

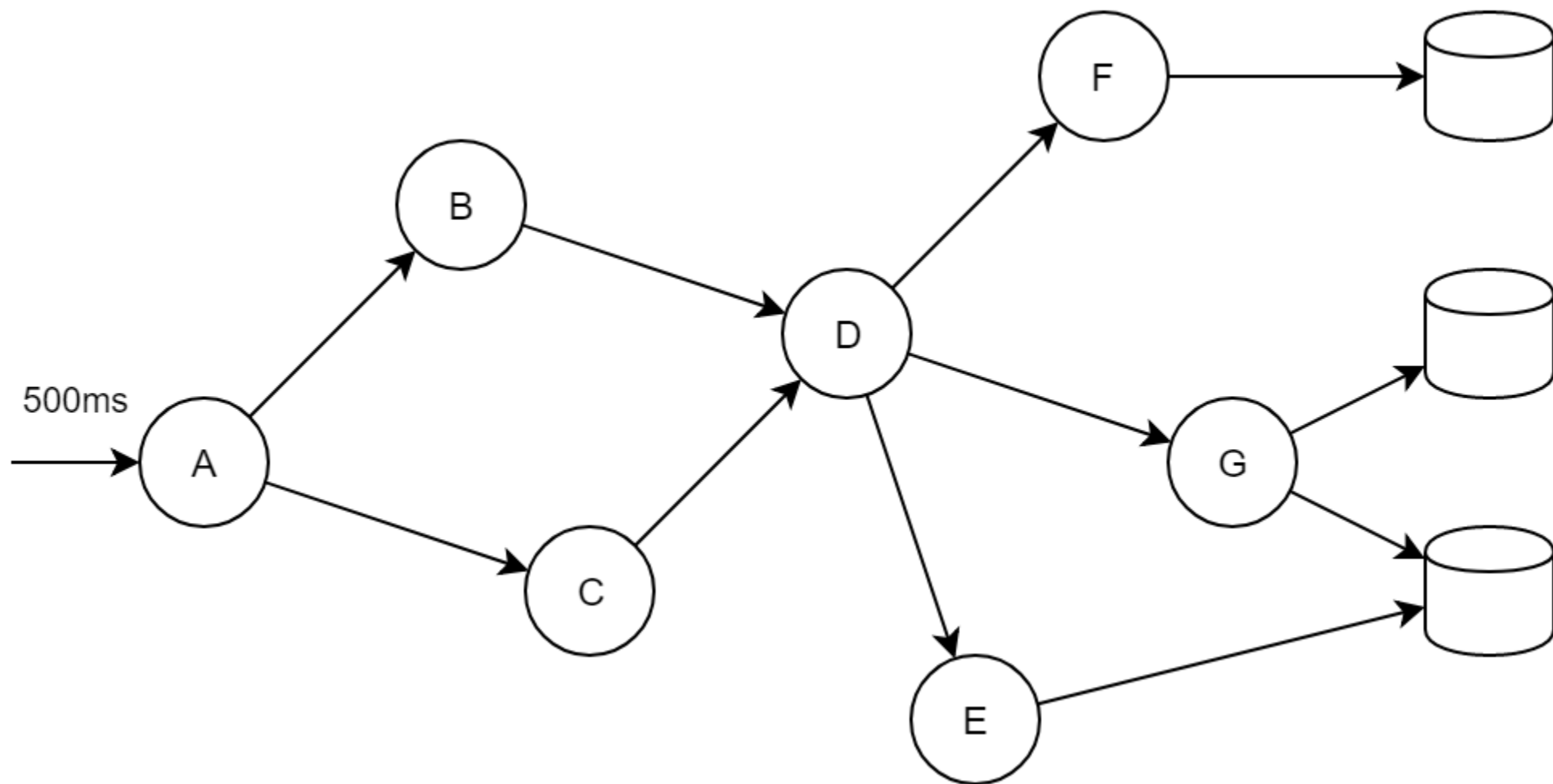
Использование OpenTracing в .NET

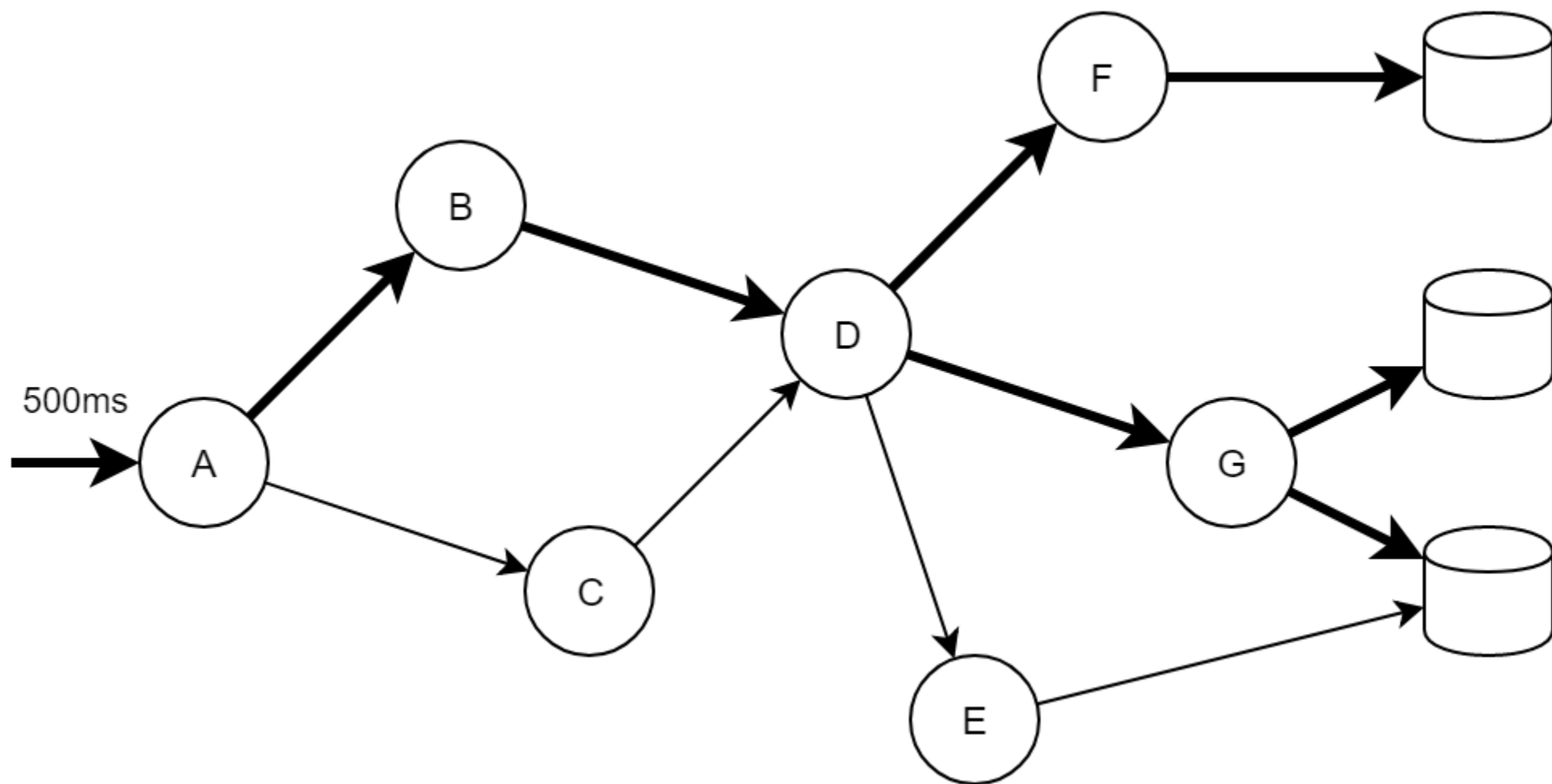
Игорь Чакрыгин | ozon.ru

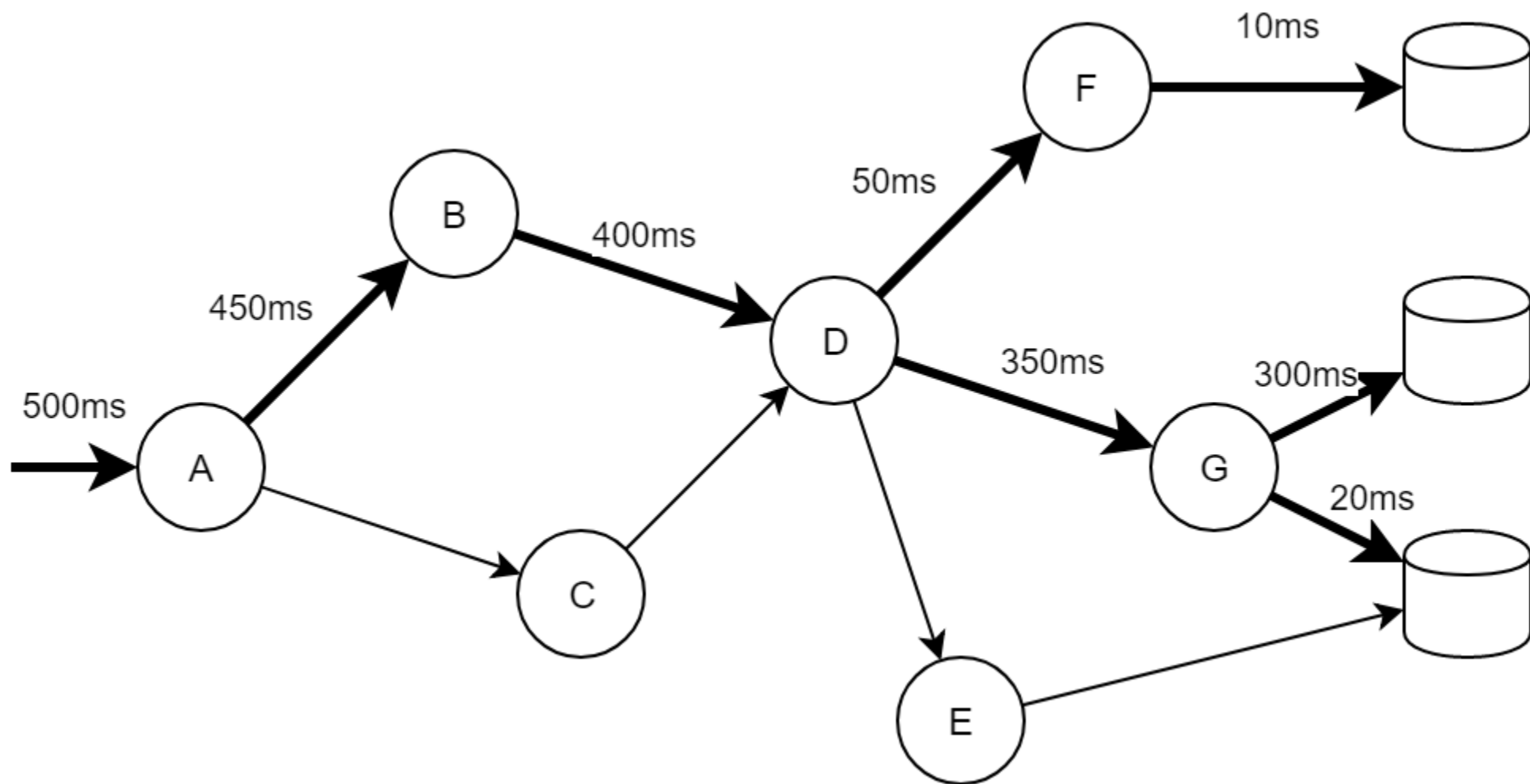
О чём доклад

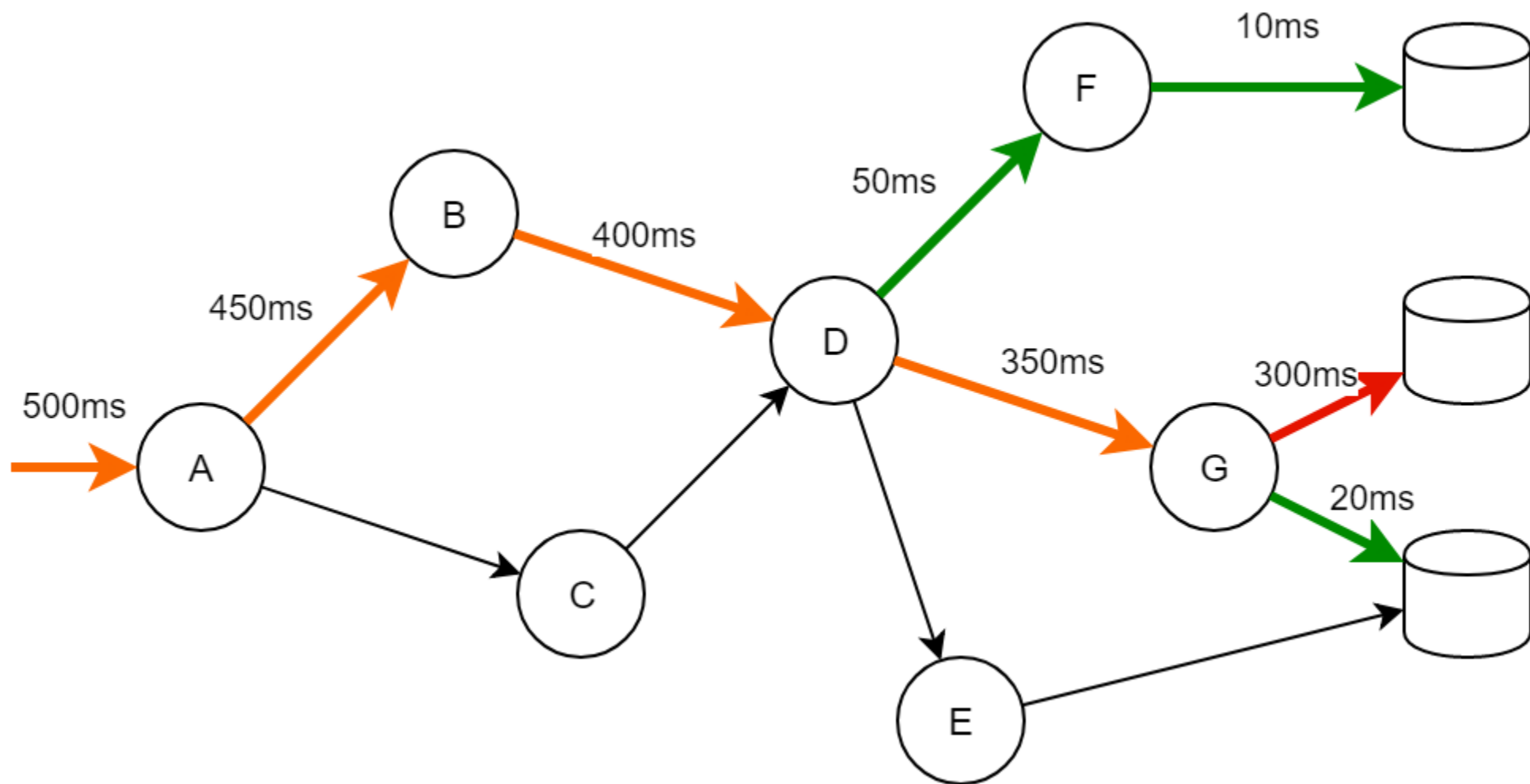
- OpenTracing
- Jaeger
- OpenTracing API for .NET
- Jaeger Client for .NET
- Автоматический сбор трассировок в ASP.NET Core

Distributed Tracing









OpenTracing

OpenTracing

Consistent, expressive, vendor-neutral APIs for distributed tracing and context propagation

- **Semantic Specification**

Описывает API и модель данных: Tracer, Trace, Span, Span Context, Reference, Tag, Log, Baggage Item

- **Semantic Conventions**

Описывает стандартные ключи для Tags и Logs, а также правила их использования.

OpenTracing

Реализации для 9 языков программирования:

Go, JavaScript, Java, Python, Ruby, PHP, Objective-C, C++, C#

Реализация для .NET в NuGet пакете OpenTracing

<https://github.com/opentracing/opentracing-csharp>

```
ITracer tracer = new |
```

GlobalTracer() (in OpenTracing.Util)

MockTracer() (in OpenTracing.Mock)

NoopTracer() (in OpenTracing.Noop)

bool()

Jaeger

Find Traces

Service (170)

searchteam-search-api ▾

Operation (8)

all ▾

Tags ?

http.status_code=200 error=true

Lookback

Last Hour ▾

Min Duration

e.g. 1.2s, 100ms, 500us

Max Duration

e.g. 1.1s

Limit Results

20

Find Traces



20 Traces

Sort: Most Recent ▾

composer-api: page_json_v1

219.16ms

281 Spans

Ozon.Services.Item (126)
Ozon.Services.OAuth (3)
Ozon.Services.ProductModel (63)
catalog-api (27)
cms-api (6)
composer-api (26)
map-location-gateway (1)
searchteam-metasearch-api (3)
searchteam-search-api (8)
stock-service (18)

Today 2:27:36 pm
a few seconds ago

catalog-api: navi_v1_catalog_search

225.36ms

171 Spans

Ozon.Services.Item (88)
Ozon.Services.ProductModel (45)
catalog-api (21)
searchteam-search-api (6)
stock-service (11)

Today 2:27:35 pm
a few seconds ago

composer-api: page_json_v1

202.97ms

38 Spans

Ozon.Services.OAuth (3)
catalog-api (5)
composer-api (24)
map-location-gateway (1)
searchteam-search-api (5)

Today 2:27:35 pm
a few seconds ago

composer-api: page_json_v1

360.94ms

Jaeger UI

Lookup by Trace ID...

Search

Dependencies

About Jaeger ▾

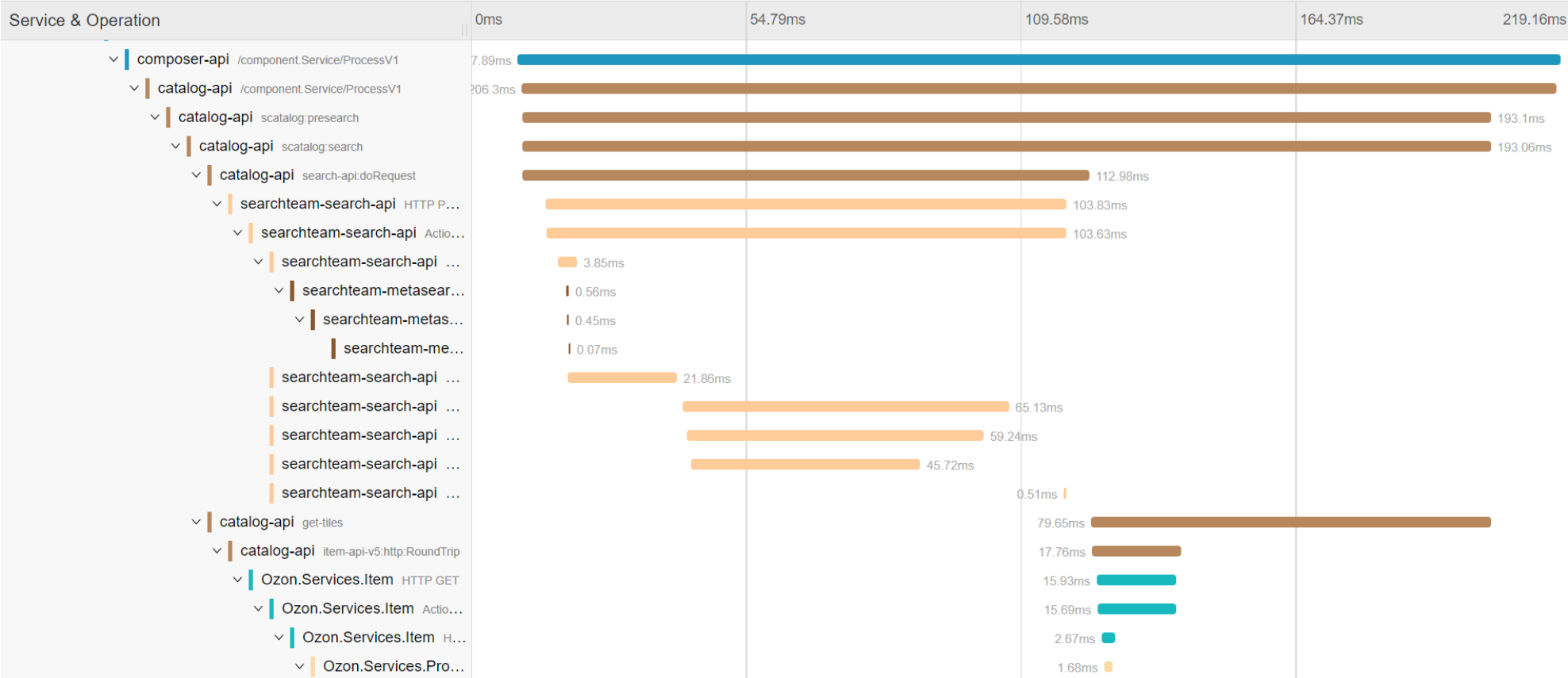
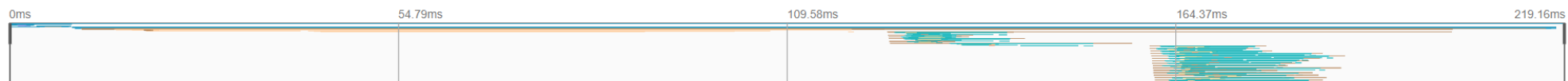
▼ composer-api: page_json_v1



Search...

View Options ▾

Trace Start: **November 25, 2018 2:27 PM** | Duration: **219.16ms** | Services: **10** | Depth: **17** | Total Spans: **281**



Jaeger

```
docker run -d -p 5775:5775/udp -p 16686:16686 jaegertracing/all-in-one:
```

Jaeger

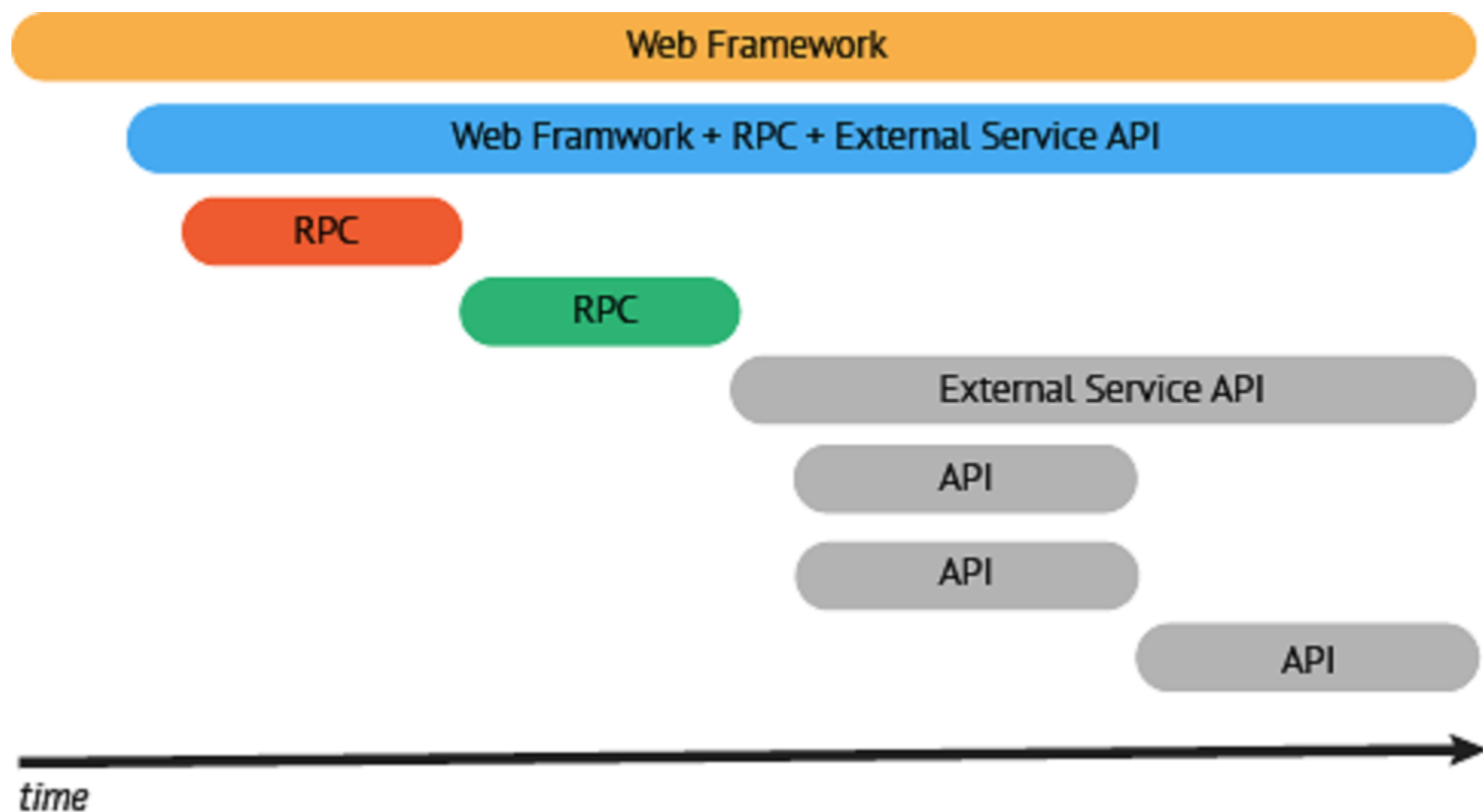
Клиент для .NET в NuGet пакете Jaeger

<https://github.com/jaegertracing/jaeger-client-csharp>

OpenTracing API for .NET

OpenTracing: Tracer

```
using Jaeger;  
using OpenTracing;  
  
ITracer tracer = ...
```



OpenTracing: Spans

```
ISpan span = tracer
    .BuildSpan(operationName: "Span Example")
    .Start();

DoSomething();

span.Finish();
```

▼ some-service: Span Example

⌘

Search...

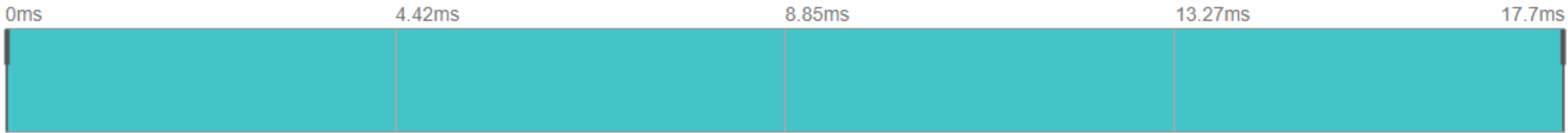
^

▼

×

View Options ▾

Trace Start: November 25, 2018 5:25 PM | Duration: 17.7ms | Services: 1 | Depth: 1 | Total Spans: 1



| Service & Oper... ▾ > ▾ >> | 0ms | 4.42ms | 8.85ms | 13.27ms | 17.7ms |
|----------------------------|-----|--------|--------|---------|--------|
| some-service Span Example | | | | | |

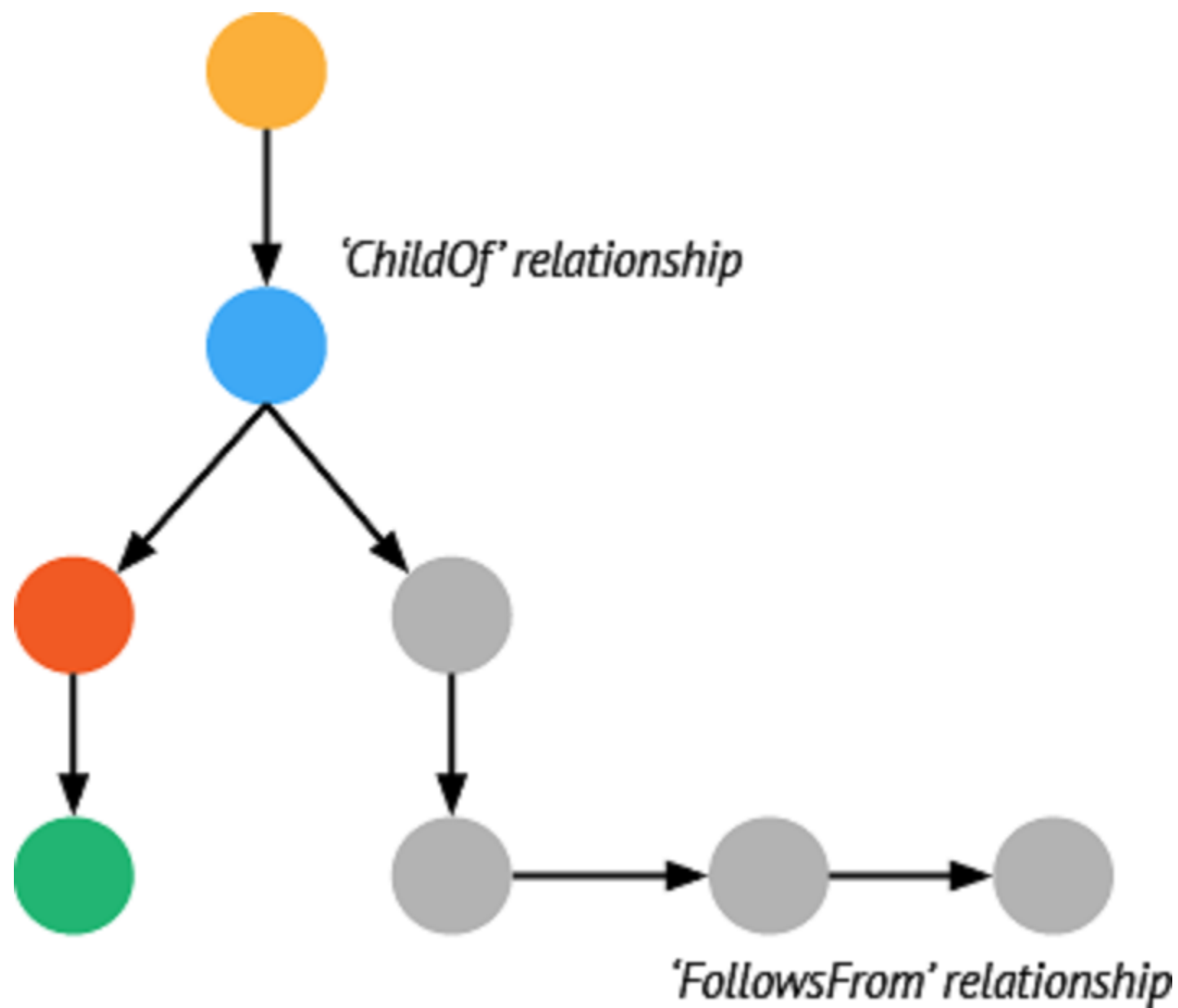
Span Example

Service: some-service | Duration: 17.7ms | Start Time: 0ms

- > **Tags:** sampler.type = const | sampler.param = true
- > **Process:** hostname = it430nbmsk | ip = 10.21.16.131 | jaeger.version = CSharp-0.2.2.0
- SpanID: 5342c7578c392a3

OpenTracing: Scopes

```
using (IScope scope = tracer
    .BuildSpan(operationName: "Scope Example")
    .StartActive())
{
    DoSomething();
}
```



OpenTracing: ChildOf References

```
using (IScope scope = tracer
    .BuildSpan(operationName: "Reference Example")
    .StartActive())
{
    using (IScope childOfScope = tracer
        .BuildSpan(operationName: "ChildOf Operation")
        .AsChildOf(scope.Span)
        .StartActive())
    {
        DoSomething();
    }
}
```


Jaeger UI

Lookup by Trace ID...

Search

Compare

Dependencies

About Jaeger ▾

▾ some-service: Reference Example

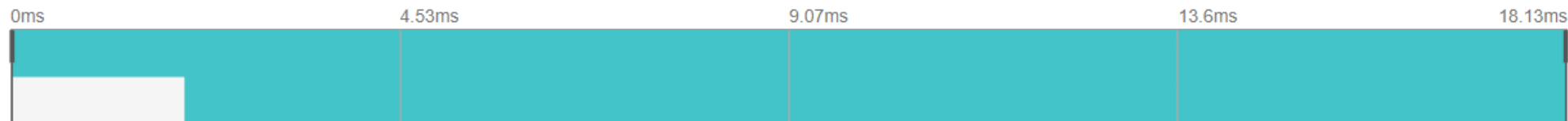


Search...



View Options ▾

Trace Start: November 25, 2018 7:39 PM | Duration: 18.13ms | Services: 1 | Depth: 2 | Total Spans: 2



Service & Operation ▾ > ▾ >>

0ms

4.53ms

9.07ms

13.6ms

18.13ms

▾ some-service Reference Example

Reference Example

Service: some-service | Duration: 18.13ms | Start Time: 0ms

 > **Tags:** sampler.type = const | sampler.param = true

 > **Process:** hostname = it430nbmsk | ip = 10.21.16.178 | jaeger.version = CSharp-0.2.2.0

SpanID: b81b6389218c80b1

some-service ChildOf Operation

16.1ms

ChildOf Operation

Service: some-service | Duration: 16.1ms | Start Time: 2.03ms

 > **Tags:**

 > **Process:** hostname = it430nbmsk | ip = 10.21.16.178 | jaeger.version = CSharp-0.2.2.0

SpanID: b37e6ce47916376a

OpenTracing: FollowsFrom References

```
ISpanContext spanContext = null;

using (IScope scope = tracer
    .BuildSpan(operationName: "Reference Example")
    .StartActive())
{
    spanContext = scope.Span.Context;

    DoSomething();
}

using (IScope followsFromScope = tracer
    .BuildSpan(operationName: "FollowsFrom Operation")
    .AddReference(References.FollowsFrom, spanContext)
    .StartActive())
{
    DoSomething();
}
```

Jaeger UI

Lookup by Trace ID...

Search

Compare

Dependencies

About Jaeger ▾

some-service: Reference Example

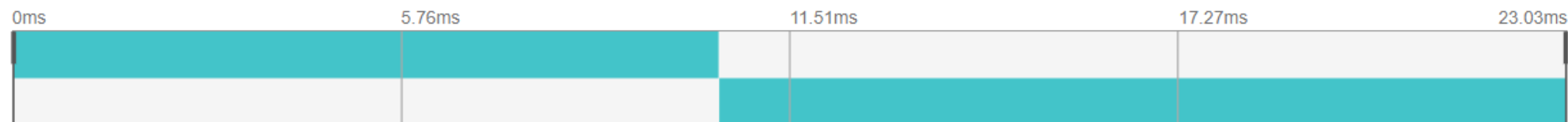


Search...



View Options ▾

Trace Start: November 25, 2018 7:39 PM | Duration: 23.03ms | Services: 1 | Depth: 2 | Total Spans: 2



Service & Operation ▾ > ▾ >> || 0ms 5.76ms 11.51ms 17.27ms 23.03ms

some-service Reference Example

0ms 5.76ms 11.51ms 17.27ms 23.03ms

Reference Example

Service: some-service | Duration: 10.46ms | Start Time: 0ms

> **Tags:** sampler.type = const | sampler.param = true

> **Process:** hostname = it430nbmsk | ip = 10.21.16.178 | jaeger.version = CSharp-0.2.2.0

SpanID: 4722772fbdbc4e38

some-service FollowsFrom O...

12.55ms

FollowsFrom Operation

Service: some-service | Duration: 12.55ms | Start Time: 10.47ms

> **Tags:**

> **Process:** hostname = it430nbmsk | ip = 10.21.16.178 | jaeger.version = CSharp-0.2.2.0

SpanID: 66992d3fbe1c8c85

OpenTracing: ScopeManager

```
var activeScope = tracer.ScopeManager.Active;  
  
using (tracer.BuildSpan("ScopeManager Example").StartActive())  
{  
    using (tracer.BuildSpan("First Operation").StartActive())  
    {  
        DoSomething();  
    }  
  
    using (tracer.BuildSpan("Second Operation").StartActive())  
    {  
        DoSomething();  
    }  
}
```

▼ some-service: ScopeManager Example

⌘

Search...

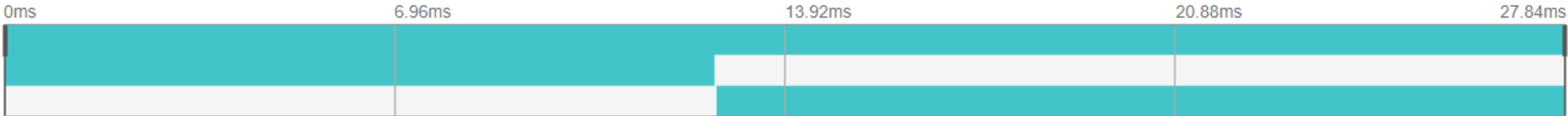
^

▼

×

View Options ▾

Trace Start: November 25, 2018 7:39 PM | Duration: 27.84ms | Services: 1 | Depth: 2 | Total Spans: 3



| Service & Operation | 0ms | 6.96ms | 13.92ms | 20.88ms | 27.84ms |
|---------------------------------------|---------|--------|---------|---------|---------|
| ▼ some-service ScopeManager Example | | | | | |
| some-service First Operation | 12.66ms | | | | |
| some-service Second Operation | 15.13ms | | | | |

OpenTracing: Tags

```
using (IScope scope = tracer
    .BuildSpan(operationName: "Tags Example")
    .StartActive())
{
    ISpan span = scope.Span;

    span.SetTag("Foo", 42);
    span.SetTag("Bar", true);
    span.SetTag("Baz", "Test");

    DoSomething();
}
```

some-service Tags Example

Tags Example

Service: some-service | Duration: 14.16ms | Start Time: 0ms

Tags

| | |
|---------------|---------|
| sampler.type | "const" |
| sampler.param | true |
| Foo | 42 |
| Bar | true |
| Baz | "Test" |

Process

| | |
|----------------|------------------|
| hostname | "it430nbmsk" |
| ip | "10.21.16.178" |
| jaeger.version | "CSharp-0.2.2.0" |

SpanID: 3c785d47fc9b455e

OpenTracing: Logs

```
using (IScope scope = tracer
    .BuildSpan(operationName: "Logs Example")
    .StartActive())
{
    ISpan span = scope.Span;

    span.Log(new Dictionary<string, object>
    {
        { "Bar", true },
        { "Baz", "Test" },
    });

    span.Log("Foo");

    DoSomething();
}
```


some-service Logs Example

Logs Example

Service: **some-service** | Duration: **17.4ms** | Start Time: **0ms**

- > **Tags:** sampler.type = const | sampler.param = true
- > **Process:** hostname = it430nbmsk | ip = 10.21.16.178 | jaeger.version = CSharp-0.2.2.0

▼ Logs (2)

▼ 0.14ms

| | |
|-------|-------|
| event | "Foo" |
|-------|-------|

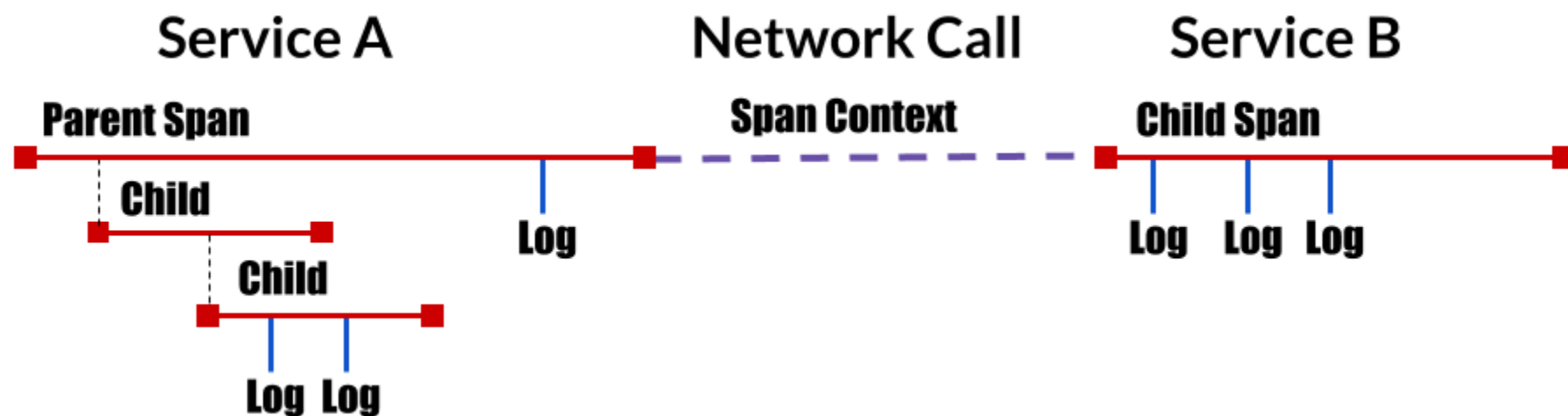
▼ 0.7ms

| | |
|-----|--------|
| Bar | true |
| Baz | "Test" |

Log timestamps are relative to the start time of the full trace.

SpanID: 57402a1d51aab09e

Context Propagation



Context Propagation: Inject

```
using (IScope scope = tracer
    .BuildSpan("Service A")
    .StartActive())
{
    var dict = new Dictionary<string, string>

    tracer.Inject(scope.Span.Context,
        BuiltinFormats.TextMap, new TextMapInjectAdapter(dict));

    // Span Context:
    // "uber-trace-id": "f5ae6d81832558e:f5ae6d81832558e:0:1",

    DoSomething();
}
```

Context Propagation: Extract

```
var dict = new Dictionary<string, string>
{ /* ... */ };

var spanContext = tracer.Extract(
    BuiltinFormats.HttpHeaders, new TextMapExtractAdapter(dict));

using (IScope scope = tracer.BuildSpan("Service B")
    .AsChildOf(spanContext)
    .StartActive())
{
    DoSomething();
}
```

Context Propagation: Baggage Items

```
// Service A
tracer.ActiveSpan.SetBaggageItem("some-baggage-key", "Some Value")

// Span Context:
// "uberctx-some-baggage-key": "Some Value"

// Service B
string item = tracer.ActiveSpan.GetBaggageItem("some-baggage-key");
```

Jaeger Client for .NET

```
IReporter reporter = ...  
ISampler sampler = ...;  
  
ITracer tracer = new Tracer.Builder(serviceName: "some-service")  
    .WithReporter(reporter)  
    .WithSampler(sampler)  
    .Build();
```

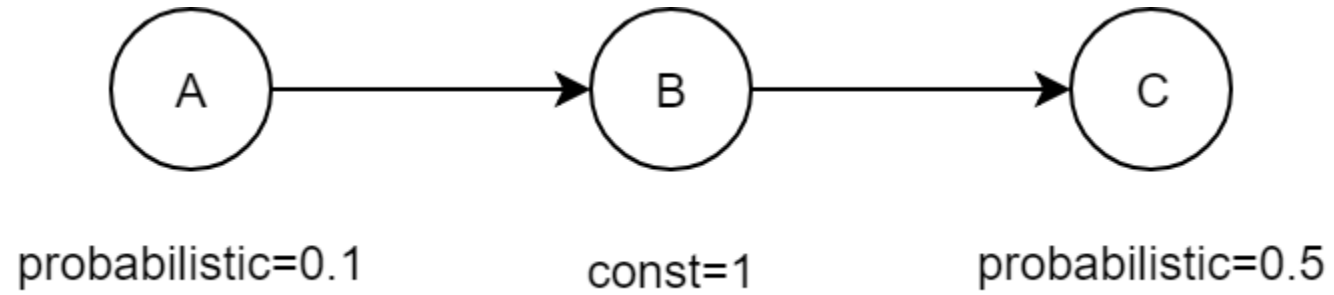


```
ISender udpSender =  
    new UdpSender("jaeger_collector_host", 5775, maxPacketSize: 0);  
  
ISender httpSender =  
    new HttpSender("http://jaeger_collector_host:14268/api/traces")  
  
IReporter reporter = new RemoteReporter.Builder()  
    .WithSender(udpSender)  
    .WithMaxQueueSize(maxQueueSize: 100)  
    .Build();
```

```
ISampler sampler = new ConstSampler(sample: true);
```

Jaeger Samplers

- ConstSampler
- ProbabilisticSampler
- RateLimitingSampler
- GuaranteedThroughputSampler
- PerOperationSampler
- RemoteControlledSampler



```
// JAEGER_SERVICE_NAME=some-service  
// JAEGER_AGENT_HOST=localhost  
// JAEGER_AGENT_PORT=5775  
// JAEGER_SAMPLER_TYPE=probabilistic  
// JAEGER_SAMPLER_PARAM=0.1
```

```
ILoggerFactory loggerFactory = ...
```

```
var configuration = Configuration.FromEnv(loggerFactory);  
var tracer = configuration.GetTracer();
```

Автоматический сбор трассировок в ASP.NET Core

Реализация в NuGet пакете
OpenTracing.Contrib.NetCore

<https://github.com/opentracing-contrib/csharp-netcore>

```
// Startup.cs
```

```
public void ConfigureServices(IServiceCollection services)
{
    services.AddSingleton<ITracer>(serviceProvider =>
    {
        var loggerFactory =
            serviceProvider.GetRequiredService<ILoggerFactory>();

        var configuration = Jaeger.Configuration.FromEnv(loggerFactory);
        return configuration.GetTracer();
    });

    services.AddOpenTracing();
    services.AddMvc();
}
```


Демо

Вопросы

Полезные ссылки:

- <https://opentracing.io/>
- <https://www.jaegertracing.io/>
- <https://github.com/opentracing/opentracing-csharp>
- <https://github.com/opentracing-contrib/csharp-netcore>
- <https://github.com/jaegertracing/jaeger-client-csharp>



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