

Serverless on OpenStack

with Mistral and StackStorm

Dmitri Zimine

@dzimine

@Stack_Storm

Agenda

What is Serverless

Definition, stack, frameworks overview

Show & Tell

Toy example,
Real world use case

A path forward

Serverless, OpenStack, and
StackStorm

Serverless

DevOps

Agile

Cloud

WHAT IS DEVOPS? – DAVE FARLEY

4

"DevOps is about developers and operations people working collaboratively to release software to users.

Continuous Delivery is about making businesses more early and continuous



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WHAT IS DEVOPS? – MATTHEW

"Highly effective, daily collaboration between software developers and IT operations people to produce relevant, working systems."

Matthew Skelton, Skelton Thatcher Consulting



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WHAT IS DEVOPS (M)

DevOps is an alternative model for the creation of business value from the software development life-cycle that encompasses a product-centric view across the entire product life-cycle (from inception to retirement) and recognises the value in close collaboration, experimentation and rapid feedback."

" <https://blogs.pearsoncmg.com/2014/04/16/devops-is-a-product-centric-and-continuous-lifecycle/>



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WHAT IS DEVOPS? – AMY

7

"I'm afraid I'm a tester... so have pretty much no idea what DevOps is about."

Amy Phillips, Songkick



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WHAT IS DEVOPS? – ANNA

6

"DevOps means a culture where developers and web operations engineers communicate and work together, as opposed to a siloed organisation where developers throw code over the wall to operations and expect web operations engineers to make sure it runs in production."

Anna Shipman, GDS



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What is Serverless?





marak

@marak

One man army. Former Government Contractor. Open-Source Software Linchpin. Founder of [hook.io](#) and [@Nodejitsu](#) [github.com/marak](#)

📍 Brooklyn, NY



marak

@marak

+ Follow

Can we please rename [#serverless](#) to [#faas](#)? Functions as a Service. The term "Serverless" is a misnomer. It's also vendor lock-in.

RETWEETS

44

LIKES

58



5:44 PM - 27 May 2016



9



44



58



Tweet your reply



Jesse Ditson @jesseditson · 28 May 2016

Replying to [@marak](#)

it took me about 50 tweets to figure out what the hell anyone was talking about, then I was like oh, lambda? But it runs on a server!



1



1



marak @marak · 28 May 2016

For real! I did an on-site enterprise install last week of an intranet only [#faas](#). I'm

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Privacy policy Cookies Ads info

What is Serverless?

Authoritative: Mike Roberts on martinfowler.com:



Mike Roberts

@mikebroberts

Following



The final installment of my [#serverless](#) architecture article, about possible future developments, is now up.

<https://goo.gl/bTfgfU>

What is Serverless?

- Event driven programming model
- Functions, not services – **“down when done”**
- Scale – “infinite”, transparent for dev, handled by Platform/Framework

SCALE?

A man with a beard and glasses, wearing a white shirt and a dark tie, is leaning forward over a desk. He has a stressed or intense expression. His hands are resting on a black keyboard. The background is a dark blue-grey surface with a digital rain effect, where characters from various alphabets (Latin, Cyrillic, Greek) and numbers fall vertically. The overall tone is serious and tech-related.

IT'S NOW YOUR PROBLEM !

What is Serverless?

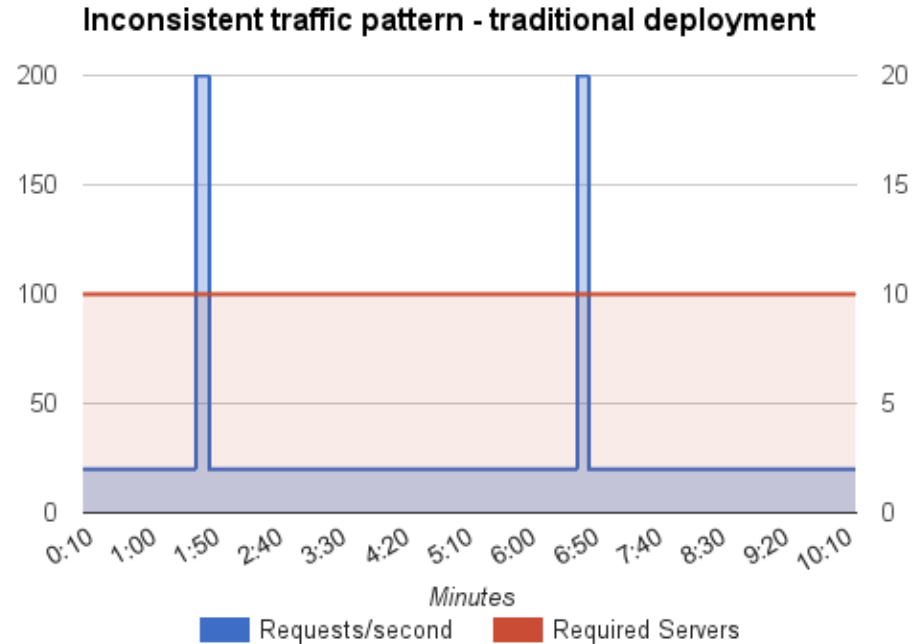
- Event driven programming model
- Functions, not services
 - “down when done”
- Scale – infinite, transparent,
 - “not my problem”
- Pay-per use consumption model



What is Serverless?

Good for:

- Spiky inconsistent workloads
- Occasional requests
- **Saving \$\$\$ money**

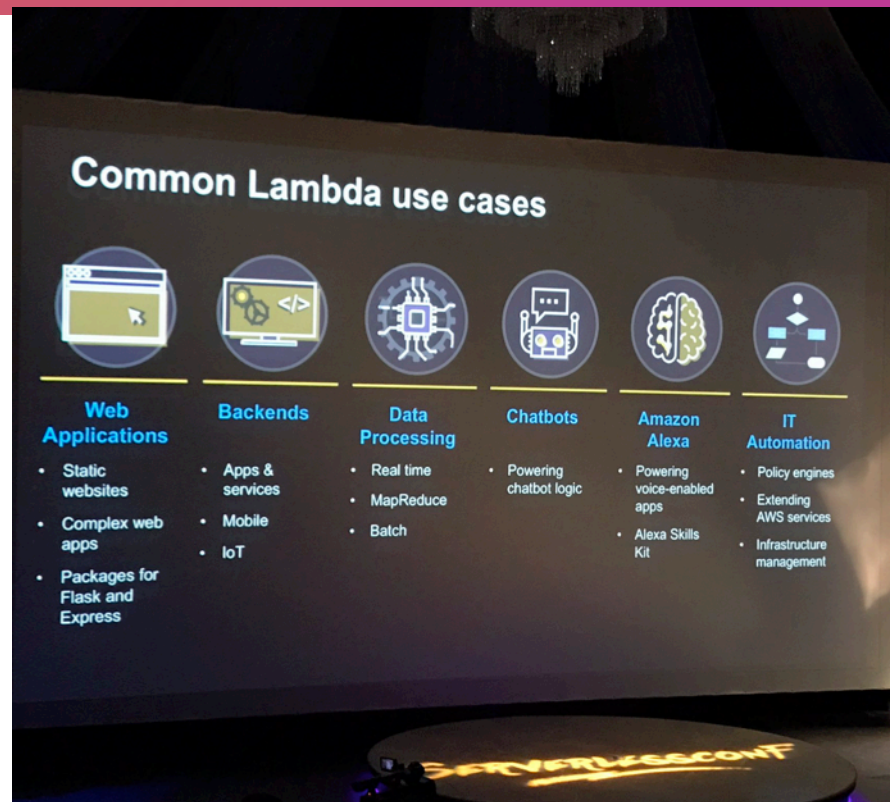


Value-driven development

- [Link to that article](#)

Serverless Use Cases

- Data Processing
- Services for web & mobile apps
- Other automation
 - DevOps automation
 - Email clients
 - Load testing (Artillery)
 - IoT, Alexa, ChatBots
 - Exotic (serverless Wordpress)



Serverless Use Cases

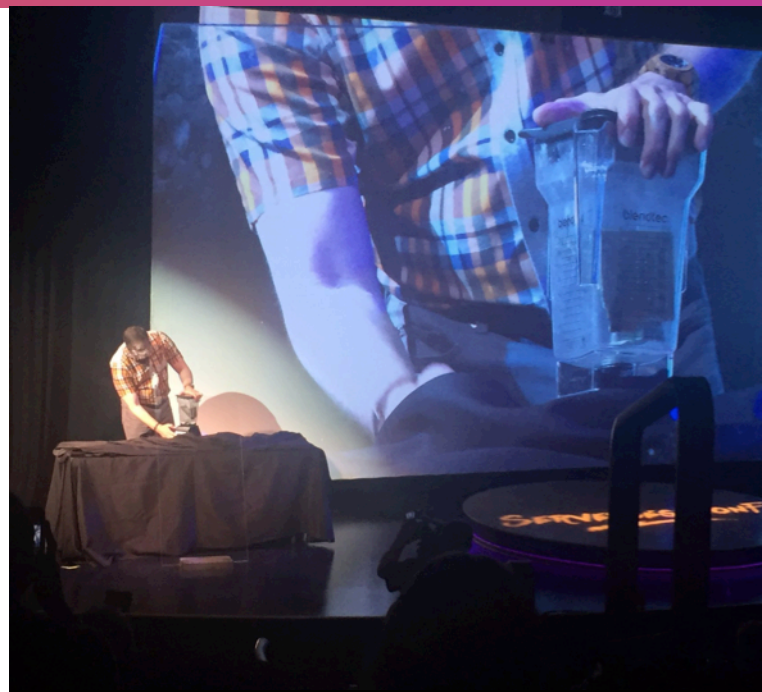
serverless framework use-cases

	data processing	services	other automation
invocations	75%	20%	5%
functions	17%	58%	23%



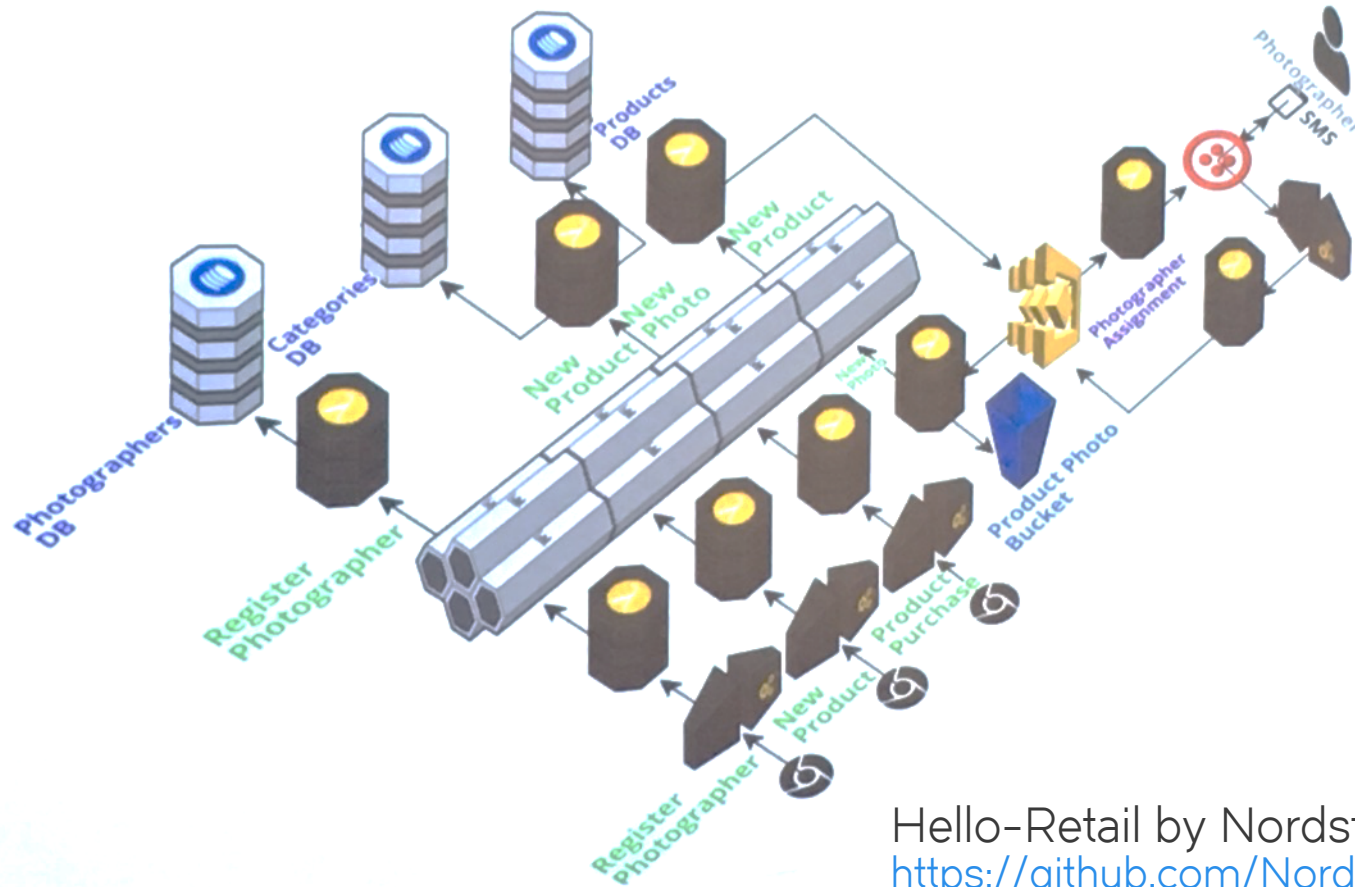
Serverless Use Cases

- Thomson Reuters
 - processes 4,000 requests per second with Serverless.
- FINRA (Financial Industry Regulatory Authority)
 - processes half a trillion validations of stock trades, every day.
- Expedia
 - triggers 1.2 billion serverless requests each month



Source: Tim Wagner, AWS
#serverlessconf Austin

Example: Nordstrom



Hello-Retail by Nordstrom

<https://github.com/Nordstrom/hello-retail>

Serverless stack formed

Serverless > FaaS

	AWS	Azure
FaaS	Lambda	Azure Functions
API Gateway	API Gateway	API Management
Event streams	Kinesis, SNS	Event Hubs, Notification Hubs
Authentication	IAM, Cognito	Azure Apps auth
Database	DynamoDB	Tables, DocDB
File storage	S3	Azure Storage
Workflows	Step Function	Logic Apps

Serverless ecosystem: platforms & frameworks

Standalone
Serverless PaaS

Usability shims
for AWS FaaS

Serverless
from public cloud
giants

FaaS extensions
For k8s & Swarm

Open source
DIY platforms

Serverless from public cloud giants



Google Cloud Platform



IBM Bluemix

Standalone Serverless PaaS offerings



webtask



Auth0

Back&

Usability shims for AWS Lambda/FaaS

SERVERLESS

APEX

serverless architecture



<stdlib>

FaaS extensions for Kubernetes / Swarm



Docker FaaS by Alex Ellis

github.com/alexellis/faas

Serverless-swarm

github.com/dzimine/serverless-swarm

Open source DIY platforms



APACHE
OpenWhisk™

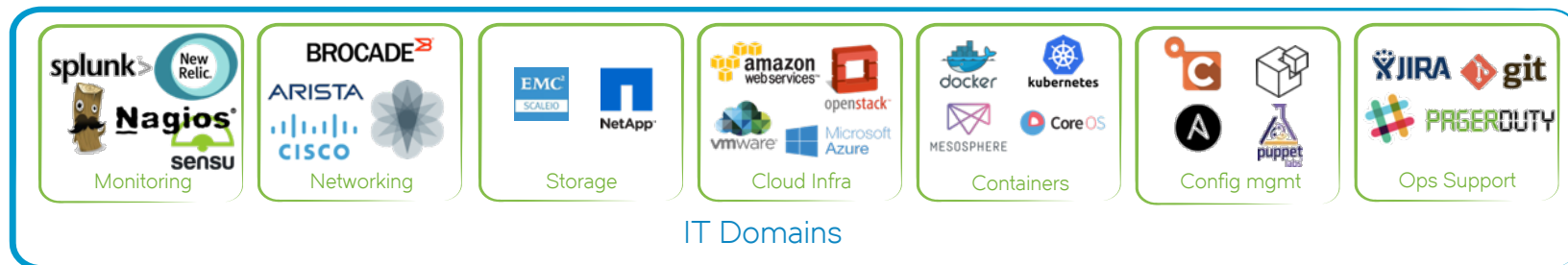
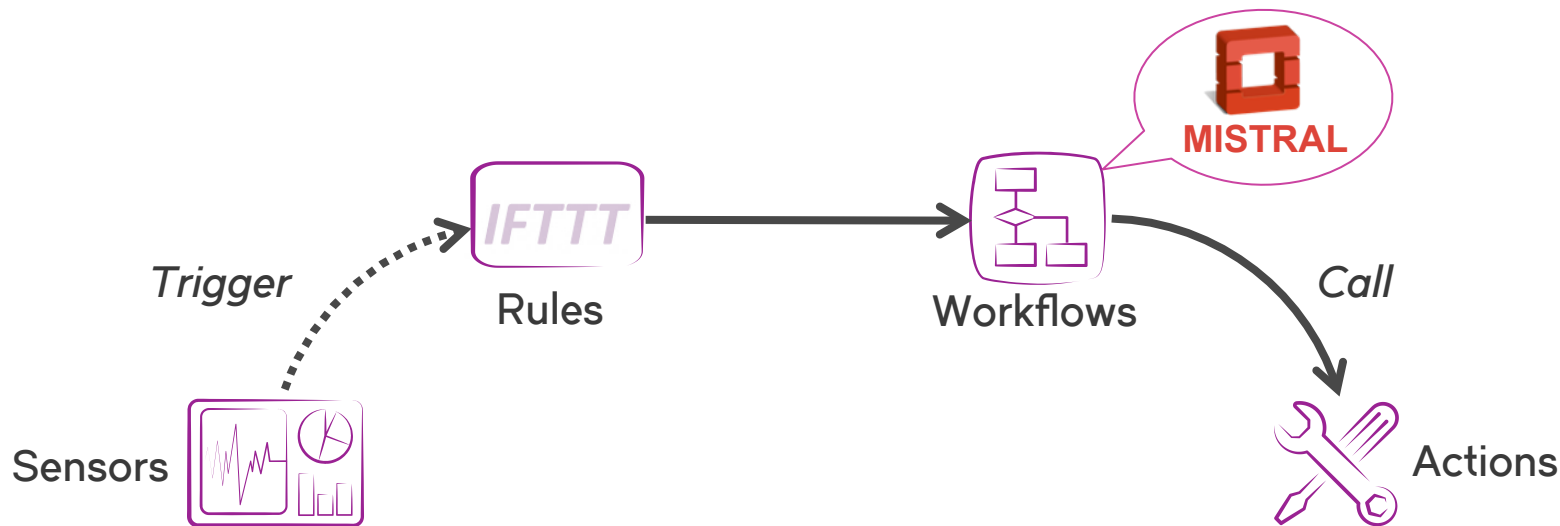


StackStorm

SHOW & TELL, part 1

Serverless 101 with StackStorm

Ingredients



Take aways

- Functions easy to create, on Python (pref), Bash, Ruby, Java, any ...
- Functions (actions) get API (with access control)
- Rules define events and criteria to trigger actions
- Workflows? Coming up next...




Genomic Annotation Pipeline

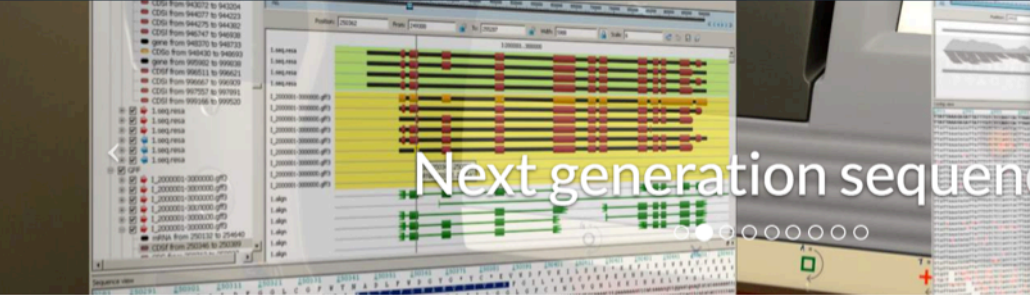
A serverless solution with
StackStorm, Mistral, & Swarm

Softberry Home Page


www.softberry.com

Softberry


Run Programs Online



Next generation sequencing




AboutDownloadsProductsServicesIn publications




Next generation

Genome and transcripts assembling, Reads Mapping, Alternative transcripts (Transomics pipeline), Snp discovery and evaluation, visualization



Annotation of Bacterial Genomes

Bacterial gene, promoters, terminators, operons identification, metagenomics, Fgenesb pipeline. Microbiome sequence analysis and annotation.



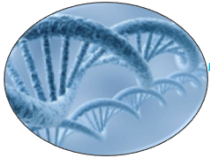
Annotation of Animal Genomes

Gene identification, HMM, Fgenesb gene finder and Fgenesb++ genome annotation pipeline, building gene models accounting RNASeq data, finding alternatively spliced isoforms, 329 custom model gene-finding parameters

- Gene finding in Eukaryota
- Gene finding with similarity
- Operon and Gene Finding in Bacteria
- Gene Finding in Viral Genomes
- Next Generation
- Alignment (sequences and genomes)
- Genome visualization tools
- Search for promoters/functional motifs
- Deep Learning Recognition
- Protein Location
- RNA structures
- Protein structure
- Pathway prediction
- Protein/DNA 3D-Visual Works
- Manipulations with sequences
- Multiple alignments
- Synteny from genome contigs
- Analysis of gene expression data
- Plant Promoter Database
- Repeats
- SNP

Genomic Sequencing and Annotation

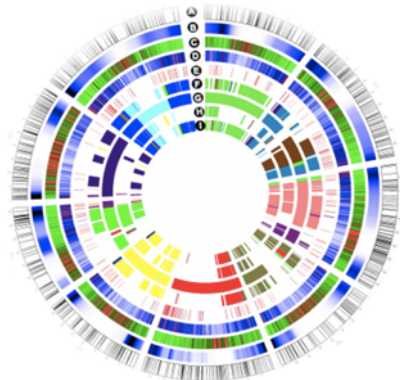
DNA Sample



Sequencer

Sequenced Genome

```
ACGTGACCGGTACTGGTAACGTACA  
CCTACGTGACCGGTACTGGTAACGT  
ACGCCTACGTGACCGGTACTGGTAA  
CGTATACACGTGACCGGTACTGGTA  
ACGTACACCTACGTGACCGGTACTG  
CTGGTAACGTATACCTCT...
```



Annotated Sequence

Compute
in silico



So that...

- Conclusions can then be drawn about the significance of the differences, and how they may affect gene expression and contribute to a specific disease or trait.

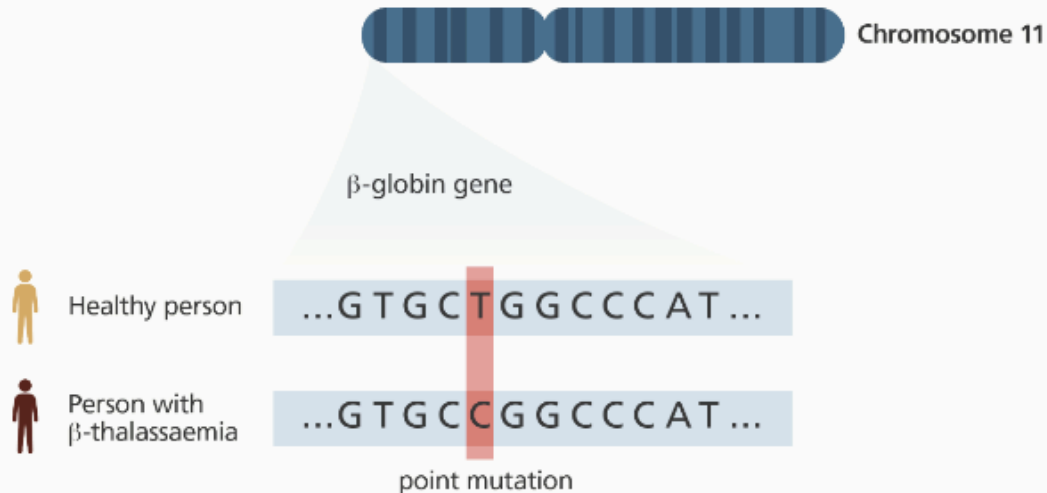
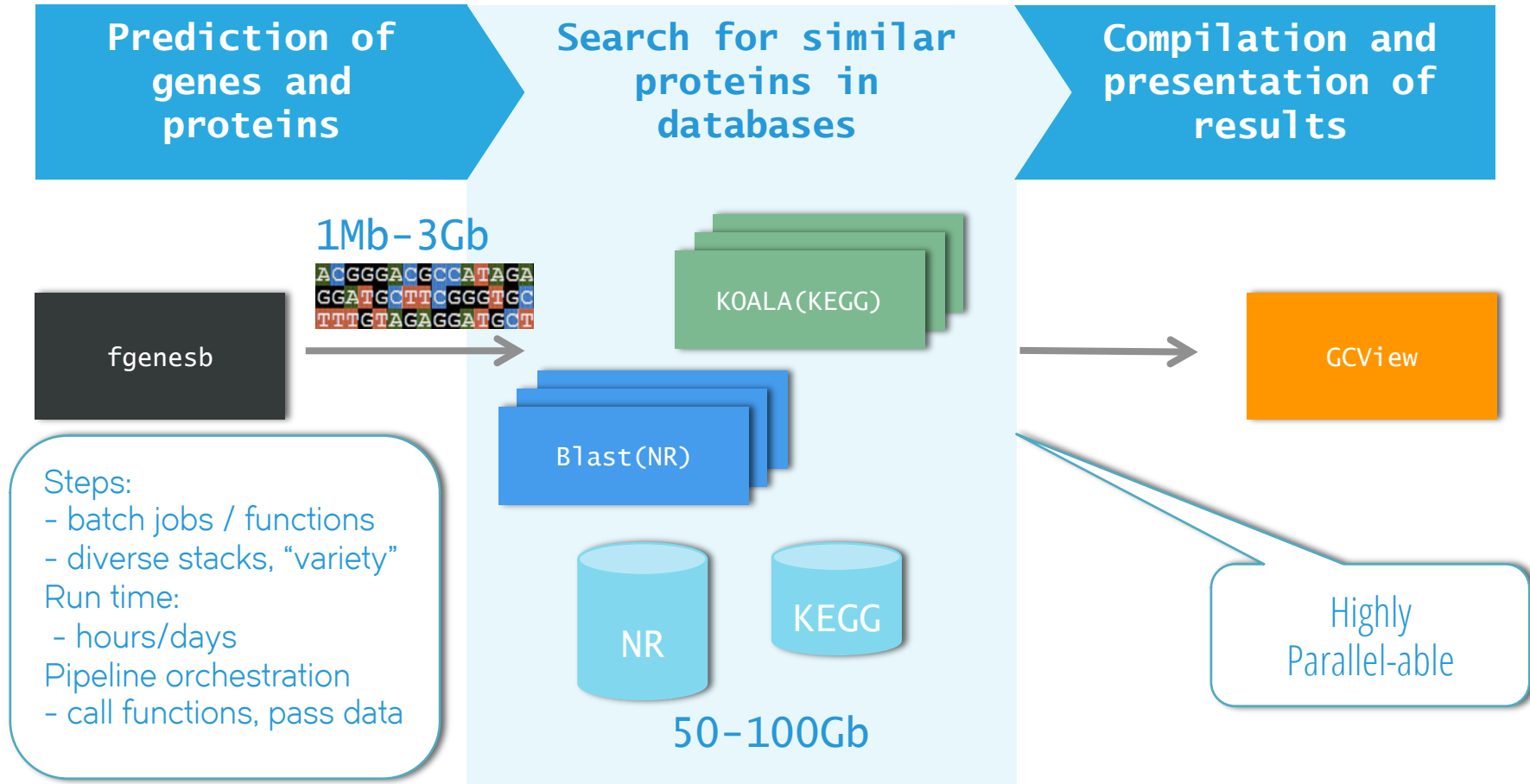


Illustration showing the point mutation in the β -globin gene responsible for the genetic blood disorder β -thalassaemia. Image credit: Genome Research Limited.

Typical genomic annotation pipeline



Why Serverless

Typical serverless requirements:

- Elastic scale: handle spiky workload pattern
- “Functions”, not “servers”, down when done
- BYOC: package programs into containers, run everywhere
- Launch on [high variety of] events

Additional requirements:

- Long running times: hours
- Pipeline orchestration: execution logic and data passing
- Local Dev environment, consistent and convenient

Why not <...>

- Not Lambda?
 - 5 min limitation - jobs run for hours and days
- Not OpenWhisk?
 - Need powerful workflow to orchestrate pipelines
- Not Azure?
 - No native support for Jobs in docker containers

Serverless solution

The three sides to the story



End
User

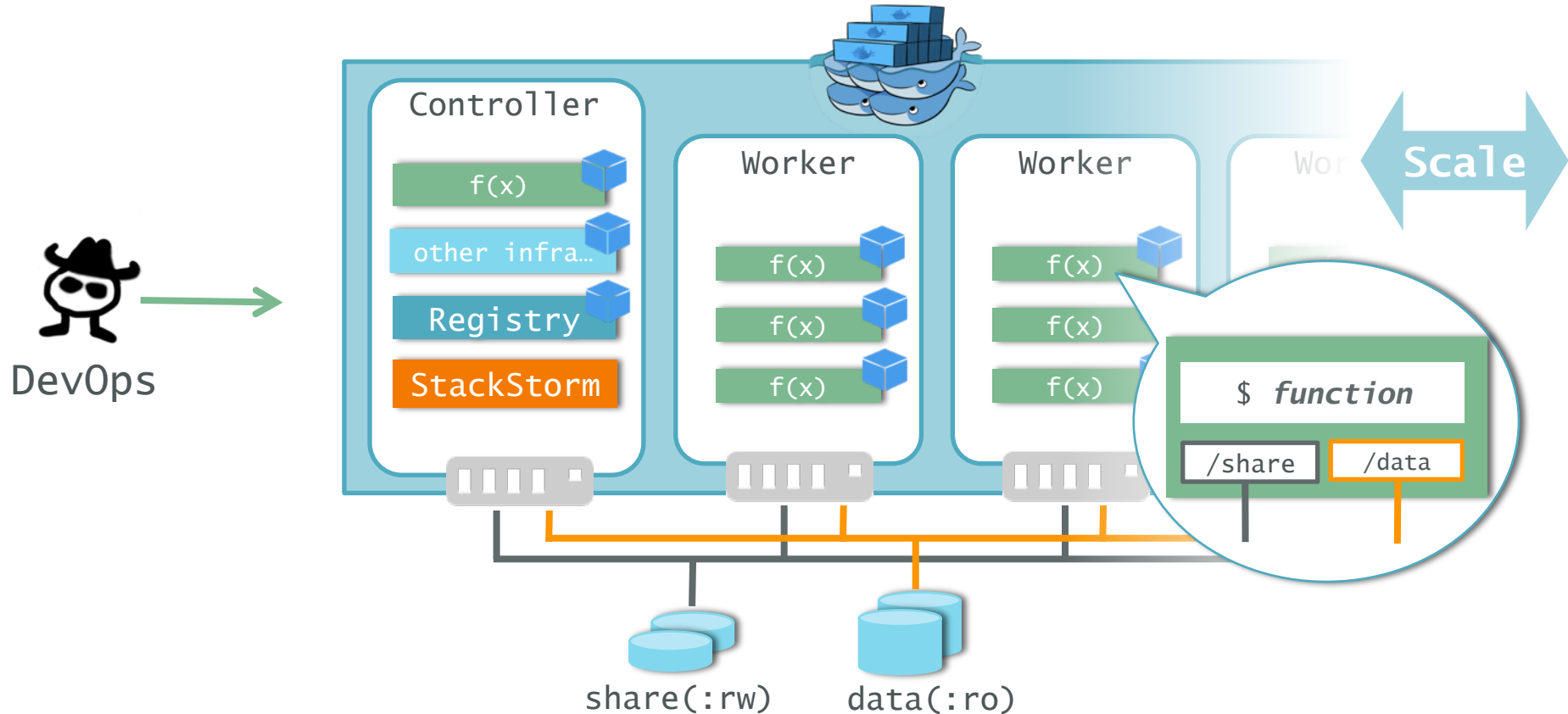


DevOps



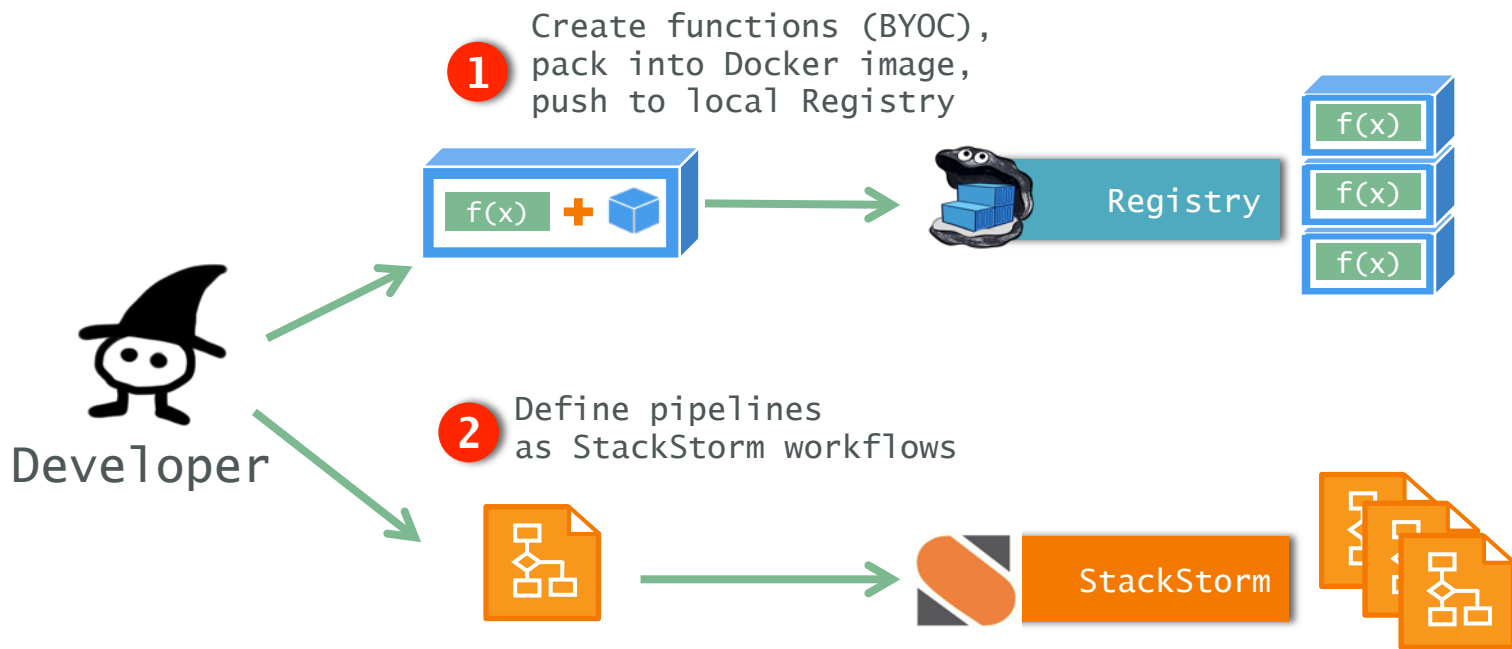
Developer

1. Admin: deploys the serverless solution

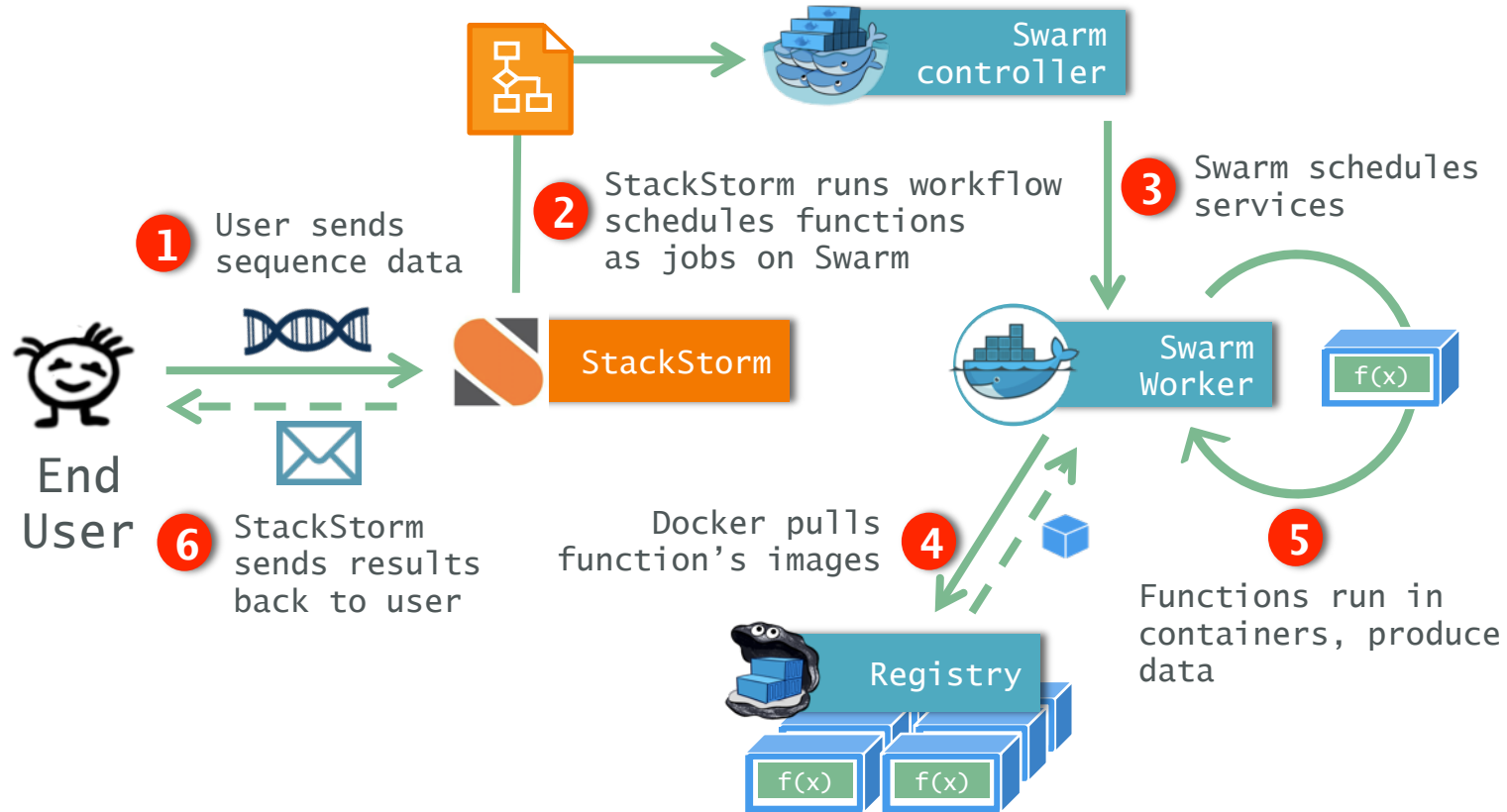


2. Developer:

creates functions, defines pipeline



3. User submits data, System runs pipeline & produces results



SHOW & TELL, part 2

Serverless solution with StackStorm and Swarm
for Genomic annotation computations

fgenesb pipeline: some [prev] results



Genome Sequence of a Multidrug-Resistant Strain of *Stenotrophomonas maltophilia* with Carbapenem Resistance, Isolated from King Abdullah Medical City, Makkah, Saudi Arabia

Alyaa M. Abdel-Haleem,^{a,d} Zineb Rchiad,^a Babar K. Khan,^a Abdallah M. Abdallah,^a Raece Naeem,^a Shalam Nikhat Sheerin,^b Victor Solovyev,^{d,e} Abdalla Ahmed,^c Arnab Pain^a

Biological and Environmental Sciences and Engineering (BESE) Division, King Abdullah University of Science and Technology (KAUST), Thuwal, Saudi Arabia^a; Microbiology Unit, Department of Laboratory and Blood Bank, King Abdullah Medical City, Makkah, Saudi Arabia^b; Department of Microbiology, College of Medicine, Umm Al-Qura University, Makkah, Saudi Arabia^c; Computational Bioscience Research Centre, King Abdullah University of Science and Technology (KAUST), Thuwal, Saudi Arabia^d; Softberry, Inc., Mount Kisco, New York, USA^e

A.M.A.-H., Z.R., and B.K.K. contributed equally to this work.

The emergence and spread of multidrug-resistant (MDR) bacteria have been regarded as major challenges among health care-associated infections worldwide. Here, we report the draft genome sequence of an MDR *Stenotrophomonas maltophilia* strain isolated in 2014 from King Abdulla Medical City, Makkah, Saudi Arabia.

Serverless on OpenStack

the path forward

SHOW & TELL, part 3

Serverless, with Swarm, on OpenStack,
and something VERY SPECIAL

Credit:

Winson Chan, *Mistral core contributor, old Stormer*
Anirudh Rekhi, *a new Stormer*

Swarm auto-scale: what did it take?

- Heat template with scale policies
 - https://github.com/dzimine/serverless-swarm/blob/master/terraform/openstack/docker_cluster_autoscaling.yaml
- Scale-up action (auth + web call)
 - <https://github.com/dzimine/serverless-swarm/blob/master/pipeline/actions/scaling.py>
- Swarm “pending tasks queue” sensor to trigger scale-up event
 - https://github.com/dzimine/serverless-swarm/blob/master/pipeline/sensors/pending_queue.py
- Rule to call ‘scale-up action’ on “pending tasks over threshold” trigger
 - <https://github.com/dzimine/serverless-swarm/tree/master/pipeline/rules>

Serverless on OpenStack?

Who cares?

- Cloud providers ?
- Private clouds ?
- OpenStack ?
- **Developers !**
 - Use event centric programming models
 - Workloads where serverless is best fit



Serverless on OpenStack: Options

Build
ourselves



Serverless on OpenStack: Options



Serverless on OpenStack: Options



Serverless stack on OpenStack with StackStorm

	AWS	OpenStack
FaaS	Lambda	StackStorm
API Gateway	API Gateway	StackStorm ?
Event streams	Kinesis, SNS	Zaquar
Authentication	IAM, Cognito	Keystone
Database	DynamoDB	Trove
File storage	S3	Swift
Workflows	Step Function	Mistral



TROVE

an OpenStack Community Project



ZAQAR

an OpenStack Community Project



StackStorm

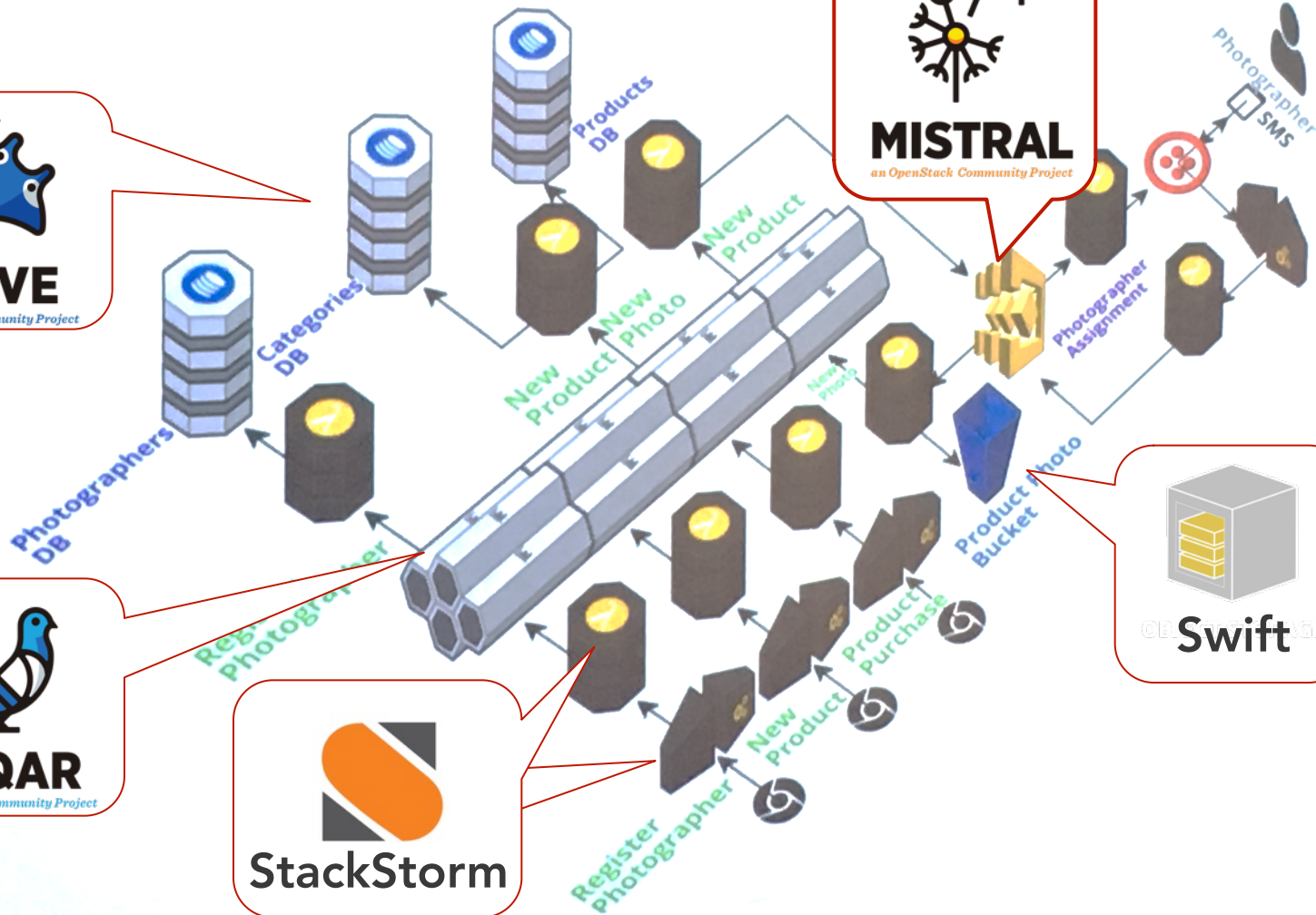


MISTRAL


an OpenStack Community Project



Swift



StackStorm facts

- Apache 2.0
- Since April '14
- 100,000,000₂ contributors (=256) 
- ~3,000 installations/month
- ~100 integration packs

StackStorm facts

- Largely, OpenStack's tech stack:
Python, RabbitMQ, Pecan,
Oslo config & utils, eventlets, etc.
- Team part of community -
- - Mistral contributors since inception



StackStorm Exchange

Automate all the things you already know and use
with dozens of ready-made integration packs.

Cloud providers, monitoring services, lightbulbs.

```
st2 pack install travis_ci
```

Search

All Staff Picks Cloud Providers Monitoring Curiosities



activecampaign



Integration with ActiveCampaign

v0.2.0

DoriftoShoes



alertlogic



AlertLogic ActiveIntegration APIs

AlertLogic



ansible



st2 content pack containing ansible
integrations



astral



triggers for sunrise/sunset information

v0.1.1

Tim Braly

Discuss, decide

- **Get StackStorm, decide on merits**
 - st2vagrant – play – github.com/StackStorm/st2vagrant
 - st2-docker – play & light prod – github.com/StackStorm/st2-docker
 - Chef/Puppet/Ansible – for production @ scale
 - RTFM: docs.stackstorm.com/install
- **Today's show materials:**
 - github.com/dzimine/serverless-swarm
 - github.com/dzimine/openstack_boston
- **Discuss:**
 - here in Boston – find us at D26 or @dzimine
 - on openstack-dev, Subj: [FaaS]

Thank You!

Dmitri Zimine
@dzimine

@Stack_Storm

<http://github.com/StackStorm/st2>

★ Star

1,950