

Reactive Extensions

Vi tittar på ett av projekten från MS DevLabs: Reactive Extensions, som är ett ramverk för att underlätta programmering av asynkrona operationer och händelsestyrda system. Vi går igenom tekniken och hur den påverkar vårt sätt att närma oss denna typ av problem samt resonerar kring om och hur detta kan användas framöver.

Pär Nordström, Valtech

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Data Development Center

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```
// Example 1.a
var list = new List<int>() { 1, 2, 3, 4, 5, 6 };

foreach (var item in list)
{
    Console.WriteLine(item);
}
Console.WriteLine("---");
```

```
//Example 1.b
var list = new List<int>() { 1, 2, 3, 4, 5, 6 };
var enumerator = list.GetEnumerator();
while (enumerator.MoveNext())
{
    Console.WriteLine(enumerator.Current);
}
Console.WriteLine("---");
```

```
// Example 2
var sequence = new FunkyEnumerable(i => i*10);
foreach (var item in sequence)
{
    Console.WriteLine(item);
    Console.WriteLine("Waiting...");
}
```

```
// Example 3
var sequence =
    new FunkyEnumerable(i => i * i)
    .ToObservable(Scheduler.TaskPool)
    .Subscribe(str => Console.WriteLine(str));

Console.WriteLine("Working with other stuff..");
while (true)
{
    Console.Write(".");
    Thread.Sleep(10);
}
```

```
// Example 4
var evenNumbers = from t in new FunkyEnumerable(i => 100)
                  .ToObservable(Scheduler.TaskPool)
                  where int.Parse(t)%2 == 0
                  select t;

var oddNumbers = from t in new FunkyEnumerable(i => 200)
                  .ToObservable(Scheduler.TaskPool)
                  where int.Parse(t) % 2 != 0
                  select t;

using (evenNumbers.Subscribe(str => Console.WriteLine(str + " - even")))
using (oddNumbers.Subscribe(str => Console.WriteLine(str + " - odd")))
{
    Console.WriteLine("Press Enter to stop...");
    Console.ReadLine();
}
```

```
var moves = from evt in Observable.FromEvent<MouseEventArgs>(frm, "MouseMove")
            where txt.Text.ToUpper() == "ON"
            select evt.EventArgs.Location.ToString();
var input = from evt in Observable.FromEvent<EventArgs>(txt, "TextChanged")
            select txt.Text;
var quit = from evt in Observable.FromEvent<EventArgs>(txt, "TextChanged")
            where txt.Text.ToUpper() == "QUIT"
            select txt.Text;
```

```
var moves = from evt in Observable.FromEvent<MouseEventArgs>(frm, "MouseMove")
            .Sample(TimeSpan.FromSeconds(1))
            .DistinctUntilChanged(e => e.EventArgs.Location)
            where txt.Text.ToUpper() == "ON"
            select evt.EventArgs.Location.ToString();
var input = from evt in Observable.FromEvent<EventArgs>(txt, "TextChanged")
            .Delay(TimeSpan.FromSeconds(3))
            .DistinctUntilChanged(e => txt.Text)
            select txt.Text;
var quit = from evt in Observable.FromEvent<EventArgs>(txt, "TextChanged")
            .Throttle(TimeSpan.FromSeconds(2))
            where txt.Text.ToUpper() == "QUIT"
            select txt.Text;
```

```
// Exempel 7
var loremSvc = new LoremService.LoremClient();

var svc1 = from text in Observable.FromAsyncPattern<string>(loremSvc.BeginGetLorem, loremSvc.EndGetLorem)()
           select "Svc1: " + text;
var svc2 = from text in Observable.FromAsyncPattern<string>(loremSvc.BeginGetLorem, loremSvc.EndGetLorem)()
           select "Svc2: " + text;
var svc3 = from text in Observable.FromAsyncPattern<string>(loremSvc.BeginGetLorem, loremSvc.EndGetLorem)()
           select "Svc3: " + text;
```

Rx for Windows Phone 7, Xbox, and Zune

Windows Phone 7 ships with a version of the Reactive Extensions baked into the ROM of the device. For more information, see [Reactive Extensions for .NET Overview for Windows Phone](#). This version of the Reactive Extensions can be found in Windows Phone API's [Microsoft.Phone.Reactive Namespace](#).

After shipping the initial version of the Reactive Extensions with the Windows Phone 7 release, our team continues to improve and extend the library. This section describes how to get started with the latest version of Reactive Extensions for Windows Phone 7, which is defined in the System.Linq namespace. As a result, the new APIs don't clash with the library built in to the phone (nor do they replace the version in the ROM).

We also provide implementations of the Reactive Extensions for XNA-based platforms, which can be used to write reactive applications that run on Xbox 360 and Zune.

Rx for JavaScript

We're proud to announce the availability of Reactive Extensions for JavaScript (RxJS), bringing the power of reactive programming to JavaScript. It allows you to use the Rx combinators in JavaScript, and it does this in a download size of less than 7KB (using GZip compression). RxJS provides easy-to-use conversions from existing DOM, XMLHttpRequest (AJAX), and jQuery events to Rx push-collections, allowing users to seamlessly plug Rx into their existing JavaScript-based web sites.

Install Rx through NuGet

Rx assemblies can also be included to a Visual Studio 2010 project using the NuGet package management system. For more information on how to install it, visit the [NuGet project page on CodePlex](#). To find the Rx assemblies in the NuGet "Add Library Package Reference..." dialog, use "Rx" as the search term.

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The Reactive Extensions (Rx)...

...is a library to compose asynchronous and event-based programs using observable collections and LINQ-style query operators.

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About the Reactive Extensions

The "A" in "AJAX" stands for asynchronous, and indeed modern Web-based and Cloud-based applications are fundamentally asynchronous. In fact, Silverlight bans all blocking networking and threading operations. Asynchronous programming is by no means restricted to Web and Cloud scenarios, however. Traditional desktop applications also have to maintain responsiveness in the face of long latency I/O operations and other expensive background tasks.

Another common attribute of interactive applications, whether Web/Cloud or client-based, is that they are event-driven. The user interacts with the application via a GUI that receives event streams asynchronously from the mouse, keyboard, and other inputs.

Rx is a superset of LINQ's standard query operators that exposes asynchronous and event-based computations as push-based, observable collections via the new `IObservable<T>` interface in .NET 4. This interface is analogous to the familiar `IEnumerable<T>` interface used for pull-based, enumerable collections.

LINQ over enumerable sequences allows developers to consume and transform values from a wide range of pull-based sequences such as in-memory collections, database tables, and XML documents. Similarly, Rx's LINQ implementation over observable sequences allows developers to glue together complex event processing queries over push-based sequences such as .NET events, APM-based ("AsyncResult") computations, Task<T>-based computations, the Windows 7 Sensor and Location APIs, Windows Phone 7 sensors, SQL Streaminsight temporal event streams, F# first-class events, and async workflows.

Rx goes beyond .NET on the desktop as well, with releases for Silverlight, Windows Phone 7, XNA, XBOX 360, and even a port to JavaScript. Rx for JavaScript (RxJS) provides easy-to-use conversions from existing DOM, XMLHttpRequest, and jQuery events to observable collections, allowing users to seamlessly plug RxJS into their existing JavaScript-based web sites.

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