Particular Software

Welcome

# Rearchitect your code

## towards async/await

Particular Software

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# Goals

target

CPU-bound vs IO-bound

Threads and Tasks

Async best-practices

Why async is the future

# Premise

Terminology
Why
WrapUp

The die

is cast

# javascript

## ES2015

```
async function chainAnimationsPromise(elem, animations)
{
    let ret = null;
    try {
    for(const anim of animations) {
        ret = await anim(elem);
    }
    catch(e) { /* ignore and keep going */ }
    return ret;
}
```

```
$ npm install babel-plugin-syntax-async-functions
$ npm install babel-plugin-transform-async-to-generator
```

# httpclient

```
using (var client = new HttpClient()) {
  var response = await
      client.GetAsync("api/products/1");
  if (response.IsSuccessStatusCode)
  {
     var product = await
        response.Content.ReadAsAsync<Product>();
  }
}
```

# Azure SDK

```
var queryable =
client.CreateDocumentQuery<Entity>(...)
    .AsDocumentQuery();

while (queryable.HasMoreResults)
{
  foreach(var e in await
queryable.ExecuteNextAsync<Entity>())
  {
    // Iterate through entities
  }
}
```

# async

## event-driven

# Task

uniform

# Task

## IO-bound

# Task

## CPU-bound

# Recap

## best-practices

Use async Task instead of async void

Async all the way, don't mix blocking and asynchronous code

Async / await

is viral

but

It kicks your

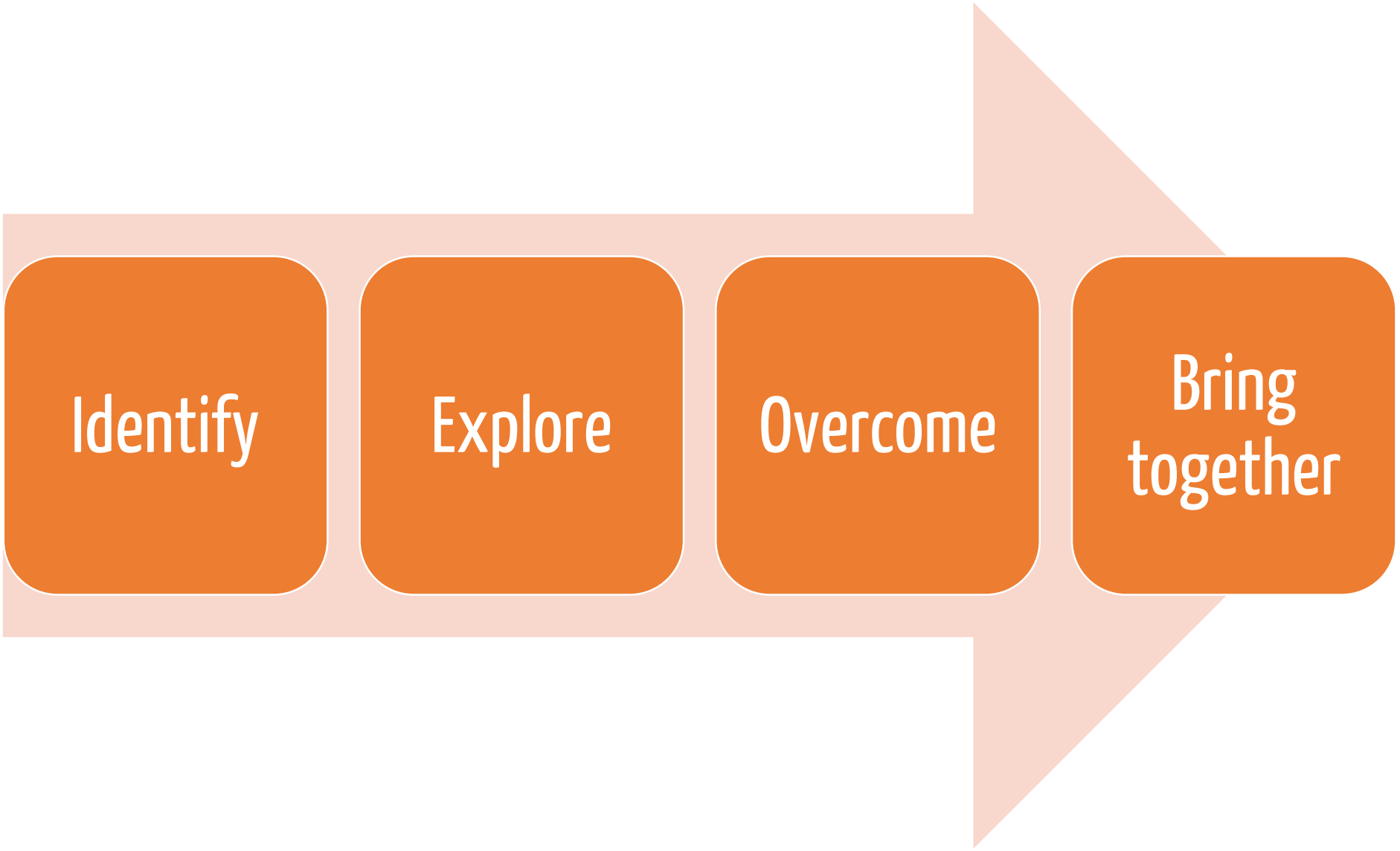
servers

butt

NServiceBus

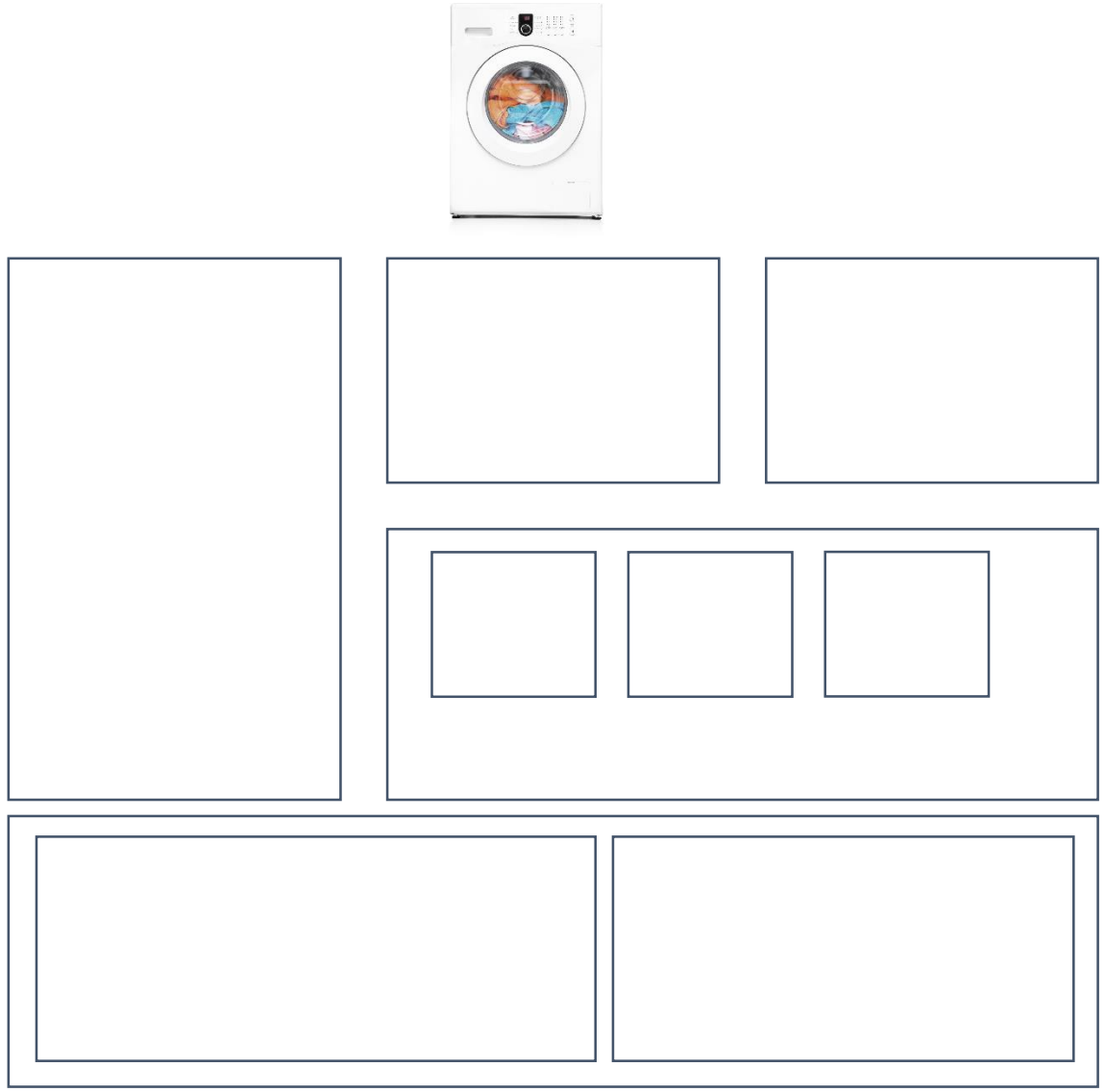
| | |
|---|---|
| Azure Service Bus | 26 times |
| Azure Storage Queues | 6 times |
| MSMQ | 3 times |

more message throughput


Identify
Explore
Overcome
Bring together

# Identify

## IO-bound



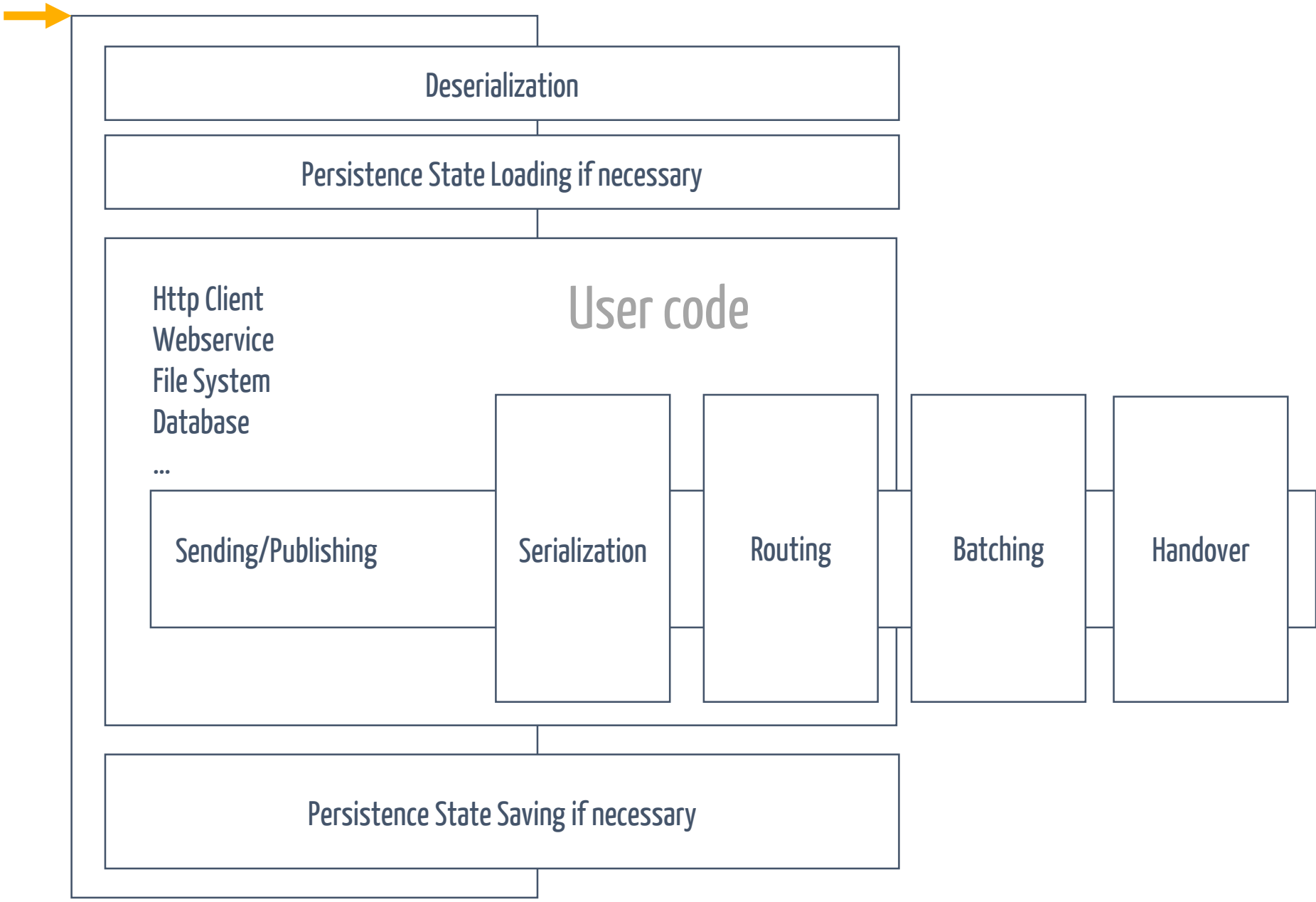
# NServiceBus

## IO-bound

Queue

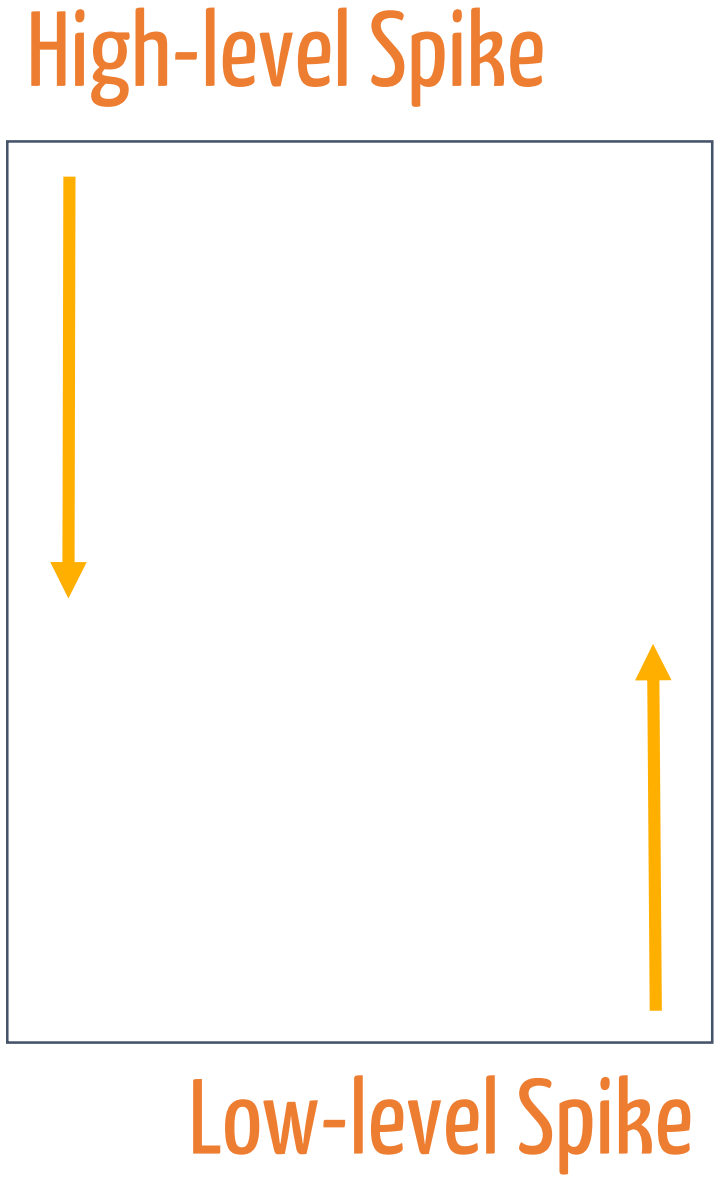
# NServiceBus

IO-bound



# Explore

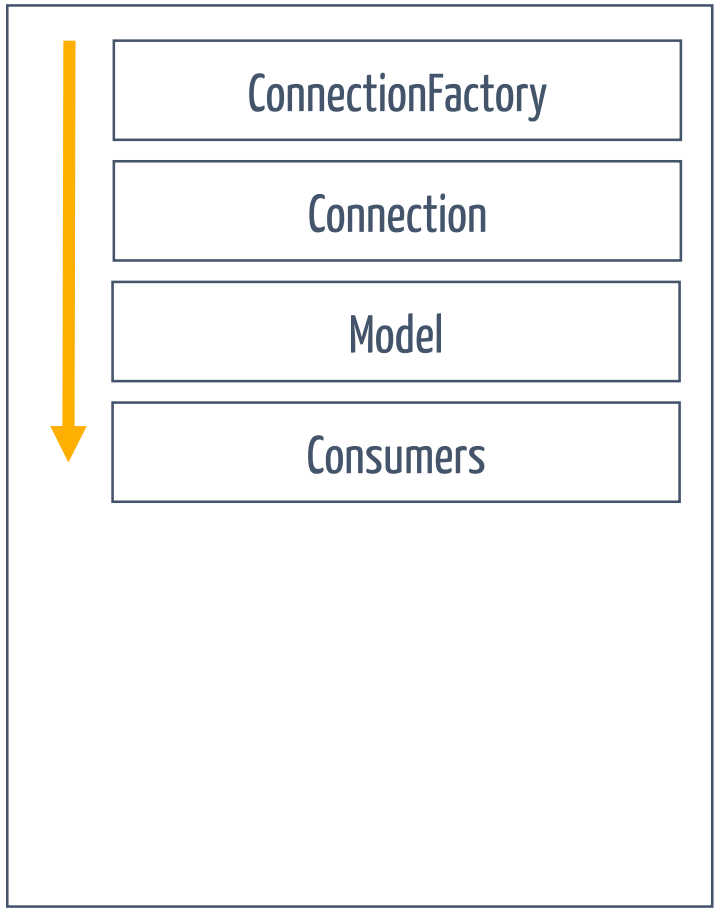
IO-bound



# RabbitMQ Client

## IO-bound

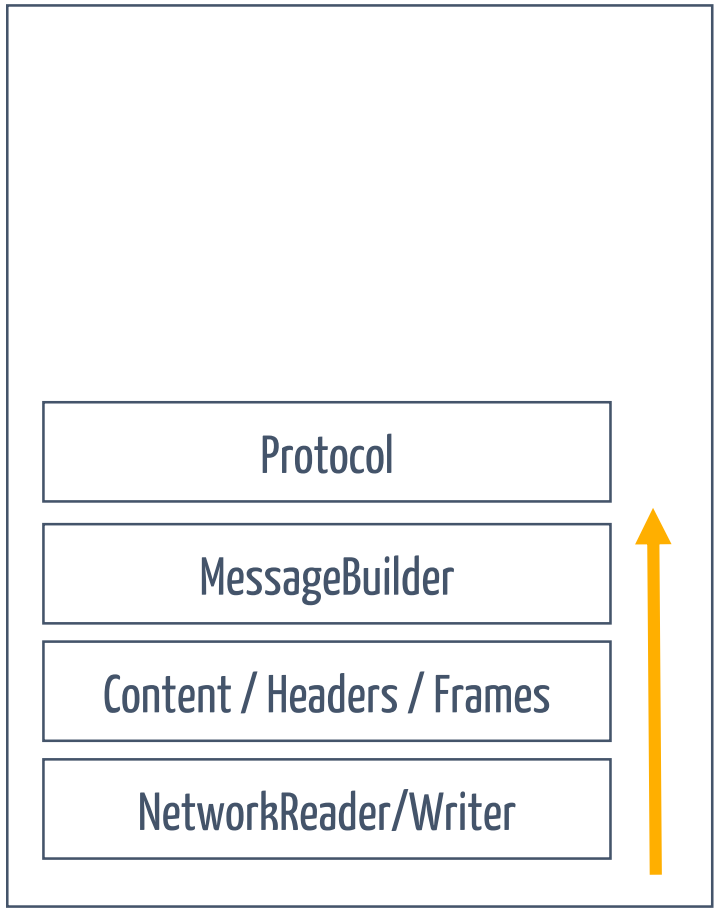
## High-level Spike




github.com/rabbitmq/rabbitmq-dotnet-client/pull/151

# RabbitMQ Client

## IO-bound




Low-level Spike

github.com/rabbitmq/rabbitmq-dotnet-client/pull/149

Event handlers

Locks

Monitor

Semaphore / Mutex

Auto / ManualResetEvent

Ref/Out parameters

Thread

Ambient state

IO-bound calls in 3rd Party libs

Remote Procedure Calls

# Event handlers

```
public delegate void EventHandler(Object sender, EventArgs e);

public delegate void EventHandler<TEventArgs>(Object sender, TEventArgs e);
```

```
async void MyEventHandler(object sender, EventArgs e)
{
    await Task.Yield();
    throw new InvalidOperationException();
}
```

# ManualResetEvent

```
var syncEvent = new ManualResetEvent(false);

var t1 = Task.Run(() => {
  "Entering wait".Output();
  syncEvent.WaitOne();
  "Continue".Output();
});

ar t2 = Task.Run(() => {
  Thread.Sleep(2000);
  syncEvent.Set();
});

await Task.WhenAll(t1, t2);
```

```
01:08:14:093: Entering wait
01:08:16:094: Continue
```

void stinks wait smells

# Remember

Async all the way means avoid blocking code

# locks

```
 var locker = new object();
lock (locker)
{
   await Task.Yield();
}
```

Error CS1996
Cannot await in the body of a lock statement

http://stackoverflow.com/questions/7612602/why-cant-i-use-the-await-operator-within-the-body-of-a-lock-statement

# Ref/Out

```
static async Task Out(string content, out string parameter)
{
  var randomFileName = Path.GetTempFileName();
  using (var writer = new StreamWriter(randomFileName))
  {
    await writer.WriteLineAsync(content);
  }
  parameter = randomFileName;
}
```

Error CS1988

Async methods cannot have ref or out parameters

# Ambient state

```
class ClassWithAmbientState
{
  static ThreadLocal<int> ambientState =
      new ThreadLocal<int>(() => 1);

  public void Do()
  {
    ambientState.Value++;
  }
}
```

Older constructs bound to threads
fall apart in the async/await world

# Remember

Forget thread!

think Task

Terminology

Why

WrapUp

# Recap

## reminder

Use Task.Run, Factory.StartNew for CPU-bound work

Use Task directly for IO-bound work

Use async Task instead of async void

# Recap

## reminder

Libraries and frameworks should use ConfigureAwait(false)

Async all the way, don't mix blocking and asynchronous code

# Slides, Links...

github.com/danielmarbach/RearchitectTowardsAsyncAwait

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await Q & A

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# Thanks