External Format Processing

Parsing JSON, JSON.NET

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#csharp-db

The JSON Data Format

Definition and Syntax

JSON Data Format

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- **JSON** (**J**ava**S**cript **O**bject **N**otation) is a lightweight data format
  - Human and machine-readable plain text
  - Based on **JavaScript** objects
  - Independent of development platforms and languages
  - JSON data consists of:
    - Values (strings, numbers, etc.)
    - Key-value pairs: **{ key : value }**
    - Arrays: **[value1, value2, …]**

JSON Data Format (2)

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- The JSON data format follows the rules of object creation in JS
  - **Strings**, **numbers** and **Booleans** are valid JSON:

```
"this is a string and is valid JSON"
```

```
3.14
```

```
true
```

  - **Arrays** are valid JSON:

```
[5, "text", true]
```

  - **Objects** are valid JSON (key-value pairs):

```
{
  "firstName": "Vladimir", "lastName": "Georgiev",
  "jobTitle": "Technical Trainer", "age": 25
}
```

Processing JSON

Parsing JSON in C# and .NET

Built-in JSON Support

- .NET has a built-in **DataContractJsonSerializer** class
- Contained in **System.Runtime.Serialization** assembly
- Supports **deserializing** (parsing) strings and **serializing** objects
- Including **DataContractJsonSerializer** into a project:

```
using System.Runtime.Serialization.Json;
```

Serializing JSON

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- DataContractJsonSerializer can serialize an object:

```
static string SerializeJson<T>(T obj)
{
  var serializer = new DataContractJsonSerializer(obj.GetType());
  using (var stream = new MemoryStream())
  {
    serializer.WriteObject(stream, obj);
    var result = Encoding.UTF8.GetString(stream.ToArray());
    return result;
  }
}
```

```
var product = new Product();
```

product {Json.Product}

Cost	25
Description	null
Id	0
Name	"Oil Pump"

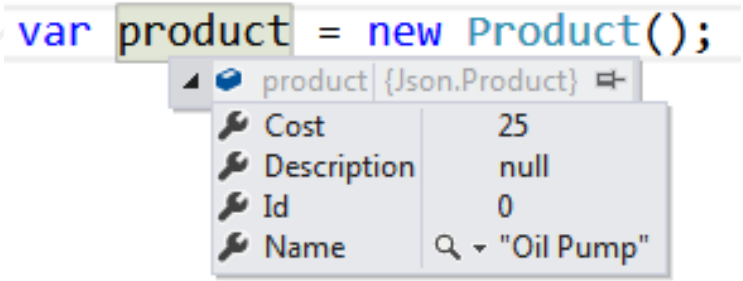
```
{
  "Id":0,
  "Name":"Oil Pump",
  "Description":null,
  "Cost":25
}
```

Deserializing JSON

- DataContractJsonSerializer can deserialize a JSON string:

```
static T DeserializeJson<T>(string jsonString)
{
  var serializer = new DataContractJsonSerializer(typeof(T));
  var jsonStringBytes = Encoding.UTF8.GetBytes(jsonString);
  using (var stream = new MemoryStream(jsonStringBytes))
  {
    var result = (T)serializer.ReadObject(stream);
    return result;
  }
}
```

```
{
  "Id":0,
  "Name":"Oil Pump",
  "Description":null,
  "Cost":25
}
```



JSON.NET

Better JSON Parsing for .NET Developers

What is JSON.NET?

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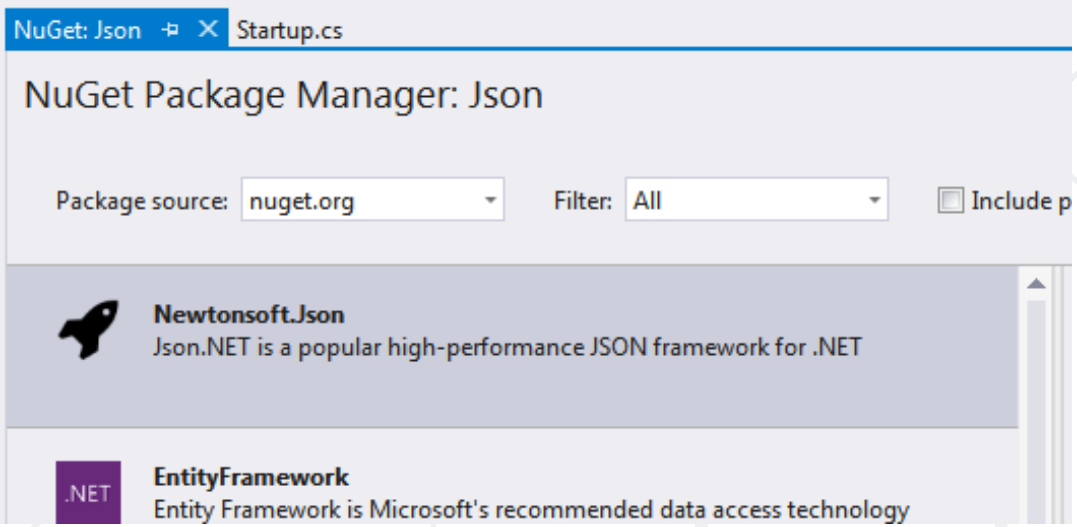
- **JSON.NET** is a JSON **framework** for .NET
  - **More functionality** than built-in functionality
  - Supports **LINQ-to-JSON**
  - Out-of-the-box support for parsing between **JSON** and **XML**
  - Open-source project: **http://www.newtonsoft.com**
  - Json.NET vs .NET Serializers: **https://www.newtonsoft.com/json/help/html/JsonNetVsDotNetSerializers.htm**

Installing JSON.NET

- To install JSON.NET use the **NuGet Package Manager**:



- Or with a command in the Package Manager Console:

```
Install-Package Newtonsoft.Json
```

General Usage

- JSON.NET exposes a static service **JsonConvert**
- Used for parsing and configuration
  - To **Serialize** an object:

```
var jsonProduct = JsonConvert.SerializeObject(product);
```

  - To **Deserialize** an object:

```
var objProduct =
  JsonConvert.DeserializeObject<Product>(jsonProduct);
```

JSON.NET Features

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- JSON.NET can be configured to:
  - **Indent** the output JSON string
  - To convert JSON to **anonymous types**
  - To control the **casing** and **properties** to parse
  - To skip errors
- JSON.NET also supports:
  - LINQ-to-JSON
  - Direct parsing between XML and JSON

Configuring JSON.NET

- By default, the result is a **single line of text**
- To indent the output string use **Formatting.Indented**

```
JsonConvert.SerializeObject(products, Formatting.Indented);
```

```
{
  "pump": {
    "Id": 0,
    "Name": "Oil Pump",
    "Description": null,
    "Cost": 25.0
  },
  "filter": {
    "Id": 0,
    "Name": "Oil Filter",
    "Description": null,
    "Cost": 15.0
  }
}
```

Configuring JSON.NET

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- Deserializing to **anonymous** types:

Incoming JSON

```
var json = @"{ 'firstName': 'Vladimir',
               'lastName': 'Georgiev',
               'jobTitle': 'Technical Trainer' }";
var template = new
{
    FirstName = string.Empty,
    LastName = string.Empty,
    Occupation = string.Empty
};
var person = JsonConvert.DeserializeAnonymousType(json, template);
```

Template objects

JSON.NET Parsing of Objects

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- By default JSON.NET takes each property / field from the class and parses it
  - This can be controlled using attributes:

```
public class User
{
  [JsonProperty("user")]
  public string Username { get; set; }

  [JsonIgnore]
  public string Password { get; set; }
}
```

Parse Username to user

Skip the property

JSON.NET Parsing of Objects

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- By default JSON.NET takes each property / field from the class and parses it
  - This can be controlled using **ContractResolver**:

```
DefaultContractResolver contractResolver = new DefaultContractResolver()
{
    NamingStrategy = new SnakeCaseNamingStrategy()
};

var serialized = JsonConvert.SerializeObject(person, new JsonSerializerSettings()
{
    ContractResolver = contractResolver,
    Formatting = Formatting.Indented
});
```

LINQ-to-JSON

- LINQ-to-JSON works with JObjects
  - Create from JSON string:

```
JObject obj = JObject.Parse(jsonProduct);
```

  - Reading from file:

```
var people = JObject.Parse(File.ReadAllText(@"c:\people.json"))
```

  - Using **JObject**:

```
foreach (JToken person in people)
{
  Console.WriteLine(person["FirstName"]); // Ivan
  Console.WriteLine(person["LastName"]); // Petrov
}
```

LINQ-to-JSON (2)

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- JObjects can be queried with LINQ

```
var json = JObject.Parse(@"{'products': [
  {'name': 'Fruits', 'products': ['apple', 'banana']},
  {'name': 'Vegetables', 'products': ['cucumber']}]}");

var products = json["products"].Select(t =>
  string.Format("{0} ({1})",
    t["name"],
    string.Join(", ", c["products"])
))

// Fruits (apple, banana)
// Vegetables (cucumber)
```

XML-to-JSON

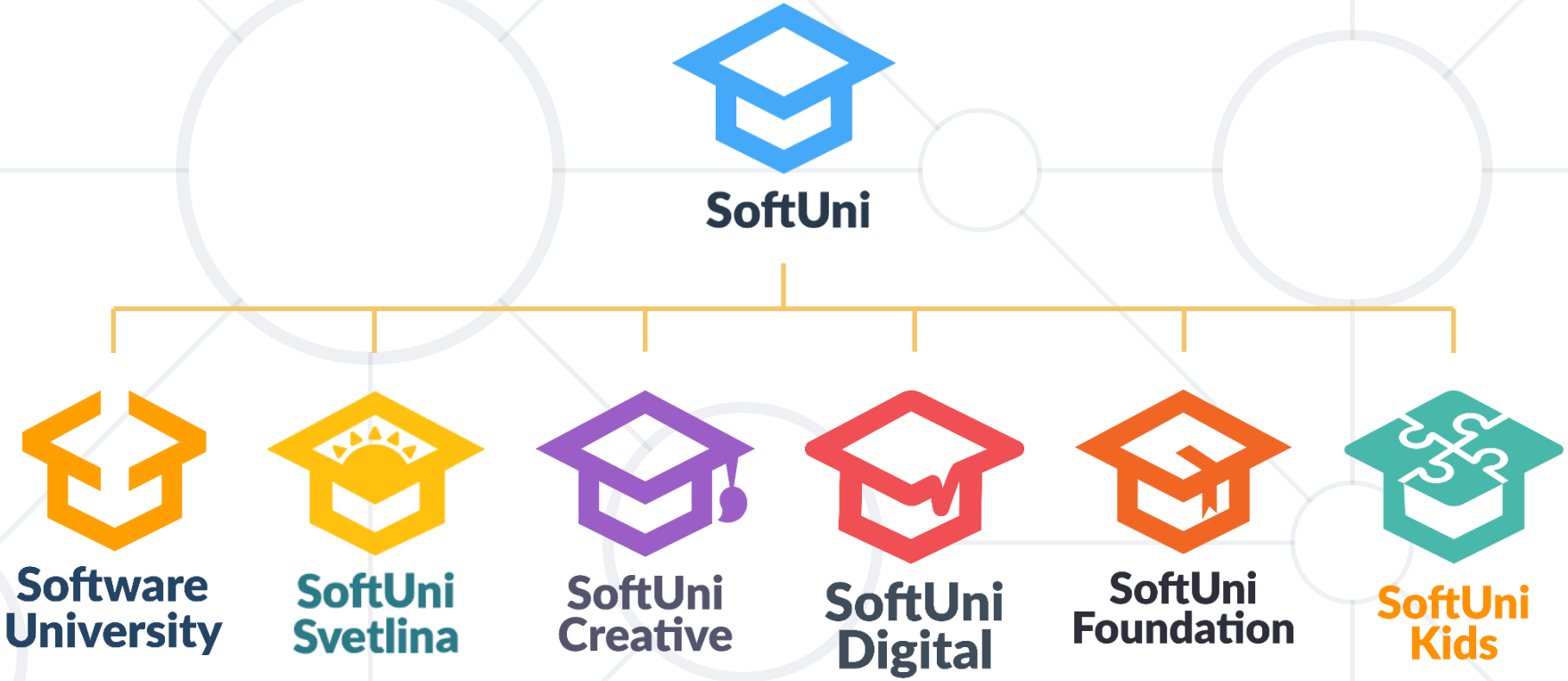
```
string xml = @"<?xml version='1.0' standalone='no'?>
 <root>
    <person id='1'>
        <name>Alan</name>
        <url>www.google.com</url>
    </person>
    <person id='2'>
        <name>Louis</name>
        <url>www.yahoo.com</url>
    </person>
</root>";

XmlDocument doc = new XmlDocument();
doc.LoadXml(xml);
string jsonText = JsonConvert.SerializeXmlNode(doc);
```

```
{
    "?xml": {
    "@version": "1.0",
    "@standalone": "no"
    },
    "root": {
        "person": [
        {
            "@id": "1",
            "name": "Alan",
            "url": "www.google.com"
        },
        {
            "@id": "2",
            "name": "Louis",
            "url": "www.yahoo.com"
        }
        ]
    }
}
```

Summary

- JSON is cross platform data format
- **DataContractJsonSerializer** is the default JSON Parser in C#
- **JSON.NET** is a fast framework for working with JSON data

Questions?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