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ANDREW BLOOMGARDEN
STAFF ENGINEER, NEW RELIC

THE NTH REGION PROJECT

FORMAT

- What New Relic does
- What made this project difficult
- The technical changes we made
- The retro: the organizational challenges we faced
- Where we are now

New Relic®

New Relic INSIGHTS™

New Relic BROWSER™

New Relic MOBILE™

New Relic SYNTHETICS™

New Relic APM™

New Relic INFRASTRUCTURE™

Think 2018

New Relic Teams with IBM to Expand in Europe, Speed Cloud Adoption

RAILS MONOLITH

UI
API
DATA COLLECTION

RAILS MONOLITH

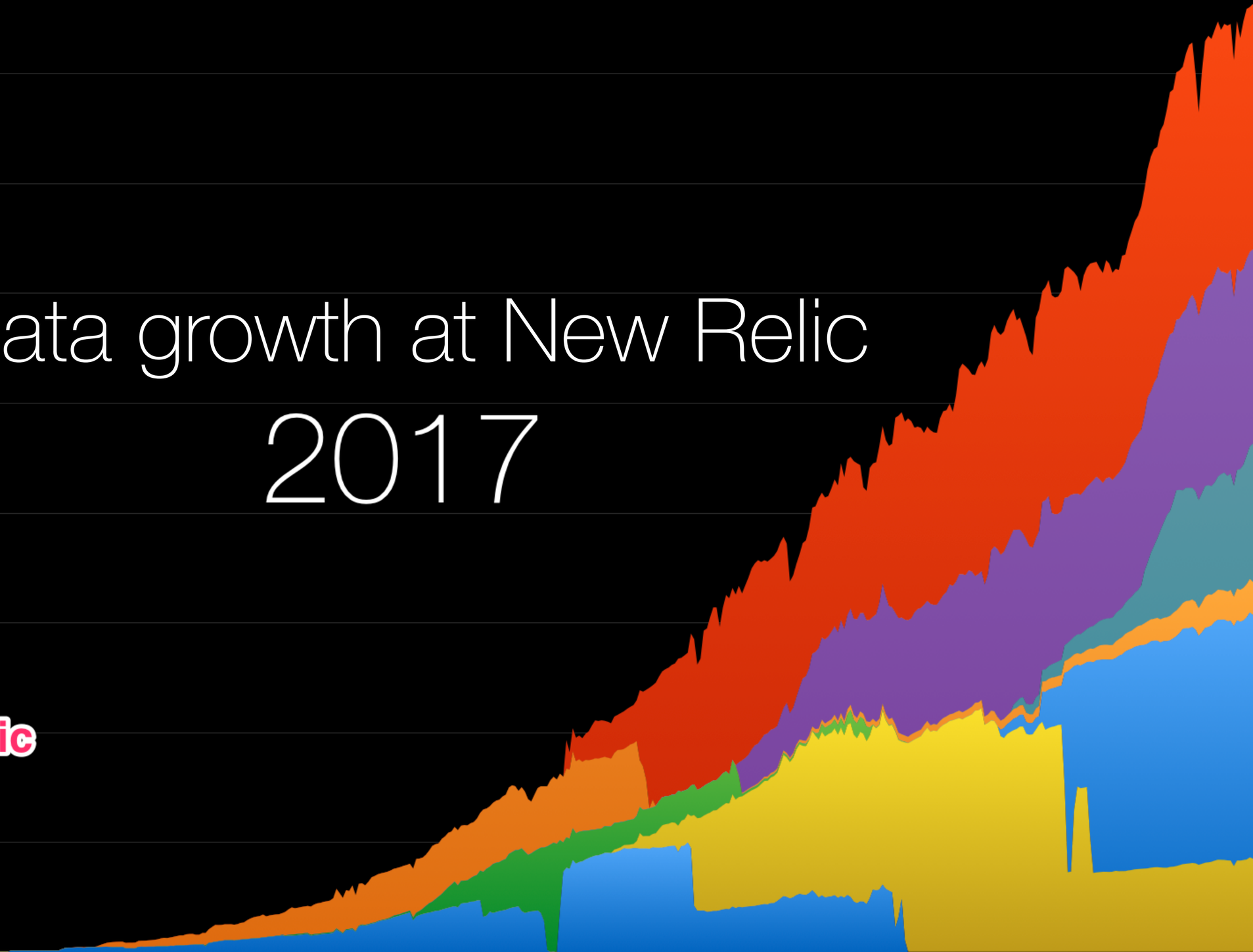
UI
API

JAVA COLLECTOR

DATA COLLECTION

Data growth at New Relic

2017



I start at New Relic

30

GIGABIT PER SECOND INBOUND

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15,000,000

KAFKA MESSAGES PER SECOND

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600 MILLION

EVENTS PER MINUTE

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~50

ENGINEERING TEAMS

HUNDREDS

OF ENGINEERS

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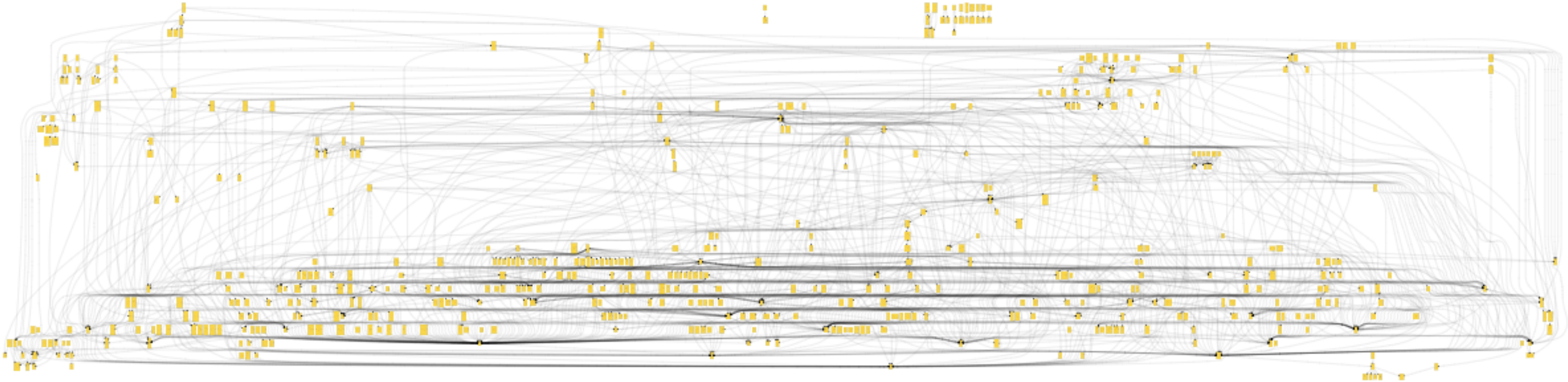
100%

DEV TEAMS ON CALL FOR THEIR SERVICES



1

REGION

EU region

Nth region
Aspiration: one small team can build a region

Project Backpack

MIGRATIONS AND DISASTER RECOVERY

PROBLEMS TO SOLVE IN EIGHT YEARS

- Deploying many services
- Supporting a polyglot environment
- Service discovery
- Better secret management
- Container orchestration

PROBLEMS TO SOLVE IN EIGHT YEARS

- Deploying many services
- Supporting a polyglot environment
- Service discovery
- Better secret management
- Container orchestration
- Multiple regions

MIGRATIONS ARE THE ONLY MECHANISM TO EFFECTIVELY MANAGE TECHNICAL DEBT AS YOUR COMPANY AND CODE GROWS. IF YOU DON'T GET EFFECTIVE AT SOFTWARE AND SYSTEM MIGRATIONS, YOU'LL END UP LANGUISHING IN TECHNICAL DEBT.

Will Larson, April 2018

THE VINTAGES OF NEW RELIC

- 2010: Capistrano and Puppet
- 2013: Docker v0.x and Centurion
- 2013: Serveza (in-house service discovery)
- 2016: Vault
- 2017: Grand Central (in-house build/deploy) and Container Fabric (Mesos)

CAPISTRANO AND PUPPET

Dr 2017 #3176

Edit

Closed [redacted] wants to merge 212 commits into `master` from `dr-2017`

Conversation 9 | Commits 212 | Files changed 81 | +2,325 −286

CENTURION

```
desc 'Production environment'
task :production => :common do
  env_vars NEW_RELIC_JAVA_AGENT_ENVIRONMENT: 'production'
  set_current_environment(:production)

  env_vars AGENT_DB_USERNAME: 'al_acs'
  env_vars AGENT_DB_PASSWORD: '…'

  host '….nr-ops.net'
  host '….nr-ops.net'
  host '….nr-ops.net'
end
```

CENTURION

```
desc 'Disaster Recovery environment'
task :recovery => :common do
  env_vars NEW_RELIC_JAVA_AGENT_ENVIRONMENT: 'recovery'
  set_current_environment(:recovery)

  env_vars AGENT_DB_USERNAME: 'agent_commands'
  env_vars AGENT_DB_PASSWORD: '…'

  host 'usw2v-dr-docker-8.dr.nr-ops.net'
  host 'usw2v-dr-docker-16.dr.nr-ops.net'
end
```

SERVICE DISCOVERY

```
handle = Serveza::Service.new('feature_flag', 1)
endpoint = handle.api
```

```
private final static Map<String, Map<Integer, String>> AGENT_DB_NAMES =
                ImmutableMap.<String, Map<Integer, String>>builder()
                                .put(STAGING,
                                                ImmutableMap.<Integer, String>builder()
                                                                .put(1, [redacted])
                                                                .put(2, [redacted])
                                                                .build())
                                .put(LOCAL_STAGING,
                                                ImmutableMap.<Integer, String>builder()
                                                                .put(1, [redacted])
                                                                .put(2, [redacted])
                                                                .build())
                                .put(RECOVERY,
                                                ImmutableMap.<Integer, String>builder()
                                                                .put(1, "usw2v-dr-agentdb-3.dr.nr-ops.net")
                                                                .put(2, "usw2v-dr-agentdb-7.dr.nr-ops.net")
                                                                .build())
                                .put(PRODUCTION,
                                                ImmutableMap.<Integer, String>builder()
                                                                .put(1, [redacted])
                                                                .put(2, [redacted])
                                                                .put(3, [redacted])
                                                                .put(4, [redacted])
                                                                .put(5, [redacted])
                                                                .put(6, [redacted])
                                                                .put(7, [redacted])
                                                                .put(8, [redacted])
                                                                .put(9, [redacted])
                                                                .put(10, [redacted])
                                                                .build())
                                .put(DEVELOPMENT, ImmutableMap.of(1, "localhost"))
                                .put(INTEGRATION, ImmutableMap.of(1, "agentdb"))
                                .build();
```

SERVICE DISCOVERY

```
.put(RECOVERY,
                ImmutableMap.<Integer, String>builder()
                                .put(1, "usw2v-dr-agentdb-3.dr.nr-ops.net")
                                .put(2, "usw2v-dr-agentdb-7.dr.nr-ops.net")
                                .build())
```

CONTAINER FABRIC AND GRAND CENTRAL

```
- name: production
  datacenter: chicago
  instances: 5
  cpus: 3
  memory_mb: 1024
  vips: [[redacted].nr-ops.net]
  env_vars:
    NEWRELIC_LICENSE_KEY: "vault_secret_path:containers/teams/connectivity/production/portal-service/newrelic_license_key"
    NEW_RELIC_INSIGHTS_INSERT_API_ENDPOINT: "https://staging-insights-collector.newrelic.com/v1/accounts/1/events"
    NEW_RELIC_INSIGHTS_INSERT_API_KEY: "vault_secret_path:containers/teams/connectivity/production/portal-service/insights_
    NEW_RELIC_JAVA_AGENT_ENVIRONMENT: "production"
    FEATURE_FLAG_SERVICE_ENVIRONMENT: 'production'
    SERVEZA_BACKING_STORE_URI: 'http://staticserve.nr-ops.net/serveza/v1/production.yaml'
    FEATURE_FLAG_AWS_ACCESS_KEY: "[redacted]"
    FEATURE_FLAG_AWS_SECRET_KEY: "vault_secret_path:containers/teams/connectivity/production/portal-service/feature_flag_aw
    FEATURE_FLAG_AWS_REGION: "us-east-1"
```

CONTAINER FABRIC AND GRAND CENTRAL

```yaml
- name: dr
  instances: 3
  cpus: 3
  memory_mb: 1024
  notify_on_stale_releases: false
  vips: [p[redacted].dr.nr-ops.net]
  env_vars:
    NEWRELIC_LICENSE_KEY: "vault_secret_path:containers/teams/connectivity/dr/portal-service/newrelic_license_key"
    NEW_RELIC_INSIGHTS_INSERT_API_ENDPOINT: "https://staging-insights-collector.newrelic.com/v1/accounts/1/events"
    NEW_RELIC_INSIGHTS_INSERT_API_KEY: "vault_secret_path:containers/teams/connectivity/dr/portal-service/insights_insert_a
    NEW_RELIC_JAVA_AGENT_ENVIRONMENT: "dr"
    FEATURE_FLAG_SERVICE_ENVIRONMENT: 'dr'
    FEATURE_FLAG_ALERTS_BASE_URI: 'http://alertservice-dr.dr.nr-ops.net/api'
    SERVEZA_BACKING_STORE_URI: 'http://staticserve.dr.nr-ops.net/serveza/v1/dr.yaml'
    FEATURE_FLAG_AWS_ACCESS_KEY: "[redacted]"
    FEATURE_FLAG_AWS_SECRET_KEY: "vault_secret_path:containers/teams/connectivity/dr/portal-service/feature_flag_aws_secret
    FEATURE_FLAG_AWS_REGION: "us-west-2"
```

INTERFACES

Interfaces separate the contract from the implementation

GETTING DATABASE CREDENTIALS

- File a ticket
- Wait for the DB team to add the credentials and share them
- Add them to your service configuration
- Deploy

GETTING DATABASE CREDENTIALS

- Programmatically declare your service needs access to the DB
- ...black box...
- Deploy

GETTING DATABASE CREDENTIALS, REALITY

- Programmatically declare your service needs access to the DB
- DB team still manually adds credentials
- Deploy

GETTING DATABASE CREDENTIALS, REIMPLEMENTATION

- Programmatically declare your service needs access to the DB
- Credentials automatically generated once a human reviews the access request
- Deploy

Encapsulation lets small teams act independently

HIGH LEVERAGE INTERFACES

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SERVICE DISCOVERY: PROBLEMS

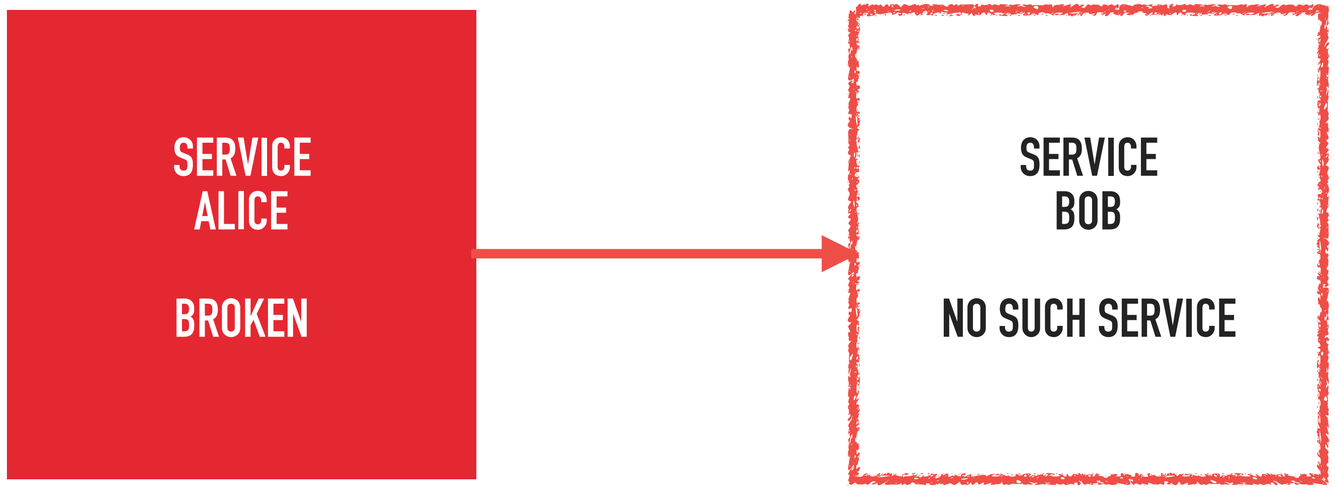
- Mix of:
  - Serveza (homegrown)
  - Hard-coded
  - Env vars
- Credential management unsolved
- No way to do static analysis

WHY STATIC ANALYSIS?

SERVICE
ALICE

DEPLOYING

WHY STATIC ANALYSIS?

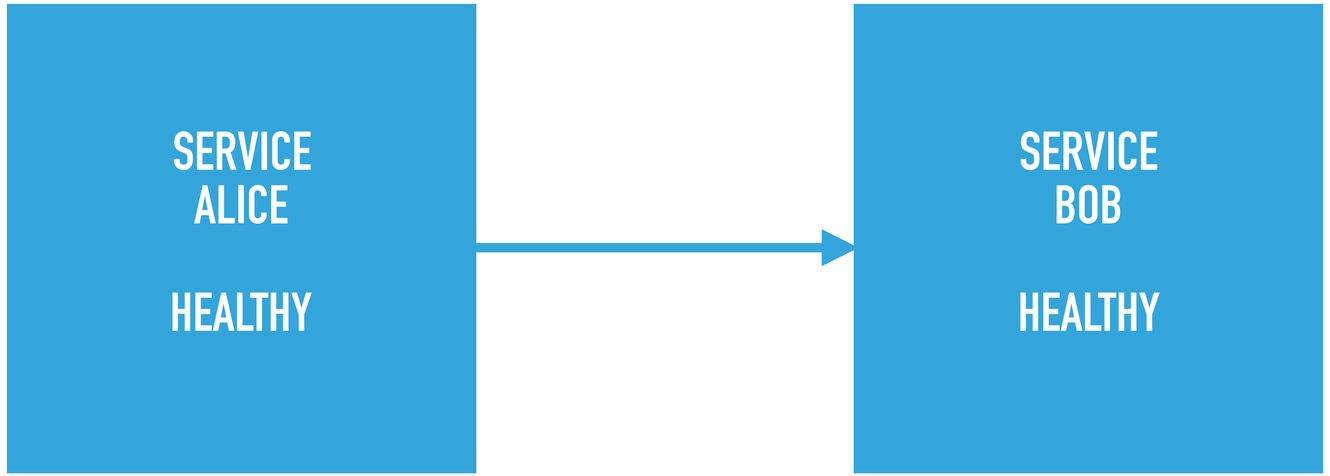


WHY STATIC ANALYSIS?

SERVICE
BOB

HEALTHY

WHY STATIC ANALYSIS?



SERVICE DISCOVERY

```
handle = Serveza::Service.new('feature_flag', 1)
endpoint = handle.api
```

SERVICE DISCOVERY

```
BOB_URL: please tell me where bob is
```

SERVICE DISCOVERY

```
BOB_URL: 'http://bob.local'

BOB_HOST: 'bob.local'

BOB_ENDPOINT: 'http://bob.local/path/to/api/i/use'
```

SERVICE DISCOVERY

```
BOB_URL: 'discovery_path:bob'
BOB_URL: 'http://bob.local'
```

SERVICE DISCOVERY

```
DATABASE_HOST: 'my-db.local'
DATABASE_PORT: '3306'
DATABASE_USERNAME: 'myuser'
DATABASE_PASSWORD: 'mypass'
DATABASE_NAME: 'my_schema'
```

SERVICE DISCOVERY

```
DATABASE_URL:
  'mysql://myuser:mypass@my-db.local:3306/my_schema'
```

SERVICE DISCOVERY

```
DATABASE_URL: 'discovery_path:@mydb'
```

SERVICE DISCOVERY AS DEPENDENCY INJECTION

- Services declare their dependencies
- Locations injected via env var in standard format (URLs)
- Credentials part of URLs
- Static analysis is possible

CONTAINERS EVERYWHERE

- Interface between teams and machines
- Stateless in Container Fabric (Mesos)
- Stateful in containers controlled via Centurion or Ansible
  - Cassandra running in Docker since 2015
  - Multitenant relational DBs in Docker since 2017 https://www.percona.com/live/18/sessions/containerizing-databases-at-new-relic-what-we-learned

CoreOS NOT CentOS

- Containers containers containers
- Ignition replaces need for Puppet

```
c.AssertUnit("newrelic-infra.service")

- name: newrelic-infra.service
  enable: true
  contents: |
    [Unit]
    Description=New Relic Infrastructure Agent
    After=docker.service
    Requires=docker.service
    [Service]
    TimeoutSec=0
    Restart=always
    ExecStartPre=-/usr/bin/docker kill %p
    ExecStartPre=-/usr/bin/docker rm %p
    ExecStartPre=/usr/bin/docker pull …
    ExecStart=/usr/bin/docker run  \
                …
```

TERRAFORM

- Interface between us and the cloud
- Declarative infrastructure-as-code
- Allows repeatability
- Developed our own Terraform providers as necessary

Second System?

2X

OPERATIONAL LOAD

SAME

TIME TO BUILD A NEW REGION

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The Goldilocks balance: Choose the right work

THE PLAN

WE HOPED…

- Discovery
- Fan out
- Test
- Release

THE RETRO

Quick ramp-ups
How do you prioritize work?

Autonomous teams

AN EXAMPLE OF PROJECT PRIORITIZATION

1. One team's must-ship project. Everyone makes sure this team can succeed.
2. High-priority cross-cutting project. All teams do their part as soon as possible.
3. Feature promised to marketing.
4. Future highest-priority project. Don't block the top, but this needs to ramp up.

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WHAT WASN'T READY?

- Full documentation of what we were asking for
- Service discovery
- Other core tooling
- Easily digestible philosophy to help people make decisions

QUICK RAMP-UPS

START

Prepare for what happens when a project suddenly receives high priority.

Produce project philosophy document.

STOP

CONTINUE

Prioritizing important work across the company

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Moving goalposts

UPFRONT WORK

- Containerization
- Move to Container Fabric (Mesos)
- Service discovery via env vars

UPFRONT WORK

- Containerization
- Move to Container Fabric (Mesos)
- Service discovery via env vars

LATER WORK

- Replace hardcoded env vars with discovery_path
- base_environment in YAML config
- Regional redirection

Heroes

3

BUILDOUTS

THE REALITY OF A BUILDOUT

1. A team does the work in the US.
2. Wait a few days or weeks. (In reality, do other things.)
3. Backpack team tries to deploy the team's services, finds problems.
4. Team is now potentially blocking the buildout.
5. Frustration.
6. GOTO 1.

Steel thread:
Validate a design using a subproject that tests it thoroughly.

START

Use a small number of teams that form a complete system as a test case.

Be more honest and transparent.

STOP

Hidden work, even if only by acknowledging that unknown future work exists.

CONTINUE

Avoid waterfall planning. Agile is still good.

Communication is hard

Backpack M1 Core Services Weekly Update 12/1/17

Backpack M2 Containerization Weekly Update 12/8/17

Backpack M1 Core Services Weekly Update 12/8/17

HERO recap: week of 11/27 - Backpack!

Backpack November DR Exercise Update

Backpack M2 Containerization Weekly Update 12/1/17

Container Fabric Supports Biosecurity Service Discovery

Shared by

from Container Fabric

Project Backpack Update for week ending

12/1/2017

Shared by

Configuring Service Gateway with Service Paths

Shared by

from API & Service Ecosystem Team

Backpack DR1 Readiness Checkpoint

Backpack November DR Schedule

Project Backpack Update for week ending 11/17/2017

Shared by

Backpack M2 Containerization Weekly Update 11/17/17

COMMUNICATION METHODS

- Blog posts
- Town hall events
- Checklist app
- Linting
- Emails

COMMUNICATION METHODS

- Blog posts… don’t get read.
- Town hall events… are optional.
- Checklist app… doesn’t get looked at.
- Linting… doesn’t get used.
- Emails… don’t get read.

Centralized documentation

START

Put all project requirements and deliverables in one place, with a user-readable changelog (not Git commits).

Have better linting.

STOP

CONTINUE

Blogging internally.

Communicating using as many channels as possible.

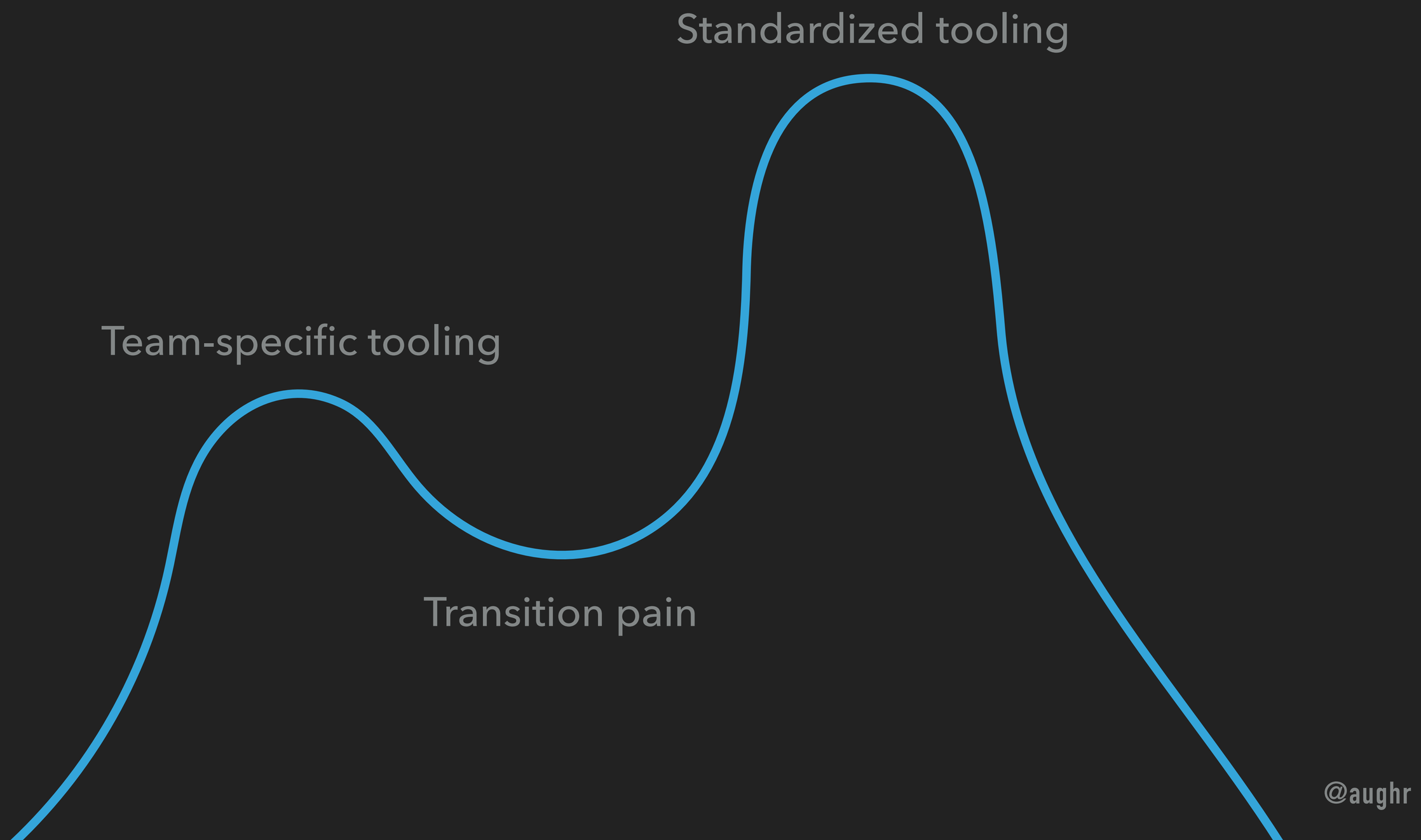
Local maximums

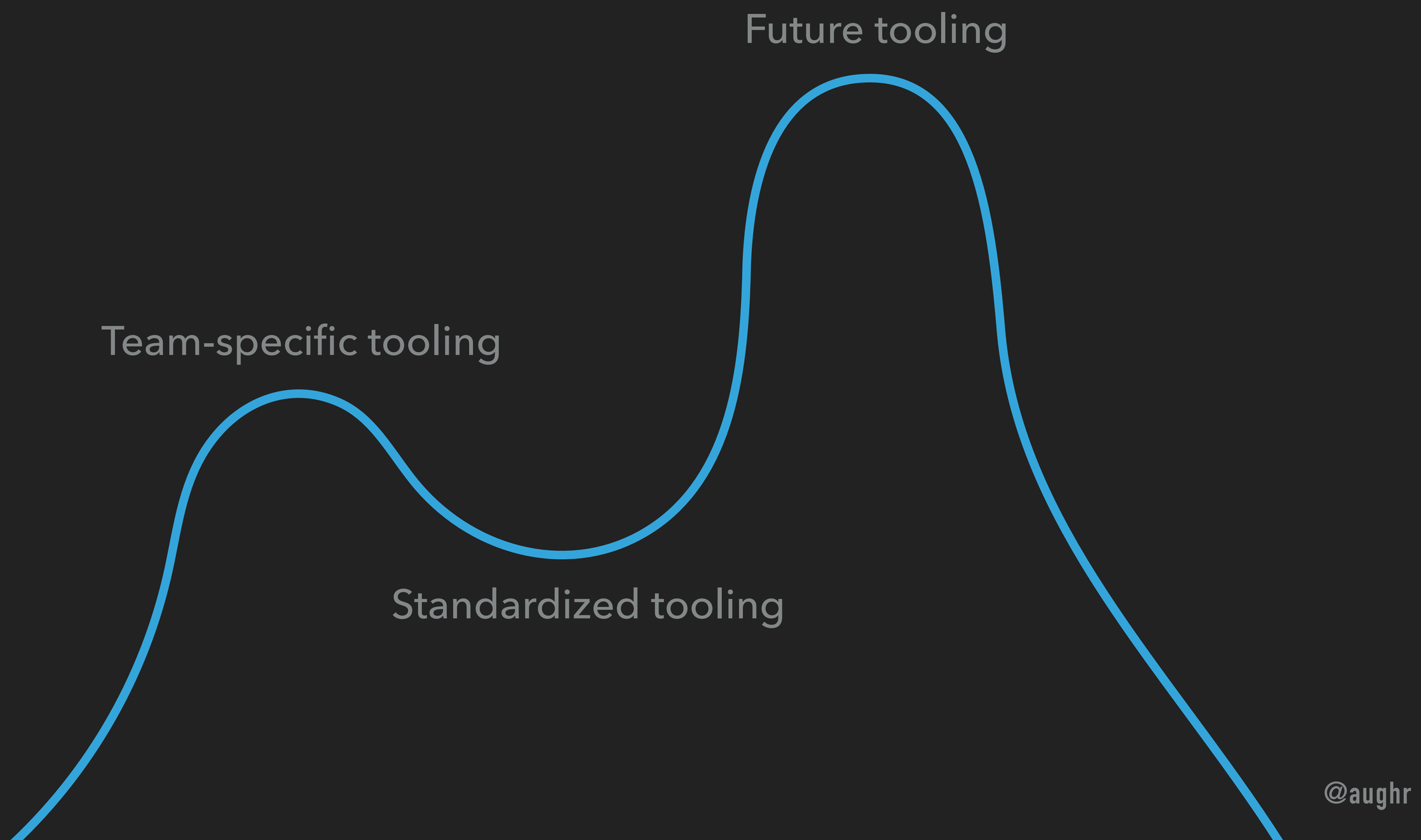
YOUR TEAM 3 YEARS AGO

- 20 services
- Want:
  - chained deploys
  - shared configuration
  - service discovery

YOUR TEAM NOW

- 20 services
- Have:
  - chained deploys
  - shared configuration
  - service discovery
- Don’t have: the standardized platform that was built in the meantime


Standardized tooling
Team-specific tooling
Transition pain
@aughr


Future tooling
Team-specific tooling
Standardized tooling
@aughr

LOCAL MAXIMUMS

START

Have more empathy for teams stuck in a local maximum.
Communicate well in advance, hopefully close gaps early.

STOP

Making assumptions about how teams or individuals will react.

CONTINUE

Making standard tooling better.

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Leaning on what you have

IN-FLIGHT PROJECTS

- Container Fabric team building Mesos-based platform
- Build and Deploy Tools building Grand Central build/deploy system
- DB Engineering building Megabase, containerized DB platform

Huge upticks in adoption rate

START

Make clear which priorities are highest for infrastructure teams.

STOP

CONTINUE

Look for high-leverage work a small number of teams can do.

Pilot phase

THE ORIGINAL PLAN

- Discovery
- Fan out
- Test *ourselves*
- Release

THE REVISED PLAN

- Discovery
- Fan out
- Test *ourselves*
- Run a pilot
- Release

START

STOP

Magical thinking.

CONTINUE

Where we are now

It worked

EU region

Disaster recovery

Less busywork

95%

SERVICES IN CONTAINER FABRIC

The New Relic product benefits

We've learned a lot

START

STOP

CONTINUE

A little bit of magical thinking.
Trying bold things.

THANK YOU

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