

XML Processing

Parsing XML

XDocument and LINQ-to-XML



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sli.do

#csharp-db



What is XML?

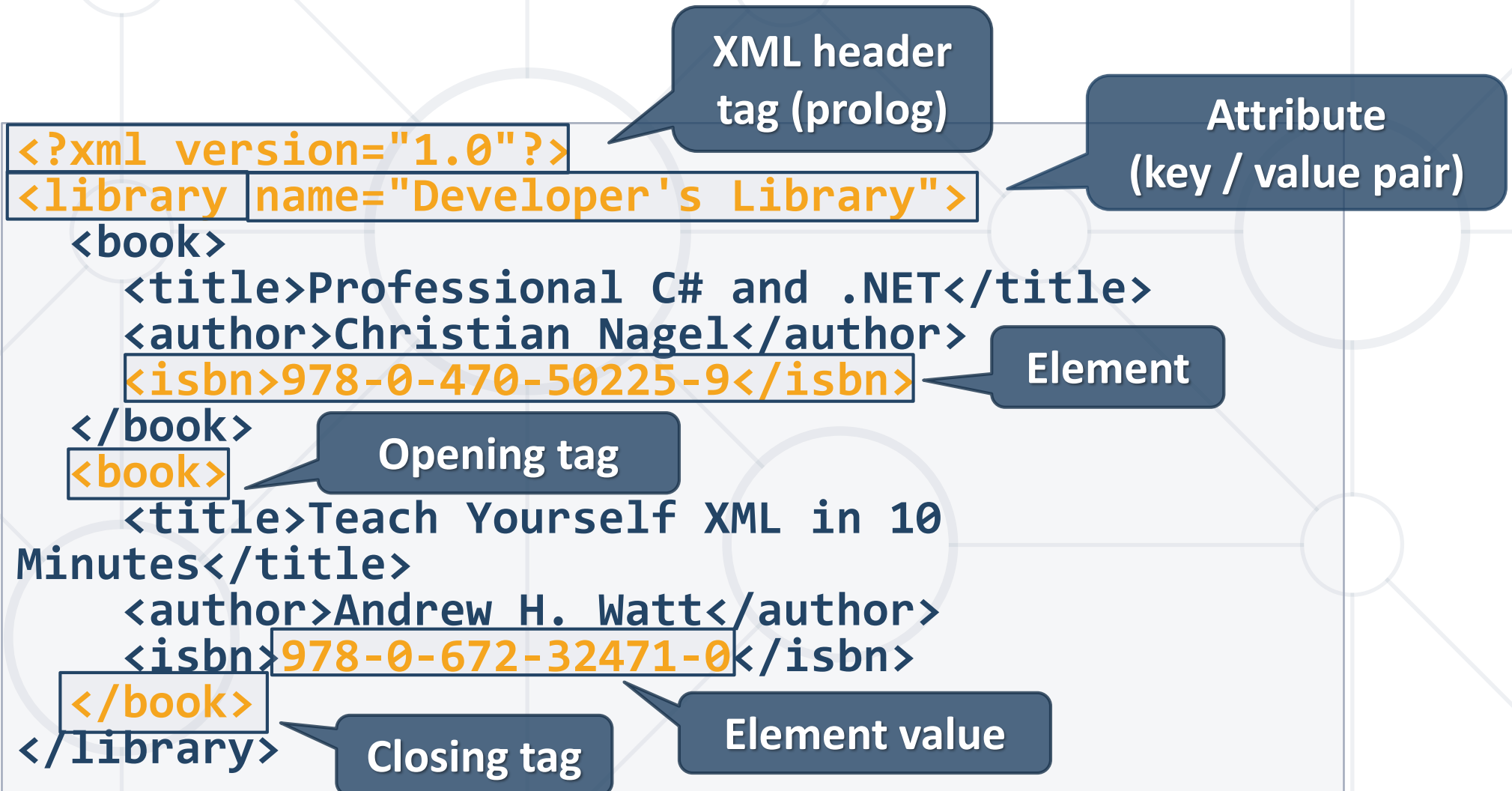
Format Description and Application

What is XML?

- **E**Xtensible **M**arkup **L**anguage
 - **Universal notation** (data format / language) for describing structured data using text with tags
 - Designed to **store** and **transport** data
 - The data is stored together with the **meta-data** about it



XML - Example



- **Header** – defines a **version** and character **encoding**

```
<?xml version="1.0" encoding="UTF-8"?>
```

- **Elements** – define the structure
- **Attributes** – element metadata
- **Values** – actual data, that can also be nested elements

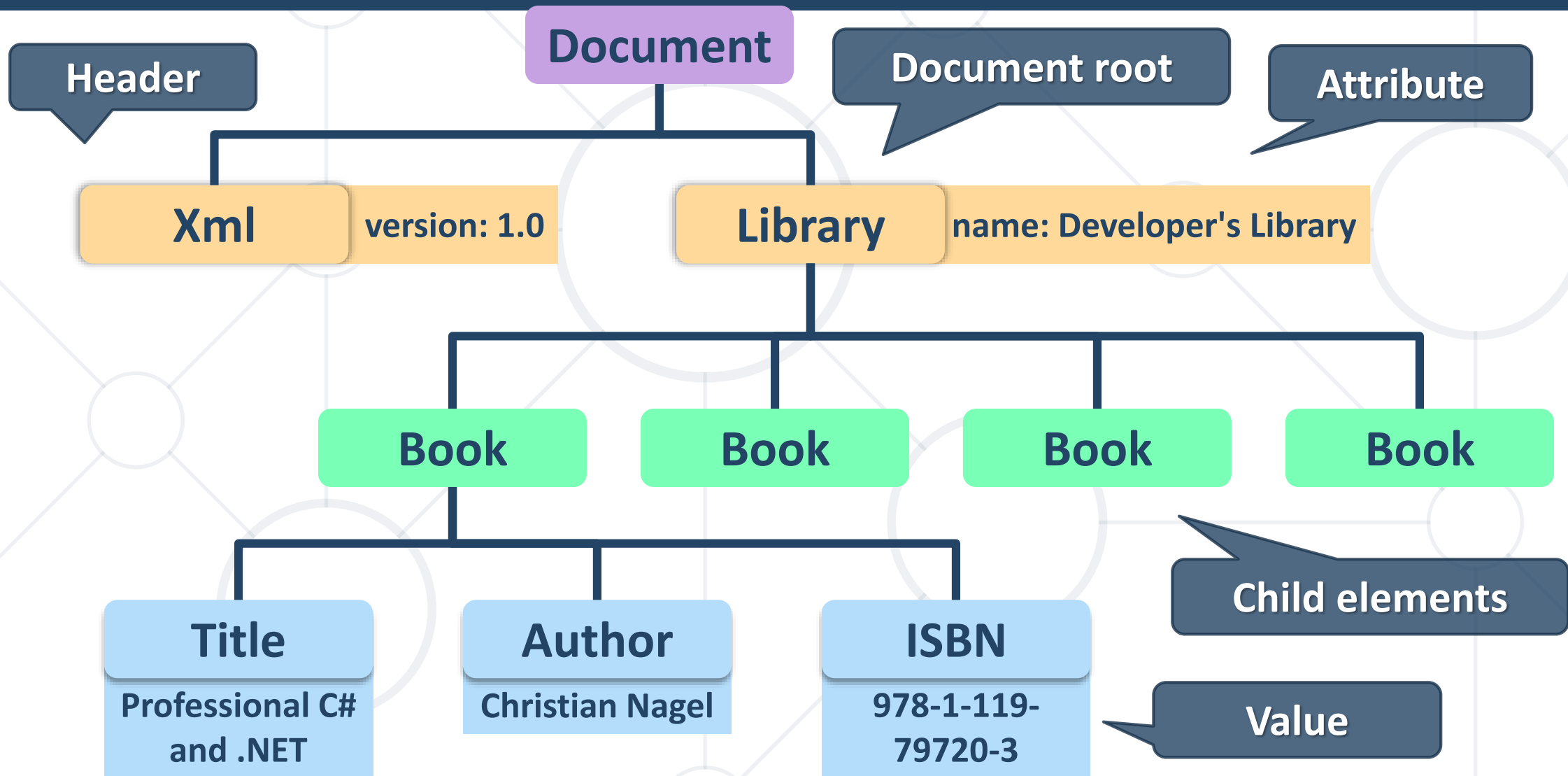
Element name

Attribute

Value

```
<title lang="en">Professional C# and .NET</title>
```

- **Root element** – required to **only** have **one**



■ Similarities

- Both are **text based** notations
- Both use **tags** and **attributes**



■ Differences

- HTML describes documents, XML is a syntax for describing other languages (**meta-language**)
- HTML describes the **layout** and the structure of information
- XML requires the documents to be **well-formatted**

XML: Advantages

- XML is **human-readable** (unlike binary formats)
- Stores any kind of **structured data**
- Data comes with self-describing **meta-data**
- Full Unicode support
- Custom XML-based languages can be designed for certain apps
- **Parsers** available for virtually all languages and platforms



- XML data is **bigger** (takes more space) than binary or JSON
 - More memory consumption, more network traffic, more hard-disk space, more resources, etc.
- **Decreased performance**
 - CPU consumption: need of parsing / constructing the XML tags
- XML is **not** suitable for **all** kinds of **data**
 - E.g., binary data: graphics, images, videos, etc.

■ XML

- XML data is typeless
- All XML data should be string
- Data needs to be parsed
- Supports comments
- Supports various encoding

■ JSON

- JSON object has a type
- JSON types: string, number, array, Boolean
- Data is accessible as JSON objects
- Doesn't support comments
- Supports only UTF-8 encoding





Parsing XML

Using XDocument and LINQ

LINQ-to-XML

- LINQ-to-XML
 - Use the power of **LINQ** to process XML data
 - Easily read, search, write, modify XML documents
- LINQ-to-XML classes
 - **XDocument** – represents a LINQ-enabled XML document (containing prolog, root element, ...)
 - **XElement** – main component holding information
 - **XAttribute** – XML attributes information



- To process an XML string

```
string str = @"<?xml version=""1.0""?>  
<!-- comment at the root level -->  
<Root>  
    <Child>Content</Child>  
</Root>";  
XDocument doc = XDocument.Parse(str);
```

- Loading XML directly from file

```
XDocument xmlDoc = XDocument.Load("../../books.xml");
```

Working with XDocument (1)

Access root element

Get collection of children

```
var cars = xmlDoc.Root.Elements();  
foreach (var car in cars)  
{  
    string make = car.Element("make").Value;  
    string model = car.Element("model").Value;  
    Console.WriteLine($"{make} {model}");  
}
```

Access element by name

Get value

- Set an element value by name
 - If it doesn't exist, it will be **added**
 - If it is set to **null**, it will be **removed**

```
customer.SetElementValue("birth-date", "1990-10-04T00:00:00");
```

- Remove an element from its parent

```
var youngDriver = customer.Element("is-young-driver");  
youngDriver.Remove();
```

- Get or set an element attribute by name

```
customer.Attribute("name").Value
```

- Get a list of all attributes for an element

```
var attrs = customer.Attributes();
```

- Set an attribute value by name

- If it doesn't exist, it will be **added**

- If it is set to **null**, it will be **removed**

```
customer.SetAttributeValue("age", "21");
```

- Searching in XML with LINQ is like searching with LINQ in array

```
XDocument xmlDoc = XDocument.Load("cars.xml");
var cars = xmlDoc.Root.Elements()
    .Where(e => e.Element("make").Value == "Opel" &&
        long.Parse(e.Element("travelled-distance").Value) >= 30000)
    .Select(c => new
    {
        Model = c.Element("model").Value,
        Traveled = c.Element("travelled-distance").Value
    })
    .ToList();
foreach (var car in cars)
    Console.WriteLine(car.Model + " " + car.Traveled);
```

- **XDocuments** can be composed from **XElements** and **XAttributes**

```
<books>
  <book>
    <author>Don Box</author>
    <title lang="en">ASP.NET</title>
  </book>
</books>
```

```
XDocument xmlDoc = new XDocument();
xmlDoc.Add(
  new XElement("books",
    new XElement("book",
      new XElement("author", "Don Box"),
      new XElement("title", "ASP.NET", new XAttribute("lang", "en"))
    )));
```

Add as root

Added with value

Optional attribute

- To flush an **XDocument** to file with default settings

```
xmlDoc.Save("myBooks.xml");
```

- To disable automatic indentation

```
xmlDoc.Save("myBooks.xml", SaveOptions.DisableFormatting);
```

- To serialize **any object** to file

```
var serializer = new XmlSerializer(typeof(ProductDTO));  
using (var writer = new StreamWriter("myProduct.xml");)  
{  
    serializer.Serialize(writer, product);  
}
```

- To **deserialize** an object from an XML string

```
var serializer = new XmlSerializer(typeof(OrderDto[]),  
    new XmlRootAttribute("Orders"));  
  
var deserializedOrders =  
    (OrderDto[])serializer.Deserialize(new StringReader(xmlString));
```

- Specifying **root attribute** name

```
var attr = new XmlRootAttribute("Orders");  
var serializer = new XmlSerializer(typeof(OrderDto[]), attr);  
  
var deserializedOrders =  
    (OrderDto[])serializer.Deserialize(new StringReader(xmlString));
```



XML Attributes

Using Xml Attributes

- We can use several attributes to control serialization to XML
 - `[XmlType("Name")]` – Specifies the type's **name** in XML
 - `[XmlAttribute("name")]` – Serializes as **XML Attribute**
 - `[XmlElement]` – Serialize as **XML Element**
 - `[XmlIgnore]` – **Do not** serialize
 - `[XmlArray]` – Serialize as an **array** of XML elements
 - `[XmlRoot]` – Specifies the **root** element name
 - `[XmlText]` – Serialize **multiple xml elements** on **one line**

XML Attributes: Example

- We can use several XML attributes to control serialization

```
[XmlType("Book")]
public class BookDto
{
    [XmlAttribute("name")]
    public string Name { get; }

    [XmlElement("Author")]
    public string Author { get; }

    [XmlIgnore]
    public decimal Price { get; }
}
```

XML Type name

Not serialized

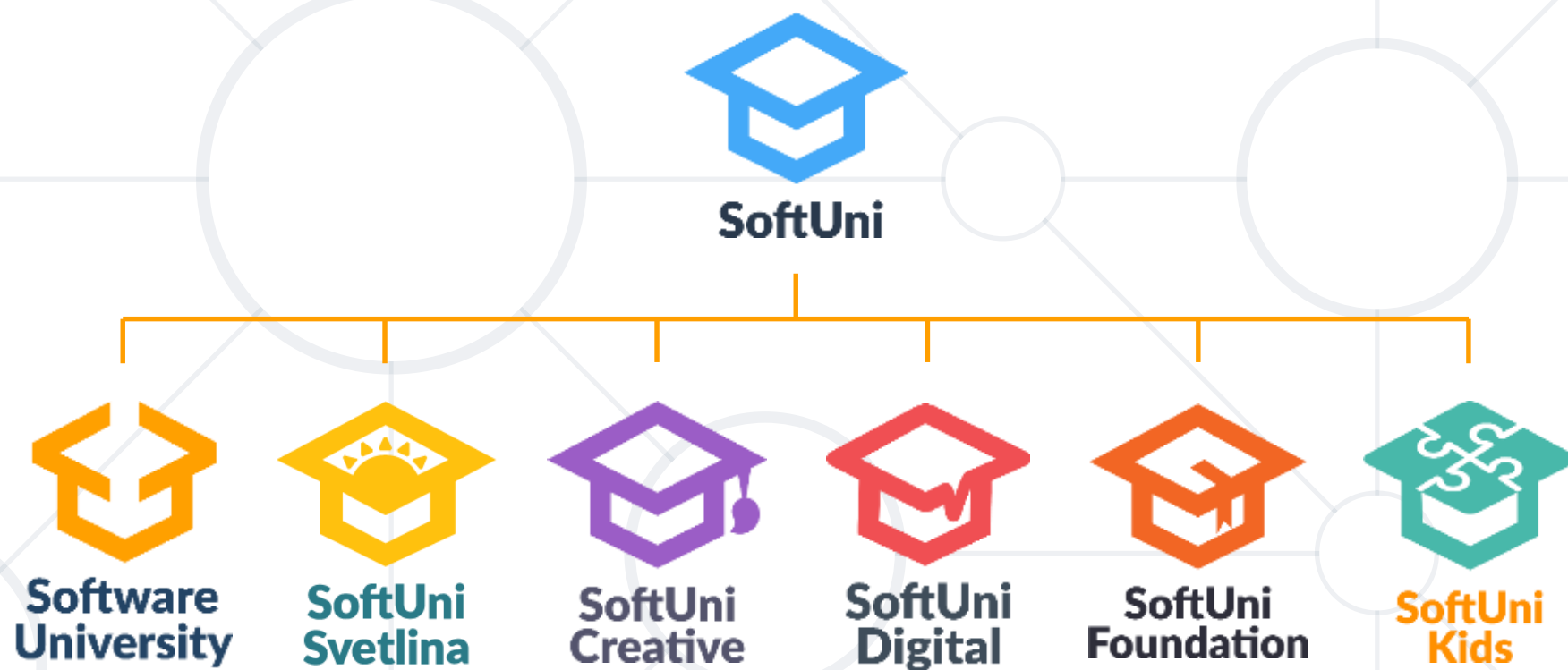


```
<Book name="It">
  <Author>Stephen King</Author>
</Book>
<Book name="Frankenstein">
  <Author>Mary Shelley</Author>
</Book>
<Book name="Queen Lucia">
  <Author>E.F. Benson</Author>
</Book>
<Book name="Paper Towns">
  <Author>John Green</Author>
</Book>
```

- **XDocument** is a system object for working with XML in .NET, which supports LINQ
- XML can be read and saved **directly to file**
- **XML** can be serialized to and from **class**
- **XML Attributes** are easy way to describe the **XML file**



Questions?



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