DevOps

Martin Kellogg

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Today's agenda:

- **Operations, Toil, and the DevOps philosophy**
- Achieving reliability
  - the service reliability hierarchy + SLAs/targets
  - monitoring and reliability testing
  - incident/emergency response
  - preventing problems before they occur
  - post-mortems + learning from failure

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- deploying new versions of the software

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  - other advantages: easy to staff for, off-the-shelf tooling, etc.

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Traditional approach to operations can work in either of these models!

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- But, they are serious concerns for modern systems with high release cadences, especially those that are:
  - microservices
  - delivered via the web
  - use “continuous delivery”

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- encourage operators to automate **toil**
- may still have some dedicated ops roles (e.g., SREs at Google)

Operations: the DevOps approach

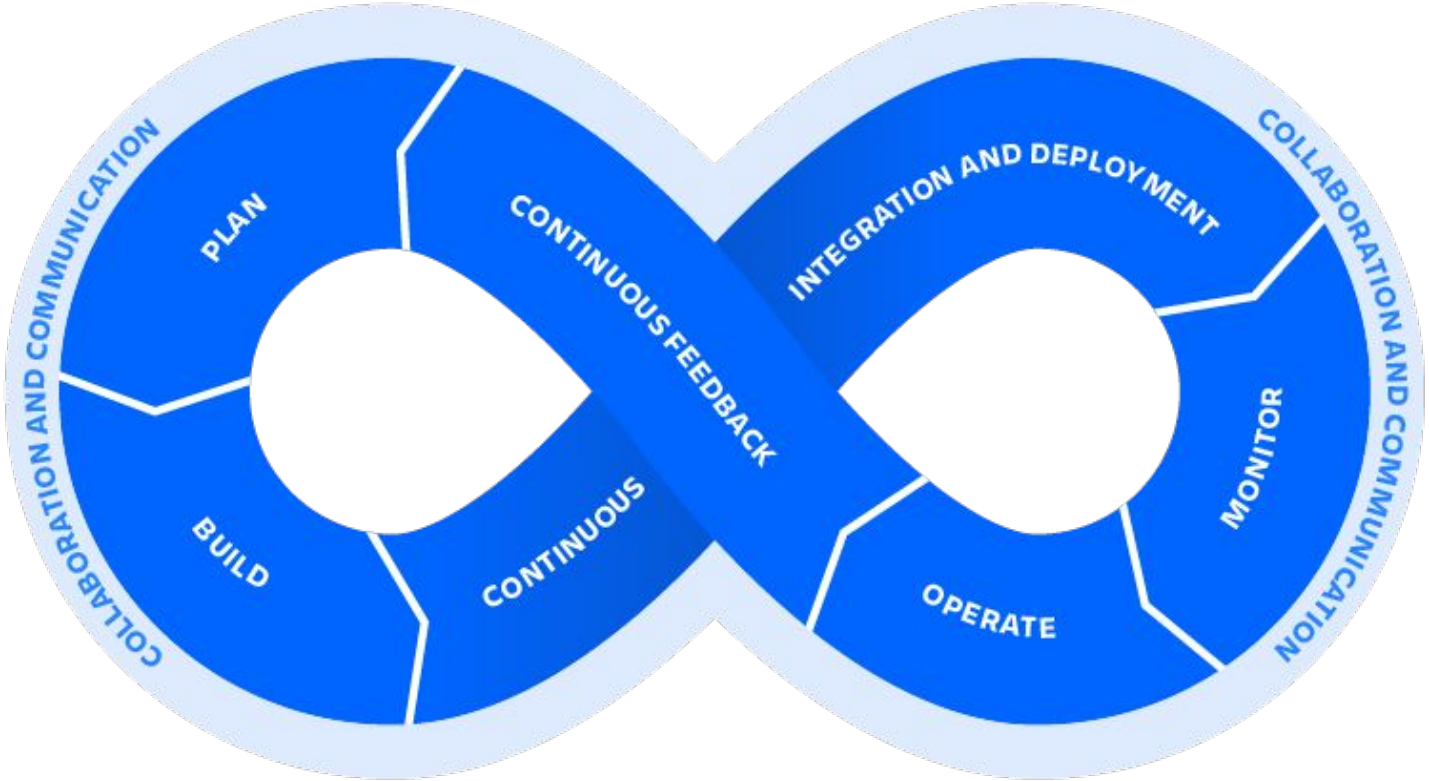

figure credit: Atlassian

Operations: toil

> *If a human operator needs to touch your system during normal operations, you have a bug. The definition of normal changes as your systems grow.*
>
> Carla Geisser, Google SRE

Operations: toil

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A key advantage of DevOps is that it encourages **removing** toil

- if operators are separate from devs, devs have no incentive to avoid toil

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- **repetitive**: if you're performing a task for the first time ever, or even the second time, this work is not toil
- **automatable**: if human judgment is essential for the task, there's a good chance it's not toil

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- **O(n) with service growth**: if the work involved in a task scales up linearly with *service size*, *traffic volume*, or *user count*, that task is probably toil

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A task doesn't need to have **all** of these attributes to be toil. But, the more closely work matches one or more of these descriptors, the **more likely** it is to be toil.

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  - tasks like team meetings, setting and grading goals, and HR paperwork (that are not tied to operations) are overhead

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- career stagnation (it doesn't get you promoted)
- lowers morale (it's boring)
- creates confusion (easy to forget to do a manual task!)
- slows progress (could be doing useful work instead)
- sets precedent (avoid letting toil become normal!)
- promotes attrition ("I want to work on something interesting!")

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Despite all this, a **little bit** of toil is often okay. After all, engineers only have so many productive hours in every day, and sometimes a **mental break** is nice :)

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- SRE motto: “Hope is not a strategy”

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    - makes technical debt riskier to take on (why?)

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- these two properties are related: an unavailable service **cannot** be correct
  - so, availability is the first thing we need to worry about when trying to make a service reliable

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    - **durability** (how much of your data can you still retrieve after a fixed time has passed)

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Sometimes SLAs are written into contracts with your customers!

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E.g., consider two systems:

- system A serves 200 requests in every even-numbered second, and 0 requests in every odd-numbered second
- system B serves 100 requests every second

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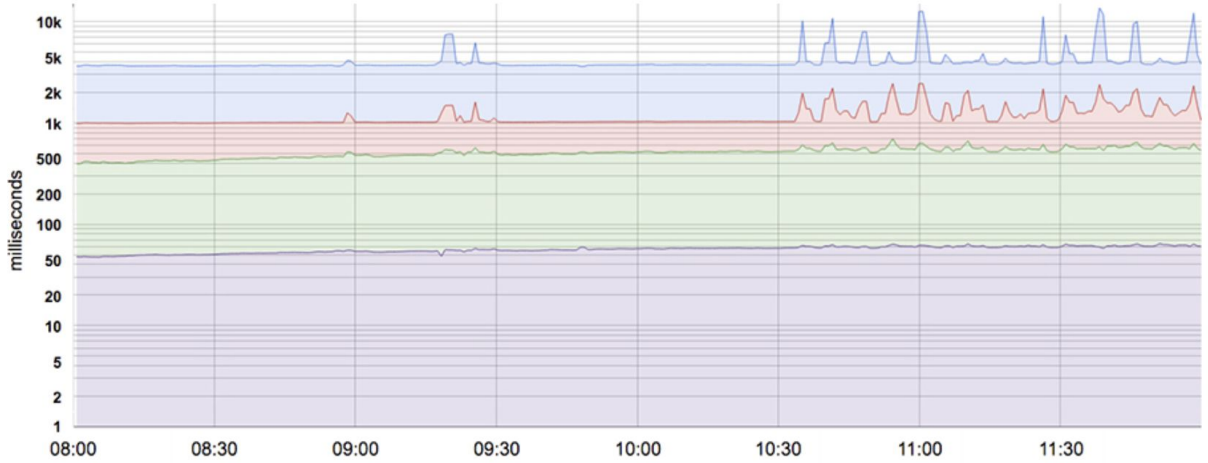

blue is 99th % latency

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  - avoid metrics that aren't useful in arguing for priorities

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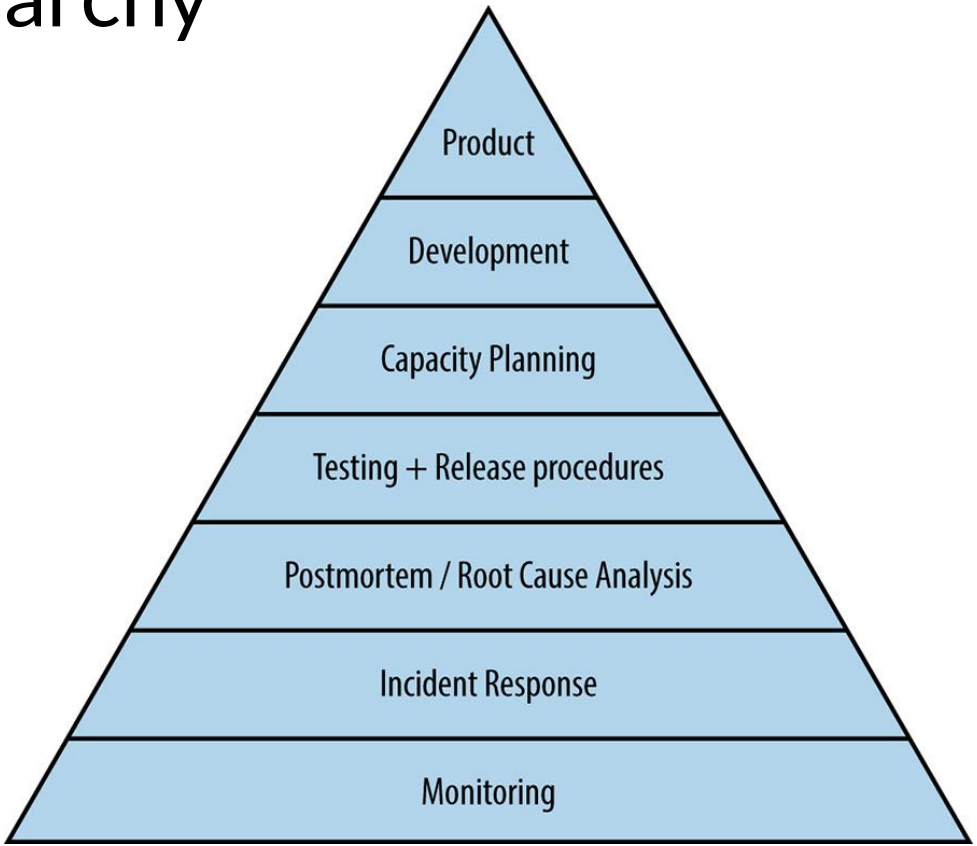
  - Then, make sure that those metrics actually look good.
- How do we think about how to do this?
  - **insight**: there is a **hierarchy** of system components that need to be working well in order to meet an SLA

Service Reliability Hierarchy

- analogy to Maslow's "Hierarchy of Needs" for humans



[Image credit: https://sre.google/sre-book/part-III-practices/]

Maslow’s Hierarchy of Needs

Maslow's hierarchy of needs

[Image credit: https://www.thoughtco.com/maslows-hierarchy-of-needs-4582571]

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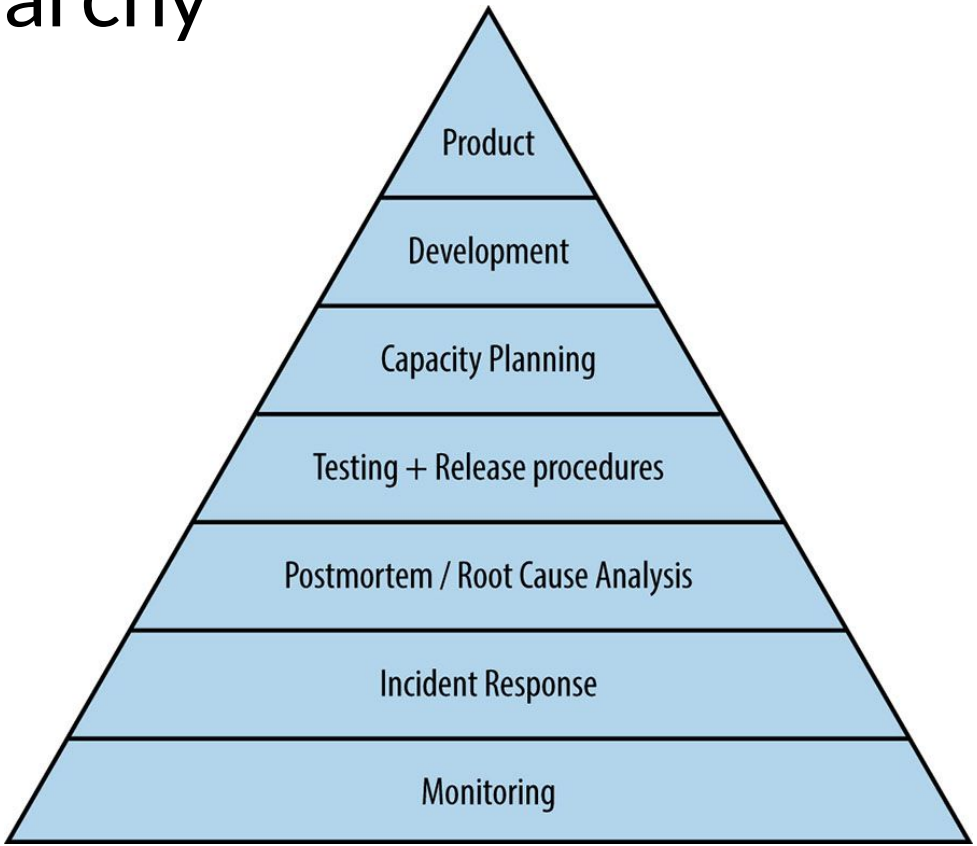

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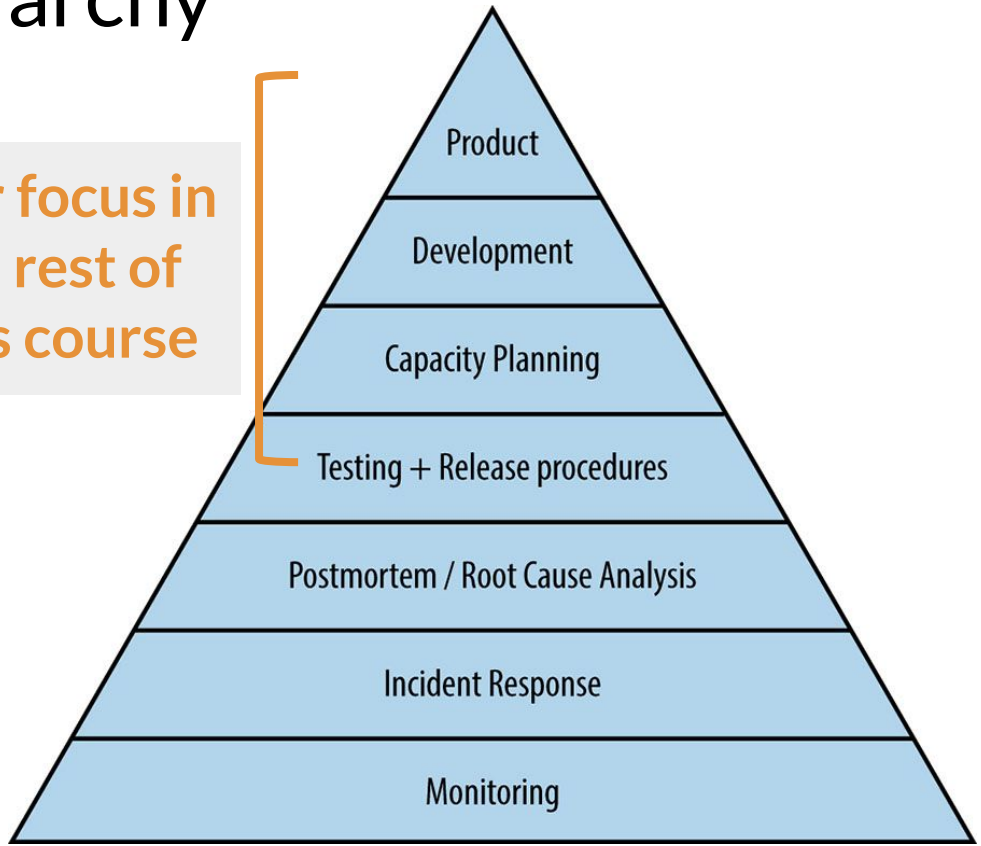
our focus in the rest of this course



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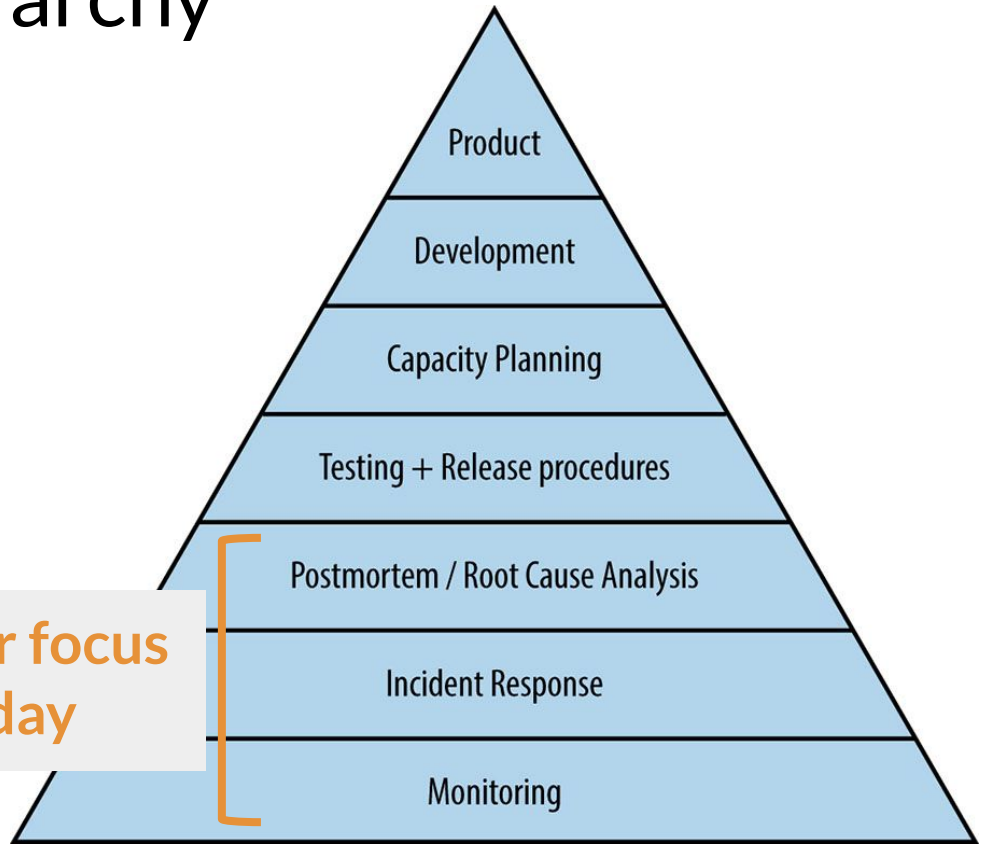

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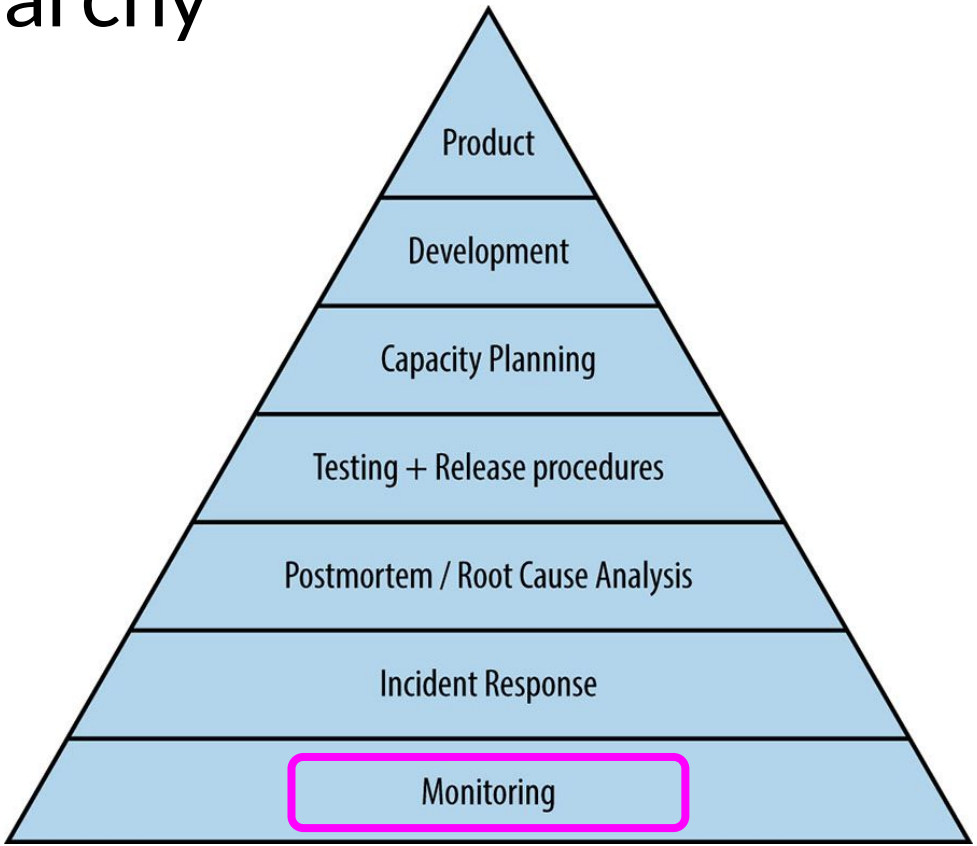

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