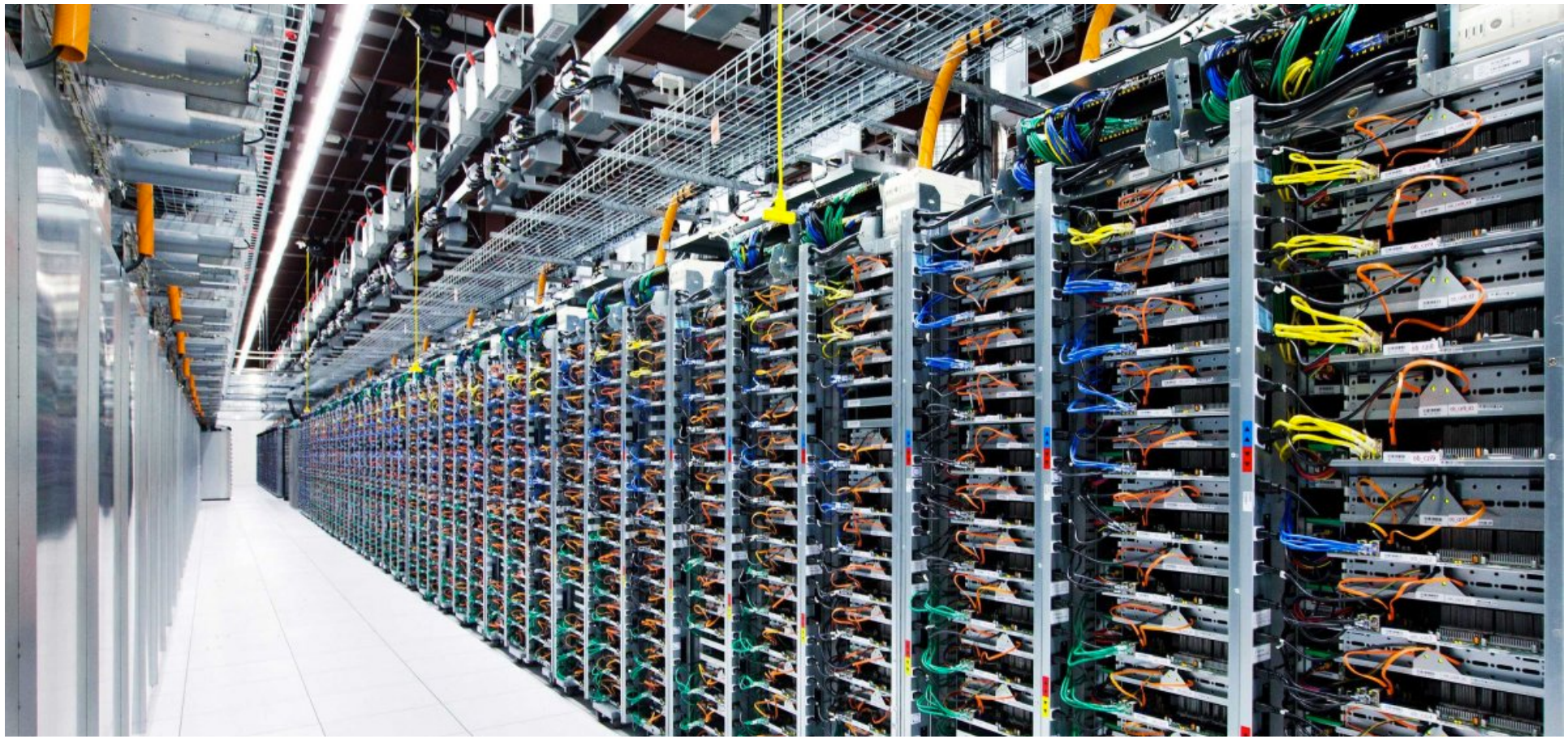
Introduction to Serverless

for geospatial applications

What is Serverless?

What is Serverless not?

Serverless ≠ no servers



Serverless ≠ Lambda

Google Cloud Platform

Auth0

Iron.io

Microsoft Azure

Serverless ≠ FaaS


Firebase


okta


cloudboost

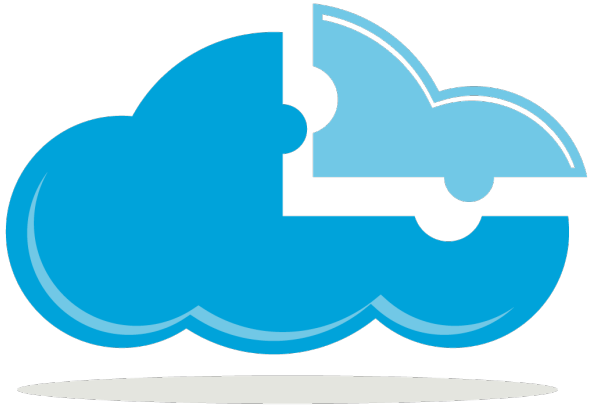

Braintree
A PayPal Company

Serverless ≠ The Serverless Framework

APEX

serverless architecture

SERVERLESS



Claudia.js

CloudFormation

Serverless ≠ Just a Fad

Break										
Google Earth Enterprise	***Drones/Satellite***	***Visualization***	***R***	***Misc.***	***Big Data***	***QGIS***	***3D***	***Serverless***	***Data Serving/Cartography***	***Education***
Google Earth Enterprise: From Acquisition, to Enterprise Sales, to Open Source - Doing What is Right for Users	DIY mapping with drones and open source in a humanitarian context	Transforming Geospatial Data for Visualization with D3	A Journey through R for Geo	Sharing and Migrating GIS Projects with OGC GeoPackage	GIS-Explorations of Earth: A Gateway to the Big Data Workforce	DSG Tools: a toolbox for database management and vector data quality in QGIS	3D Tiles in Action	Introduction to Serverless for Geo	Best Practice for Serving Imagery using MapServer on Amazon Web Services	State of Geoforall - OSGeo global education and research labs network
Everything old is new again: What open source Google Earth Enterprise means for FOSS4G and Cesium	LiveDroneMap - an Automatic Real-time UAV Mapping Solution	The Utility of Beautiful Geovisualizations	Implementation of a large-scale, interactive agricultural water balance model using R and GDAL	Devops for GIS in the Cloud	Remote Analysis of Big Data in Cloud Object Storage using FUSE, Jupyter Notebooks, Docker and Kubernetes	Geographic Update Partnership Software	Why 3D? The benefits of 3D geospatial visualization beyond pretty pictures	We're gonna need a bigger boat! Serverless Geo to avoid disaster	OnEarth 2.0: Updates to NASA's open source high performance map server	It´s all about data
Google Earth Enterprise is Thriving as Open Source	Imaging the earth every day	Data driven styling for fast GL maps	Developing Scalable Information Extraction Processing Pipelines using R for Earth Observation Applications	GeoNotebook: an extension to the Jupyter Notebook for exploratory geospatial analysis	GeoWave: Utilizing Distributed Key-Value Stores for Multidimensional Data	QKan - Management of drainage system data with QGIS	3D City Models for everyone!	Hosted Services are Hard (And So Can You!)	Critical Cartography: Encoding ideas about equity and equality in spatial algorithms	Two laptops and a bag of thumb drives: knitting together a global community using FOSS4G
Lunch										
Misc.	***Big Data***	***Visualization***	***R***	***Government***	***Water Management***	***Standards***	***3D***	***Serverless***	***Projections***	***Education***
Mapbox GL: How vector maps work **(1:30pm - 2:10pm)**	Approaches to Visualising Big Data	Non-cartographic visualizations of geographic data	Rspatial.org, tutorials for learning Spatial R	Tufts Spatial Data Rescue: Crawling at-risk Government Data	Pghydro Project: postgresql-postgis extension to assist in water resources decision making	Promoting your open source implementation and getting OGC free certification	A Brand-New GeoBIM (Building Information Model) platform on Top of Cusium and World Wind	Serverless architectures for geo	Exploring open (and closed) coordinate system definitions in off the shelf software such as Global Mapper and Geographic Calculator	Teaching QGIS in the Public Sector: Adoption through Education
	Geopyter: GeoMesa and PySpark in Jupyter notebooks.	Visionmaker NYC: Browser-based cellwise raster editing for urban sustainability	GeoTuple: a Framework for Web Based Geo-Analytics with R and PostGIS	USGS Open Source Algorithms for Land Remote Sensing Time-Series Data Analysis	Conservation Irrigation Water Management using FOSS4G - Season 2	Towards OSGeo best practices for scientific software citation: Integration options for persistent identifiers in OSGeo project repositories	Trillions of points - spatial indexing, organization, and exploitation of massive point clouds	Geospatial Lambda for scaleable, serverless geo-processing	Discrete global grids: what they are, how to use them	i-Reindeer - developing educational 3D quest game based on Taimyr herd migration
Skyhook Open Data for Global Signal + Mobile User Behavior **(2: 10pm - 2:50pm)**	Accelerating geospatial analytics using Apache Spark	Fake Maps, Very Dishonest	R in the Z-dimension: Processing LiDAR data for free	Forest Management - A FOSS4G Approach	Surface Runoff Estimation and Sediment Load Simulation: Basis for Surface Runoff Mitigation Plan of Madgao and Saug Rivers Watershed in Asuncion, Davao Del Norte, Philippines	ORFEO ToolBox license change from CeCILL to Apache : diary of a long journey	Planning and Visioning with Virtual Reality	Serverless architectures & automated pipelines for GIS applications	Introduction to Apache Spatial Information System (SIS)	Building an open access "spatial data management and integration" course for the world based on Common-based Peer Production principles
Open Mobile Data Collection **(2: 50pm - 3:30pm)**	Converging GeoData, Big Data, And Web Applications	Visualization and analysis of active transportation patterns derived from public webcams	Integrating Apache Spark and R for Big Data Analytics on solving geographic problems	National Collaborative Mapping of Forests and Natural Resources From a Government Initiative - The Rural Environmental Registry (CAR)	Automatic generation of a 2-D-TIN for river hydraulics from 1-D cross section data	Making Ocean Observations Accessible and Usable: A Standards and Software Case Study	HOWL: 3D/4D mapping and visualization of Oregon's wildlands	Serverless! Serving GeoData in Open Standards One Request at a Time	A history, status report, and outlook of Proj.4	TBD
Break										

What is Serverless?

BaaS & FaaS

BaaS & FaaS

(mobile) **b**ack end **a**s **a** **s**ervice

“… applications that significantly or fully depend on 3rd party applications / services (‘in the cloud’) to manage server-side logic and state”

Mike Roberts, What is Serverless?


stripe


Auth0


twilio


amazon
web services™

BaaS & FaaS

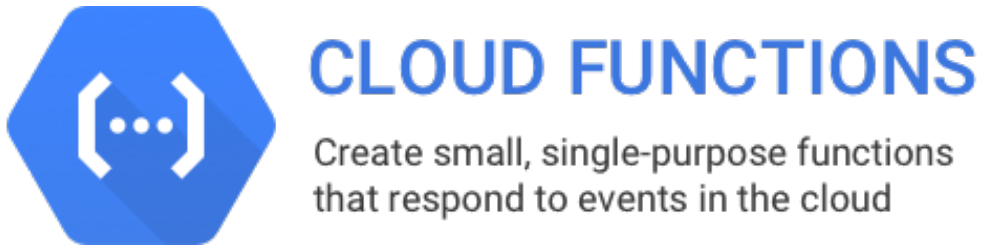
function as a service

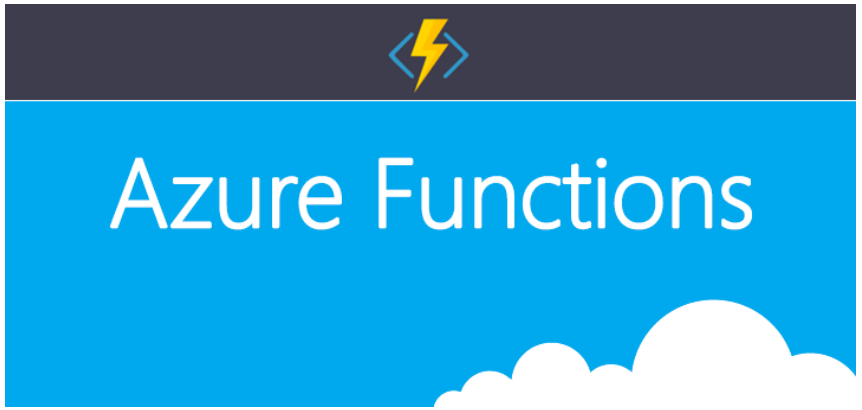
"… applications where some amount of server-side logic is still written by the developer … run in stateless compute containers that are event-triggered, ephemeral … and fully managed by a 3rd party"

ThoughtWorks


AWS Lambda


webtask


CLOUD FUNCTIONS
Create small, single-purpose functions
that respond to events in the cloud


Azure Functions

Why go Serverless?

Save Money

with FaaS we only pay per invocation which can save $$$

Scale Instantly

no servers to worry about, vendor takes the strain

Reduce Complexity

task specific functions for your app, BaaS for non-core

Reduce Time to Market

easier to get up and running quickly and experiment

Why not go Serverless?

Startup Latency

serverless functions need time to “wake up”

Harder to Test

difficult to reproduce production environment / triggers

Harder to Deploy

tooling helps but often lots of external dependencies to manage

Harder to Debug

we cannot SSH in to our functions to see what is going wrong

Recognise the limitations

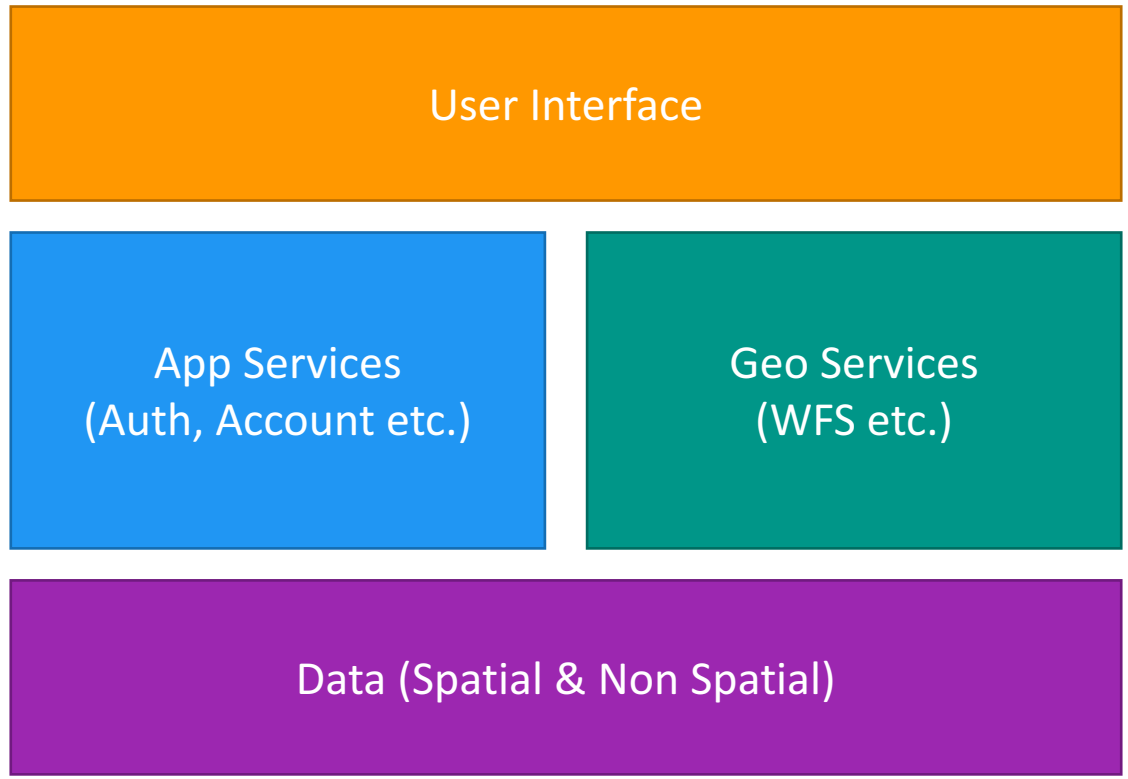
most can be mitigated however serverless is not for all use cases

What about geo?

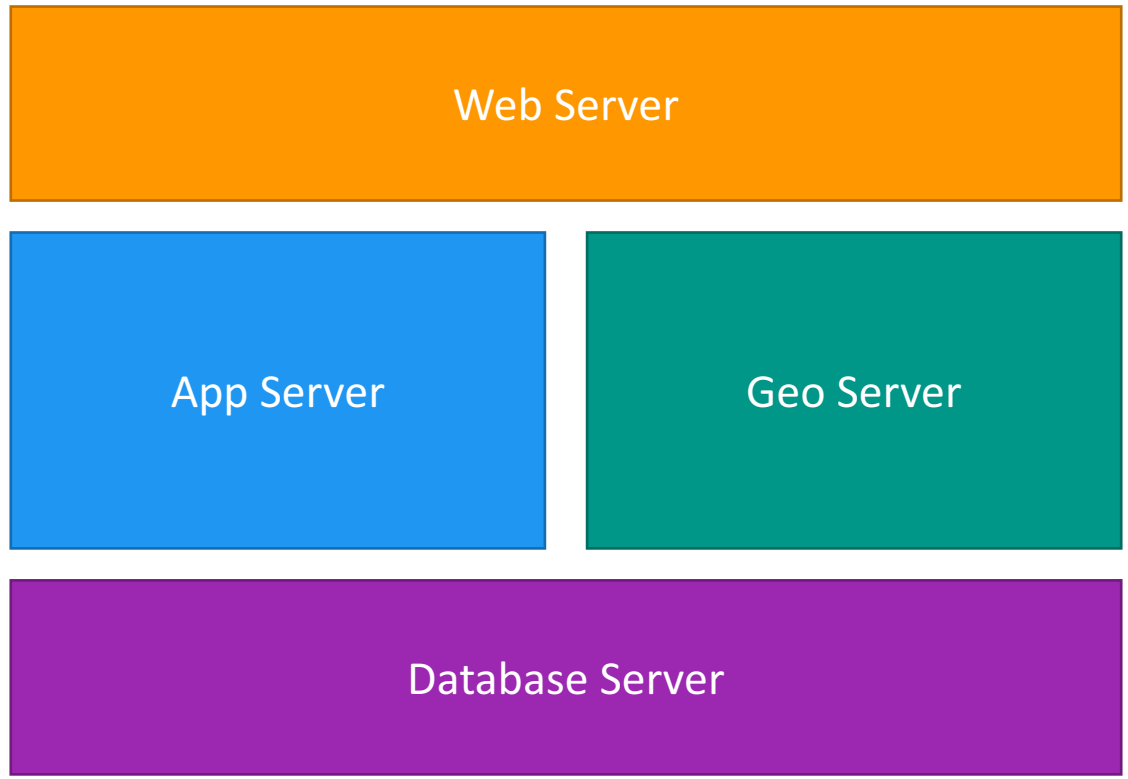
this is a geo conference after all!

“I want to build a geo app”

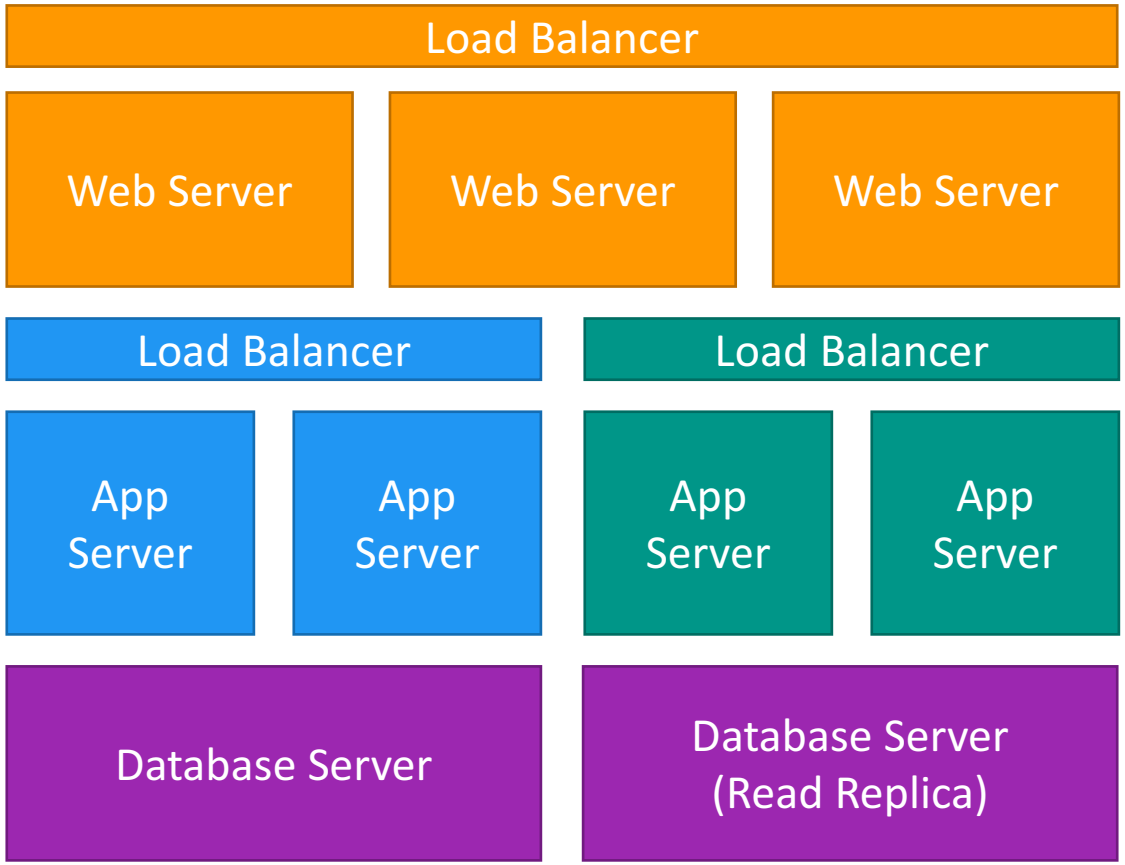
what components do I need?


User Interface
App Services
(Auth, Account etc.)
Geo Services
(WFS etc.)
Data (Spatial & Non Spatial)

“What does the infrastructure look like?”


Web Server
App Server
Geo Server
Database Server

“Oh, and it needs to be highly available?”


Load Balancer
Web Server
Web Server
Web Server
Load Balancer
Load Balancer
App Server
App Server
App Server
App Server
Database Server
Database Server (Read Replica)

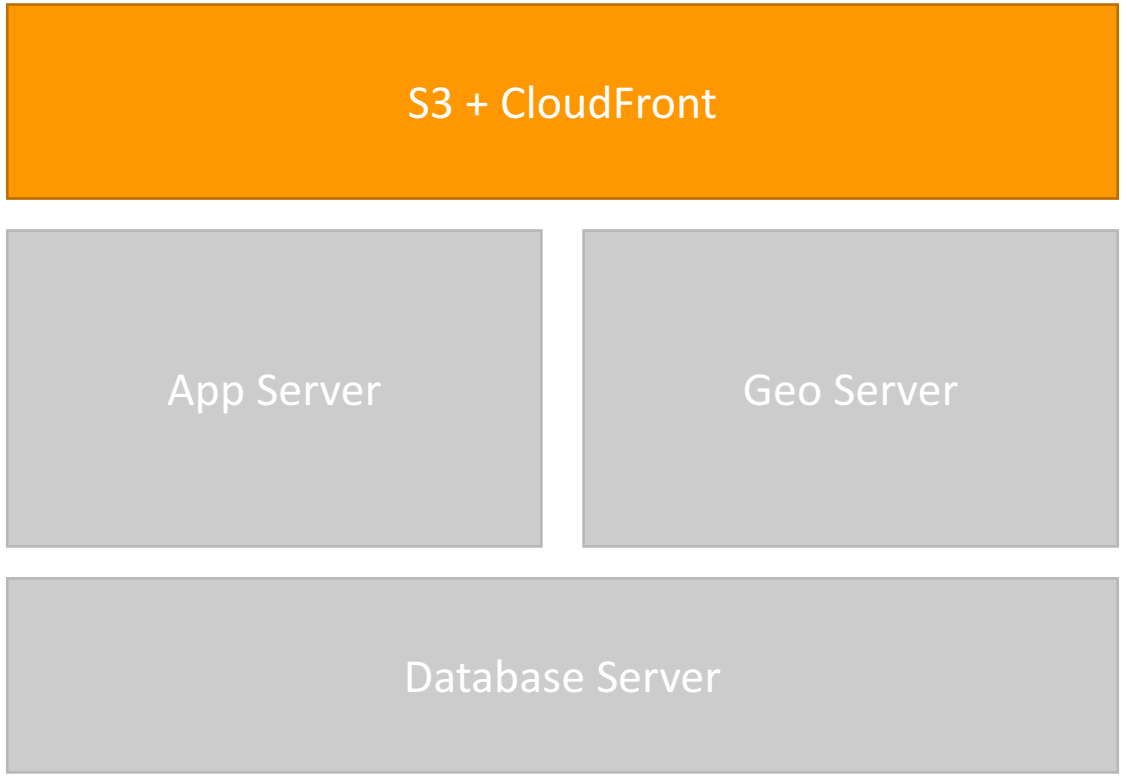
“That’s a lot of boxes to show a map!”

(wait until you see the bill!)

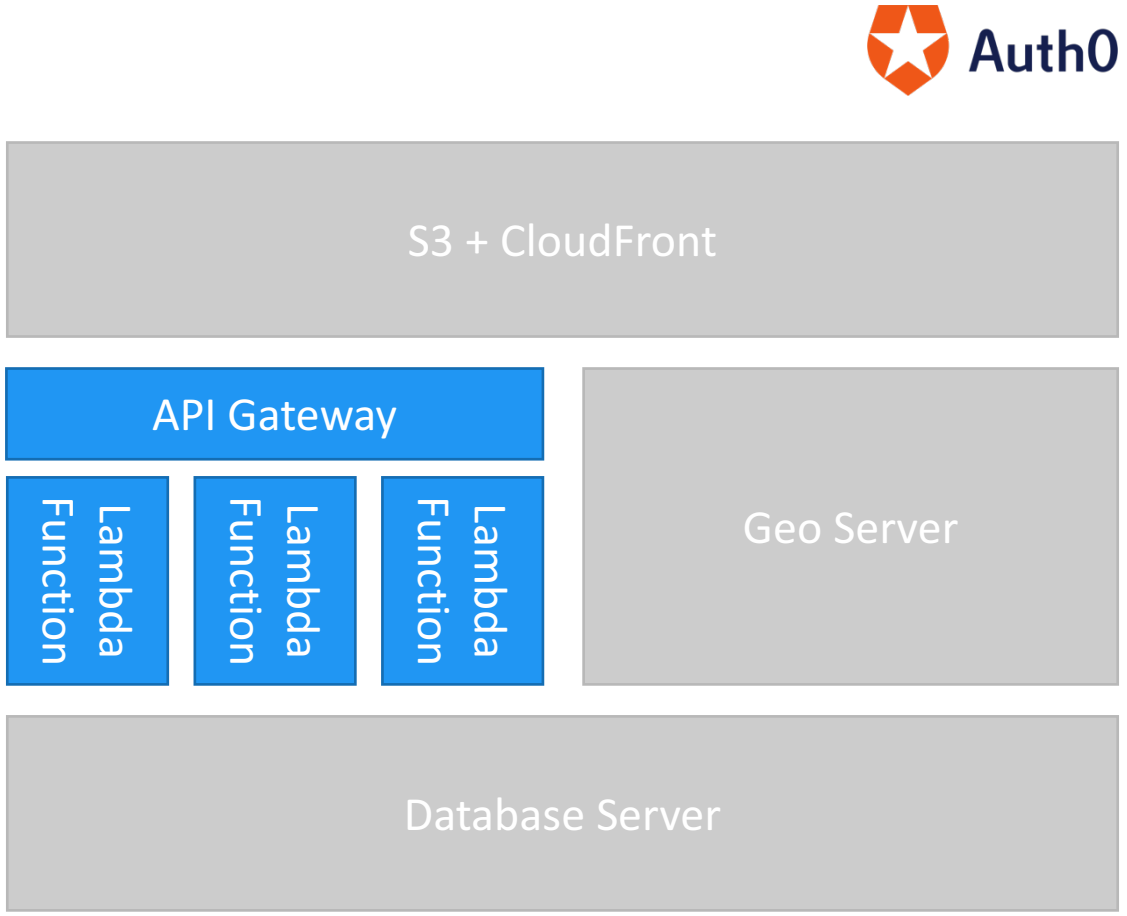
“We just moved to AWS, does that help?”

they provide lots of services other than IaaS, what we can use…

- Re-factor application as Single Page App (SPA)
- Can host as static website using an S3 bucket
- Use CloudFront to handle HTTPS, re-directs to index, error handling
- Free root SSL cert, managed!
- Distributed over CDN so no latency
- Only pay for what you use
- Scale to millions of users
- Serverless!

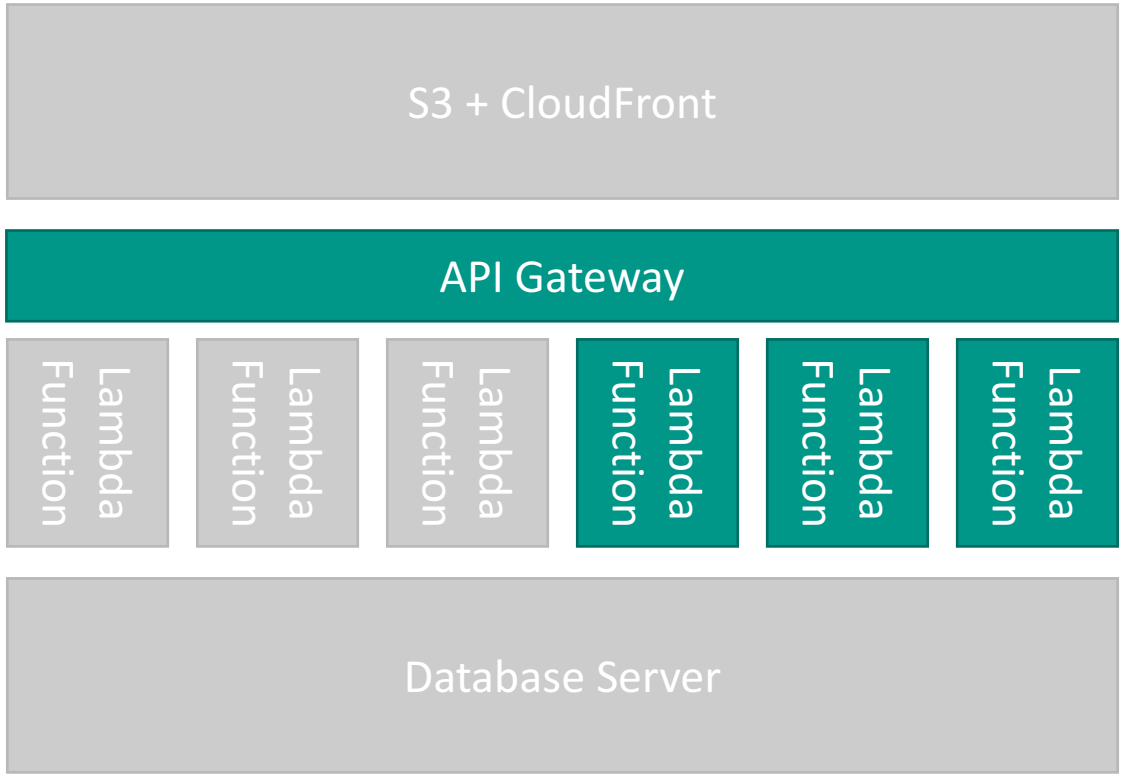


- Move authentication service to 3rd party BaaS e.g. Auth0 (could also use AWS Cognito)
- Write simple lambda functions for all application specific logic e.g. accounts
- Connect UI to lambdas using API Gateway
- API Gateway manages security, rate limiting, CORS, DDoS protection etc.
- Only pay for what you use
- Scale to millions of users
- Serverless!

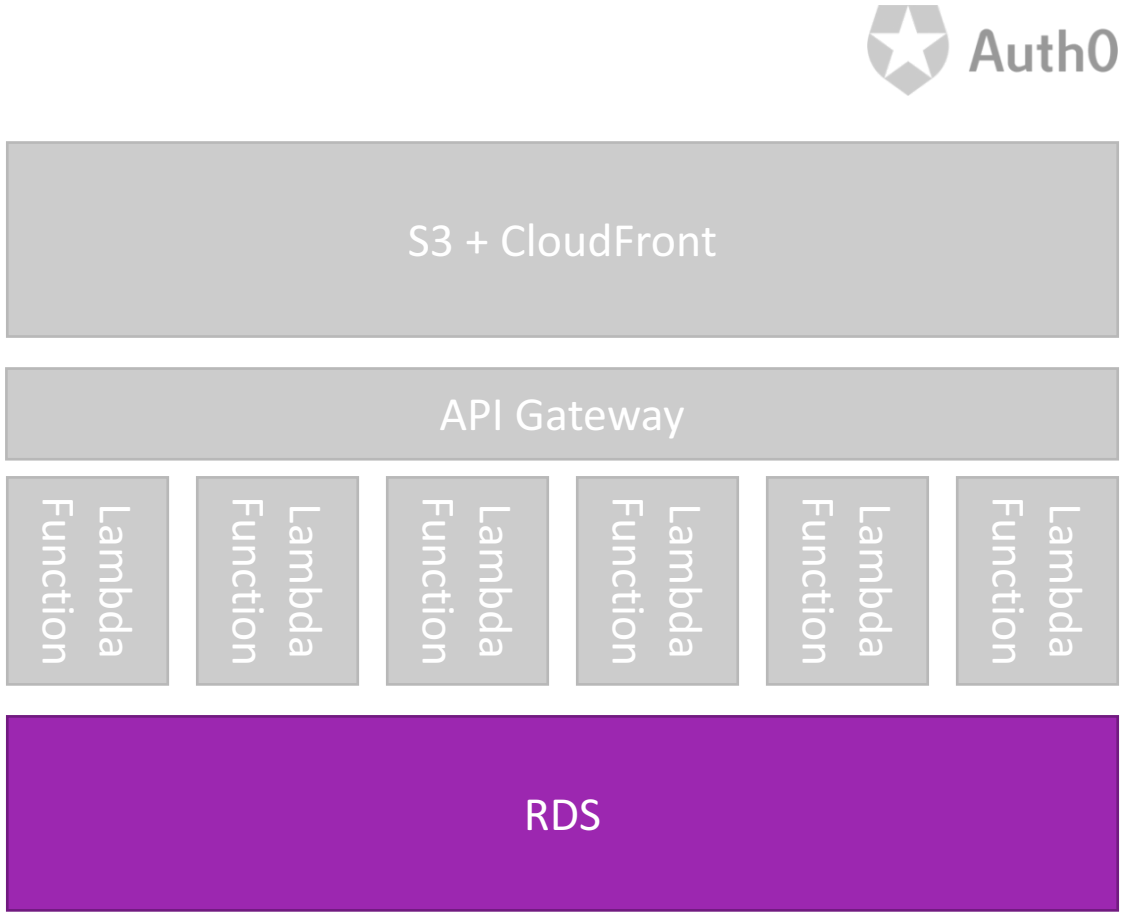


- Do we need a geo server?
- What does it actually do for us?
- We can write lambda functions which query PostGIS and convert results to GeoJSON / TopoJSON
- But what about OGC standards, WFS etc?
- GeoJSON is a standard and supported by Leaflet
- Mitigate latency by using a scheduled lambda to keep our other lambdas “warm”
- Serverless geo!

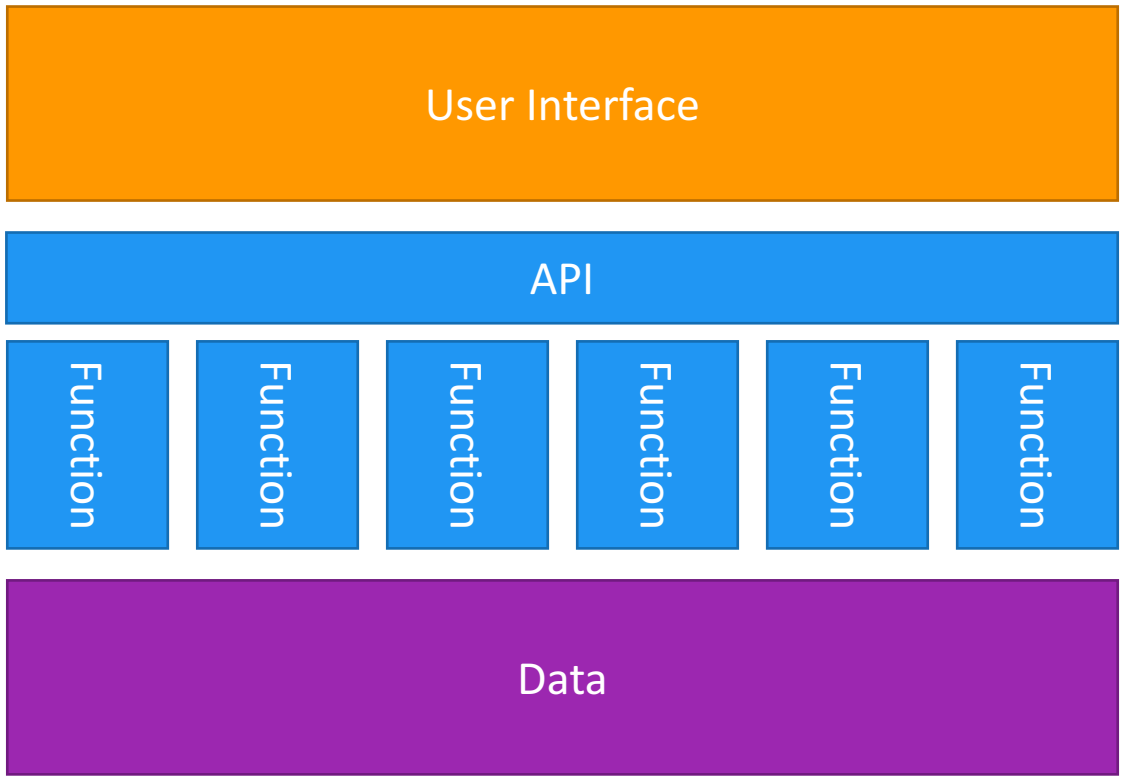
Auth0



- No real BaaS option: Carto, GIS Cloud etc. still need to scale account and less functionality
- Keep PostGIS but use Amazon RDS to manage and scale the cluster
- Setup auto scaling and multi-AZ for high availability
- Automated backups and SLA
- Could use DynamoDB for non-geo functions such as Account mgmt but “Polyglot persistence” can introduce complexity
- Not “serverless” but fully managed!



- Our architecture looks a lot simpler
- We have an application which can scale to millions of users
- It should be faster, less moving parts and we are using a CDN
- We do not have any servers to manage
- We have to monitor and scale our DB but we can automate that
- We can focus on our use case and not re-inventing the wheel
- Avoid lock-in by only using AWS services for generic functionality



RESTful Feature Specification (RFS)

a common language for working with geographic data using a RESTful interface and GeoJSON (or XML for sadists!)

github.com/openrfs

OpenAPI (swagger) spec + lambda reference implementation + docs (work in progress!)

“YOUR COMMUNITY NEEDS

YOU”

Mark Varley

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