Microservices with OpenShift Experience from the fields Campfire & Battlefield stories

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RED HAT SUMMIT

Welcome

Who am I ?

twitter @braoru

@Leshop since 2012

I ’am a computer security enthusiast

Security contests, Malware, Web architecture

Open source contributor since 2001

Cinema, Music, Beer, Whisky, Food, Wine

Presentation plan

Not so technical

Who & what is LeShop

Why we dramatically needed micro-services

Battlefield & campfire story

  Jobs, Load Balancing, PAAS, Distributed architecture & more

“The corollary of constant change is ignorance. This is not often talked about: we computer experts barely know what we’re doing. We’re good at fussing and figuring out. We function well in a sea of unknowns. Our experience has only prepared us to deal with confusion. A programmer who denies this is probably lying, or else is densely unaware of himself.”

Ellen Ullman, Close to the Machine: Technophilia and Its Discontents

Before we start

This talk is not a set of absolute truth

There are plenty of amazing microservices related talks

I will try to focus on what we found useful in our case

Our choice could not be the best at all, but at least, it worked for us

Who is leshop.ch ?

MIGROS

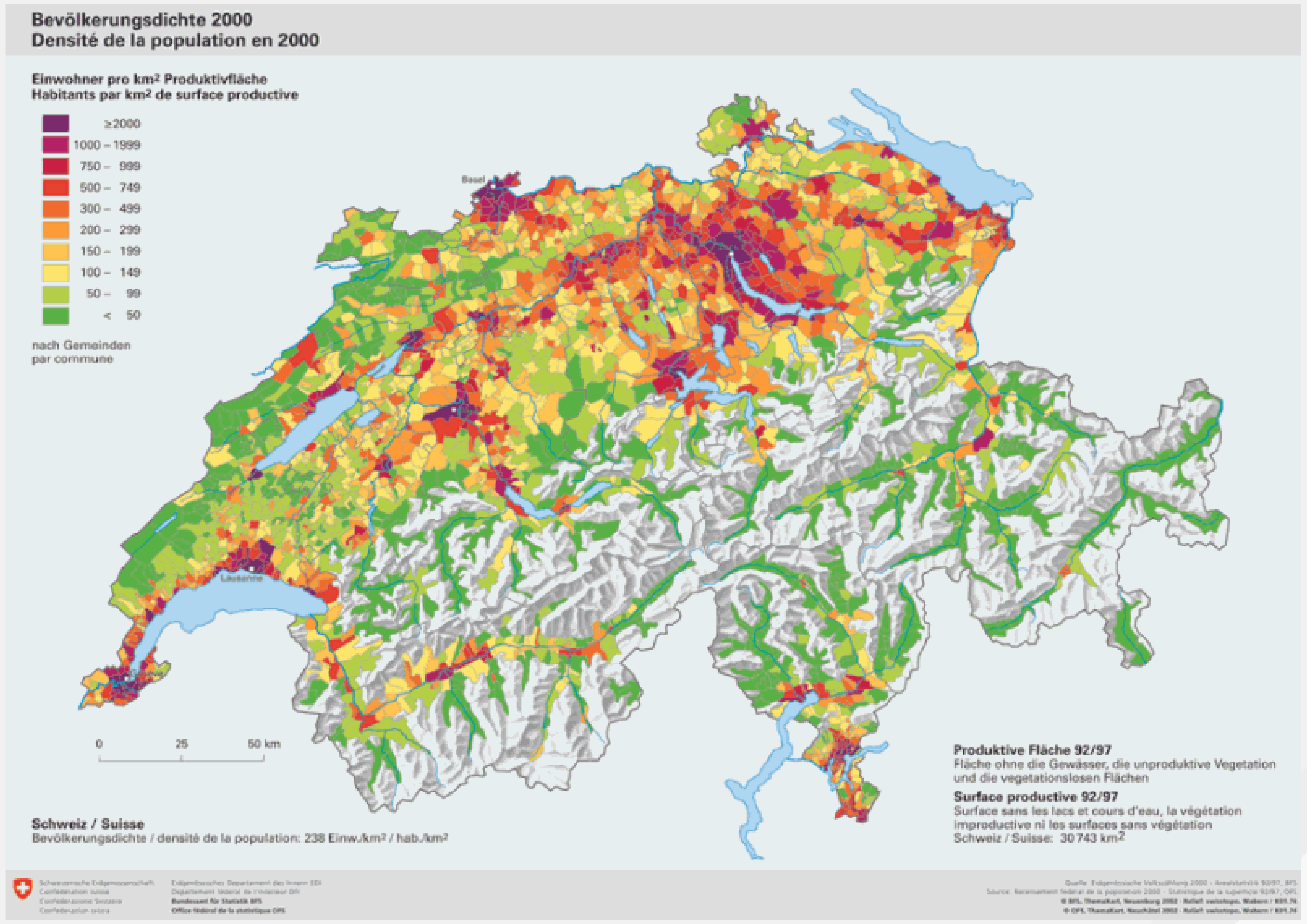
Swizerland & LeShop customers

Private customers & B2B

Between 10% and 12% of everything is sold online

Our customer want the ease of use of amazon with the quality and flexibility of a local retail shop

Small country, and relatively wide area to cover (for our company size)


Bevölkerungsdichte 2000
Densité de la population en 2000
Einwohner pro km² Produktivfläche
Habitants par km² de surface productive
≥2000
1000 – 1999
750 – 999
500 – 749
300 – 499
200 – 299
150 – 199
100 – 149
50 – 99
< 50
nach Gemeinden
par commune
Basel
Lausanne
0
25
50 km
Schweiz / Suisse
Bevölkerungsdichte / densité de la population: 238 Einw./km² / hab./km²
Produktive Fläche 92/97
Fläche ohne die Gewässer, die unproduktive Vegetation und die vegetationslosen Flächen
Surface productive 92/97
Surface sans les lacs et cours d'eau, la végétation improductive ni les surfaces sans végétation
Schweiz / Suisse: 30 743 km²

SNACK-BOX
MIGROS

A lot of boxes

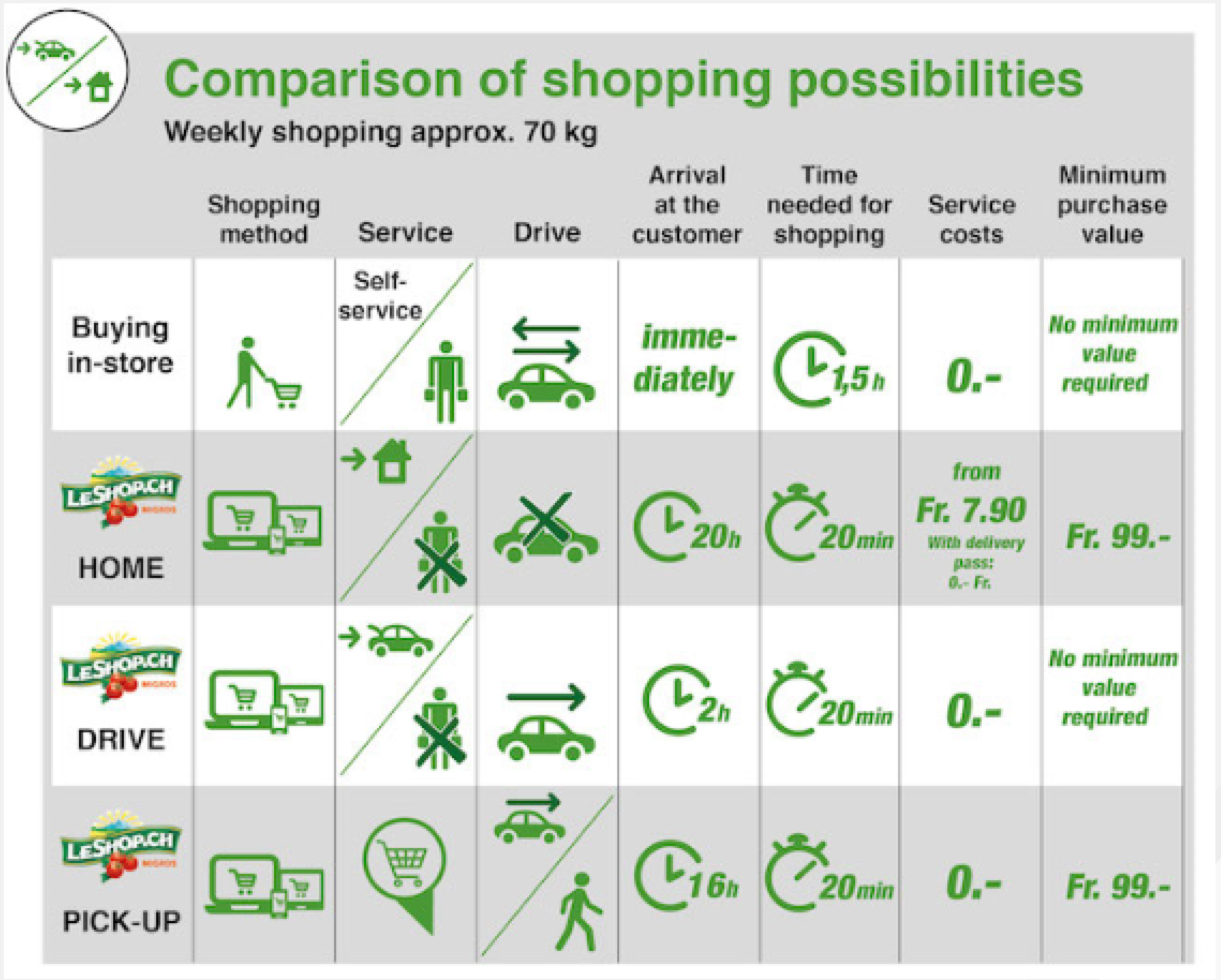
700’000 orders/year

45’000’000 items/year to deliver

- Most of them are fresh(perishable) product

2’900’000 boxes/years to deliver

180 ton/day to deliver



Comparison of shopping possibilities

Weekly shopping approx. 70 kg

	Shopping method	Service	Drive	Arrival at the customer	Time needed for shopping	Service costs	Minimum purchase value
Buying in-store		Self-service	⇄	imme-diately	1,5 h	0.-	No minimum value required
LESHOP.CH HOME		→		20 h	20 min	from Fr. 7.90 With delivery pass: 0.- Fr.	Fr. 99.-
LESHOP.CH DRIVE		→	→	2 h	20 min	0.-	No minimum value required
LESHOP.CH PICK-UP			→	16 h	20 min	0.-	Fr. 99.-

LeShop.ch
MIGROS
www.migros-shop.ch

Where it started

Leshop

Internal ERP, Internal website, Internal supply chain management, Internal warehouse management and so on..

15 years old massive & organically grown applications started with java 1.0

More than 250 various recurrent jobs

Everything distributed on 5 Data center

308 collaborators

20 IT people (Dev, Design, Operation & Infrastructure, Business intelligence)

12 Devs

5 Operations people

The Great divide

Migros (main shareholder) ask us to follow group guidelines and centralize all our IT within 2 new Data-Center

Several technical requirements must be meet

- Active-Active (Connection between DC can be loss at anytime without any warning)
- Spread users across both DC (internal and external)
- No DC stickiness

And there is internal requirements

- Must be manageable by small team of people
- 2 years from start time to production full launch

Critical business requirements

Time to market

- Being able to release often (hourly) without any downtime

Compliance & security

- Being constantly up to date with software update (Systems, software and dependencies)
- Being easier to review and analyses

Reproducible & cost efficient

- Unit testable infrastructure and systems configurations

TODAY
TOMORRO

[illegible]

People

People

People tend to react badly to violent change

Always keep in mind the human advantages of technology changes (ex: less midnight call)

DevOps is not a dream, you just have to make it happen

Make people working in peer (cross team)

- Software packaging
- Bug solving is a good source of accomplishment feeling

Involve everyone on software requirements

People

1 change at a time, and don't forget mind adaptation time

Avoid the 30 minutes barrier

2 minutes is the maximum length it should take to explain a change

- If it's longer, split it

Does Never apply a change in production until you are sure everyone knows what you are doing

Never forget the "midnight call effect"

How we did it

Reminder

Avoid overengineering

Avoid massive and non-flexible frameworks

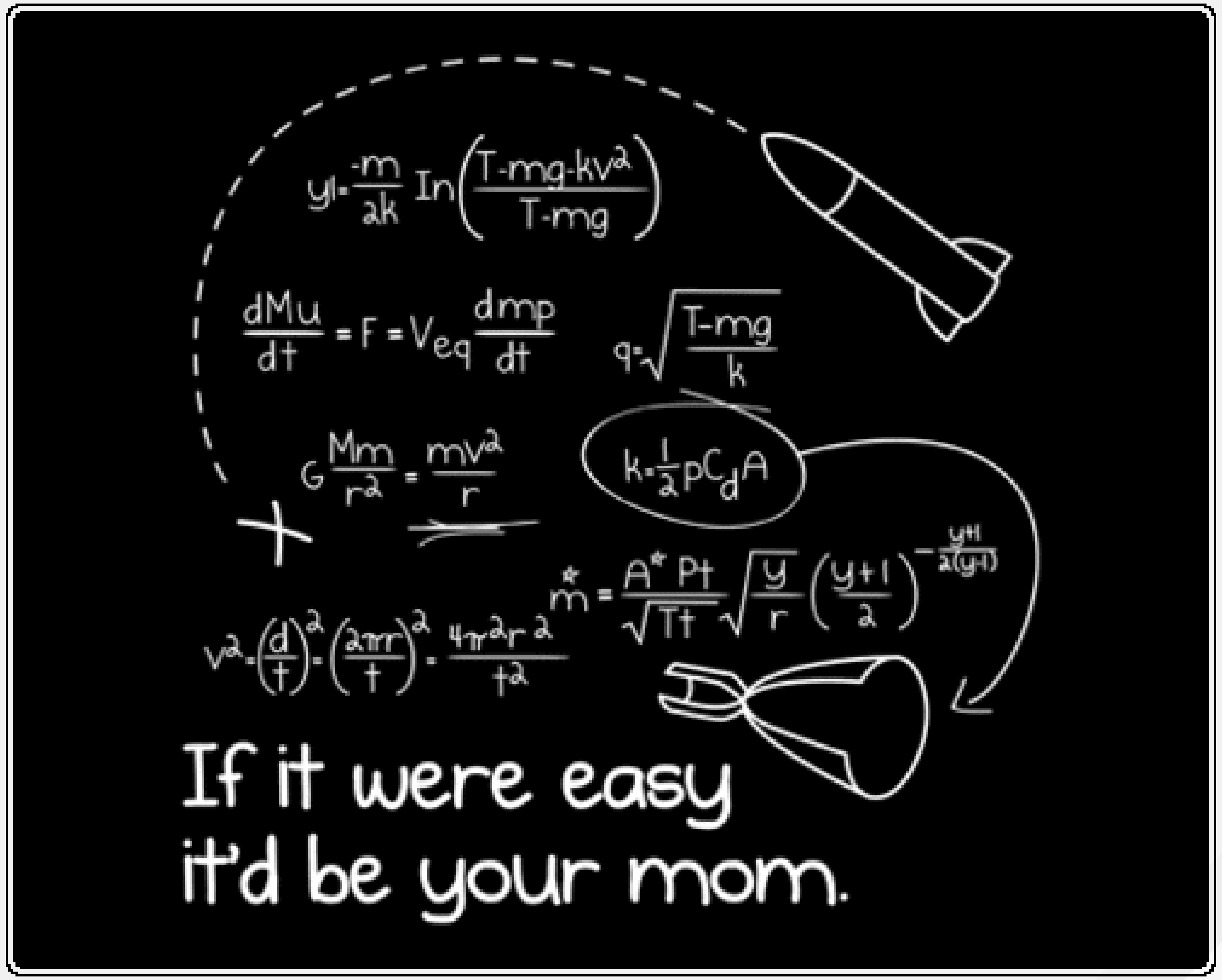
Prefer open and well-maintained frameworks

Workaround is not a new dev methodology

If something dosen’t work change it

Sometime you need to create

Do not hesitate to learn



Reminder

Follow RFC

-Don’t forget drafts

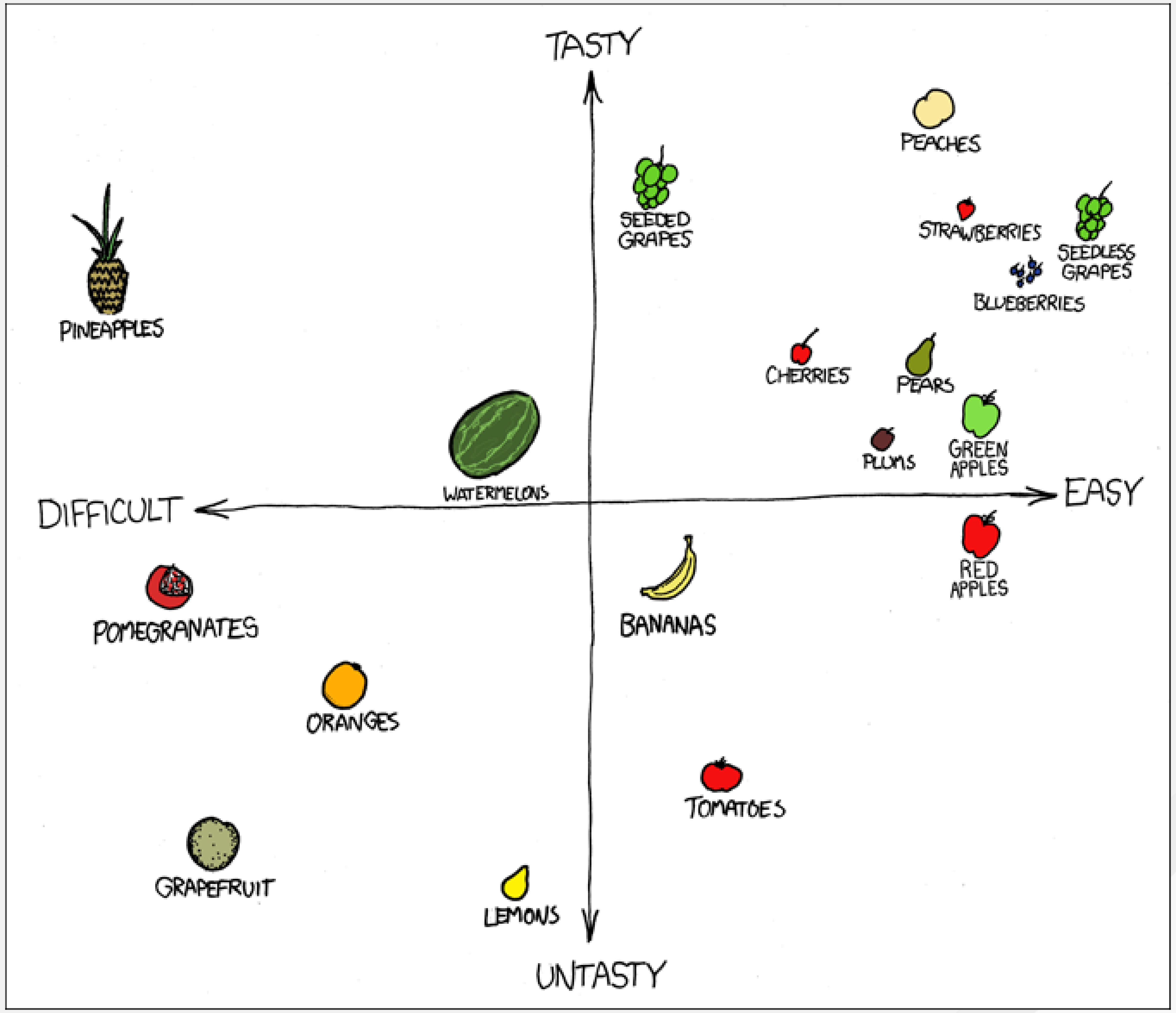
Apply web best practices

Don’t ignore OWASP

Be critic about what do you read

Understand what you do

Google coding is not a new dev methodology



LeShop OpenShift dev guidelines

Every request is authenticated
- Client - Service
- Service – Service

Input validation & Output validation within each service
- JSON format, fields content, object creation and so on…

Input business validation & output business validation
- Can this item be in this cart ? Can this item be added ?

LeShop OpenShift dev guidelines

Applications must be stateless and scalable (known limits)

No Client-Service and Service-Service session

Independent and idempotent messages

“Current state” never expire

Work with functional programming approach as much as possible

LeShop OpenShift dev guidelines

No local logs

Split business logs from technical logs

HTTPS only

Application only speak JSON

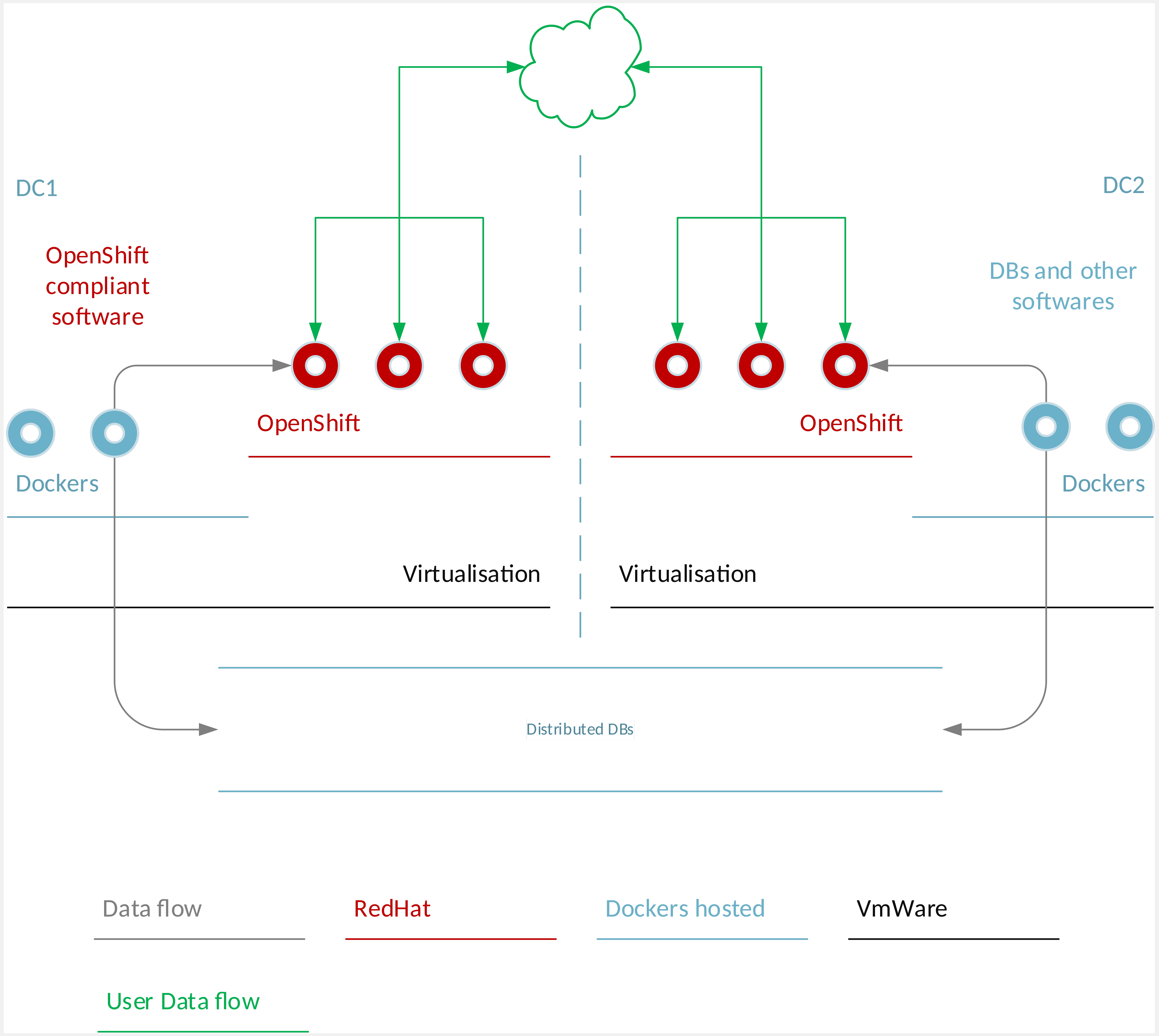
Application only expose Data

LeShop OpenShift dev guidelines

Security context (user + roles) used at every steps

Input & Output request/s must be throttled and measurable

DB & Service access must be throttled and measurable


DC1
OpenShift compliant software
Dockers
OpenShift
Virtualisation
DC2
DBs and other softwares
OpenShift
Dockers
Virtualisation
Distributed DBs
Data flow
RedHat
Dockers hosted
VmWare
User Data flow

PAAS & LeShop 2014/2016

We run on Openshift 2

2 clusters of 25 nodes

Approximately 100 micro services in production

Docker Kubernetes dedicated clusters

- Non Heterogeneous services
- Databases (ElasticSearch, Riak, Redis, Mongo, InfluxDB, Graphite, LevelDB)
- Services that require high resources

One rule

III

Independent Immutable Idempotent

Design a container ready micro services

Elementary concept

1 service 1 business functionality aka “the unix way”

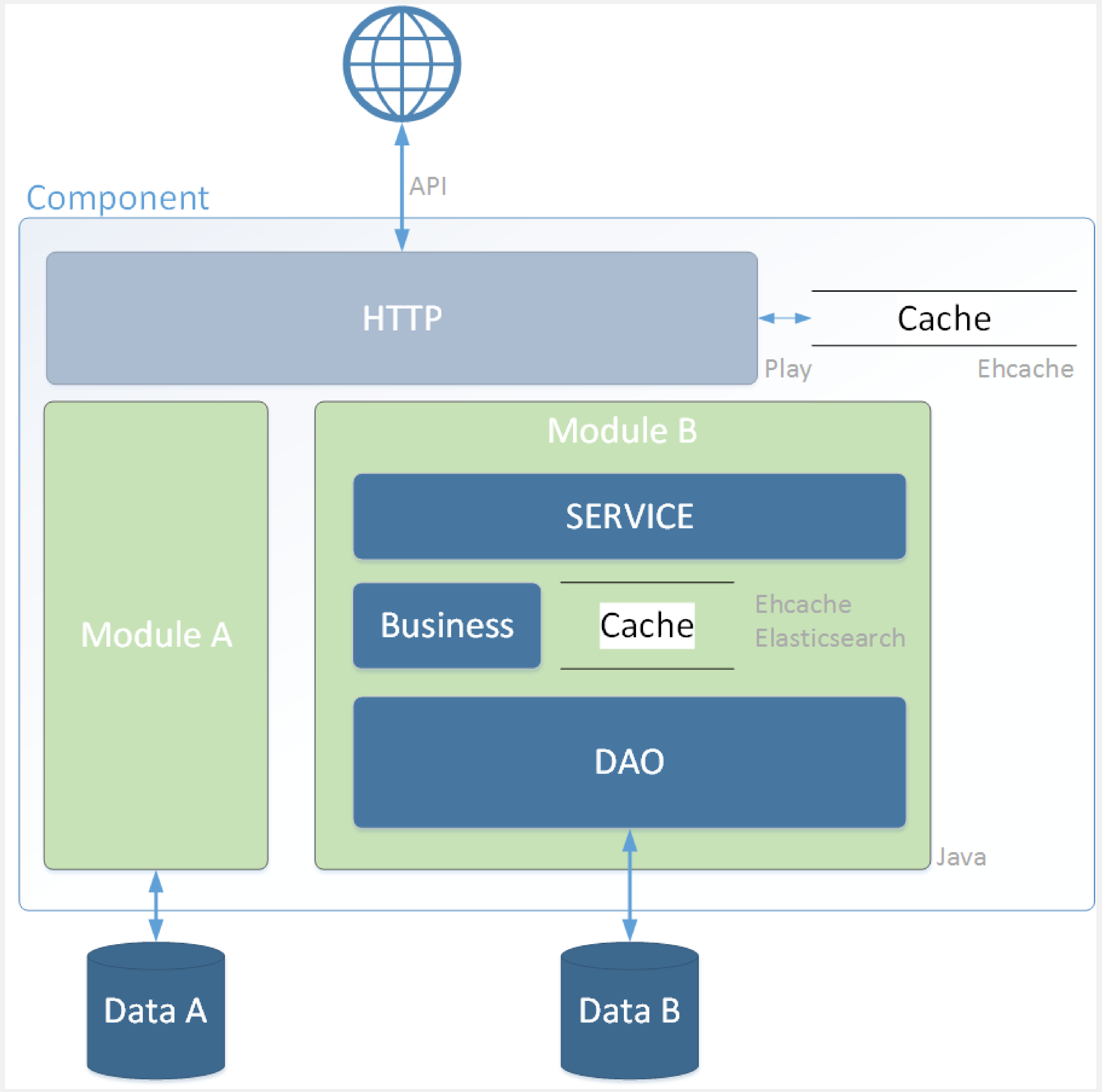
Services are responsible of their own data

Data processing lead to schema then schema lead to storage selection

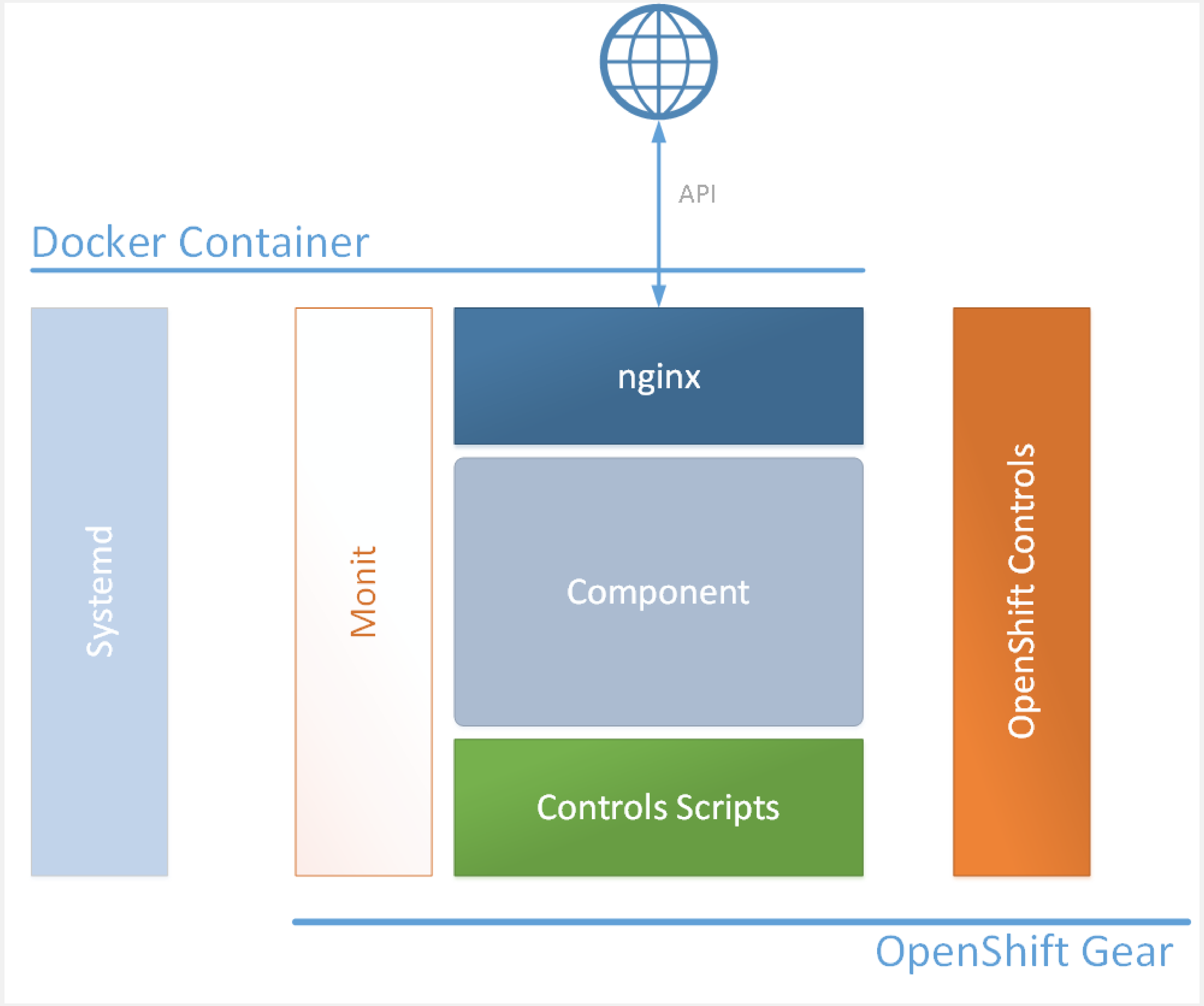
If service(s) need to communicate with other service(s) then use messages

A database is not a communication channel

Run a self contained services



Self contained `container`



Advices

Do input & Output throttling
- We use Nginx as input throttling within each container
- We use actors-based programming for output throttling

Each micro-service is tested and a request/s value is stetted
- Scaling and resources planning

I I I
- Each micro-service can run by itself everywhere (independent)
- Each container is completely immutable and reproducible (idempotent)

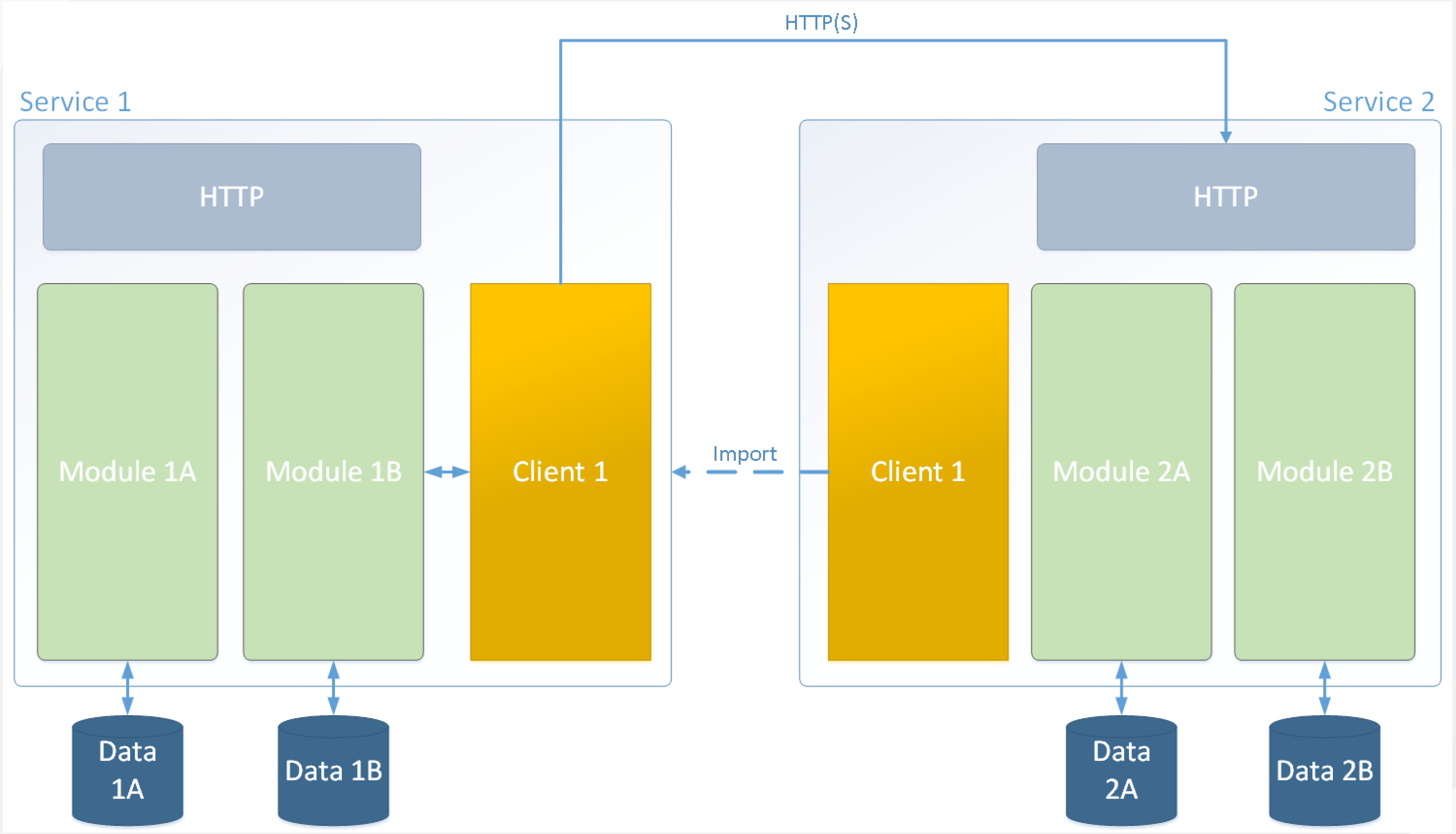
Let’s make them speak together

Client based approach

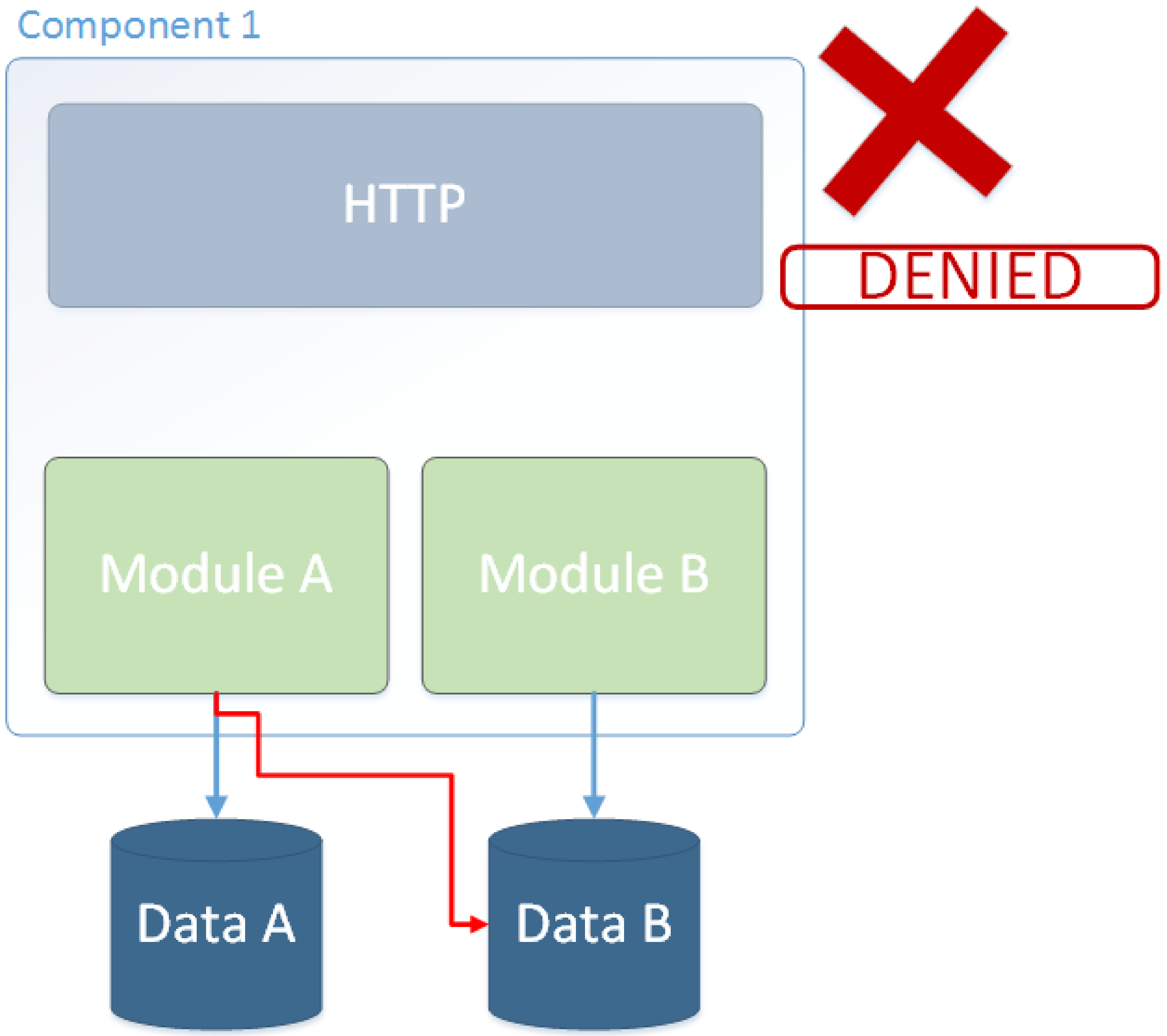
Each service is released with a corresponding client library

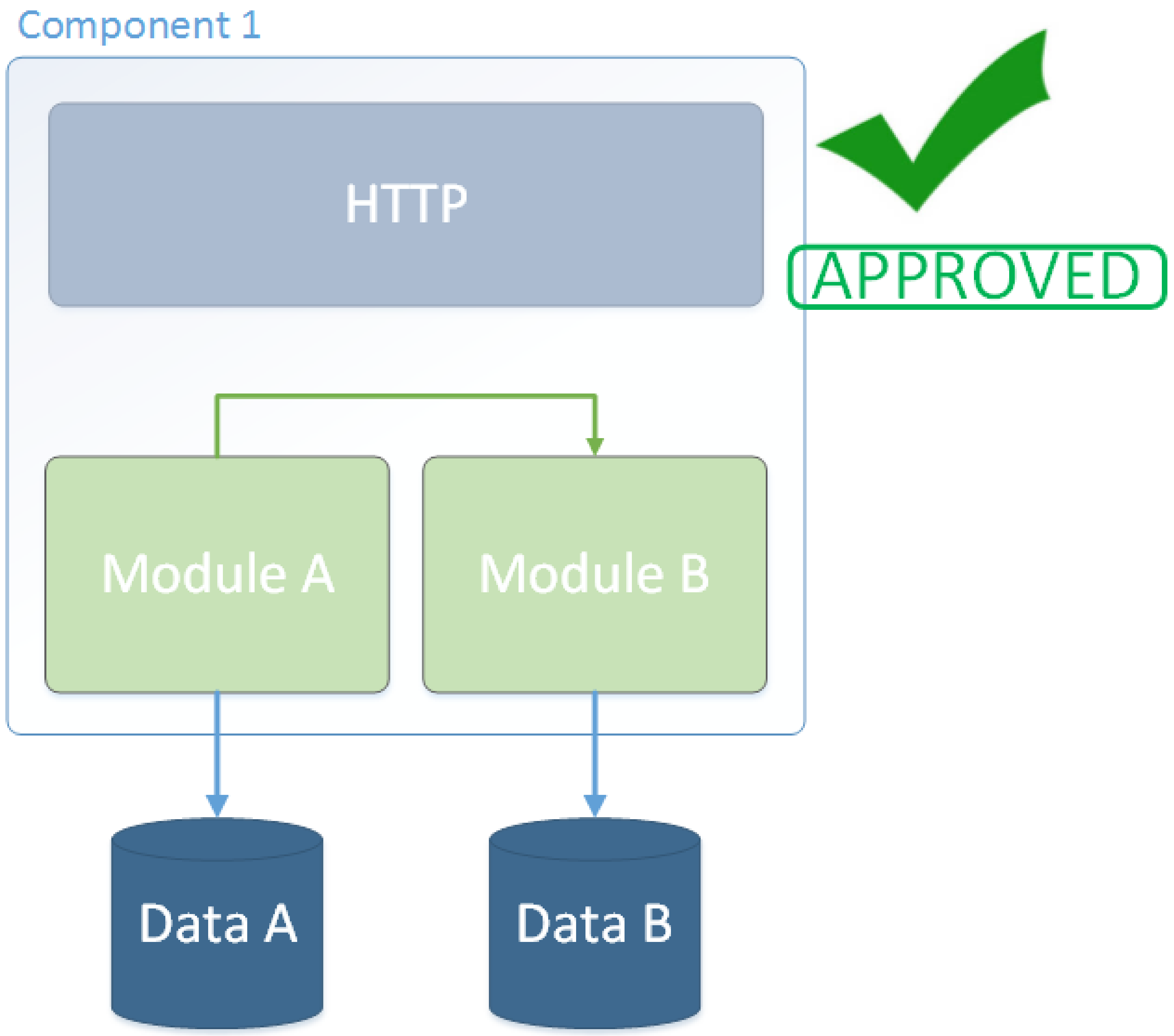
- Business related Dev should only use business object and never deal with HTTP layers

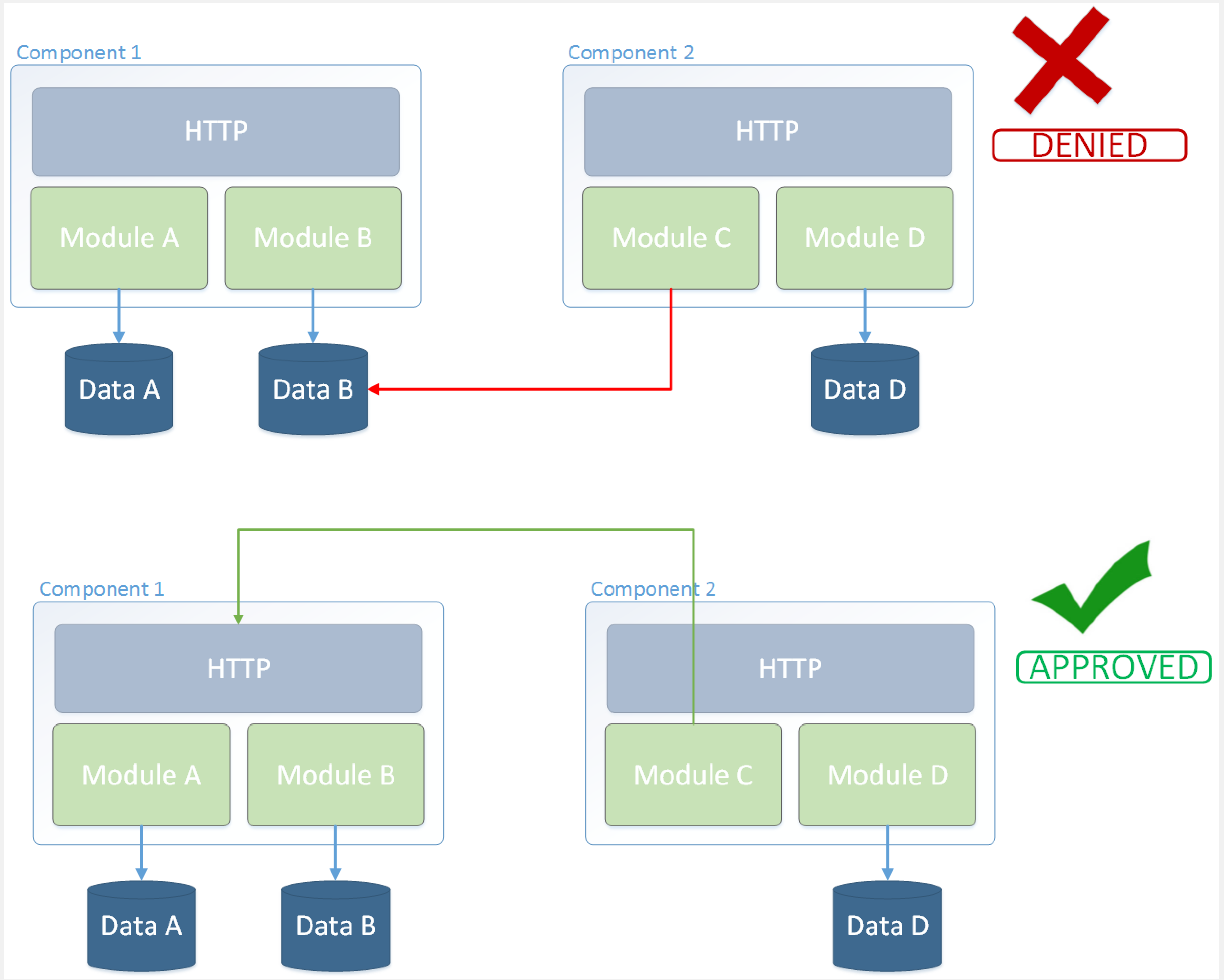
Don't forget to use version within your HTTP endpoints to allows easier and smooth internal library upgrade


HTTP(S)
Service 1
Service 2
HTTP
HTTP
Module 1A
Module 1B
Client 1
Import
Client 1
Module 2A
Module 2B
Data 1A
Data 1B
Data 2A
Data 2B

Databases and MicroServices


Component 1
HTTP
DENIED
Module A
Module B
Data A
Data B


Component 1
HTTP
APPROVED
Module A
Module B
Data A
Data B


Component 1
HTTP
Module A
Module B
Data A
Data B
Component 2
HTTP
Module C
Module D
Data D
DENIED
Component 1
HTTP
Module A
Module B
Data A
Data B
Component 2
HTTP
Module C
Module D
Data D
APPROVED

Load Balancing

Load balancing

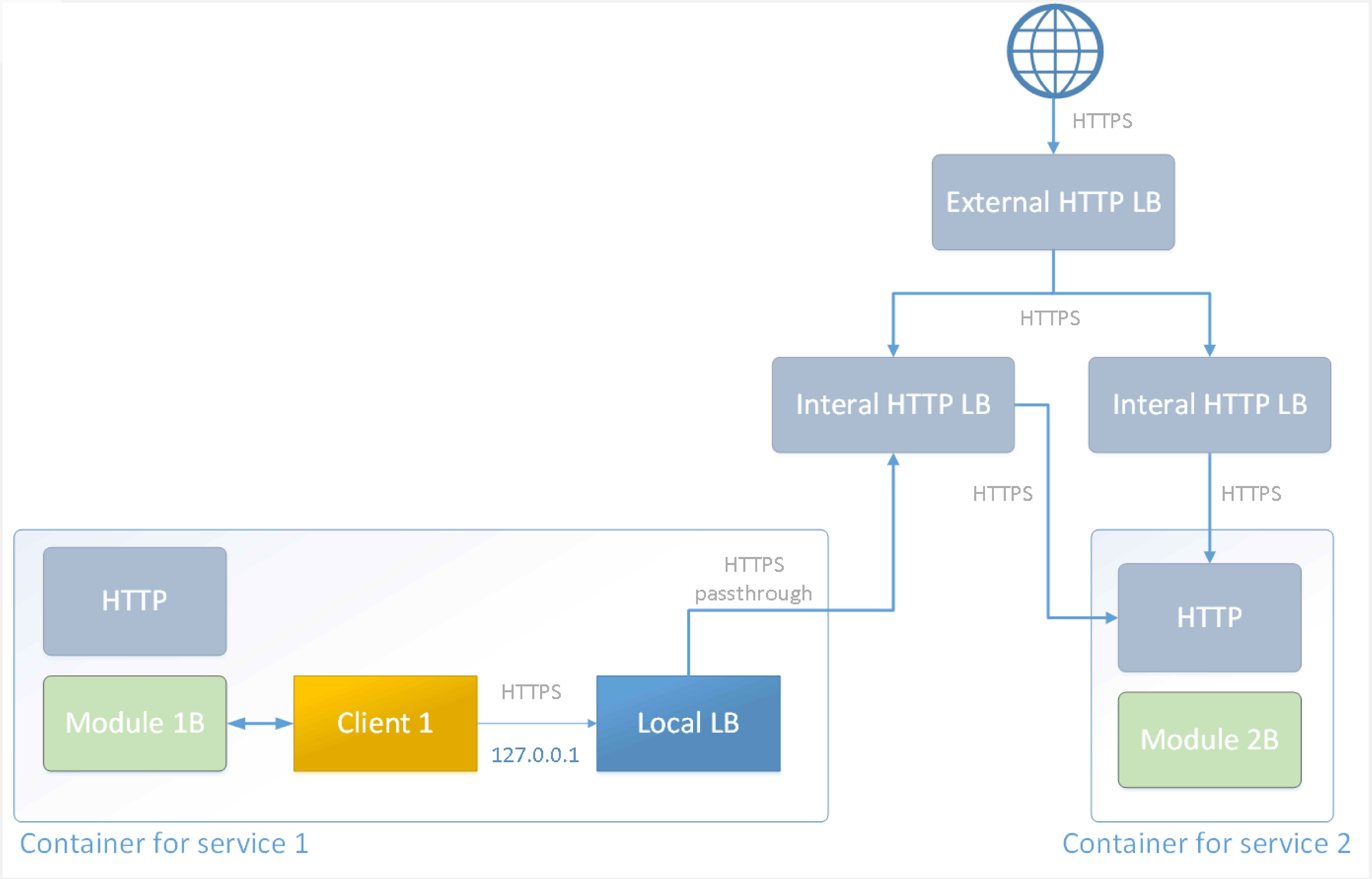
Avoid single point of failure

III

Place LB as close as possible from client

Internal & External client Facing : FrontEnd LB

Services & Tools client : Load blancer on each node (Independent)
-More complicated but no single point of failure
-All fqdn to 127.0.0.1 (Allow SSL passthroug)


HTTPS
External HTTP LB
HTTPS
Interal HTTP LB
Interal HTTP LB
HTTPS
HTTPS
HTTPS
passthrough
HTTP
HTTP
Module 1B
Client 1
HTTPS
127.0.0.1
Local LB
Module 2B
Container for service 1
Container for service 2

Jobs

Jobs

The best way to manage jobs is to avoid recurrent Jobs

- But it's almost never possible

Use reactive programming instead of batch programming

Minimal requirements

- Jobs must have a single “effective” running instance
- Detect and handle job failures

Jobs – distributed the heavy way

Distributed jobs engine

- Mesosphere
- Chronos + mesos

At least 5 different kinds of services to manage

Not very compliant with small teams and low maintenance times

Jobs – leShop way

Each jobs is owned by a micro-service

Allow each job to be idempotent and independent instances

Each job decided to stop/start himself

- This require each micro-service to use an internal scheduler
- Quartz is an internal scheduler, cron/systemd.timer are not :-)

Jobs – leShop way

Cleaning phase: detects jobs that are running for too long or are hung.

Reservation phase: place a reservation for the job

Execution phase: If the instance owns the reservation, it executes and handles the job.

Place easy to use milestone before critical operation within the execution phase

You need atomic operations on “quorum”

- You have to use a fully consistent write-oriented database (this is exactly the SQL pattern)
- But this imply active-passive setup (Break III)

Database
Instance 1
Instance 2
Start I1 T0
read
read
Term I1 T0
Term I1 T0
write
write
Start I1T1
Start I2 T1
T1
T1
read
read
Start I2 T1
Arbort
Start I2T1
Start JOB
RUN I2 T2
RUN I2 T3
read
Check before
critical operation
OK
TERM I2 T3
Reservation
Execution phase

Reservation phase

1 Read status of job

2 If <status> is START/RUN → ARBORT

3 Update job status (Start, worker, now)

Execution phase

1 Read status of job

2 If <status> != START || not my worker id → ARBORT

3 Update job status : (Run, worker, now)

4 Peform job:

  a regulary update job status

  b for critical action, check if worker still own the job

5 Finish job (Term, worker, now)

Monitoring

Monitoring

Each component runs multiple instances, each instance deals with jobs

- You may not know the current number of instances at a time T

Monitor business state instead of detailed views

Base your monitoring on business requirements

- A customer can create an account
- A retailer order can be send
- And so on ...

Monitoring

Require deep knowledge of business and inter-services communication

- Luckily, It's exactly the job of the acceptance phase in continuous delivery
- Just reuse a subset of your acceptance tasks/tests
- Dedicated special HTTP route to run services self-business test

Create a service in charge of running end to end business case

- Use it for continuous integration/delivery

To follow III each test must be self contained and leave do track

Monitoring jobs & instances

We store micro-services status within a distributed databases

Same for jobs

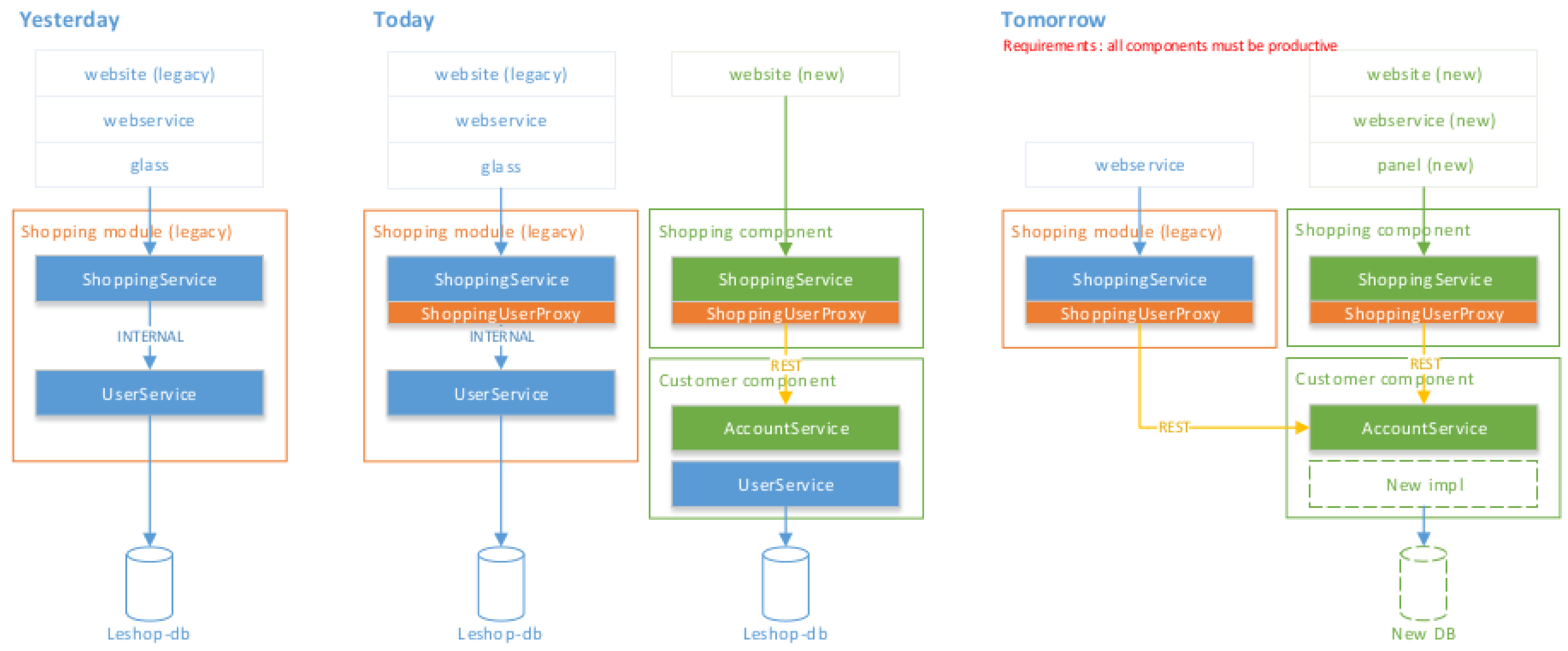
Services instances periodically update their status (from business internal test)

Job periodically update their status (last completion time)

Check if number of alive instances are able to support business

Check if jobs have run in a business reliable time-span

Migrate and survive the great divide


Yesterday
website (legacy)
webservice
glass
Shopping module (legacy)
ShoppingService
INTERNAL
UserService
Leshop-db
Today
website (legacy)
webservice
glass
Shopping module (legacy)
ShoppingService
ShoppingUserProxy
INTERNAL
UserService
Leshop-db
website (new)
Shopping component
ShoppingService
ShoppingUserProxy
REST
Customer component
AccountService
UserService
Leshop-db
Tomorrow
Requirements: all components must be productive
webservice
Shopping module (legacy)
ShoppingService
ShoppingUserProxy
REST
website (new)
webservice (new)
panel (new)
Shopping component
ShoppingService
ShoppingUserProxy
REST
Customer component
AccountService
New impl
New DB

Where we are and where we go

PAAS & LeShop 2016/2017

We run on Openshift 2

Approximately 100 micro services in production

Docker Kubernetes dedicated clusters

Plan to move on Openshift 3 within 2017

We will not add Database within Openshift

We plan to move some services from dedicated dockers cluster to OpenShift 3

Wrap up

Don't forget people

Never forget the human natural Fear of Changes

- Keep change smooth and make them natural and part of your software life-cycle
- Release often and water down perception of "Breaking change"

Never forget to try on the battlefield

- Use less important services to effectively test your changes

III :-)

Thank you

RED HAT
SUMMIT

LEARN. NETWORK.
EXPERIENCE OPEN SOURCE.

Authentication

Security context, authentication, AC and no session

JSON Web Token (JWT) “pronounced JOT”

-draft-ietf-oauth-json-web-token-32

Contain user role & authorizations (Called claims in literature)

Non-cookie based Token

Not automatically sent by browser

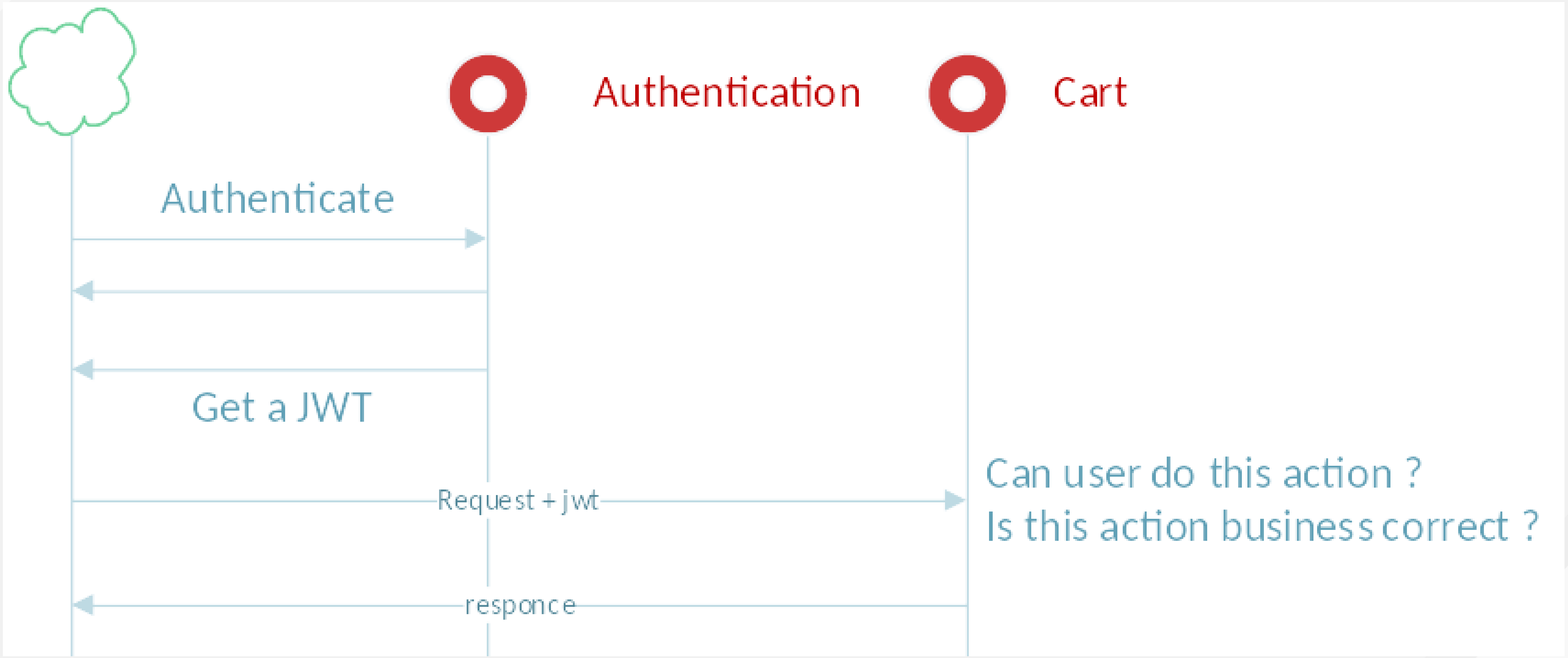
Easier to manipulate from non-browser apps

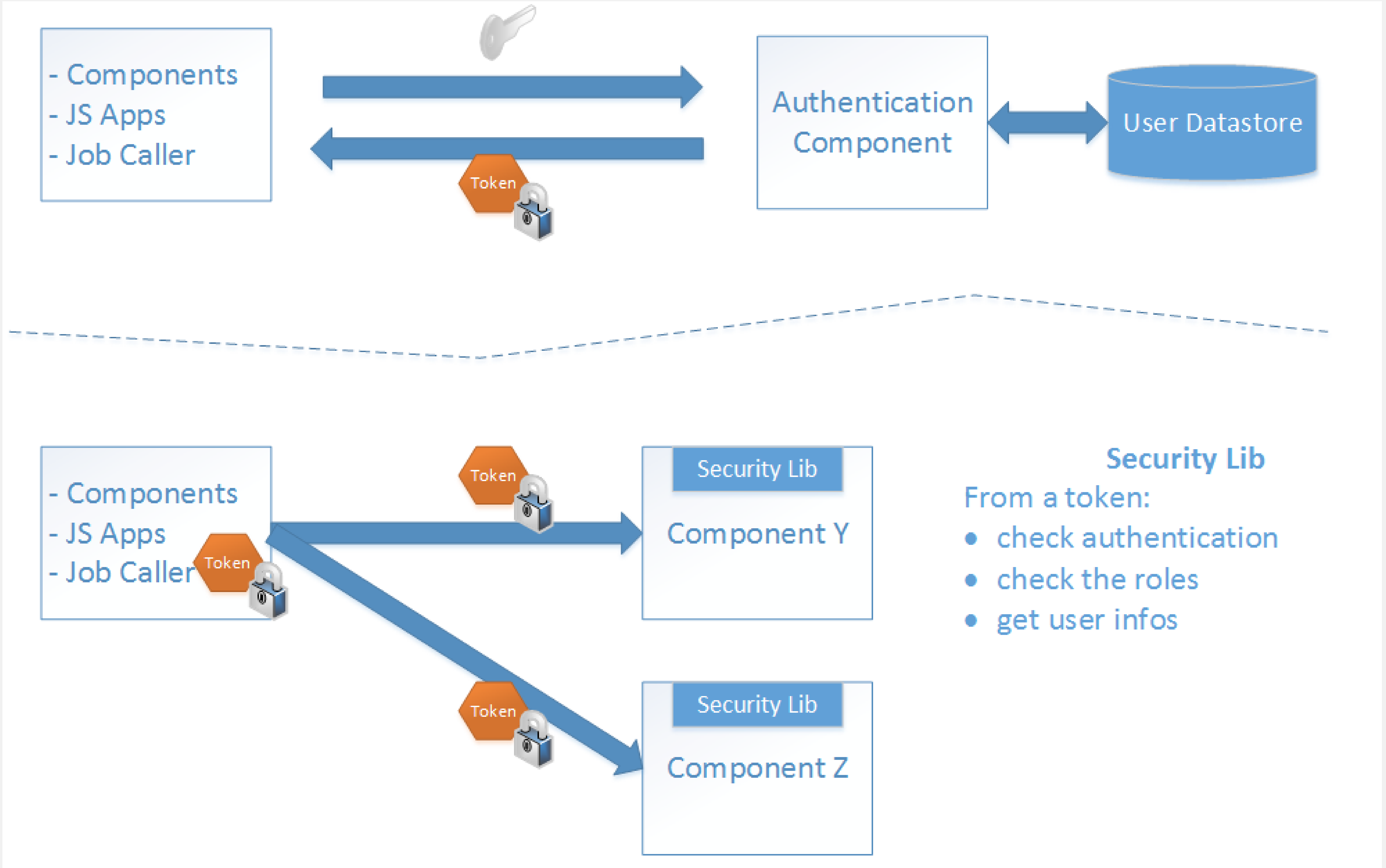
Short and Hard lifetime

Signed and enciphered

Allow message to be independent

Security context, authentication, AC and no session





Security Lib

From a token:

- check authentication
- check the roles
- get user infos

A token is valid for a given period of time -> No need to contact the authentication component