Creational Patterns: Singleton

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Overview

Classification: Creational

Ensure a class has only one instance

Control access to limited resource

- Device access
- Buffer pools
- Web/DB connection pools

Provide a global point of access

Class responsible for its one instance

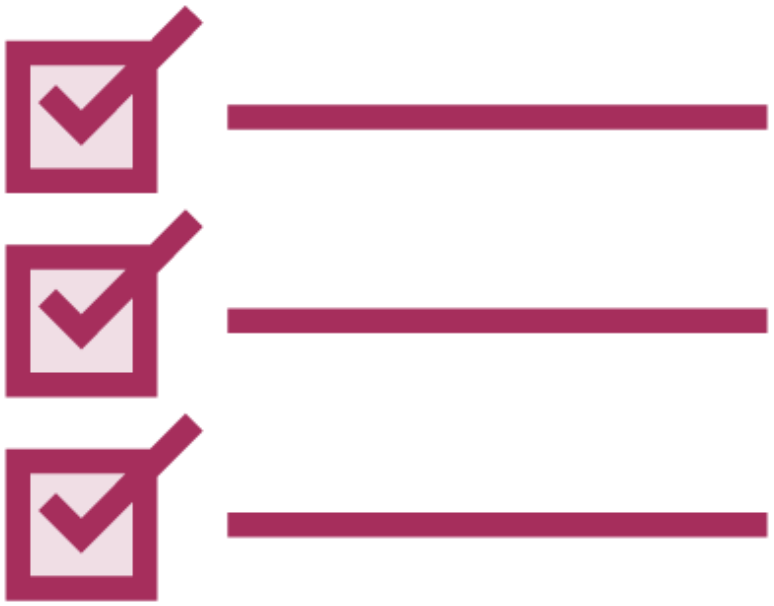
Lazy construction

Demo

Motivating example

Logging subsystem:

- Log events to a file
- Only one instance can write to the file
- Need to control access
- Classic Singleton pattern



Violate Single Responsibility Principle

Non-standard class access

Harder to test

Carry global state

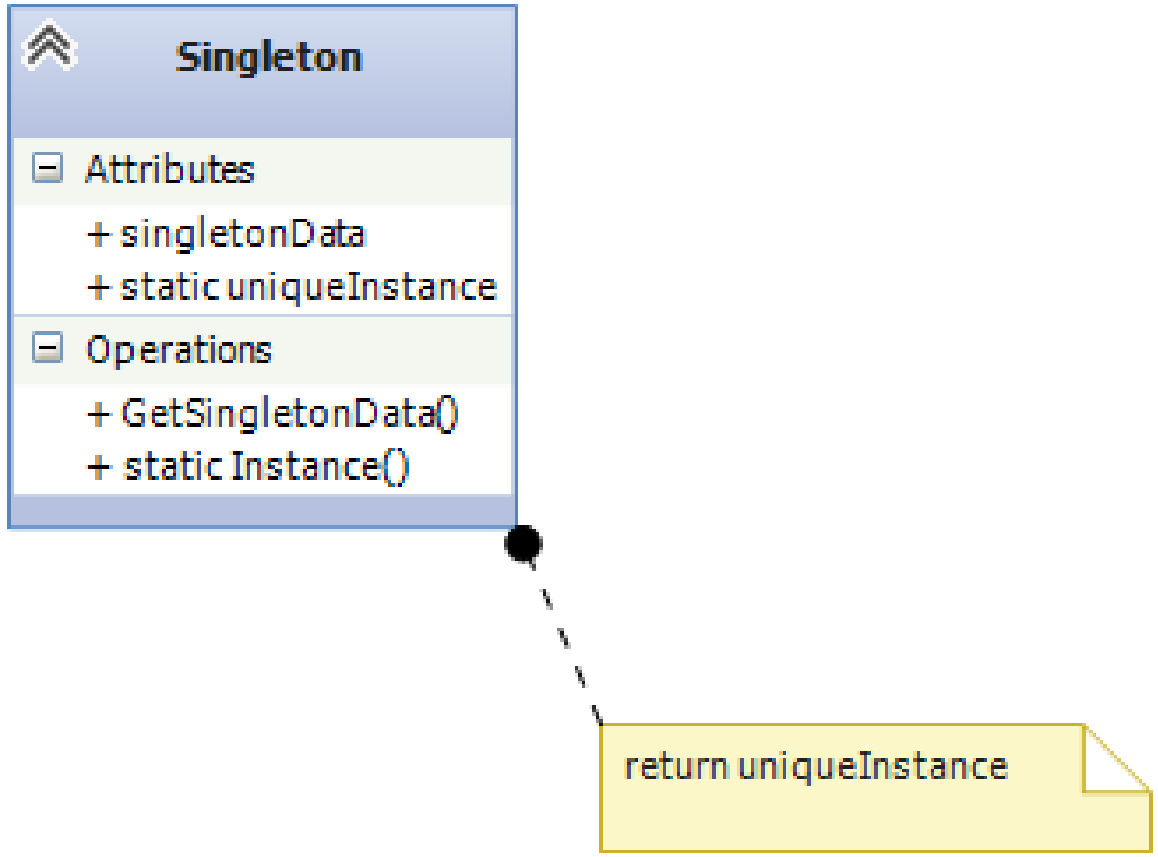
Hard to sub-class

Singletons considered harmful!

- http://goo.gl/VUWmC6
- http://goo.gl/O4s3VE

Singletons called an *anti*-pattern

Singleton Pattern Structure



Demo

Fix the Single Responsibility problem

- Building a base class for all singletons
- Inherit from the base class for each one
- Fix non-standard instance access
- Other problems remain

Demo

First demo, classic pattern

- Single Responsibility violation

Second demo, built a base class

- Fixed the SRP violation

Third demo, build a metaclass

- Class's class
- Class is an instance of a metaclass
- Control building of class

Demo

What!? Another demo?

First demo, classic pattern

Second demo, built a base class

Third demo, build a metaclass

Fourth demo, the MonoState pattern

Summary

Controlled access to a single instance

Reduces the global namespace

Subclassible for extended uses

Variable number of instances

- Base class and metaclass variants

More flexible than a static class

- Class with no instances

MonoState shares all state

Can also use a Python module

Use sparingly – *anti-p*attern