1.1 ./csharp/Platform.Converters/CachingConverterDecorator.cs

```
using System.Collections.Generic;
using System.Runtime.CompilerServices;
using Platform.Collections;

#pragma warning disable CS1591 // Missing XML comment for publicly visible type or member

namespace Platform.Converters
{
    public class CachingConverterDecorator<TSource, TTarget> : IConverter<TSource, TTarget>
    {
        private readonly IConverter<TSource, TTarget> _baseConverter;
        private readonly IDictionary<TSource, TTarget> _cache;

        [MethodImpl(MethodImplOptions.AggressiveInlining)]
        public CachingConverterDecorator(IConverter<TSource, TTarget> baseConverter,
        ↪  IDictionary<TSource, TTarget> cache) => (_baseConverter, _cache) = (baseConverter,
        ↪  cache);

        [MethodImpl(MethodImplOptions.AggressiveInlining)]
        public CachingConverterDecorator(IConverter<TSource, TTarget> baseConverter) :
        ↪  this(baseConverter, new Dictionary<TSource, TTarget>()) { }

        [MethodImpl(MethodImplOptions.AggressiveInlining)]
        public TTarget Convert(TSource source) => _cache.GetOrAdd(source,
        ↪  _baseConverter.Convert);
    }
}
```

1.2 ./csharp/Platform.Converters/CheckedConverter.cs

```
using System;
using System.Runtime.CompilerServices;
using Platform.Reflection;

#pragma warning disable CS1591 // Missing XML comment for publicly visible type or member

namespace Platform.Converters
{
    public abstract class CheckedConverter<TSource, TTarget> : ConverterBase<TSource, TTarget>
    {
        public static CheckedConverter<TSource, TTarget> Default
        {
            [MethodImpl(MethodImplOptions.AggressiveInlining)]
            get;
        } = CompileCheckedConverter();

        [MethodImpl(MethodImplOptions.AggressiveInlining)]
        private static CheckedConverter<TSource, TTarget> CompileCheckedConverter()
        {
            var type = CreateTypeInheritedFrom<CheckedConverter<TSource, TTarget>>();
            EmitConvertMethod(type, il => il.CheckedConvert<TSource, TTarget>());
            return (CheckedConverter<TSource,
            ↪  TTarget>)Activator.CreateInstance(type.CreateTypeInfo());
        }
    }
}
```

1.3 ./csharp/Platform.Converters/ConverterBase.cs

```
using System;
using System.Reflection;
using System.Reflection.Emit;
using System.Runtime.CompilerServices;
using Platform.Reflection;

#pragma warning disable CS1591 // Missing XML comment for publicly visible type or member

namespace Platform.Converters
{
    /// <summary>
    /// <para>Represents a base implementation for IConverter interface with the basic logic
    ↪  necessary for value converter from the <typeparamref name="TSource"/> type to the
    ↪  <typeparamref name="TTarget"/> type.</para>
    /// <para>Представляет базовую реализацию для интерфейса IConverter с основной логикой
    ↪  необходимой для конвертера значений из типа <typeparamref name="TSource"/> в тип
    ↪  <typeparamref name="TTarget"/>.</para>
    /// </summary>
    /// <typeparam name="TSource"><para>Source type of conversion.</para><para>Исходный тип
    ↪  конверсии.</para></typeparam>
```

```
16      /// <typeparam name="TTarget"><para>Target type of conversion.</para><para>Целевой тип
        ↪  конверсии.</para></typeparam>
17      public abstract class ConverterBase<TSource, TTarget> : IConverter<TSource, TTarget>
18      {
19          /// <summary>
20          /// <para>Converts the value of the <typeparamref name="TSource"/> type to the value of
            ↪  the <typeparamref name="TTarget"/> type.</para>
21          /// <para>Конвертирует значение типа <typeparamref name="TSource"/> в значение типа
            ↪  <typeparamref name="TTarget"/>.</para>
22          /// </summary>
23          /// <param name="source"><para>The <typeparamref name=="TSource"/> type
            ↪  value.</para><para>Значение типа <typeparamref name="TSource"/>.</para></param>
24          /// <returns><para>The converted value of the <typeparamref name="TTarget"/>
            ↪  type.</para><para>Значение конвертированное в тип <typeparamref
            ↪  name="TTarget"/>.</para></returns>
25          [MethodImpl(MethodImplOptions.AggressiveInlining)]
26          public abstract TTarget Convert(TSource source);
27
28          /// <summary>
29          /// <para>Generates a sequence of instructions using <see cref="ILGenerator"/> that
            ↪  converts a value of type <see cref="System.Object"/> to a value of type
            ↪  <typeparamref name="TTarget"/>.</para>
30          /// <para>Генерирует последовательность инструкций при помощи <see cref="ILGenerator"/>
            ↪  выполняющую преобразование значения типа <see cref="System.Object"/> к значению типа
            ↪  <typeparamref name="TTarget"/>.</para>
31          /// </summary>
32          /// <param name="source"><para>The source type value (TSource).</para><para>Значение
            ↪  исходного типа (TSource).</para></param>
33          [MethodImpl(MethodImplOptions.AggressiveInlining)]
34          protected static void ConvertFromObject(ILGenerator il)
35          {
36              var returnDefault = il.DefineLabel();
37              il.Emit(OpCodes.Brfalse_S, returnDefault);
38              il.LoadArgument(1);
39              il.Emit(OpCodes.Castclass, typeof(IConvertible));
40              il.Emit(OpCodes.Ldnull);
41              il.Emit(OpCodes.Callvirt, GetMethodForConversionToTargetType());
42              il.Return();
43              il.MarkLabel(returnDefault);
44              LoadDefault(il, typeof(TTarget));
45          }
46
47          /// <summary>
48          /// <para>Converts the value of the source type (TSource) to the value of the target
            ↪  type.</para>
49          /// <para>Конвертирует значение исходного типа (TSource) в значение целевого типа.</para>
50          /// </summary>
51          /// <param name="source"><para>The source type value (TSource).</para><para>Значение
            ↪  исходного типа (TSource).</para></param>
52          /// <returns><para>The value is converted to the target type
            ↪  (TTarget).</para><para>Значение ковертированное в целевой тип
            ↪  (TTarget).</para></returns>
53          [MethodImpl(MethodImplOptions.AggressiveInlining)]
54          protected static string GetNewName() => Guid.NewGuid().ToString("N");
55
56          /// <summary>
57          /// <para>Converts the value of the source type (TSource) to the value of the target
            ↪  type.</para>
58          /// <para>Конвертирует значение исходного типа (TSource) в значение целевого типа.</para>
59          /// </summary>
60          /// <param name="source"><para>The source type value (TSource).</para><para>Значение
            ↪  исходного типа (TSource).</para></param>
61          /// <returns><para>The value is converted to the target type
            ↪  (TTarget).</para><para>Значение ковертированное в целевой тип
            ↪  (TTarget).</para></returns>
62          [MethodImpl(MethodImplOptions.AggressiveInlining)]
63          protected static TypeBuilder CreateTypeInheritedFrom<TBaseClass>()
64          {
65              var assemblyName = new AssemblyName(GetNewName());
66              var assembly = AssemblyBuilder.DefineDynamicAssembly(assemblyName,
                ↪  AssemblyBuilderAccess.Run);
67              var module = assembly.DefineDynamicModule(GetNewName());
68              var type = module.DefineType(GetNewName(), TypeAttributes.Public |
                ↪  TypeAttributes.Class | TypeAttributes.Sealed, typeof(TBaseClass));
69              return type;
70          }
```

```
71
72          /// <summary>
73          /// <para>Converts the value of the source type (TSource) to the value of the target
            ↪  type.</para>
74          /// <para>Конвертирует значение исходного типа (TSource) в значение целевого типа.</para>
75          /// </summary>
76          /// <param name="source"><para>The source type value (TSource).</para><para>Значение
            ↪  исходного типа (TSource).</para></param>
77          /// <returns><para>The value is converted to the target type
            ↪  (TTarget).</para><para>Значение ковертированное в целевой тип
            ↪  (TTarget).</para></returns>
78          [MethodImpl(MethodImplOptions.AggressiveInlining)]
79          protected static void EmitConvertMethod(TypeBuilder typeBuilder, Action<ILGenerator>
            ↪  emitConversion)
80          {
81              typeBuilder.EmitFinalVirtualMethod<Converter<TSource,
                ↪  TTarget>>(nameof(IConverter<TSource, TTarget>.Convert), il =>
82              {
83                  il.LoadArgument(1);
84                  if (typeof(TSource) == typeof(object) && typeof(TTarget) != typeof(object))
85                  {
86                      ConvertFromObject(il);
87                  }
88                  else if (typeof(TSource) != typeof(object) && typeof(TTarget) == typeof(object))
89                  {
90                      il.Box(typeof(TSource));
91                  }
92                  else
93                  {
94                      emitConversion(il);
95                  }
96                  il.Return();
97              });
98          }
99
100         /// <summary>
101         /// <para>Converts the value of the source type (TSource) to the value of the target
            ↪  type.</para>
102         /// <para>Конвертирует значение исходного типа (TSource) в значение целевого типа.</para>
103         /// </summary>
104         /// <param name="source"><para>The source type value (TSource).</para><para>Значение
            ↪  исходного типа (TSource).</para></param>
105         /// <returns><para>The value is converted to the target type
            ↪  (TTarget).</para><para>Значение ковертированное в целевой тип
            ↪  (TTarget).</para></returns>
106         [MethodImpl(MethodImplOptions.AggressiveInlining)]
107         protected static MethodInfo GetMethodForConversionToTargetType()
108         {
109             var targetType = typeof(TTarget);
110             var convertibleType = typeof(IConvertible);
111             var typeParameters = Types<IFormatProvider>.Array;
112             if (targetType == typeof(bool))
113             {
114                 return convertibleType.GetMethod(nameof(IConvertible.ToBoolean), typeParameters);
115             }
116             else if (targetType == typeof(byte))
117             {
118                 return convertibleType.GetMethod(nameof(IConvertible.ToByte), typeParameters);
119             }
120             else if (targetType == typeof(char))
121             {
122                 return convertibleType.GetMethod(nameof(IConvertible.ToChar), typeParameters);
123             }
124             else if (targetType == typeof(DateTime))
125             {
126                 return convertibleType.GetMethod(nameof(IConvertible.ToDateTime),
                    ↪  typeParameters);
127             }
128             else if (targetType == typeof(decimal))
129             {
130                 return convertibleType.GetMethod(nameof(IConvertible.ToDecimal), typeParameters);
131             }
132             else if (targetType == typeof(double))
133             {
134                 return convertibleType.GetMethod(nameof(IConvertible.ToDouble), typeParameters);
135             }
136             else if (targetType == typeof(short))
```

```
            {
                return convertibleType.GetMethod(nameof(IConvertible.ToInt16), typeParameters);
            }
            else if (targetType == typeof(int))
            {
                return convertibleType.GetMethod(nameof(IConvertible.ToInt32), typeParameters);
            }
            else if (targetType == typeof(long))
            {
                return convertibleType.GetMethod(nameof(IConvertible.ToInt64), typeParameters);
            }
            else if (targetType == typeof(sbyte))
            {
                return convertibleType.GetMethod(nameof(IConvertible.ToSByte), typeParameters);
            }
            else if (targetType == typeof(float))
            {
                return convertibleType.GetMethod(nameof(IConvertible.ToSingle), typeParameters);
            }
            else if (targetType == typeof(string))
            {
                return convertibleType.GetMethod(nameof(IConvertible.ToString), typeParameters);
            }
            else if (targetType == typeof(ushort))
            {
                return convertibleType.GetMethod(nameof(IConvertible.ToUInt16), typeParameters);
            }
            else if (targetType == typeof(uint))
            {
                return convertibleType.GetMethod(nameof(IConvertible.ToUInt32), typeParameters);
            }
            else if (targetType == typeof(ulong))
            {
                return convertibleType.GetMethod(nameof(IConvertible.ToUInt64), typeParameters);
            }
            else
            {
                throw new NotSupportedException();
            }
        }

        /// <summary>
        /// <para>Converts the value of the source type (TSource) to the value of the target
        ↪  type.</para>
        /// <para>Конвертирует значение исходного типа (TSource) в значение целевого типа.</para>
        /// </summary>
        /// <param name="source"><para>The source type value (TSource).</para><para>Значение
        ↪  исходного типа (TSource).</para></param>
        /// <returns><para>The value is converted to the target type
        ↪  (TTarget).</para><para>Значение ковертированное в целевой тип
        ↪  (TTarget).</para></returns>
        [MethodImpl(MethodImplOptions.AggressiveInlining)]
        protected static void LoadDefault(ILGenerator il, Type targetType)
        {
            if (targetType == typeof(string))
            {
                il.Emit(OpCodes.Ldsfld, targetType.GetField(nameof(string.Empty),
                ↪  BindingFlags.Static | BindingFlags.Public));
            }
            else if (targetType == typeof(DateTime))
            {
                il.Emit(OpCodes.Ldsfld, targetType.GetField(nameof(DateTime.MinValue),
                ↪  BindingFlags.Static | BindingFlags.Public));
            }
            else if (targetType == typeof(decimal))
            {
                il.Emit(OpCodes.Ldsfld, targetType.GetField(nameof(decimal.Zero),
                ↪  BindingFlags.Static | BindingFlags.Public));
            }
            else if (targetType == typeof(float))
            {
                il.LoadConstant(0.0F);
            }
            else if (targetType == typeof(double))
            {
                il.LoadConstant(0.0D);
            }
```

```
            else if (targetType == typeof(long) || targetType == typeof(ulong))
            {
                il.LoadConstant(0L);
            }
            else
            {
                il.LoadConstant(0);
            }
        }
    }
}
```

1.4 ./csharp/Platform.Converters/IConverter[TSource, TTarget].cs

```
namespace Platform.Converters
{
    /// <summary>
    /// <para>Defines a value converter from the <typeparamref name="TSource"/> type to the <typeparamref name="TTarget"/> type.</para>
    /// <para>Определяет конвертер значений из типа <typeparamref name="TSource"/> в тип <typeparamref name="TTarget"/>.</para>
    /// </summary>
    /// <typeparam name="TSource"><para>Source type of conversion.</para><para>Исходный тип конверсии.</para></typeparam>
    /// <typeparam name="TTarget"><para>Target type of conversion.</para><para>Целевой тип конверсии.</para></typeparam>
    public interface IConverter<in TSource, out TTarget>
    {
        /// <summary>
        /// <para>Converts the value of the <typeparamref name="TSource"/> type to the value of the <typeparamref name="TTarget"/> type.</para>
        /// <para>Конвертирует значение типа <typeparamref name="TSource"/> в значение типа <typeparamref name="TTarget"/>.</para>
        /// </summary>
        /// <param name="source"><para>The <typeparamref name=="TSource"/> type value.</para><para>Значение типа <typeparamref name="TSource"/>.</para></param>
        /// <returns><para>The converted value of the <typeparamref name="TTarget"/> type.</para><para>Значение конвертированное в тип <typeparamref name="TTarget"/>.</para></returns>
        TTarget Convert(TSource source);
    }
}
```

1.5 ./csharp/Platform.Converters/IConverter[T].cs

```
namespace Platform.Converters
{
    /// <summary>
    /// <para>Defines a converter between two values of the same <typeparamref name="T"/> type.</para>
    /// <para>Определяет конвертер между двумя значениями одного типа <typeparamref name="T"/>.</para>
    /// </summary>
    /// <typeparam name="T"><para>The type of value to convert.</para><para>Тип преобразуемого значения.</para></typeparam>
    public interface IConverter<T> : IConverter<T, T>
    {
    }
}
```

1.6 ./csharp/Platform.Converters/UncheckedConverter.cs

```
using System;
using System.Runtime.CompilerServices;
using Platform.Reflection;

#pragma warning disable CS1591 // Missing XML comment for publicly visible type or member

namespace Platform.Converters
{
    public abstract class UncheckedConverter<TSource, TTarget> : ConverterBase<TSource, TTarget>
    {
        public static UncheckedConverter<TSource, TTarget> Default
        {
            [MethodImpl(MethodImplOptions.AggressiveInlining)]
            get;
        } = CompileUncheckedConverter();

        [MethodImpl(MethodImplOptions.AggressiveInlining)]
        private static UncheckedConverter<TSource, TTarget> CompileUncheckedConverter()
```

```
        {
            var type = CreateTypeInheritedFrom<UncheckedConverter<TSource, TTarget>>();
            EmitConvertMethod(type, il => il.UncheckedConvert<TSource, TTarget>());
            return (UncheckedConverter<TSource,
             ↪  TTarget>)Activator.CreateInstance(type.CreateTypeInfo());
        }
    }
}
```

1.7 ./csharp/Platform.Converters/UncheckedSignExtendingConverter.cs

```
using System;
using System.Runtime.CompilerServices;
using Platform.Reflection;

#pragma warning disable CS1591 // Missing XML comment for publicly visible type or member

namespace Platform.Converters
{
    public abstract class UncheckedSignExtendingConverter<TSource, TTarget> :
     ↪  ConverterBase<TSource, TTarget>
    {
        public static UncheckedSignExtendingConverter<TSource, TTarget> Default
        {
            [MethodImpl(MethodImplOptions.AggressiveInlining)]
            get;
        } = CompileUncheckedConverter();

        [MethodImpl(MethodImplOptions.AggressiveInlining)]
        private static UncheckedSignExtendingConverter<TSource, TTarget>
         ↪  CompileUncheckedConverter()
        {
            var type = CreateTypeInheritedFrom<UncheckedSignExtendingConverter<TSource,
             ↪  TTarget>>();
            EmitConvertMethod(type, il => il.UncheckedConvert<TSource, TTarget>(extendSign:
             ↪  true));
            return (UncheckedSignExtendingConverter<TSource,
             ↪  TTarget>)Activator.CreateInstance(type.CreateTypeInfo());
        }
    }
}
```

1.8 ./csharp/Platform.Converters.Tests/ConverterTests.cs

```
using System;
using Xunit;

namespace Platform.Converters.Tests
{
    public static class ConverterTests
    {
        [Fact]
        public static void SameTypeTest()
        {
            var result = UncheckedConverter<ulong, ulong>.Default.Convert(2UL);
            Assert.Equal(2UL, result);
            result = CheckedConverter<ulong, ulong>.Default.Convert(2UL);
            Assert.Equal(2UL, result);
        }

        [Fact]
        public static void Int32ToUInt64Test()
        {
            var result = UncheckedConverter<int, ulong>.Default.Convert(2);
            Assert.Equal(2UL, result);
            result = CheckedConverter<int, ulong>.Default.Convert(2);
            Assert.Equal(2UL, result);
        }

        [Fact]
        public static void SignExtensionTest()
        {
            var result = UncheckedSignExtendingConverter<byte, long>.Default.Convert(128);
            Assert.Equal(-128L, result);
            result = UncheckedConverter<byte, long>.Default.Convert(128);
            Assert.Equal(128L, result);
        }

        [Fact]
        public static void ObjectTest()
        {
```

```
38              TestObjectConversion("1");
39              TestObjectConversion(DateTime.UtcNow);
40              TestObjectConversion(1.0F);
41              TestObjectConversion(1.0D);
42              TestObjectConversion(1.0M);
43              TestObjectConversion(1UL);
44              TestObjectConversion(1L);
45              TestObjectConversion(1U);
46              TestObjectConversion(1);
47              TestObjectConversion((char)1);
48              TestObjectConversion((ushort)1);
49              TestObjectConversion((short)1);
50              TestObjectConversion((byte)1);
51              TestObjectConversion((sbyte)1);
52              TestObjectConversion(true);
53          }
54
55          private static void TestObjectConversion<T>(T value) => Assert.Equal(value,
            ↪  UncheckedConverter<object, T>.Default.Convert(value));
56      }
57  }
```

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