Particular Software

Welcome

Rearchitect your code

towards async/await

Particular Software

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Microsoft MVP for systems integration

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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
```

dart

release 1.9

```
runUsingAsyncAwait() async {
  //...
  var entrypoint = await findEntrypoint();
  var exitCode = await
      runExecutable(entrypoint, args);
  await flushThenExit(exitCode);
}
```

python

release 3.5

```
import asyncio

async def http_get(domain):
    reader, writer =
        await asyncio.open_connection(domain, 80)

async for line in reader:
    print('>>>', line)
```

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

concurrent

concurrent

concurrent

concurrent

concurrent

interleaved

parallel

parallel

simultaneous

Continuation

function

```
await cleanLaundry;
await dryLaundry;
```

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

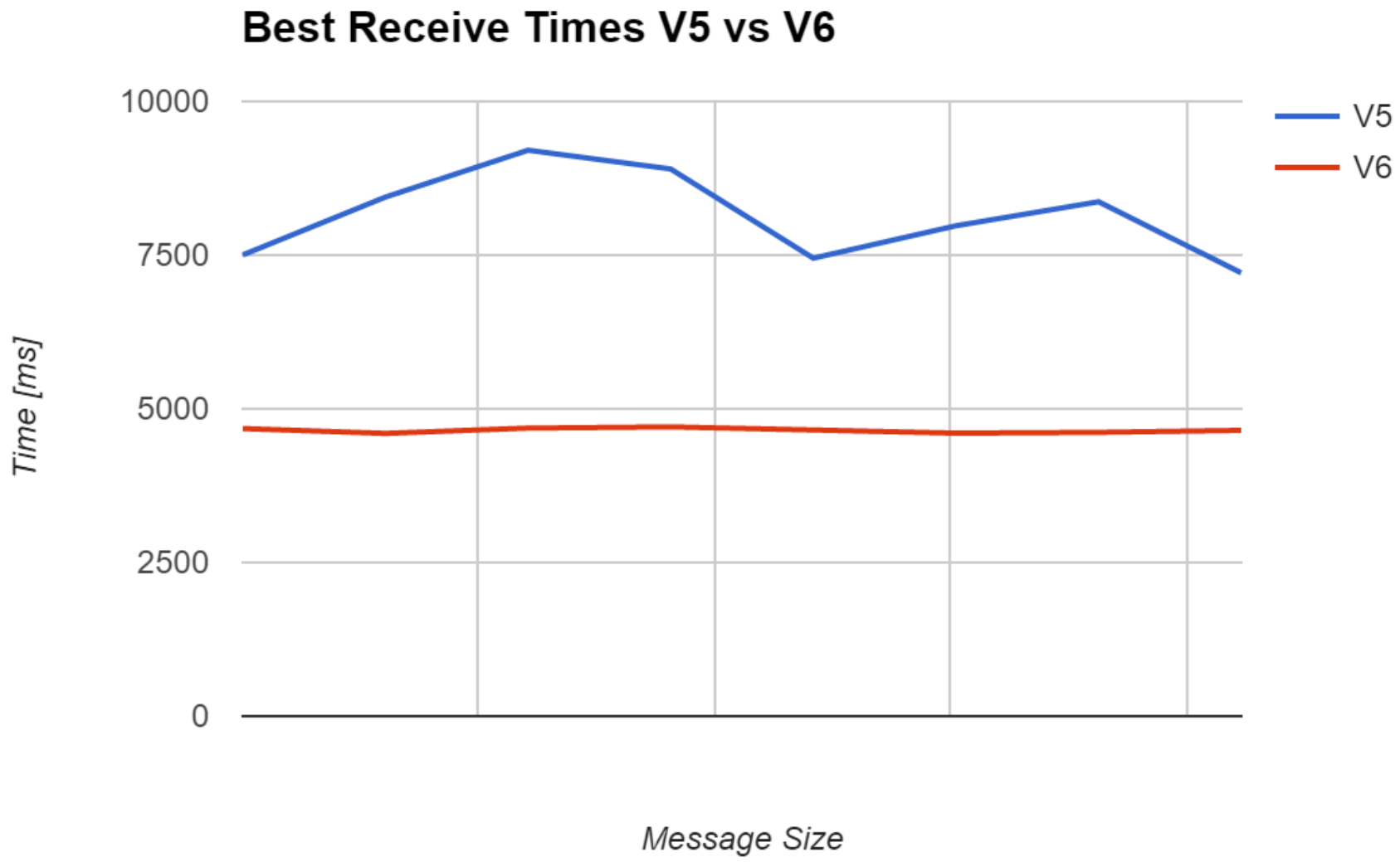
butt

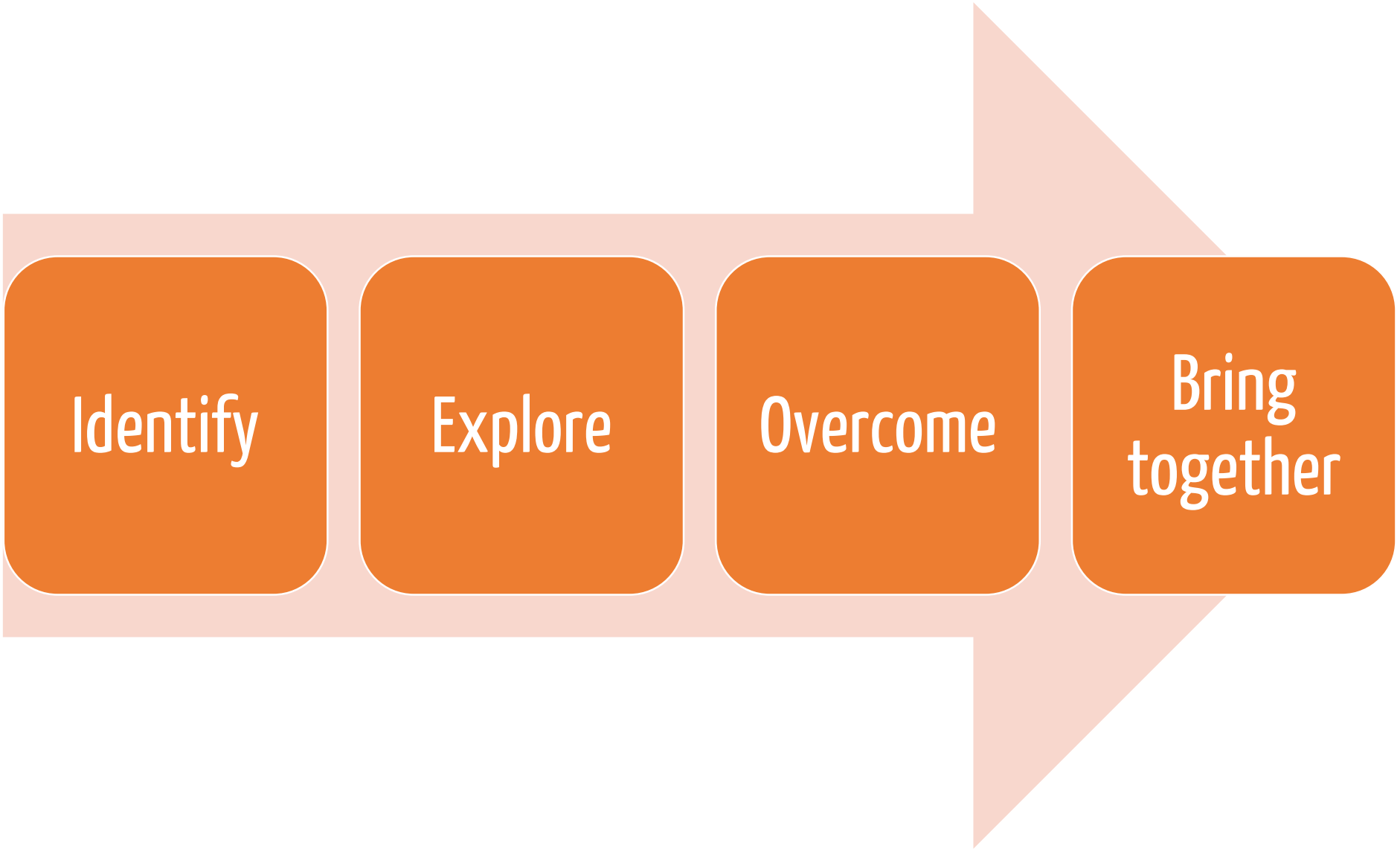
NServiceBus

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

more message throughput

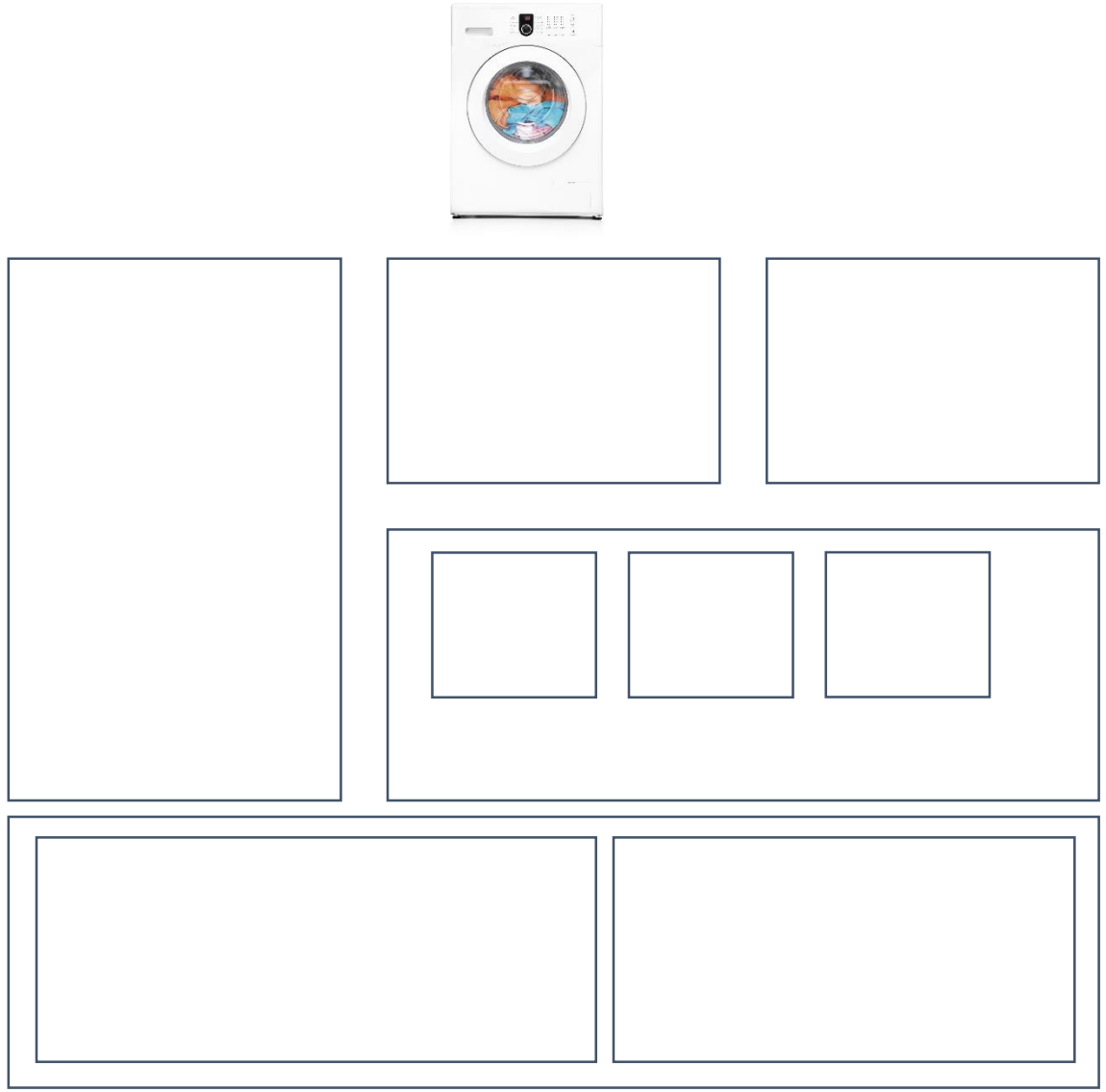
NServiceBus.SqlServer




Identify
Explore
Overcome
Bring together

Identify

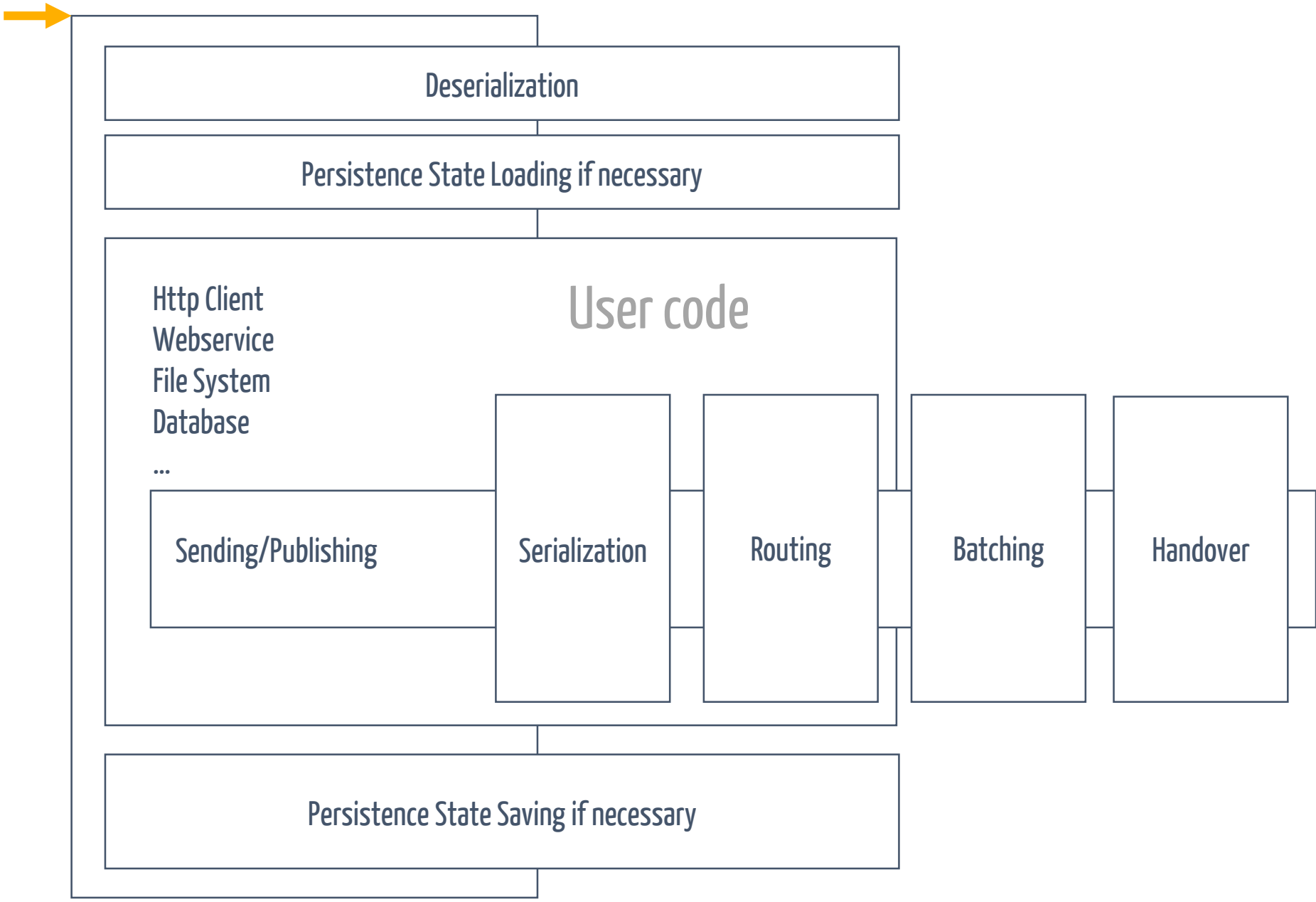
IO-bound



Queue

NServiceBus

IO-bound



Task.Run
Task.Factory.StartNew
Parallel.For
Parallel.ForEach

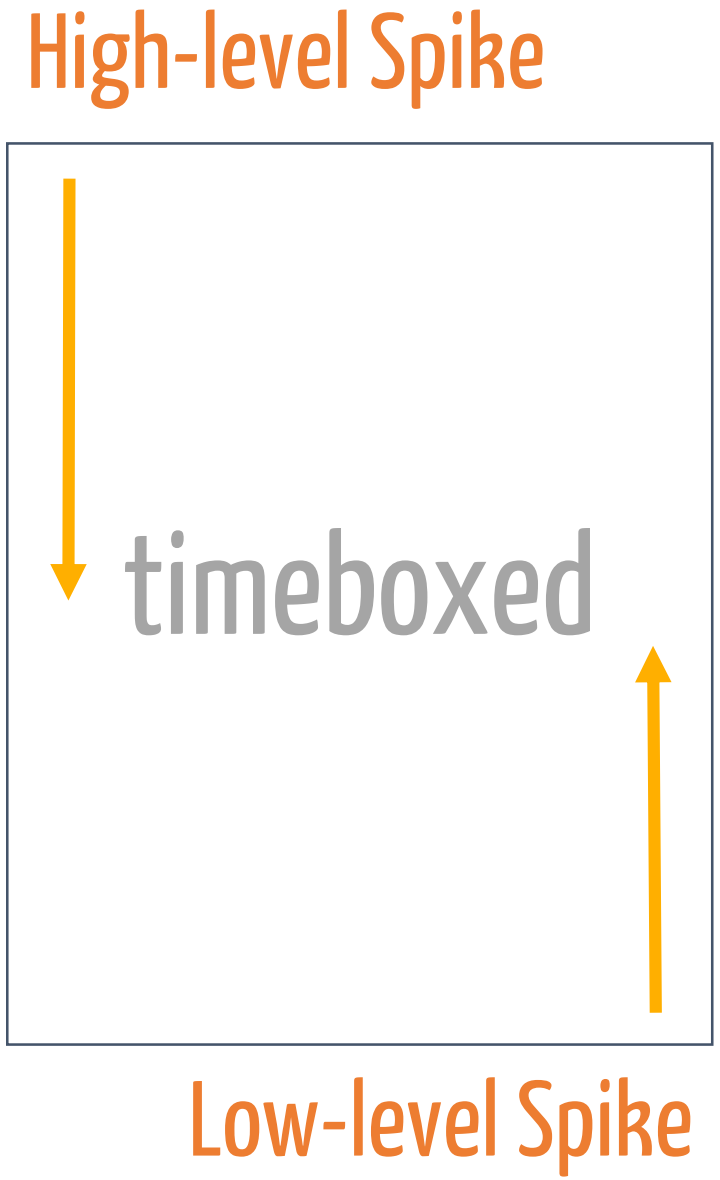
Worker Threadpool

IO Threadpool

await iobound
iobound.FireForget()

Explore

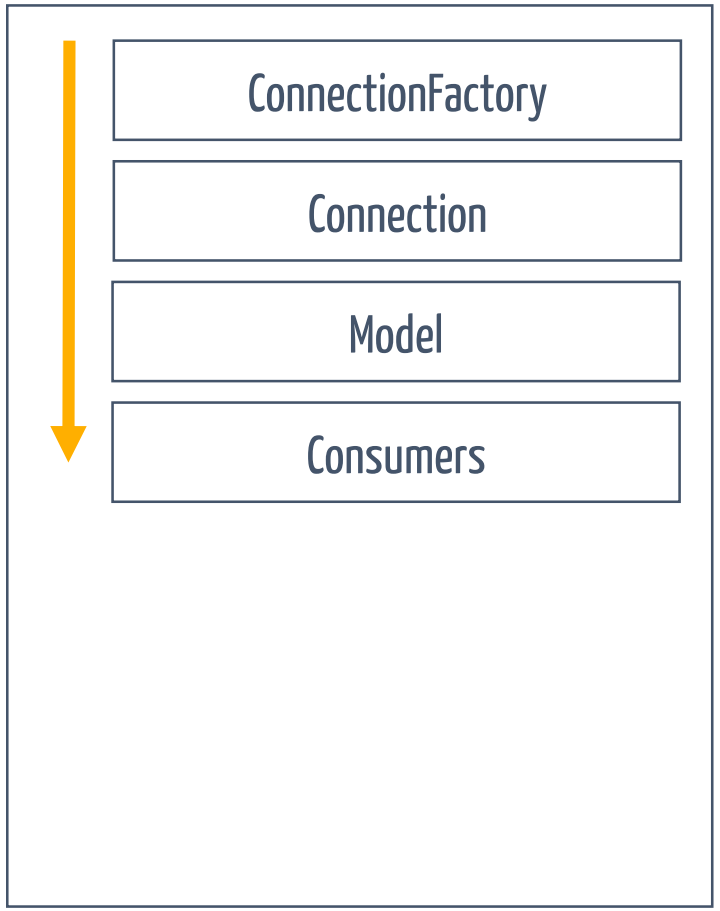
IO-bound



RabbitMQ Client

IO-bound

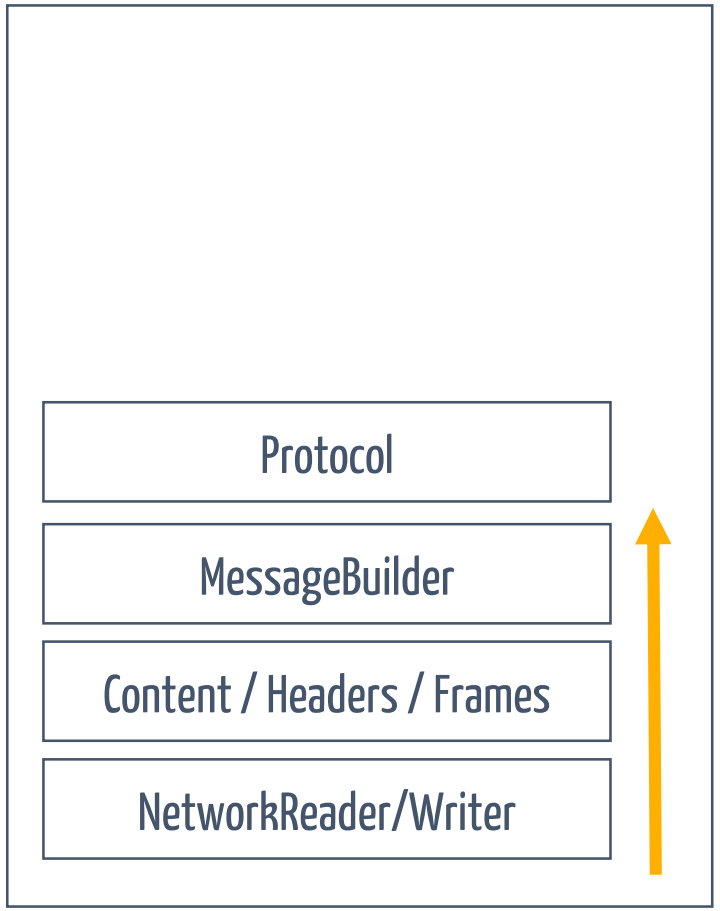
High-level Spike



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

Thread

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();
}
```

locks


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

Error CS1996
Cannot await in the body of a lock statement presentation

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

void stinks wait smells

Remember

Async all the way means avoid blocking code

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

Particular Software

await Q & A

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Thanks