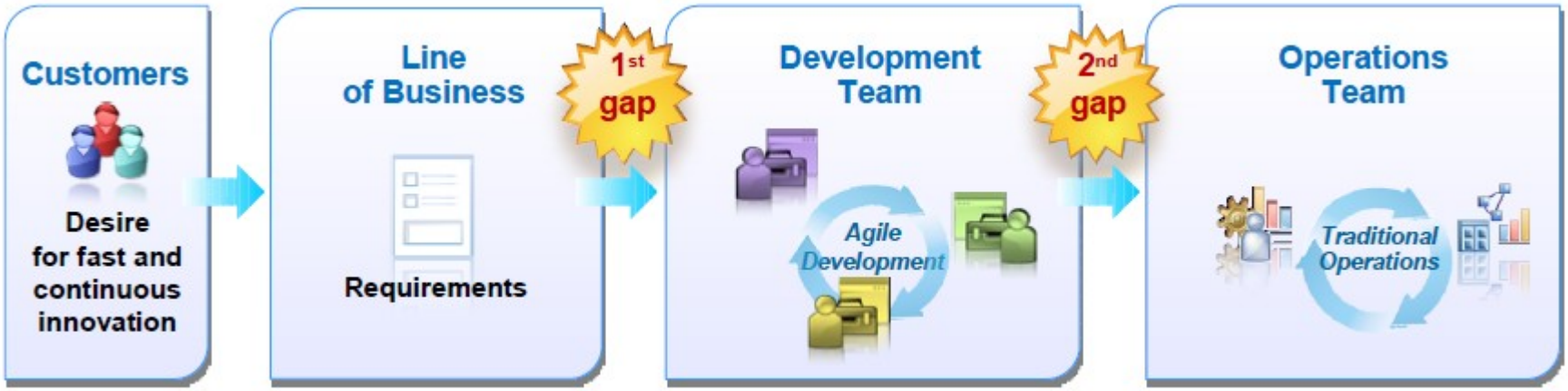
DEVOPS

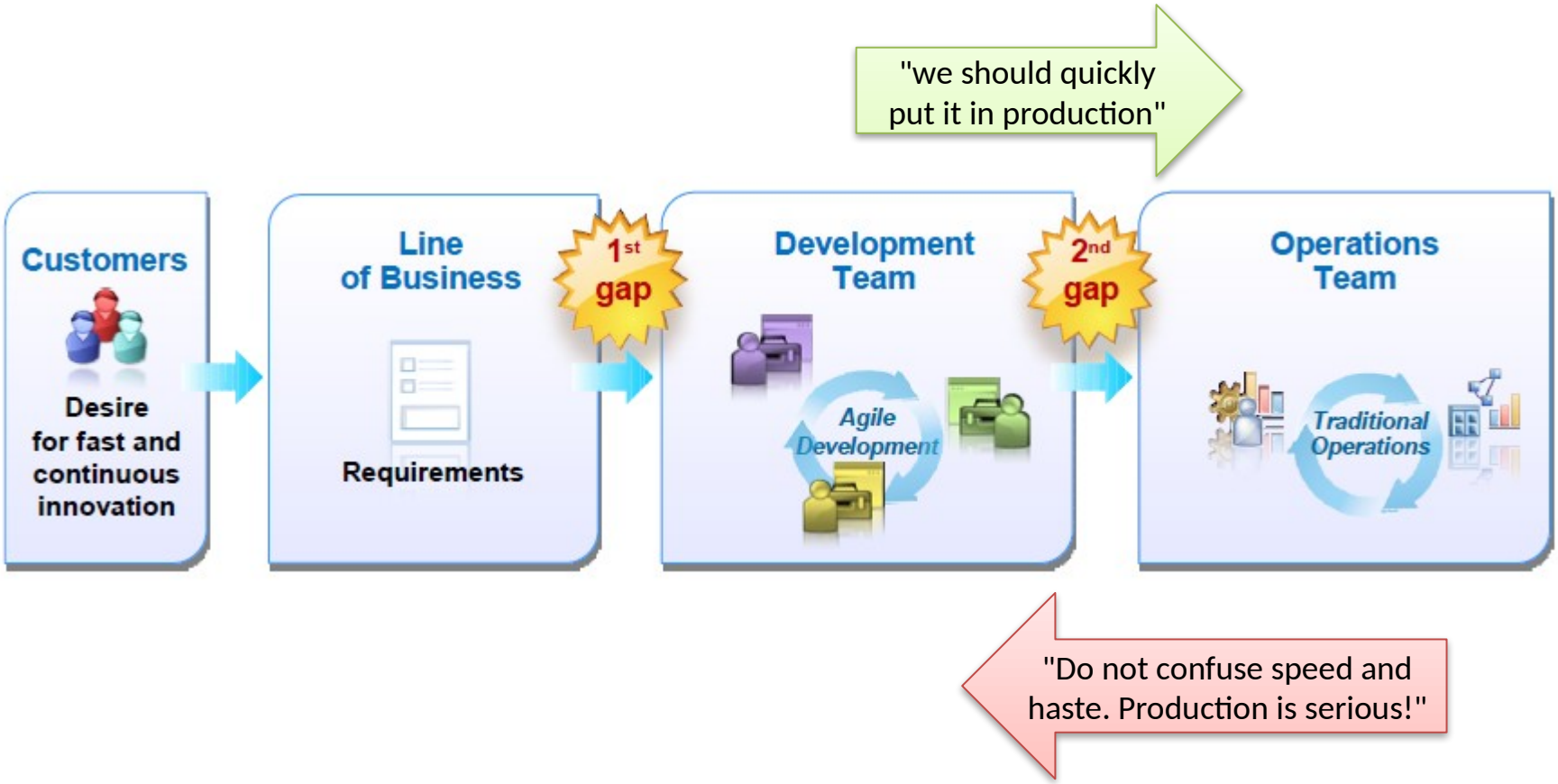
UR1 ISTIC/ESIR, 2024-2025

BRICE EKANE (D'APRÈS LES SLIDES DE B. COMBEMALE ET DE NOMBREUSES DISCUSSIONS AVEC O. BARAIS)

Traditional Software Development Model



Traditional Software Development Model



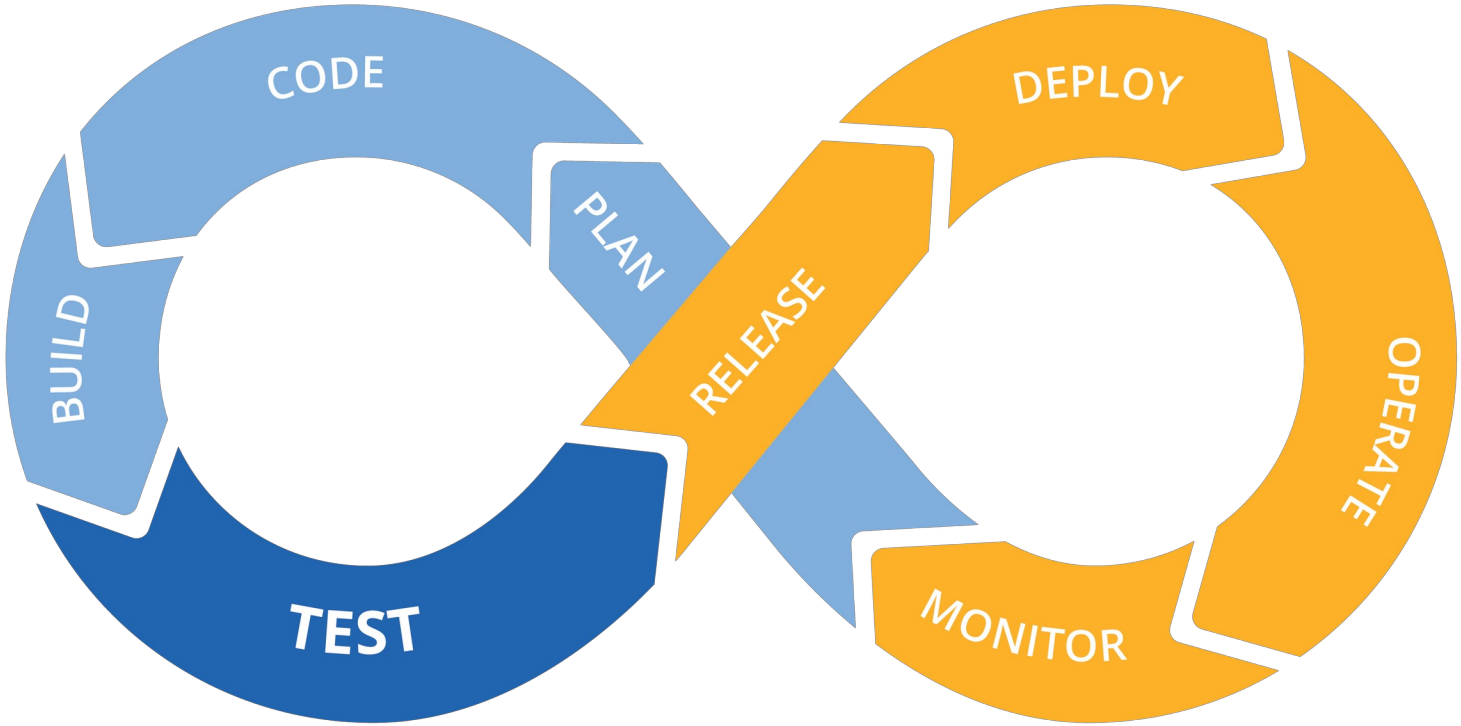
https://medium.com/point-nine-news/do-you-speak-devtools-73237550bf4f

What's DevOps?

"*A **software engineering practice** that aims at unifying **software development** (Dev) and **software operation** (Ops).*"

DevOps has been initially coined by Patrick Debois in 2009

What’s DevOps?



Motivations

- Reduce the release cycle (time to market, lead time between fixes…)
- More fragmented approach (small increments vs. bigbang)
- Seamless updates
- Shared responsibilities (all in the same boat)
- Continuous improvement

Typical Stories

- Story 0: Dev and Ops collaborate to develop environment definitions
  - *Value: Ensures that Dev understands and deals with production-like environments; avoids architectural miscommunications*
- Story 1: Dev continuously delivers application changes to a realistic environment for testing
  - *Value: Shared technology ensures testable environments and script reuse for repeatable delivery; Test org always has known good builds, properly deployed*
- Story 2: Release Applications from Test /Staging to production
  - *Value: Shared technology and automation ensures no gratuitous differences between dev/test and prod*
- Story 3: Collaborative incident management
  - *Value: ensures an integrated process for reproducing and resolving defects and issues between dev, test, and ops*
- Story 4: Dev and Ops use the same analysis and instrumentation in dev, test, and ops
  - *Value: Ensures a common understanding of quality and performance (and no fingerpointing)*
- Story 5: Manage the entire delivery pipeline with end-to-end visibility and dashboards
  - *Value: Enables end-to-end delivery metrics and visibility into bottlenecks*

cf. wikipedia

Expected Benefits

- Faster time-to-market/delivery times that improves ROI
- Engaged, empowered cross-discipline teams
- Stable/reliable operating environments
- Early detection and faster correction of defects
- Improved quality

Responsabilities

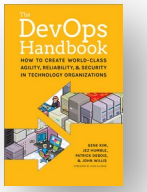
Pre-DevOps

- Developpers produce the source code
  - *Do not care about the impact on the overall system in production*
- *IT teams operate the system and ensure the quality of service*
  - *Do not care about the*

Post-DevOps

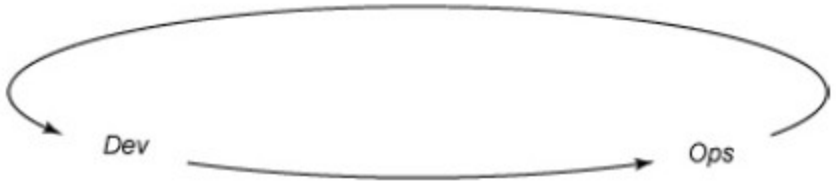
- Shared responsabilities with all stakeholders in the same boat
- *"You build it, You run it."* - Walter Vogels, Amazon CTO

DevOps: 3 Basic Principles

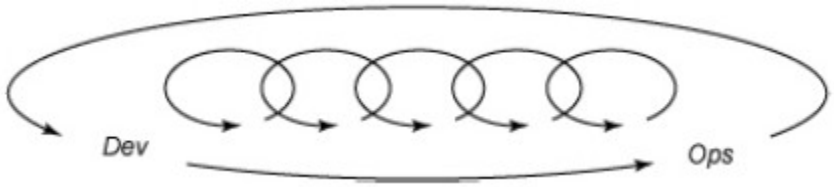


- System thinking

- Amplify feedback loops



- Culture of continual experiment and learning



https://itrevolution.com/the-three-ways-principles-underpinning-devops by Gene Kim

System thinking

Create a smooth and fast flow from dev to ops

- Make your work visible *(visual board, lead time)*
- Limit Work In Progress *(“Stop starting. Start finishing.”)*
- Reduce batch size and intervals of work
- Continually identify and elevate the system’s constraints
- Eliminate hardships and waste in the value stream

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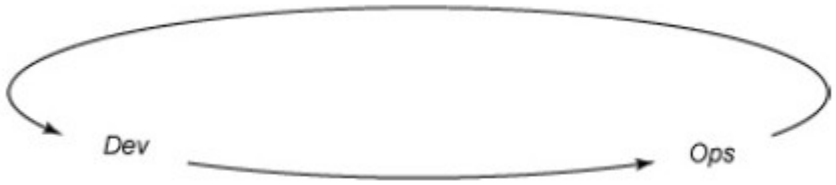
Feedback loops



Enable a fast and constant feedback from ops to dev

- Working safely within complex systems
- See problems as they occur
- Swarm and solve problems to build new knowledge
- Keep pushing quality closer to the source
- Enable optimizing for downstream work centers

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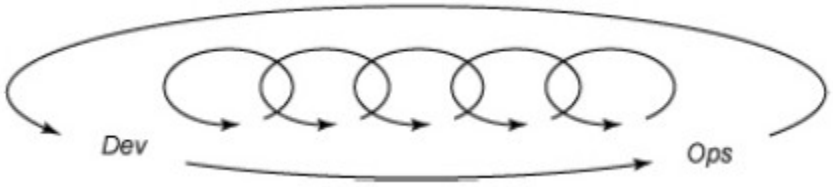
Continual experiment and learning



Enable constant creation of individual knowledge, which is then turned into team and organizational knowledge

- Enabling organizational learning and a safety culture
- Institutionalize the improvement of daily work
- Transform local discoveries into global improvements
- Inject resilience patterns into our daily work
- Leaders reinforce a learning culture

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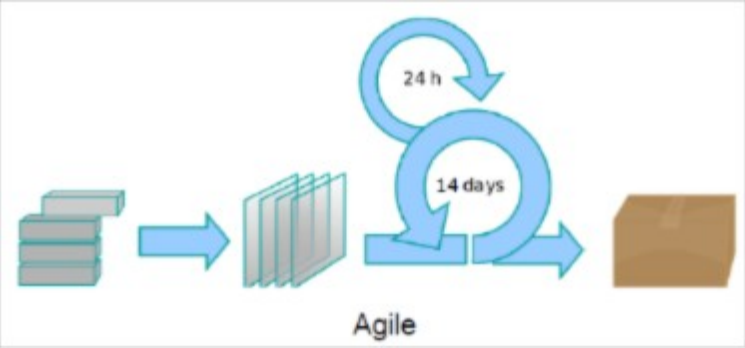
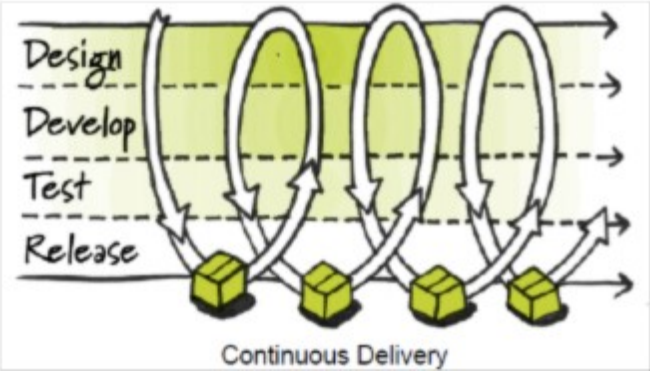
DevOps vs. Agile

- DevOps is especially complementary to the Agile software development process.
  - extends and completes the continuous integration and release process

- DevOps enables a far more continuous flow of work into IT Operations
  - Avoid situation where development delivers code every two weeks but it's deployed only every two months





Some DevOps Principles

- Observability
- Stateless architecture
- Reproducibility and replicability
- Accountability
- Software lifecycle automation

The CALMS Conceptual Framework

- **Culture**: There is nothing fluffy about culture.
- **Automation**: Automation is the idea that you should program everything.
- **Lean**: Running lean means keeping everything to a minimum.
- **Measurement**: If a team does not have visibility into everything, something will eventually go horribly wrong.
- **Sharing**: Sharing is not just reporting facts, it is regular exchanging of ideas across teams.

- ✓ Often used as a maturity model
- ✓ Proposed by Jez Humble

Common Attributes of Successful Cultures

- **Infrastructure As Code**
  - Full Stack Automation
  - Commodity Hardware and/or Cloud infra
  - Reliability in software stack
  - Datacenter or Cloud Infrastructure APIs
  - Core Infra Services

- **Application As Services**
  - Service Orientation
  - Lightweight Protocols
  - Versioned APIs
  - Software Resiliency (Design for Failure)
  - Database/Storage Abstraction

- **Dev/Ops/All As Teams**
  - Shared Metrics/Monitoring
  - Incident Management
  - Service Owners On-call
  - Tight integration
  - Continuous Integration
  - Continuous Deployment
  - GameDay

Some DevOps Practices

- Static analysis and test automation
- Continuous integration/deployment/delivery
- Release/configuration management and Infrastructure as Code (IaC)
- Monitoring (e.g., performance, availability…)

- Change management, hypothesis driven dev.
- Resilience engineering

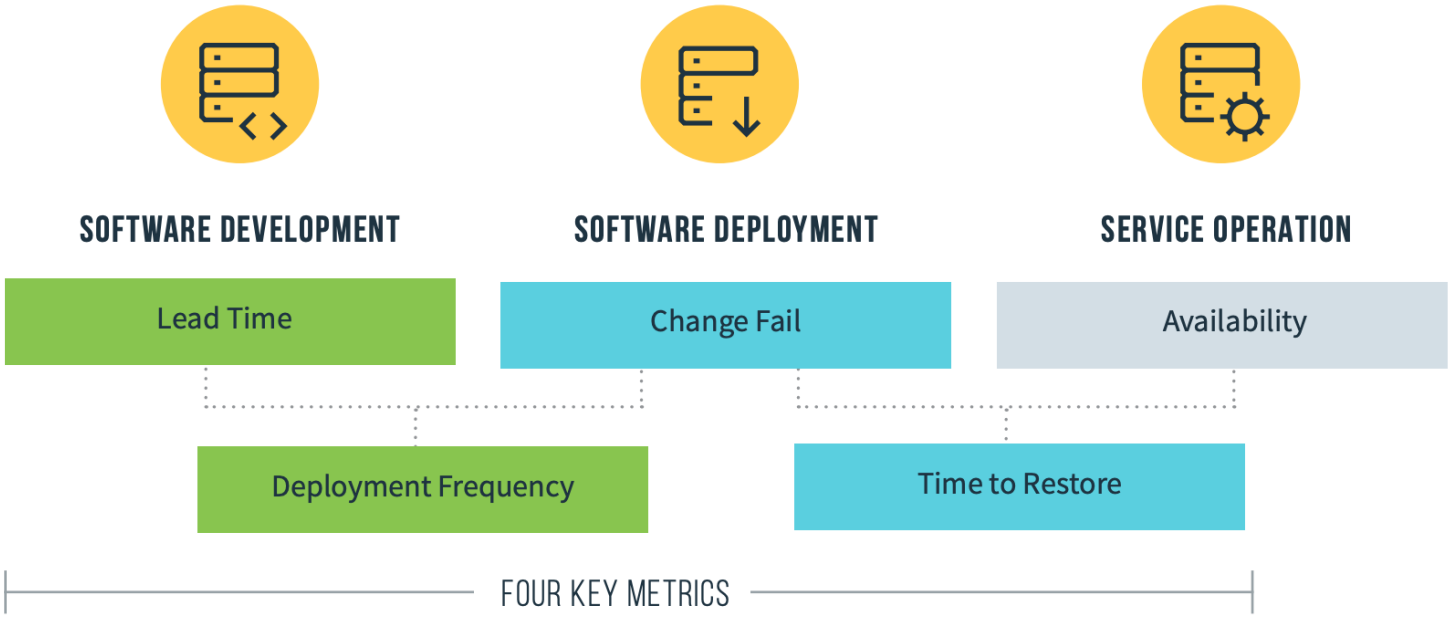
Purpose of the Configuration, Release and Deployment Pipeline

- **Visibility**: All aspects of the delivery system are visible to all team members promoting collaboration

- **Feedback**: Team members learn of problems as soon as they occur so that issues are fixed as soon as possible

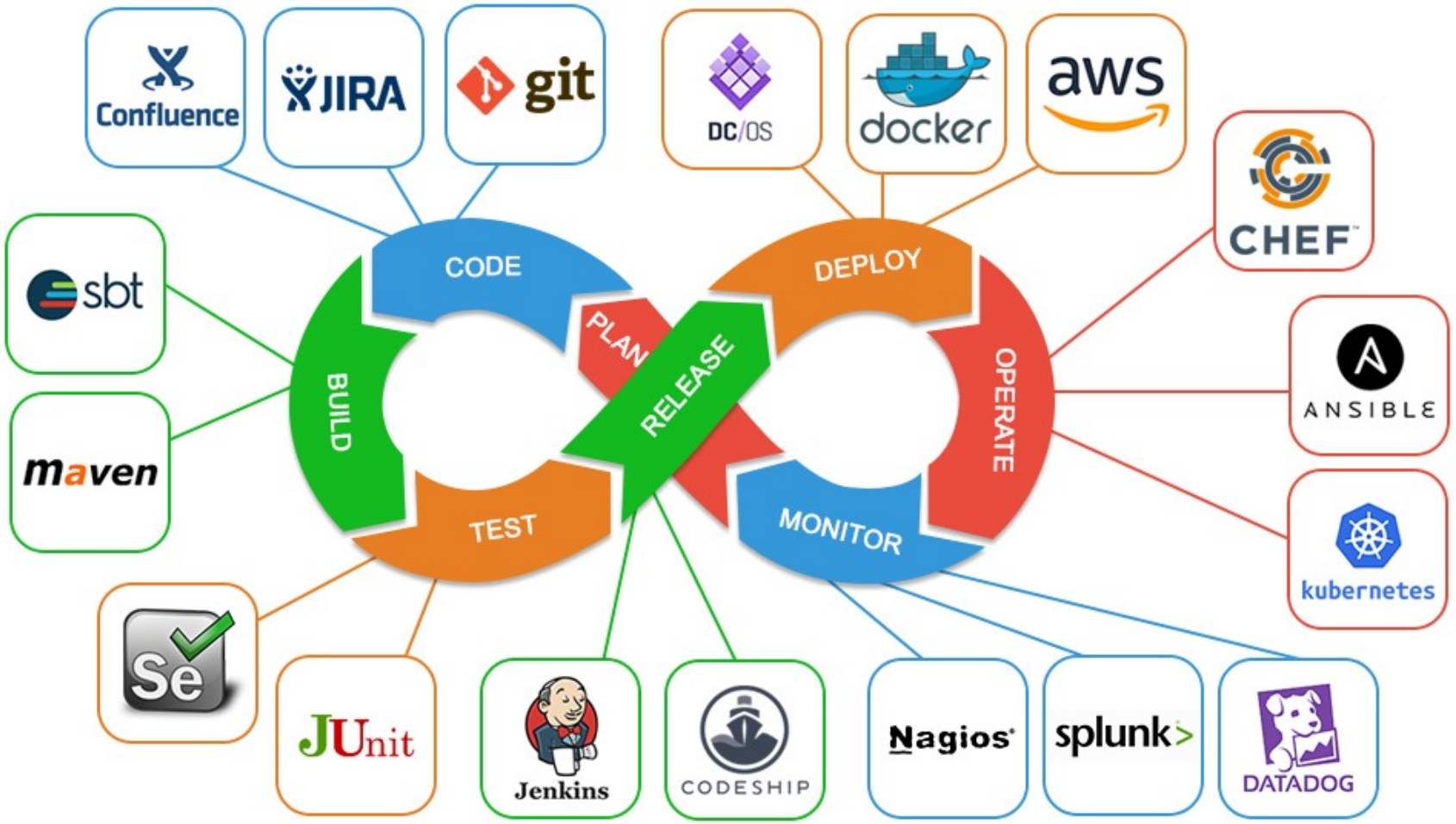
- **Continually Deploy**: Through a fully automated process, you can deploy and release any version of the software to any environment

Performance Metrics

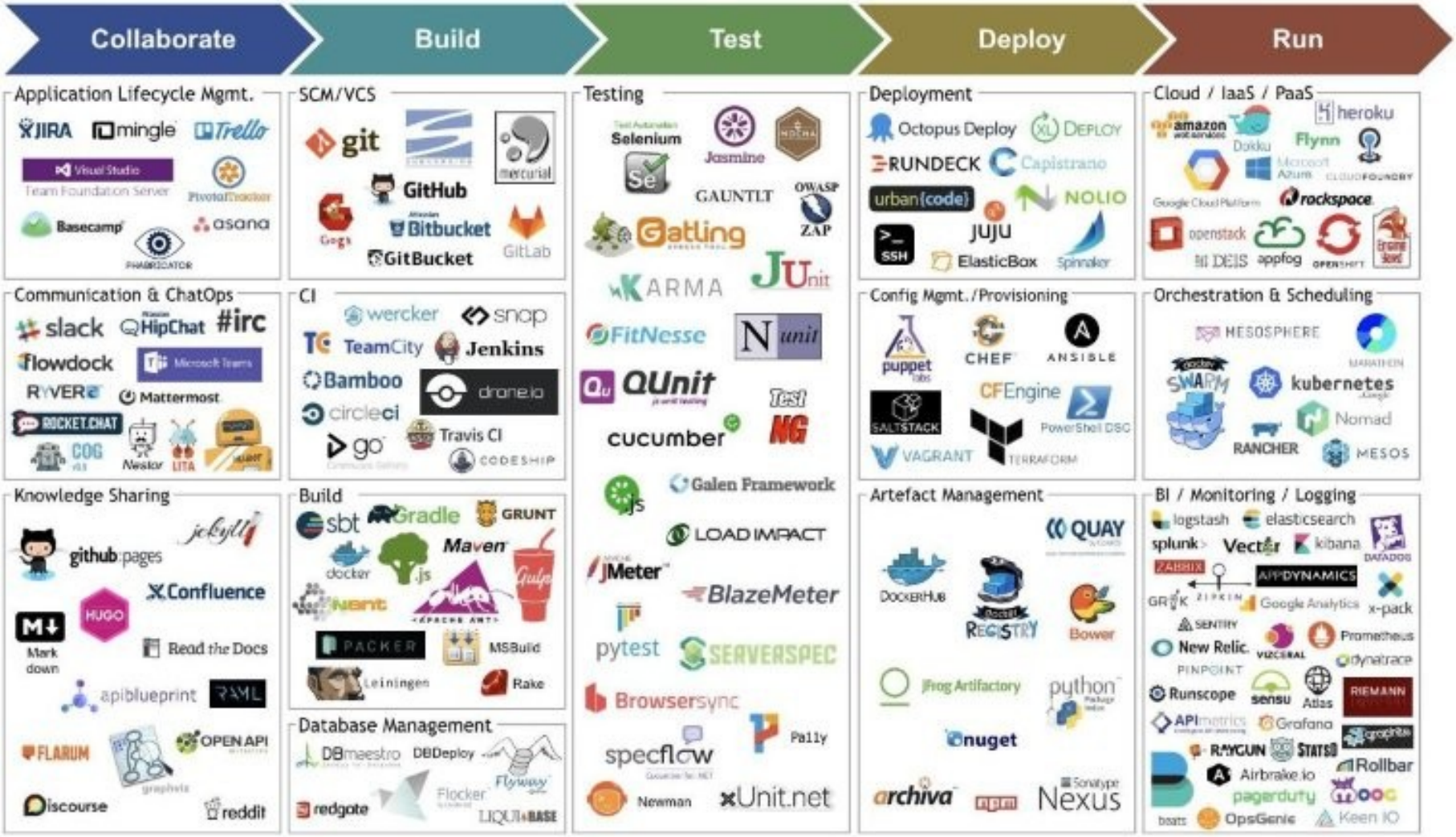


from https://services.google.com/fh/files/misc/state-of-devops-2019.pdf

DevOps Tools



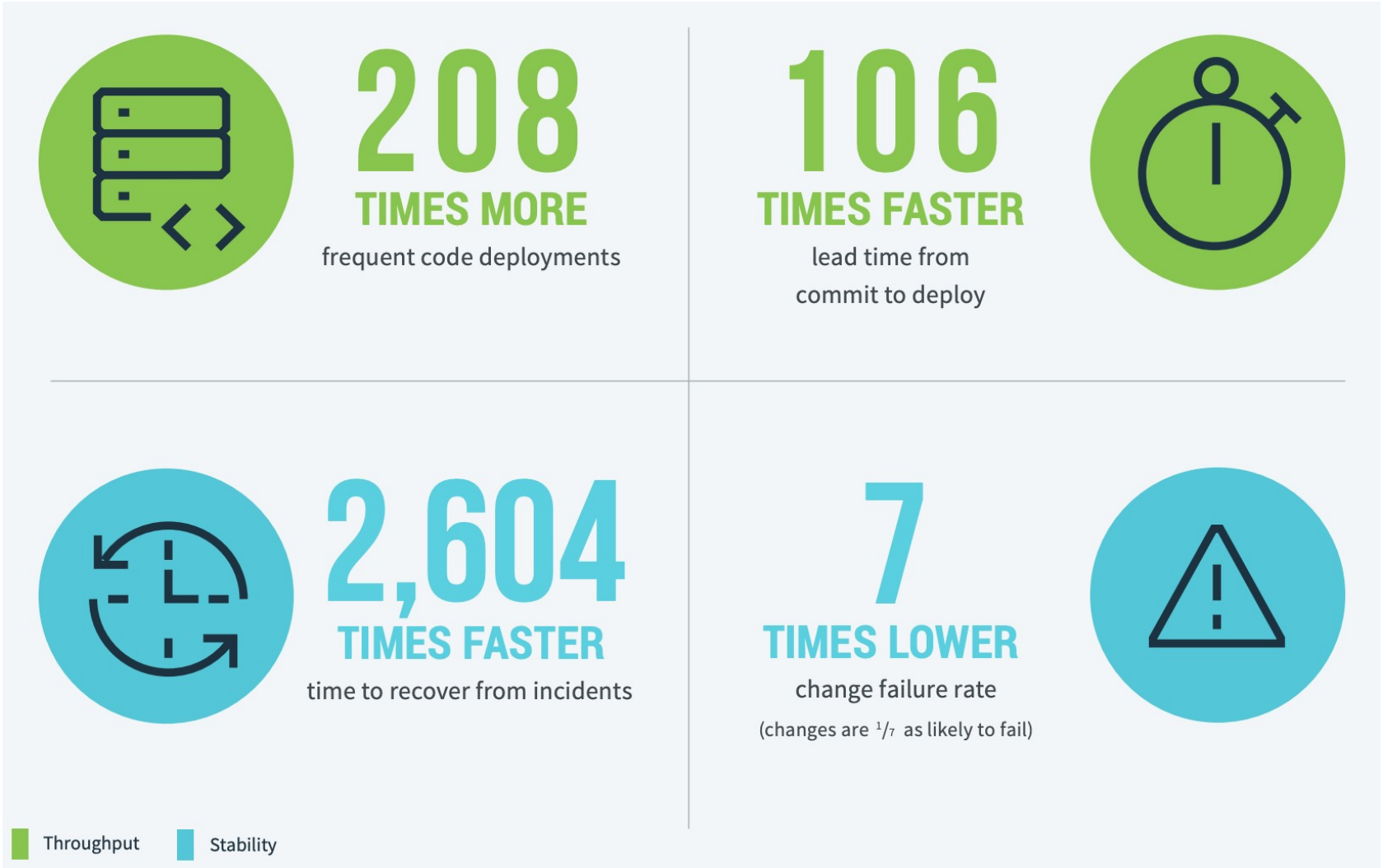
DevOps Tools



The adoption of DevOps is being driven by factors

- Use of **agile** and other development processes and methodologies
- Demand for an **increased rate of production releases** from application and business unit stakeholders
- Wide availability of **virtualized and cloud infrastructure** from internal and external providers
- Increased usage of data center **automation and configuration management tools**
- Increased focus on **test automation and continuous integration** methods;

Key indicators of performers



Comparing highest to lowest performers.

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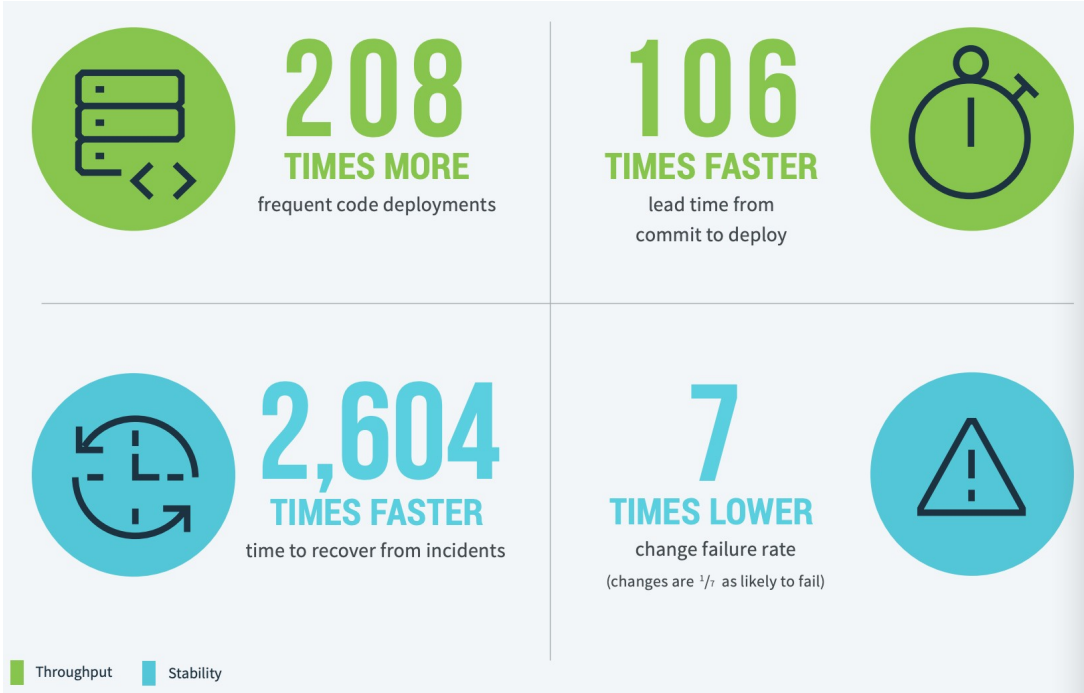

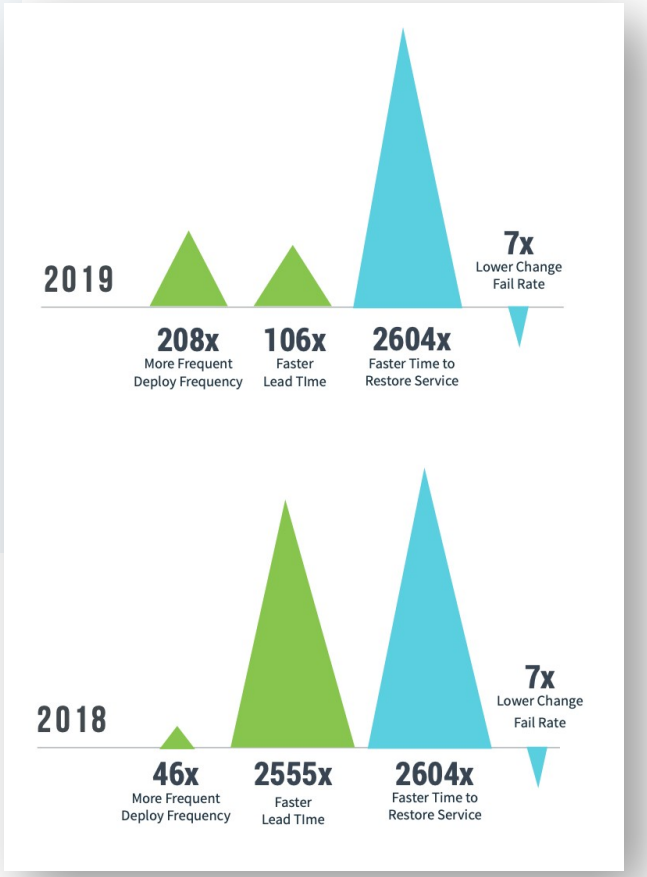

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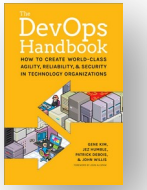
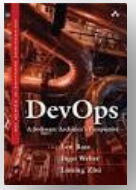
Anti-patterns

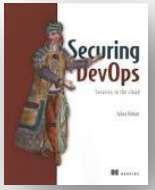
- Management just saying we’re doing DevOps
- Just changing job titles to DevOps
- Just merging dev and ops teams or creating a separate DevOps team
- Committing is done
- My responsibility ends here
- Devs blaming Ops; Ops blaming Devs
- Ops not involved early
- DevOps means Developers Managing Production
- It’s not just automation or a tool (or set of tools)

Further Material

- Books







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- Conferences
  - DevOpsCon
  - DevOpsDays
  - DevSecDays
  - KubeCon + CloudNativeCon
- A lot of high-quality posts (e.g., medium)
- Teaching initiative: https://teachdevops.github.io