Welcome!

WWCode San Francisco - Backend Study Group

January 19, 2023

- 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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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
- Backend Study Group: Learn and discuss backend engineering concepts

Prachi Shah
Instructor
Senior Software Engineer, Unity
Director, WWCode SF

Harini Rajendran
Host
Software Engineer, Confluent
Lead, WWCode SF

- System Design - Series Part 1 of 3:
    - What is System Design?
    - What are the design considerations?
    - Understand Frontend architecture
    - Understand Backend architecture
    - Q & A

- Part 2: Design considerations in detail
- Part 3: Interview questions

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

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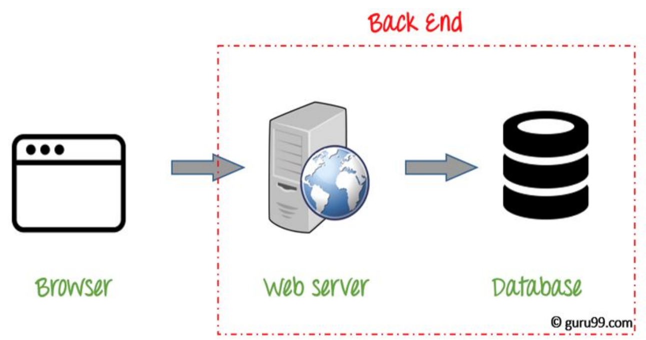
Backend Engineering

- Design, build and maintain server-side web applications

- Concepts: Client-server architecture, networking, APIs, web fundamentals, microservices, databases, security, operating systems, etc.



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

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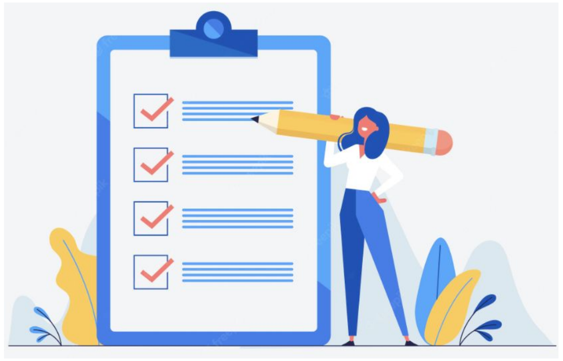
System Design

- Solve a problem or build a product
- Defining the architecture, modules, interfaces and data flow
- Architecture: Defines behavior and view of a system
- Modules: Each module corresponds to a task
- Interfaces: Defines the communication between modules
- Data flow: Flow of data and information between systems
- Define the input, output, business rules, data schema



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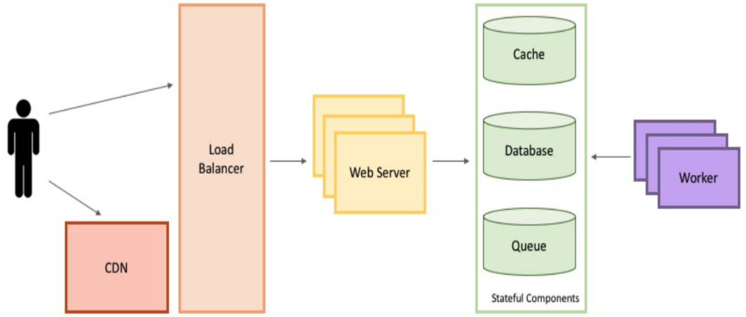
Design Considerations

- Scaling: Change in performance as per changing application demands
- Availability: System uptime and downtime
- Reliability: System performs the tasks as expected
- Robustness: Functional when errors or disturbances
- Load Balancing: Network traffic distribution across servers
- Caching: Data storage layer
- Data Partitioning: Distribute data across systems to improve querying performance
- SQL vs. NoSQL: Relational vs. Non-relational data model
- Performance: Glitch-free* and fast
- Extensibility: Future growth
- Error Handling and Security: UX and secure data



** requirements may vary*

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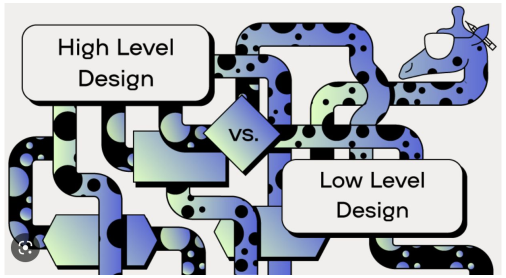
HLD vs LLD

High-Level Design:

- Big picture explanation of system modules, functionality and relationships
- Converts business requirements into technical solutions
- Understanding of functionality and data flow
- Focus is on the system architecture

Low-Level Design:

- Detailed implementation based on HLD
- Understanding of tools, technologies and configurations
- Define APIs, data schema and error handling
- Focus is on the system implementation



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Frontend Architecture

- Development of graphical user interface (GUI) for interactions with the users of a website
- Networking and internet protocols (HTTP Hypertext Transfer Protocol, etc.)
- Content Delivery Network (CDN): Distributed servers that deliver webpage content
- Web design: Creating and editing graphics
- Accessibility: Websites should be perceivable, operable, understandable and robust
- UI Internationalization: Localization across regions, cultures and languages
- Server Side rendering: Convert server-side HTML files into fully rendered HTML files
- Full Text Search: Searching text inside of extensive data sets
- Lazy load: Delay loading resources to improve performance
- Responsive design and browser compatibility: Website resize based on device, browser and screen size
- Web Security: Denial of Service (DOS), SQL injection, Code injection, etc.

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Frontend Architecture

- HTML (HyperText Markup Language): Meaning and structure of the web content
- CSS (Cascading Style Sheets): Styling web contents
- JavaScript: Scripting language for defining functionalities
- OOP: Object-Oriented Programming principles
- DOM (Document Object Model): Document as a logical tree of objects (node)
- Web browsers (Chrome, Firefox, Safari, etc.)
- Webviews: Native applications rendering a single tab of a web browser
    - Devices: iOS, Android, Windows
    - Solutions: Cordova for phone/tablet applications, Electron for desktops applications
- Frameworks: Build multi-platform applications
    - Flutter and React Native
- Developer tools: Test and debug code
- Documentation: Product and process

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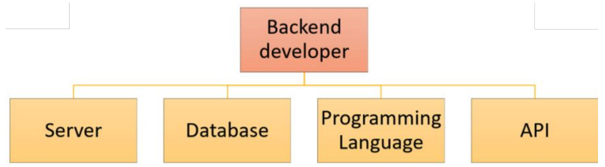
Backend Architecture

- Microservices: One functionality per service, and loosely coupled services
- API (Application Programming Interface): Communication between systems
- Data types and modeling: Data structures and relationships between various data
- Exception and error handling: To maintain normal execution of an application program
- Logging and Monitoring: Saving events in time for analysis and monitoring system health
- Notifications: Timely alerts
- Configurations: Define a system and its boundaries
- Automations: Cron jobs and build jobs for periodic maintenance
- CI/CD (Continuous Integration/Continuous Development): Code merge and automated testing
- Security and Privacy: Safeguard data and user identity
- Scale: Manage application demand needs
- Cloud architecture: Data shared across networks
- Data streaming: Real-time data collection
- Networking and Operating System



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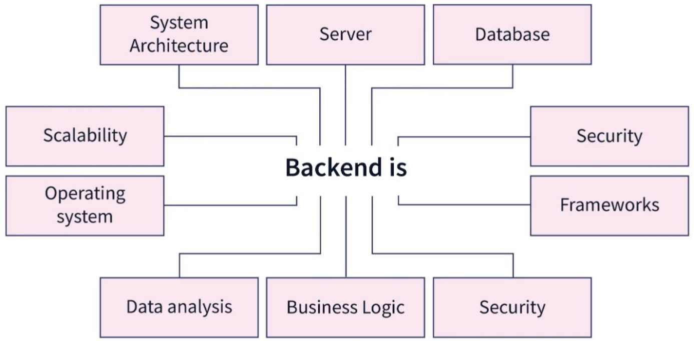
Backend Architecture

- PHP (Hypertext Preprocessor): Scripting language to develop web applications
- Python: Primarily used for data analytics and machine learning
- Java: OOP language for development of web, mobile, tablet, gaming, etc. applications
- MySQL: Relational database
- BigQuery: Big data analytics
- Cassandra: Non-relational database
- Docker: Build, test and deploy applications fast
- JavaScript: Node.js for backend development
- AWS: Data and infrastructure management
- Jenkins and Circle CI: Automate builds and testing
- GitHub and Stash: Source code management
- New Relic: System monitoring and observability
- Postman: API development and testing
- NGINX: Web server management
- Wireshark: Network troubleshooting and packet analysis



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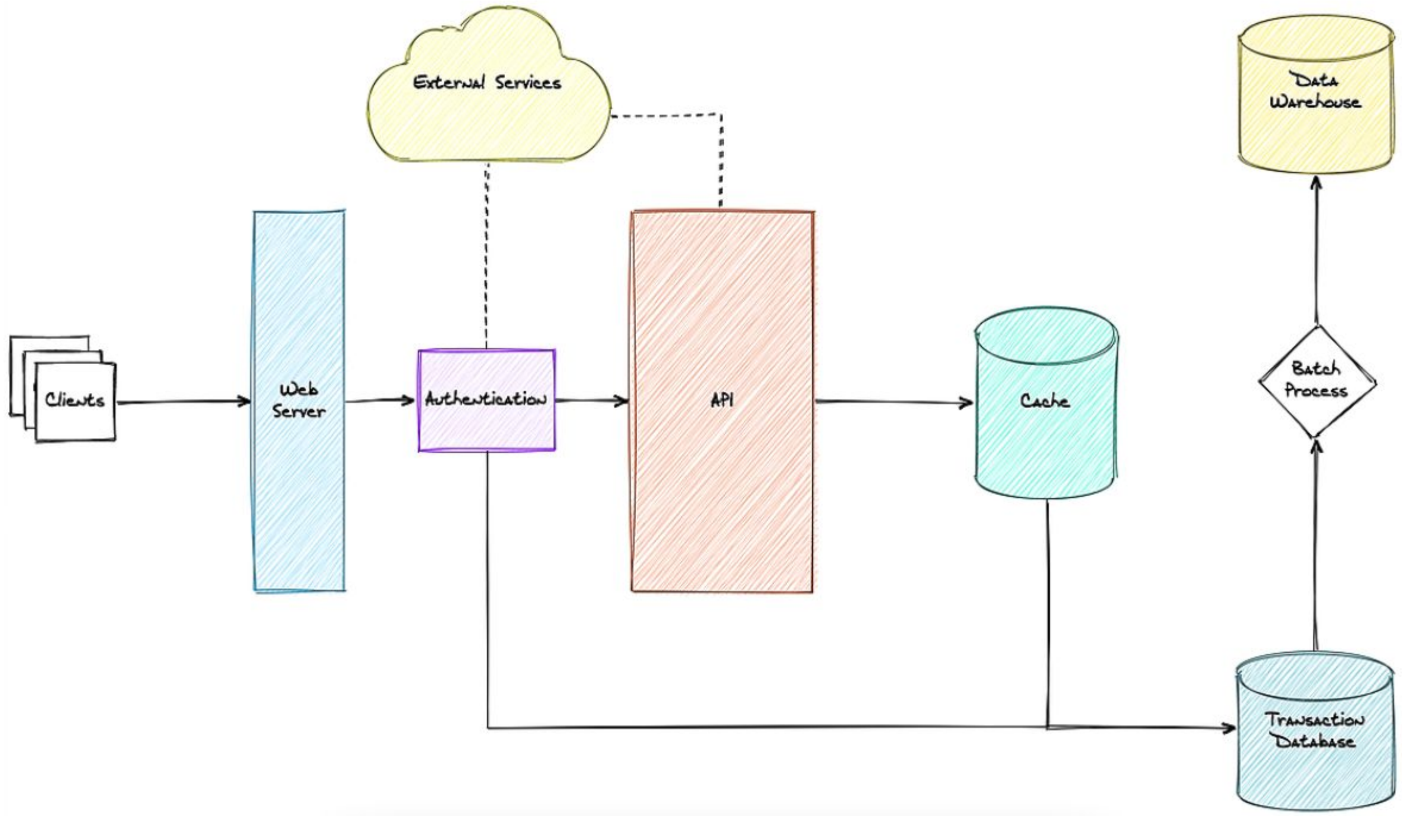
Visualization



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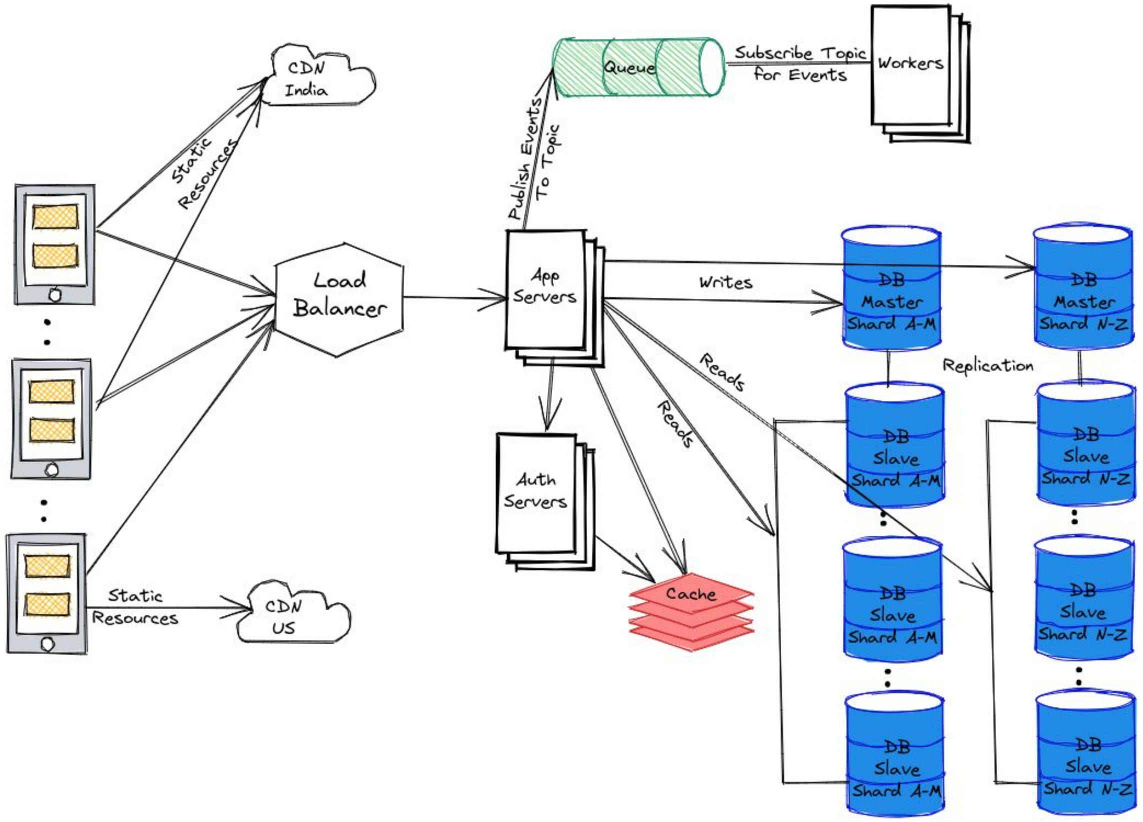
Visualization



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Skillset

- Problem solving
- Attention to detail
- Conceptual understanding of the tech stack
- Working with technologies at scale
- Planning and collaboration

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Backend Study Group

References:

- System Design Primer
- Frontend Handbook

Backend Study Group:

- Presentations on GitHub and session recordings available on WWCode YouTube channel
- System Design Series:
  - February 23rd, 2023: Part 2 - Design considerations in detail
  - March 16th, 2023: Part 3 - Interview questions

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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