Deployment

CS 485/698: AI-Assisted SE

Today’s Agenda

- Team meeting (~15 minutes)
  - Sprint planning: how are you going to deploy your course project for P6? What kind of user load can you handle?
    - I will stop by during the team meeting to ask
- Lecture on cloud computing, CI/CD
- In-class activity: deploying a simple web application

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- What does your **tech stack** look like? What do you need to do?
  - Hook up Internet to your house.
  - Put a server in your garage.
  - Use the LAMP stack:
    - Linux
    - Apache web server (serves directories and files)
    - MySQL database (holds welding supply info)
    - All code written in Perl (e.g., for updating inventory)

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- What are the downsides of the 2005 tech stack?
  - You must set up and run everything by yourself!
  - How can you restart the server if you're not home?
  - Who rebuilds the system when the hard drive dies?
  - What if a hacker gets in and hijacks your site?
  - How do you scale?
    - What if you needed more storage? bandwidth?

Cloud Computing

- “The cloud is just someone else’s computer”
- A cloud provider (AWS, GCP, Azure, etc) builds a **big datacenter** with thousands of computers
  - They rent compute time to you
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  - **Simplifies your planning**: if you suddenly get popular, you can just rent more compute time

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  - Platform as a Service (PaaS)
    - E.g., Microsoft’s Azure offers an OS, scaling, deployment. You do apps.

Cloud Computing: Continuous Delivery

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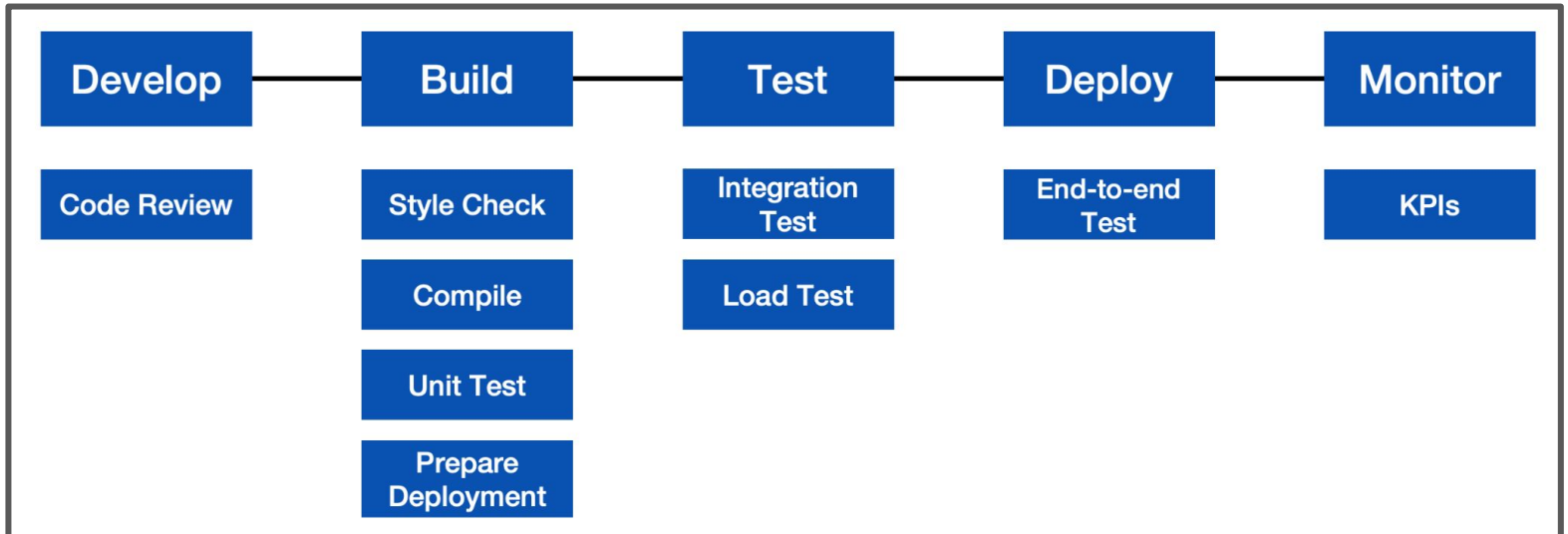

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- **Continuous *delivery***: Deploy frequently and monitor
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  - Key values of continuous delivery:
    - “Faster is safer”
    - Release frequently, in small batches
    - Maintain key performance indicators to evaluate the impact of updates
    - Phase roll-outs
    - Evaluate business impact of new features

Continuous Delivery: Motivation

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Knightmare: A DevOps Cautionary Tale

Published by **D7** on **April 17, 2014**

I was speaking at a conference last year on the topics of DevOps, Configuration as Code, and Continuous Delivery and used the following story to demonstrate the importance making deployments fully automated and repeatable as part of a DevOps/Continuous Delivery initiative. Since that conference I have been asked by several people to share the story through my blog. This story is true – this really happened. This is my telling of the story based on what I have read (I was not involved in this).

This is the story of how a company with nearly $400 million in assets went bankrupt in 45-minutes because of a failed deployment.

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"In the week before go-live, a Knight engineer manually deployed the new RLP code in SMARS to its 8 servers. However, he made a mistake and did not copy the new code to one of the servers. Knight did not have a second engineer review the deployment, and neither was there an automated system to alert anyone to the discrepancy. "

https://www.henricodolfing.com/2019/06/project-failure-case-study-knight-capital.html

What could Knight have done better?

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- Use capture/replay testing instead of driving market conditions in a test
- Avoid including “test” code in production deployments
- Automate deployments
- Define and monitor risk-based KPIs
- Create checklists for responding to incidents

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All elements of a good **continuous delivery** strategy!

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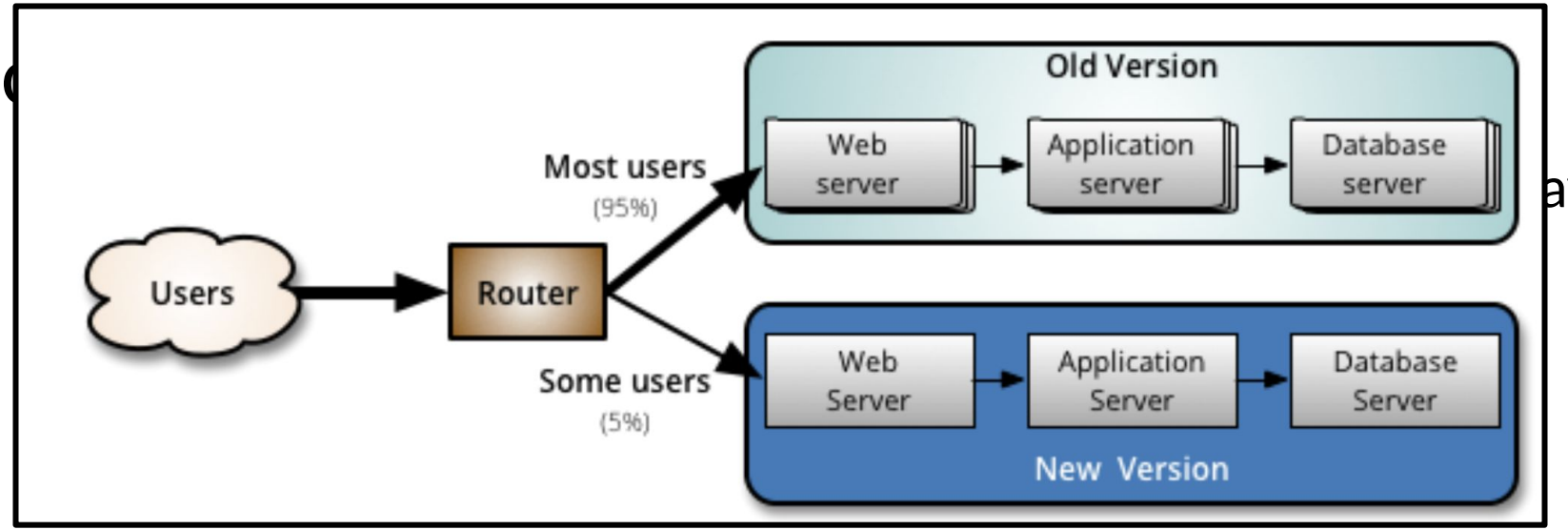

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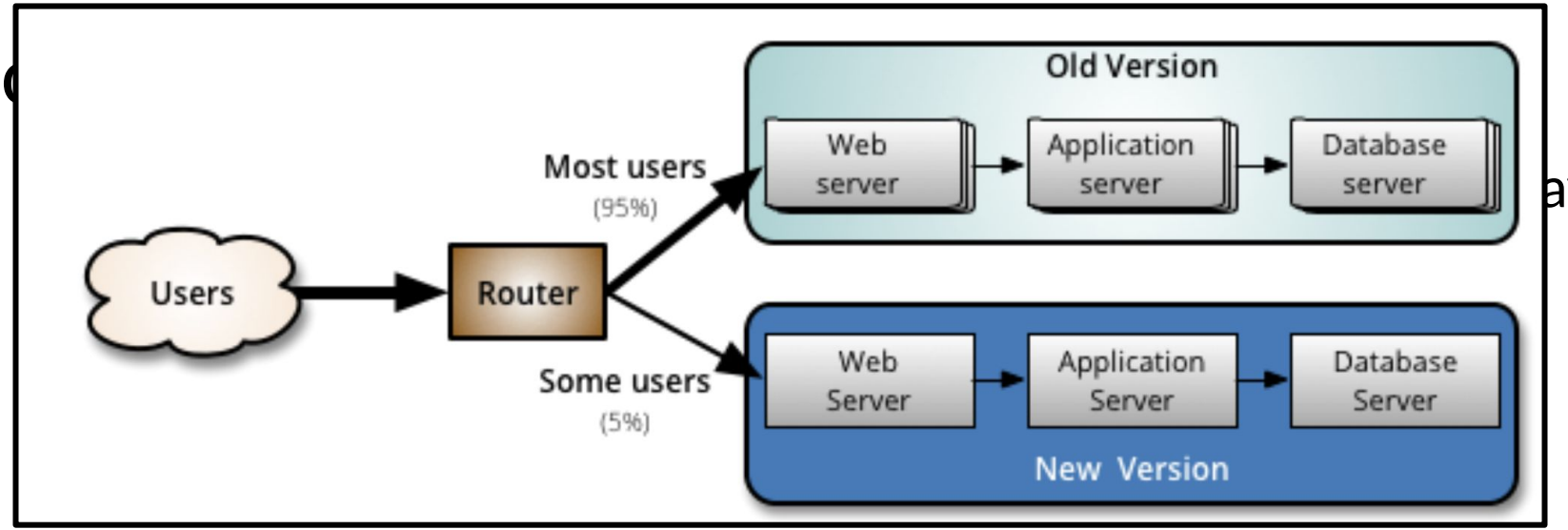

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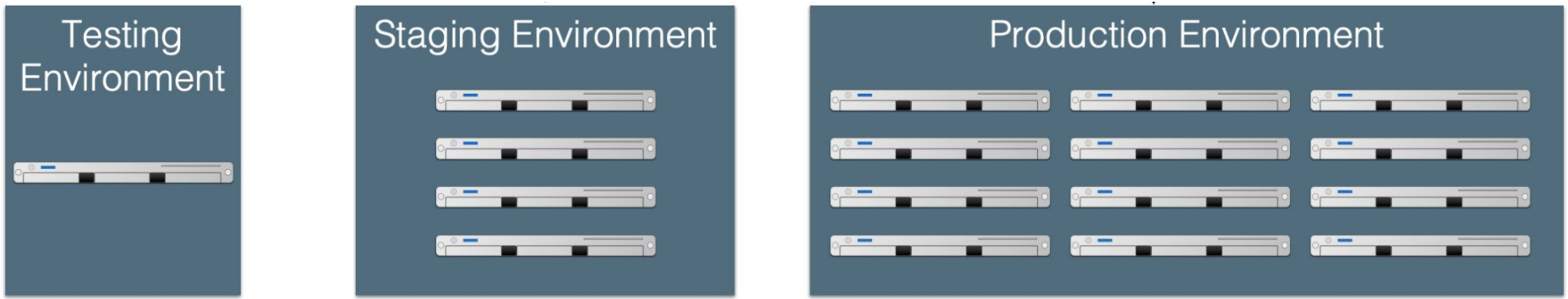
  - Lower risk if a problem occurs in ***staging*** than in production
    - "Dogfood" your own apps in staging, use alpha testers, etc

Continuous Delivery: Staging Environments



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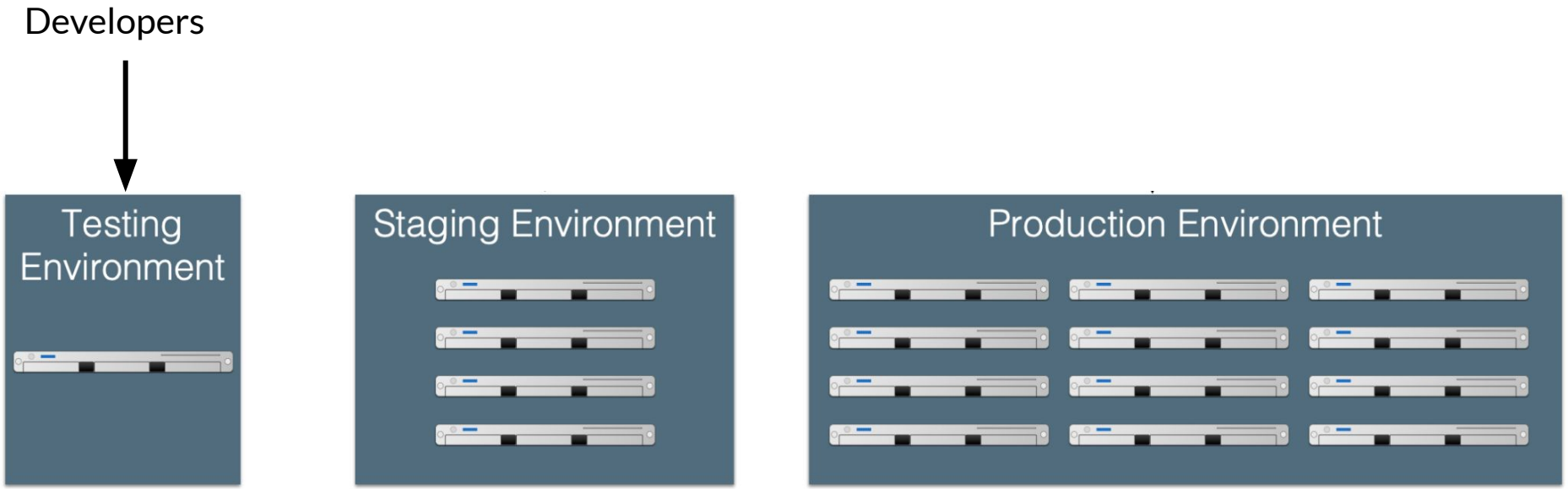

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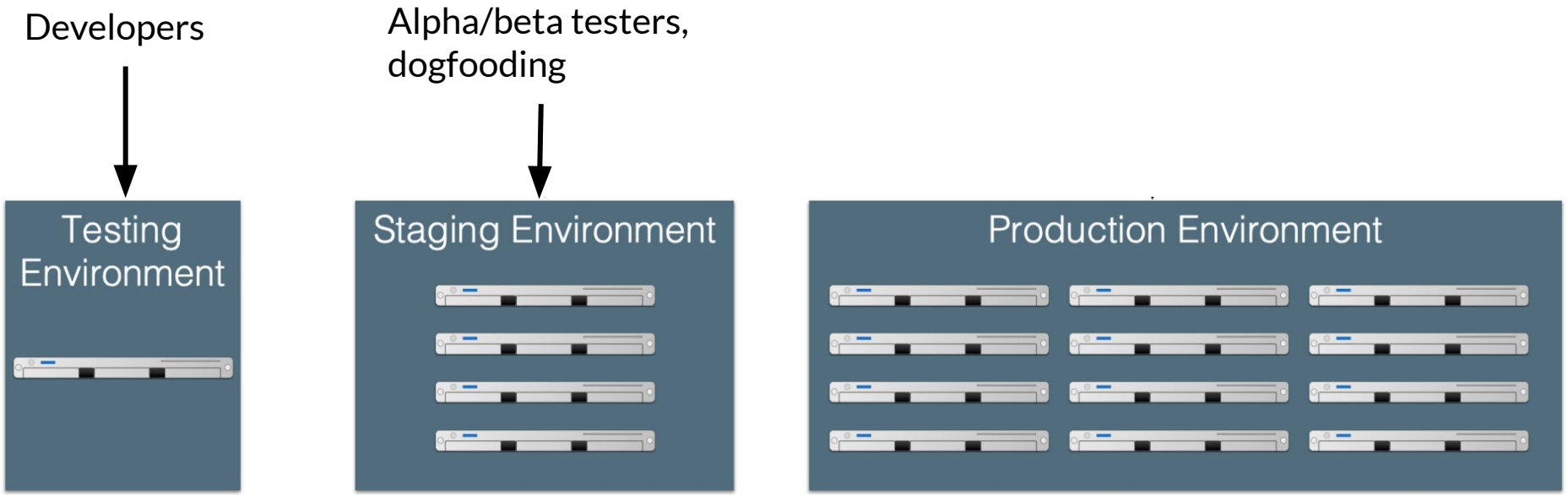

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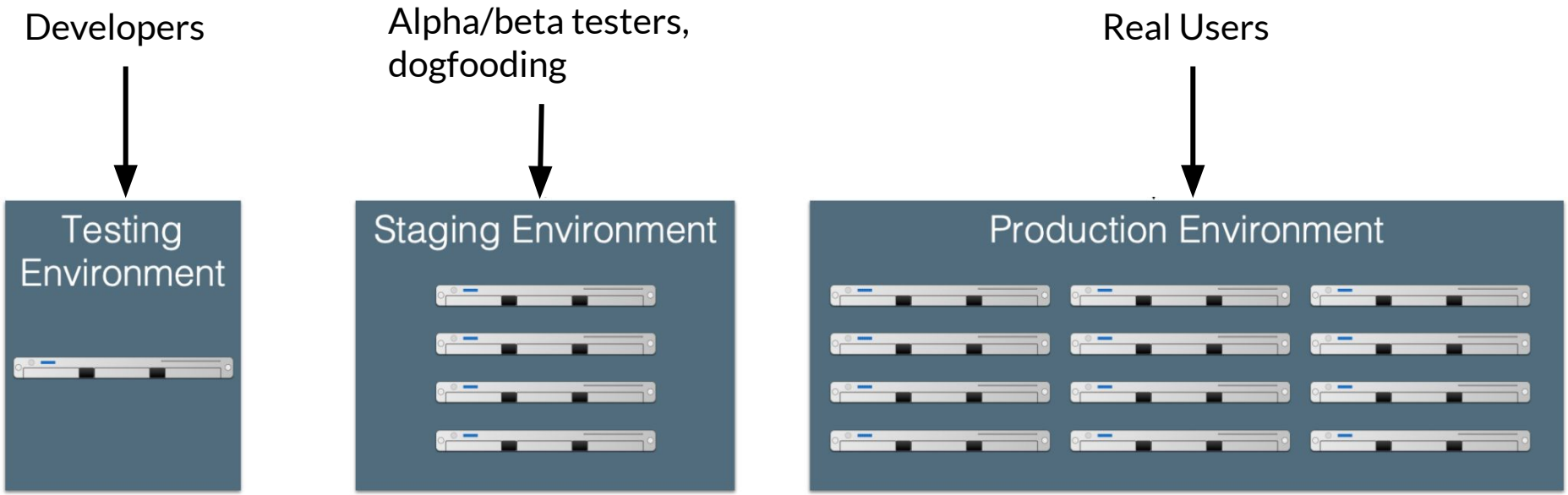

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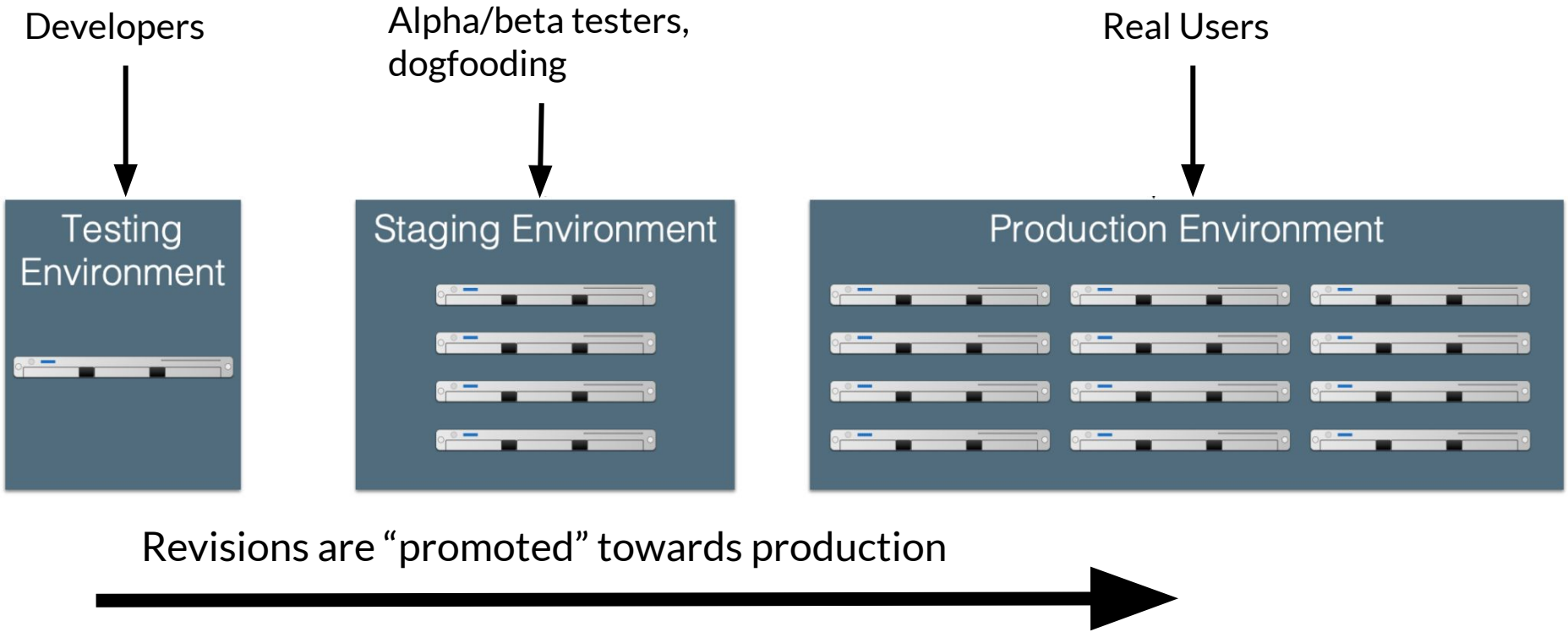

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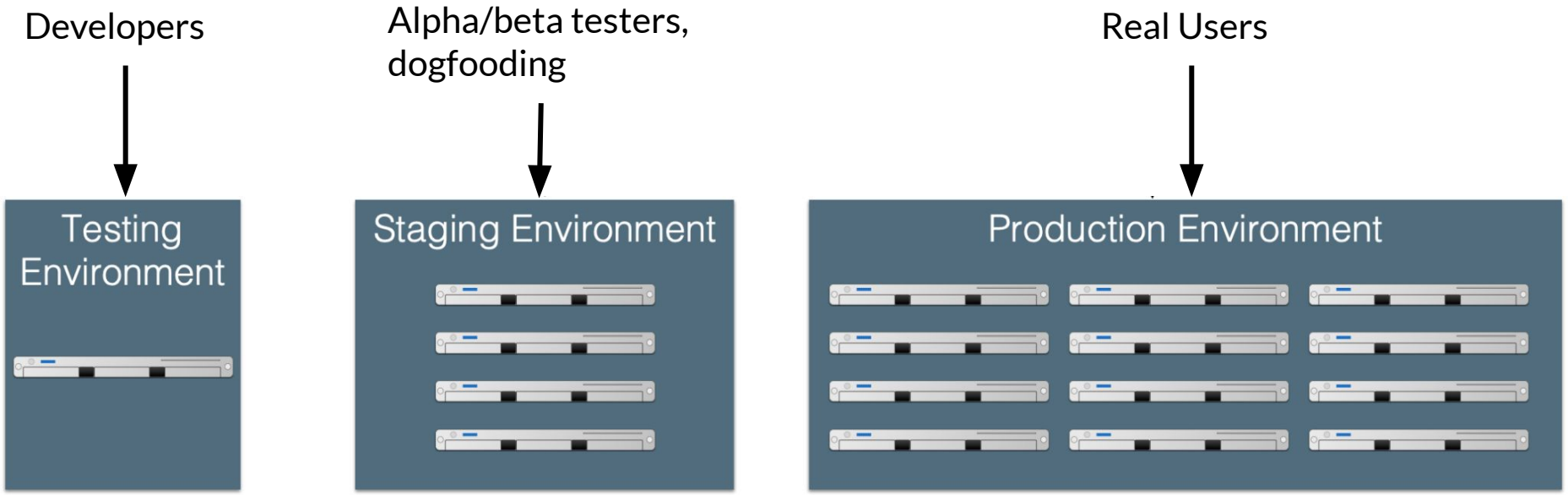

Continuous Delivery: Tooling

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- More complex tools:
  - Auto-deploys from version control to a staging environment + promotes through release pipeline
  - Monitors key performance indicators to automatically take corrective actions
  - Example: “Spinnaker” (Open-Sourced by Netflix, c 2015)

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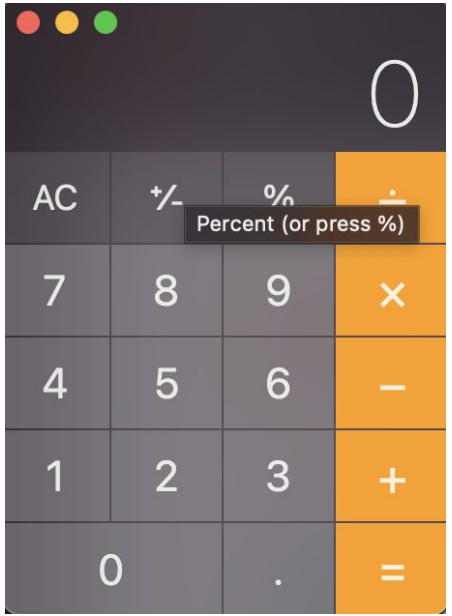
- Once you have the app, work together to actually get it deployed
  - Let us know once you've done so

In-class Activity: Calculator App

- Create a Node.js React app for a basic calculator.
- The frontend should contain the following buttons:
  - Numbers: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, . (decimal)
  - Functions: +, -, x, ÷, %, =, +/-, Clear, Backspace
  - It should create a string with the current expression as the user presses buttons and display it at the top.
  - Handle Clear and Backspace on the frontend.
- The backend should compute the value of the expression.
  - It has one public function: `string calculate(string)`
- When the user presses =, the frontend should call calculate() on the backend with the current expression and display the return value at the top of the calculator.
- Test out your calculator on localhost to make sure it works.



In-class Activity: AWS Amplify

- Assume that your partner will check your calculator app into a GitHub repo that you own
- Connect to AWS Console (https://console.aws.amazon.com)
  - Create an AWS account if you don't have one
- Go to AWS Amplify and connect it to your GitHub
  - Authorize AWS Amplify to use your GitHub account
- Pick your calculator repo and branch. Ask us if you don't see it in the pulldown.
  - Check the box "My app is a monorepo."
  - Fill in the root directory of your frontend app
  - Save and deploy
  - Deploy and visit the deployed URL

In-class Activity: Advanced Calculation

- Once your calculator is deployed, practice automated deployment and testing:
  - Add a small feature to your calculator (e.g., an exponentation function). Does Amplify automatically deploy it?
  - Have your LLM add automated tests for the calculator. If these tests fail, will Amplify still deploy a change?
    - Intentionally break the tests and find out!

Wrapup and Reminders

- A6 sign up are open
  - sign up by Wednesday