Building an Async API with ASP.NET Core

UNDERSTANDING THE POWER OF ASYNC

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Coming Up

Prerequisites and Tooling

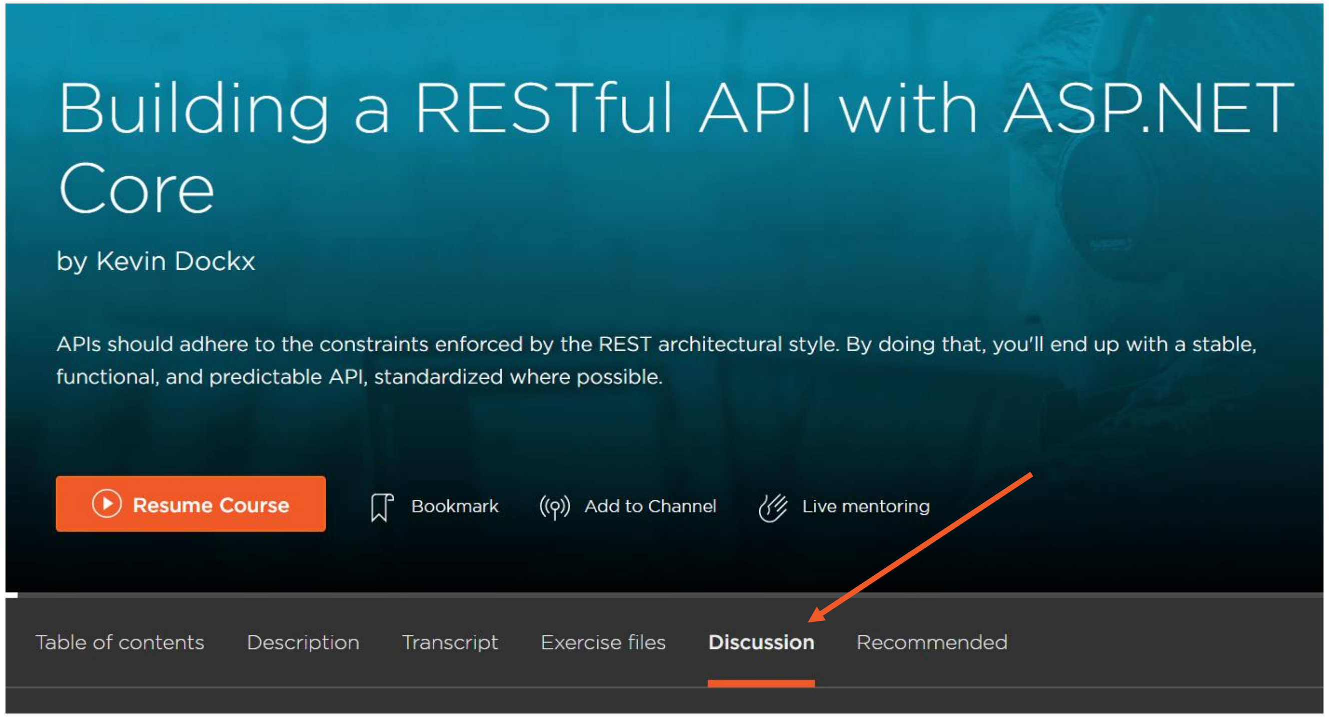
Sync and Async Request Handling

I/O Versus Computational Bound Work

Multithreading, Concurrency, and Parallelism

Discussion tab on the course page

Twitter: @KevinDockx


Building a RESTful API with ASP.NET Core

by Kevin Dockx

APIs should adhere to the constraints enforced by the REST architectural style. By doing that, you'll end up with a stable, functional, and predictable API, standardized where possible.

(Course shown is one of my other courses, not this one)

Course Prerequisites

Good knowledge of C#

Knowledge of building an API with ASP.NET Core

Course Prerequisites

ASP.NET Core Fundamentals (Scott Allen)

- https://bit.ly/2gg9WSH

Building Your First API with ASP.NET Core (yours truly)

- https://bit.ly/2GCkkFV

Frameworks and Tooling

Visual Studio 2017

http://bit.ly/2dSGoN5

Visual Studio for Mac

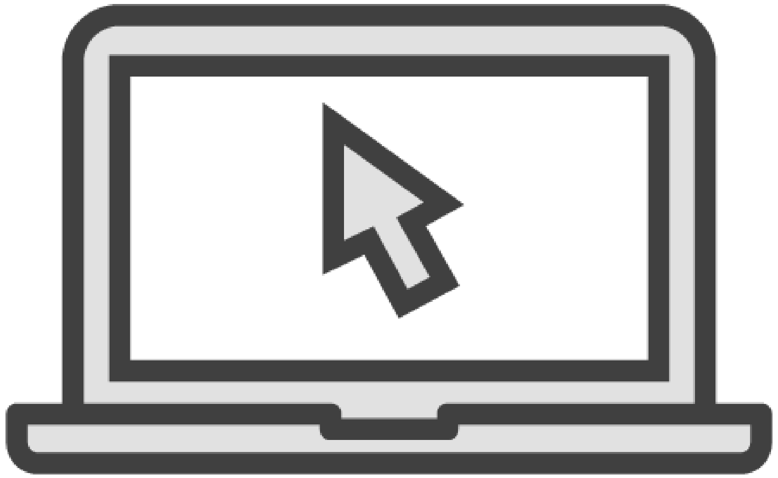
http://bit.ly/2fXmQpH

Visual Studio Code

http://bit.ly/1J6QrU6

JetBrains Rider,
Sublime, …

Introducing the Demo Project



Library API, built with ASP.NET Core 2.1

- Start from scratch

Exercise files

- Exercise files tab on the course page
- GitHub: https://bit.ly/2ONREdi

The Advantage of Asynchronous Code

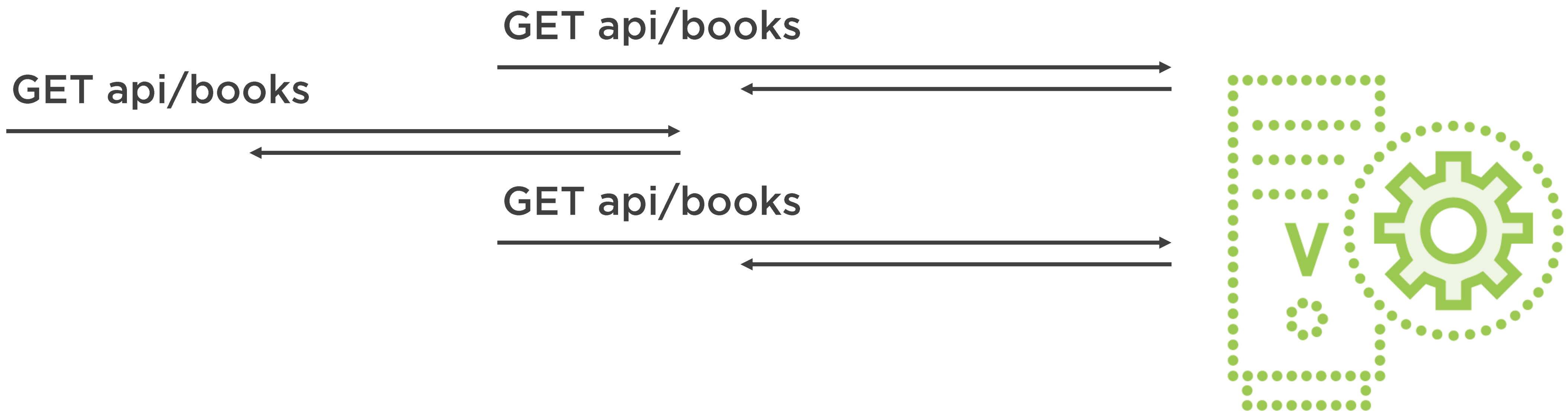
Performance is not the key benefit

The key benefit of writing async server-side code is increased scalability

Scalability

The capability of a system, network, or process to handle a growing amount of work, or its potential to be enlarged to accommodate that growth

Horizontal Scaling



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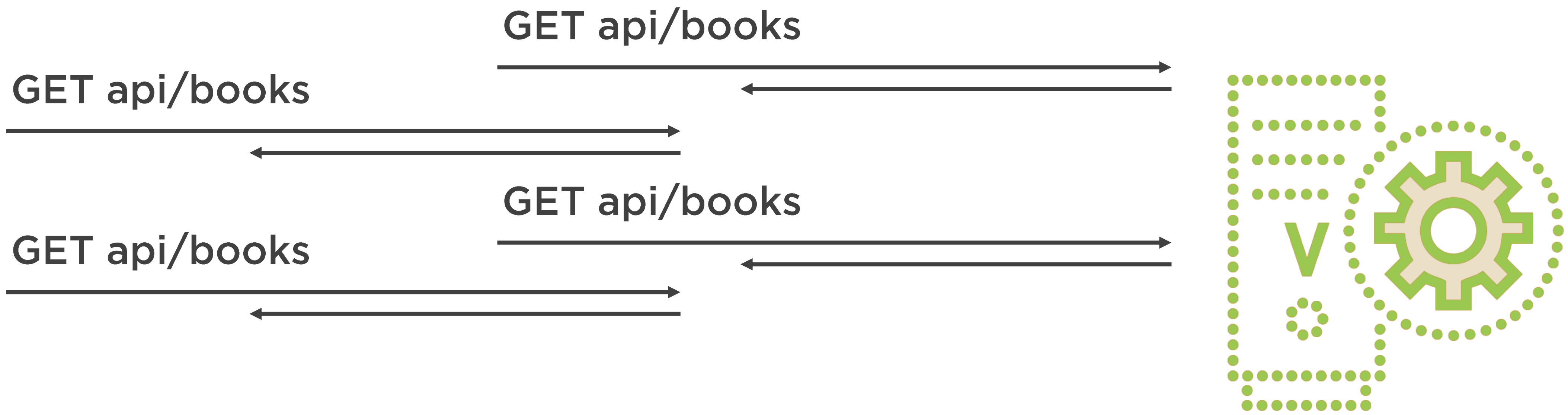

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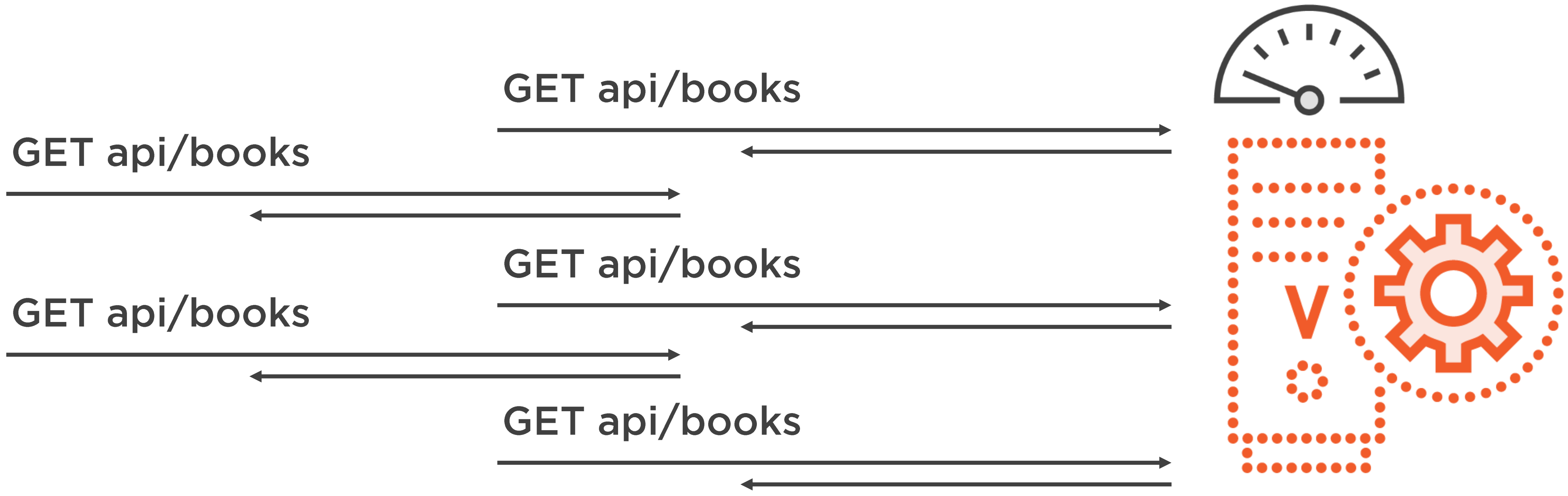

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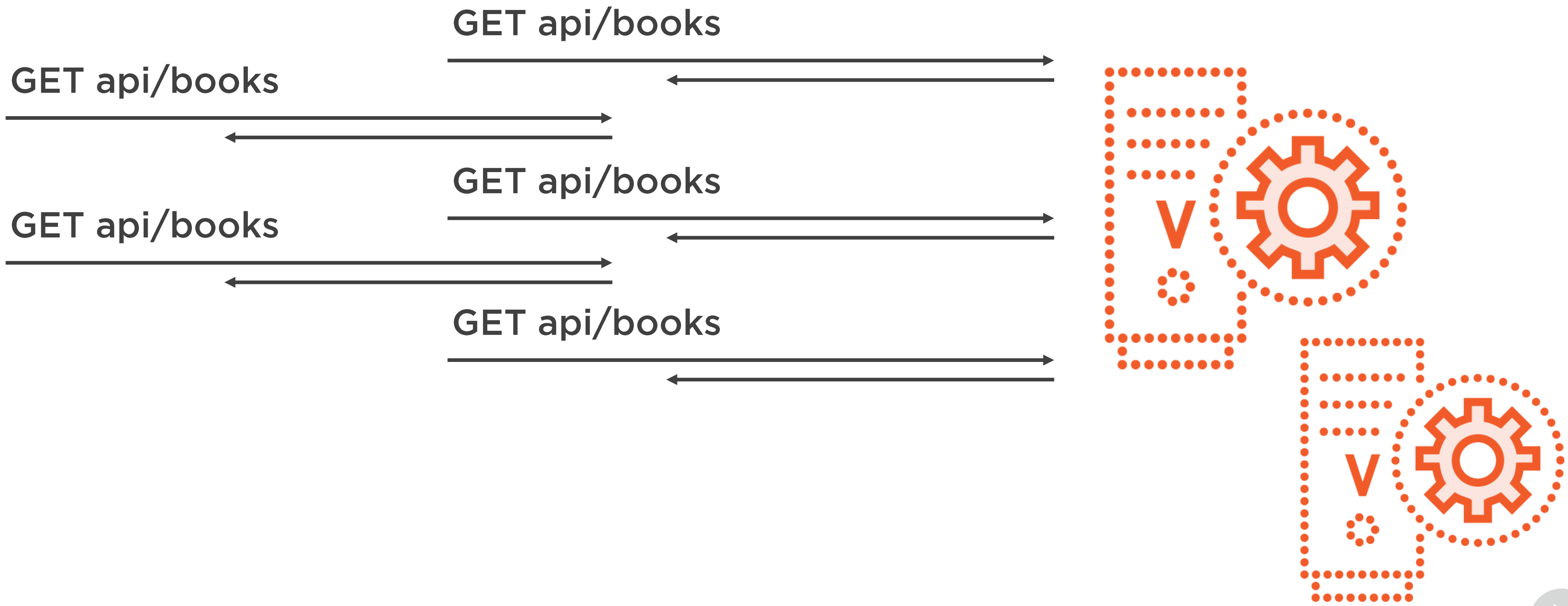

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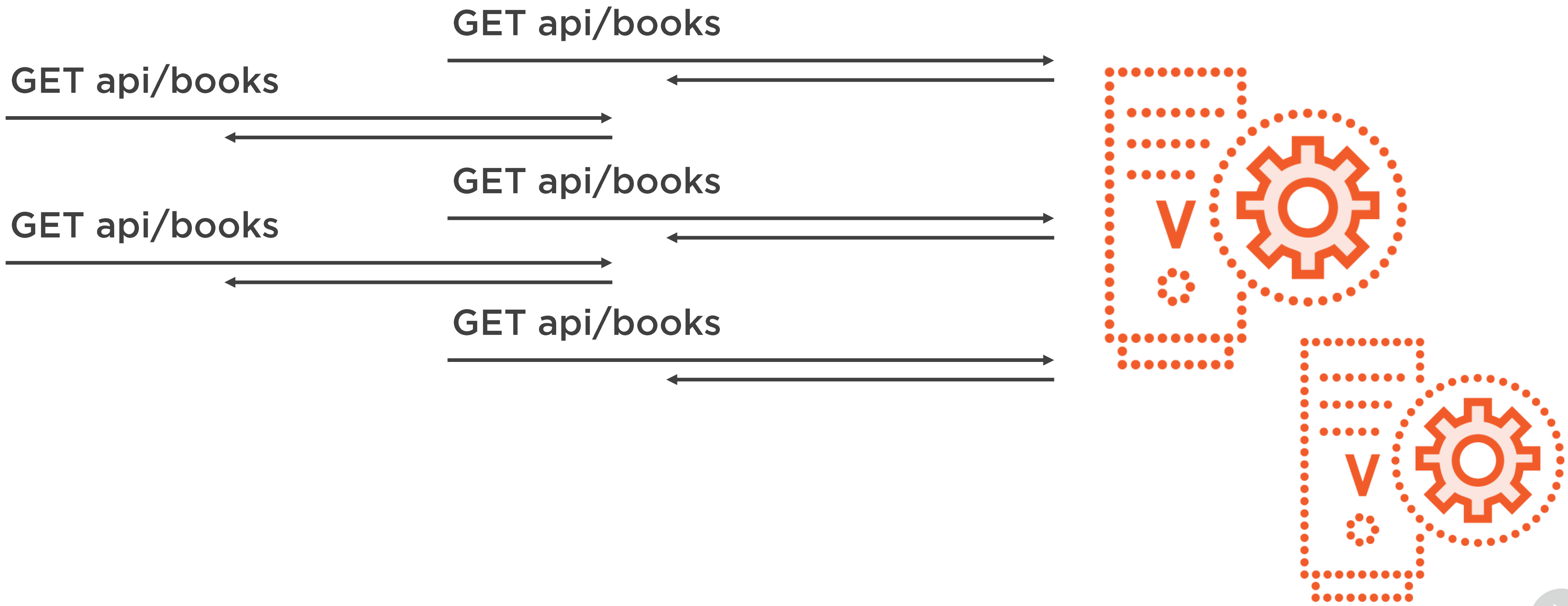

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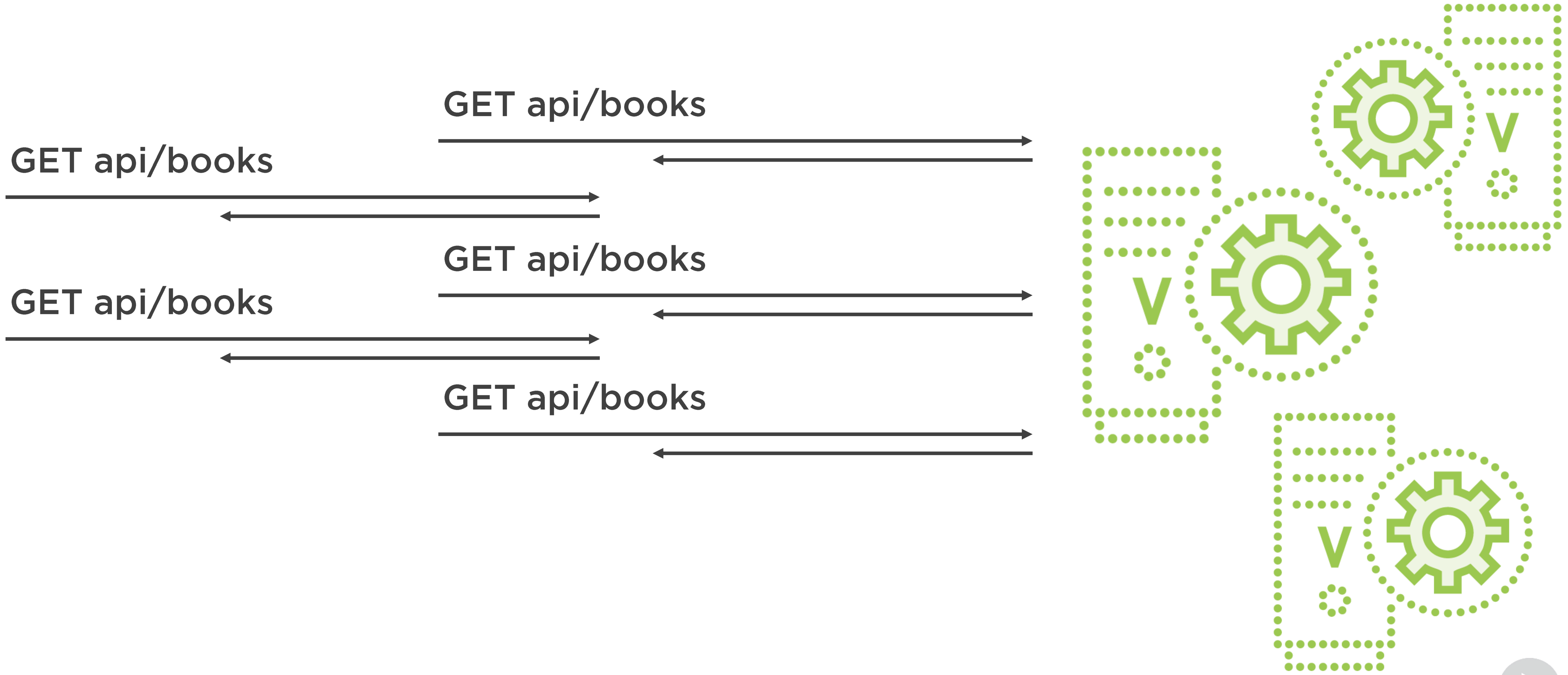


Horizontal Scaling

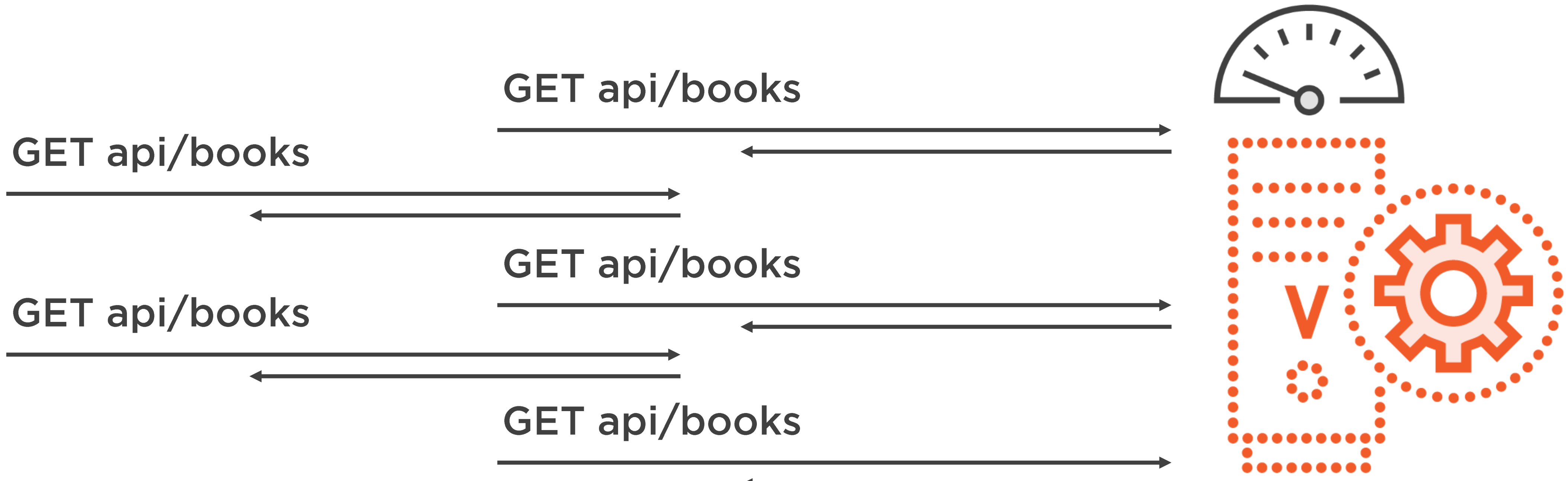
One way of increasing scalability is by writing an API in a way that can accommodate horizontal scaling

- RESTful systems are a good start

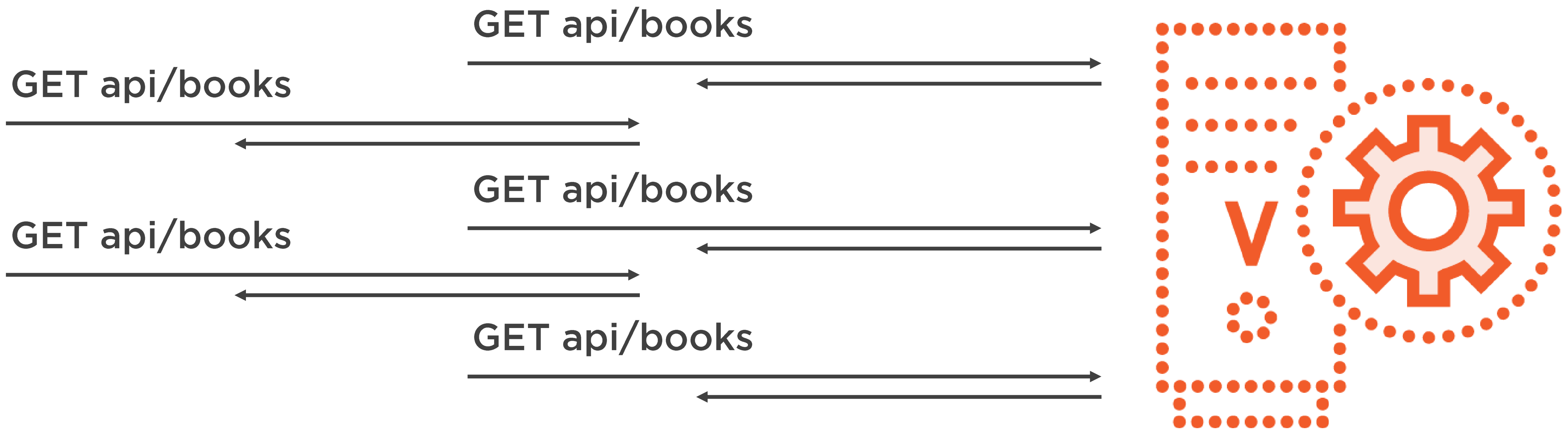
Other components can still hurt scalability

- Non-distributed databases or caches

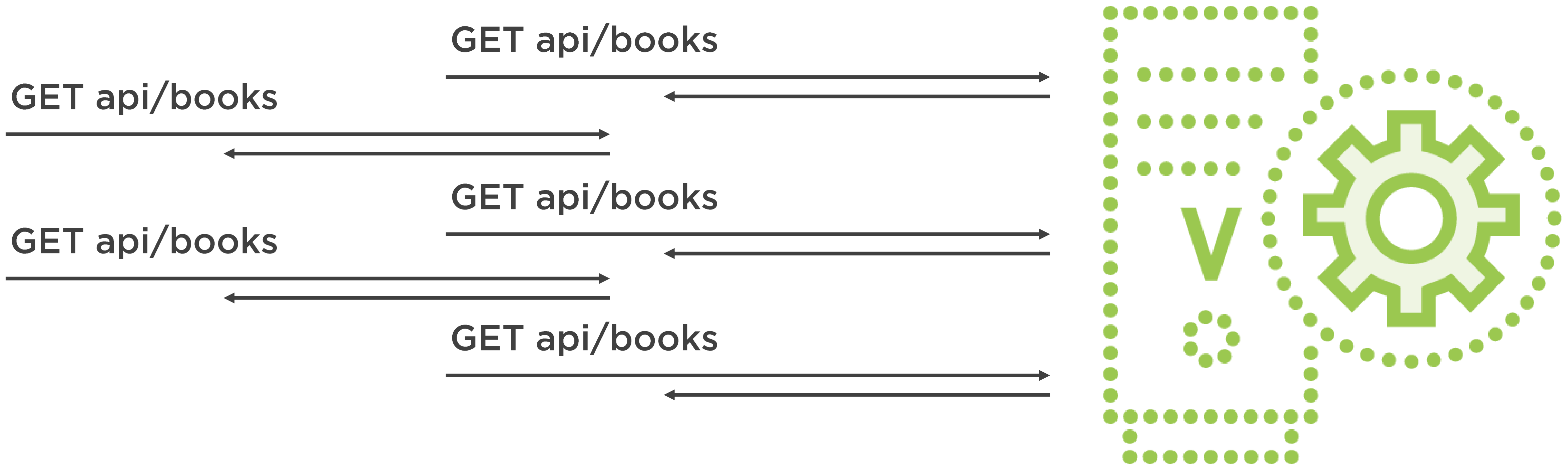
Vertical Scaling



Vertical Scaling



Vertical Scaling

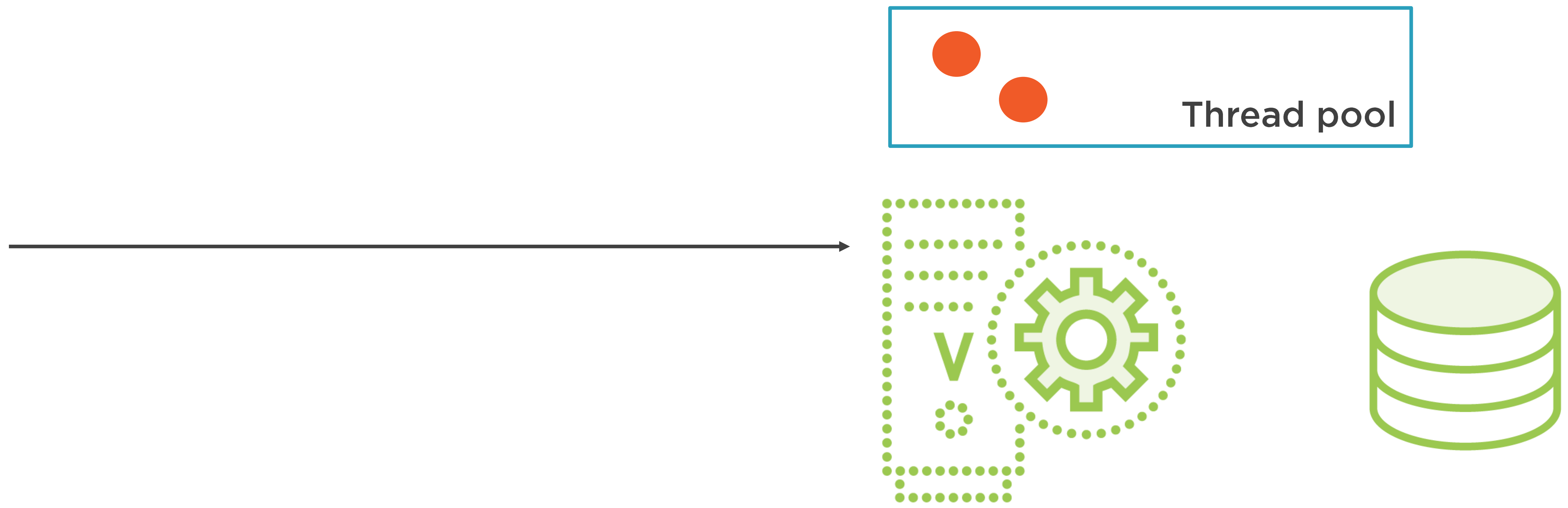


Vertical Scaling

Another way of increasing scalability is by writing an API in such a way that resource utilization is improved

Writing async code helps with improving the vertical scalability at server level

Handling Synchronous Requests



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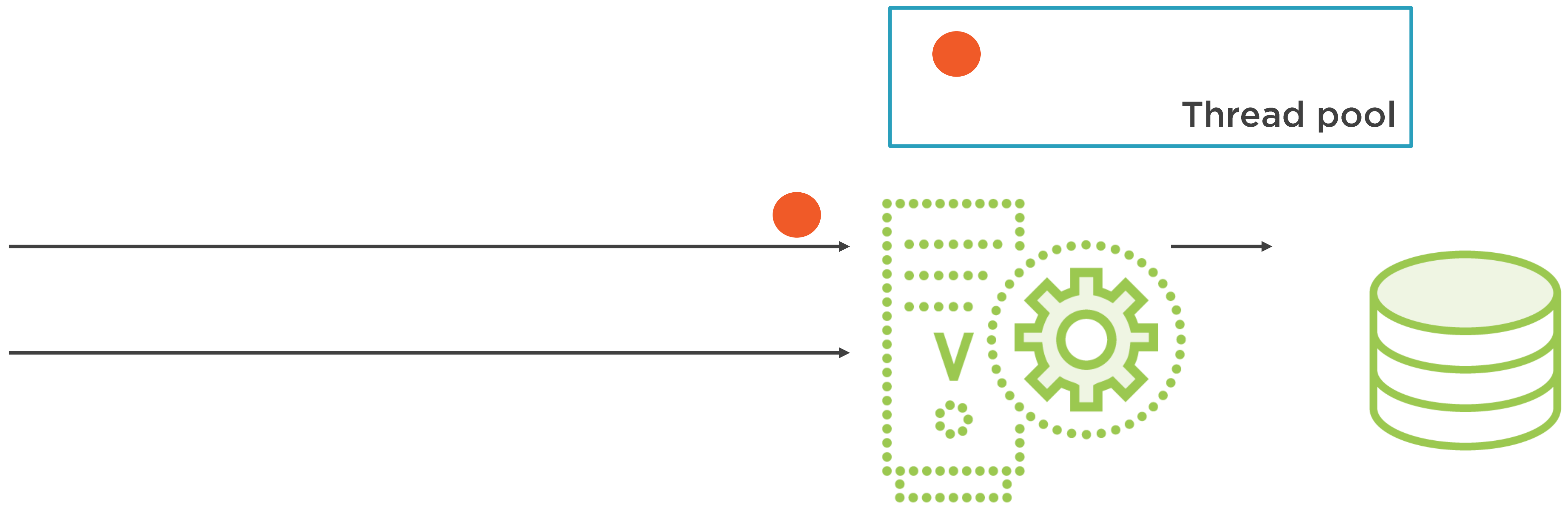

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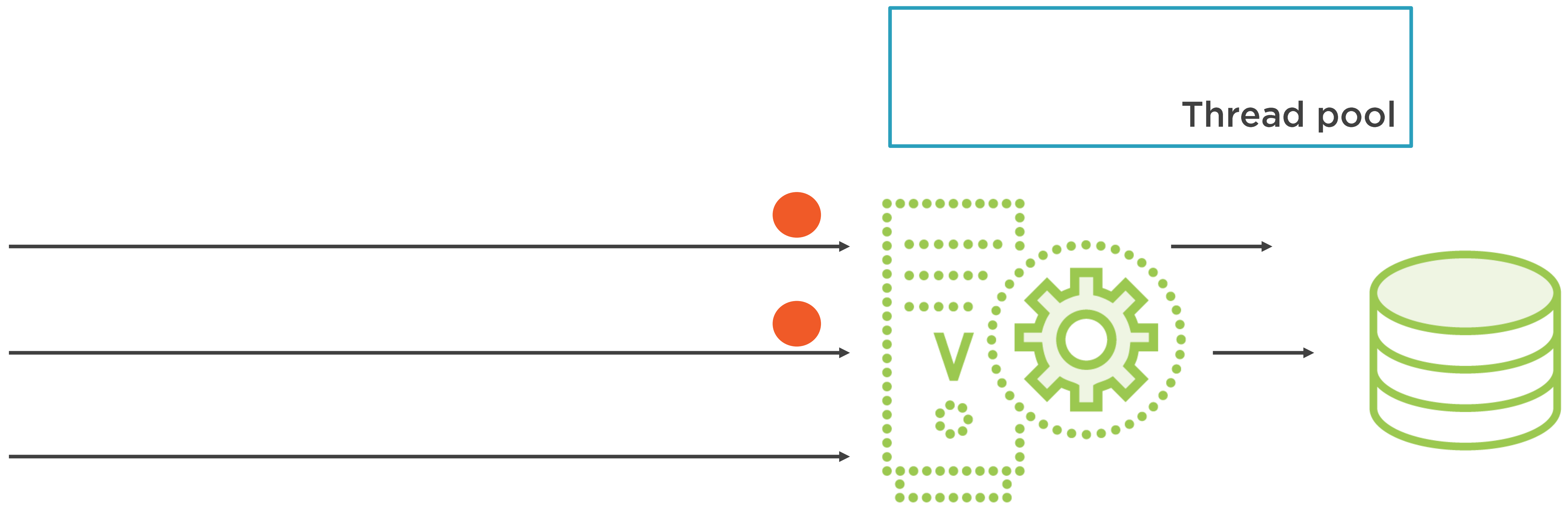

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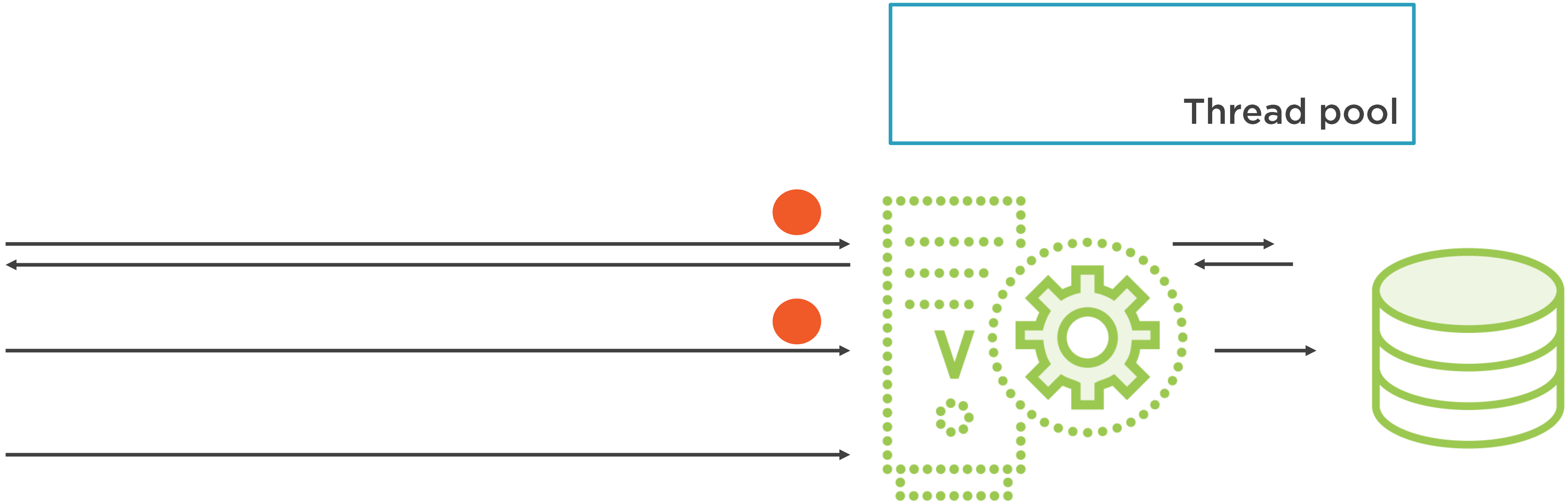

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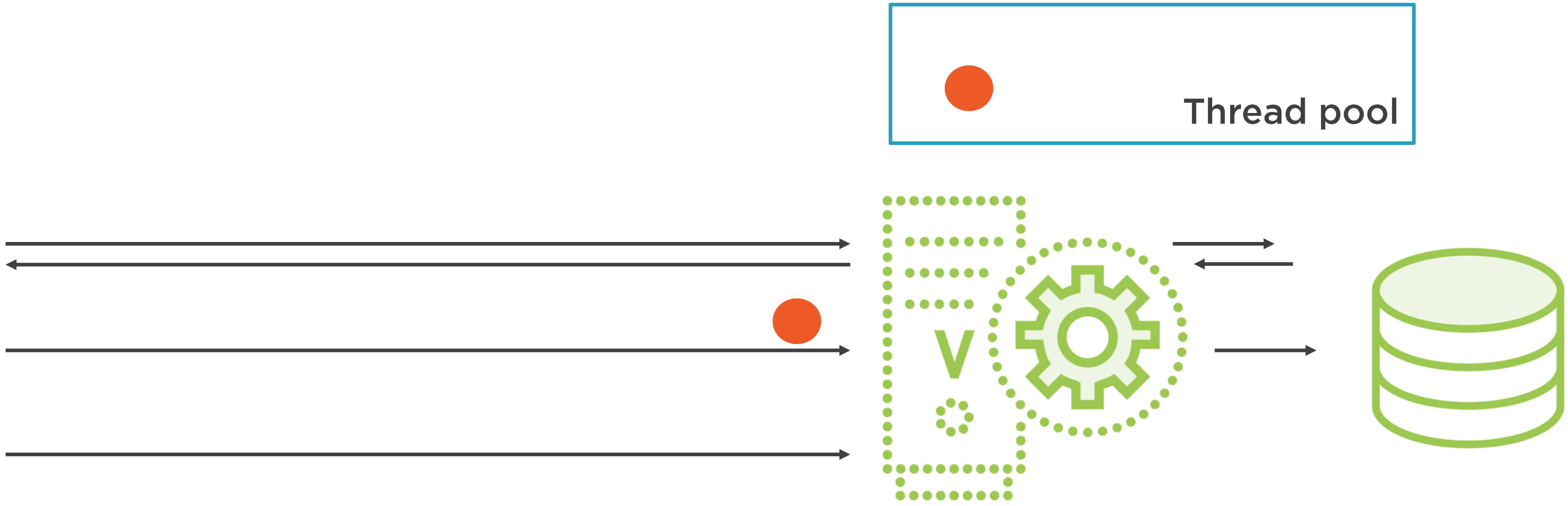

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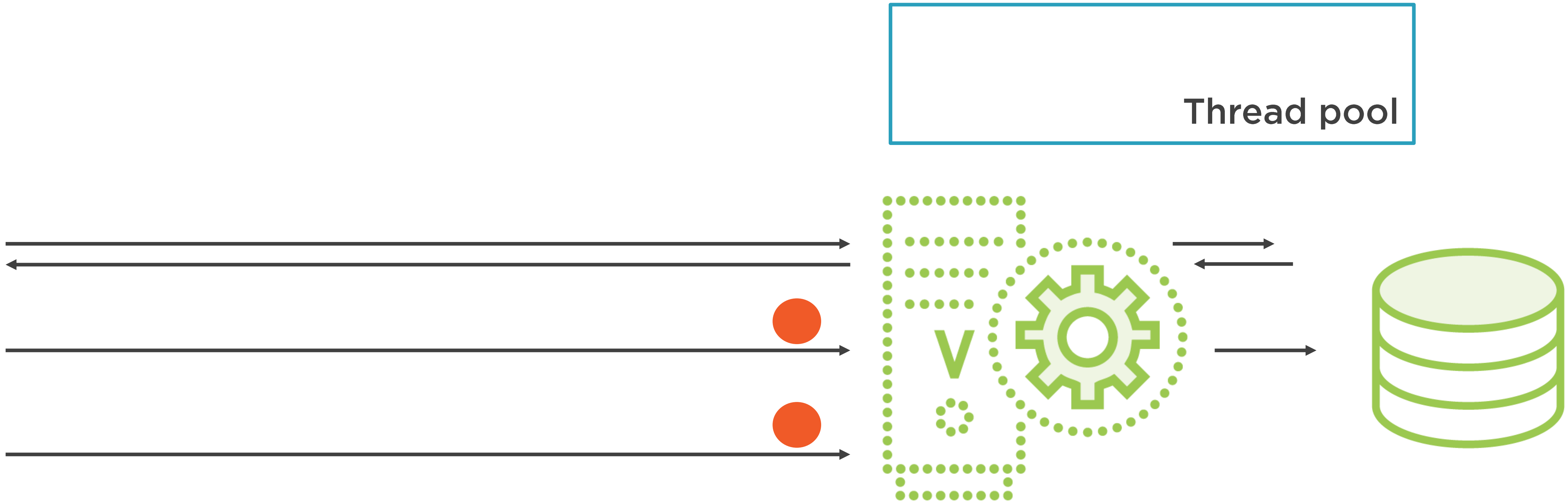
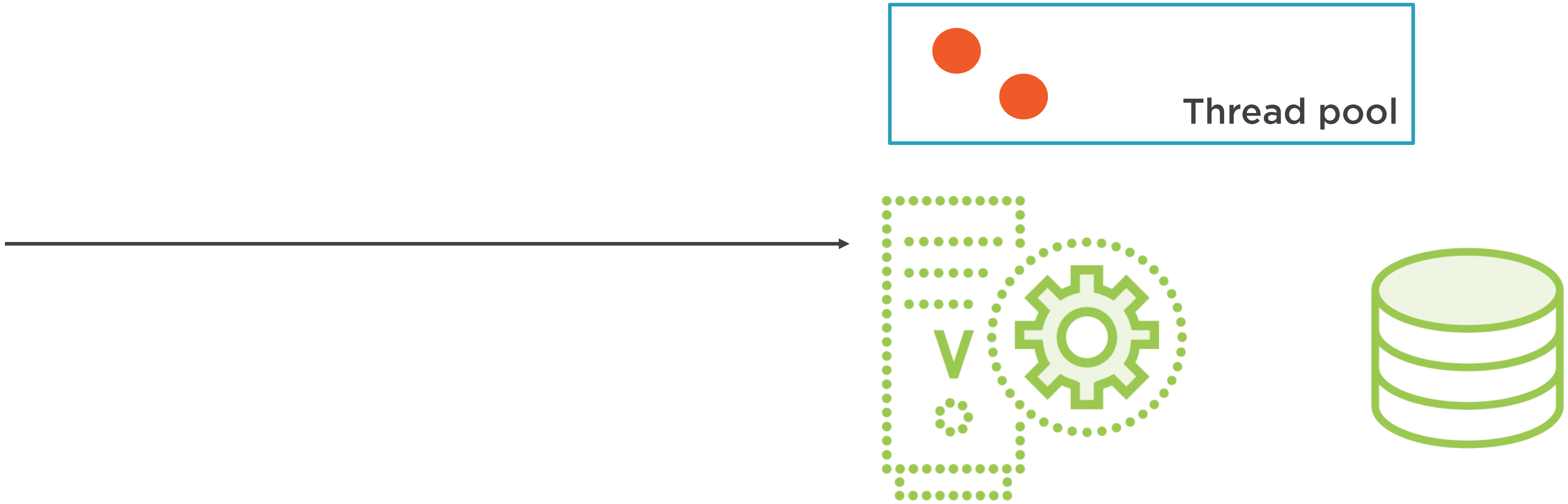


Handling Asynchronous Requests



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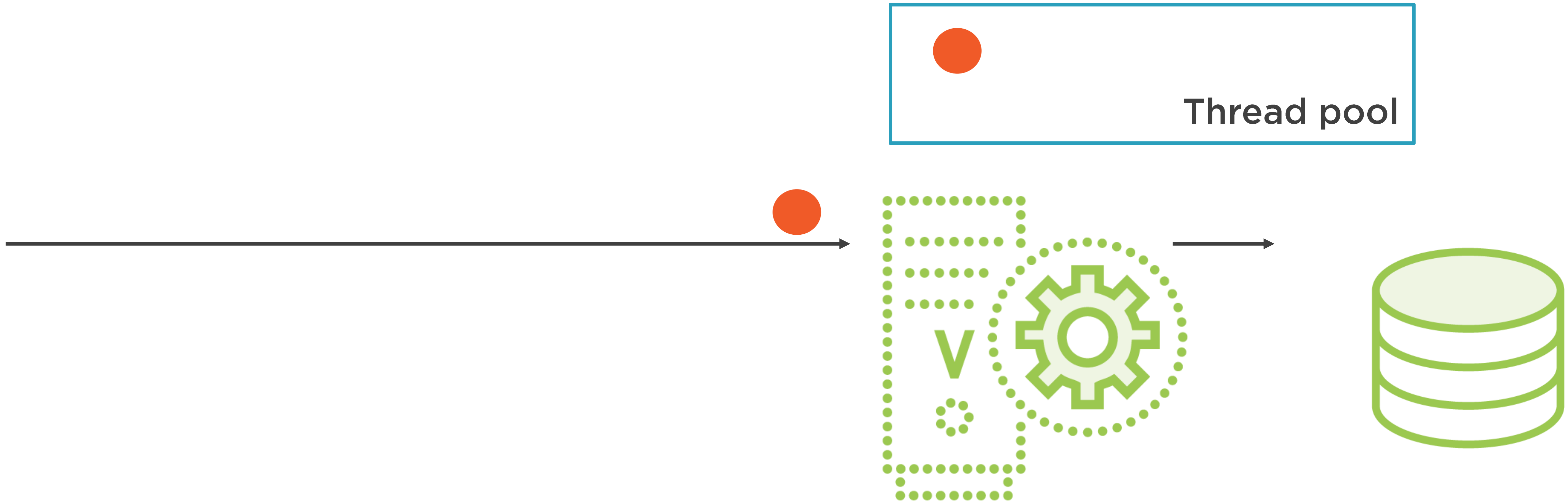

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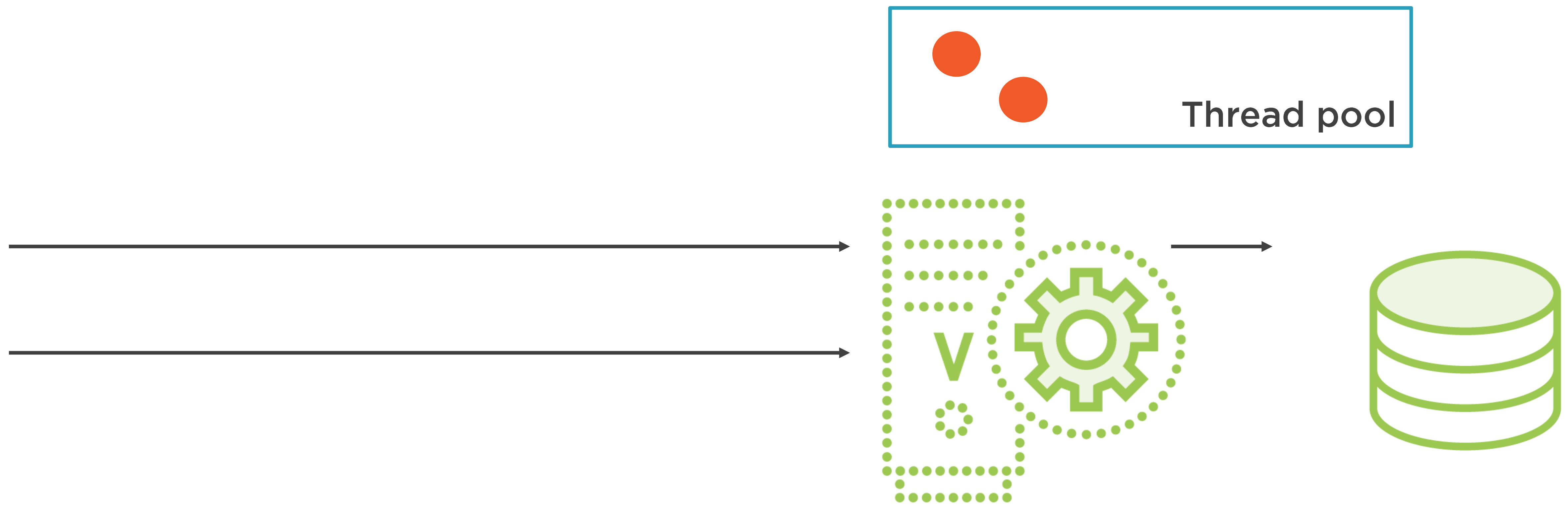

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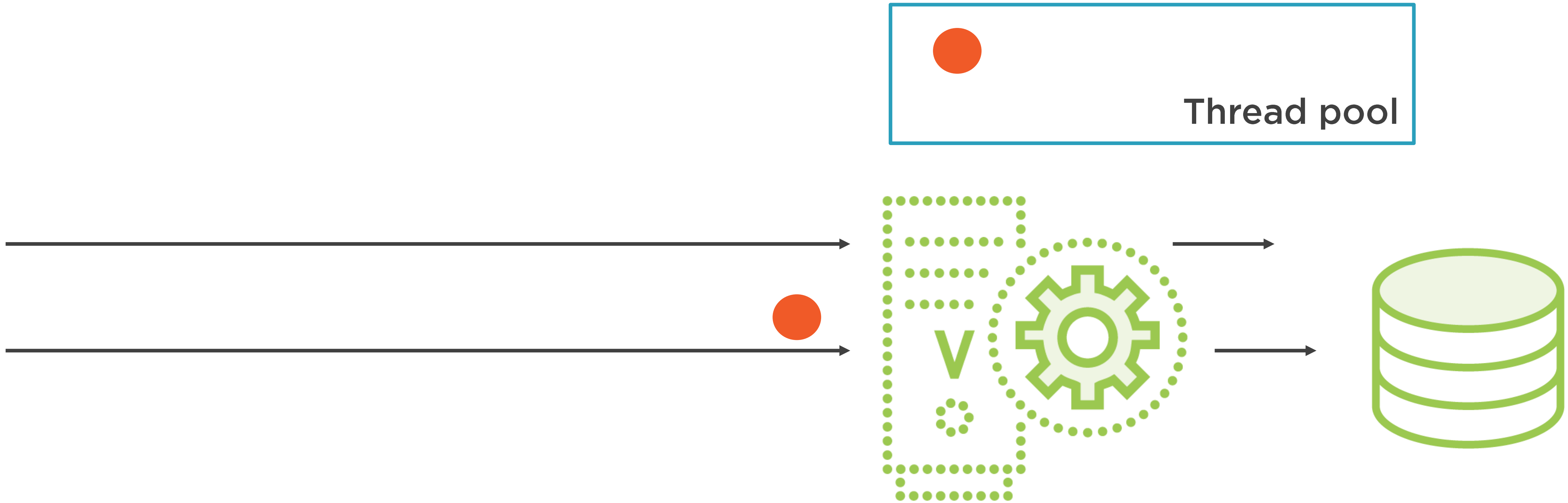

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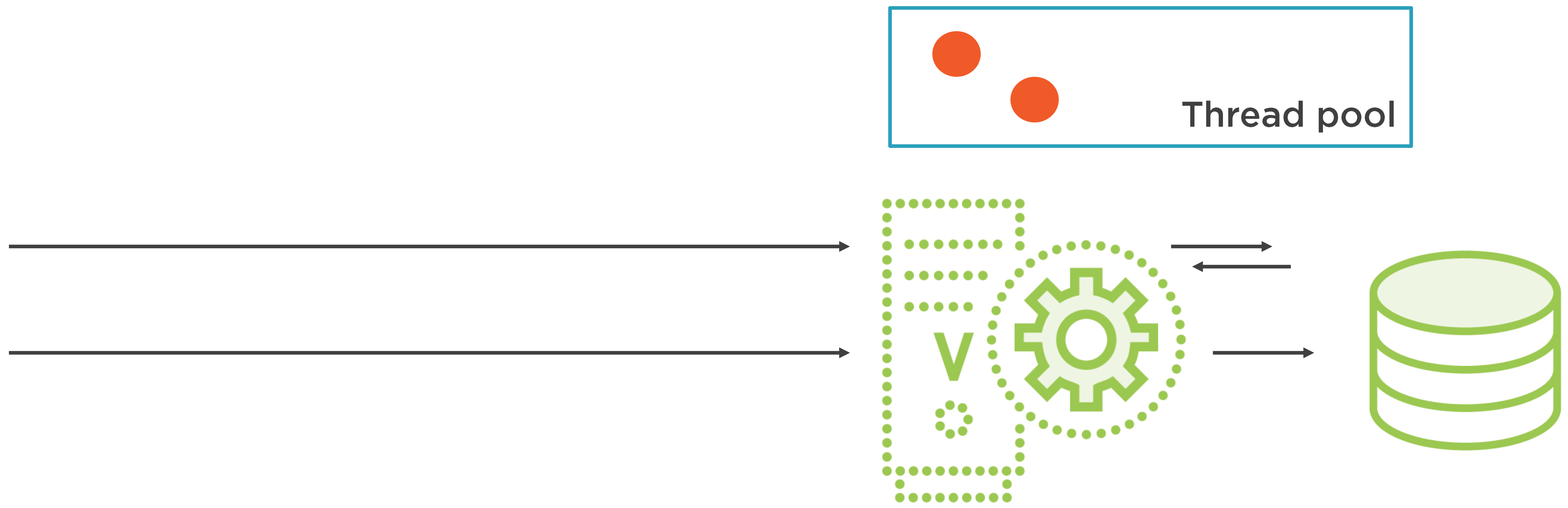

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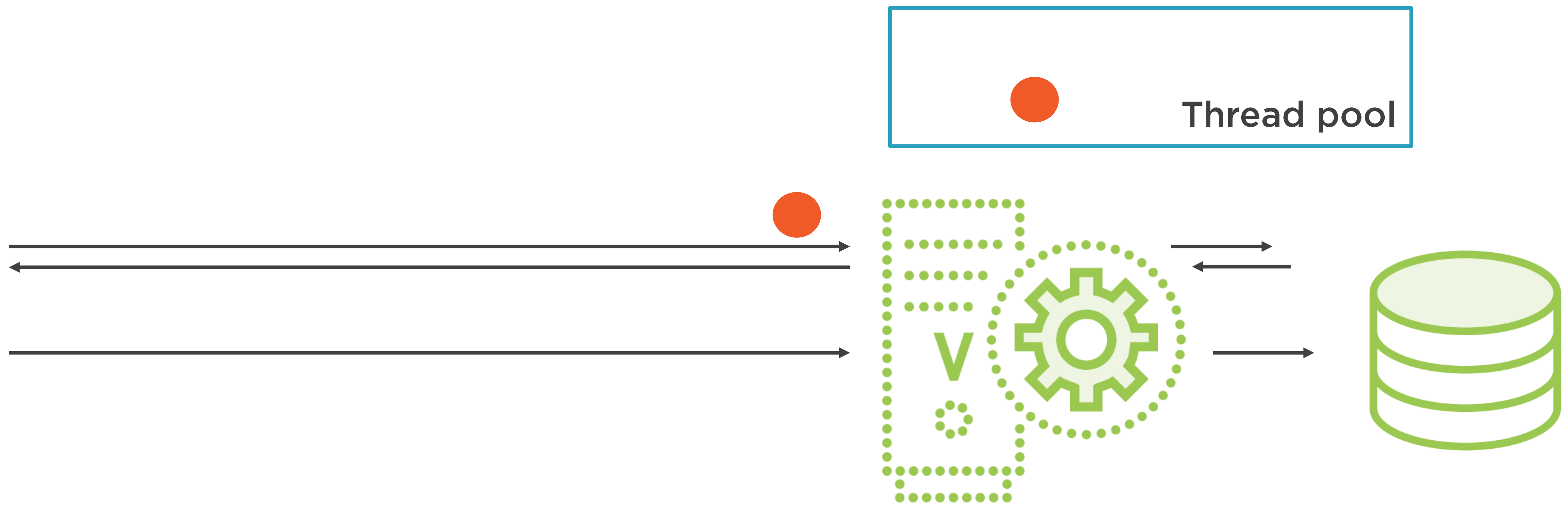

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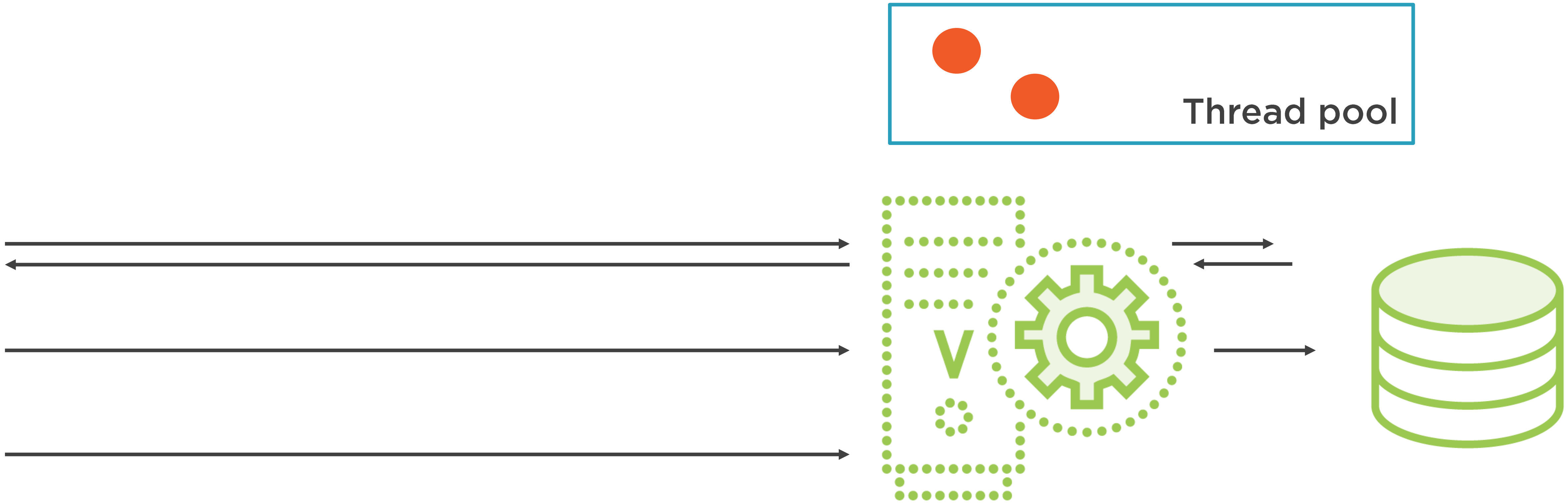

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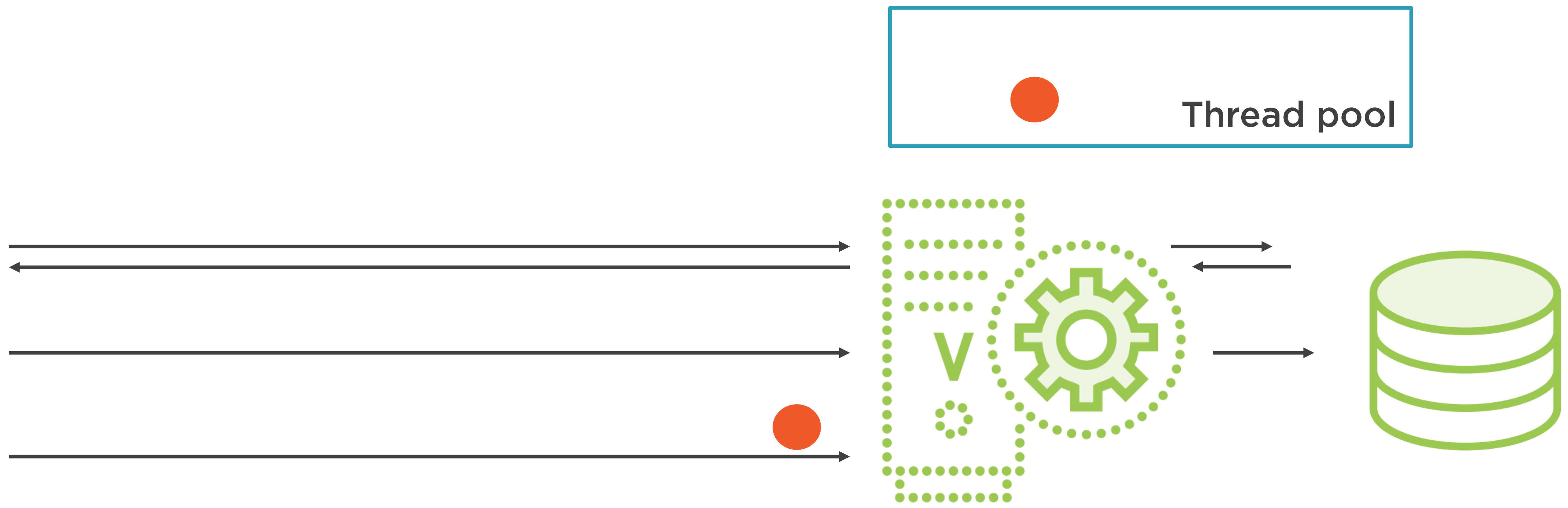


I/O Bound vs. Computational-bound Work

I/O bound work

"Will my code be waiting for a task to be complete before continuing?"

File system, database, network calls

Server-side and client-side

Computational-bound work

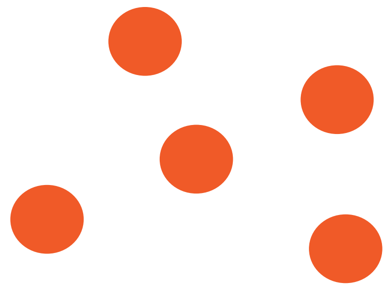
"Will my code be performing an expensive computation?"

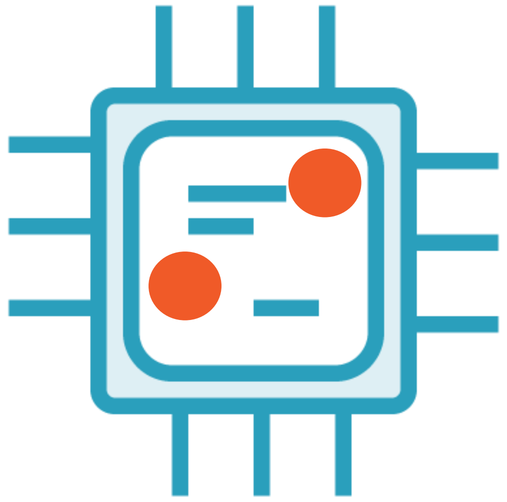
Expensive business algorithm

Client-side

Don't use async on the server for computational-bound work

Threads, Multithreading, Concurrency, Parallelism





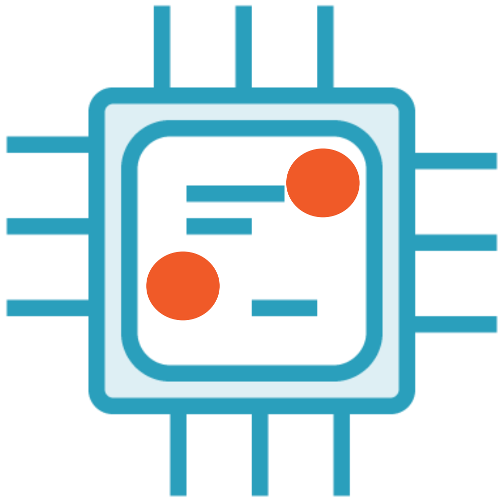
A thread is...

a basic unit of CPU utilization

Multithreading means that...

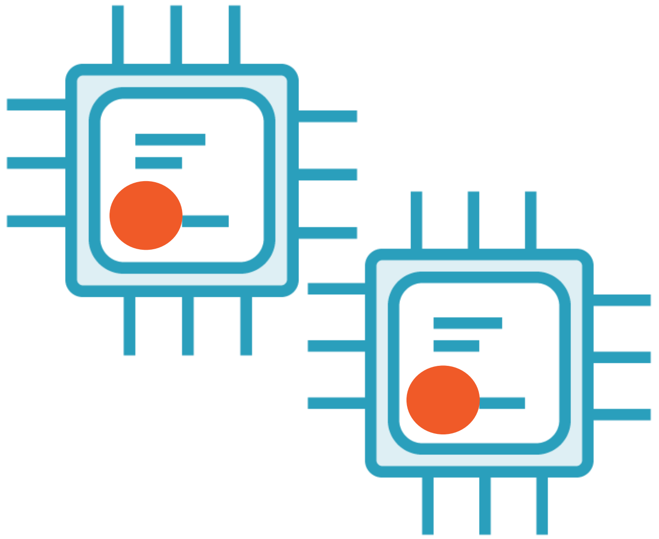
one single CPU or single core in a multi-core CPU can execute multiple threads concurrently

Threads, Multithreading, Concurrency, Parallelism



Concurrency is…

a condition that exists when at least two threads are making progress



Parallelism means that…

at least two threads are executing simultaneously

Summary

Use async on the server to increase scalability

- The thread that's handling an async request is freed up to handle other requests
- It doesn't wait idly for an I/O operation to finish

Summary

Use async on the server for I/O bound work

- Eg: file system, network, database requests

Don’t use async on the server for computational bound work

- Eg: long-running calculations
- Might have adverse effects
- Can be used on the client