

# LinksPlatform's Platform.Unsafe Class Library

## 1.1 ./csharp/Platform.Unsafe/ByteArrayExtensions.cs

```
1 using Platform.Exceptions;
2 using Platform.Collections;
3 using System.Runtime.CompilerServices;
4 using static System.Runtime.CompilerServices.Unsafe;
5
6 #pragma warning disable CS1591 // Missing XML comment for publicly visible type or member
7
8 namespace Platform.Unsafe
9 {
10     /// <summary>
11     /// <para>
12     /// Represents the byte array extensions.
13     /// </para>
14     /// <para></para>
15     /// </summary>
16     public unsafe static class ByteArrayExtensions
17     {
18         /// <summary>
19         /// <para>
20         /// Returns the structure using the specified bytes.
21         /// </para>
22         /// <para></para>
23         /// </summary>
24         /// <typeparam name="TStruct">
25         /// <para>The struct.</para>
26         /// <para></para>
27         /// </typeparam>
28         /// <param name="bytes">
29         /// <para>The bytes.</para>
30         /// <para></para>
31         /// </param>
32         /// <returns>
33         /// <para>The structure.</para>
34         /// <para></para>
35         /// </returns>
36         [MethodImpl(MethodImplOptions.AggressiveInlining)]
37         public static TStruct ToStructure<TStruct>(this byte[] bytes)
38             where TStruct : struct
39         {
40             Ensure.OnDebug.ArgumentNotEmpty(bytes, nameof(bytes));
41             Ensure.OnDebug.ArgumentMeetsCriteria(bytes, HasSameSizeAs<TStruct>, nameof(bytes),
42                 ↪ "Bytes array should be the same length as struct size.");
43             TStruct structure = default;
44             fixed (byte* pointer = bytes)
45             {
46                 Copy(ref structure, pointer);
47             }
48             return structure;
49         }
50         [MethodImpl(MethodImplOptions.AggressiveInlining)]
51         private static bool HasSameSizeAs<TStruct>(byte[] array) where TStruct : struct =>
52             ↪ array.Length == Structure<TStruct>.Size;
53     }
54 }
```

## 1.2 ./csharp/Platform.Unsafe/IntPtrExtensions.cs

```
1 using System;
2 using System.Runtime.CompilerServices;
3 using static System.Runtime.CompilerServices.Unsafe;
4
5 #pragma warning disable CS1591 // Missing XML comment for publicly visible type or member
6
7 namespace Platform.Unsafe
8 {
9     /// <summary>
10     /// <para>
11     /// Represents the int ptr extensions.
12     /// </para>
13     /// <para></para>
14     /// </summary>
15     public unsafe static class IntPtrExtensions
16     {
17         /// <summary>
18         /// <para>
19         /// Writes the element value using the specified pointer.
20         /// </para>
21         /// <para></para>
```

```

22     /// </summary>
23     /// <typeparam name="TValue">
24     /// <para>The value.</para>
25     /// <para></para>
26     /// </typeparam>
27     /// <param name="pointer">
28     /// <para>The pointer.</para>
29     /// <para></para>
30     /// </param>
31     /// <param name="index">
32     /// <para>The index.</para>
33     /// <para></para>
34     /// </param>
35     /// <param name="value">
36     /// <para>The value.</para>
37     /// <para></para>
38     /// </param>
39     [MethodImpl(MethodImplOptions.AggressiveInlining)]
40     public static void WriteElementValue<TValue>(this IntPtr pointer, long index, TValue
        ↪ value) => Write((byte*)pointer + (SizeOf<TValue>() * index), value);
41
42     /// <summary>
43     /// <para>
44     /// Reads the element value using the specified pointer.
45     /// </para>
46     /// <para></para>
47     /// </summary>
48     /// <typeparam name="TValue">
49     /// <para>The value.</para>
50     /// <para></para>
51     /// </typeparam>
52     /// <param name="pointer">
53     /// <para>The pointer.</para>
54     /// <para></para>
55     /// </param>
56     /// <param name="index">
57     /// <para>The index.</para>
58     /// <para></para>
59     /// </param>
60     /// <returns>
61     /// <para>The value</para>
62     /// <para></para>
63     /// </returns>
64     [MethodImpl(MethodImplOptions.AggressiveInlining)]
65     public static TValue ReadElementValue<TValue>(this IntPtr pointer, long index) =>
        ↪ Read<TValue>((byte*)pointer + (SizeOf<TValue>() * index));
66 }
67 }

```

### 1.3 ./csharp/Platform.Unsafe/MemoryBlock.cs

```

1  using System;
2  using System.Collections.Concurrent;
3  using System.Runtime.CompilerServices;
4  using System.Threading.Tasks;
5  using static System.Runtime.CompilerServices.Unsafe;
6
7  #pragma warning disable CS1591 // Missing XML comment for publicly visible type or member
8
9  namespace Platform.Unsafe
10 {
11     /// <summary>
12     /// <para>
13     /// Represents the memory block.
14     /// </para>
15     /// <para></para>
16     /// </summary>
17     public static unsafe class MemoryBlock
18     {
19         /// <summary>
20         /// <para>
21         /// Zeroes the pointer.
22         /// </para>
23         /// <para></para>
24         /// </summary>
25         /// <param name="pointer">
26         /// <para>The pointer.</para>
27         /// <para></para>
28         /// </param>

```

```

29     /// <param name="capacity">
30     /// <para>The capacity.</para>
31     /// <para></para>
32     /// </param>
33     [MethodImpl(MethodImplOptions.AggressiveInlining)]
34     public static void Zero(void* pointer, long capacity)
35     {
36         // A way to prevent wasting resources due to Hyper-Threading.
37         var threads = Environment.ProcessorCount / 2;
38         if (threads <= 1)
39         {
40             ZeroBlock(pointer, 0, capacity);
41         }
42         else
43         {
44             // Using 2 threads because two-channel memory architecture is the most available
45             // ↪ type.
46             // CPUs mostly just wait for memory here.
47             threads = 2;
48             Parallel.ForEach(Partitioner.Create(OL, capacity), new ParallelOptions {
49                 ↪ MaxDegreeOfParallelism = threads }, range => ZeroBlock(pointer, range.Item1,
50                 ↪ range.Item2));
51         }
52     }
53     [MethodImpl(MethodImplOptions.AggressiveInlining)]
54     private static void ZeroBlock(void* pointer, long from, long to)
55     {
56         var offset = (byte*)pointer + from;
57         var length = to - from;
58         var uintMaxValue = uint.MaxValue;
59         while (length > uintMaxValue)
60         {
61             InitBlock(offset, 0, uintMaxValue);
62             length -= uintMaxValue;
63             offset += uintMaxValue;
64         }
65         InitBlock(offset, 0, unchecked((uint)length));
66     }
67 }

```

#### 1.4 ./csharp/Platform.Unsafe/Structure.cs

```

1  using System;
2  using System.Runtime.CompilerServices;
3  using System.Runtime.InteropServices;
4  using static System.Runtime.CompilerServices.Unsafe;
5
6  #pragma warning disable CS1591 // Missing XML comment for publicly visible type or member
7
8  namespace Platform.Unsafe
9  {
10     /// <summary>
11     /// <para>
12     /// Represents the structure.
13     /// </para>
14     /// <para></para>
15     /// </summary>
16     public static class Structure<TStruct>
17         where TStruct : struct
18     {
19         /// <summary>
20         /// <para>
21         /// Returns the size of an unmanaged type in bytes.
22         /// This property do this without throwing exceptions for generic types as <see
23         /// ↪ cref="Marshal.SizeOf{T}()" /> and <see cref="Marshal.SizeOf(Type)" /> do.
24         /// </para>
25         /// <para>
26         /// Возвращает размер неуправляемого типа в байтах.
27         /// Этот свойство делает это без выбрасывания исключений для универсальных типов, как
28         /// ↪ это делают <see cref="Marshal.SizeOf{T}()" /> и <see cref="Marshal.SizeOf(Type)" />.
29         /// </para>
30         /// </summary>
31         public static int Size
32         {
33             [MethodImpl(MethodImplOptions.AggressiveInlining)]
34             get;
35         } = SizeOf<TStruct>();
36     }
37 }

```

### 1.5 ./csharp/Platform.Unsafe/StructureExtensions.cs

```
1 using System.Runtime.CompilerServices;
2 using static System.Runtime.CompilerServices.Unsafe;
3
4 #pragma warning disable CS1591 // Missing XML comment for publicly visible type or member
5
6 namespace Platform.Unsafe
7 {
8     /// <summary>
9     /// <para>Represents a set of extension methods for structs.</para>
10    /// <para>Представляет набор методов расширения для структур.</para>
11    /// </summary>
12    public unsafe static class StructureExtensions
13    {
14        /// <summary>
15        /// <para>this process does something</para>
16        /// <para>этот процесс что-то делает</para>
17        /// </summary>
18        [MethodImpl(MethodImplOptions.AggressiveInlining)]
19        public static byte[] ToBytes<TStruct>(this ref TStruct obj)
20            where TStruct : struct
21        {
22            var bytes = new byte[Structure<TStruct>.Size];
23            fixed (byte* pointer = bytes)
24            {
25                Copy(pointer, ref obj);
26            }
27            return bytes;
28        }
29    }
30 }
```

### 1.6 ./csharp/Platform.Unsafe.Tests/IntPtrExtensionsTests.cs

```
1 using System;
2 using System.Runtime.InteropServices;
3 using Xunit;
4 using static System.Runtime.CompilerServices.Unsafe;
5
6 namespace Platform.Unsafe.Tests
7 {
8     /// <summary>
9     /// <para>
10    /// Represents the int ptr extensions tests.
11    /// </para>
12    /// <para></para>
13    /// </summary>
14    public unsafe class IntPtrExtensionsTests
15    {
16        /// <summary>
17        /// <para>
18        /// Tests that read and write operations for pointer values unsafe class methods test.
19        /// </para>
20        /// <para></para>
21        /// </summary>
22        [Fact]
23        public void ReadAndWriteOperationsForPointerValuesUnsafeClassMethodsTest()
24        {
25            void* pointer = (void*)Marshal.AllocHGlobal(sizeof(ulong));
26            Write(pointer, 42UL);
27            Assert.Equal(42UL, Read<ulong>(pointer));
28            Marshal.FreeHGlobal((IntPtr)pointer);
29        }
30
31        /// <summary>
32        /// <para>
33        /// Tests that element offset operations for pointer values test.
34        /// </para>
35        /// <para></para>
36        /// </summary>
37        [Fact]
38        public void ElementOffsetOperationsForPointerValuesTest()
39        {
40            void* pointer = (void*)Marshal.AllocHGlobal(sizeof(ulong) * 10);
41            ulong result = (ulong)Add<ulong>(pointer, 5);
42            Assert.Equal(5UL * 8UL, result - (ulong)pointer);
43            Marshal.FreeHGlobal((IntPtr)pointer);
44        }
45    }
46 }
```

## 1.7 ./csharp/Platform.Unsafe.Tests/SizeOfTests.cs

```

1 using System.Runtime.InteropServices;
2 using Xunit;
3
4 namespace Platform.Unsafe.Tests
5 {
6     /// <summary>
7     /// <para>
8     /// Represents the size of tests.
9     /// </para>
10    /// <para></para>
11    /// </summary>
12    public static class SizeOfTests
13    {
14        /// <summary>
15        /// <para>
16        /// The .
17        /// </para>
18        /// <para></para>
19        /// </summary>
20        public struct X<T>
21        {
22            /// <summary>
23            /// <para>
24            /// The .
25            /// </para>
26            /// <para></para>
27            /// </summary>
28            public readonly T F1;
29            /// <summary>
30            /// <para>
31            /// The .
32            /// </para>
33            /// <para></para>
34            /// </summary>
35            public readonly T F2;
36        }
37
38        /// <summary>
39        /// <para>
40        /// Tests that unsafe class size of test.
41        /// </para>
42        /// <para></para>
43        /// </summary>
44        [Fact]
45        public static void UnsafeClassSizeOfTest()
46        {
47            var size = System.Runtime.CompilerServices.Unsafe.SizeOf<X<int>>();
48            Assert.Equal(8, size);
49        }
50
51        /// <summary>
52        /// <para>
53        /// Tests that marshal size of test.
54        /// </para>
55        /// <para></para>
56        /// </summary>
57        [Fact]
58        public static void MarshalSizeOfTest()
59        {
60            var size = Marshal.SizeOf(default(X<int>));
61            Assert.Equal(8, size);
62        }
63
64        /// <summary>
65        /// <para>
66        /// Tests that structure property test.
67        /// </para>
68        /// <para></para>
69        /// </summary>
70        [Fact]
71        public static void StructurePropertyTest()
72        {
73            var size = Structure<X<int>>.Size;
74            Assert.Equal(8, size);
75        }
76    }
77 }

```

## 1.8 ./csharp/Platform.Unsafe.Tests/StructAndBytesConversionTests.cs

```
1 using Xunit;
2
3 namespace Platform.Unsafe.Tests
4 {
5     /// <summary>
6     /// <para>
7     /// Represents the struct and bytes conversion tests.
8     /// </para>
9     /// <para></para>
10    /// </summary>
11    public static class StructAndBytesConversionTests
12    {
13        /// <summary>
14        /// <para>
15        /// Tests that struct to bytes test.
16        /// </para>
17        /// <para></para>
18        /// </summary>
19        [Fact]
20        public static void StructToBytesTest()
21        {
22            ulong source = ulong.MaxValue;
23            var result = source.ToBytes();
24            for (int i = 0; i < result.Length; i++)
25            {
26                Assert.Equal(byte.MaxValue, result[i]);
27            }
28        }
29
30        /// <summary>
31        /// <para>
32        /// Tests that bytes to struct test.
33        /// </para>
34        /// <para></para>
35        /// </summary>
36        [Fact]
37        public static void BytesToStructTest()
38        {
39            byte[] bytes = new[] { byte.MaxValue, byte.MaxValue, byte.MaxValue, byte.MaxValue,
40                ↪ byte.MaxValue, byte.MaxValue, byte.MaxValue, byte.MaxValue };
41            ulong result = bytes.ToStructure<ulong>();
42            Assert.Equal(ulong.MaxValue, result);
43        }
44    }
```

## 1.9 ./csharp/Platform.Unsafe.Tests/ZeroMemoryTests.cs

```
1 using Xunit;
2
3 namespace Platform.Unsafe.Tests
4 {
5     /// <summary>
6     /// <para>
7     /// Represents the zero memory tests.
8     /// </para>
9     /// <para></para>
10    /// </summary>
11    public static unsafe class ZeroMemoryTests
12    {
13        /// <summary>
14        /// <para>
15        /// Tests that zero memory test.
16        /// </para>
17        /// <para></para>
18        /// </summary>
19        [Fact]
20        public static void ZeroMemoryTest()
21        {
22            var bytes = new byte[1024];
23            for (int i = 0; i < bytes.Length; i++)
24            {
25                bytes[i] = unchecked((byte)i);
26            }
27            fixed (byte* pointer = bytes)
28            {
29                MemoryBlock.Zero(pointer, bytes.Length);
30            }
31        }
32    }
```

```
31         for (int i = 0; i < bytes.Length; i++)
32         {
33             Assert.Equal(0, bytes[i]);
34         }
35     }
36 }
37 }
```

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