



Monitoring and Logging with .NET Applications and Microsoft Azure

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Professional

C# and .NET
2021 Edition

Christian Nagel

- Training
- Coaching
- Consulting
- Development

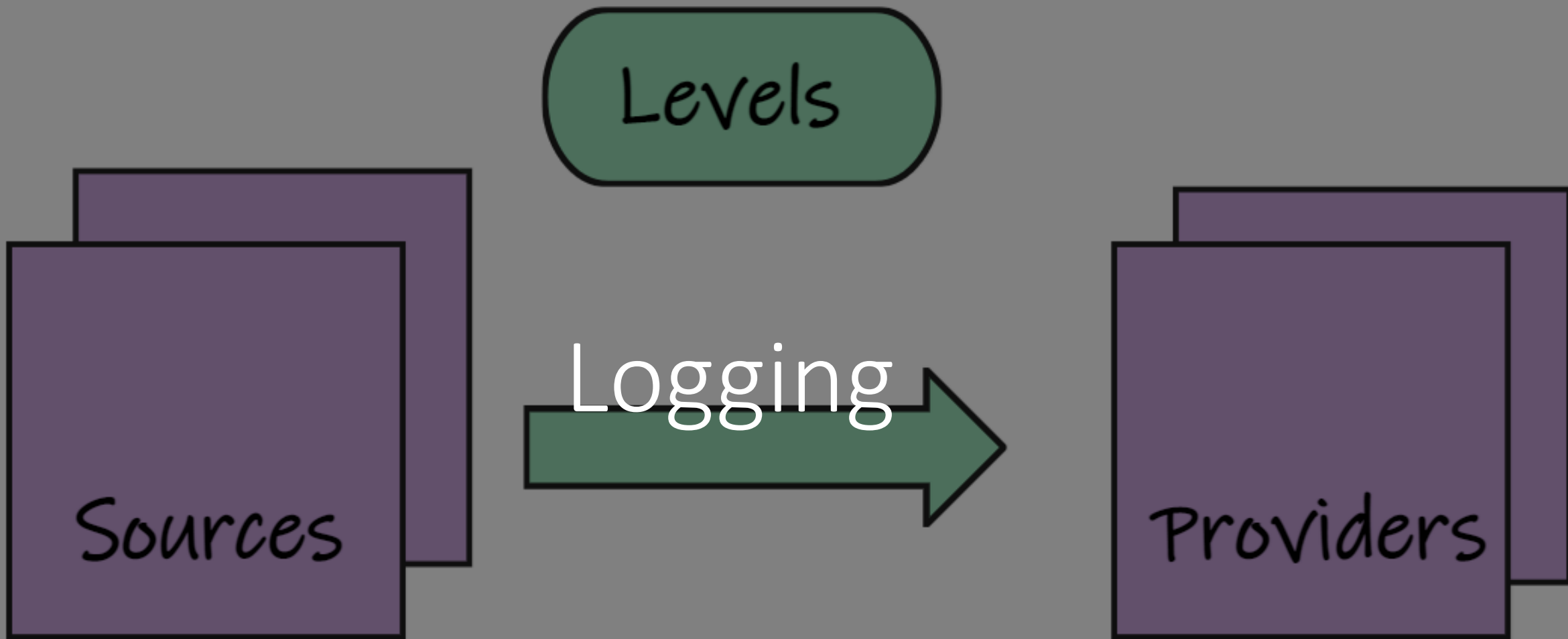
Topics

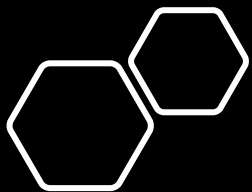
Diagnostics with
.NET

Azure Monitor

The background of the image is a blurred ECG (heart rate) monitor display. It features a grid of orange lines and a black line representing the heart's electrical activity. The text "Diagnostics with .NET" is overlaid in white.

Diagnostics with .NET





Log Providers

EventLog

- Windows
- Defaults to Warning

Console

- Console, SimpleConsole, JsonConsole

Debug

- Uses Debug class

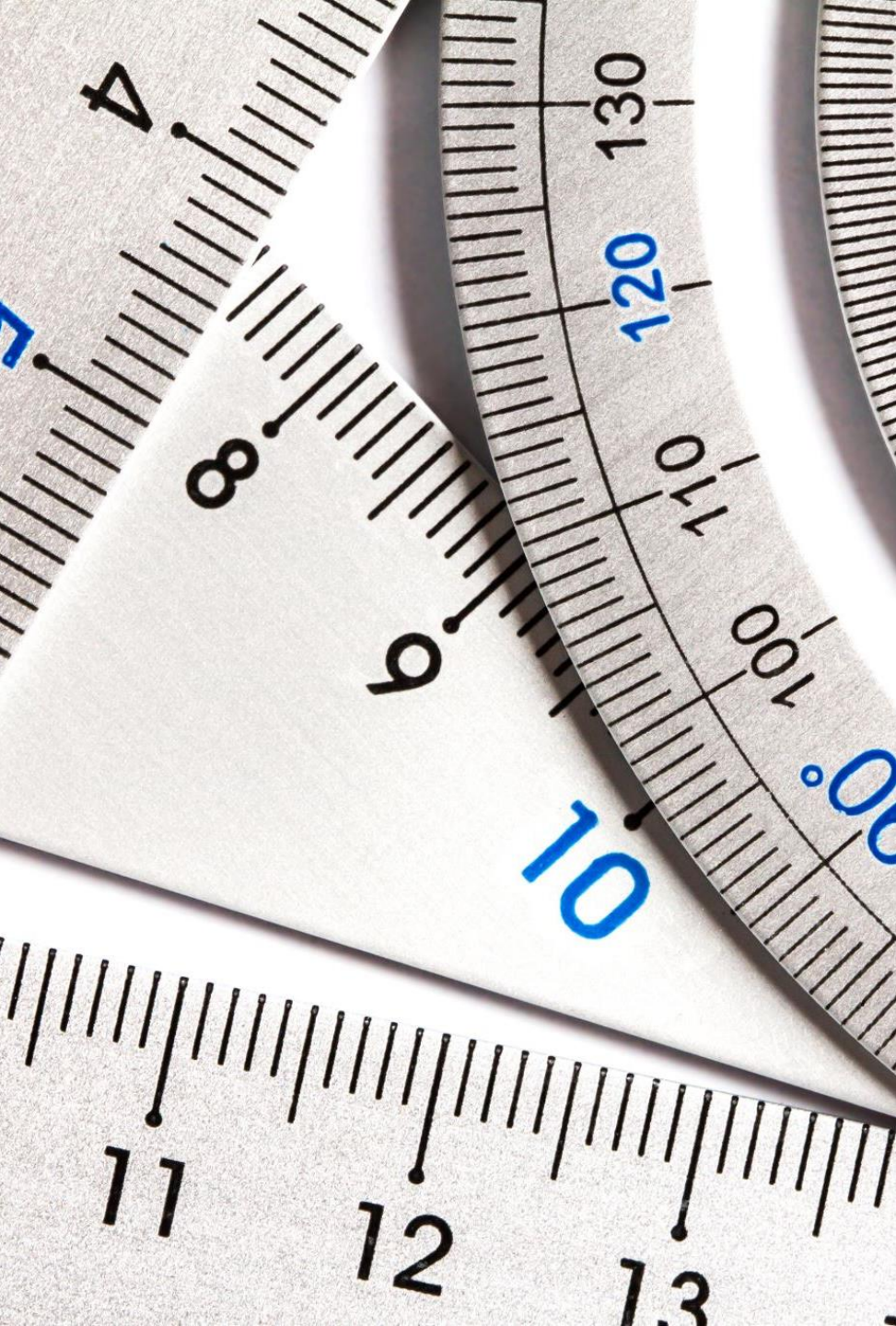
EventSource

- Cross-platform
- Microsoft-Extensions-Logging

Logging Source Generator

- High-performance logging
- Cached delegates

```
public static partial class Log
{
    [LoggerMessage(
        EventId = 4000,
        Level = LogLevel.Information,
        Message = "Started a game `{game}`")]
    public static partial void GameStarted(this ILogger logger, string game);
}
```

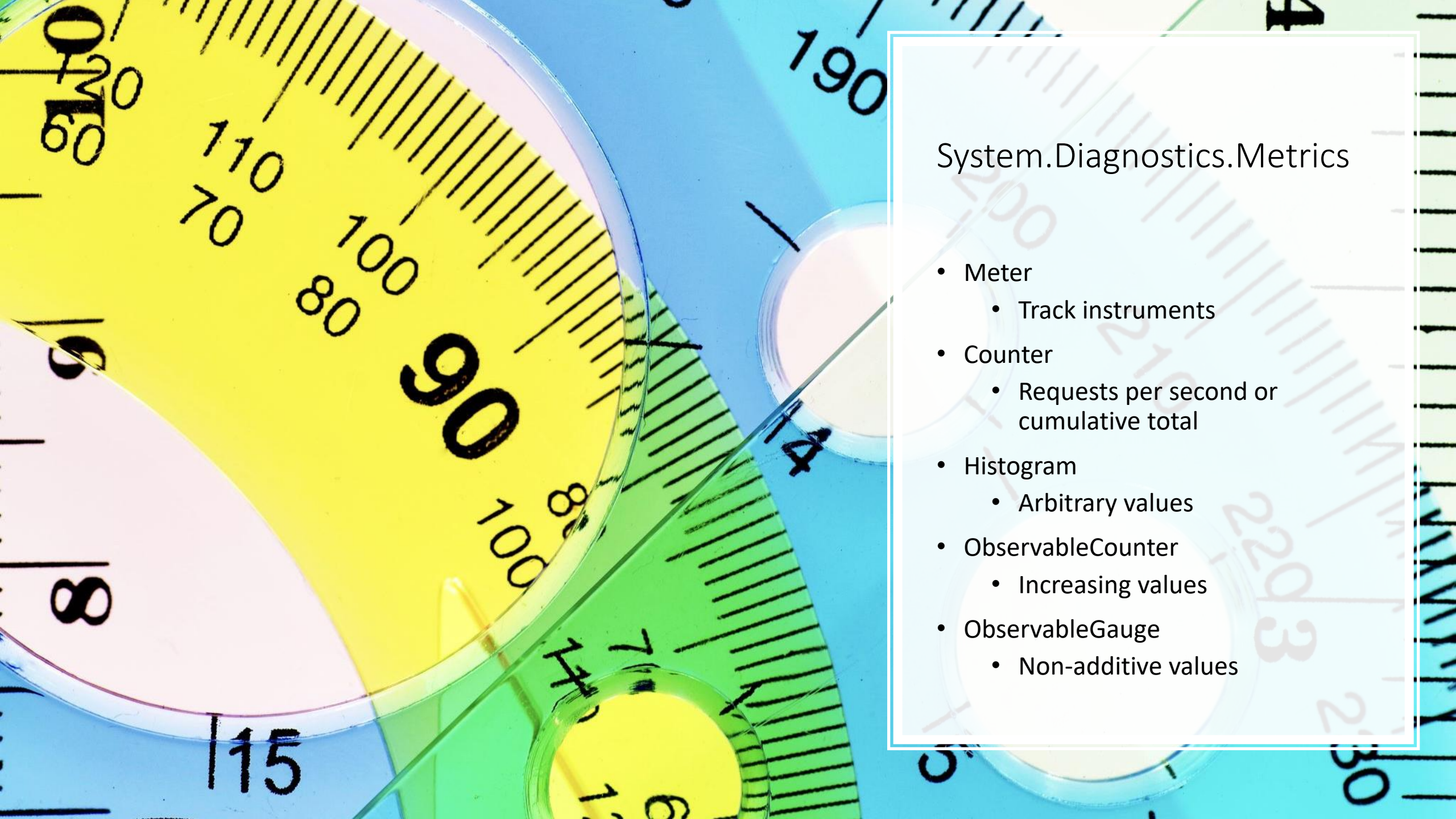


Metrics

- Numerical measurements
- “Traditional API”: `EventSource (System.Diagnostics.Tracing)`
- “New Simple API”: `System.Diagnostics.Metrics`

Built-in .NET counters

- .NET Runtime
- DI Container
- System.Net
- ASP.NET Core
- EF Core
- ...

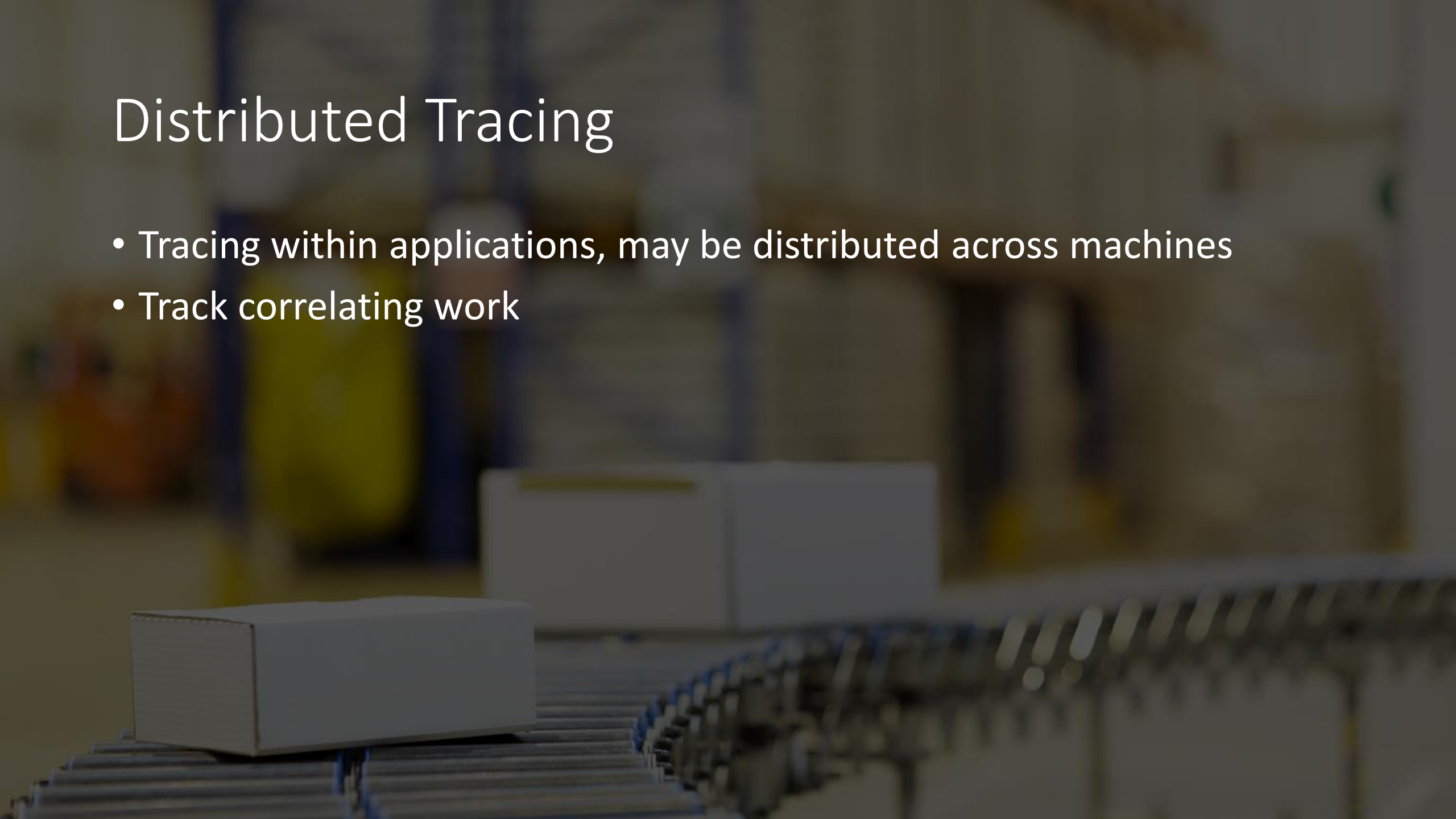


System.Diagnostics.Metrics

- Meter
 - Track instruments
- Counter
 - Requests per second or cumulative total
- Histogram
 - Arbitrary values
- ObservableCounter
 - Increasing values
- ObservableGauge
 - Non-additive values

Distributed Tracing

- Tracing within applications, may be distributed across machines
- Track correlating work





.NET Activity

- Id
 - Hierarchical structure
 - separated by '.' or '_'
- Tags
 - Information logged with activity
- Baggage
 - Logged with activity and passed to child
- Events
 - Time-stamped messages (e.g. "done now")

.NET Tools

dotnet trace

- Performance analysis

dotnet counters

- Investigate performance counters

dotnet monitor

- Processes, dumps traces, metrics, logs, operations...

OpenTelemetry

- <https://opentelemetry.io>
- Instrumentation
 - C++, .NET, Erlang/Elixir, Go, Java, JavaScript, PHP, Python, Ruby, Rust, Swift
- Collectors
 - Vendor-agnostic way to receive, process, export telemetry data



.NET

Logging

Metrics

Distributed Tracing

Azure Monitor



Azure Monitor

Metrics

Insights

Logs

Visualizations

Analysis

Traces

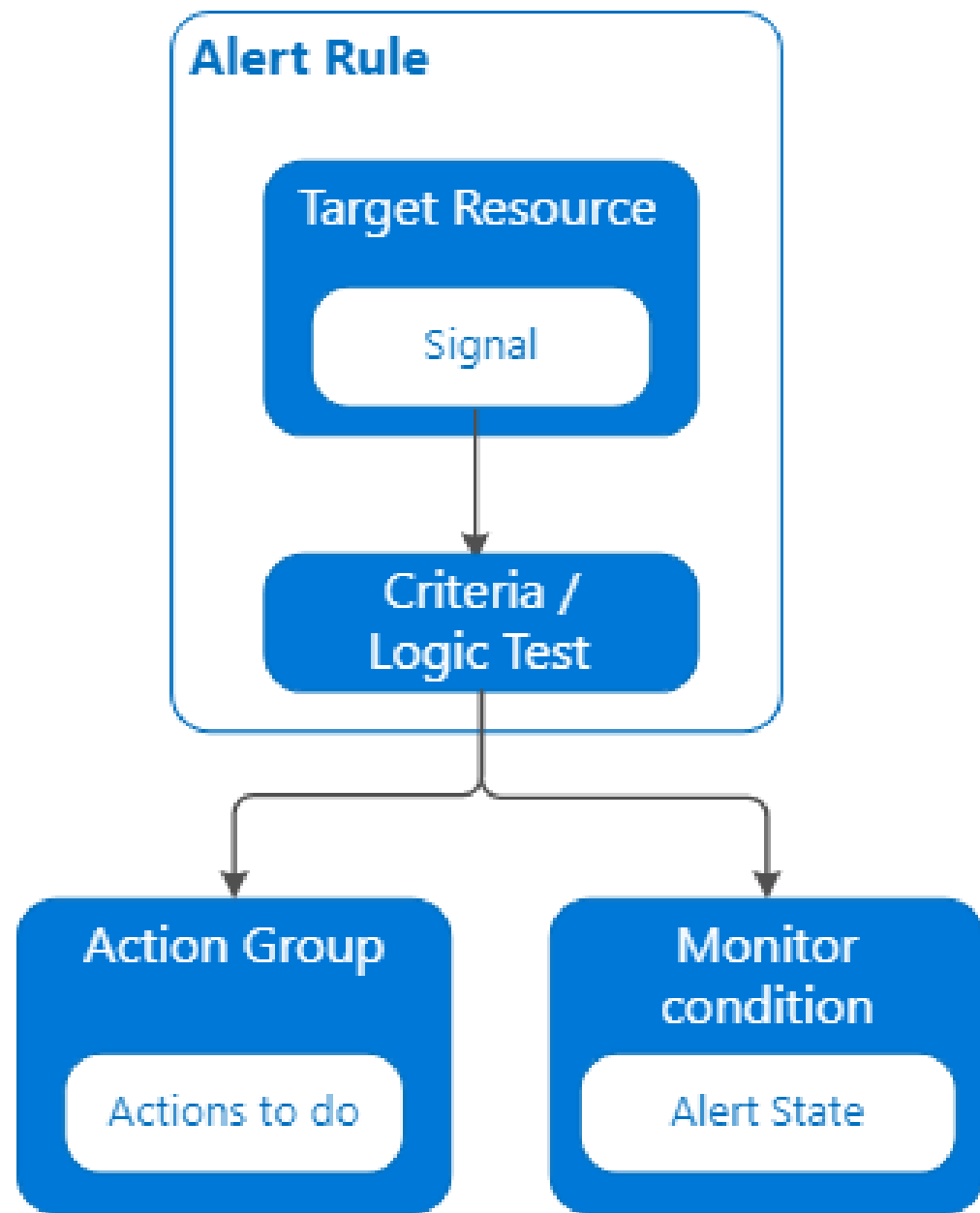
Act

Integrate

Logs

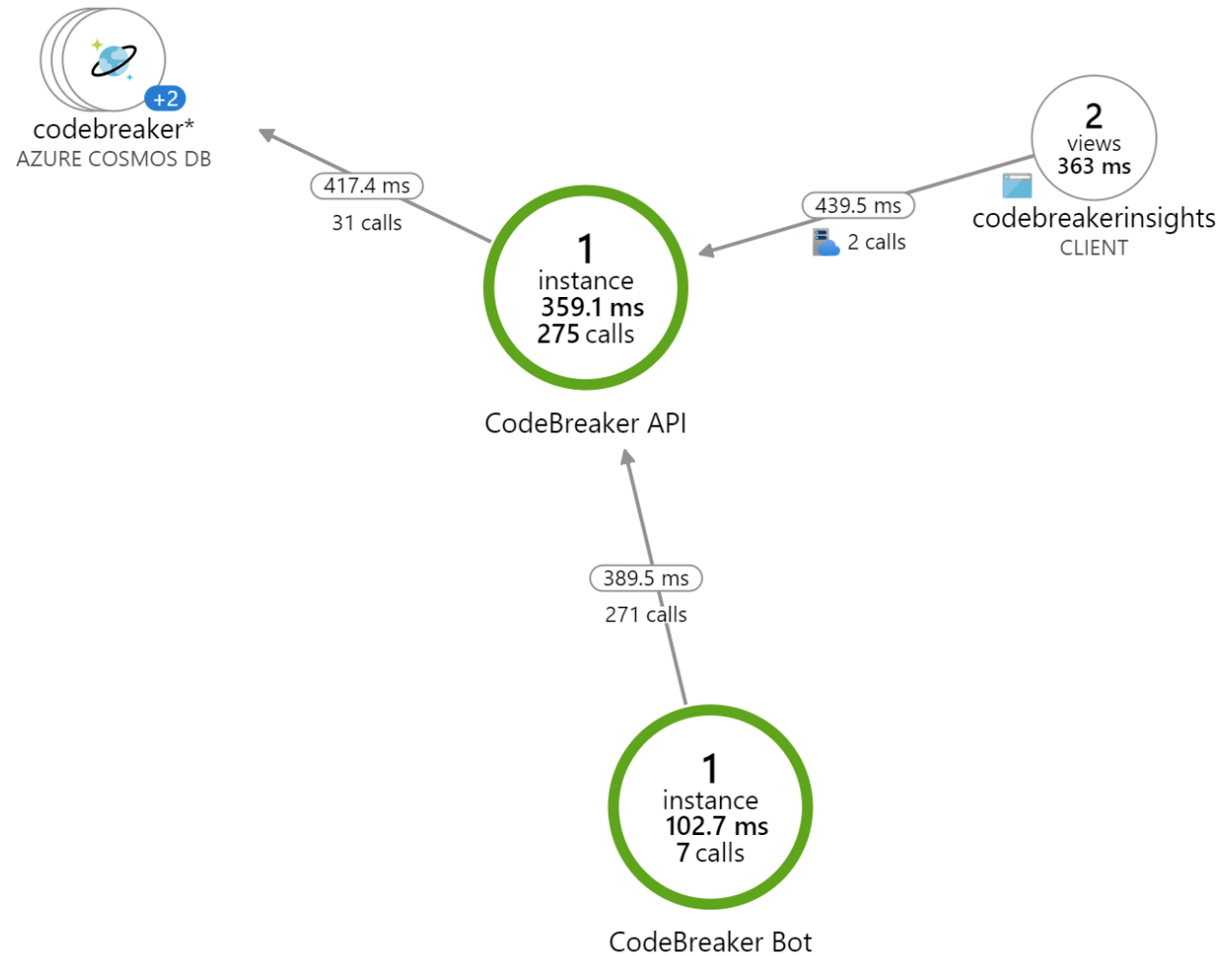
- Kusto Query Language (KQL)
- Explore data, patterns, explore anomalies
- Tabular output
- Visualize with Dashboards, PowerBI, Grafana

Alerts



Application Insights

- Application Performance Management
- Live Monitoring
- Automatically detect performance anomalies
- See what users do



Take away

- Use .NET features for logging, metrics, distributed tracing
- Source code generator logging
- System.Diagnostics.Metrics API
- OpenTelemetry
- Azure Monitor
- Dashboards
- Logging
- Alerts
- Application Insights

<https://github.com/cnilearn/globalaustria2022>

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Thank you!

Questions?