Desmistificando Microsserviços e DevOps: Projetando Arquiteturas Efetivamente Escaláveis

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[IF1004] - Seminários em SI 3
https://github.com/vinicius3w/if1004-DevOps

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Crosscuting Concerns

Other Ilities

“As a child my family’s menu consisted of two choices: take it or leave it.
— Buddy Hackett”

Introduction

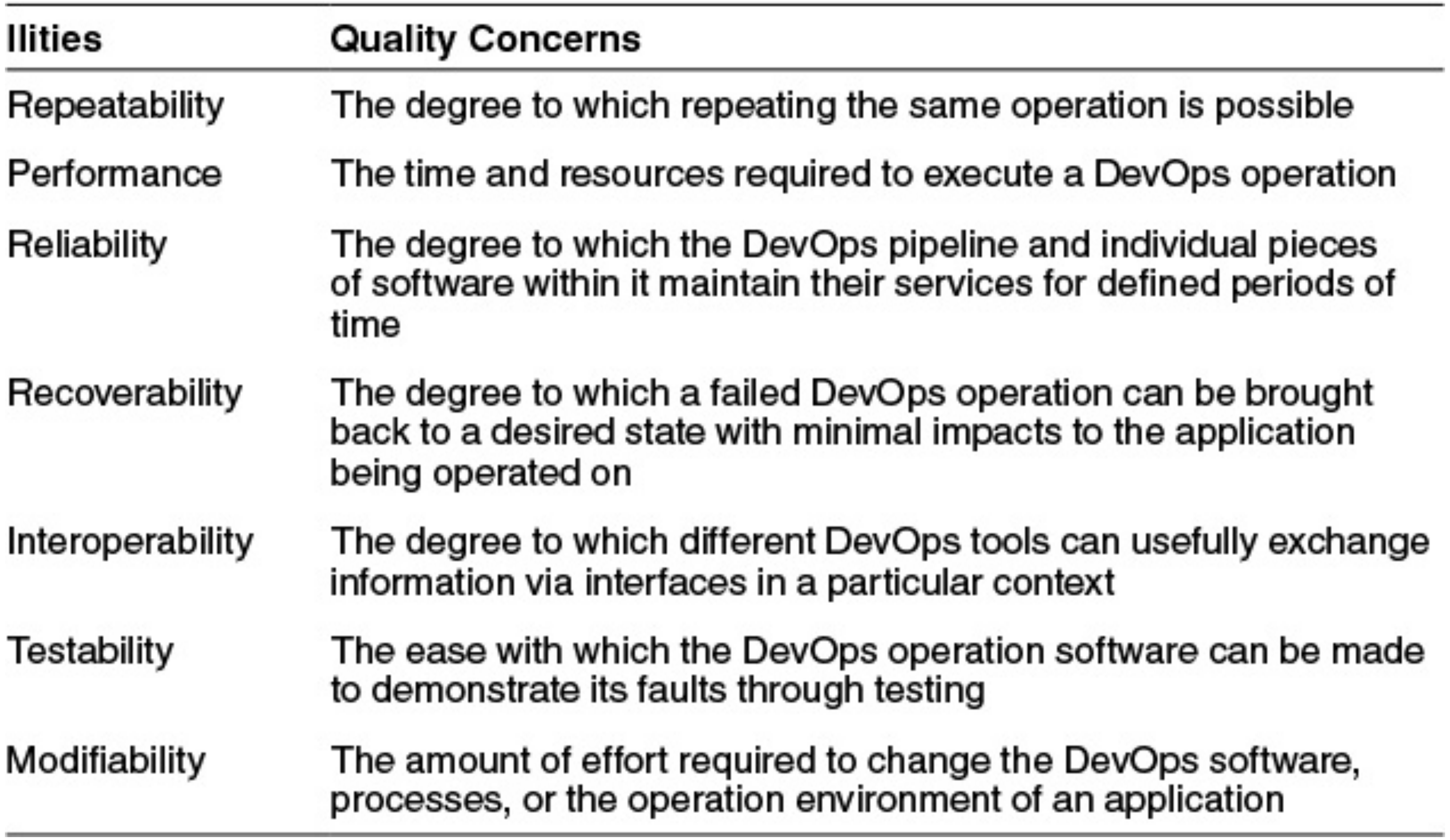
- We already discussed the major functionalities of the continuous deployment pipeline, such as build, test, and deployment

- There are other DevOps operations that resemble a process-like pipeline such as error detection, diagnosis, and recovery

Introduction

- “ility”: quality concerns other than those that focus on the basic functionalities and their correctness
  - How well are these functionalities in your pipeline performing?
  - Can you precisely repeat your DevOps operations when needed?
  - How much time has passed between a business concept and its final release?
  - How can different tools in your pipeline interoperate?

List of the ilities and their primary quality concerns



Ilities	Quality Concerns
Repeatability	The degree to which repeating the same operation is possible
Performance	The time and resources required to execute a DevOps operation
Reliability	The degree to which the DevOps pipeline and individual pieces of software within it maintain their services for defined periods of time
Recoverability	The degree to which a failed DevOps operation can be brought back to a desired state with minimal impacts to the application being operated on
Interoperability	The degree to which different DevOps tools can usefully exchange information via interfaces in a particular context
Testability	The ease with which the DevOps operation software can be made to demonstrate its faults through testing
Modifiability	The amount of effort required to change the DevOps software, processes, or the operation environment of an application

We consider the ility issues of the DevOps pipeline from two different perspectives: product and process

Repeatability

- Repeatability is the degree to which a process can be repeated for a different application or branch.
  - It can be measured by counting the number of failures and successes of that process.
  - If a process that was previously successful now fails, this failure is an indication that the process is not repeatable in some different context.

- Two activities are key to achieving repeatability: definition and enforcement of processes and maintaining version control over all artifacts.

Repeatability

- Measuring repeatability depends on being able to identify that two executions of an operation are executing the same process.

- One means for doing this is to examine traces of the process to ensure they have performed the same steps in the same order.
  - In other words, we are equating repeatability and traceability

Defining and Enforcing Process at the Appropriate Level

- There will be important tradeoffs between defining and enforcing repeatable actions to improve quality and allowing for leeway to enable desired creative activities.

- Process enforcement is a matter both of automation and of social processes.
  - Automating a process will enforce certain actions and certain gates.
  - Social processes such as wearing a hat that says “I Broke the Build” also educate and encourage team members to conform to particular processes.

Defining and Enforcing Process at the Appropriate Level

- In order to achieve repeatability, processes must enforce selected practices.
- The choice of which practices to enforce is a portion of the tradeoffs that go into designing a DevOps process.
- The goal is to have some defined and repeatable best practices around the development workflow at an appropriate level.
- Defining an operation through scripts and automation tools does not inherently achieve repeatability

Version Control Everything

- Single tool vs Multiple tools
  - Scripts change over time
    - Any script or code that changes the infrastructure or environment should be version controlled
  - A script often takes some parameters to run, and these parameters operate on a particular environment and make changes to that particular environment

Version Control Everything

- Deployment tools. Maintaining traceability of the higher-level process could be accomplished by a deployment tool since it is the last stage of placing an instance in production.
- Configuration management database (CMDB). The configuration parameters are stored in a database. This database can also record accesses, so that tools and scripts that access configuration information will be known later.
- Tagging data items. Each script manipulates some entity. Tagging the entity will lead to the final deployed version having traceability information.

Performance

- Performance is characterized by the amount of useful work it accomplishes and the time and resources used to accomplish that work
  - Can be measured by the response time to a given piece of work

Measuring the Important Things

- Before you can improve the performance of your pipeline, you should first measure it!

- At a high level, the performance of interest is the time between a business concept and its successful deployment.

Measuring the Important Things

- Measure the different types of errors that occur and the reasons behind them
- A recent empirical study from Google shows that the top build errors are related to dependency issues representing 52.68% (C++) or 64.71% (Java) of all build errors.
- Understanding these errors can guide your efforts for improvement.

Measuring the Important Things

- For various reasons it is not always best to enforce best practices proactively and mechanically. Instead, monitoring compliance provides an indication of problems.

- Not all deviations are problems, some may be justified.
- On the other hand, multiple compliance deviations can indicate a need to improve a process.

Improving Resource Utilization

- Moving all the above environments to the cloud, thereby switching off machines that are currently underutilized and only paying for what you use.

- Using containers rather than virtual machines (VMs).

Reliability

- Software fails.

- Reliability refers to the capability of the overall DevOps pipeline and its individual pieces to maintain service.

- The DevOps pipeline can be seen as a distributed system of systems dealing with various distributed services.

Improving the reliability of the pipeline

- Understanding the Reliability Characteristics of Different Services
  - Use a wrapper around the original service to improve reliability, employing standard fault-tolerant mechanisms.
  - Use local mirrors of the remote services.

- Detecting and Repairing Errors Early

Recoverability

- The goal of recoverability is to enable easy recovery after a failure, whether the cause is an internal or external system, or human operators.
  - Include extensive exception handlings in your operation logic.
  - Build in support for external monitoring or recovery systems.
  - Design your software with operators as first-class stakeholders.

Interoperability

- Interoperability refers to the degree to which different tools can usefully exchange information via interfaces in a particular context.
  - Paying Attention to Interoperation of Interfaces
  - Understanding Existing Data Models

Testability

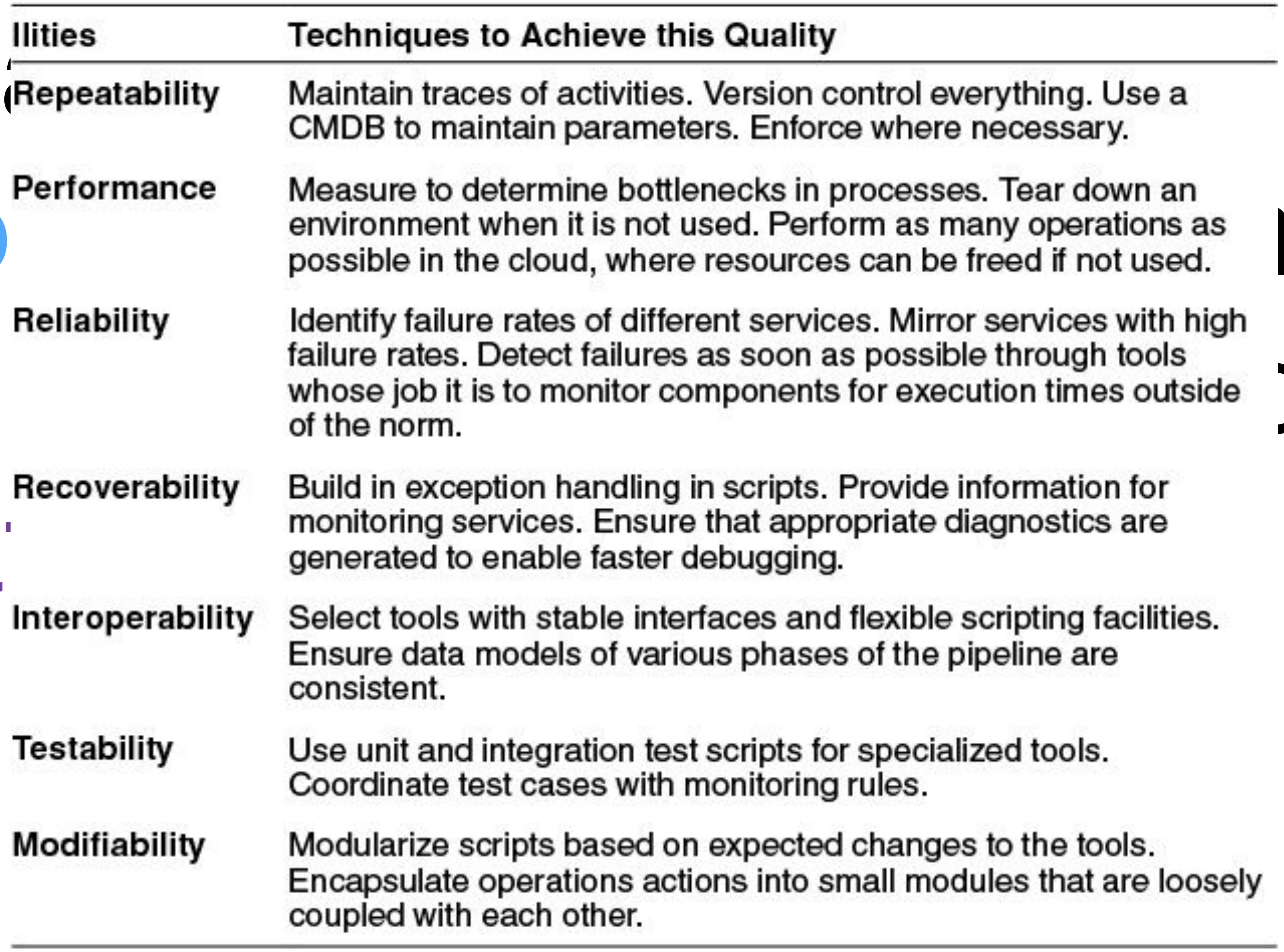
- Testability concerns the effort required for the software to demonstrate its faults through testing.
- However, a DevOps pipeline poses additional challenges…
  - the difficulty of testing infrastructure outcomes [infrastructure-as-code]

Modifiability

- Modifiability is a measure of the ability to make changes in existing software.
    - Change either the interactions with one of the stages in the pipeline or the conditions for moving from one stage to the next.

Summary

- The take- ilities and quality co nsidered early and dding them in as an a



Ilities	Techniques to Achieve this Quality
Repeatability	Maintain traces of activities. Version control everything. Use a CMDB to maintain parameters. Enforce where necessary.
Performance	Measure to determine bottlenecks in processes. Tear down an environment when it is not used. Perform as many operations as possible in the cloud, where resources can be freed if not used.
Reliability	Identify failure rates of different services. Mirror services with high failure rates. Detect failures as soon as possible through tools whose job it is to monitor components for execution times outside of the norm.
Recoverability	Build in exception handling in scripts. Provide information for monitoring services. Ensure that appropriate diagnostics are generated to enable faster debugging.
Interoperability	Select tools with stable interfaces and flexible scripting facilities. Ensure data models of various phases of the pipeline are consistent.
Testability	Use unit and integration test scripts for specialized tools. Coordinate test cases with monitoring rules.
Modifiability	Modularize scripts based on expected changes to the tools. Encapsulate operations actions into small modules that are loosely coupled with each other.

For Further Reading

- For ilities in software architecture: L. Bass, P. Clements, and R. Kazman. Software Architecture in Practice, 3rd Edition. Addison-Wesley, 2013.
- For common build errors, you can read the Google study published in "Programmers' Build Errors: A Case Study (at Google)”
- “For more about testability and test-driven development for infrastructure code, "Test-Driven Infrastructure with Chef”

Homework #6

- Students should read the article "Programmers' build errors: a case study (at google)", and post their understanding of the work in a MD file. Submit in our Slack team, the MD file (LOGIN-HW6.md) containing the following:
  - Your identification (name and CIn email address)
  - Your understanding of the work, a brief resume, strong and positive points, weak points, etc.
- Due D+5 (Sunday, 9/04), 17:00.