Getting Started with Python Concurrency

CONCURRENCY CONCEPTS

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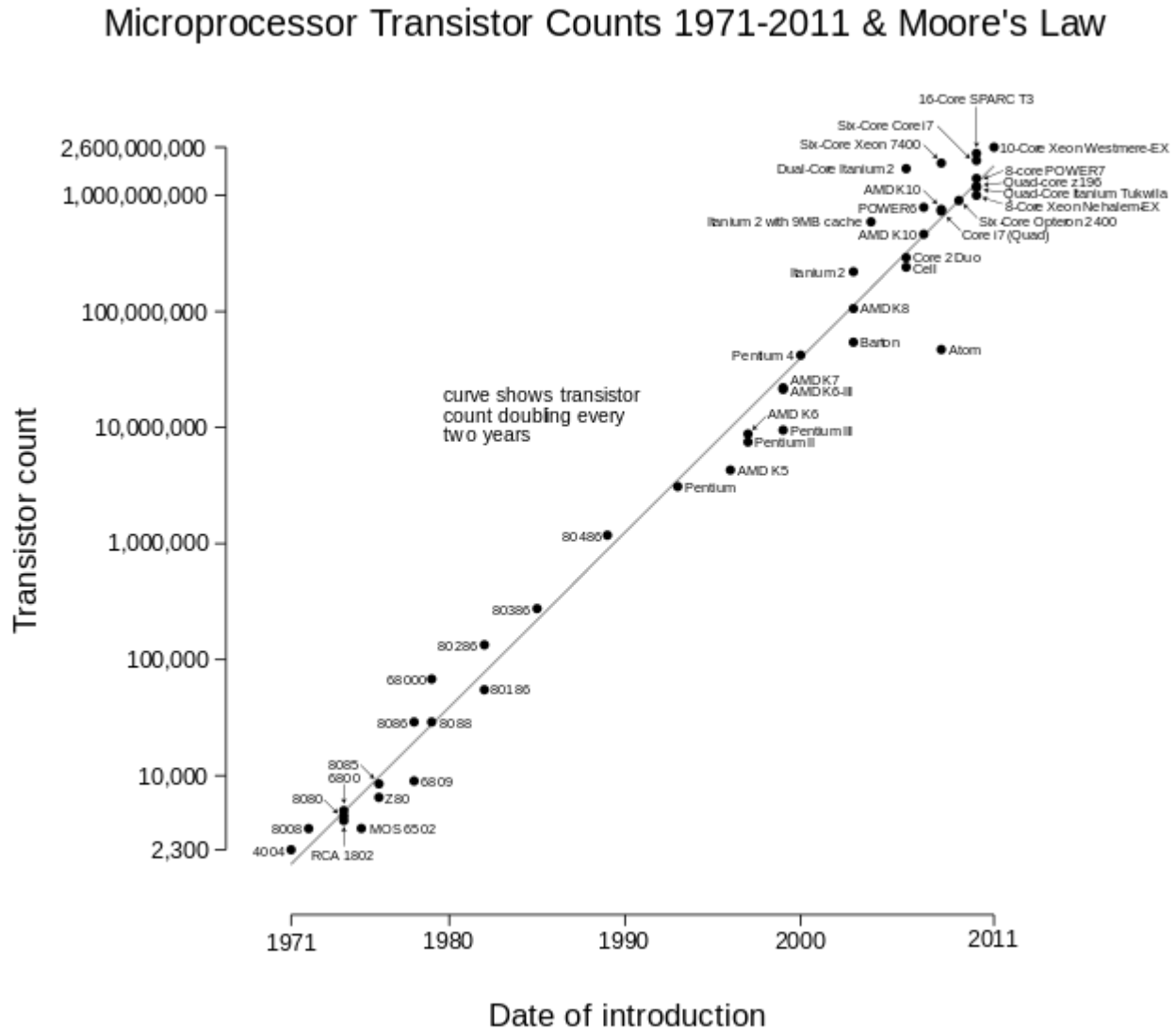
Summary

- Concurrency concepts
- Thread based concurrency
- Process based concurrency
- Concurrent.Futures API
- Asynchronous Programming

Moore's Law

The number of transistors in a dense integrated circuit will continue to double approximately every two years

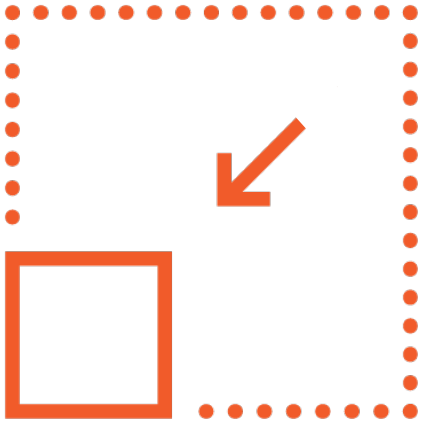
Gordon E. Moore



Source: Wikimedia Commons - Wgsimon

Moore's Law Benefits

Cheaper



Smaller

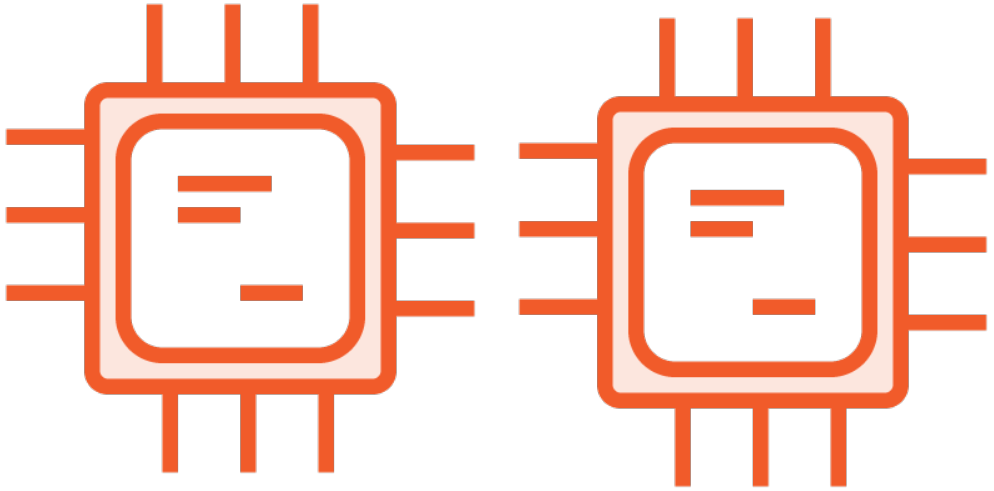
More powerful

More energy efficient

The End of Moore's Law

Rate of advancement

The End of Moore's Law

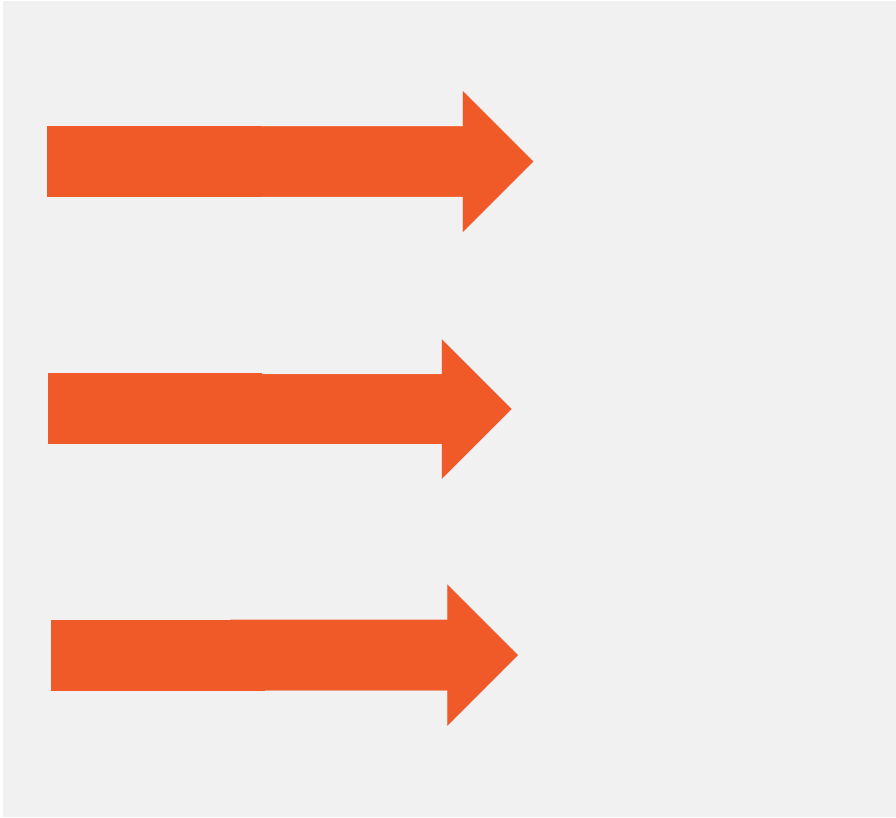


Multicore CPUs

What Is Concurrency?

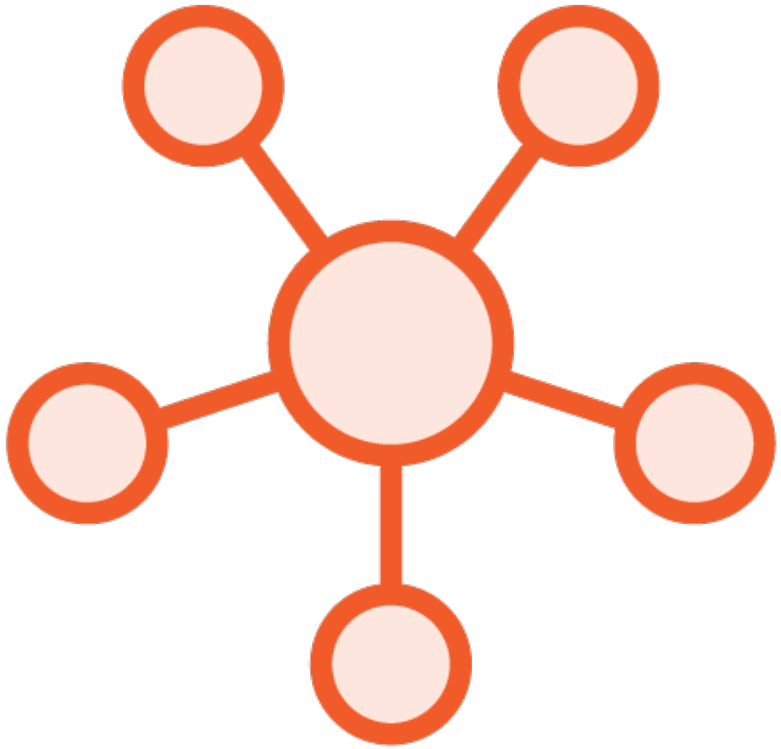
Concurrency Is the execution of multiple instruction sequences at the same time.

Order of execution



Order of execution

Shared resources



Types of Concurrency

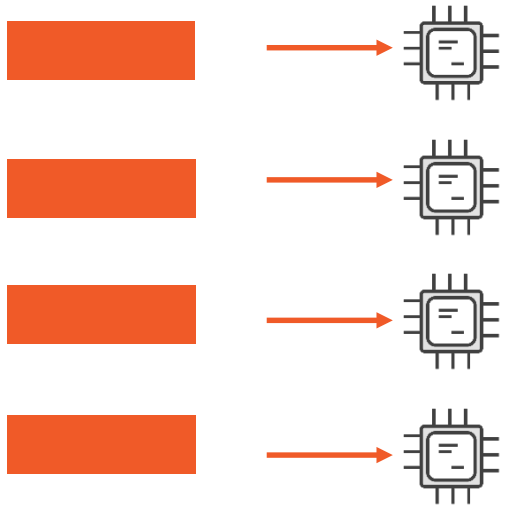
Concurrency Types

Parallel Programming

Asynchronous Programming

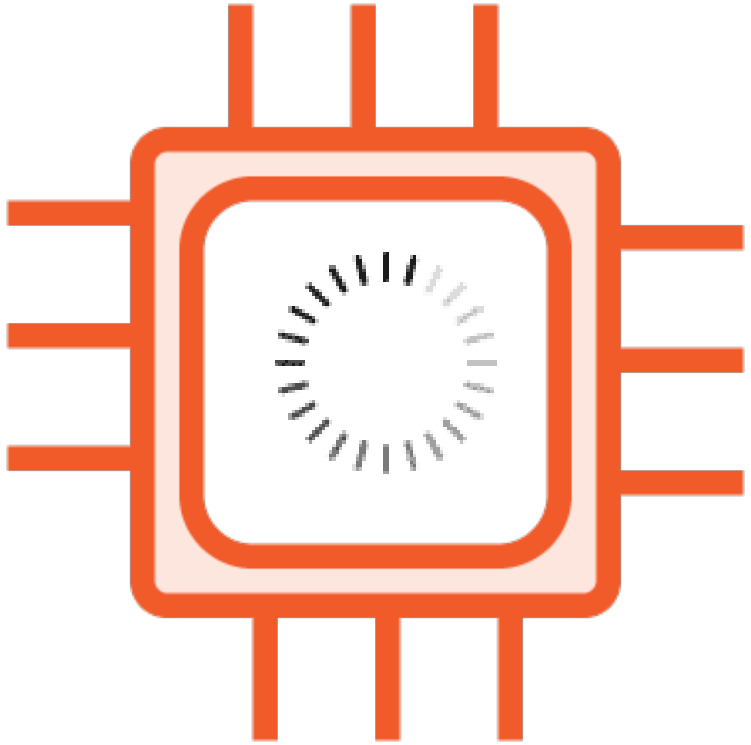
Parallel Programming

Parallel Programming



Best suited for

CPU Intensive Tasks



Best suited for

CPU Intensive Tasks

String operations

Search algorithms

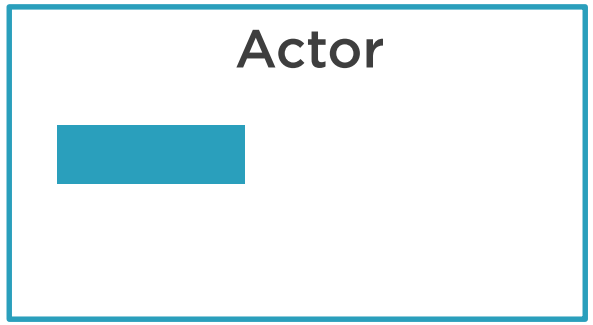
Graphics processing

Number crunching algorithms

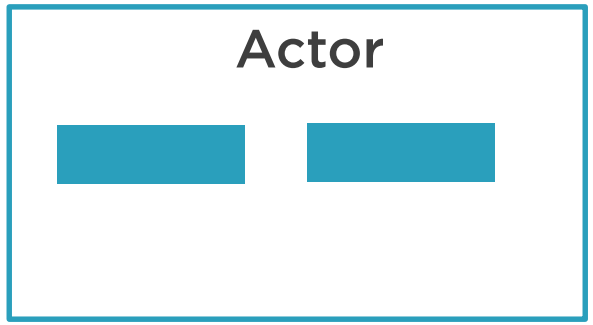
Etc.

Asynchronous Programming

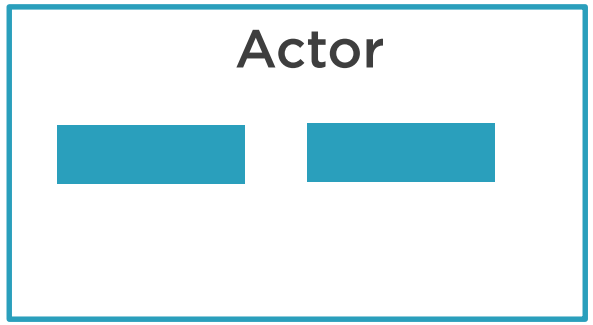
Asynchronous Programming



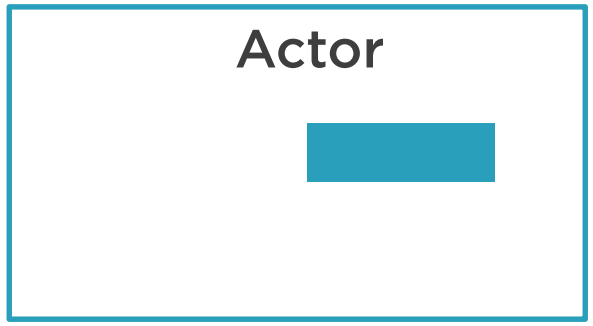
Asynchronous Programming



Asynchronous Programming



Asynchronous Programming



Asynchronous Programming

Asynchronous Programming

Best suited for

IO Intensive Tasks

Database reads, writes

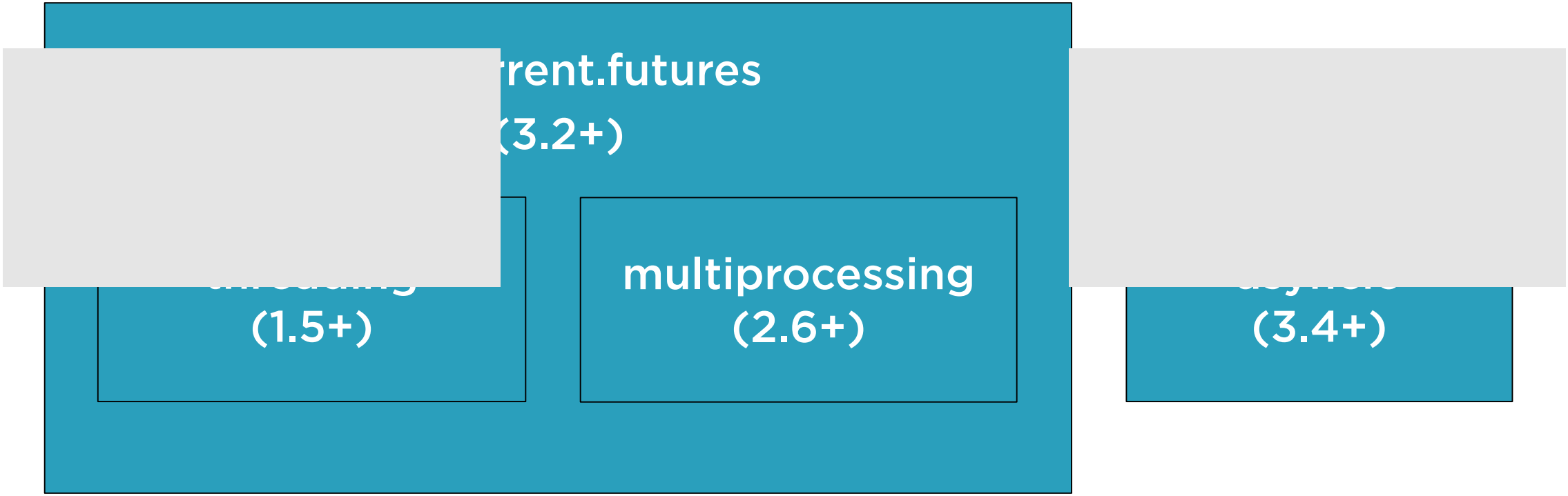
Web Service calls

Copying, downloading, uploading data

Etc.

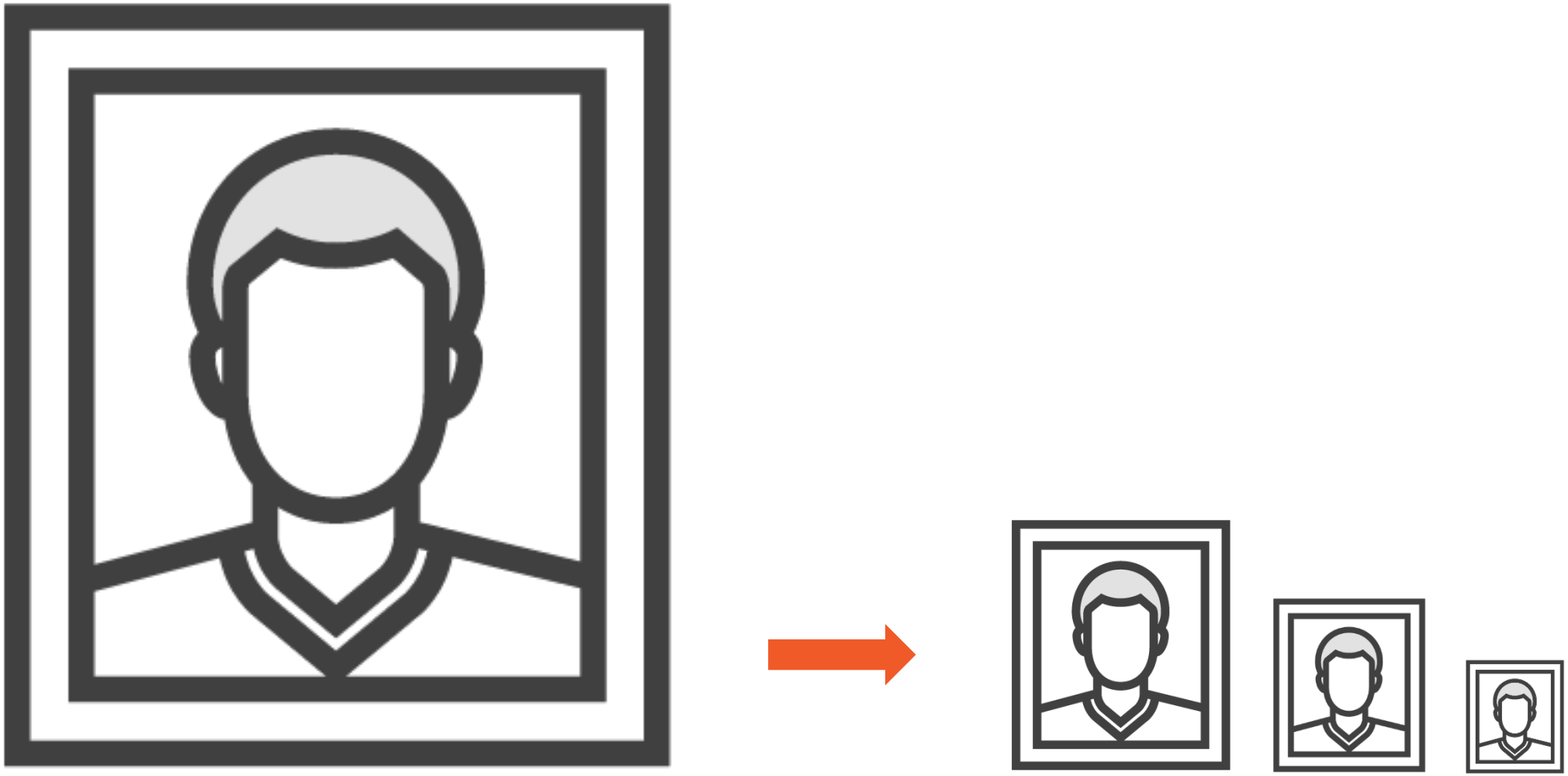
Concurrency in Python

Concurrency in Python

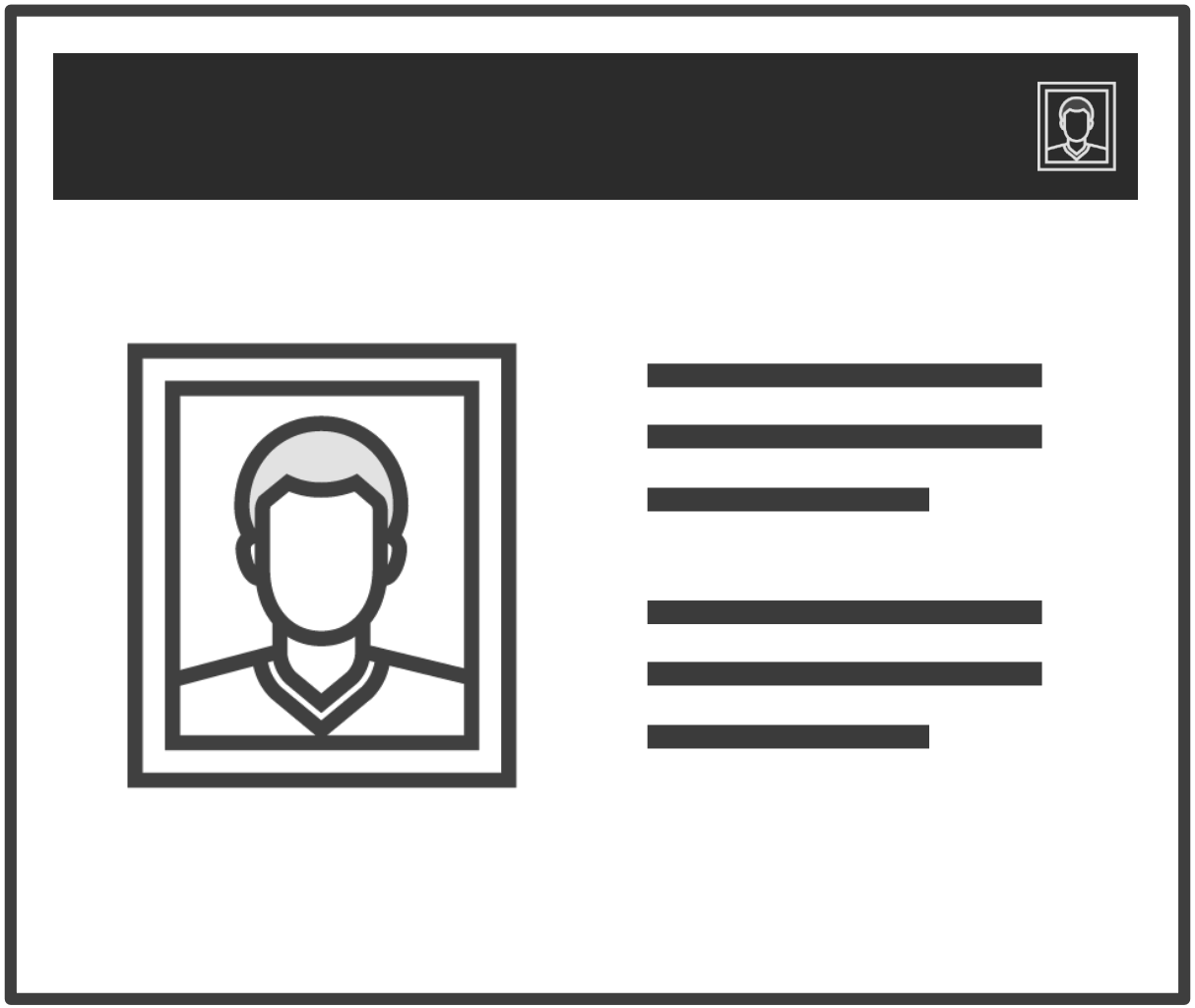


Demo Application: Thumbnail Maker

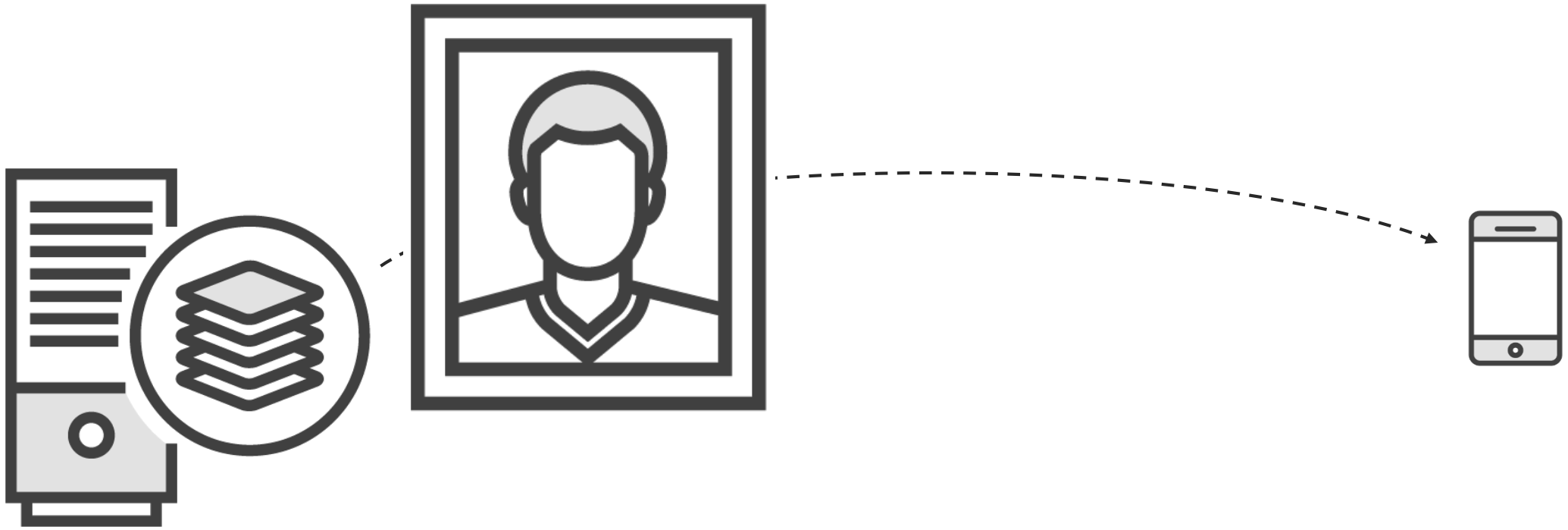
Thumbnail Maker



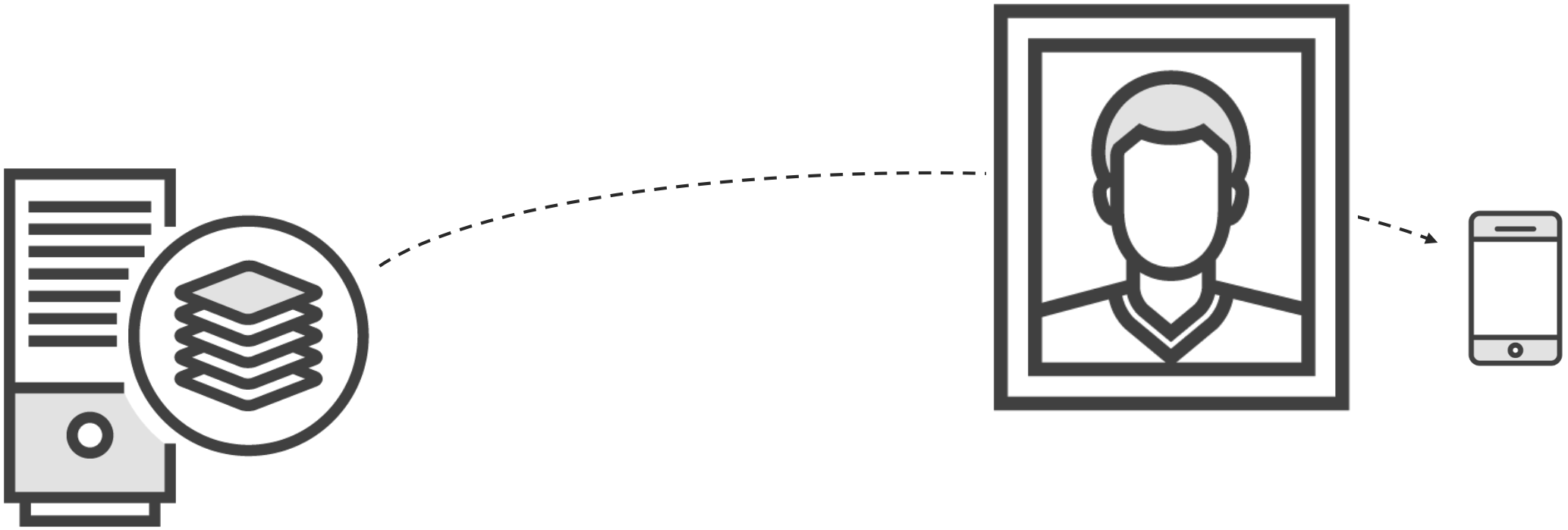
Thumbnail Maker



Thumbnail Maker



Thumbnail Maker

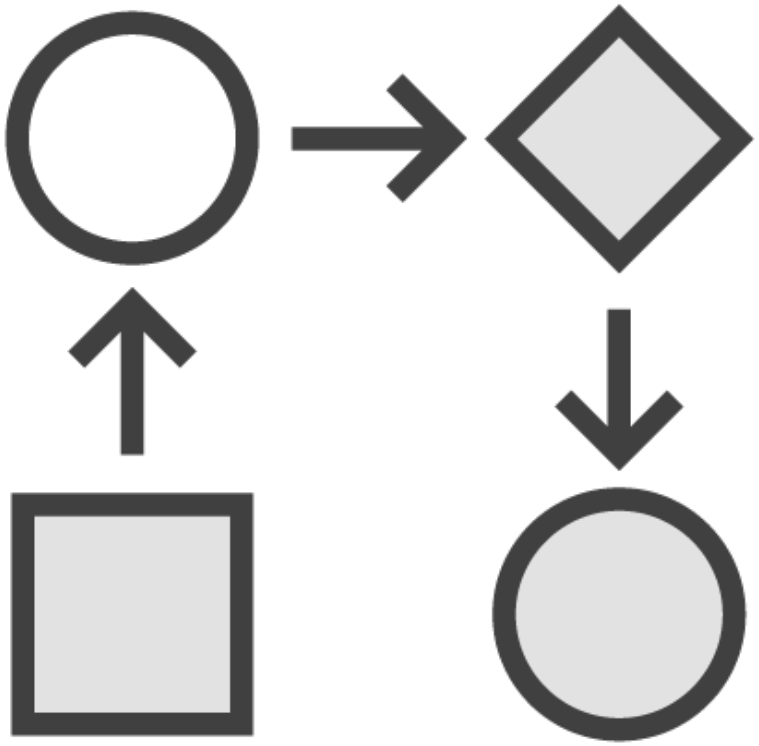


Resolution		Size in bytes
3264x1836	...	4,000,000
200x200	...	8,500
50x50	...	1,600
32x32	...	1,000

Resolution		Size in bytes
3264x1836	...	4,000,000
96x96	...	3,000
48x48	...	1,400

Resolution		Size in bytes
3264x1836	...	4,000,000
165x165	...	6,600
32x32	...	1,000

Thumbnail Maker Workflow

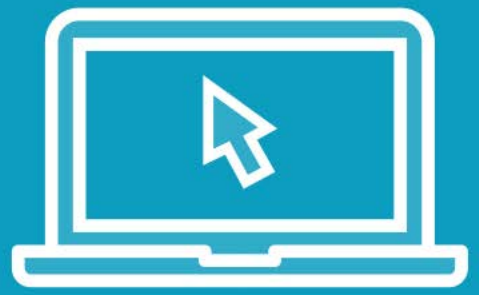


Download the images from the source location

Perform the resize operation

Upload resized images to target location

Demo



Starting code is single threaded

Introduce concurrency where applicable

github.com/tim-ojo/python-concurrency-getting-started

Summary

- Motivations
- Definition of concurrency
- Types of concurrency
- Python has great concurrency support
- Introduced Thumbnail Maker Service