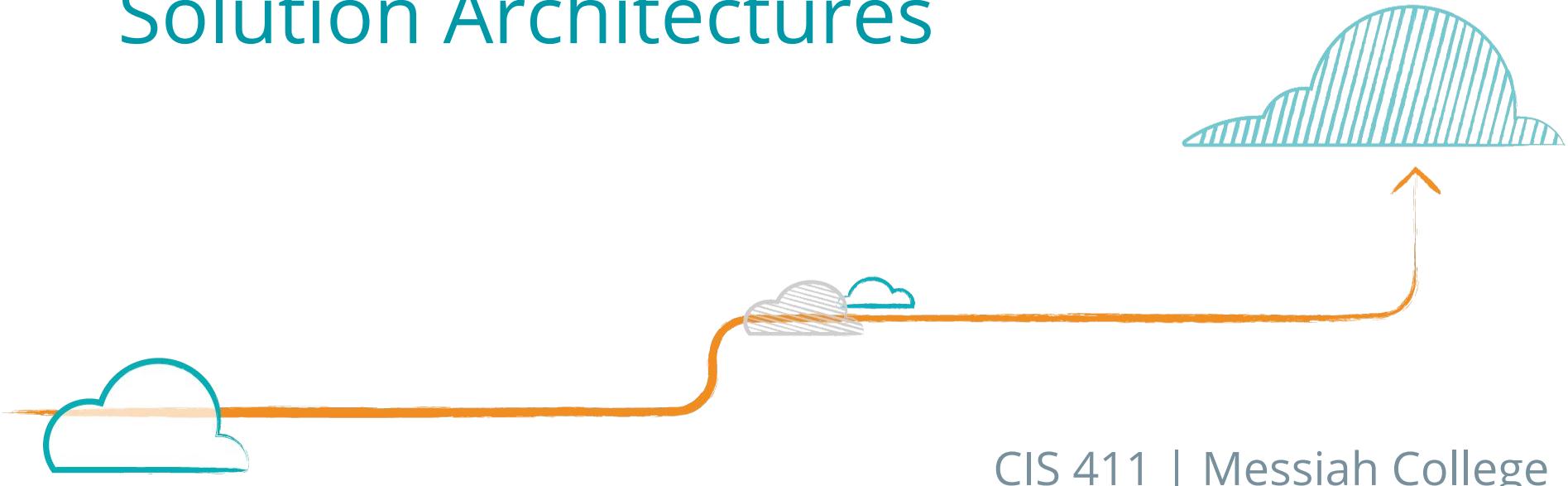


Solution Architectures



Agenda

Attendance, Agenda & Devotions

Fundamentals of Software Architecture

Architecture Patterns

Architecture Case Study

Look Ahead

Lab

Design & Structure

in Scripture



400 YEARS PASS

1-18 EXODUS FROM EGYPT

1-1 PHARAOH TRIES TO DESTROY ISRAEL

CONFRONTATION BETWEEN GOD & PHARAOH

15 SONG OF THE SEA

16-18 IN THE WILDERNESS

THE POINT

- GOD KNEW PHARAOH WOULD RESIST, BUT STILL GAVE HIM MANY CHANCES
- PHARAOH'S EVIL REACHES A POINT OF NO RETURN
- GOD BENDS PHARAOH'S EVIL TO HIS PURPOSES & LURES HIM INTO HIS OWN DESTRUCTION

PASSOVER

'GOD HARDENED PHARAOH'S HEART'

'GOD HARDENED PHARAOH'S HEART'

IT WAS BETTER IN EGYPT!

ARE YOU TRYING TO KILL US?!

WHERE'S THE FOOD & WATER?

EXODUS

GOD'S COVENANT PROMISES

ABRAHAM (GENESIS 12, 15, 17): GOD'S BLESSING TO ALL NATIONS
ISRAEL (EXODUS 19: 1-6) { KINGDOM OF PRIESTS TO THE NATIONS
 RESTORATION OF GOD'S PRESENCE

19-40 COVENANT AT MT. SINAI

19-21 GOD'S COVENANT WITH ISRAEL

TERMS OF THE COVENANT: (CHS 20-23)

- THE 10 COMMANDMENTS
- 52 MORE COMMANDS ABOUT WORSHIP & SOCIAL JUSTICE

SIGN US UP!

25-31 TABERNACLE BLUEPRINT

32-34 ISRAEL BREAKS THE COVENANT

35-40 MOSES BUILDS THE TABERNACLE

LOT'S OF SYMBOLISM

GARDEN OF EDEN

MOST HOLY SPACE HOT SPOT OF GOD'S PRESENCE

ARK OF THE COVENANT

MOSES CAN'T ENTER

LEAVE ME ALONE THAT I MAY DESTROY THEM.

HERE ARE YOUR GODS WHO BROUGHT YOU OUT OF EGYPT.

MAKE US A GOD!

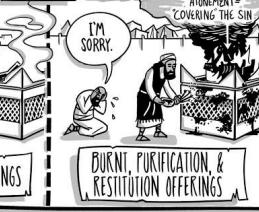
REMEMBER YOUR COVENANT PROMISE TO ABRAHAM!

'THE LORD IS MERCIFUL AND GRACIOUS, SLOW TO ANGER, ABUNDING IN COVENANT FAITHFULNESS. HE FORGIVES SIN, BUT WILL NOT LEAVE THE WICKED UNPUNISHED.' (34: 6-7)

created by The Bible Project



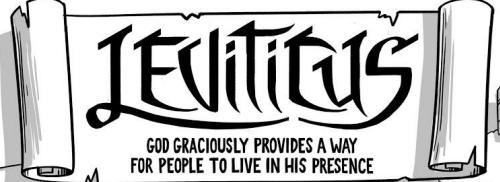
1-7 RITUAL SACRIFICES



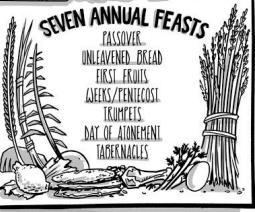
ATONEMENT = COVERING THE SIN

THANK YOU!
I'M SORRY.

BURNT, PURIFICATION, & RESTITUTION OFFERINGS



23-25 RITUAL FEASTS



SEVEN ANNUAL FEASTS

PASSOVER, UNLEAVENED BREAD, FIRST FRUITS, WEEKS/PENTECOST, TRUMPETS, DAY OF ATONEMENT, TABERNACLES

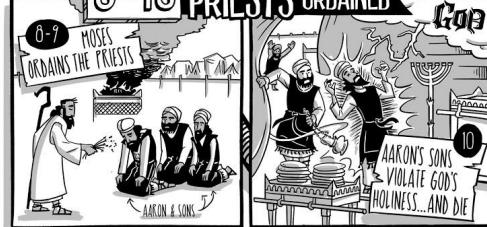


NUMBERS 1:1

THE LORD SPOKE TO MOSES IN THE TENT

CALL TO COVENANT FAITHFULNESS
OBEDIENCE PEACE & ABUNDANCE IN THE LAND
UNFAITHFULNESS DISASTER & EXILE FROM THE LAND

8-10 PRIESTS ORDAINED

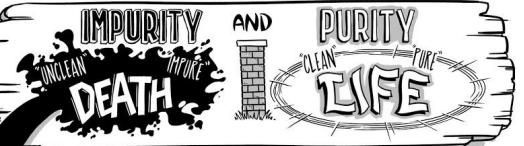


8-9 MOSES ORDAINS THE PRIESTS

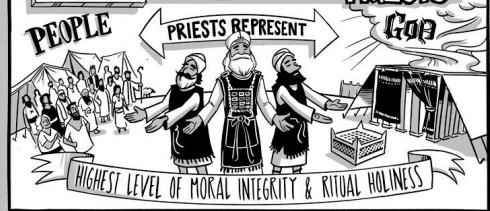
GOD

AARON'S SONS VIOLATE GOD'S HOLINESS...AND DIE

AARON & SONS



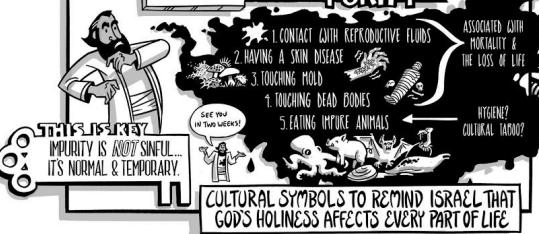
21-22 QUALIFICATIONS FOR PRIESTS



PEOPLE ← PRIESTS REPRESENT → GOD

HIGHEST LEVEL OF MORAL INTEGRITY & RITUAL HOLINESS

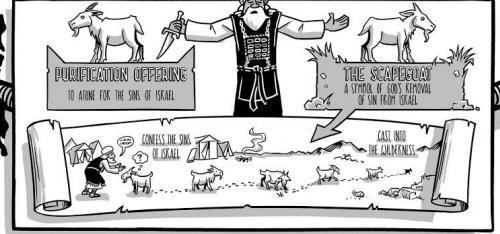
11-15 RITUAL PURITY



THIS IS KEY
IMPUITY IS NOT SINFUL.
IT'S NORMAL & TEMPORARY.

- 1. CONTACT WITH REPRODUCTIVE FLUIDS
 - 2. HAVING A SKIN DISEASE
 - 3. TOUCHING MOLD
 - 4. TOUCHING DEAD BODIES
 - 5. EATING IMPURE ANIMALS
- HYGIENE CULTURAL TABOO?
- CULTURAL SYMBOLS TO REMIND ISRAEL THAT GOD'S HOLINESS AFFECTS EVERY PART OF LIFE

16-17 DAY OF ATONEMENT



PURIFICATION OFFERING
TO ATONE FOR THE SINS OF ISRAEL

THE SCAPEROAT
A SYMBOL OF GOD'S REMOVAL OF SIN FROM ISRAEL

18-20 MORAL PURITY

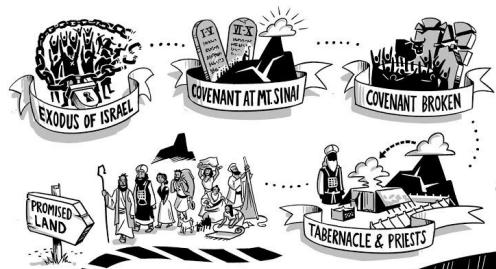


CARE FOR THE POOR

SEXUAL INTEGRITY

SOCIAL JUSTICE

ISRAEL CALLED TO LIVE DIFFERENTLY THAN THE CANANITES



NUMBERS

REBELLION IN THE WILDERNESS
GOD BRINGS JUDGEMENT... AND SHOWS MERCY.



WARNING
GOD IS FAITHFUL TO HIS PROMISES, BUT WILL LET HIS PEOPLE WALK AWAY AND FACE THE CONSEQUENCES.

1-10a MT. SINAI

- 1-7 ISRAEL NUMBERED & ARRANGED
- CENSUS: REUBEN — 467,000 GAV — 43,721 MANASSEH — 32,500 LESHON — 32,500 JUDAH — 405,500
- LEVITES
- PRIESTS
- JUDAH
- LAWS ABOUT RITUAL PURITY

10b-12 TRAVEL

PEOPLE COMPLAIN: WHERE'S THAT MANNA? IT WAS BETTER IN EGYPT! LET'S GO BACK TO EGYPT!!!

13-19 WILDERNESS OF PARAN

SPY OUT THE LAND! THE CANANITES WILL DESTROY US!!! NOT GOD WILL SAVE US!! CALEB & JOSHUA: LET'S GO IN AND TAKE IT!!

13-14 SPIES EXPLORE THE PROMISED LAND

15-17 REBELLION OF KORAH: REMEMBER YOUR PROMISE TO ABRAHAM!

YOU'VE GOT TOO FAR, MOSES! WHO ARE YOU TO LEAD US?

20-21 TRAVEL

PEOPLE COMPLAIN & MOSES REBELS: WHEE! TINNINNINNISH!! YOU REBELS!! MUST WE BRING WATER OUT OF THIS ROCK?

MOSES: YOU WILL NOT ENTER THE PROMISED LAND EITHER.

22-36 PLAINS OF MOAB

22-25 BALAM & THE KING OF MOAB: CURSE ME FOR ME! SEE GENESIS 12

BALAK: HOW CAN I CURSE SOMEONE GOD HAS NOT CURSED? GOD HAS BLESSED THEM AND I CAN'T CHANGE IT!

BALAM: A SCEPTER WILL ARISE OUT OF ISRAEL. SEE GENESIS 49

26-30 THE NEXT GENERATION PREPARES TO ENTER THE LAND: NEW CENSUS: ISRAEL — 601,731 ZEBULUN — 57,470 EPHRAIM — 40,571 BENJAMIN — 35,172 FISHER — 4,700

31-36 VICTORY OVER ENEMIES: TRIBES BEGIN TO SETTLE

A STRANGE SYMBOL: GOD'S JUDGMENT BECOMES A SOURCE OF LIFE

21 THE BRONZE SNAKE

25

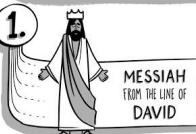
AUTHOR:



Matthew
SEE 9:9 & 10:3



THE GOSPEL ACCORDING TO MATTHEW



Things to look for

#1

LOOK UP OLD TESTAMENT QUOTATIONS
(THERE ARE A LOT)

#2

LOOK CLOSELY AT THE PEOPLE WHO ACCEPT JESUS

[IRRELIGIOUS + UNIMPORTANT]

+ FAITH = TRANSFORMATION



1-3 CONNECT JESUS TO OLD TESTAMENT

FULFILL OLD TESTAMENT PROPHETIC PROMISES

Immanuel
= GOD WITH US

1

2

3

4

5

Moses | Jesus

- OUT OF EGYPT
- CROSS THE RED SEA
- WILDERNESS FOR 10 YEARS
- RECEIVES LAW FROM MOUNTAIN
- OUT OF EGYPT
- BAPTISM IN THE JORDAN RIVER
- WILDERNESS FOR 40 DAYS
- GIVES LAW FROM MOUNTAIN

JESUS > MOSES

- DELIVER FROM SLAVERY
- GIVE NEW DIVINE TEACHING
- SAVE FROM SIN
- INITIATE A NEW COVENANT

4-7 ANNOUNCE GOD'S KINGDOM

SERMON ON THE MOUNT (ch 5-7)

- KING'S OPERATION FOR THE WORLD
- CONFIRM EVIL
- RESTORE GOD'S REIGN
- CREATE A NEW FAMILY

HOW TO LIVE IN GOD'S KINGDOM

- TRANSFORM HEARTS TO LOVE
- REFUGEE REFUGEE
- STUDENT LEADERS
- MINISTER MEN
- WEEKLY MEETINGS
- TELL YOUR FRIENDS

8-10 JESUS BRINGS KINGDOM INTO PEOPLE'S LIVES

SENDING THE 12 (ch 10)

- EXPECT ACCEPTANCE AND REJECTION

POSITIVE

- CONFIRMATION
- CONFIRMATION
- CONFIRMATION
- CONFIRMATION
- CONFIRMATION
- CONFIRMATION

NEUTRAL

- CONFIRMATION
- CONFIRMATION
- CONFIRMATION
- CONFIRMATION
- CONFIRMATION
- CONFIRMATION

NEGATIVE

- CONFIRMATION
- CONFIRMATION
- CONFIRMATION
- CONFIRMATION
- CONFIRMATION
- CONFIRMATION

11-13 RESPONSES TO JESUS

PARABLES ABOUT THE KINGDOM (ch 13)

- JESUS IS THE MESSIAH!
- IS HE THE MESSIAH?
- HE IS NOT THE MESSIAH

14-20 DIFFERENT EXPECTATIONS ABOUT THE MESSIAH

THE UPSIDE DOWN KINGDOM (ch 15-19, 20)

- BANK OF SKINNY
- REVENGE VS PURSE
- GAIN TRUE WEALTH BY GIVING IT AWAY

SUFFERING SERVANT (ISAIAH 53)

PETER & DISCIPLES

PHARISEES

VICTORIOUS! DEFEATS PAGANS!

21-25 CLASH OF KINGDOMS 3

- ASSERTING AUTHORITY
- SOLD TEMPLE AS COMPROMISED BECAUSE OF HYPOCRISY
- OFFENDED DECIDE TO KILL JESUS

VS

PETER & JAMES

WHO DO YOU SAY THAT I AM? THAT I AM THE KING OF THE JEWS?

PETER & DISCIPLES

YOU ARE A FOOL!

PHARISEES

VICTORIOUS! DEFEATS PAGANS!

26-28 PASSOVER MEAL

REFILLS THE STORY OF...

- RESUE FROM SLAVERY
- DEATH OF PASSOVER LAMB

NEW MEANING

RESUE FROM...

- EVIL & SIN
- DEATH OF JESUS

YOU HAVE BLASPHEMED GOD!

SANHEDRIN (JEWISH LEADERS)

PILATE

HE'S INNOCENT BUT...

LET HIM BE CRUCIFIED!

YOU'RE NOT THE MESSIAH!

HE IS A FOOL!

NOT A FAILURE

SUFFERING SERVANT

INSTEAD OF JUDGING THEM HE IS JUDGED ON THEIR BEHALF

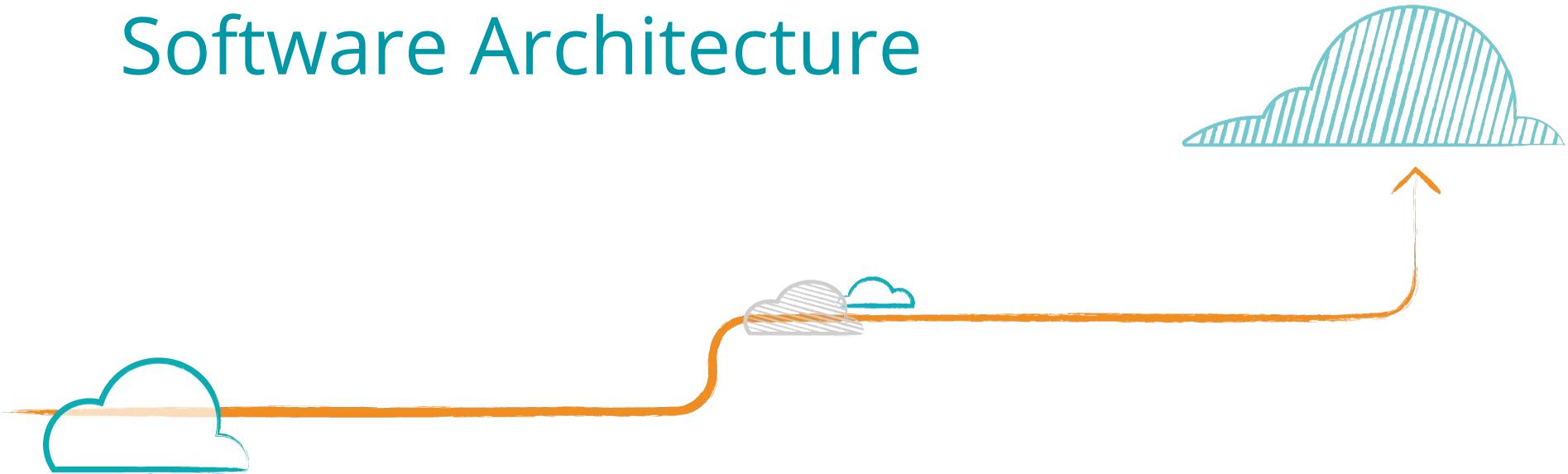
GREAT COMMISSION

- JESUS IS KING OF THE WORLD
- TELL ALL NATIONS THE GOOD NEWS
- ALL PEOPLE CAN JOIN THE KINGDOM
- BE BAPTIZED
- FOLLOW JESUS TEACHINGS
- I AM BE WITH YOU IMMANUEL

BOOKS OF MOSES (TORAH)

created by theBible Project

Fundamentals of Software Architecture



What is Software Architecture?

A sufficiently detailed design plan / *blueprint* (often expressed in working code / prototype / demo) for an end-to-end software / technology solution to a business problem that contains some ultimate human benefit/impact.

Four roles of the Software Architect

- Design *Expert*
Command of all relevant phases of sys analysis
- Domain *Expert*
Deep understanding of business, market, and users
- Technology *Expert*
Practical experience w/ relevant platforms & products
- Methodology *Expert*
Best practice knowledge of how to get things done

What goes into a Software Architecture?

- Business Strategy
- Human Constraints
- IT Strategy
- Quality / Reliability / Scalability Attributes
- Design

Business Strategy

- What kind of business are we building / serving?
- Who are the users we're serving and why?
- How are we going to measure this system's value?
- What does the resourcing model for this system look like at scale?
- What are the time constraints in bringing a solution "to market?"
- What are the alternatives (business & technical)?
- Are there other business factors/realities that provide a material constraint to IT strategy or design?
- What are the potential consequences to a reliability issue with this system in production or at scale?

Human Constraints

- What's the change impact of this system? Will it be disruptive to existing people/systems/processes?
- What's the relationship to change in the corporate culture?
- What is the human cross-section of intended users?
- What personnel are available to build and implement this system? What personnel are available to maintain it?
- Management

In a larger company, where is the executive sponsor of this project and what do they care about?

In a smaller company, who owns the budget / decision-making for this project/system?

IT Strategy

How does the (current?) IT strategy / environment impact design choices for this system with regards to:

- Physical environment
- Network / connectivity
- Compute
- Storage
- Programming tools & application development
- Release management
- Security / access control

Quality / Reliability / Scalability

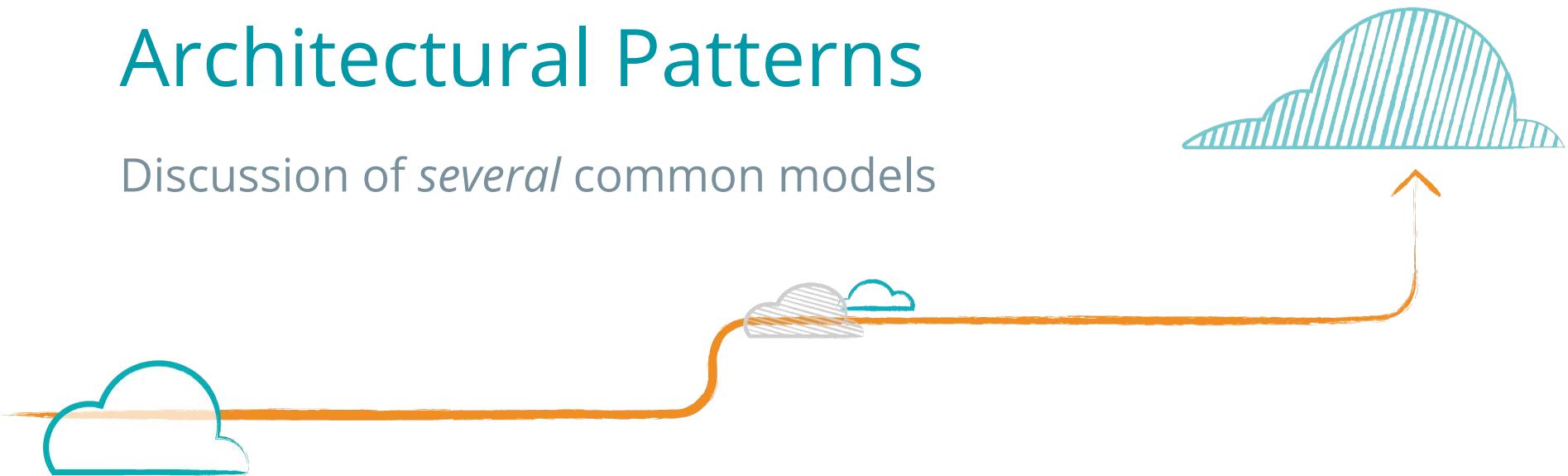
- What are the presumed / known reliability requirements of this system and why?
- How maintainable are the architectural elements (given a best-practice small, empowered teams building and maintaining each element(s))?
- How would growth in the usage of this system affect its topographical map? Where are the potential bottlenecks?
- What's the observability strategy for this architecture in a deployed environment?

Design

- Data Storage
- Data access logic
- Application/business logic
- Presentation logic

Architectural Patterns

Discussion of *several* common models



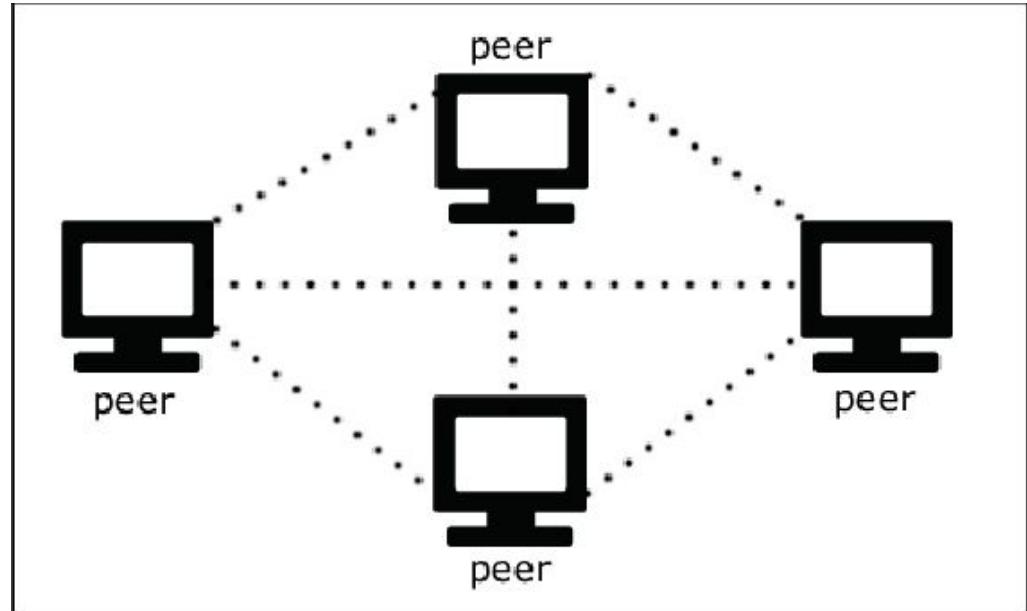
Architectural Patterns

- Peer-to-peer
- Client-server
- MVC
- Layered
- Brokered
- Master-slave
- Blackboard
- Microservice
- *plus ramblings for free*

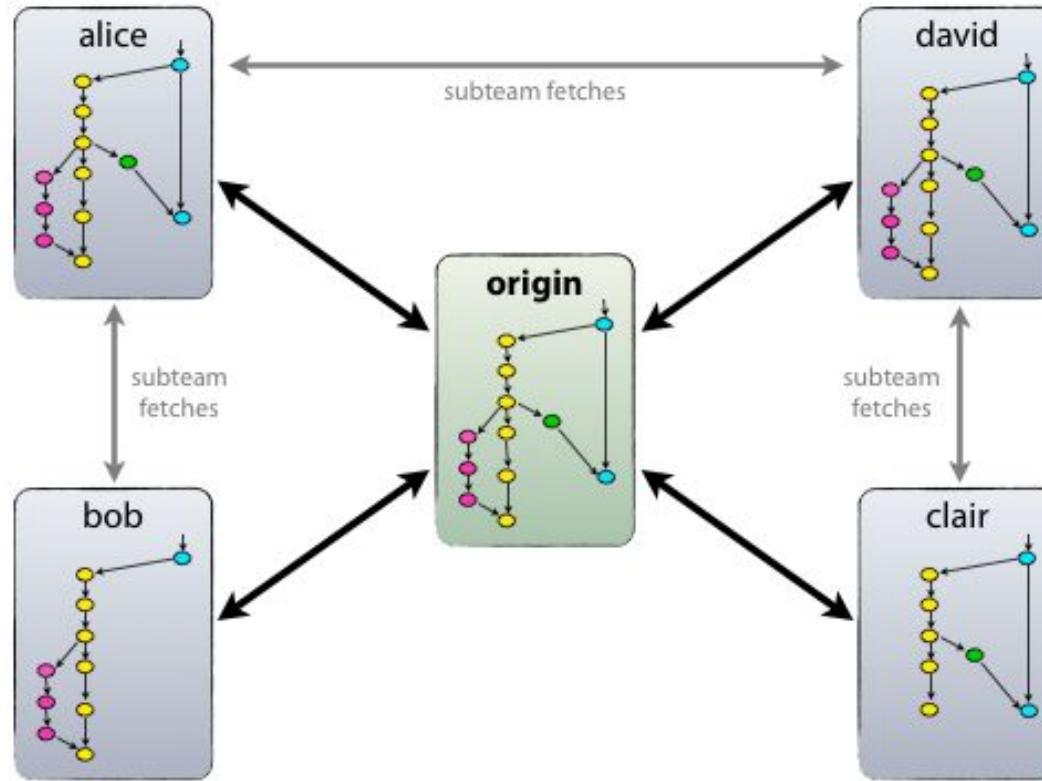
Peer-to-peer

An architecture that distributes control equally to all nodes

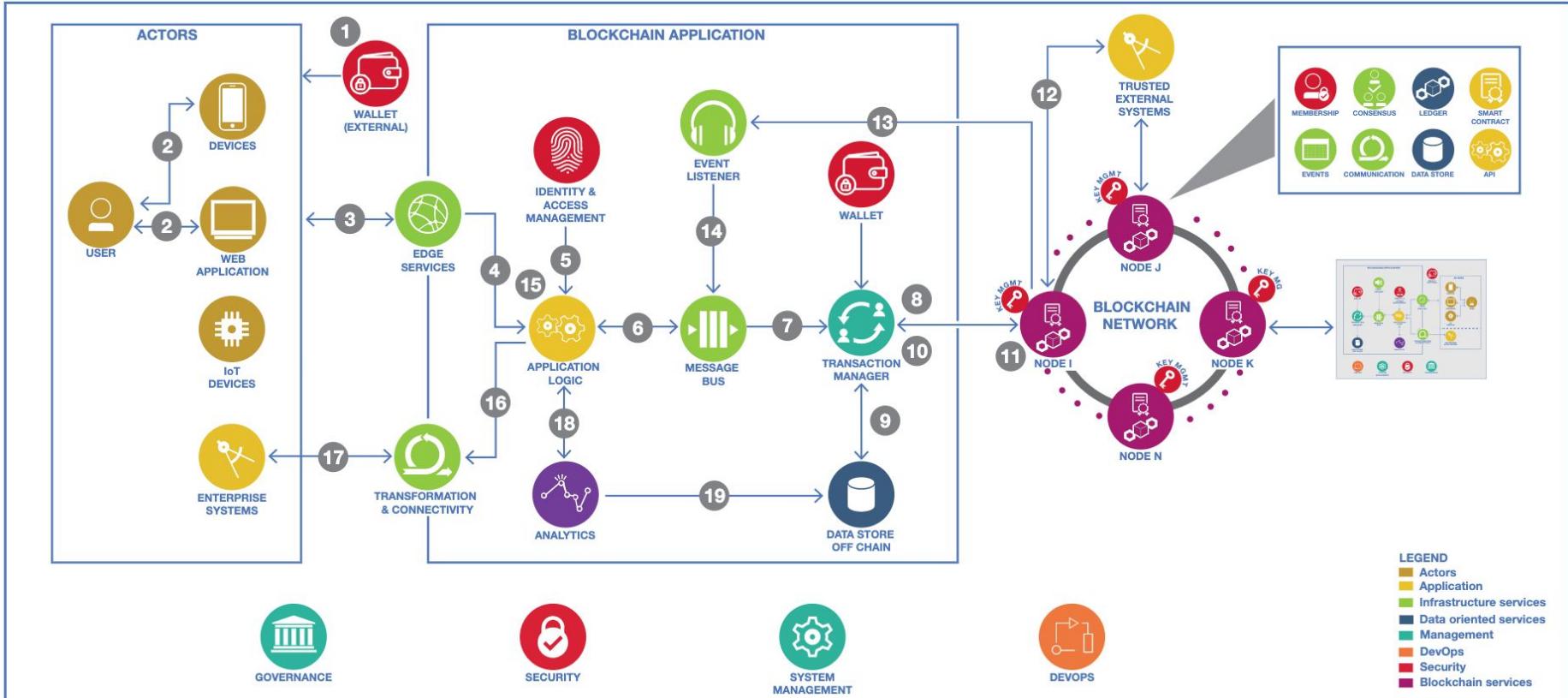
- Decentralized execution and communication
- Limited atomic redundancy
- Requires deep consideration of a continuous release as well as observability strategy



Git



Blockchain

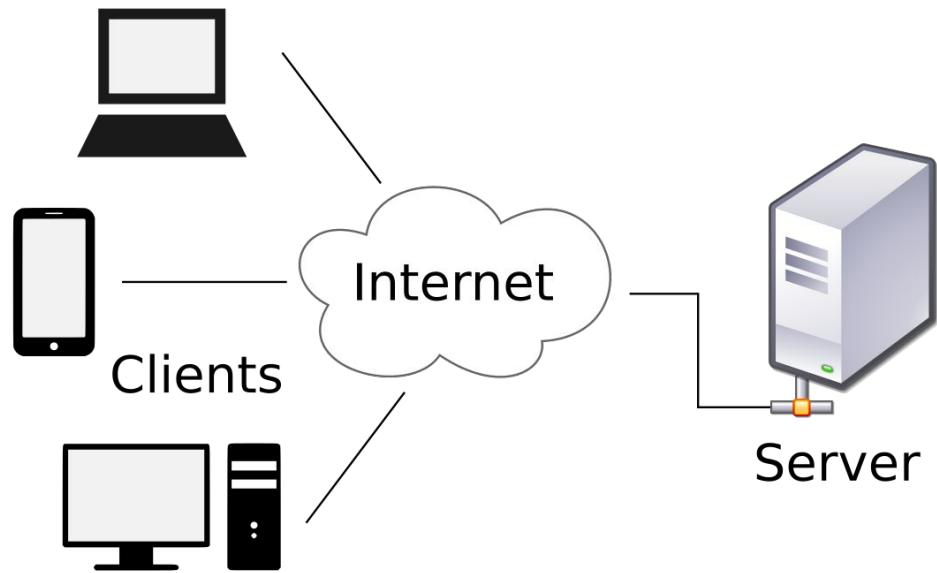


SOURCES: <https://medium.com/@MLSDevCom/blockchain-architecture-basics-components-structure-benefits-creation-beace17c8e77>
<https://www.ibm.com/cloud/architecture/architectures/blockchainArchitecture/reference-architecture>
<https://www.omg.org/cloud/deliverables/CSCC-Cloud-Customer-Architecture-for-Blockchain.pdf>

Client-server

Any architecture that centralizes control in a “single” source

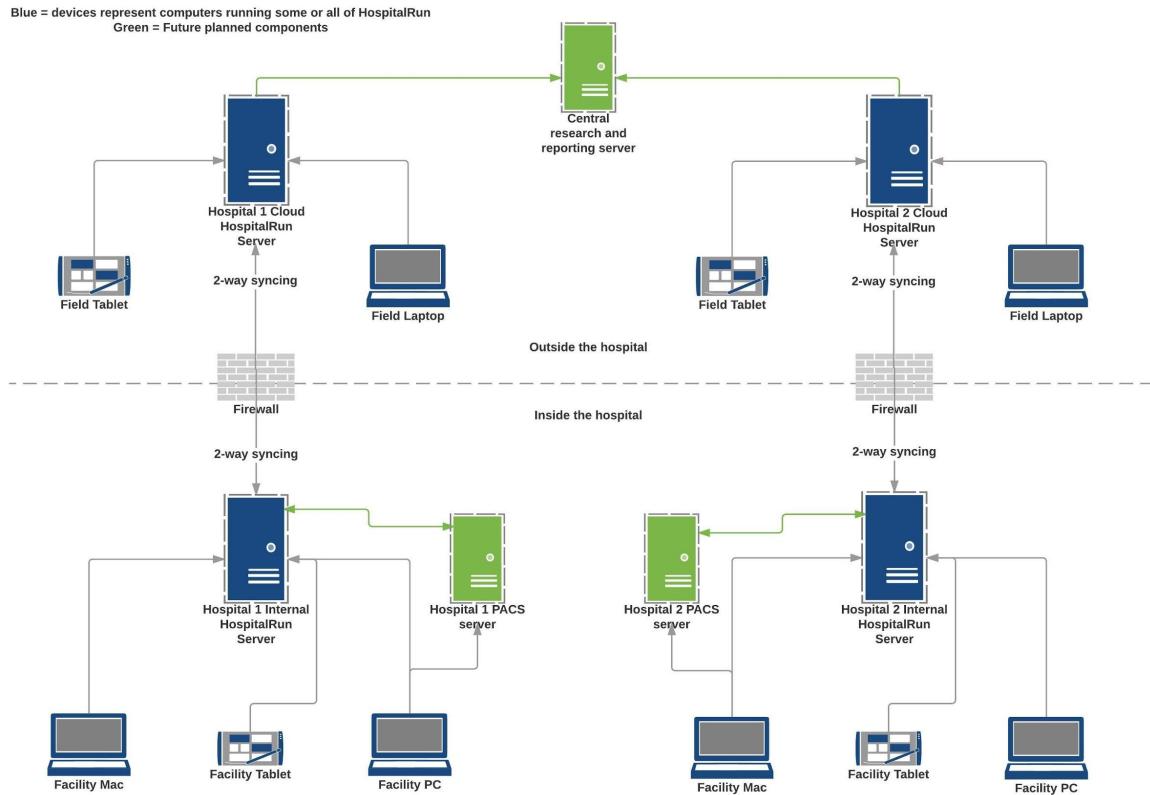
- +Clarity of data authority
- +Centralized control and (often) release mgmt.
- -State / session mgmt. challenges
- -Scaling / reliability challenges



HospitalRun

HOSPITALRUN DEPLOYMENT

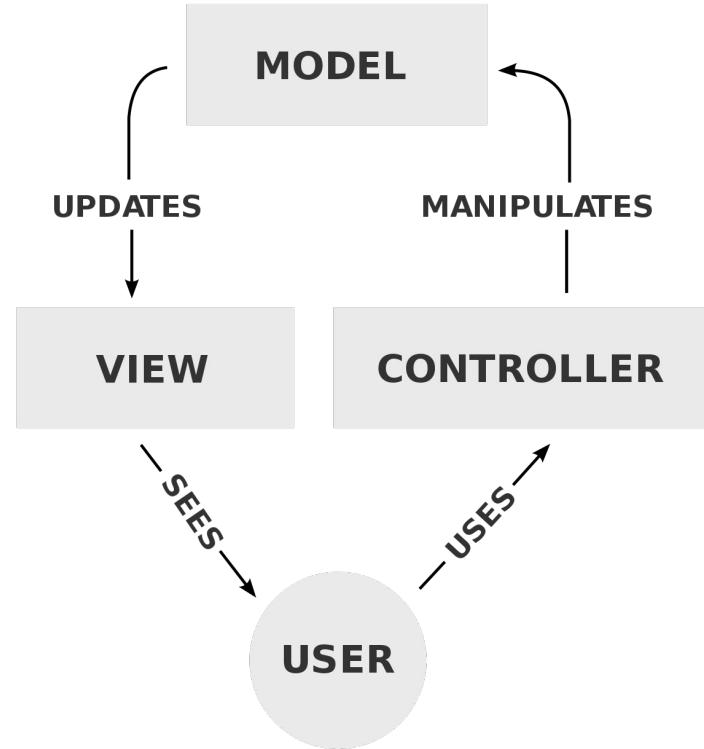
Joel Worrall | May 25, 2016



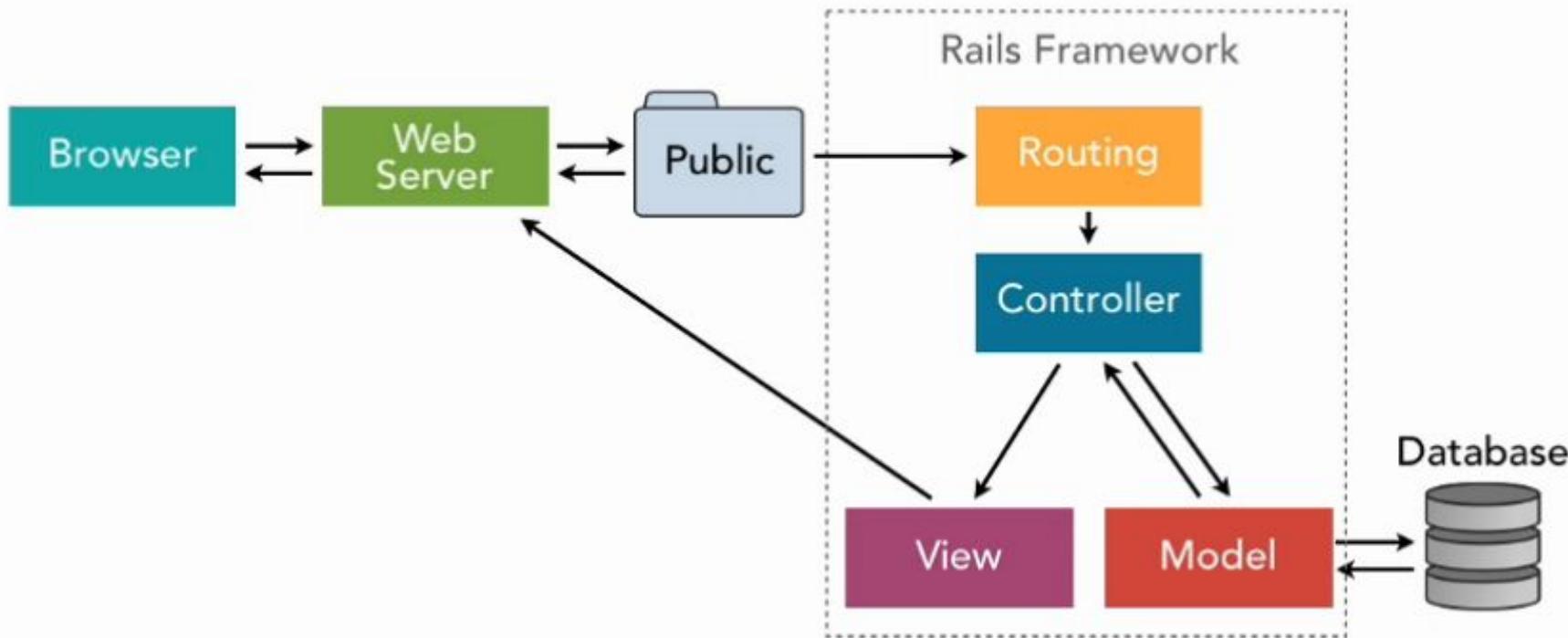
MVC

An architecture that separates modeling information (data definition) from UI/UX (data interaction) from business logic (data rules)

- +Tightly coupled design
- +Easy-to-adopt
- +Logical separations for functional mgmt.
- -Difficult to support multiple, similar views on *same* model



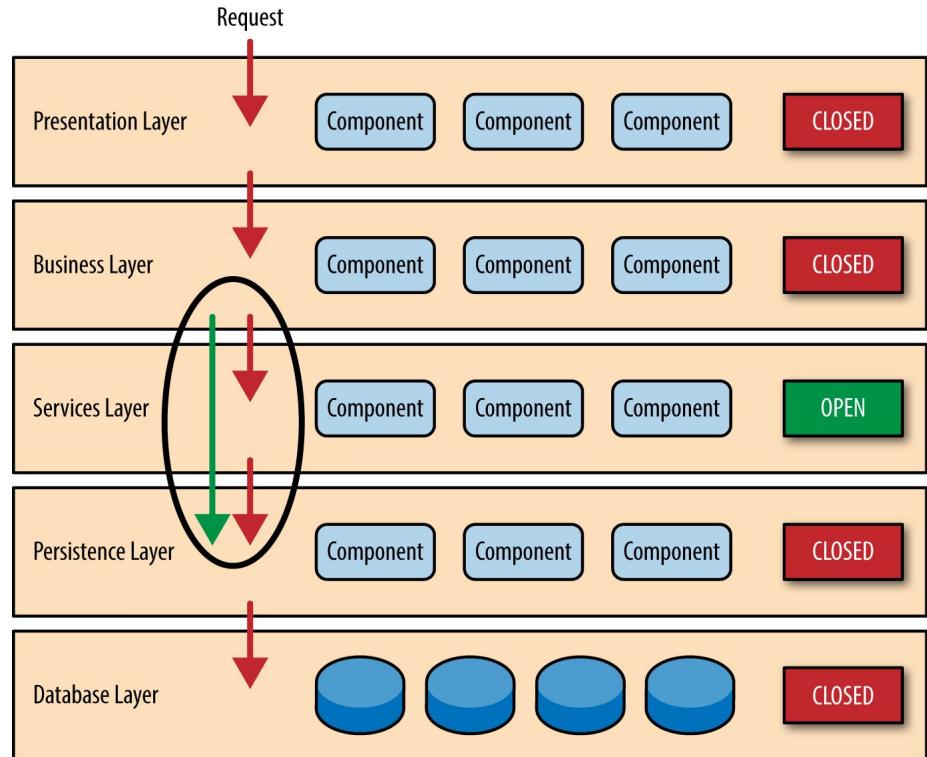
Rails architecture



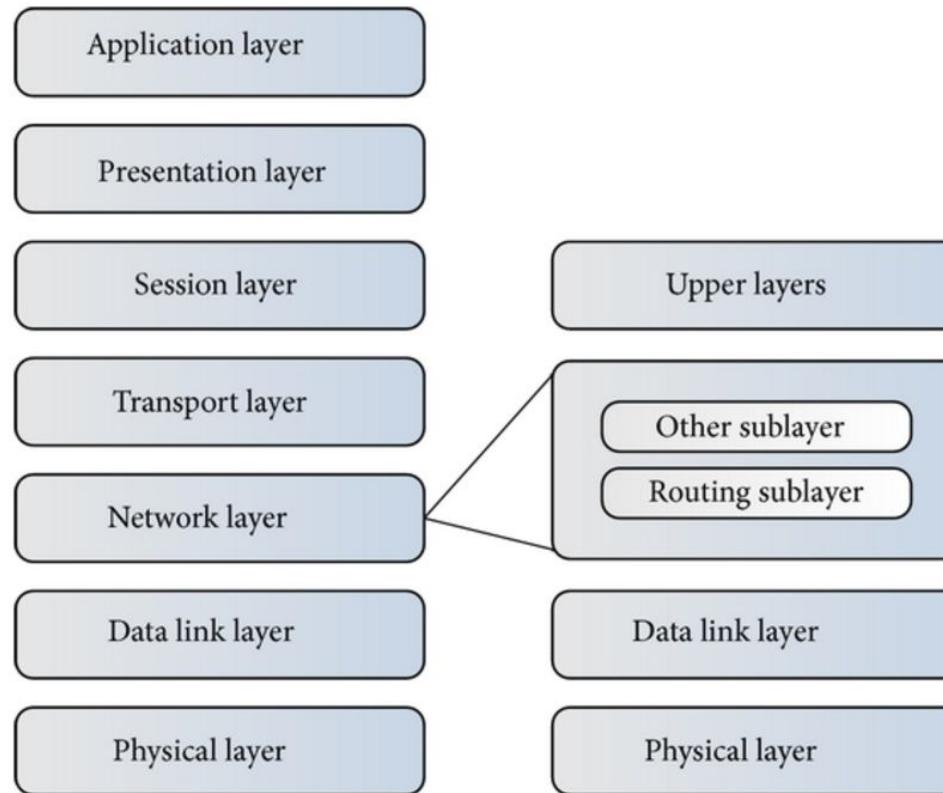
Layer

An architecture that relies of sets of independent/loosely-coupled interfaces to service a set of business requirements

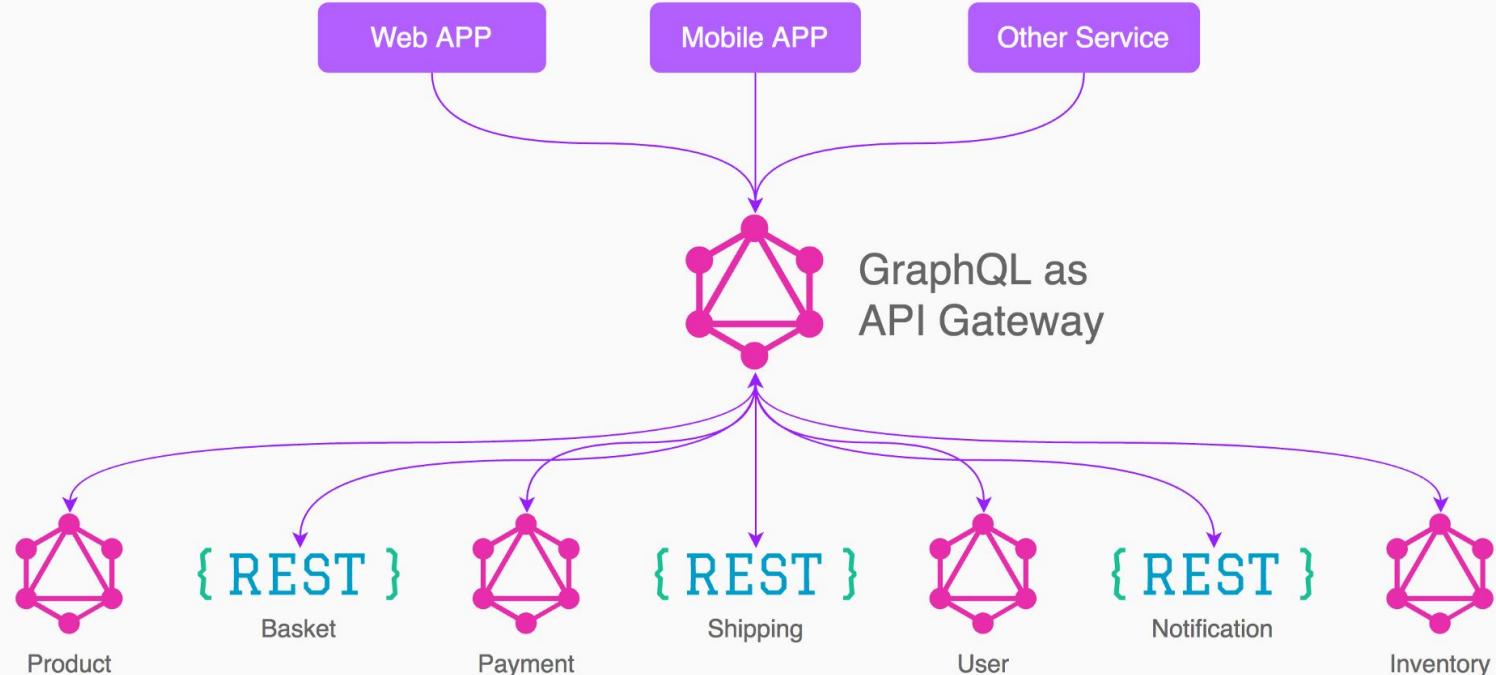
- +Insular architectural components allow more autonomous enhancement
- +Allows independent technology choices per layer
- -Requires dependency mgmt. and advanced observability



Network Architecture



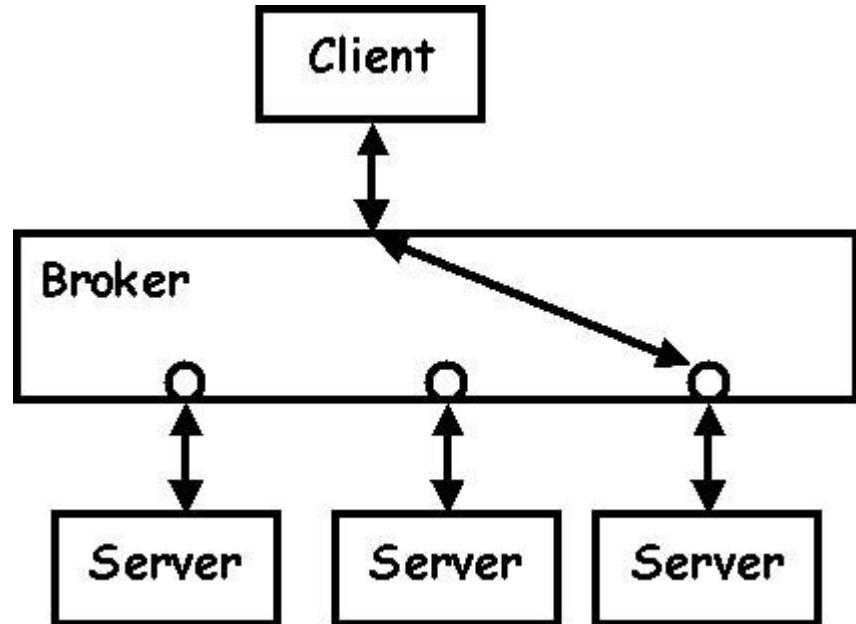
GraphQL



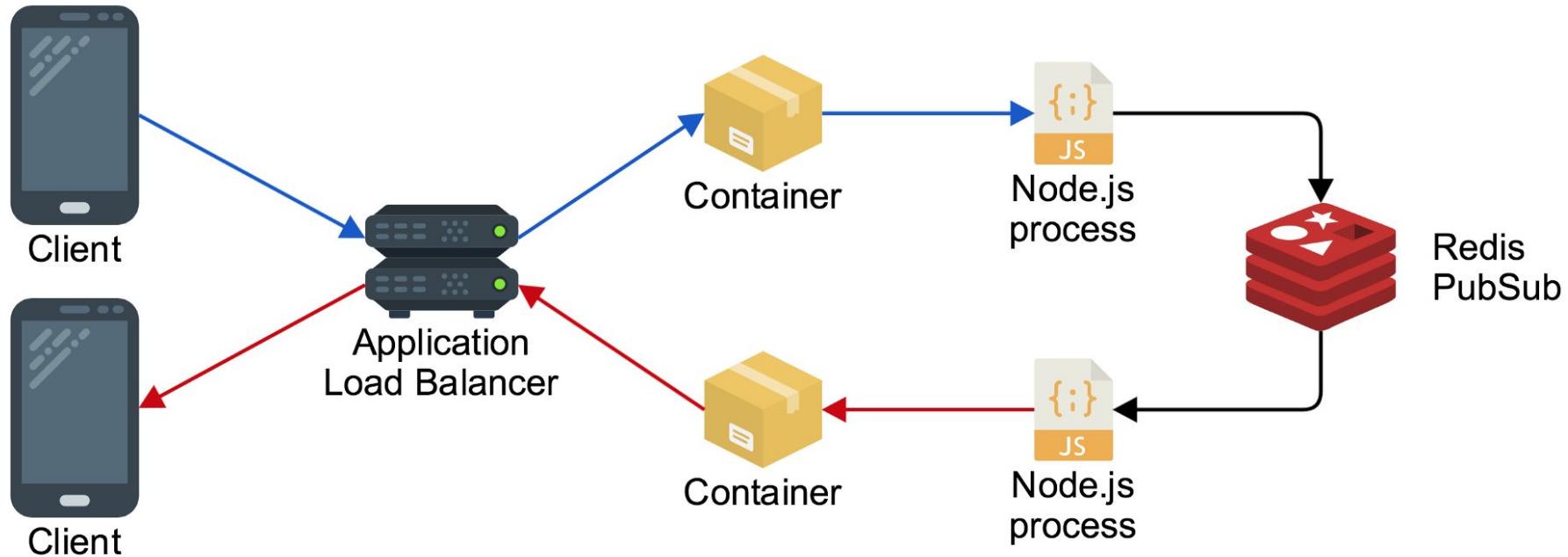
Broker

An architectural pattern that decouples services, components, or layers through a communication broker(s)

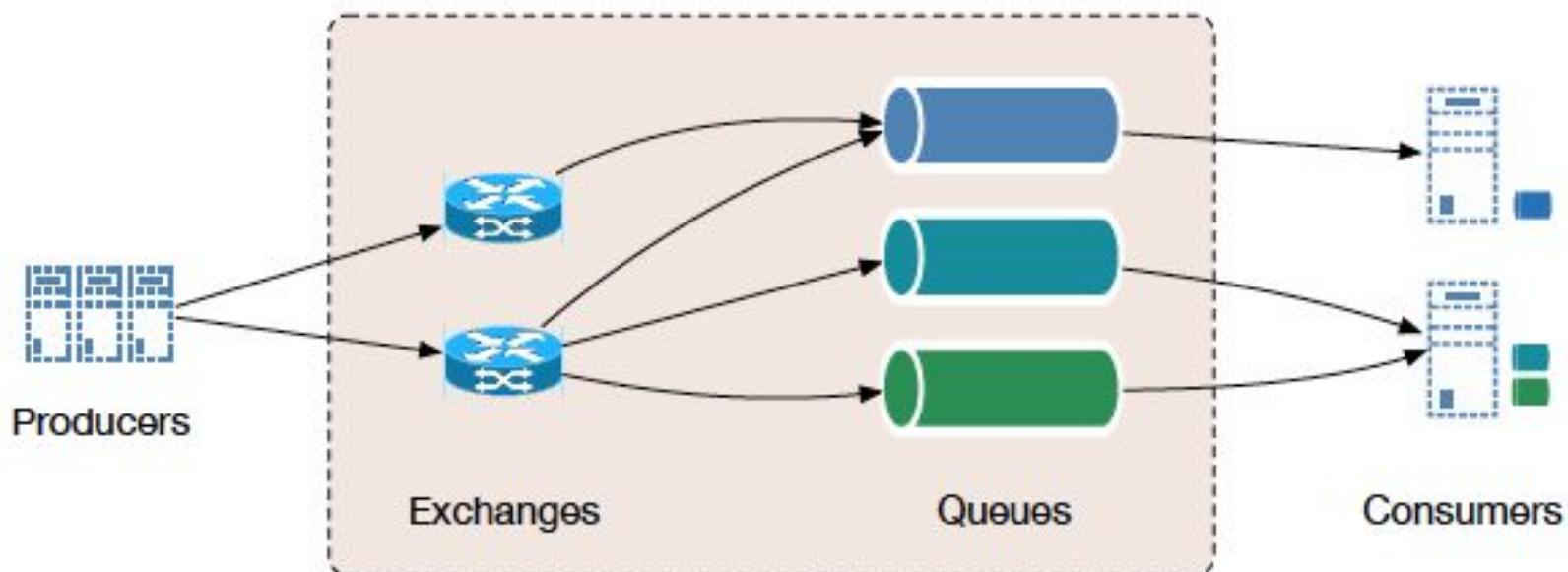
- +Makes service distribution transparent to clients
- +Supports dynamic CRUD of entities, nodes, and objects
- -May introduce overhead / complexity for smaller projects



Load balancer



Broker

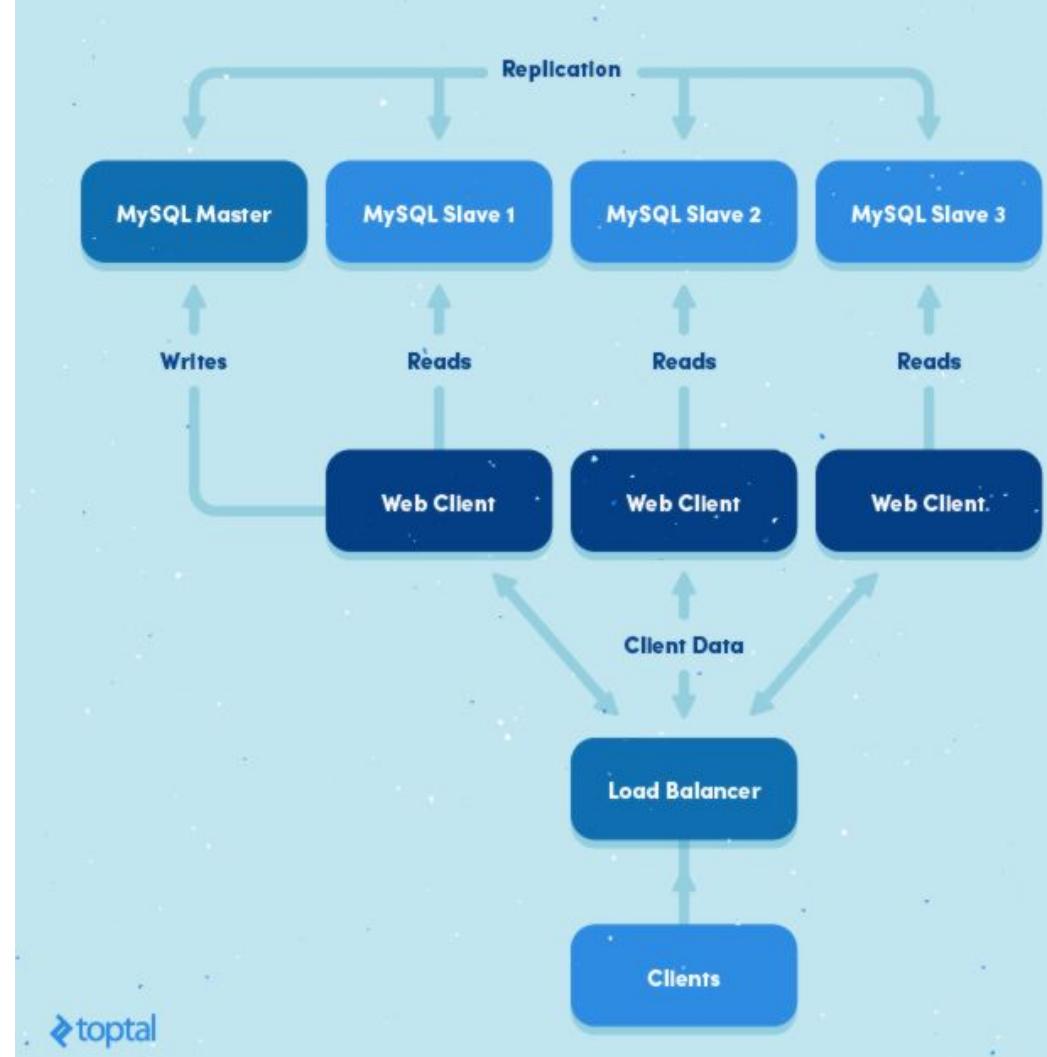


RabbitMQ
broker

Master-Slave

An architecture that distributes and manages sets of tasks amongst a set of nodes

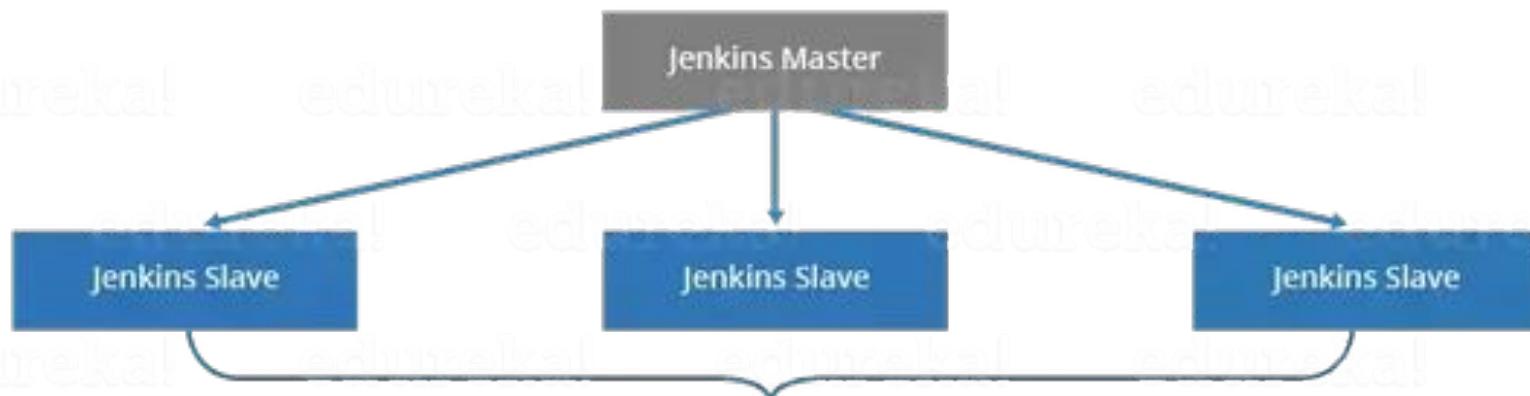
- +Flexible slave implementation and scaling, assuming efficient recombination in the master
- +/-Limited / no shared state between slaves
- -Communication latency / instability is a concern
- -Only viable for problems that can be decomposed



CI Tools

edureka!

Jenkins Master will distribute its workload to the Slaves



Jenkins Slaves are generally required to provide the desired environment.
It works on the basis of requests received from Jenkins Master.

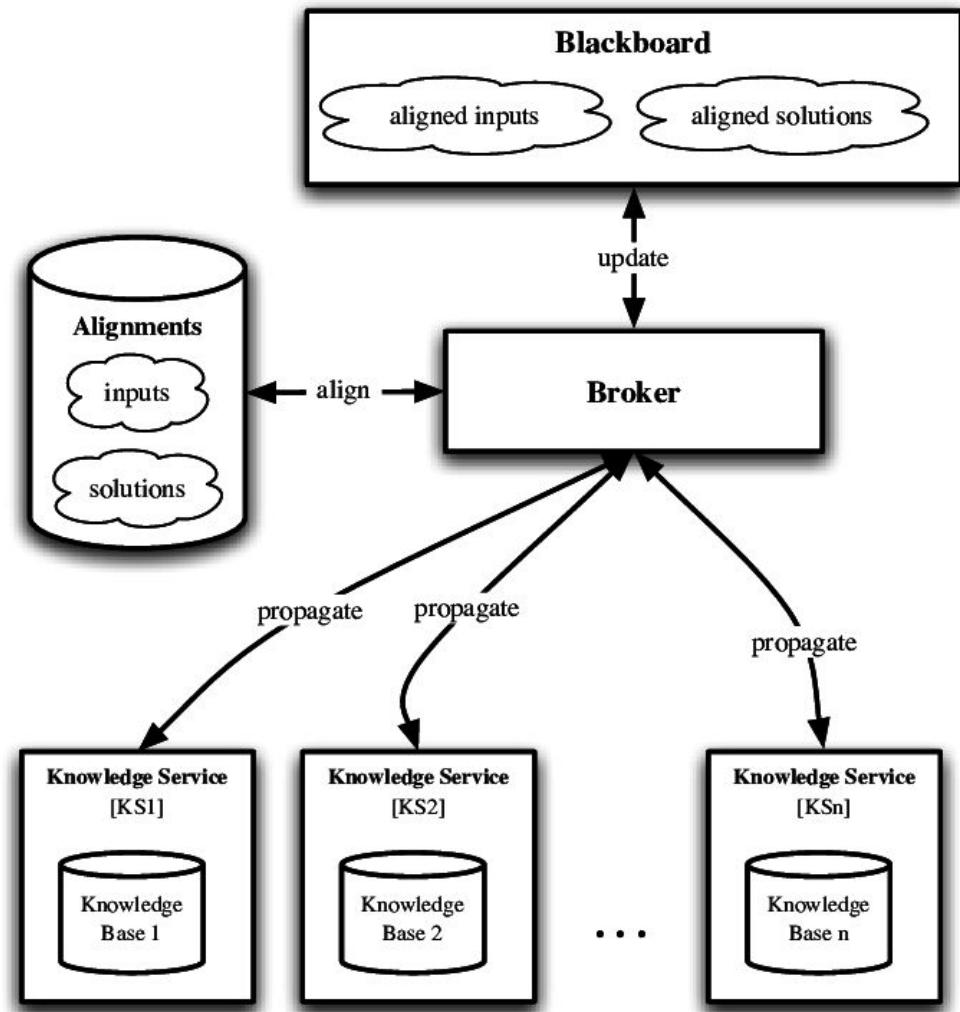
New Relic Query Language

```
SELECT count(*), average(duration),
sum(asnLatitude)/count(*) as 'Lat',
sum(asnLongitude)/count(*) as 'Lng'
FROM PageView
facet city, countryCode
SINCE 1 month ago limit 500
```

Blackboard

A flexible architecture that leverages brokered communication and large data retention to create more surface area for complex problem spaces

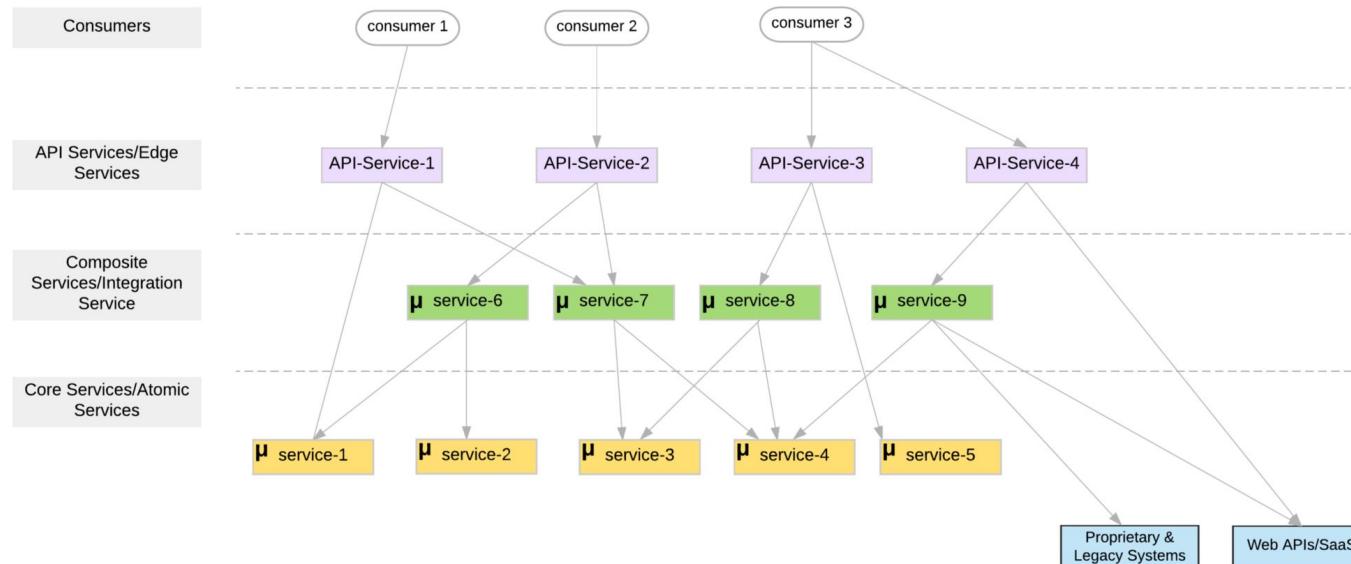
- +Primarily utilized for large multi-faceted data sets
- +Storage of both raw data and calculated solutions
- +Presumes multi-component architecture and flexibility
- -Structural mutation to foundational data can introduce complex change mgmt.



Microservice

An architecture that leverages brokered communication to support independent changes and recombination at all layers of the architecture.

Note: best applied to well-understood problem spaces.

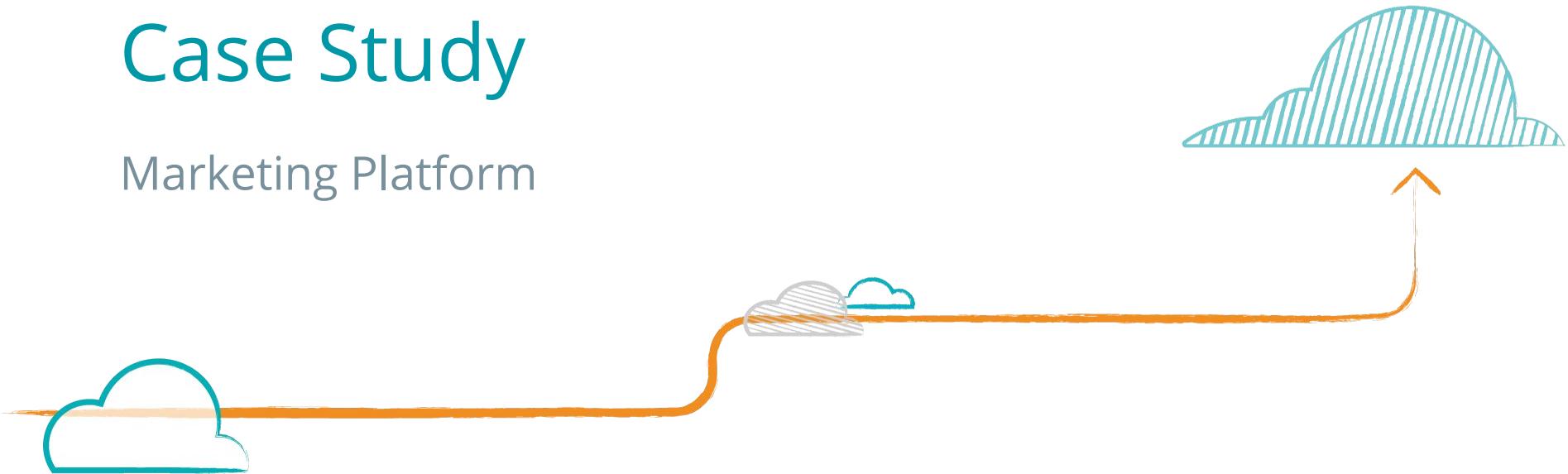


Twitter

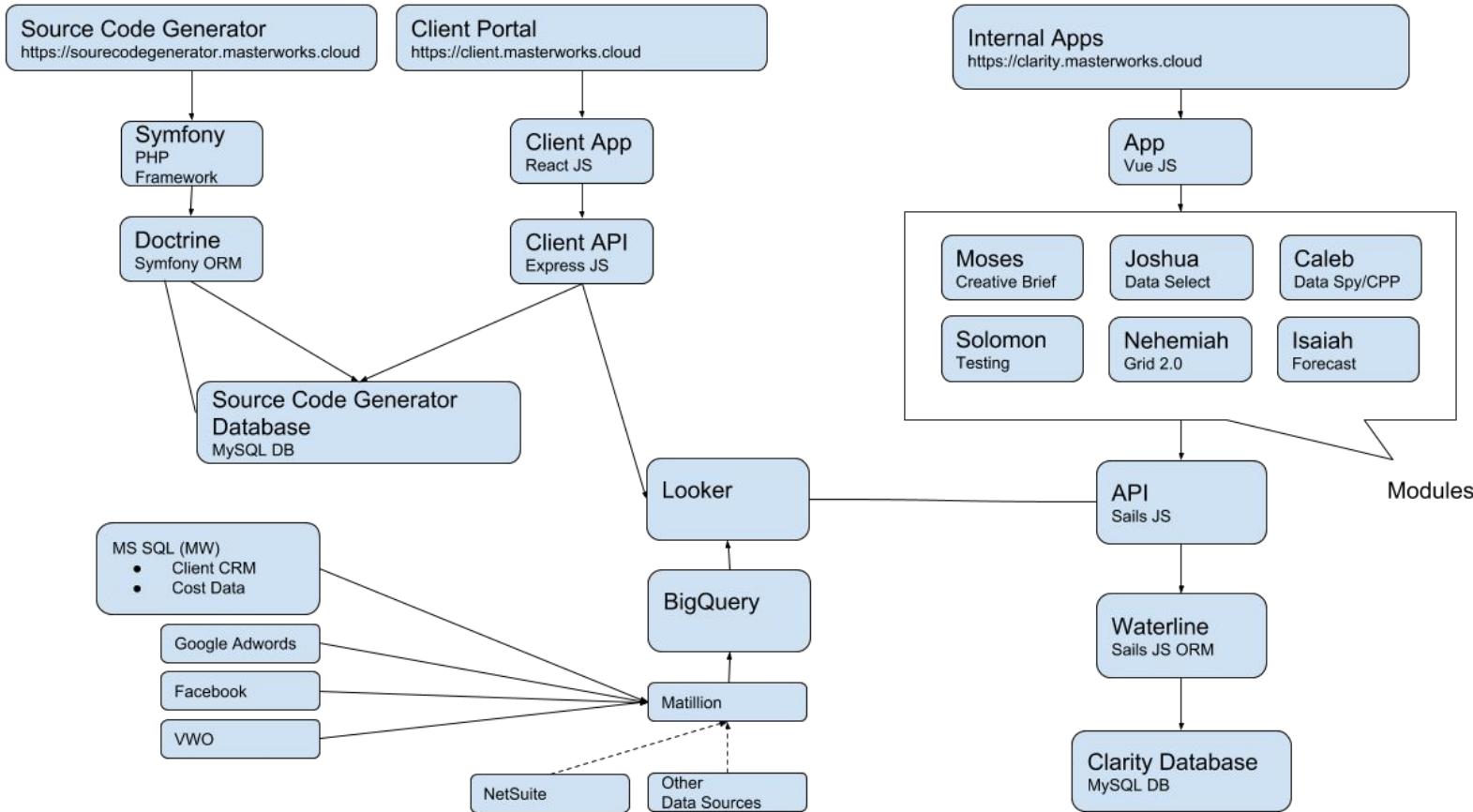


Case Study

Marketing Platform



CONCEPTUAL ARCHITECTURE (MAY 2018)



Marketing Description (DEC 2018)

What are the

Epiphany Components

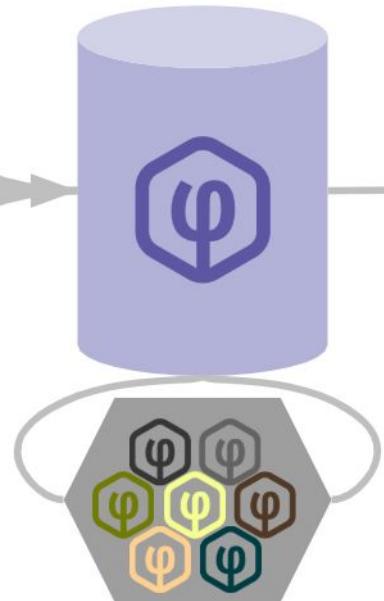
1. Telemetry

(Universal Tracking Code)



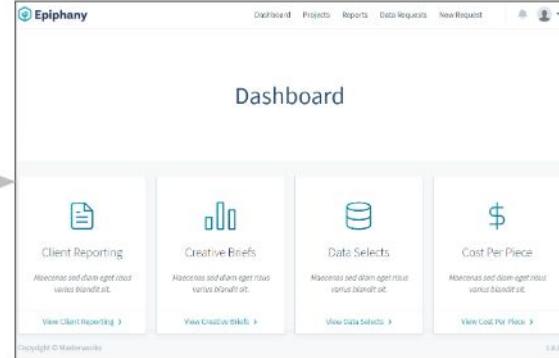
2. Rosetta

(Data Environment)



3. Portal

(Secure Website for App Delivery)



+ 4. Robots

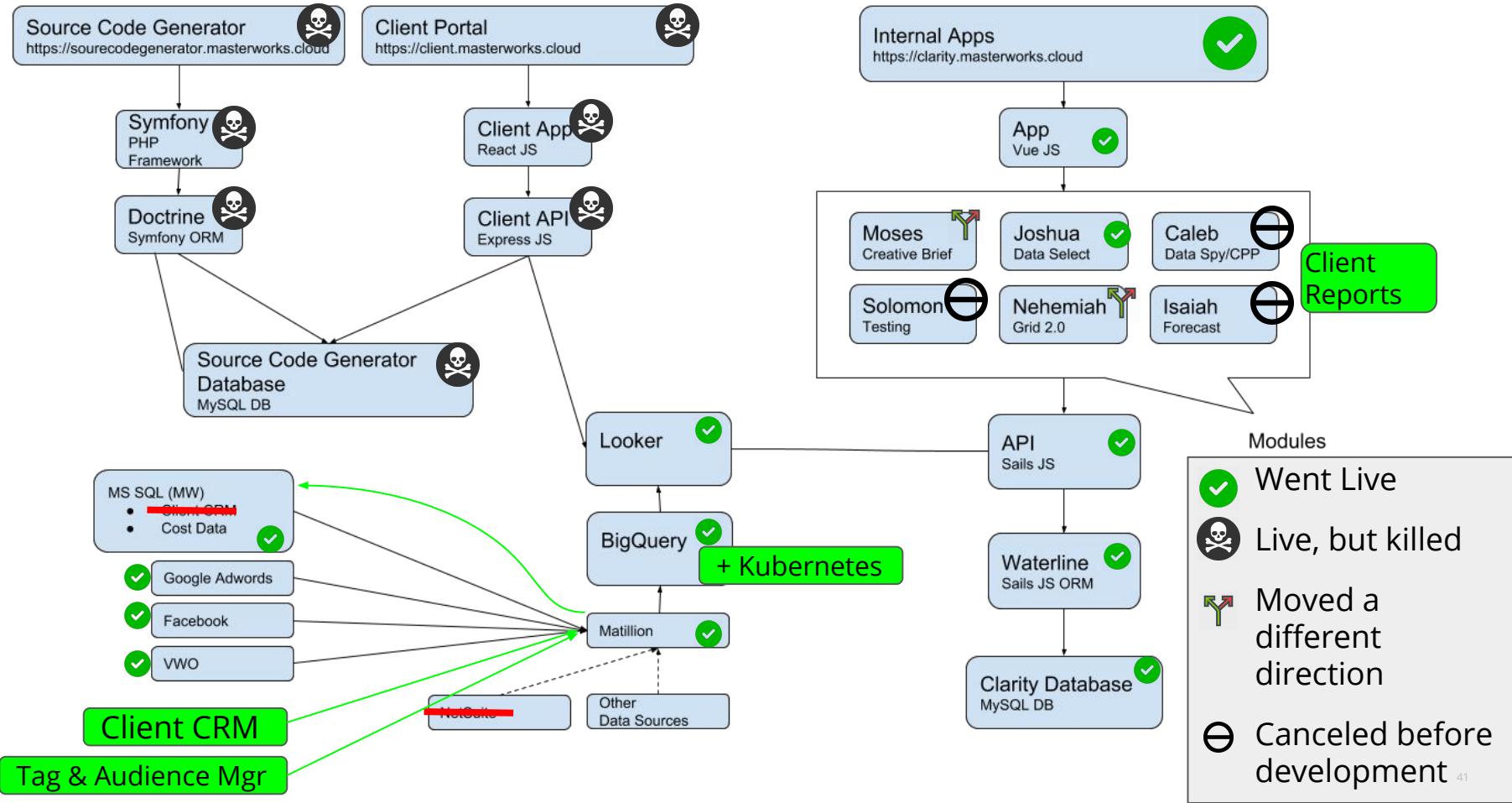
(Two types: Machine Learning & Data Profiling)



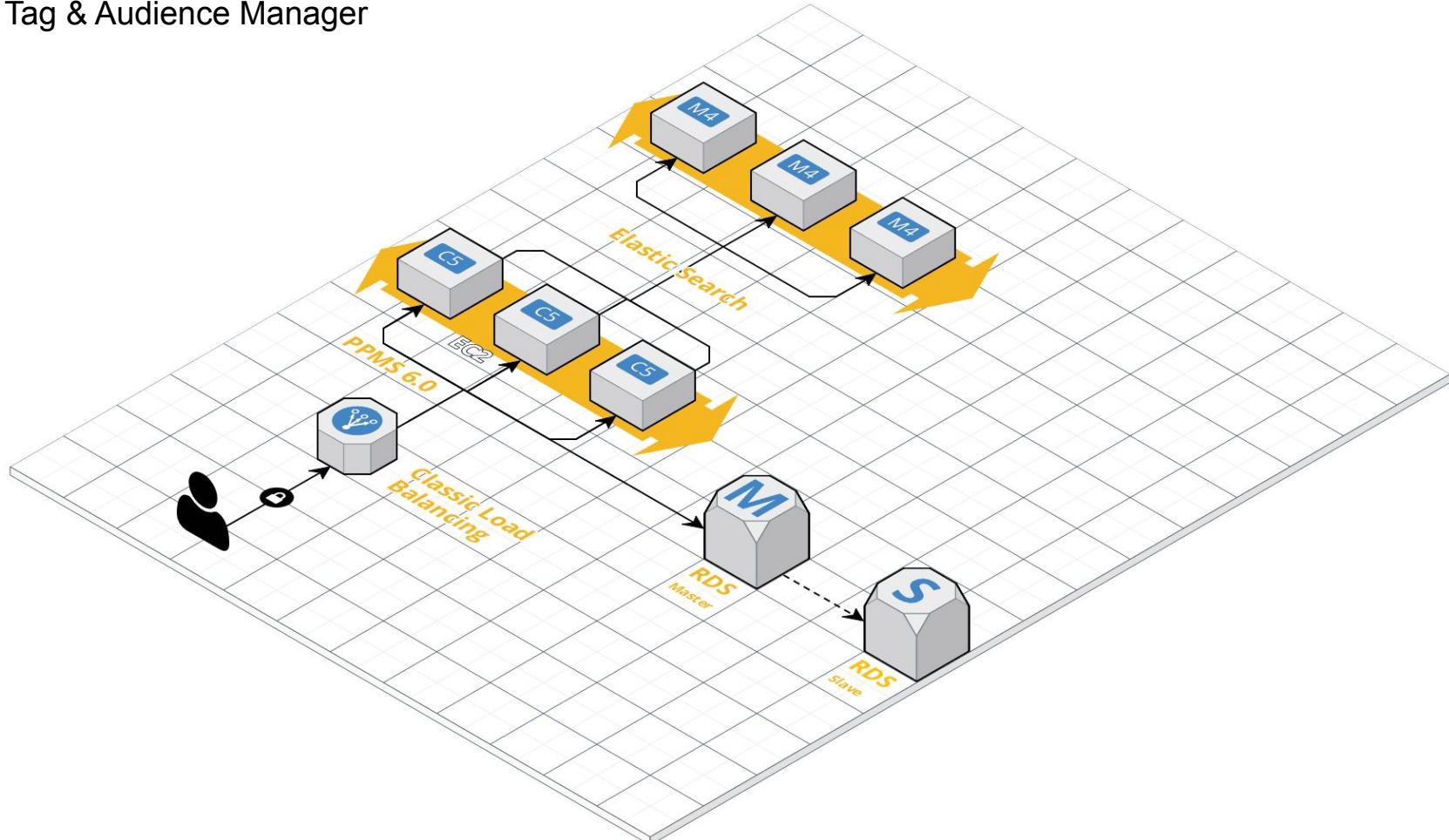
+ 5. Activation



STREAMLINED ARCHITECTURE (DEC 2018)



Tag & Audience Manager



Portal Construction

AWS Cloudfront (Content Delivery)

AWS S3
(SPA - Vue.js)

AWS Elastic Beanstalk
(API - Sails.js)

AWS RDS
(mySQL)

Looker
(API + Visualizations)

Google BigQuery
(Data Lake)

AWS S3
(Secure File Storage)

Google Compute
(ETL)

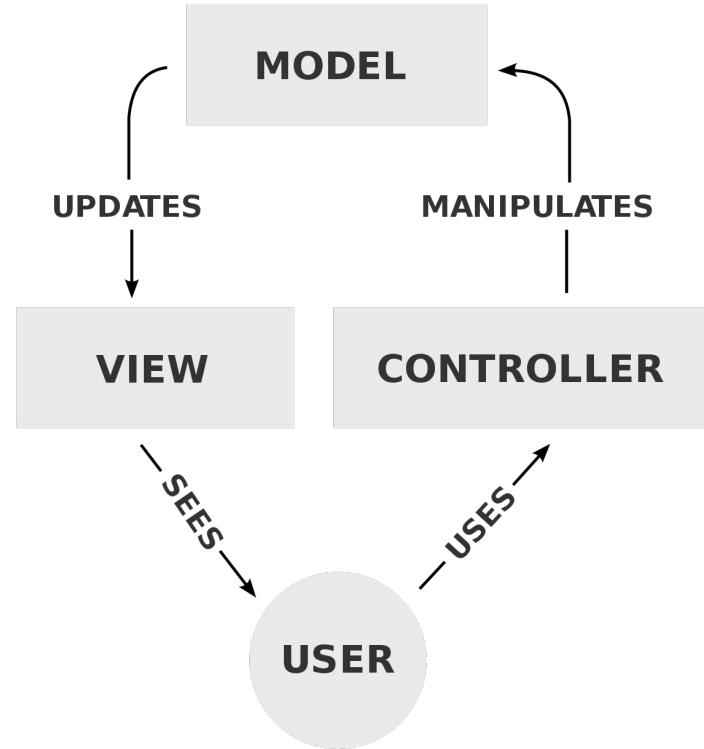
Google Compute
(Kubernetes)

Google Stackdriver
(Monitoring)

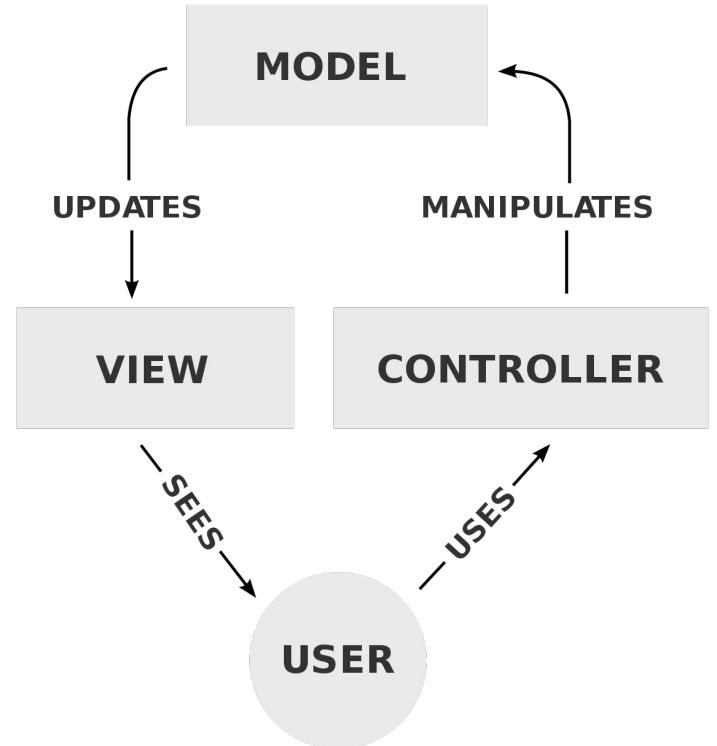
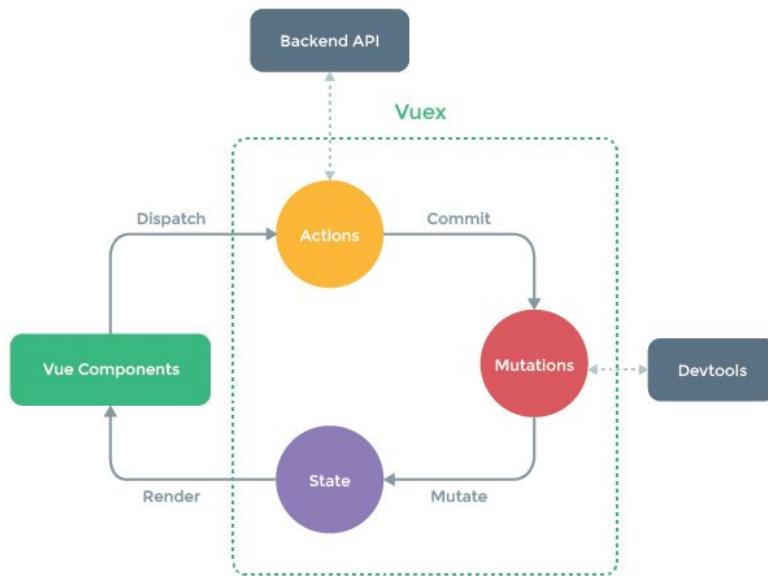
MVC

An architecture that separates modeling information (data definition) from UI/UX (data interaction) from business logic (data rules)

- +Tightly coupled design
- +Easy-to-adopt
- +Logical separations for functional mgmt.
- -Difficult to support multiple, similar views on *same* model



In Practice (App)

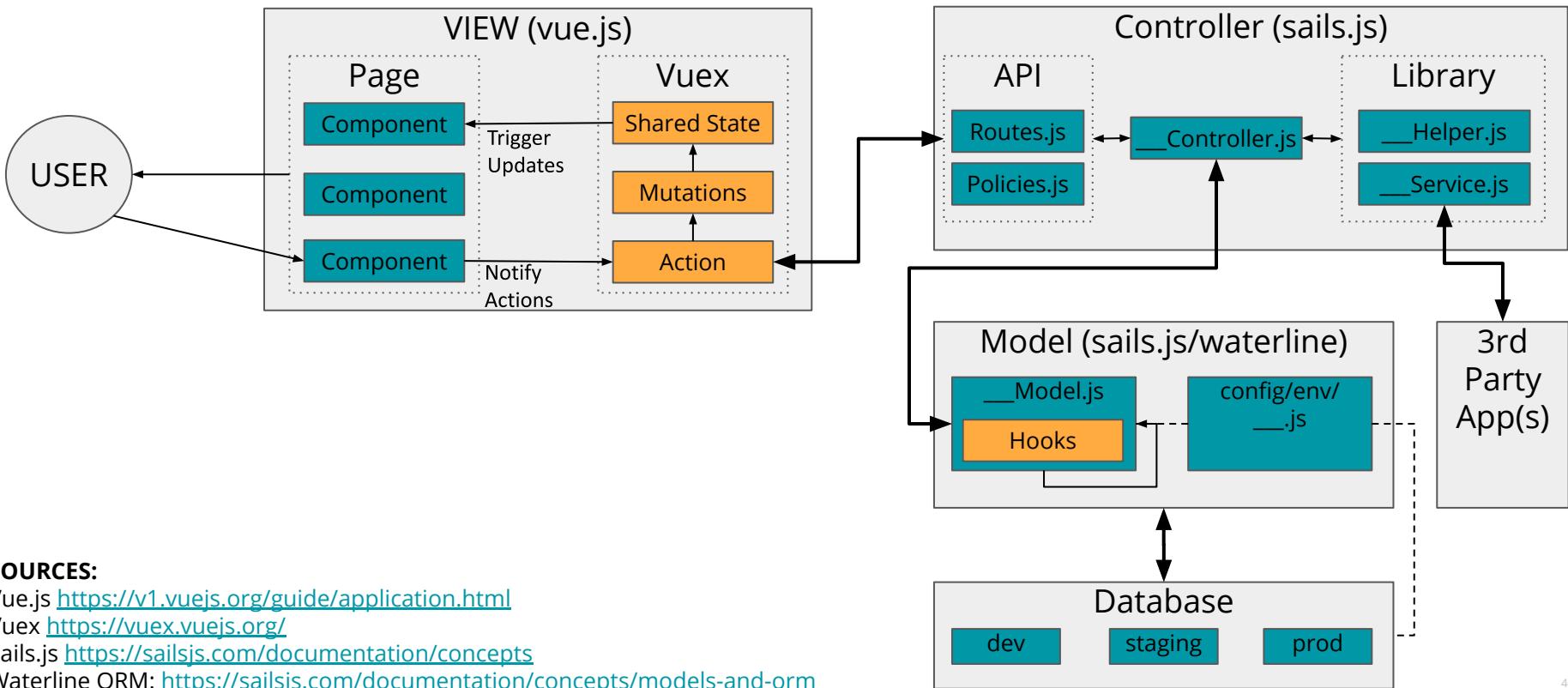


SOURCES:

Vue.js <https://v1.vuejs.org/guide/application.html>

Vuex <https://vuex.vuejs.org/>

In Practice (App + API / Data)



- ✓ clarity-api
 - > .ebextensions
 - > .elasticbeanstalk
- ✓ api
 - > bigquery
 - > controllers
 - > helpers
 - > hooks
 - > looker
 - > models
 - > policies
 - > responses
 - > services
 - > assets
 - > config
 - > documentation

How we've structured our Sails.js api

- **bigquery:** library of stock queries
- **controllers:** defines actions for each model
- **helpers:** centralized utilities (we have one for each major interface or `app`)
- **hooks:** define blueprint routes and manages our centralized scheduler
- **looker:** library of stock queries
- **models:** the Object Reference Model (ORM) that specifies how data is structured and lifecycle hooks
- **policies:** authorizes access to our controllers
- **responses:** used for api responses from policies
- **services:** a single mailgun notification service

Looking forward

Week 6 - Project Pitches

- No Reading
- **BRING LAPTOPS**
 - Presenting
 - Taking Portfolio Assessment Notes
- **TUESDAY: Project Pitch Material**
- **SUNDAY: Project Evaluations**

Week 7 - Catch-up & Spring Break

- No Reading

WEEK 8 - Teams and Roles

- Reading: Sims & Johnson (pp.4-51)
- Team Leads: Let's recruit your crew
- Everyone else: Bring your resume!
You are interviewing to join a team

Architecture Lab

<https://messiah.instructure.com/courses/1710514/assignments/11588515>

