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RXTDF

Asynchronous Computing and Composing Asynchronous and Event-Based

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Asynchronous Computing and Composing Asynchronous and Event-Based

RXTDF - Version: 1

 5 days Course

Description:

5 days that target the different approach to parallelism and computation of asynchronous events using

Async / Await, Reactive Extension (RX) and TPL Dataflow.

Rx is a functional programming library designed to handle complex event processing. The course deep-dives into the library's concept and guidelines.

It will cover topics like exception handling, testing, remote processing, and scheduling.

Students will master both practice and theory and become familiar with numerous RX operators.

TPL Dataflow is an agent-based library designed to achieve high throughput and low latency for both I/O- and CPU-bound operations. The course deep-dives into the library's concept and guidelines. Students will master both practice and theory.

Intended audience:

.NET developers or team leaders with:

- at least 2 years of experience with C#;
- Programming experience and some practice with LINQ Query;
- Programming experience and some practice with multithreading;
- Familiarity with TPL (.NET 4) is recommended.



Prerequisites:

Objectives:

- Appreciate the architectural and design principles of Async, RX and TPL Dataflow programming model
- Practice complex event and messaging processing
- Learn to handle exceptions
- Test complex event pipeline
- Know how to design RX flow and TPL Dataflow
- Learn to combine different approach together
- Master design principles and guidelines of the agent base model
- Practice the complex parallel flow
- Understand TPL Dataflow blocks and performance tuning

Topics:

Introduction

- Moore's Law
- Amdahl's Law
- Thread safety
- .NET Parallel History
- Task and Task<T>
- Custom Task
- Continuation
 - Tasks vs. APM
- Async and Await
- Cancellation
- Exception Handling

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- Concurrent Collection

Rx Introduction

- What is Rx?
- Push standard
- LINQ-able
- Like Events but better
- Course Goals
- Why Rx

◦ Push vs. pull

◦ Test Case: Cloud search

Get started

- NuGet

Concept

- Producer / Consumer

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Library structure

- Different offering
- Enlighten concept

Marble Diagram

- Concept
- Select
- Where

Built-in factories

- Interval
- Timer
- Range
- Return
- Create
- Generate

Monitoring

- Do operator
- Visual RX



▫ LAB 01

Concurrency model

- Scheduler
- Built-in Scheduler
- ObserveOn
- SubscribeOn

Backwards compatibility

- Composite events

Exception Handling

- Retry
- Catch
- Finally
- SubscribeSafe

▫ LAB 02

Producer nature

- Hot Vs. Cold Observables
- Publish
- RefCount

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Subjects

- Subject
- Replay and ReplaySubject

Operators

- District
- DistinctUntilChanged
- Sample
- Aggregate
- Scan

Common Combinators

- Merge
- Zip
- CombineLatest
- Amb

Splitting

- Buffer
- Window
- Select Many
- Group By



▫ LAB 03

Time-oriented

- Interval
- Timeout
- Timestamp
- TimeInterval
- Throttle
- Sample
- Take and Skip
- Generate Delay
- Delay Subscription

Time-based Combinators

- Join
- Group Join

Disposables

- Create
- CompositeDisposable
- RefCountDisposable
- CancellationDisposable
- BooleanDisposable
- ContextDisposable
- ScheduledDisposable
- SingleAssignmentDisposable



- `MultipleAssignmentDisposable`
- `SerialDisposable`

▫ LAB 04

Scheduling

- Custom Scheduler
- Virtual time
- Historical Scheduler

Testing

- Notification
- `TestScheduler`
- `CreateHotObservable` / `CreateColdObservable`

Custom Operations

- `Defer`
- Extending the framework



▫ LAB 05

Remote

- Rx-Remoting
- IObservable

Introduction to Async / Await (C#5)

- Using
- Loops

TPL Advance

- Scheduling
- Async and UI

Parallel I/O

- What makes I/O operations different?
- I/O completion port

What is TPL Dataflow?

- The agent base concept
- Evolution
- Goals

Getting started

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- Namespace
- NuGet

Contract

- Source API
- Target API
- Block API
- Push vs. Pool

Blocks

- Blocks categories

Action block

- Structure
- Functionality
- Throttling

Buffer Block

- Structure
- Functionality
- Push and Pool
- Bounded capacity

Broadcast Block



- Structure
- functionality
- What makes it different than Buffer Block?

Transform Block

- Structure
- Functionality

Transform Many Block

- Structure
- Functionality

TPL Dataflow and Async

- Using async / await with TDF
- Processing I/O operations

▫ LAB 06

Performance tuning

- MaxMessagesPerTask

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▫ Case Study: Web Crawler

Batch Block

- Structure
- Functionality

Join Block

- Structure
- Functionality

▫ LAB 07

Greediness

- Targeting complex scenarios and correlation
- ConsumeMessage API
- Two-phase commit
- ReserveMessage API
- ReleaseReservation API

Greediness and built-in blocks

- BatchBlock
- JoinBlock

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BatchedJoinBlock

- Structure
- Functionality

WriteOnceBlock

- Structure
- Functionality

▫ LAB 08

Rx vs. TDF

- Design differences
- Better together

▫ Summary