

# Parallel, Asynchronous and Multithreaded Applications

Course code: GOC407

The course is intended for experienced developers who would like to improve their knowledge and want to learn about parallel and asynchronous applications. There will learn the basics of threads and objects and familiarize themselves with the products which enable this kind of programming. A lot of these new features come with .NET Framework 4 (e.g. Task Parallel Library) and 4.5 (e.g. async/await). We will talk about the differences and find solutions for dealing with IO bound and CPU bound problems. We will also look at Power Threading Library. In the last few lessons of the course we will concentrate on the solutions dealing with the synchronization such as locky, mutexes, lock-free operations and we will also talk about their specific and the suitability to particular solutions.

## What we teach you

To create applications which will use all power of HW and therefore they are quicker

Applications which are scaling well on new devices

To think about the basic problems and system sources in a new innovated way

## Required skills

Experience with creation of the application in C# language

## Course outline

### Parallelism

- Current state, future of command
- Description of typical problems

### Synchronization

- Lock/Monitor
- Spin-wait
- Interlocked - lock-free operations
- Mutex, EventWaitHandle, Semaphore, ReaderWriterLockSlim
- Assembling of locks and their types
- Lock free thinking
- A little bit of .NET memory model

### IO bound operations

- Description
- Specifications
- Asynchronous (non-blocking) processing

### CPU bound operations

- Description
- Specifications
- Support in .NET
- Class Thread, in other words all hard-boiled
- ThreadPool

### NET 4

- PLINQ
- Task Parallel Library
- Improved ThreadPool
- Work stealing

### NET 4.5

- Asynchronous (non-blocking) processing

#### GOPAS Praha

Kodaňská 1441/46  
101 00 Praha 10  
Tel.: +420 234 064 900-3  
[info@gopas.cz](mailto:info@gopas.cz)

#### GOPAS Brno

Nové sady 996/25  
602 00 Brno  
Tel.: +420 542 422 111  
[info@gopas.cz](mailto:info@gopas.cz)

#### GOPAS Bratislava

Dr. Vladimíra Clementisa 10  
Bratislava, 821 02  
Tel.: +421 248 282 701-2  
[info@gopas.sk](mailto:info@gopas.sk)



Copyright © 2020 GOPAS, a.s.,  
All rights reserved

# Parallel, Asynchronous and Multithreaded Applications

- New key words `async/await`
- New "Async" methods in .NET
- Cooperation with `Task/Task`
- Progress reporting

## Power Threading Library

- `AsyncEnumerator`
- Classes which can enable you to work in multithreaded environment and to scale (`ReaderWriterGate`, `spin-locky...`)

**GOPAS Praha**  
Kodaňská 1441/46  
101 00 Praha 10  
Tel.: +420 234 064 900-3  
[info@gopas.cz](mailto:info@gopas.cz)

**GOPAS Brno**  
Nové sady 996/25  
602 00 Brno  
Tel.: +420 542 422 111  
[info@gopas.cz](mailto:info@gopas.cz)

**GOPAS Bratislava**  
Dr. Vladimíra Clementisa 10  
Bratislava, 821 02  
Tel.: +421 248 282 701-2  
[info@gopas.sk](mailto:info@gopas.sk)



Copyright © 2020 GOPAS, a.s.,  
All rights reserved