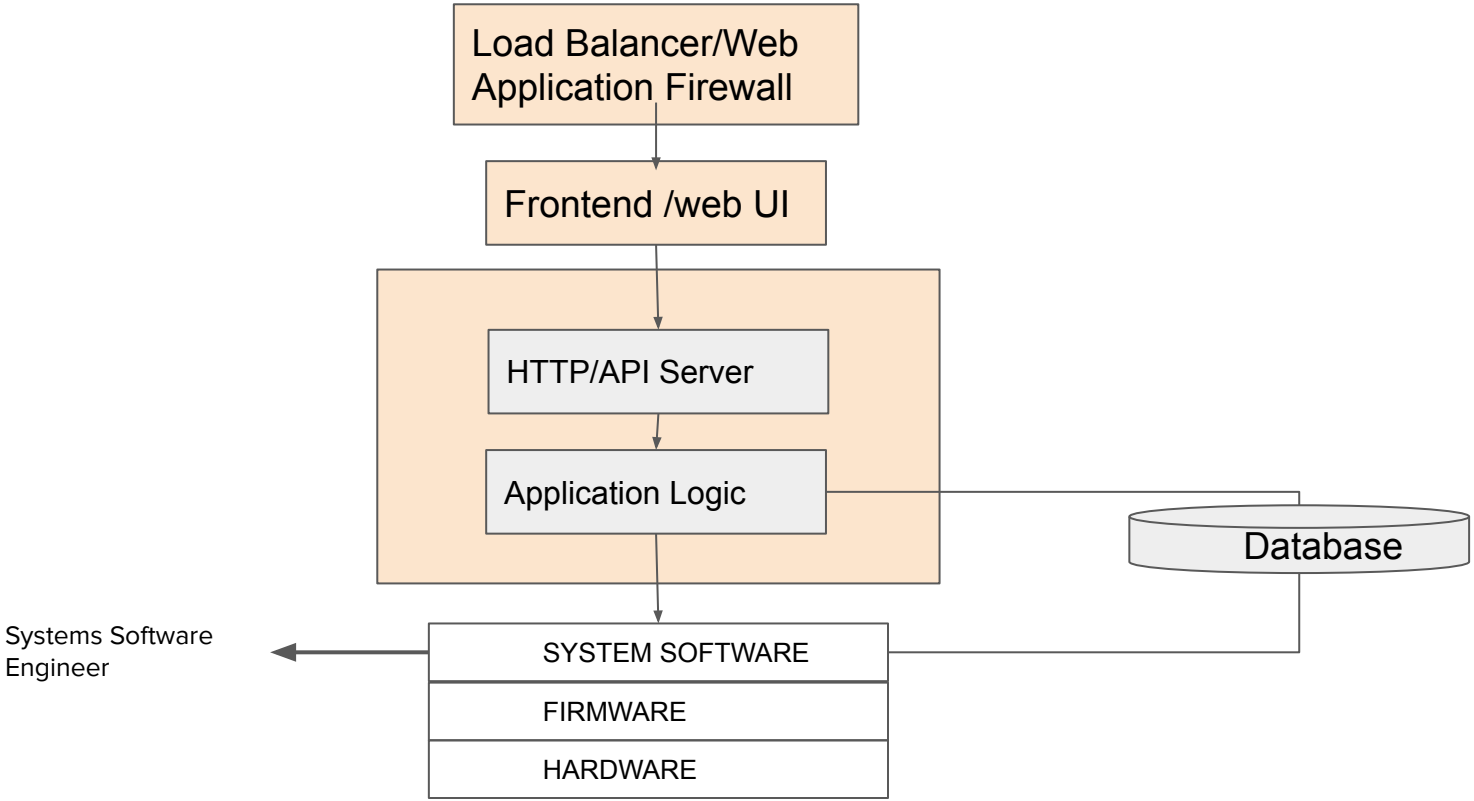
Roles based on Architecture



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Full stack Engineer

Full-stack engineers are senior-level computer programmers with proficiency in front and back-end systems coding and project management experience with systems administration skills.

What do they do?

They design user interactions on websites and develop servers and databases for website functionality and write code for mobile platforms. Full-stack engineers create servers and databases for functionality and ensure cross-platform optimization for mobile phones. They ensure applications are responsive and strive to meet both technical and consumer needs.

Interview Corner

- Understanding of large-scale software applications
- Experience in building web applications
- Experience in designing and integrating APIs
- **Coding**: Ruby, Java/JRuby, React, and JavaScript
- Experience in unit/integration testing

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Roles applicable to all layers of the stack

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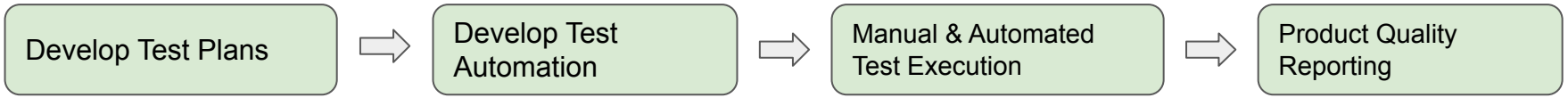
QA Engineer



- LOAD TESTING
- FUNCTIONAL TESTING
- SMOKE TESTING
- PERFORMANCE TESTING
- SECURITY TESTING
- API TESTING
- END TO END TESTING

Interview Corner

- Understanding of different types of test methodologies.
- Coding/Scripting in python, javascript
- Understanding if Test Frameworks and ability to develop test suites

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Sample Code Snippet for Testing using Locust

```
from locust import HttpUser, task, between

class QuickstartUser(HttpUser):
    wait_time = between(1, 2)

    def on_start(self):
        self.client.post("/login", json={"username":"foo", "password":"bar"})

    @task
    def hello_world(self):
        self.client.get("/hello")
        self.client.get("/world")

    @task(3)
    def view_item(self):
        for item_id in range(10):
            self.client.get(f"/item?id={item_id}", name="/item")
```

Sample Test Framework to checkout

https://github.com/locustio/locust

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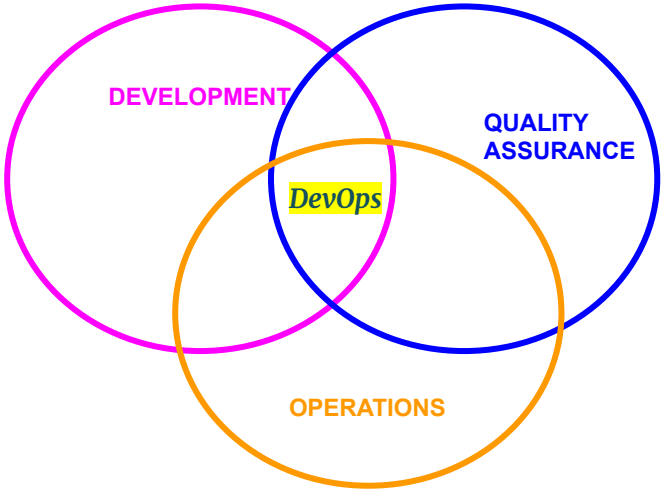
DevOps Engineer



What does a DevOPs Engineer do?

- Software Automation
- CI/CD Pipeline
- Deployment Management
- Application Scaling
- Data Management
- Network Automation
- On Call/Incident response management
- Monitoring

Interview Corner

- Understanding of deployment pipelines
- Exposure and understanding of cloud technologies [AWS/GCP] and kubernetes
- Ability to write Infrastructure as code

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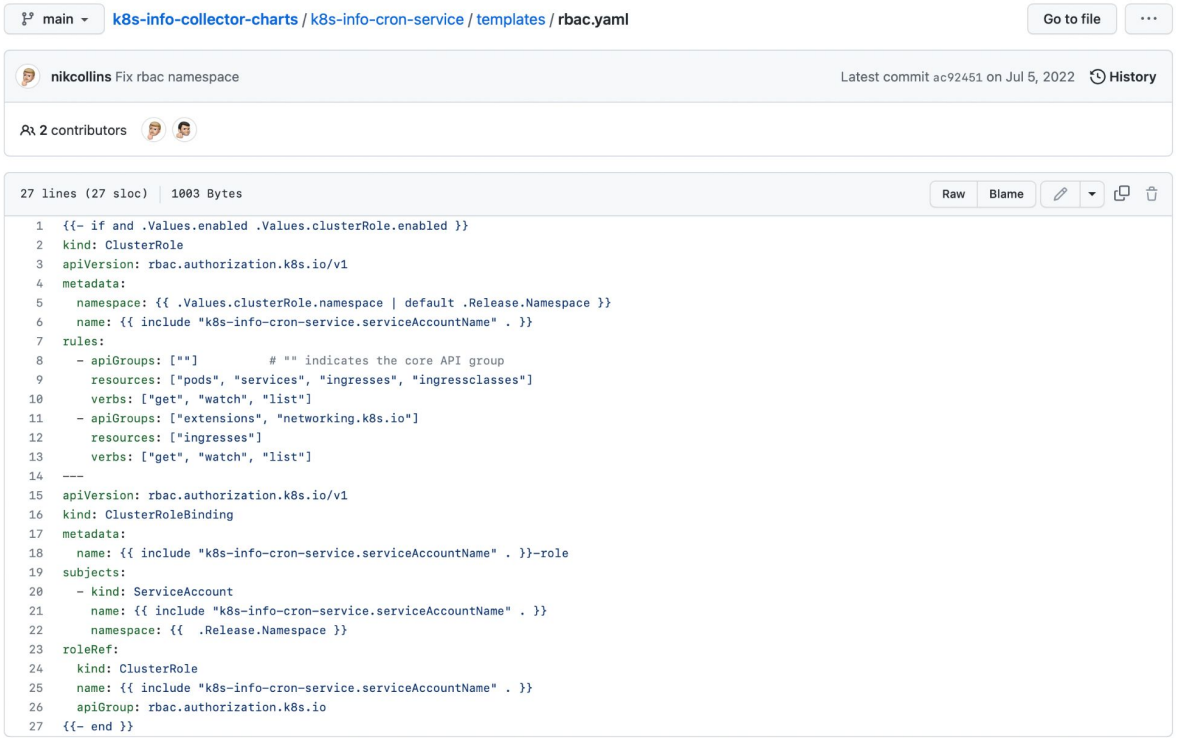
Infrastructure as Code [YAML/Config]



main k8s-info-collector-charts / k8s-info-cron-service / templates / rbac.yaml

Go to file ···

nikcollins Fix rbac namespace — Latest commit ac92451 on Jul 5, 2022 — History

2 contributors

27 lines (27 sloc) | 1003 Bytes — Raw | Blame

```
{{- if and .Values.enabled .Values.clusterRole.enabled }}
kind: ClusterRole
apiVersion: rbac.authorization.k8s.io/v1
metadata:
  namespace: {{ .Values.clusterRole.namespace | default .Release.Namespace }}
  name: {{ include "k8s-info-cron-service.serviceAccountName" . }}
rules:
  - apiGroups: [""]          # "" indicates the core API group
    resources: ["pods", "services", "ingresses", "ingressclasses"]
    verbs: ["get", "watch", "list"]
  - apiGroups: ["extensions", "networking.k8s.io"]
    resources: ["ingresses"]
    verbs: ["get", "watch", "list"]
---
apiVersion: rbac.authorization.k8s.io/v1
kind: ClusterRoleBinding
metadata:
  name: {{ include "k8s-info-cron-service.serviceAccountName" . }}-role
subjects:
  - kind: ServiceAccount
    name: {{ include "k8s-info-cron-service.serviceAccountName" . }}
    namespace: {{  .Release.Namespace }}
roleRef:
  kind: ClusterRole
  name: {{ include "k8s-info-cron-service.serviceAccountName" . }}
  apiGroup: rbac.authorization.k8s.io
{{- end }}
```

Helm Charts assists users in defining, installing, and upgrading Kubernetes applications.

Example Code:
https://github.com/devrev/k8s-info-collector-charts/tree/main/k8s-info-cron-service

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Security Engineer

- Identifying security measures to improve incident response
- Performing security assessments and code audits for compliance like SOC2
- Developing technical solutions to security vulnerabilities : Integration or development of code vulnerability scanning and analysis tools
- Threat Modelling
- Automating security improvements
- Detecting attack vectors using Fuzzers: A fuzzer is a program which injects automatically semi-random data into a program/stack and detect bugs.The data-generation part is made of generators, and vulnerability identification relies on debugging tools. Generators usually use combinations of static fuzzing vectors (known-to-be-dangerous values), or totally random data

Interview Corner

- Understanding fuzzing and ethical hacking [Simulating cyber attacks to keep systems safe]
- Good grasp of operating systems and databases
- Network security and Architecture
- Ability to analyze and model threats
- Coding skills to implement scanners and fuzzers.

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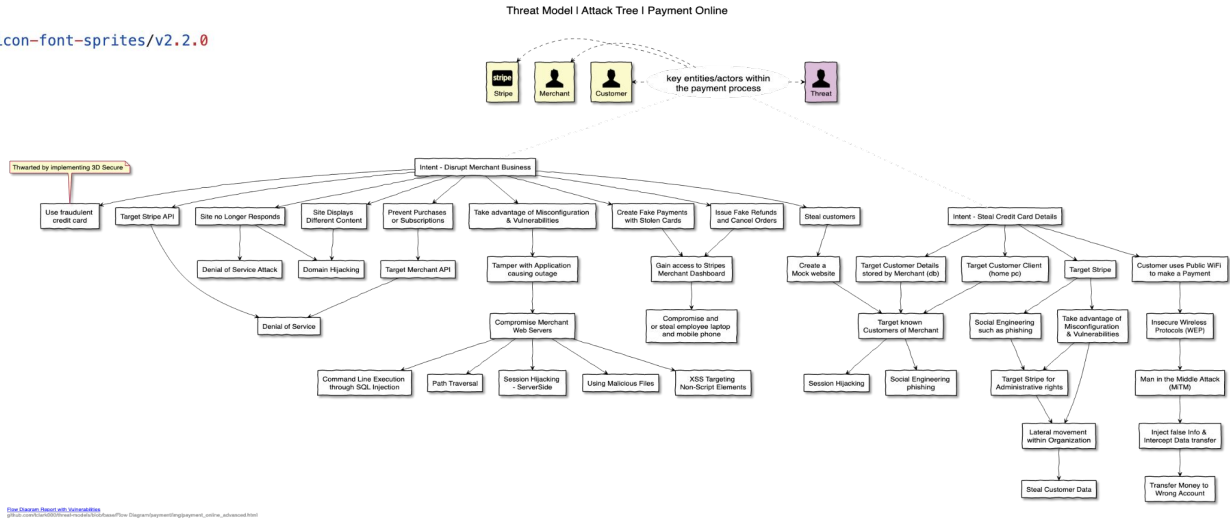
Threat Modelling and Security Architecture Analysis

```
@startuml
skinparam backgroundcolor monochrome
'skinparam monochrome true
skinparam defaultTextAlignment center
skinparam titleFontSize 22
skinparam handwritten true

!define SPRITESURL https://raw.githubusercontent.com/rabelenda/cicon-plantuml-sprites/v1.0/sprites
!includeurl SPRITESURL/user.puml

!define ICONURL https://raw.githubusercontent.com/tupadr3/plantuml-icon-font-sprites/v2.2.0
!includeurl ICONURL/common.puml
!includeurl ICONURL/font-awesome-5/cc_stripe.puml

skinparam rectangle {
  borderColor Black
  backgroundColor #fff
}
skinparam agent {
  borderColor Black
  backgroundColor #fff
}
skinparam sequence{
  arrowColor Black
}
skinparam usecase {
  borderColor #fff
  backgroundColor #fff
  shadowing false
  fontSize 18
}

```

OWASP open source Threat Models
https://github.com/OWASP/threat-model-cookbook



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Resources

Role	Resources
FrontEnd Engineer	https://github.com/stoplightio/elements
Backend Engineer	https://github.com/gohugoio/hugo
Full stack Engineer	https://github.com/kiali/kiali Interview with Full Stack Engineer https://open.spotify.com/episode/0mAYA8IrPk8UutGp4aKMSl?si=TmuHlwKJTjmvjn0XF8SqEA&nd=1
Quality Assurance	https://github.com/locustio/locust
Security Engineer	https://github.com/OWASP/threat-model-cookbook
Infrastructure Engineer	Interview with Infrastructure Engineer https://open.spotify.com/episode/6nVDdaoBJ7T2kzxXsocy2k

You can reach me on Linkedin & ashwini.wwcode@gmail.com

Backend Study Group

Backend Study Group:

- Presentations on GitHub and session recordings available on WWCode YouTube channel
- Upcoming Talks
  - February 16th, 2023: How to prep for Coding Interviews?
  - March 16th, 2023: Careers in Cyber Security

Women Who Code:

- Technical Tracks and Digital Events for more events
- Join the Digital mailing list for updates about WWCode
- Contacts us at: contact@womenwhocode.com
- Join our Slack workspace and join *#backend-study-group*!

You can unmute and talk or use the chat

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