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using System;

using System.Collections.Generic;

using System.IO;

using System.Linq;

using System.Text;

using System.Text.Json;

using System.Threading.Tasks;

using System.Xml.Serialization;

namespace Atom

{

public class Atom

{

//Atributes

public string Name { get; set; }

public string Symbol { get; set; }

public int Proton { get; set; }

public int Neutron { get; set; }

public double Weight { get; set; }

//Constructors

public Atom() { }

public Atom(string name, int proton, int neutron, double weight, string symbol)

{

Name = name;

Proton = proton;

Neutron = neutron;

Weight = weight;

Symbol = symbol;

}

//Methods

public static Atom Parse(string objectData)

{

string[] data = objectData.Split(' ');

string name = data[0];

int proton = Convert.ToInt32(data[1]);

int neutron = Convert.ToInt32(data[2]);

double weight = Convert.ToDouble(data[3]);

string symbol = data[4];

return new Atom(name, proton, neutron, weight, symbol);

}

public static List<Atom> GetAtoms()

{

List<Atom> elements = new List<Atom>();

elements.Add(Atom.Parse("Hydrogen 1 0 1.0079 H"));

elements.Add(Atom.Parse("Helium 2 2 4.0026 He")); ;

elements.Add(Atom.Parse("Lithium 3 4 6.941 Li")); ;

elements.Add(Atom.Parse("Beryllium 4 5 9.0122 Be"));

elements.Add(Atom.Parse("Boron 5 6 10.811 B"));

elements.Add(Atom.Parse("Carbon 6 6 12.0107 C"));

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elements.Add(Atom.Parse("Cerium 58 82 140.116 Ce"));

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elements.Add(Atom.Parse("Neodymium 60 84 144.24 Nd"));

elements.Add(Atom.Parse("Promethium 61 84 145 Pm"));

elements.Add(Atom.Parse("Samarium 62 88 150.36 Sm"));

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elements.Add(Atom.Parse("Dysprosium 66 97 162.5 Dy"));

elements.Add(Atom.Parse("Holmium 67 98 164.9303 Ho"));

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elements.Add(Atom.Parse("Lutetium 71 104 174.967 Lu"));

elements.Add(Atom.Parse("Hafnium 72 106 178.49 Hf"));

elements.Add(Atom.Parse("Tantalum 73 108 180.9479 Ta"));

elements.Add(Atom.Parse("Tungsten 74 110 183.84 W"));

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elements.Add(Atom.Parse("Osmium 76 114 190.23 Os"));

elements.Add(Atom.Parse("Iridium 77 115 192.217 Ir"));

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elements.Add(Atom.Parse("Neptunium 93 144 237 Np"));

elements.Add(Atom.Parse("Uranium 92 146 238.0289 U"));

elements.Add(Atom.Parse("Americium 95 148 243 Am"));

elements.Add(Atom.Parse("Plutonium 94 150 244 Pu"));

elements.Add(Atom.Parse("Curium 96 151 247 Cm"));

elements.Add(Atom.Parse("Berkelium 97 150 247 Bk"));

elements.Add(Atom.Parse("Californium 98 153 251 Cf"));

elements.Add(Atom.Parse("Einsteinium 99 153 252 Es"));

elements.Add(Atom.Parse("Fermium 100 157 257 Fm"));

elements.Add(Atom.Parse("Mendelevium 101 157 258 Md"));

elements.Add(Atom.Parse("Nobelium 102 157 259 No"));

elements.Add(Atom.Parse("Rutherfordium 104 157 261 Rf"));

elements.Add(Atom.Parse("Lawrencium 103 159 262 Lr"));

elements.Add(Atom.Parse("Dubnium 105 157 262 Db"));

elements.Add(Atom.Parse("Bohrium 107 157 264 Bh"));

elements.Add(Atom.Parse("Seaborgium 106 160 266 Sg"));

elements.Add(Atom.Parse("Meitnerium 109 159 268 Mt"));

elements.Add(Atom.Parse("Roentgenium 111 161 272 Rg"));

elements.Add(Atom.Parse("Hassium 108 169 277 Hs"));

return elements;

}

public static void WriteXml(List<Atom> atoms, string filename)

{

Atom firstAtom = atoms[0];

XmlSerializer serializer = new XmlSerializer(typeof(Atom));

TextWriter writer = new StreamWriter(filename);

serializer.Serialize(writer, firstAtom);

}

public static void ReadXml(string filename)

{

XmlSerializer serializer = new XmlSerializer(typeof(Atom));

TextReader reader = new StreamReader(filename);

List<Atom> elements = (List<Atom>)serializer.Deserialize(reader);

}

public static void WriteFirstAtomJson(Atom atom, string filename)

{

File.WriteAllText(filename, JsonSerializer.Serialize(atom));

}

public static void ReadFirstAtomJson(string filename)

{

TextReader reader = new StreamReader(filename);

Atom atom = JsonSerializer.Deserialize<Atom>(reader.ReadToEnd());

Console.WriteLine(atom);

}

public static void WriteJson(List<Atom> atoms, string filename)

{

//TextWriter writer = new StreamWriter(filename);

File.WriteAllText(filename, JsonSerializer.Serialize(atoms));

}

public static void ReadJson(string filename)

{

TextReader reader = new StreamReader(filename);

List<Atom> atomList = JsonSerializer.Deserialize<List<Atom>>(reader.ReadToEnd());

Atom.DisplayElements(atomList);

}

public static void DisplayElements(List<Atom> listAtoms)

{

foreach (Atom atom in listAtoms)

{

Console.WriteLine(atom.ToString());

}

}

public override string ToString()

{

return $"{Symbol} \n {Name} \n P: {Proton} - N: {Neutron} - W: {Weight}\n";

}

}

internal class Program

{

static void Main(string[] args)

{

Atom.DisplayElements(Atom.GetAtoms());

Atom.WriteJson(Atom.GetAtoms(),"Atoms\_list\_file.json");

Atom.ReadJson("Atoms\_list\_file.json");

Atom.WriteXml(Atom.GetAtoms(), "First\_atom.xml");

Atom.WriteFirstAtomJson(Atom.GetAtoms()[0], "First\_Atom.json");

Atom.ReadFirstAtomJson("First\_Atom.json");

}

}

}

This exercise you will be persisting data by writing text to file and serialization to and deserialization using JSON.

# You must follow the specifications exactly (to demo to instructor)

# The Atom class

This is the front end of the application. There are 12 members.

|  |
| --- |
| Atom  Class |
| Fields |
|  |
| Properties |
| **+** «c# property, set» Name : **string**  **+** «c# property, set» Symbol : **string**  **+** «c# property, set» Proton : **int**  **+** «c# property, set» Neutron : **int**  **+** «c# property, set» Weight : **double** |
| Methods |
| **+** «c# constructor» Atom()  **+** «c# constructor» Atom(  **string** name,   **int** proton,   **int** neutron,   **double** weight,   **string** symbol)  **$+** Parse(**string** objectData) : Atom  **$+** GetAtoms() : List<Atom>  **+** ToString() : **double** |

#### Description of class members

##### Fields:

There are no fields in this class.

##### Properties:

All the properties have public get and set

**Name** – this is a string representing the name of this atom. Both the getter and setter are public.

**Symbol** – this is a two-letter string representing the name of this atom that is used in chemistry. Both the getter and setter are public.

**Proton** – this is an int representing the number of protons in the nucleus of this atom. Both the getter and setter are public.

**Neutron** – this is a int representing the number of neutrons in the nucleus of this atom. Both the getter and setter are public.

**Weight** – this is a double representing the atomic weight of this atom. Both the getter and setter are public.

##### Constructor:

There are two constructors for this class: a default one and a user defined one

**public** **Atom()** – This is a default constructor that is necessary for serialization. This is an empty constructor that does not do anything.

**public** **Atom**(**string** name, **int** proton, **int** neutron, **double** weight, **string** symbol) – This constructor assigns the arguments to the appropriate fields.

##### Methods

**public static Atom Parse(string line)** – This is a public class method that takes a string and returns an Atom object. The argument is one string that is comprised of the five fields of this object. It does the following:

* It uses the Split() method to parse the argument into five parts.

If you do not have five parts, the correct thing to do is throw an exception.

* Create an Atom object and initialize the fields with the appropriate parts.
* Return the above object

You will need to examine the arguments to decide what part will be assign to which field.

**public override string ToString()** – This is a public method overrides the corresponding method in the object class to return a stringify form of the object.

### Test Harness

Insert the following code statements in your Program.cs file:

Write create two methods that will be called from Main. The first method will serialize a collection of atoms to a file and the second will deserialized the contents of a file to a list of atom.

**static void WriteJson(**List<Atom> **atoms, string filename)** – This void class method that takes the list of atoms and a filename. You will write the necessary code to serialize the first argument to the specified file.

**static void ReadJson(string filename)** – This void class method that takes a filename. You will write the necessary code to deserialize the file contents to a List<Atom> and then display all atoms.

Appendix

Code for the GetAtoms method of the Atom class

public static List<Atom> GetAtoms()

{

List< Atom > elements = new List< Atom >();

elements.Add(Atom.Parse("Hydrogen 1 0 1.0079 H"));

elements.Add(Atom.Parse("Helium 2 2 4.0026 He")); ;

elements.Add(Atom.Parse("Lithium 3 4 6.941 Li")); ;

elements.Add(Atom.Parse("Beryllium 4 5 9.0122 Be"));

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elements.Add(Atom.Parse("Potassium 19 20 39.0983 K"));

elements.Add(Atom.Parse("Argon 18 22 39.948 Ar"));

elements.Add(Atom.Parse("Calcium 20 20 40.078 Ca"));

elements.Add(Atom.Parse("Scandium 21 24 44.9559 Sc"));

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elements.Add(Atom.Parse("Chromium 24 28 51.9961 Cr"));

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elements.Add(Atom.Parse("Cobalt 27 32 58.9332 Co"));

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elements.Add(Atom.Parse("Meitnerium 109 159 268 Mt"));

elements.Add(Atom.Parse("Roentgenium 111 161 272 Rg"));

elements.Add(Atom.Parse("Hassium 108 169 277 Hs"));

return elements;

}

Create static methods that does the following and then called them from your main

//Create class methods to do the following:

//1 - Display all the items in the collection elements

//2 - Serialize the first item using xml format and save to a suitable file

//3 - Read the above file and display the item

//4 - Serialize the first item using JSON format and save to a suitable file

Reminder: To gain access to the **JavaScriptSerializer** class, you must add a reference to the **System.Web.Extension.dll** library and to simplify access you need to insert a using statement.

//5 - Read the above file and display the item

//6 - Serialize the entire collection using JSON format and save to a suitable file

//7 - Read the above file and display all the items