Deployment: Monitoring

CS 485/698: AI-Assisted SE

Today's Agenda

- Team meeting (~10 minutes)
  - Standup: is your project deployable yet? If not, what are the blockers that you need to deal with so that it is?
  - If you've already deployed your project: how do you know that it is working *right now*?
- Lecture on monitoring
- In-class activity: red team exercise on project deployment pipelines

Monitoring

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- What kinds of things can go wrong with a running application?
  - Availability**:** did the service go down?
  - Authentication: can users log in?
  - Authorization: do users have appropriate permissions?
  - Data Privacy: did user data get leaked?
  - Security: did a crypto key get leaked or expire? Is there some kind of cross-site scripting or DDOS attack occurring?
  - Etc.

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- without monitoring, you have no way to tell whether the service is **even working**

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  - but really this is a primitive form of one of the most important monitoring techniques for modern software applications: ***logging***

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Definition: ***logging*** is the process of recording information about the program's internal state as it runs via a printf-like interface

Logging: levels

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the log itself is usually a static field; the logging framework instantiates it, etc.

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levels:
error ⊆ warning ⊆ info ⊆ debug

developer chooses one level, all lower level messages are also logged

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printf-like syntax isn't just for show: goal here is **lazy evaluation**, so that if debug logging isn't enabled, this string is never constructed

Logging: levels

Typical example of a (Java) logging statement:

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arguments to printf passed by reference, so if debug-level logging is off, this argument's toString() method is never called

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  - **OS level**: memory usage, swap usage, disk space, CPU load
  - **Hardware level**: voltages, temperatures, fan speeds, component health

Logging: advice

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- **Do** log lots of information at debug or info level, so that if something is wrong with your service you can quickly get lots of information that you can use to debug it.
- **Don't** log sensitive data (e.g., credit card numbers in plaintext!)
  - this is a surprisingly common and important problem - developers have a tendency to log anything that might be useful when debugging a failure later!

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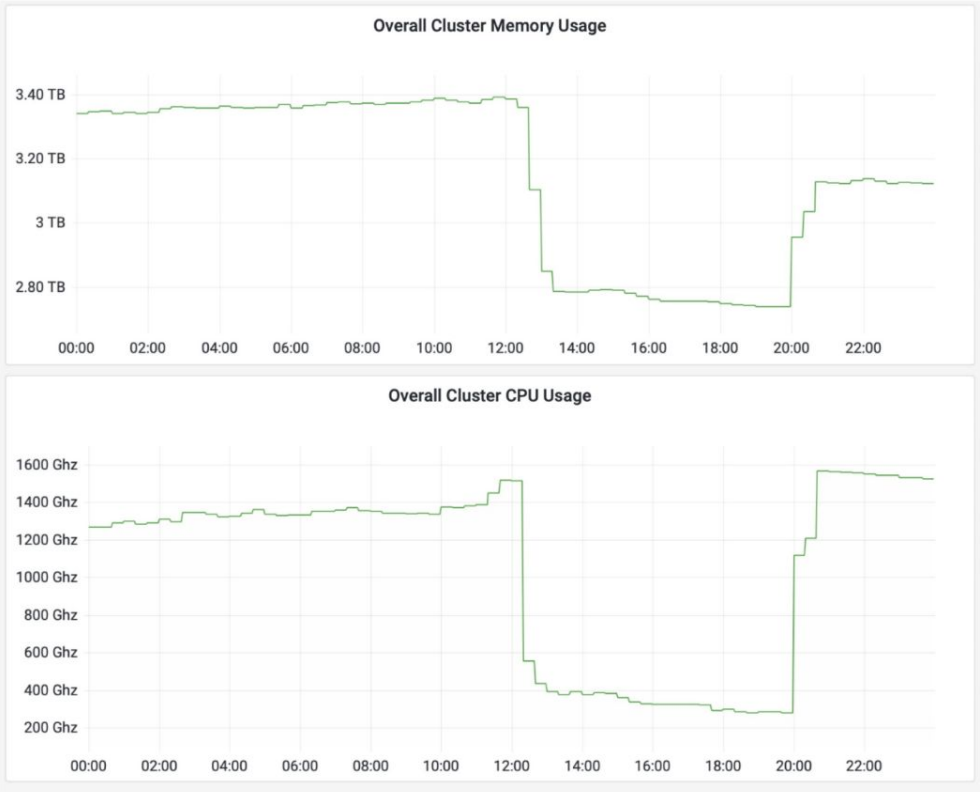
Metrics and dashboards: example dashboards



Grafana (AGPL, c 2014)

InfluxDB (MIT license, c 2013)

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- Your monitoring system should automatically ***alert*** you whenever a metric is doing something unexpected
  - This might be an email or a ticket (if it’s not urgent)
  - Or it might be a ***page*** to the on-call engineer, if the problem needs to be investigated right away

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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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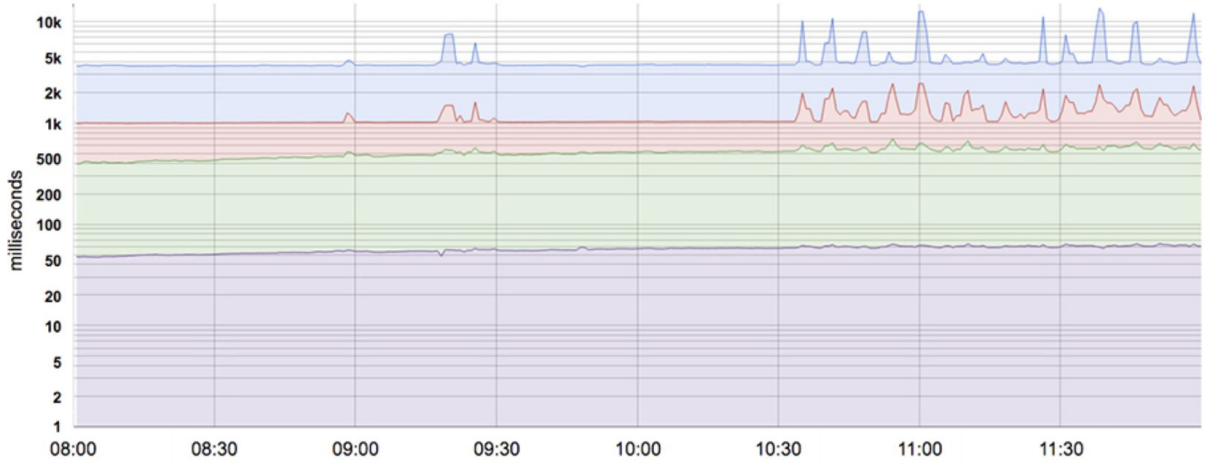

purple is 50th % latency

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green is 85th % latency

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red is 95th % latency

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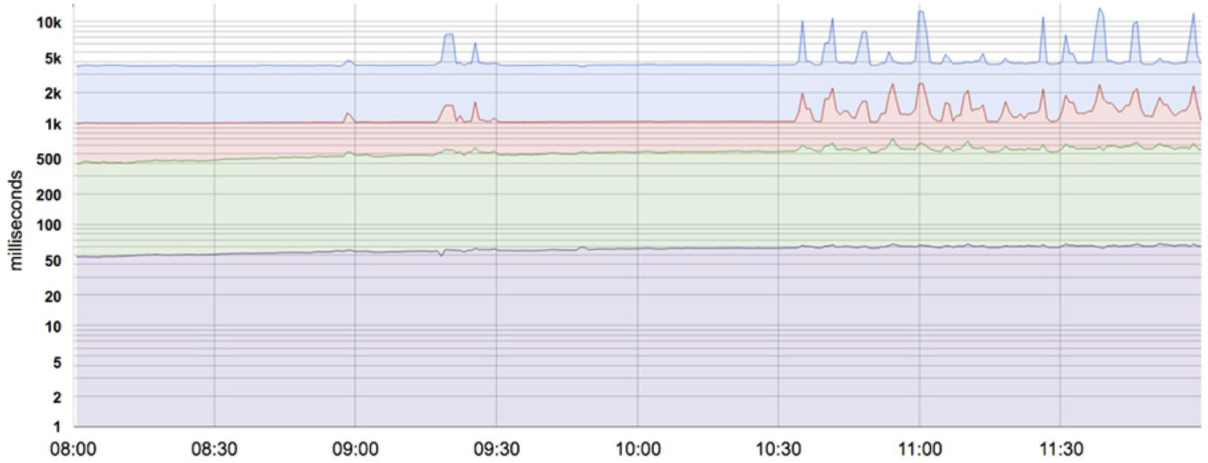

blue is 99th % latency

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- watch out for ***Goodhart's Law***: *"When a measure becomes a target, it ceases to be a good measure."*
  - regularly re-examine your chosen metrics to make sure they actually correlate with qualitative "good" system health

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  - regularly re-examine your chosen metrics to make sure they actually correlate with qualitative "good" system health
- avoid the ***McNamara Fallacy***: measure whatever can be easily measured and disregard that which cannot be measured easily

In-class Activity: Deployment Red Teams

- Each project team should have one **blue letter**
  - If your team has a “deployment expert”, give them the blue letter (swapping if necessary)
  - If you’re on a team by yourself, make sure your letter is blue
- If you have a **red letter**, you should find the person with the corresponding blue letter (note there are duplicate red letters)

In-class Activity: Deployment Red Teams

- **Goal**: the red team member(s) will audit the blue team's deployment pipeline
  - **Blue team**: start by explaining how your app is deployed to your red team
  - **Red team**: think about whether the blue team could improve…
    - deployment automation?
    - quality assurance/testing gates/CI
    - staged deploys?
    - monitoring infrastructure?
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By end of class, red team should open at least one PR that:

- documents a weakness that you discovered today
- or, even better, fixes a weakness

For participation credit. Use git's co-authoring feature to credit your whole team.

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Wrapup and Reminders

- A6 due Wednesday (discussion in class)
- P6 due Sunday night
- Do your course evaluations!
  - I will take the feedback very seriously
  - For those that took 490: what should I include from this class in future version of 490?
- My office hours this week are cancelled
  - Make an appointment if you want to talk to me