

Serverless Computing

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Common models of server-side computing

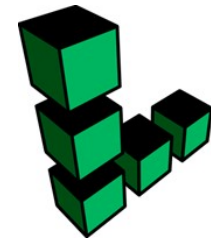
- **Raw: Server software runs directly on physical host, with nothing in the way besides the OS**
 - Fast, but inflexible
- **VM: Host creates a virtual computer with its own OS, and the software runs inside that computer**
 - Flexible – can resize HDD, RAM, CPU
 - Can transfer the machine between systems, the hard drive is just a file
 - Isolated – Crashes on one system won't affect others
 - Intensive – Lots of VMs require lots of resources

Common models of server-side computing

- **Containers: like VMs, but shares a kernel with the host**
 - All the benefits of a VM, with less overhead
 - Not really meant to be persistent – state dies with the container
 - Not as isolated as a VM – if the kernel panics, the entire system goes down

Cloud Providers

- For smaller teams and companies, buying and maintaining servers, networking equipment, bandwidth, and security is a hassle
- Cloud providers share their resources with customers, who only pay for what they need
 - Typically, you would spin up a VM with one of these companies, and they would let you use it however you want
- Microsoft Azure, Amazon Web Services, Google Cloud Platform, DigitalOcean, Linode, and more



Serverless

- **Serverless computing is a new(ish) paradigm where devs and IT don't have to worry about the physical hardware the code runs on**
 - Kind of like Software Defined Networking, but for everything
 - Compute, storage, databases, networking
- **Cloud providers partition their resources into services, customers only interface with services**
- **Azure Functions, Google Cloud Functions, AWS Lambda**
- **Super resilient**
- **Only pay for time code is actually being used**

- **Founded in 2002, AWS currently powers 33% of Cloud internet services**
- **More services than you could use in a single project**

The screenshot displays the 'All services' page in the AWS console, organized into a grid of categories. Each category contains a list of specific services available in that domain.

- Compute:** EC2, Lightsail, Lambda, Batch, Elastic Beanstalk, Serverless Application Repository, AWS Outposts, EC2 Image Builder.
- Containers:** Elastic Container Registry, Elastic Container Service, Elastic Kubernetes Service.
- Storage:** S3, EFS, FSx, S3 Glacier, Storage Gateway, AWS Backup.
- Database:** RDS, DynamoDB, ElastiCache, Neptune, Amazon QLDB, Amazon DocumentDB, Amazon Keyspaces, Amazon Timestream.
- Migration & Transfer:** AWS Migration Hub, Application Discovery Service, Database Migration Service, Server Migration Service, AWS Transfer Family, AWS Snow Family, DataSync.
- Customer Enablement:** AWS IQ, Support, Managed Services, Activate for Startups, Robotics (AWS RoboMaker), Blockchain (Amazon Managed Blockchain), Satellite (Ground Station), Quantum Technologies (Amazon Braket), Management & Governance (AWS Organizations, CloudWatch, AWS Auto Scaling, CloudFormation, CloudTrail, Config, OpsWorks, Service Catalog, Systems Manager, AWS AppConfig, Trusted Advisor, Control Tower, AWS License Manager, AWS Well-Architected Tool, Personal Health Dashboard, AWS Chatbot, Launch Wizard, AWS Compute Optimizer, Resource Groups & Tag Editor, Amazon Grafana, Amazon Prometheus, AWS Proton).
- Machine Learning:** Amazon SageMaker, Amazon Augmented AI, Amazon CodeGuru, Amazon DevOps Guru, Amazon Comprehend, Amazon Forecast, Amazon Fraud Detector, Amazon Kendra, Amazon Lex, Amazon Personalize, Amazon Polly, Amazon Rekognition, Amazon Textract, Amazon Transcribe, Amazon Translate, AWS DeepComposer, AWS DeepLens, AWS DeepRacer, AWS Panorama, Amazon Monitron, Amazon HealthLake, Amazon Lookout for Vision, Amazon Lookout for Equipment, Amazon Lookout for Metrics.
- Analytics:** Athena, Amazon Redshift, EMR, CloudSearch, Elasticsearch Service, Kinesis, QuickSight, Data Pipeline, AWS Data Exchange, AWS Glue, AWS Lake Formation, MSK, AWS Glue DataBrew.
- AWS Cost Management:** AWS Cost Explorer, AWS Budgets, AWS Marketplace Subscriptions.
- Front-end Web & Mobile:** AWS Amplify, Mobile Hub, AWS AppSync, Device Farm, Amazon Location Service.
- AR & VR:** Amazon Sumerian.
- Application Integration:** Step Functions, Amazon AppFlow, Amazon EventBridge, Amazon MQ, Simple Notification Service, Simple Queue Service, SWF, Managed Apache Airflow.
- Customer Engagement:** Amazon Connect, Pinpoint, Simple Email Service.
- Business Applications:** Alexa for Business, Amazon Chime, WorkMail, Amazon Honeycode.
- End User Computing:** WorkSpaces, AppStream 2.0, WorkDocs, WorkLink.
- Networking & Content Delivery:** VPC, CloudFront, Route 53, API Gateway, Direct Connect, AWS App Mesh, AWS Cloud Map, Global Accelerator.
- Developer Tools:** CodeStar, CodeCommit, CodeArtifact, CodeBuild, CodeDeploy, CodePipeline, Cloud9, CloudShell, X-Ray.
- Media Services:** Kinesis Video Streams, MediaConnect, MediaConvert, MediaLive, MediaPackage, MediaStore, MediaTailor, Elemental Appliances & Software, Amazon Interactive Video Service, Elastic Transcoder.
- Security, Identity, & Compliance:** IAM, Resource Access Manager, Cognito, Secrets Manager, GuardDuty, Inspector, Amazon Macie, AWS Single Sign-On, Certificate Manager, Key Management Service, CloudHSM, Directory Service, WAF & Shield, AWS Firewall Manager, Artifact, Security Hub, Detective, AWS Audit Manager, AWS Signer.
- Internet of Things:** IoT Core, FreeRTOS, IoT 1-Click, IoT Analytics, IoT Device Defender, IoT Device Management, IoT Events, IoT Greengrass, IoT SiteWise, IoT Things Graph.
- Game Development:** Amazon GameLift.

Lambda

- **Serverless compute: smaller source files you write, and AWS will run them in response to some event**
- **Can be in C#, Python, Java, or Node.js**
- **Event driven**
 - API calls
 - Updates to a storage pool
 - Updates to a database
 - Or some other AWS service

API Gateway

- **Sits in front of a backend for a REST or HTTP API**
- **Can map each individual endpoint to a VM, or a Lambda**
 - Good pattern is having a Lambda for each endpoint
- **Can implement Web Application Firewalls, CORS, other API stuff**
- **Gives you your own endpoint to use too**

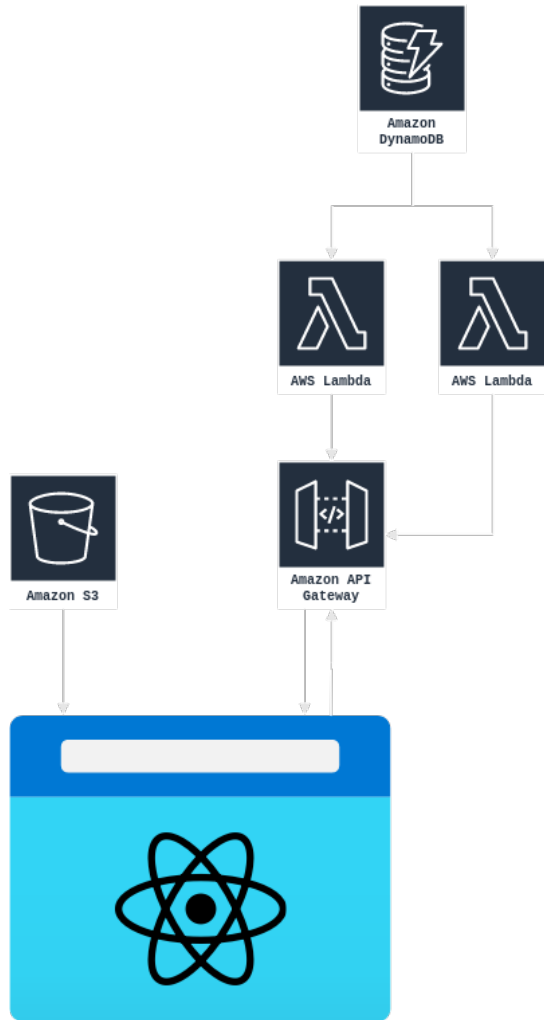
Simple Storage Service (S3)

- **Serverless storage: basically just a volume you can push and pull files to and from**
- **Used across AWS to store files for a lot of services**
- **Can share files with other AWS accounts, or open it to the public**
 - Can even share HTML/CSS/JS files straight out of a URL to run a static website

DynamoDB

- **Serverless database: NoSQL DB that can be easily used by other AWS services**
- **Complicated schema that takes getting used to and required different thinking than SQL DBs, but can be just as powerful**
- **AWS also offers RDS, which provides a regular SQL database through a VM wrapper**

LUGChat



Visit <https://github.com/prophetofxenu/lugchat> for files and instructions