./Platform.Disposables/DisposableBase.cs

```
using System;
using System.Collections.Concurrent;
using System.Threading;
using Platform.Exceptions;

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

namespace Platform.Disposables
{
    /// <summary>
    /// <para>Provides a base implementation for IDisposable interface with the basic logic necessary to increase the likelihood of correct unmanaged resources release.</para>
    /// <para>Предоставляет базовую реализацию для интерфейса IDisposable с основной логикой необходимой для повышения вероятности корректного высвобождения неуправляемых ресурсов.</para>
    /// </summary>
    public abstract class DisposableBase : IDisposable
    {
        private static readonly AppDomain _currentDomain = AppDomain.CurrentDomain;
        private static readonly ConcurrentStack<WeakReference<DisposableBase>> _disposablesWeekReferencesStack = new ConcurrentStack<WeakReference<DisposableBase>>();

        private volatile int _disposed;

        public bool IsDisposed => _disposed > 0;

        protected virtual string ObjectName => GetType().Name;

        protected virtual bool AllowMultipleDisposeAttempts => false;

        protected virtual bool AllowMultipleDisposeCalls => false;

        static DisposableBase() => _currentDomain.ProcessExit += OnProcessExit;

        protected DisposableBase()
        {
            _disposed = 0;
            _disposablesWeekReferencesStack.Push(new WeakReference<DisposableBase>(this, false));
        }

        ~DisposableBase() => Destruct();

        protected abstract void Dispose(bool manual, bool wasDisposed);

        public void Dispose()
        {
            GC.SuppressFinalize(this);
            Dispose(true);
        }

        public void Destruct()
        {
            try
            {
                if (!IsDisposed)
                {
                    Dispose(false);
                }
            }
            catch (Exception exception)
            {
                exception.Ignore();
            }
        }

        private void Dispose(bool manual)
        {
            var originalDisposedValue = Interlocked.CompareExchange(ref _disposed, 1, 0);
            var wasDisposed = originalDisposedValue > 0;
            if (wasDisposed && !AllowMultipleDisposeCalls && manual)
            {
                Ensure.Always.NotDisposed(this, ObjectName, "Multiple dispose calls are now allowed. Override AllowMultipleDisposeCalls property to modify behaviour.");
            }
            if (AllowMultipleDisposeAttempts || !wasDisposed)
            {
                Dispose(manual, wasDisposed);
```

```
            }
        }

        private static void OnProcessExit(object sender, EventArgs e)
        {
            while (_disposablesWeekReferencesStack.TryPop(out WeakReference<DisposableBase>
            ↪  weakReference))
            {
                if (weakReference.TryGetTarget(out DisposableBase disposable))
                {
                    GC.SuppressFinalize(disposable);
                    disposable.Destruct();
                }
            }
            UnsubscribeFromProcessExitedEventIfPossible();
        }

        private static void UnsubscribeFromProcessExitedEventIfPossible()
        {
            try
            {
                if (_currentDomain != null)
                {
                    _currentDomain.ProcessExit -= OnProcessExit;
                }
                else
                {
                    AppDomain.CurrentDomain.ProcessExit -= OnProcessExit;
                }
            }
            catch (Exception exception)
            {
                exception.Ignore();
            }
        }
    }
}
```

./Platform.Disposables/DisposableBaseExtensions.cs

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

namespace Platform.Disposables
{
    public static class DisposableBaseExtensions
    {
        public static void DisposeIfNotDisposed(this DisposableBase disposable)
        {
            if (!disposable.IsDisposed)
            {
                disposable.Dispose();
            }
        }
    }
}
```

./Platform.Disposables/Disposable.cs

```
using System;

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

namespace Platform.Disposables
{
    /// <summary>
    /// <para>Represents disposable object that contains OnDispose event which is raised when
    ↪  the object itself is disposed.</para>
    /// <para>Представляет высвобождаемый объект, который содержит событие OnDispose, которое
    ↪  возникает при высвобождении самого объекта.</para>
    /// </summary>
    public class Disposable : DisposableBase
    {
        private static readonly Disposal _emptyDelegate = (manual, wasDisposed) => { };

        public event Disposal OnDispose;

        public Disposable(Action disposed)
        {
            OnDispose = (manual, wasDisposed) =>
            {
```

```
                if (!wasDisposed)
                {
                    disposed();
                }
            };
        }

        public Disposable(Disposal disposed) => OnDispose = disposed;

        public Disposable() => OnDispose = _emptyDelegate;

        public static implicit operator Disposable(Action action) => new Disposable(action);

        public static implicit operator Disposable(Disposal disposal) => new
        ↪  Disposable(disposal);

        protected override void Dispose(bool manual, bool wasDisposed) => OnDispose(manual,
        ↪  wasDisposed);

        protected void RaiseOnDisposeEvent(bool manual, bool wasDisposed) => OnDispose(manual,
        ↪  wasDisposed);

        public static bool TryDisposeAndResetToDefault<T>(ref T @object)
        {
            var result = @object.TryDispose();
            if (result)
            {
                @object = default;
            }
            return result;
        }
    }
}
```

./Platform.Disposables/Disposable[T].cs

```
using System;

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

namespace Platform.Disposables
{
    /// <summary>
    /// <para>Represents disposable container that disposes contained object when the container
    ↪  itself is disposed.</para>
    /// <para>Представляет высвобождаемый контейнер, который высвобождает содержащийся в нём
    ↪  объект при высвобождении самого контейнера.</para>
    /// </summary>
    public class Disposable<T> : Disposable
    {
        public T Object { get; }

        public Disposable(T @object, Action<T> disposed)
        {
            Object = @object;
            OnDispose += (manual, wasDisposed) =>
            {
                if (!wasDisposed)
                {
                    disposed(Object);
                }
            };
        }

        public Disposable(T @object, Action disposed) : base(disposed) => Object = @object;

        public Disposable(T @object, Disposal disposed) : base(disposed) => Object = @object;

        public Disposable(T @object) => Object = @object;

        public static implicit operator Disposable<T>(ValueTuple<T, Action<T>> tuple) => new
        ↪  Disposable<T>(tuple.Item1, tuple.Item2);

        public static implicit operator Disposable<T>(ValueTuple<T, Action> tuple) => new
        ↪  Disposable<T>(tuple.Item1, tuple.Item2);

        public static implicit operator Disposable<T>(ValueTuple<T, Disposal> tuple) => new
        ↪  Disposable<T>(tuple.Item1, tuple.Item2);

        public static implicit operator Disposable<T>(T @object) => new Disposable<T>(@object);
```

```

        public static implicit operator T(Disposable<T> disposable) => disposable.Object;

        protected override void Dispose(bool manual, bool wasDisposed)
        {
            base.Dispose(manual, wasDisposed);
            Object.TryDispose();
        }
    }
}
```

./Platform.Disposables/Disposable[TPrimary, TAuxiliary].cs

```
using System;

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

namespace Platform.Disposables
{
    /// <summary>
    /// <para>Represents disposable container that disposes two contained objects when the container itself is disposed.</para>
    /// <para>Представляет высвобождаемый контейнер, который высвобождает два содержащийся в нём объектов при высвобождении самого контейнера.</para>
    /// </summary>
    public class Disposable<TPrimary, TAuxiliary> : Disposable<TPrimary>
    {
        public TAuxiliary AuxiliaryObject { get; }

        public Disposable(TPrimary @object, TAuxiliary auxiliaryObject, Action<TPrimary, TAuxiliary> action)
            : base(@object)
        {
            AuxiliaryObject = auxiliaryObject;
            OnDispose += (manual, wasDisposed) =>
            {
                if (!wasDisposed)
                {
                    action(Object, AuxiliaryObject);
                }
            };
        }

        public Disposable(TPrimary @object, TAuxiliary auxiliaryObject, Action action) : base(@object, action) => AuxiliaryObject = auxiliaryObject;

        public Disposable(TPrimary @object, TAuxiliary auxiliaryObject, Disposal disposal) : base(@object, disposal) => AuxiliaryObject = auxiliaryObject;

        public Disposable(TPrimary @object, TAuxiliary auxiliaryObject) : base(@object) => AuxiliaryObject = auxiliaryObject;

        public Disposable(TPrimary @object) : base(@object) { }

        public static implicit operator Disposable<TPrimary, TAuxiliary>(ValueTuple<TPrimary, TAuxiliary, Action<TPrimary, TAuxiliary>> tuple) => new Disposable<TPrimary, TAuxiliary>(tuple.Item1, tuple.Item2, tuple.Item3);

        public static implicit operator Disposable<TPrimary, TAuxiliary>(ValueTuple<TPrimary, TAuxiliary, Action> tuple) => new Disposable<TPrimary, TAuxiliary>(tuple.Item1, tuple.Item2, tuple.Item3);

        public static implicit operator Disposable<TPrimary, TAuxiliary>(ValueTuple<TPrimary, TAuxiliary, Disposal> tuple) => new Disposable<TPrimary, TAuxiliary>(tuple.Item1, tuple.Item2, tuple.Item3);

        public static implicit operator Disposable<TPrimary, TAuxiliary>(ValueTuple<TPrimary, TAuxiliary> tuple) => new Disposable<TPrimary, TAuxiliary>(tuple.Item1, tuple.Item2);

        public static implicit operator TPrimary(Disposable<TPrimary, TAuxiliary> disposableContainer) => disposableContainer.Object;

        public static implicit operator TAuxiliary(Disposable<TPrimary, TAuxiliary> disposableContainer) => disposableContainer.AuxiliaryObject;

        protected override void Dispose(bool manual, bool wasDisposed)
        {
            RaiseOnDisposeEvent(manual, wasDisposed);
            AuxiliaryObject.TryDispose();
```

```
            Object.TryDispose();
        }
    }
}
```

./Platform.Disposables/Disposal.cs

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

namespace Platform.Disposables
{
    public delegate void Disposal(bool manual, bool wasDisposed);
}
```

./Platform.Disposables/EnsureExtensions.cs

```
using System;
using System.Diagnostics;
using System.Runtime.CompilerServices;
using Platform.Exceptions;
using Platform.Exceptions.ExtensionRoots;

#pragma warning disable IDE0060 // Remove unused parameter
#pragma warning disable CS1591 // Missing XML comment for publicly visible type or member

namespace Platform.Disposables
{
    public static class EnsureExtensions
    {
        #region Always

        [MethodImpl(MethodImplOptions.AggressiveInlining)]
        public static void NotDisposed(this EnsureAlwaysExtensionRoot root, IDisposable
        ↪  disposable) => NotDisposed(root, disposable, null, null);

        [MethodImpl(MethodImplOptions.AggressiveInlining)]
        public static void NotDisposed(this EnsureAlwaysExtensionRoot root, IDisposable
        ↪  disposable, string objectName) => NotDisposed(root, disposable, objectName, null);

        [MethodImpl(MethodImplOptions.AggressiveInlining)]
        public static void NotDisposed(this EnsureAlwaysExtensionRoot root, IDisposable
        ↪  disposable, string objectName, string message)
        {
            if (disposable.IsDisposed)
            {
                throw new ObjectDisposedException(objectName, message);
            }
        }

        #endregion

        #region OnDebug

        [Conditional("DEBUG")]
        public static void NotDisposed(this EnsureOnDebugExtensionRoot root, IDisposable
        ↪  disposable) => Ensure.Always.NotDisposed(disposable, null, null);

        [Conditional("DEBUG")]
        public static void NotDisposed(this EnsureOnDebugExtensionRoot root, IDisposable
        ↪  disposable, string objectName) => Ensure.Always.NotDisposed(disposable, objectName,
        ↪  null);

        [Conditional("DEBUG")]
        public static void NotDisposed(this EnsureOnDebugExtensionRoot root, IDisposable
        ↪  disposable, string objectName, string message) =>
        ↪  Ensure.Always.NotDisposed(disposable, objectName, message);

        #endregion
    }
}
```

./Platform.Disposables/GenericObjectExtensions.cs

```
using System;
using Platform.Exceptions;

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

namespace Platform.Disposables
{
    /// <summary>
    /// <para>Provides a set of static methods that help dispose an object.</para>
```

```
    /// <para>Предоставляет набор статических методов которые помогают высвободить объект.</para>
    /// </summary>
    static public class GenericObjectExtensions
    {
        public static bool TryDispose<T>(this T @object)
        {
            try
            {
                if (@object is DisposableBase disposableBase)
                {
                    disposableBase.DisposeIfNotDisposed();
                }
                else if (@object is System.IDisposable disposable)
                {
                    disposable.Dispose();
                }
                return true;
            }
            catch (Exception exception)
            {
                exception.Ignore();
            }
            return false;
        }

        public static void DisposeIfPossible<T>(this T @object) => TryDispose(@object);
    }
}
```

./Platform.Disposables/IDisposable.cs

```
namespace Platform.Disposables
{
    /// <summary>
    /// <para>Представляет расширенный интерфейс IDisposable.</para>
    /// <para>Represents an extended IDisposable interface.</para>
    /// </summary>
    public interface IDisposable : System.IDisposable
    {
        /// <summary>
        /// <para>Gets a value indicating whether the object was disposed.</para>
        /// <para>Возвращает значение определяющее был ли высвобожден объект.</para>
        /// </summary>
        bool IsDisposed { get; }

        /// <summary>
        /// <para>Performs application-defined tasks associated with freeing, releasing, or
        ↪  resetting unmanaged resources without throwing any exceptions.</para>
        /// <para>Выполняет определенные пользователем задачи, связанные с освобождением,
        ↪  высвобождением или сбросом неуправляемых ресурсов без выбрасывания исключений.</para>
        /// </summary>
        /// <remarks>
        /// <para>Should be called only from classes destructors, or in case exceptions should
        ↪  be not thrown.</para>
        /// <para>Должен вызываться только из деструкторов классов, или в случае, если
        ↪  исключения выбрасывать нельзя.</para>
        /// </remarks>
        void Destruct();
    }
}
```

./Platform.Disposables.Tests/DisposableTests.cs

```
using System;
using System.Collections.Generic;
using System.Diagnostics;
using System.IO;
using System.Threading;
using Xunit;

namespace Platform.Disposables.Tests
{
    public static class DisposableTests
    {
        [Fact]
        public static void DisposalOrderTest()
        {
            string path = GetDisposalObjectTestProjectFilePath();
            var logPath = Path.GetTempFileName();
            using (var process = Process.Start("dotnet", $"run -p \"{path}\" \"{logPath}\"
            ↪  false"))
```

```
            {
                process.WaitForExit();
            }
            var result = File.ReadAllText(logPath);
            Assert.Equal("21", result);
            File.Delete(logPath);
        }

        [Fact]
        public static void DisposalAtProcessKillTest()
        {
            string path = GetDisposalObjectTestProjectFilePath();
            var logPath = Path.GetTempFileName();
            using (var process = Process.Start("dotnet", $"run -p \"{path}\" \"{logPath}\"
            ↪  true"))
            {
                Thread.Sleep(1000);
                process.Kill();
            }
            var result = File.ReadAllText(logPath);
            Assert.Equal("", result); // Currently process termination will not release resources
            File.Delete(logPath);
        }

        private static string GetDisposalObjectTestProjectFilePath()
        {
            const string currentProjectName = "Platform.Disposables.Tests";
            const string disposalOrderTestProjectName =
            ↪  "Platform.Disposables.Tests.DisposalOrderTest";
            var currentDirectory = Environment.CurrentDirectory;
            var pathParts = currentDirectory.Split(Path.DirectorySeparatorChar);
            var newPathParts = new List<string>();
            for (var i = 0; i < pathParts.Length; i++)
            {
                if (string.Equals(pathParts[i], currentProjectName))
                {
                    newPathParts.Add(disposalOrderTestProjectName);
                    break;
                }
                else
                {
                    newPathParts.Add(pathParts[i]);
                }
            }
            pathParts = newPathParts.ToArray();
            var path = Path.Combine(Path.Combine(pathParts),
            ↪  $"{disposalOrderTestProjectName}.csproj");
            if (!Path.IsPathRooted(path))
            {
                path = $"{Path.DirectorySeparatorChar}{path}";
            }
            return path;
        }
    }
}
```

./Platform.Disposables.Tests/SystemTests.cs

```
using Xunit;

namespace Platform.Disposables.Tests
{
    /// <summary>
    /// <para>Contains tests for features of .NET Framework itself, that are required by current
    ↪  implementations.</para>
    /// <para>Содержит тесты для функций самой .NET Framework, которые требуются для текущих
    ↪  реализаций.</para>
    /// </summary>
    public static class SystemTests
    {
        [Fact]
        public static void UsingSupportsNullTest()
        {
            using (var disposable = null as IDisposable)
            {
                Assert.True(disposable == null);
            }
        }
    }
```

```
20  }
```

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