



Het Asynchrone Microsoft Landschap

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Agenda

- Wat is wat
- Introductie
- Threads
- Tasks (TPL)
- Async CTP
- Conclusie
- Vragen
- Plinq
- TPL Dataflow
- Rx
- SignalR

Wat is wat

- Parallel
 - Gelijktijdig uitvoeren van taken
 - Performance
- Asynchroon
 - Niet wachten op uitvoering van taken
 - Reactieve gebruikers interface
 - Schaalbaarheid



Wat is wat

- Thread
 - De .Net 1.0 - 3.5 manier van werken
 - Een context waarbinnen code draait
 - Low level
- Task
 - De .Net 4.0 - ... manier van werken
 - Wrapper rond Thread
 - Gebruik threadpool geoptimaliseerd voor aantal cores



Introductie - Geschiedenis

- .net 1.0 => Threads APM (2001)
- .net 2.0 => Threads EAP (2005)
- .net 4.0 => Task Parallel Library (2010)
 - PLinq
 - Async CTP (async, await)
 - TPL DataFlow
- .net 4.5 => (2012)
 - Async as a language feature
 - Numerous improvements
- 15 augustus 2012 Rx v2.0 (2011)
- 22 augustus 2012 SignalR 0.5.3 (2011)



Introductie - Uitdagingen

- Shared resources
- Show progress
- Cancellation
- Exception handling
- Thread affinity
- Complexity
- Debugging
- Deadlocks / Race conditions / Heisenbugs
- Applicability
- Unit testing



Introductie - Demo omgeving

- VS 2010
- .Net 4.0
- Async CTP (version 3)
- TPL Dataflow
- Reactive Extensions 2.0
- SignalR 0.5.3
- Nuget (package restore)
- Autofac 2.6
- xUnit 1.9.1
- Moq 4.0
- Fluent Assertions 1.7
- Resharper 7.0
- xUnit plugin for Resharper
- StyleCop 4.7.35.0
- Asp.Net MVC 4.0



Threads

Standaard Thread patterns

- APM => Asynchronous Programming Model
 - BeginRead, EndRead (a.k.a. IAsyncResult pattern)
- EAP => Event-Based Asynchronous Programming
 - DownloadStringAsync, DownloadStringCompleted
 - Geschikt voor UI



Threads

Show Code



Tasks (TPL)

- Simplify model
- Generics
- Composition
- Schedulers
- Smarter



Tasks (TPL)

- Tasks
- TaskFactory
- Parallel.Invoke
- Parallel.For
- Parallel.ForEach
- BlockingCollection
- ConcurrentBag
- ConcurrentDictionary
- ConcurrentStack
- ConcurrentQueue



Tasks (TPL)

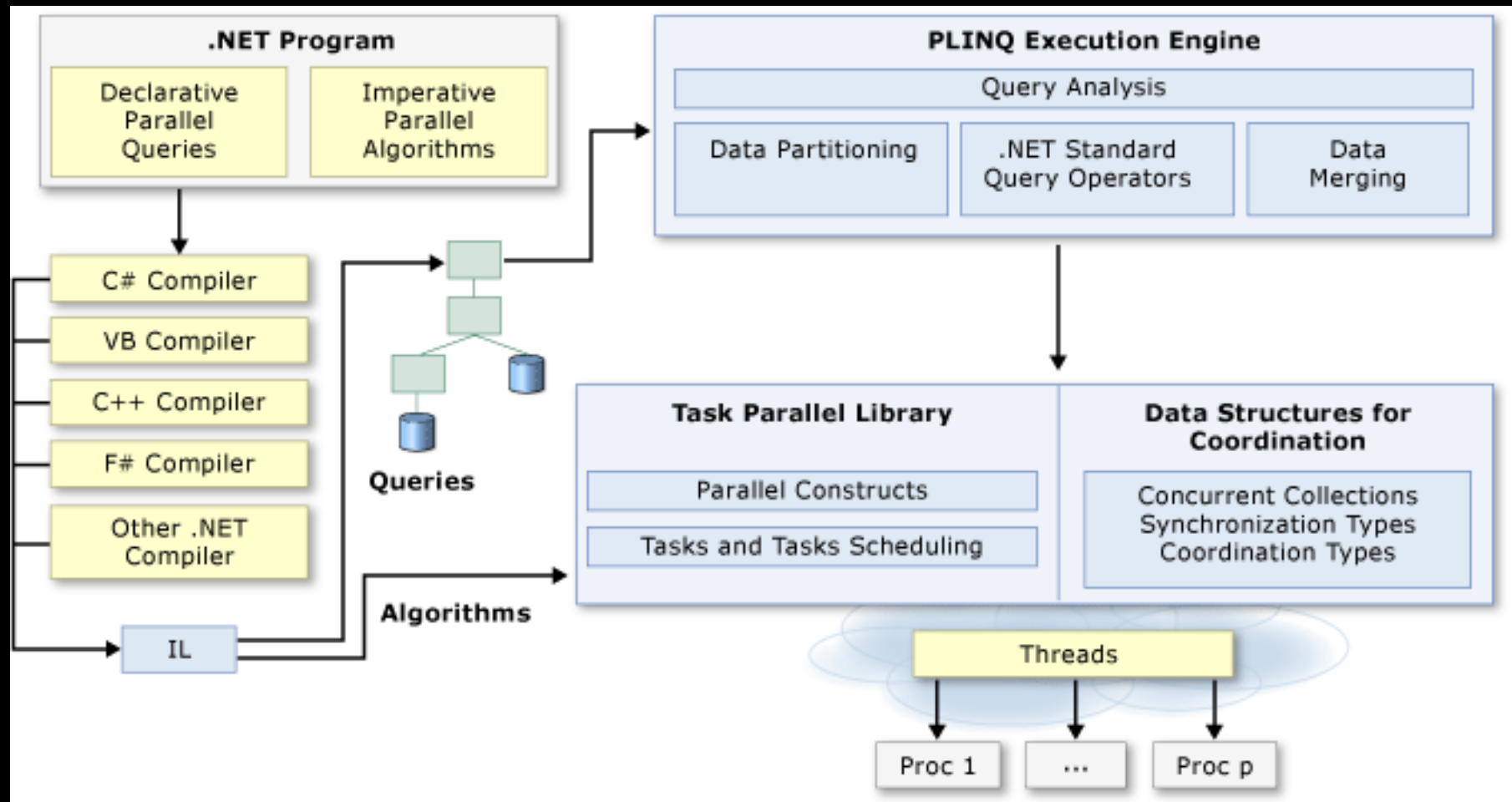
Show Code

- Async en Await keywords
- Async Extensions methods
- RunEx =>
 - Delay
 - Run (Action)
 - RunEx (Function)
 - ...



Async CTP

Show Code





PLinq

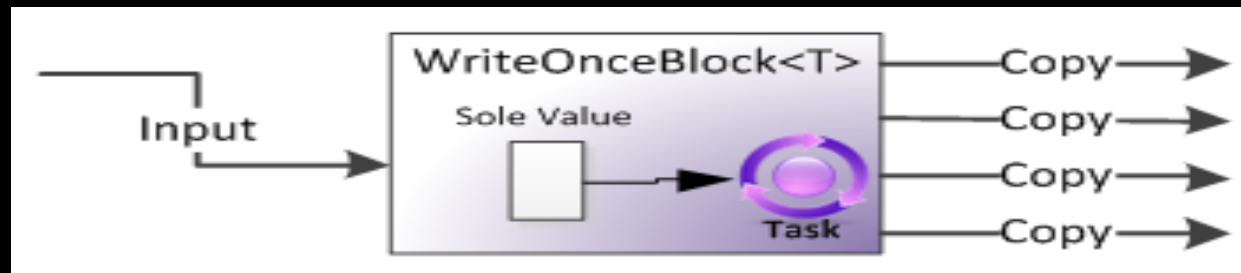
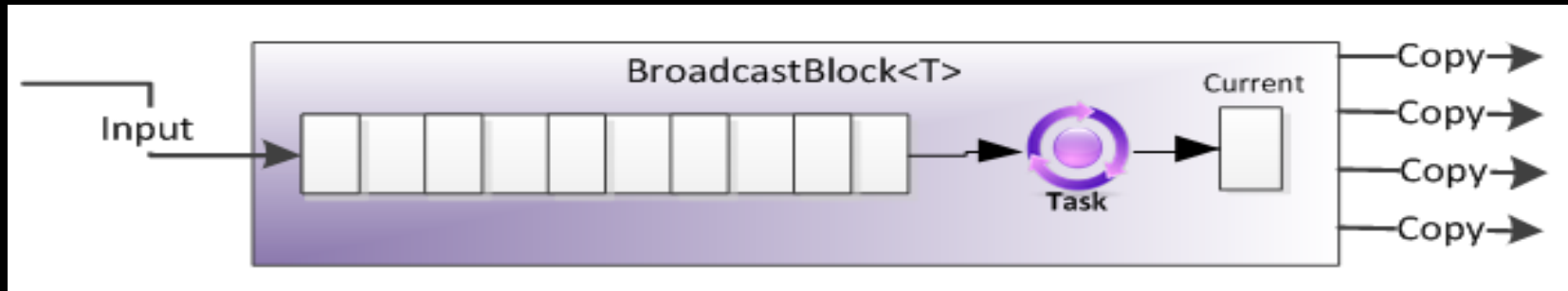
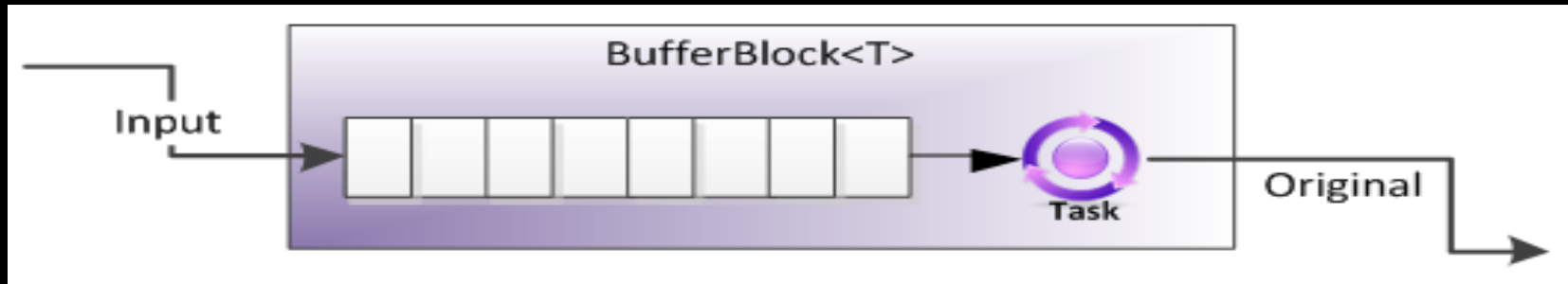
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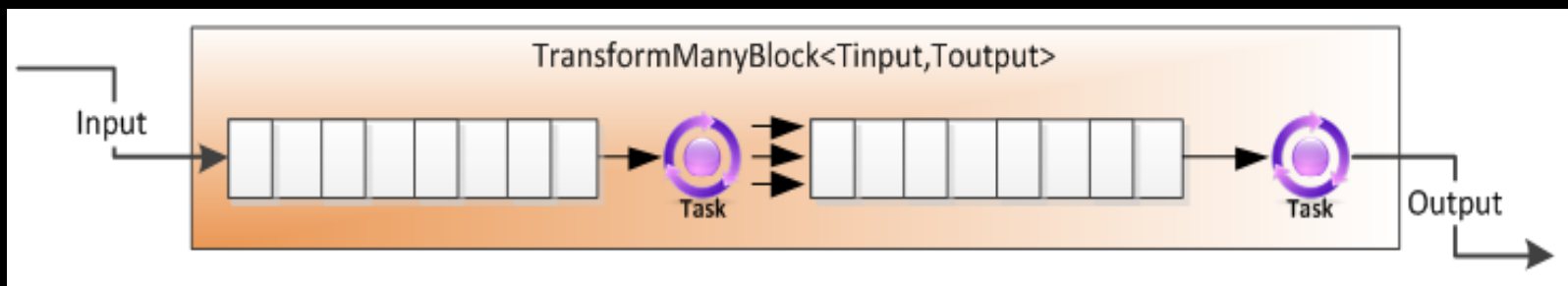
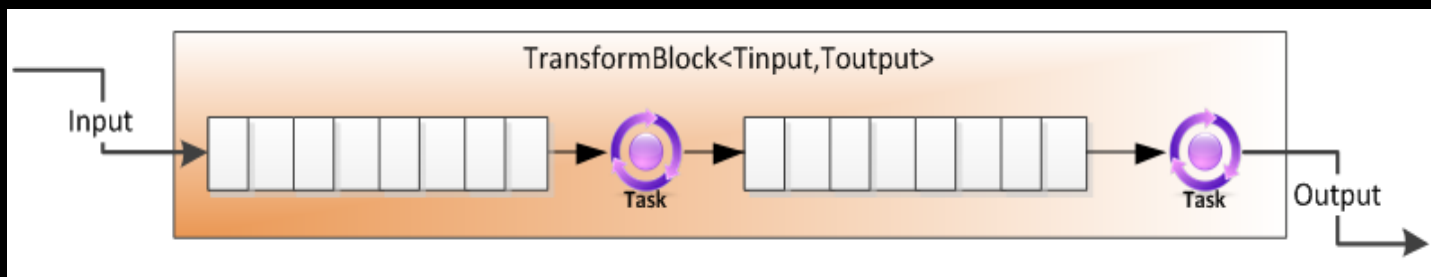
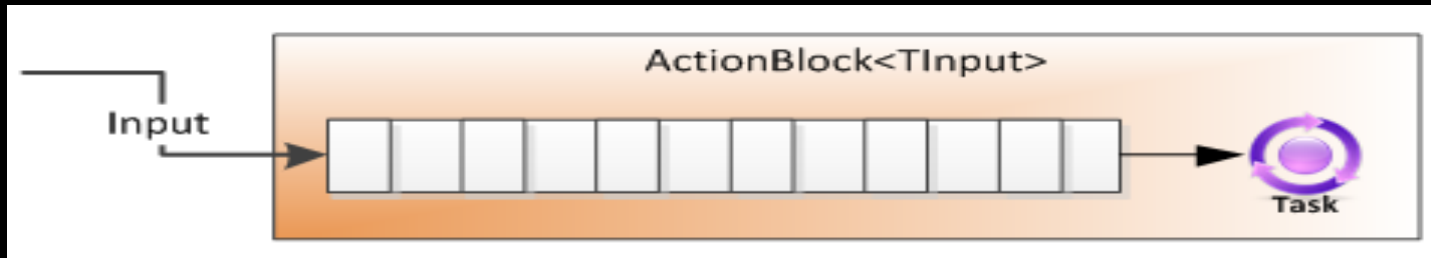
TPL Dataflow

- Stephen Toub
- ISourceBlock
- ITargetBlock

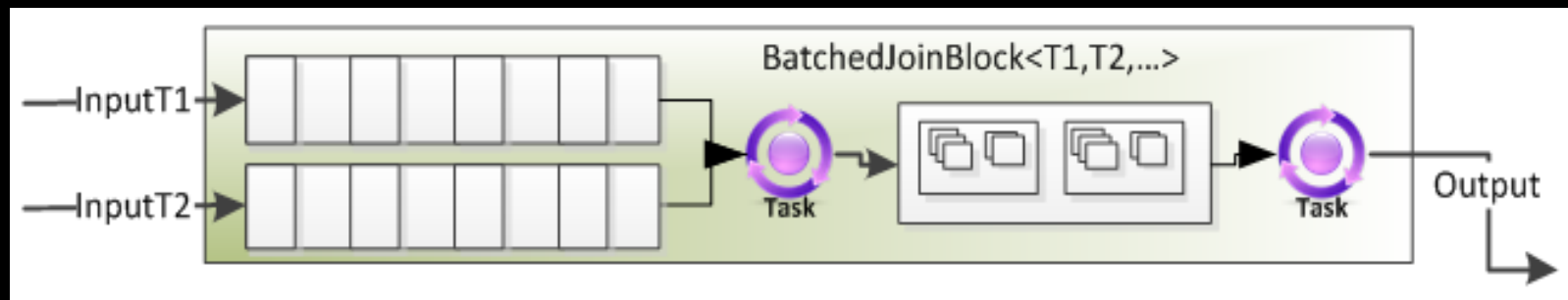
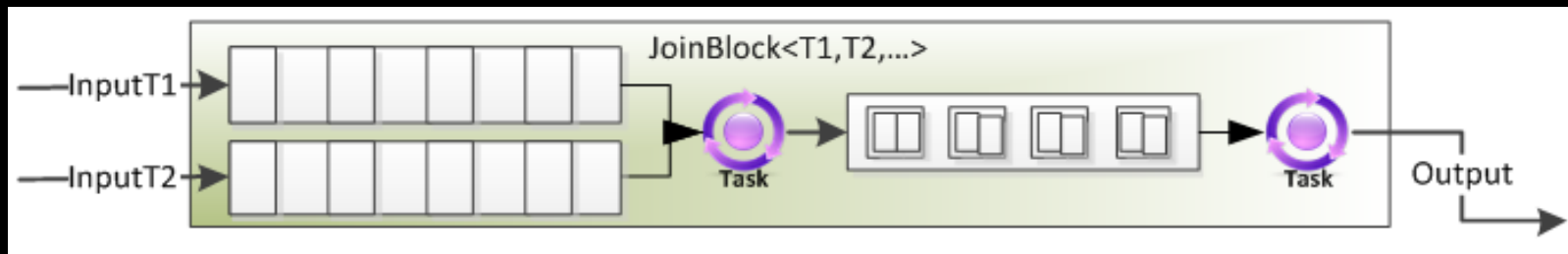
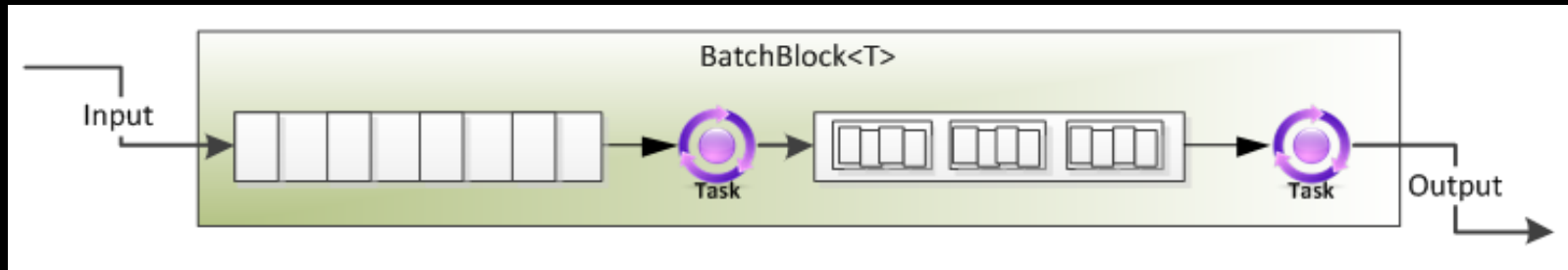
TPL Buffer Blocks



TPL Dataflow Execution Blocks



TPL Dataflow Join Blocks





TPL Dataflow

Show Code



Reactive Extensions (Rx)

- Simplify model
- Composition
- Schedulers
- Smarter
- Gebruik Linq
- Event streams
- Testbaarheid
- Multiplatform

Bart de Smet



Reactive Extensions (Rx)

Rx = Observables + Linq + Schedulers

```
public interface IObservable<out T>
{
    IDisposable Subscribe(IObserver<T> observer);
}
```

```
public interface IObserver<in T>
{
    void OnNext(T value);
    void OnError(Exception error);
    void OnCompleted();
}
```

OnNext* [OnError | OnCompleted]



Reactive Extensions (Rx)

Schedulers:

Wat => Execution Context

Hoe => Execution Policy

Wanneer => Clock



Reactive Extensions (Rx)

Show Code



SignalR

David Fowler

Sites

Services

Web
Forms

Web
Pages

Single
Page
Apps

MVC

Web
API

SignalR

ASP.NET

Show Code



Unit testen

- In VS 2010 met xUnit 1.9.1 support voor async await
- In VS 2010 mstest eigen Async Context maken (voorbeeld in async samples/unit test)
- In VS 2012 mstest support voor async await
- Rx heeft testschedulers (time travel)
- TypeMock racer (betaald)
- Chess (tot vs 2008)



Conclusies - Uitdagingen

- Shared resources
- Show progress
- Cancellation
- Exception handling
- Thread affinity
- Complexity
- Debugging
- Deadlocks / Race conditions / Heisenbugs
- Unit testing

Conclusies

- Think before you leap (is het echt nodig)
- Meet
- APM en EAP : zelf niet meer implementeren
- TPL + Async : Default keuze
- Plinq : In memory Linq queries met bewerkingen per rij
- TPL Dataflow : producer/consumer meerdere bewerkingen achter elkaar
- Rx : event streams, maar kan veel, hoge leercurve
- SignalR : client/server publish/subscribe communicatie

Vragen ?

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Referenties

AsyncDemo

<https://github.com/KeesDijk/AsyncDemo>

Parallel programming

<http://tinyurl.com/pp-on-msdn>

TPL

<http://tinyurl.com/tpl-book>

TPL Dataflow

<http://msdn.microsoft.com/en-us/devlabs/gg585582.aspx>

Rx

<http://msdn.microsoft.com/en-us/data/gg577609.aspx>

SignalR

<https://github.com/SignalR/SignalR>

Plinq

<http://msdn.microsoft.com/en-us/library/dd460688.aspx>