

SERVERLESS BLOCKCHAIN: BUILDING OPEN-SOURCE BLOCKCHAIN APPLICATIONS

CONTAINER WORLD - APRIL 17, 2019

DAVID NUGENT

DEVELOPER ADVOCATE - COGNITIVE, DATA AND ANALYTICS

> DRNUGENT@IBM.COM

> [@DRNUGENT](https://twitter.com/DRNUGENT)

> [MEDIUM.COM/@DRNUGENT](https://medium.com/@drnugent)

MY GOAL THIS AFTERNOON



PROJECT

YOUR PRESENTER: DAVE NUGENT FORWARDJS CONFERENCE CO-ORGANIZER

DATE

JANUARY, 2019

CLIENT

FORWARDJS.COM



PROJECT

YOUR PRESENTER: DAVE NUGENT SAN FRANCISCO JAVASCRIPT MEETUP ORGANIZER

DATE

DECEMBER, 2018

CLIENT

SF JAVASCRIPT MEETUP



PROJECT

YOUR PRESENTER: DAVE NUGENT

HACKATHON MENTOR

DATE

NOVEMBER 2018

CLIENT

CALHACKS, BERKELEY



PROJECT

YOUR PRESENTER: DAVE NUGENT

HACKATHON MENTOR

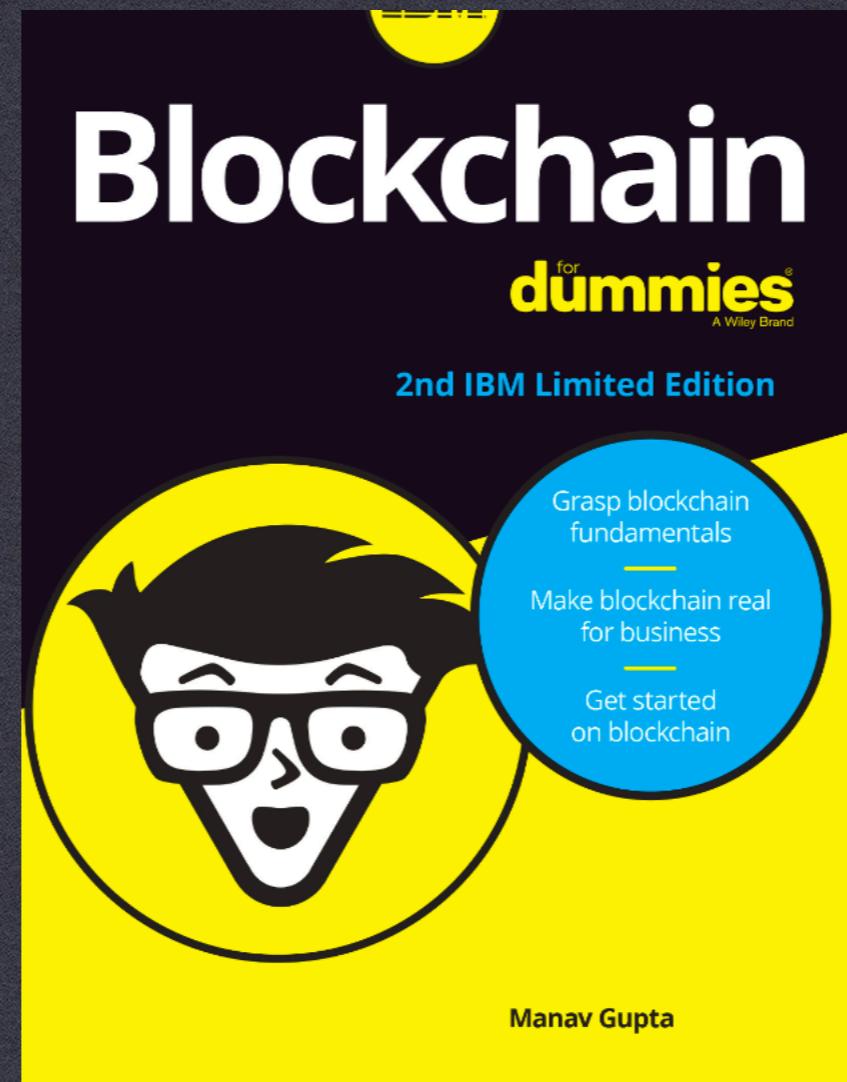
DATE

FEBRUARY 2019

CLIENT

TREEHACKS, STANFORD

DON'T TRUST ME?
[HTTP://BIT.LY/BLOCKCHAIN4DUMMIES](http://bit.ly/blockchain4dummies)



The Birth of Blockchain

- * October 2008, Satoshi Nakamoto's paper
<https://bitcoin.org/bitcoin.pdf>

What is Blockchain?

- * Distributed ledger
- * Linked list
- * Proof of work
- * Immutability

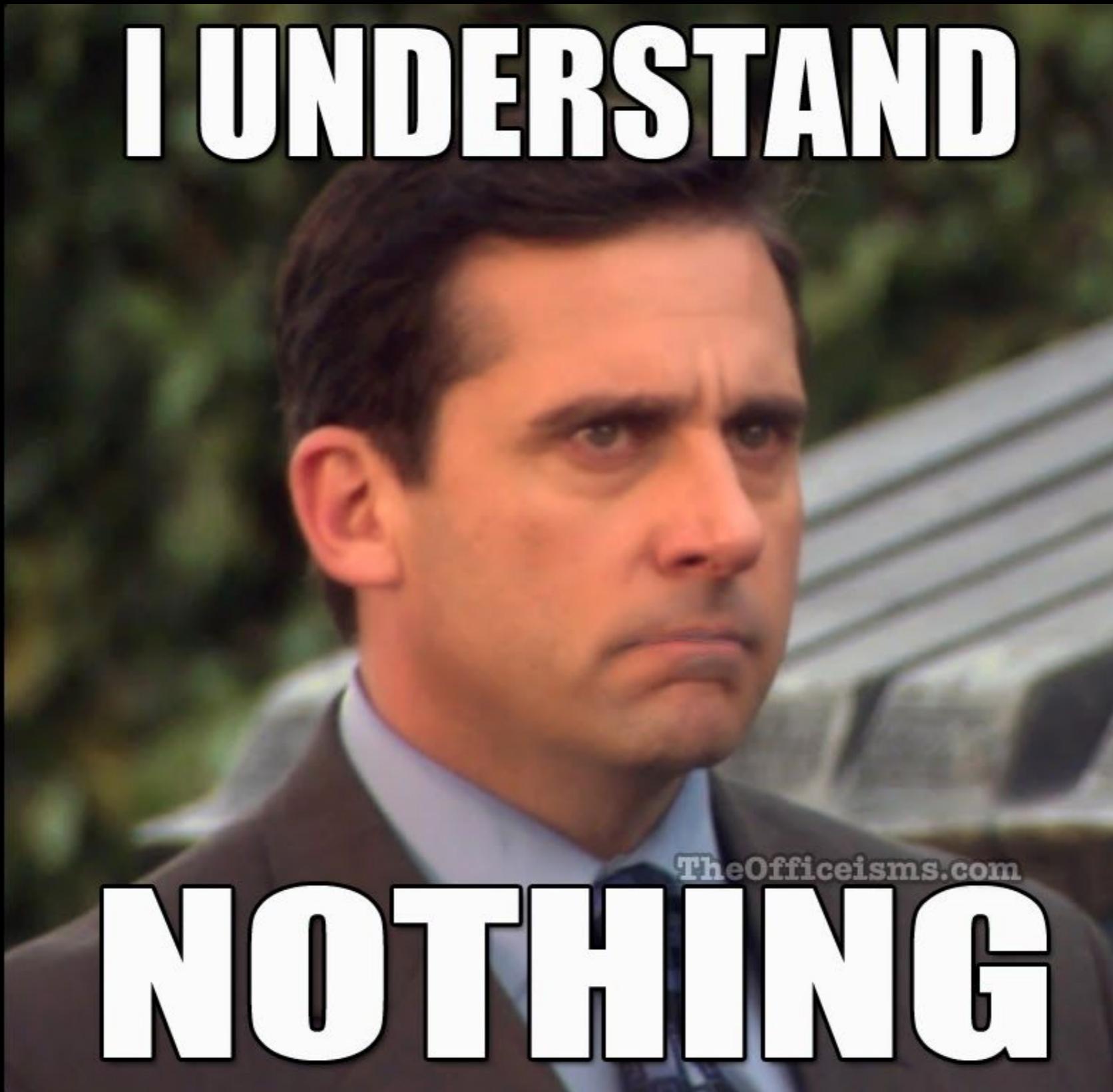
Hyperledger Fabric

- * July 2016, Architecture of Hyperledger Blockchain Fabric
[https://www.zurich.ibm.com/dccl/papers/
cachin_dccl.pdf](https://www.zurich.ibm.com/dccl/papers/cachin_dccl.pdf)
- * Latest News: Hyperledger-Ethereum Alliance

Agenda

1. Hyperledger Fabric
2. Hyperledger vs. Ethereum
3. Actors in Fabric Network
4. Endorsement Policy
5. Demo

Hyperledger Fabric

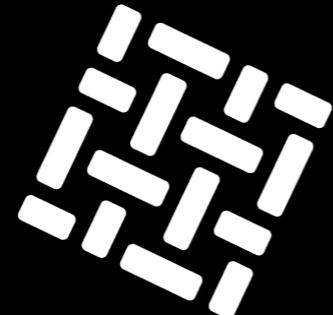




HYPERLEDGER FABRIC

Careful, or
you'll end up
in my novel!

What is Hyperledger Fabric



**HYPERLEDGER
FABRIC**

- Open source platform used for smart contract development, aimed at developers & the enterprise
- Hosted by the Linux Foundation
- Major differences to modern cryptocurrency - there is no concept of ‘mining’ blocks
- Permissioned blockchain, you need to be invited to join the network

Hyperledger vs. Ethereum Throughput



**HYPERLEDGER
FABRIC**

- Approximate throughput - Ethereum: 1,000 / minute
- Approximate throughput - Hyperledger: 500,000 / minute
- **No concept of cryptocurrency in Hyperledger**
- No cryptocurrency = no mining = more efficient in terms of electricity
- Enterprise needs high throughput = Hyperledger is made for enterprise

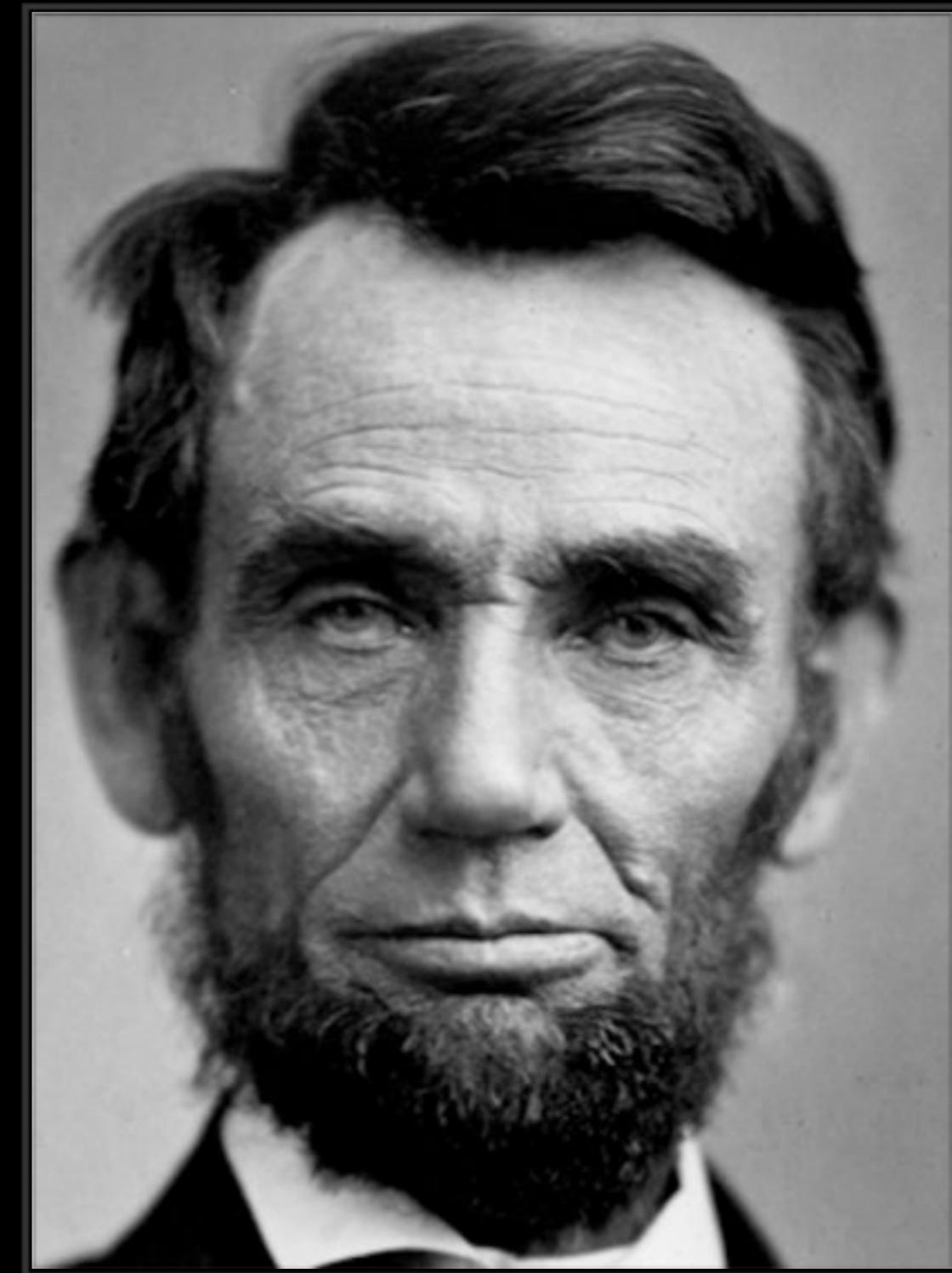
**“HYPERLEDGER IS
BY FAR THE MOST
EFFECTIVE AND
USEFUL BLOCKCHAIN
IMPLEMENTATION”**

-ELON MUSK



**“DON’T BELIEVE
EVERYTHING YOU SEE
ON THE INTERNET
JUST BECAUSE
THERE’S A QUOTE
WITH A PICTURE
NEXT TO IT.”**

-ABRAHAM LINCOLN



Concepts



HYPERLEDGER
FABRIC

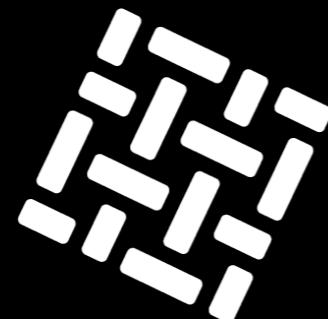
- NOT central database
- Data is distributed
- If you make a mistake, you need to have another transaction to fix it.
- No '**delete**' operation in Hyperledger
- Cannot change ledger

Concepts Part 2



- If you replay all events in the ledger, you get the ‘current state’
- All data is cryptographically signed
- **Flexible requirements** on hardware, network infrastructure, software, security
- Can be adjusted for any use case
- **Not vulnerable to 51% attack** (unlike Bitcoin)

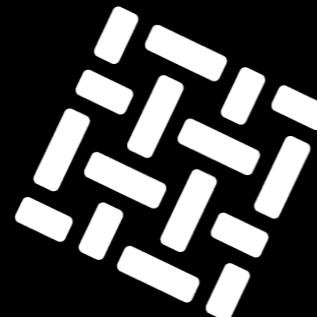
Concepts Part 3



**HYPERLEDGER
FABRIC**

- **Main use case - Party A doesn't trust Party B**
- Party A records don't match Party B
- **How to resolve?** Settlement process (lawyers, audits) - expensive, time-intensive
- Instead, you can use 3rd party (verification authority), and send all data to them. Very expensive
- Need to all trust verification authority
- Verification authority run by humans = prone to mistakes

Concepts Part 4



**HYPERLEDGER
FABRIC**

- No bulletproof way to work with two parties that don't trust each other
- All info is enforced by Hyperledger - all participants see this
- **Not possible for any party to alter data** - must pass through smart contract (chain code)

Actors in Hyperledger



<http://mtncatholic.com/2016/10/06/no-joke-dante-puts-michael-scott-hell/>

- Michael Scott, a.k.a. **the peer node**. The peer, (M. Scott) runs the show (chaincode). The manager of The Office.



http://theoffice.wikia.com/wiki/Toby_Flenderson

- Toby, a.k.a the **CA(Certificate Authority)**. The CA hands out certificates to members of the network. The H.R. of The Office - hands out offer letters.



<https://www.dailybreak.com/break/chilis-lifts-ban-on-pam-beesly>

- Pam, a.k.a. **the orderer** broadcasts messages to peers. As the receptionist in the office, she relays messages to other employees.

Endorsement Policy

- This is consensus mechanism of Fabric
- Operation must be verified before we update the ledger
- Endorsement policy specifies **who must validate**
- **Example:** All peers, majority of peers, ONLY 1 peer (this is dangerous)
- If you have a channel with 10 CC, then every single chaincode can have a different policy 😱🐱🐱🐱🐱🐱🐱🐱

Approaches for development



Local



Cloud

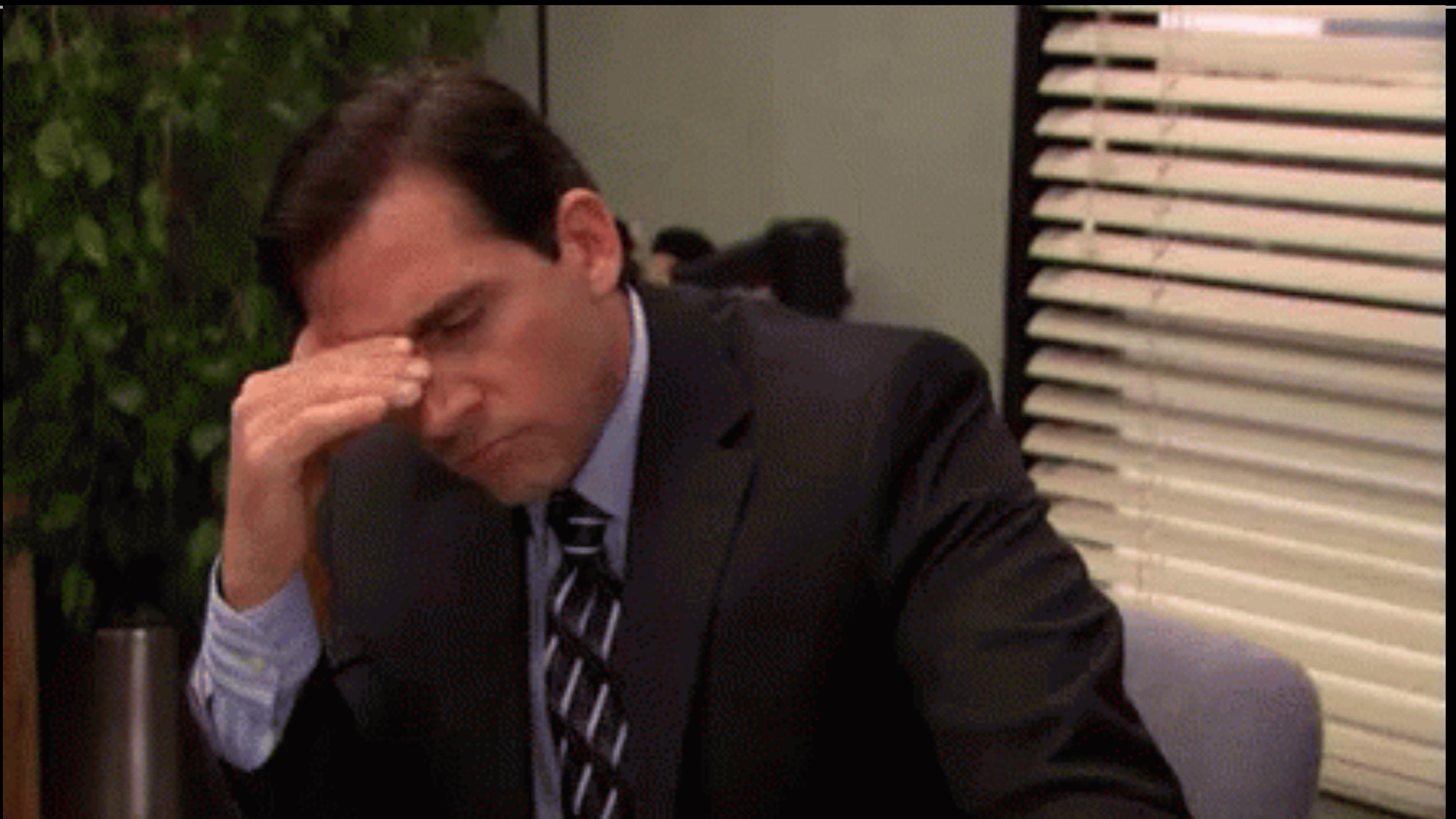
- Run docker containers (peer, orderer, certificate authority, couchDb)
- Inviting other orgs, viewing blocks is hard

- Network setup is done for you
- Nice interface to view all blocks
- Easy to invite other organizations to the network

Our approach



Cloud - via the IBM
Blockchain Platform



@drnugent

IBM Developer

Blockchain use-cases

- Medicalchain



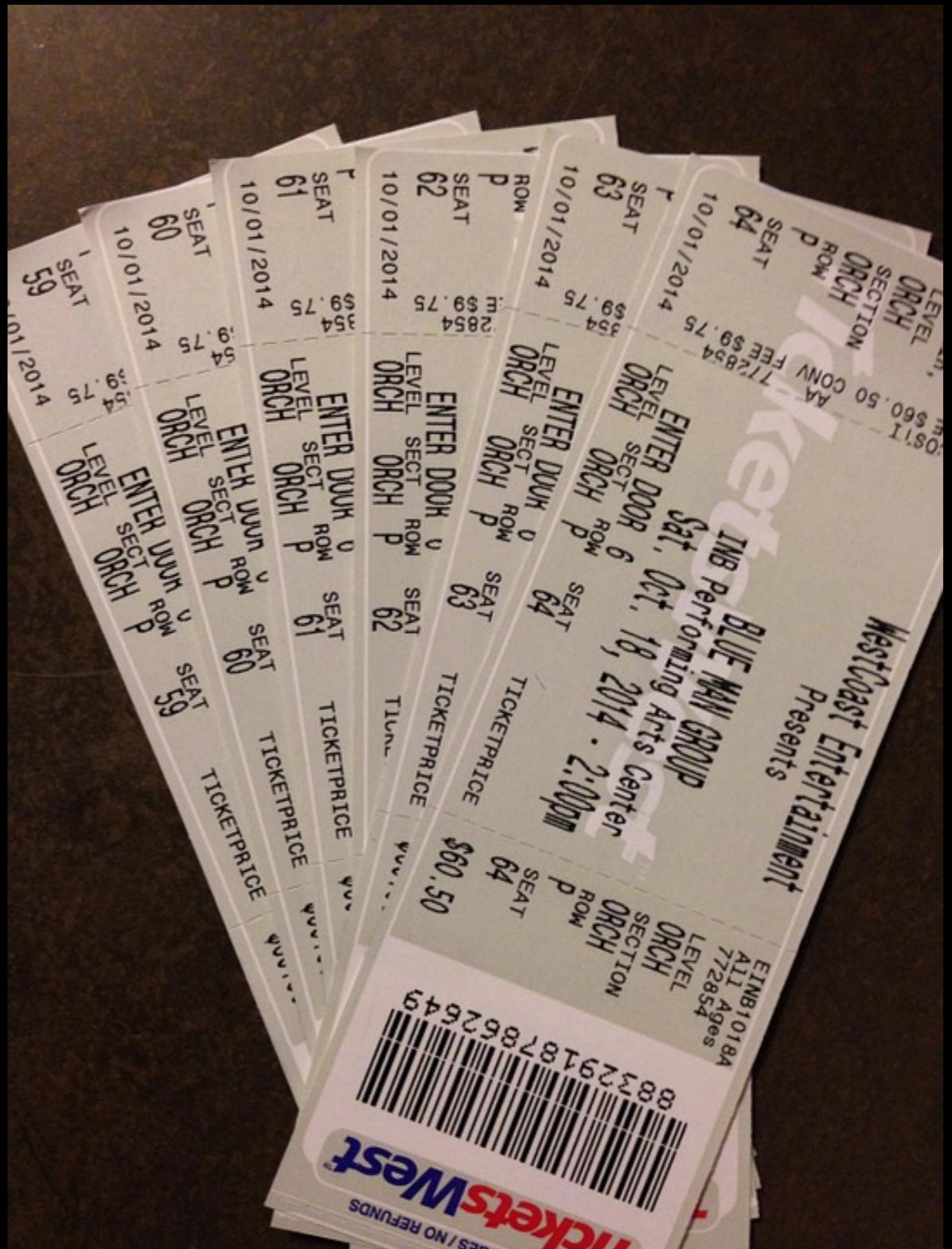
Blockchain use-cases

- Digital Identity
- Hyperledger Indy
- “For all these reasons, Hyperledger Indy has developed specifications, terminology, and design patterns for decentralized identity along with an implementation of these concepts that can be leveraged and consumed both inside and outside the Hyperledger Consortium”

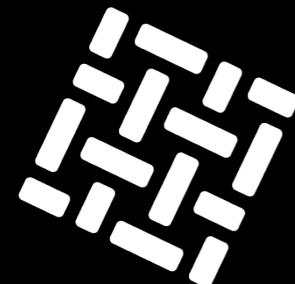


Blockchain use-cases

- Concert Tickets - True Tickets

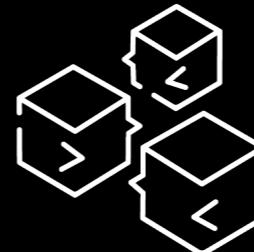


Hyperledger Fabric v. Composer



**HYPERLEDGER
FABRIC**

- Original project
- Learn Fabric SDK - Node.js, Java
- Uses channels to divide communication between participants
- **Status:** active



**HYPERLEDGER
COMPOSER**

- Tool for using Fabric
- Easy to generate REST API
- Learn Composer modeling language
- Test your contracts in a sandbox, online
- **Status:** incubation

IBM Blockchain Starter Kit

- <http://goo.gl/i9WZcH>

- Need either business or student email address, gmail wont work
- Takes a few business days to process, please be patient

Code Patterns

- Hello world Hyperledger Fabric Car Auction -
<https://github.com/IBM/car-auction-network-fabric-node-sdk>
- Blockchain Bean UI - <https://www.ibm.com/thought-leadership/blockchainbean/index.html>
- Blockchain Bean Code -<https://github.com/IBM/blockchainbean>



@drnugent

IBM Developer

What is Serverless?

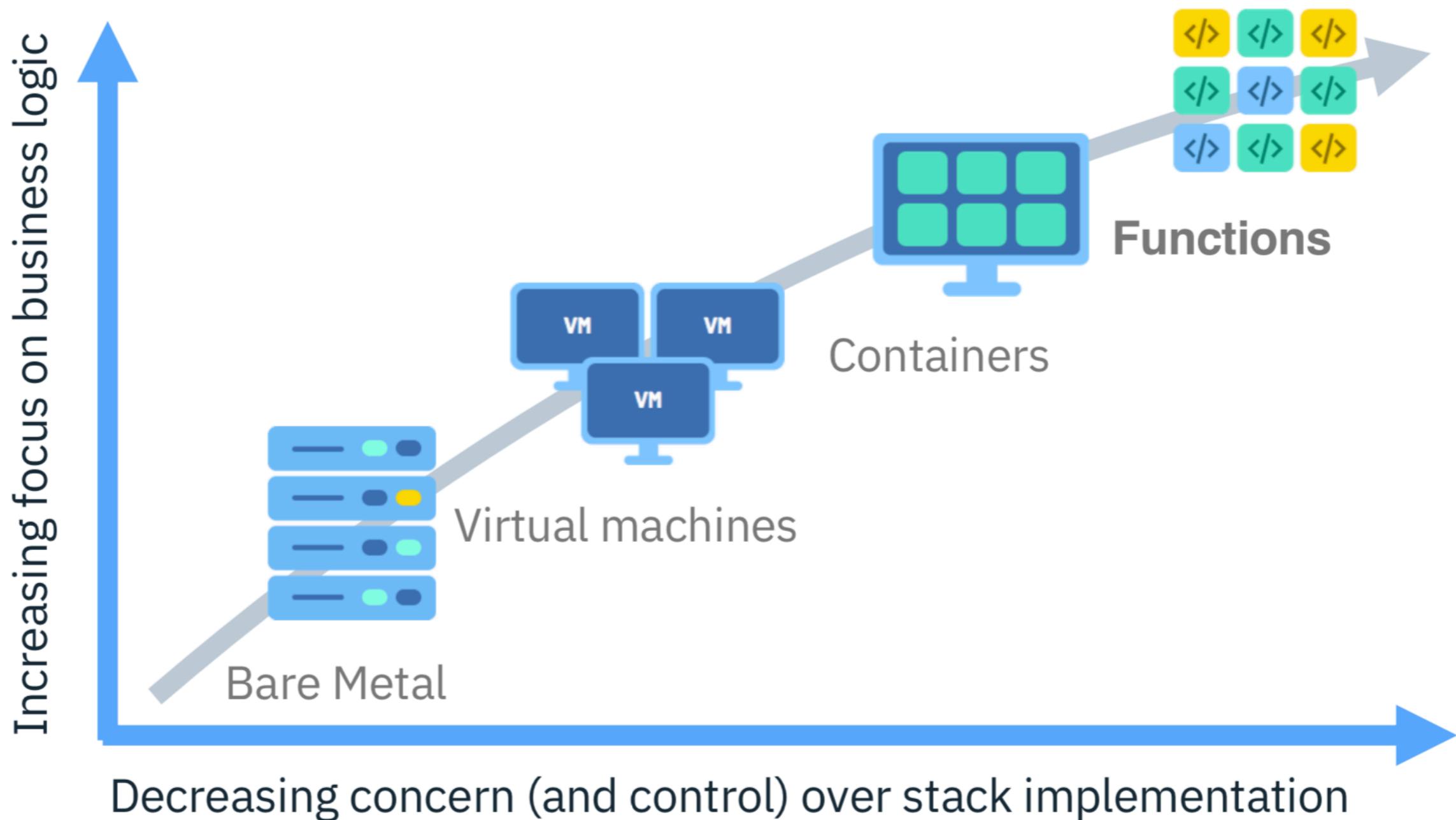
Serverless computing refers to the concept of building and running applications that **do not require server management**.

It describes a finer-grained deployment model where applications, **bundled as one or more functions**, are uploaded to a platform and then **executed, scaled, and billed** in response to the **exact demand needed** at the moment.

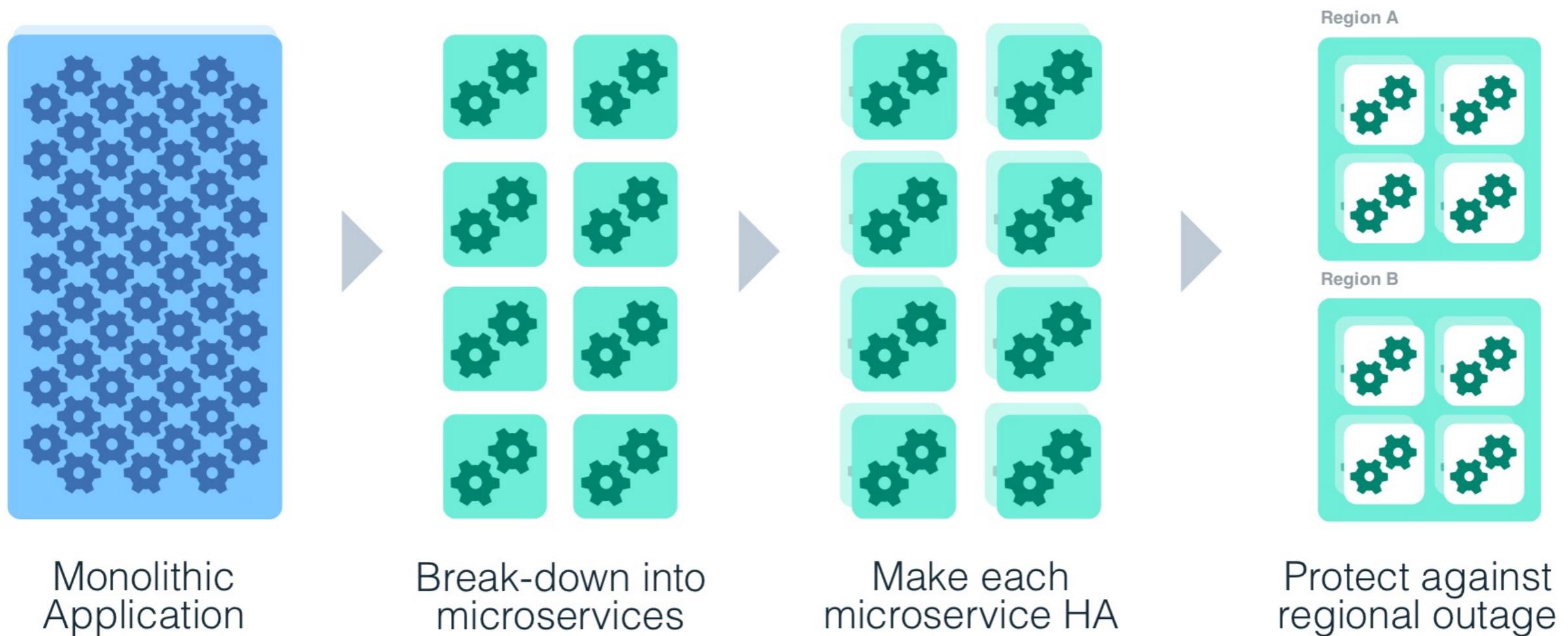
It refers to the idea that consumers of serverless computing no longer need to spend time and resources on **server provisioning, maintenance, updates, scaling, and capacity planning**. Instead, all of these tasks and capabilities are handled by a serverless platform and are completely abstracted away from the developers

<https://github.com/cncf/wg-serverless/tree/master/whitepapers/serverless-overview>

What is Serverless?



What is Serverless?



What is Serverless?

Runs code **only** on-demand on a per-request basis

Serverless deployment & operations model



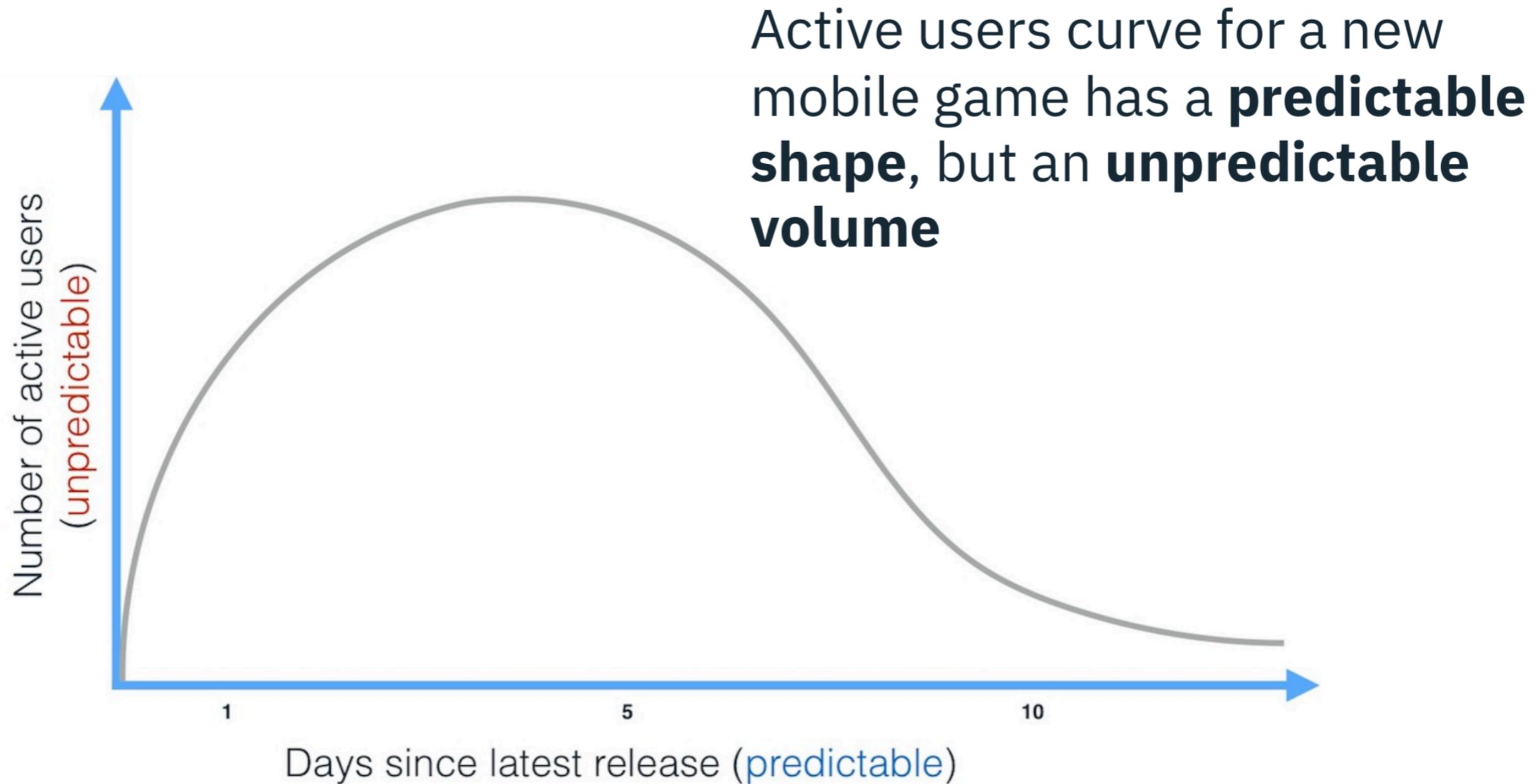
Not your problem



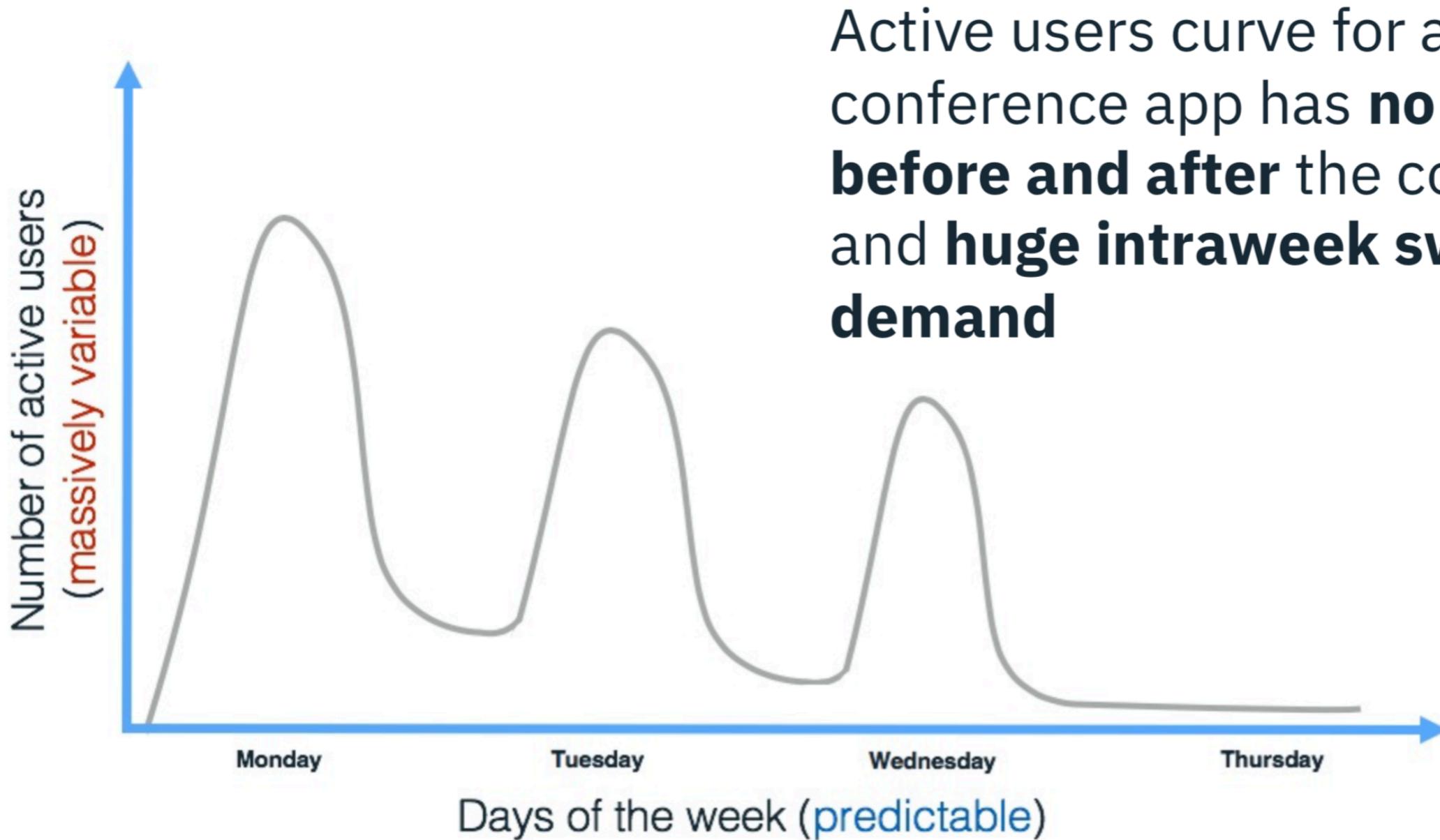
Focus on CODE

Why Serverless?

Why Serverless?

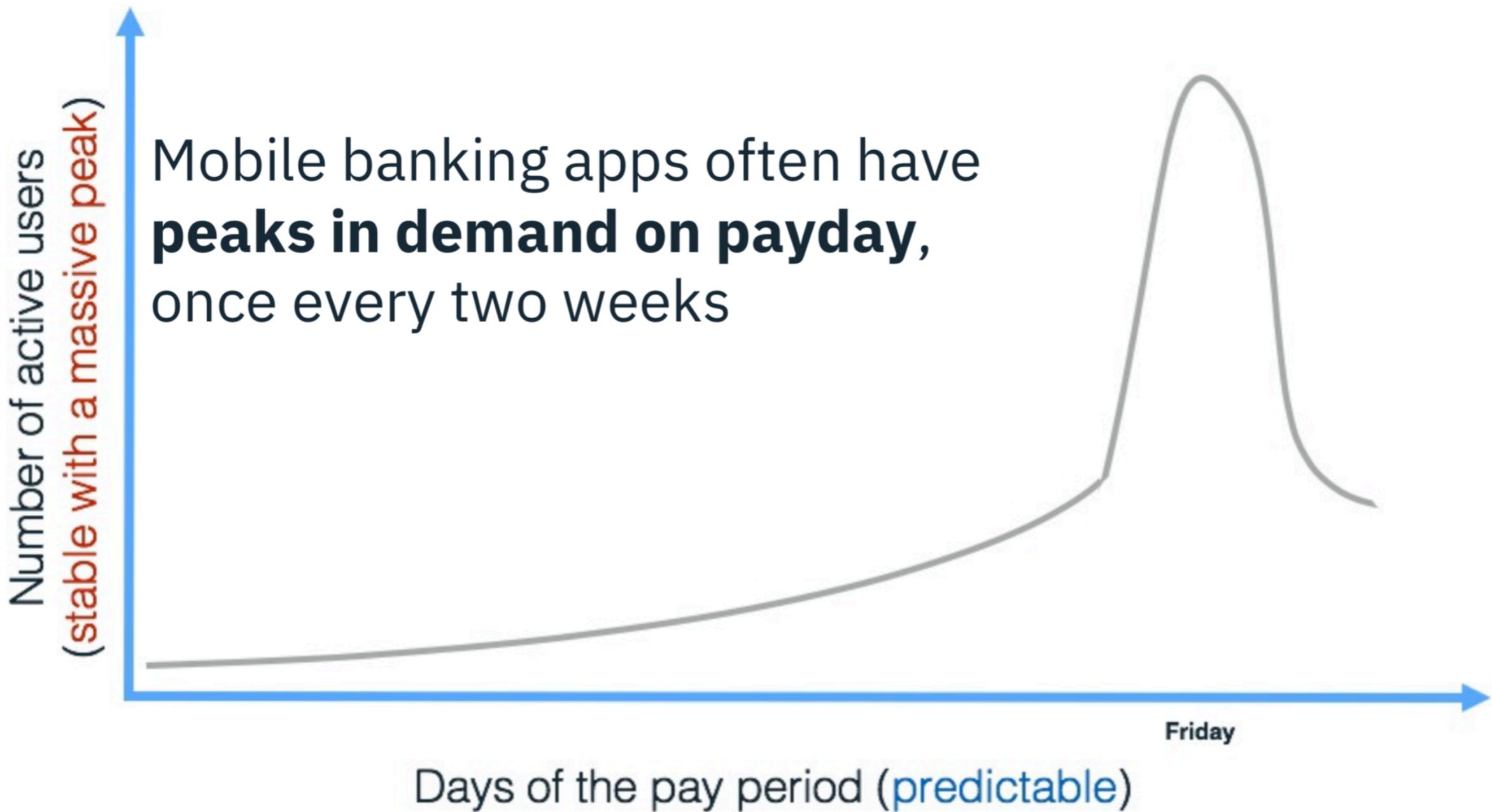


Why Serverless?



Active users curve for a mobile conference app has **no demand before and after** the conference, and **huge intraweek swings in demand**

Why Serverless?

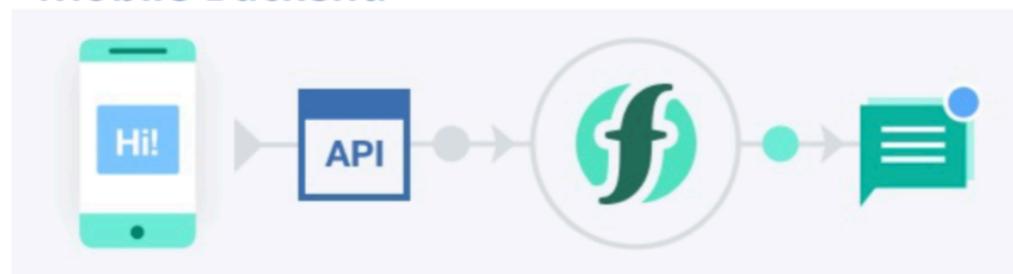


Serverless Use Cases

Serverless Backends



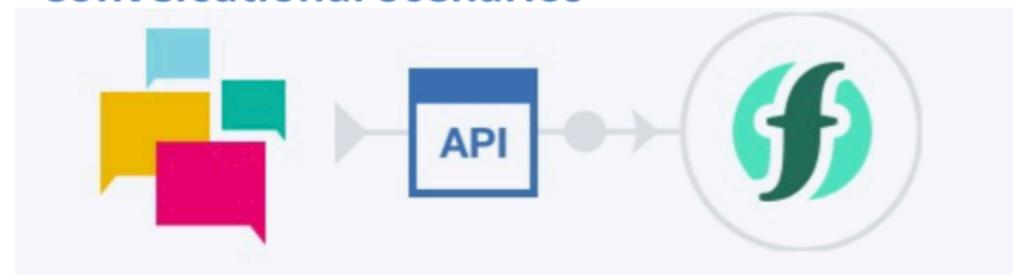
Mobile Backend



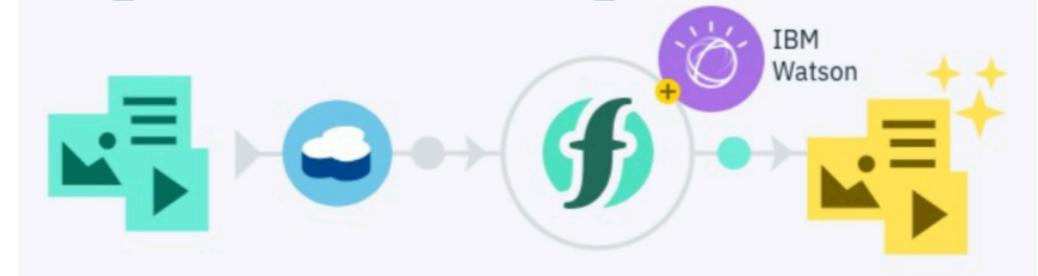
Data Processing



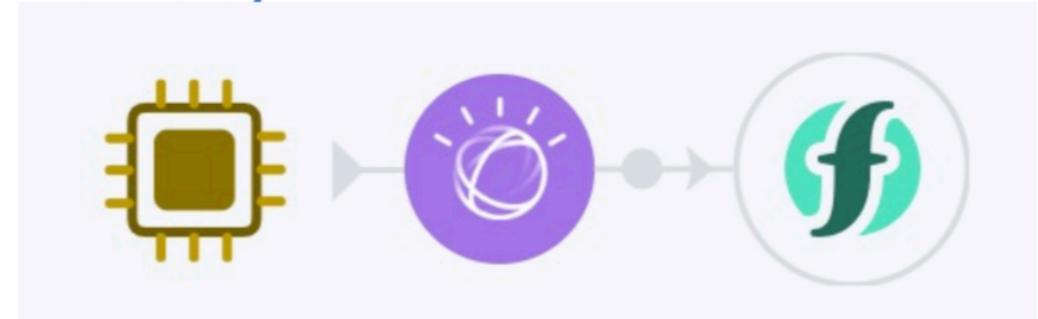
Conversational Scenarios



Cognitive Data Processing



IoT Ready



Event Stream Processing



Scheduled Tasks



Serverless Use Cases

- * Asynchronous, concurrent, easy to parallelize into independent units of work
- * Infrequent or has sporadic demand, with large, unpredictable variance in scaling requirements
- * Stateless, ephemeral, without a major need for instantaneous cold start time
- * Highly dynamic in terms of changing business requirements that drive a need for accelerated developer velocity

Serverless Use Cases

- * Static web sites (Contact forms)
- * Automated backups
- * Bots
- * Tasks like uptime checks, policy enforcement
- * Background jobs
- * Prototypes

Serverless Languages

Amazon Lambda

Node.js, Python, Java, C#, PowerShell, Ruby and Go

IBM Cloud Functions

Node.js 8, Node.js 6, Python 3.6.4, Python 3.6.1, PHP 7.1, PHP 7.2, and Swift 4, Swift 3.1.1, Ruby, Other languages can be added via Docker container (for example Java)

Based on open source OpenWhisk serverless platform. Can create your own serverless platform based on OpenWhisk

Microsoft Azure

C#, F#, Node.js (in GA) Java, Python, PHP, TypeScript, Bash, PowerShell (experimental mode)

Google Cloud Functions

Node.js, Python, Go

Execution Time Limit

Amazon Lambda

15 minutes (prev. 5 minutes)

IBM Cloud Functions

10 minutes

Microsoft Azure

10 minutes

Google Cloud Functions

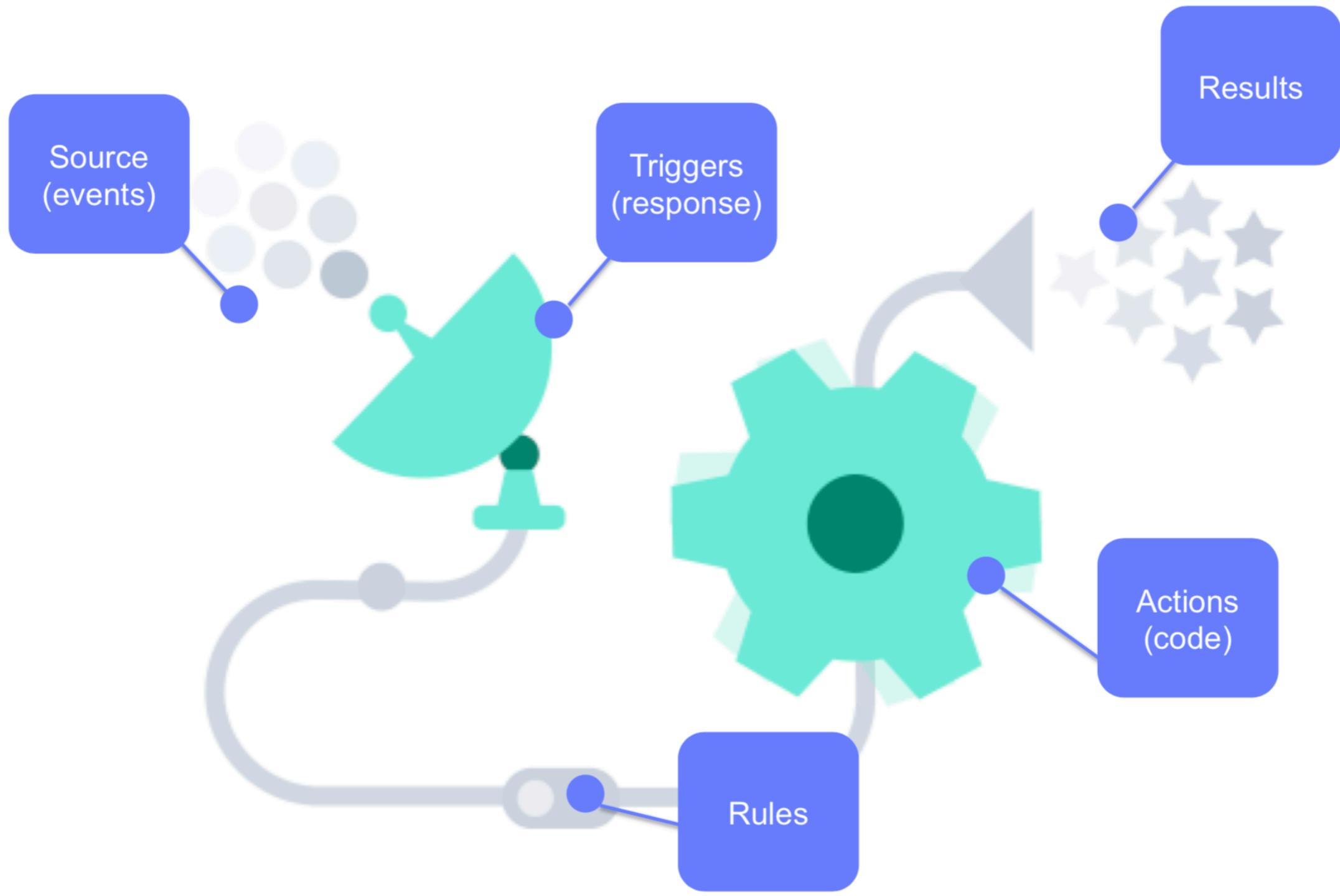
9 minutes

Serverless Latency

- * Cold Start (when functions start after a long time, it may take longer)
- * Workaround: keep your function warm with schedule invocations
- * Type of application you're building is important.
 - * Cold start may be OK for a backend app
 - * Not if you're sending a rocket into space

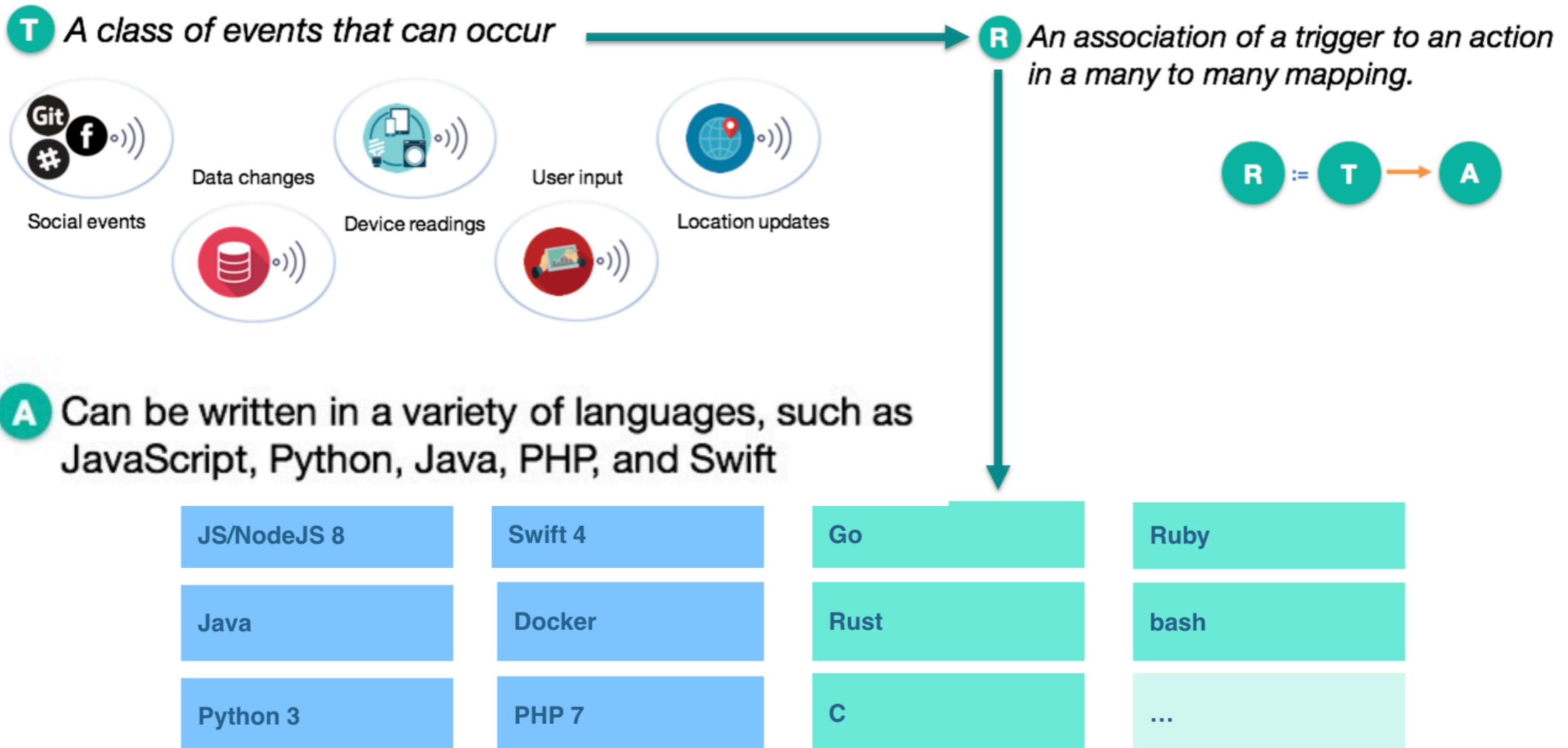
IBM Cloud Functions

(Apache OpenWhisk)



IBM Cloud Functions

(Apache OpenWhisk)



IBM Cloud Functions

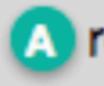
(Apache OpenWhisk)

P

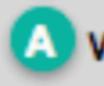
A shared collection of triggers and actions



IBM Cloudant*



A read



A write



T changes



IBM Watson



A translate



The Weather Company



A forecast

Open
Source



A post
T topic

Third
Party

Git

T commit

Yours



A myAction
T myFeed

IBM Cloud Functions

(Apache OpenWhisk)

	Open source	Hosted service
Serverless engine	Apache OpenWhisk	IBM Cloud Functions
API Gateway	LoopBack	IBM API Gateway
Databases	Apache CouchDB MySQL	IBM Cloudant IBM Compose
Message streams	Apache Kafka	IBM Message Hub

IBM Cloud Functions

(Apache OpenWhisk)

- * Functions are stateless. Need some sort of persistence between runs.
- * Are you able to test and develop locally? `ibmcloud fn` CLI
- * Can you easily version your functions? Source control?
- * Can you easily monitor your functions?
- * Security and API gateway
- * Avoid long-running loops / mini-monoliths?
- * Latency (cold, warm and hot loads)
- * How do you track dependencies?

LET'S CREATE A FUNCTION

CLOUD.IBM.COM

Don't Use Serverless!

When should you not use Serverless?

- * Extensive customization/flexibility
- * Very long-running task that can't be broken down
- * Complex computation, high memory requirements
- * Extremely fast response time
- * Service availability > cloud functions service availability

SERVERLESS + BLOCKCHAIN

Serverless + Blockchain

- * Serverless Peers
- * Blockchain as ledger/data store
- * Hyperledger database in the cloud
- * Distributed database

Resources

Lists

- <https://github.com/anaibol/awesome-serverless>
- <https://github.com/pmuens/awesome-serverless>
- <https://twitter.com/tmclaughbos/lists/serverless>

Email newsletter

- <https://serverless.email/>

Code Patterns

- <https://developer.ibm.com/patterns/category/serverless/>

Serverless architecture

- <https://martinfowler.com/articles/serverless.html>

Code Patterns

CODE PATTERN | NOV 28, 2018

Implementing mobile user authentication

[Get the Code »](#)

IBM Cloudant Local (NoSQL)
Mobile Development +

CODE PATTERN | NOV 28, 2018

Analyze large data sets collected from a long-range IoT system that uses LoRaWAN networking

[Get the Code »](#)

Data Science IoT +

CODE PATTERN | NOV 27, 2018

Technical support ticket classification using Watson Natural Language Classification

[Get the Code »](#)

Artificial Intelligence Data Science +

CODE PATTERN | NOV 26, 2018

Stream and store retail order data for analysis

[Get the Code »](#)

Akka Analytics +

CODE PATTERN | NOV 19, 2018

Build a handwritten digit recognizer in Watson Studio and PyTorch

[Get the Code »](#)

Analytics Artificial Intelligence +

CODE PATTERN | NOV 16, 2018

Build an AR avatar for the iPhone

[Get the Code »](#)

Artificial Intelligence Conversation +

CODE PATTERN | NOV 16, 2018

Implement digest authentication in unsupported tools

[Get the Code »](#)

API Management Docker +

CODE PATTERN | NOV 14, 2018

Develop a voting application using Hyperledger and Ethereum

[Get the Code »](#)

Blockchain Hyperledger Fabric



IBM Developer

San Francisco Bay Area

#IBMCODESF

THU, FEB 28, 12:00 PM

Lunch and Learn : Let's build some bots - An IBM / Twilio joint workshop

📍 44 Tehama St

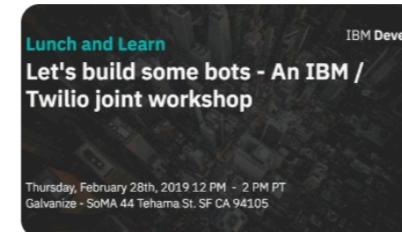
Come join IBM developer SF's meetup and learn how to build bots. Grab free food learn new things, and connect with fellow developers who are interested in the same topic as you. What are you waiting for? Sign up NOW! Talk 1 Most Bot and...



105 attendees

Manage

Going



Part of IBM Developer – 27 groups

IBM Developer SF Bay Area

📍 San Francisco, CA

👤 6,080 members · Public group

👤 Organized by Angie K and 6 others

Share: [f](#) [t](#) [in](#)

WED, MAR 6, 9:30 AM

Online Meetup: Serverless Java - Mobile Serverless Backend as a...

📍 Needs a location



REGISTER on Crowdcast: <https://www.crowdcast.io/e/serverless-java---mobile> So you've been hearing a lot of buzz about Serverless tech in conjunction with Mobile, but what exactly is the serverless or cloud functions? Come find out at IBM...



11 attendees

Manage

Going

IBM Partners

Enabling Independent Software Vendors (ISVs)
and tech companies for growth

Target audience

- ISVs and tech companies building and selling cloud solutions
- New to IBM Cloud
- Startups who aspire to build and sell their own solutions

Offers to help you get started



Build with up to \$12,000 of free IBM Cloud™ credits (\$1,000 per month for 12 months)

Integrate your solutions with leading-edge IBM Cloud technologies to deliver more innovation and value to your clients. Access more than **130 unparalleled services** including Watson™, Analytics and Security.



Build with 10TB of IBM Cloud Object Storage at no charge

Build data capability into your offering. IBM Cloud Object Storage is designed for high durability, resiliency and security.



Build with IBM Watson Assistant with a 1-year free trial

Receive access to 100K API calls per month plus 10 workspaces. Build and deploy chatbots quickly and efficiently with IBM Watson Assistant's advanced capabilities and seamless interface.



Build with IBM Cloud Kubernetes Service with a 1-year free trial

Containerize your solution with 1TB of block storage. Ship all your applications in one agile, well-defined structure with IBM Cloud Kubernetes Service.



Build with IBM Blockchain with a 6-month free trial

Build a network with up to 3 organizations to prototype. Build a secure business transaction network for your clients using blockchain and smart contracts.



Finished building and testing? Go-to-market with IBM

Access Provider Workbench, attend an orientation session and join the premier network of over 400 partners who are already listing their solutions on the IBM Marketplace.



Is your business a Startup? Build with up to \$120,000 in IBM Cloud credits

If your business revenue in the last 12 months is less than \$1M and you've been in business for fewer than five years, then you may qualify for Startup with IBM.

Get started

Experience IBM's countless partner benefits. Start building and selling with IBM today.

Learn more and access offers at ibm.com/partners/start

THANK YOU!

DAVID NUGENT

DEVELOPER ADVOCATE, COGNITIVE, DATA AND ANALYTICS

› DRNUGENT@IBM.COM

› [@DRNUGENT](https://twitter.com/DRNUGENT)

› [MEDIUM.COM/@DRNUGENT](https://medium.com/@DRNUGENT)

SIGN UP: [CLOUD.IBM.COM](https://cloud.ibm.com)