

1.1 ./csharp/Platform.RegularExpressions.Transformer.CSharpToCpp/CSharpToCppTransformer.cs

```

1  using System;
2  using System.Collections.Generic;
3  using System.Linq;
4  using System.Text.RegularExpressions;
5
6  #pragma warning disable CS1591 // Missing XML comment for publicly visible type or member
7
8  namespace Platform.RegularExpressions.Transformer.CSharpToCpp
9  {
10     public class CSharpToCppTransformer : TextTransformer
11     {
12         public static readonly IList<ISubstitutionRule> FirstStage = new List<SubstitutionRule>
13         {
14             // // ...
15             //
16             (new Regex(@"(\r?\n)?[ \t]++/.+"), "", 0),
17             // #pragma warning disable CS1591 // Missing XML comment for publicly visible type
18             // or member
19             //
20             (new Regex(@"^-s*?\#pragma\[sa-zA-Z0-9]+\$"), "", 0),
21             // {\n\n\n
22             // {
23             (new Regex(@"{\s+[\r\n]+") , "{" + Environment.NewLine, 0),
24             // Platform.Collections.Methods.Lists
25             // Platform::Collections::Methods::Lists
26             (new Regex(@"(namespace[^\r\n]+?)\.([^\r\n]+?)") , "$1::$2", 20),
27             // nameof(numbers)
28             // "numbers"
29             (new
30             ↪ Regex(@"(?<before>\W)nameof\(((^)\n)+\.)?(?<name>[a-zA-Z0-9_]+)(<(^)\n)+)?\)",
31             ↪ "${$before}\"{$name}\"", 0),
32             // Insert markers
33             // EqualityComparer<T> _equalityComparer = EqualityComparer<T>.Default;
34             // EqualityComparer<T> _equalityComparer =
35             ↪ EqualityComparer<T>.Default; /*~_comparer~/
36             (new Regex(@"(?<declaration>EqualityComparer<(?<type>[^\n]+)>
37             ↪ (?<comparer>[a-zA-Z0-9_]+) = EqualityComparer<\k<type>>\.Default;)" ,
38             ↪ "{$declaration}/*~${comparer}~/", 0),
39             // /*~_equalityComparer~/..._equalityComparer.Equals(Minimum, value)
40             // /*~_equalityComparer~/...Minimum == value
41             (new Regex(@"(?<before>/\/*~(?<comparer>[a-zA-Z0-9_]+)~\*/(.\n)+\W)\k<comparer>\.Equ_
42             ↪ als\((?<left>[^\n]+), (?<right>[^\n]+)\)", "{$before}${left} == ${right}",
43             ↪ 50),
44             // Remove markers
45             // /*~_equalityComparer~/
46             //
47             (new Regex(@"\r?\n[^\n]+/\/*~[a-zA-Z0-9_]+~\*/") , "", 10),
48             // Insert markers
49             // Comparer<T> _comparer = Comparer<T>.Default;
50             // Comparer<T> _comparer = Comparer<T>.Default; /*~_comparer~/
51             (new Regex(@"(?<declaration>Comparer<(?<type>[^\n]+)> (?<comparer>[a-zA-Z0-9_]+) =
52             ↪ Comparer<\k<type>>\.Default;)" , "{$declaration}/*~${comparer}~/", 0),
53             // /*~_comparer~/..._comparer.Compare(Minimum, value) <= 0
54             // /*~_comparer~/...Minimum <= value
55             (new Regex(@"(?<before>/\/*~(?<comparer>[a-zA-Z0-9_]+)~\*/(.\n)+\W)\k<comparer>\.Com_
56             ↪ pare\((?<left>[^\n]+),
57             ↪ (?<right>[^\n]+)\)\s*(?<comparison>[<=>=?)\s*0(?<after>\D)" ,
58             ↪ "{$before}${left} ${comparison} ${right}${after}", 50),
59             // Remove markers
60             // private static readonly Comparer<T> _comparer =
61             ↪ Comparer<T>.Default; /*~_comparer~/
62             //
63             (new Regex(@"\r?\n[^\n]+/\/*~[a-zA-Z0-9_]+~\*/") , "", 10),
64             // Comparer<TArgument>.Default.Compare(maximumArgument, minimumArgument) < 0
65             // maximumArgument < minimumArgument
66             (new Regex(@"Comparer<[^\n]+>\.Default\.Compare\(\s*(?<first>[^\n]+),\s*(?<second_
67             ↪ >[^\n]+)\s*\)\s*(?<comparison>[<=>=?)\s*0(?<after>\D)" , "{$first}
68             ↪ ${comparison} ${second}${after}", 0),
69             // public static bool operator ==(Range<T> left, Range<T> right) =>
70             ↪ left.Equals(right);
71             //
72             (new Regex(@"\r?\n[^\n]+bool operator ==\(((?<type>[^\n]+) (?<left>[a-zA-Z0-9_]+),
73             ↪ \k<type> (?<right>[a-zA-Z0-9_]+)\) \s*
74             ↪ ((\k<left>|\k<right>)\.Equals\((\k<left>|\k<right>)\);)" , "", 10),
75             // public static bool operator !=(Range<T> left, Range<T> right) => !(left == right);

```

```

58 //
59 (new Regex(@"r?\n[^\n]+bool operator !=\(((?<type>[^\n]+) (?<left>[a-zA-Z0-9]+),
    ↳ \k<type> (?<right>[a-zA-Z0-9]+)\) => !\((\k<left>|\k<right>) ==
    ↳ (\k<left>|\k<right>)\);"), "", 10),
60 // public override bool Equals(object obj) => obj is Range<T> range ? Equals(range)
    ↳ : false;
61 //
62 (new Regex(@"r?\n[^\n]+override bool Equals\((System\.)?[Oo]bject
    ↳ (?<this>[a-zA-Z0-9]+)\) => \k<this> is [^\n]+ (?<other>[a-zA-Z0-9]+) \?
    ↳ Equals\(\k<other>\) : false;"), "", 10),
63 // out TProduct
64 // TProduct
65 (new Regex(@"(?<before><|, ))(in|out)
    ↳ (?<typeParameter>[a-zA-Z0-9]+)(?<after>>|,))"),
    ↳ "${before}${typeParameter}${after}", 10),
66 // public ...
67 // public: ...
68 (new Regex(@"(?<newLineAndIndent>r?\n?[
    ↳ \t]*) (?<before>[^\{\\(\r\n)*) (?<access>private|protected|public) [ \t]+(?![^\{\\(\r
    ↳ \n]*((?<=\\s)|\\W) (interface|class|struct) (\\W) [^\{\\(\r\n)*[^\{\\(\r\n)]"),
    ↳ "${newLineAndIndent}${access}: ${before}", 0),
69 // public: static bool CollectExceptions { get; set; }
70 // public: inline static bool CollectExceptions;
71 (new Regex(@"(?<access>(private|protected|public): ) (?<before>(static )? [^\r\n]+
    ↳ ) (?<name>[a-zA-Z0-9]+) {[~;]}*(?<=\\W) get; [~;]}*(?<=\\W) set; [~;]}*"),
    ↳ "${access}inline ${before}${name}";", 0),
72 // public abstract class
73 // class
74 (new Regex(@"((public|protected|private|internal|abstract|static)
    ↳ )*(?<category>interface|class|struct)", "${category}", 0),
75 //class GenericCollectionMethodsBase<TElement> {
76 // template <typename TElement> class GenericCollectionMethodsBase {
77 (new Regex(@"(?<before>r?\n) (?<indent>[ \t]*) (?<type>class|struct)
    ↳ (?<typeName>[a-zA-Z0-9]+)<(?<typeParameters>[a-zA-Z0-9
    ↳ ,]+)> (?<typeDefinitionEnding>[^\{]+){", "${before}${indent}template <typename
    ↳ ...> ${type} ${typeName};" + Environment.NewLine + "${indent}template <typename
    ↳ ${typeParameters}> ${type}
    ↳ ${typeName}<${typeParameters}>${typeDefinitionEnding}{", 0),
78 // static void
    ↳ TestMultipleCreationsAndDeletions<TElement>(SizedBinaryTreeMethodsBase<TElement>
    ↳ tree, TElement* root)
79 // template<typename T> static void
    ↳ TestMultipleCreationsAndDeletions<TElement>(SizedBinaryTreeMethodsBase<TElement>
    ↳ tree, TElement* root)
80 (new Regex(@"static ([a-zA-Z0-9]+) ([a-zA-Z0-9]+)<([a-zA-Z0-9]+)>\\(((\\r\\n)+)\\)",
    ↳ "template <typename $3> static $1 $2($4)", 0),
81 // interface IFactory<out TProduct> {
82 // template <typename...> class IFactory; \ntemplate <typename TProduct> class
    ↳ IFactory<TProduct>
83 (new Regex(@"(?<before>r?\n) (?<indent>[ \t]*) interface
    ↳ (?<interface>[a-zA-Z0-9]+)<(?<typeParameters>[a-zA-Z0-9
    ↳ ,]+)> (?<typeDefinitionEnding>[^\{]+){", "${before}${indent}template <typename
    ↳ ...> class ${interface};" + Environment.NewLine + "${indent}template <typename
    ↳ ${typeParameters}> class
    ↳ ${interface}<${typeParameters}>${typeDefinitionEnding}{", 0),
    ↳ "public:", 0),
84 // template <typename T> object, TProperty, TValue>
85 // template <typename T> object, typename TProperty, typename TValue>
86 (new Regex(@"(?<before>template <((, )?typename [a-zA-Z0-9]+)+,
    ↳ ) (?<typeParameter>[a-zA-Z0-9]+) (?<after>(,|>))"), "${before}typename
    ↳ ${typeParameter}${after}", 10),
87 // Insert markers
88 // private: static void BuildExceptionString(this StringBuilder sb, Exception
    ↳ exception, int level)
89 // /*~extensionMethod~BuildExceptionString~*/private: static void
    ↳ BuildExceptionString(this StringBuilder sb, Exception exception, int level)
90 (new Regex(@"private: static [^\r\n]+ (?<name>[a-zA-Z0-9]+)\\(this [^\r\n]+\\)",
    ↳ "/*~extensionMethod~${name}~*/$0", 0),
91 // Move all markers to the beginning of the file.
92 (new Regex(@"A(?<before>[^\r\n]+r?\n(.|\n) ) (?<marker>\/\~extensionMethod~(?<name>
    ↳ [a-zA-Z0-9]+)~\*/)", "${marker}${before}",
    ↳ 10),
93 // /*~extensionMethod~BuildExceptionString~*/...sb.BuildExceptionString(exception.In
    ↳ nerException, level +
    ↳ 1);

```

```

94 // /*~extensionMethod~BuildExceptionString~*/...BuildExceptionString(sb,
95   ↳ exception.InnerException, level + 1);
96 (new Regex(@"(?<before>/\/*~extensionMethod~(?<name>[a-zA-Z0-9]+)~\*/(.|\n)+\W)(?<var_
97   ↳ iable>[_a-zA-Z0-9]+)\. \k<name>\("), "${before}${name}(${variable}, ",
98   ↳ 50),
99 // Remove markers
100 // /*~extensionMethod~BuildExceptionString~*/
101 //
102 (new Regex(@"\/*~extensionMethod~[a-zA-Z0-9]+~\*/"), "", 0),
103 // (this
104 // (
105 (new Regex(@"\((this ", "(", 0),
106 // private: static readonly Disposal _emptyDelegate = (manual, wasDisposed) => { };
107 // private: inline static std::function<Disposal> _emptyDelegate = [](auto manual,
108   ↳ auto wasDisposed) { };
109 (new Regex(@"(?<access>(private|protected|public): )?static readonly
110   ↳ (?<type>[a-zA-Z][a-zA-Z0-9]*) (?<name>[a-zA-Z_][a-zA-Z0-9_]*) =
111   ↳ \((?<firstArgument>[a-zA-Z_][a-zA-Z0-9_]*)
112   ↳ (?<secondArgument>[a-zA-Z_][a-zA-Z0-9_]*)\)) => {\s*};"), "${access}inline static
113   ↳ std::function<${type}> ${name} = [](auto ${firstArgument}, auto
114   ↳ ${secondArgument}) { };", 0),
115 // public: static readonly EnsureAlwaysExtensionRoot Always = new
116   ↳ EnsureAlwaysExtensionRoot();
117 // public: inline static EnsureAlwaysExtensionRoot Always;
118 (new Regex(@"(?<access>(private|protected|public): )?static readonly
119   ↳ (?<type>[a-zA-Z0-9]+(<[a-zA-Z0-9]+>?)) (?<name>[a-zA-Z0-9_]+) = new
120   ↳ \k<type>\(\);"), "${access}inline static ${type} ${name};", 0),
121 // public: static readonly Range<int> SByte = new
122   ↳ Range<int>(std::numeric_limits<int>::min(), std::numeric_limits<int>::max());
123 // public: inline static Range<int> SByte =
124   ↳ Range<int>(std::numeric_limits<int>::min(), std::numeric_limits<int>::max());
125 (new Regex(@"(?<access>(private|protected|public): )?static readonly
126   ↳ (?<type>[a-zA-Z0-9]+(<[a-zA-Z0-9]+>?)) (?<name>[a-zA-Z0-9_]+) = new
127   ↳ \k<type>\(\((?<arguments>[^\n]+)\)\);"), "${access}inline static ${type} ${name} =
128   ↳ ${type}(${arguments});", 0),
129 // public: static readonly string ExceptionContentsSeparator = "---";
130 // public: inline static std::string ExceptionContentsSeparator = "---";
131 (new Regex(@"(?<access>(private|protected|public): )?(const|static readonly) string
132   ↳ (?<name>[a-zA-Z0-9_]+) = ""(?<string>\\\\"|["'\r\n]+)"";"), "${access}inline
133   ↳ static std::string ${name} = \"${string}\";"), 0),
134 // private: const int MaxPath = 92;
135 // private: inline static const int MaxPath = 92;
136 (new Regex(@"(?<access>(private|protected|public): )?(const|static readonly)
137   ↳ (?<type>[a-zA-Z0-9]+) (?<name>[_a-zA-Z0-9]+) = (?<value>[^\r\n]+);"),
138   ↳ "${access}inline static const ${type} ${name} = ${value};", 0),
139 // ArgumentNotNull(EnsureAlwaysExtensionRoot root, TArgument argument) where
140   ↳ TArgument : class
141 // ArgumentNotNull(EnsureAlwaysExtensionRoot root, TArgument* argument)
142 (new Regex(@"(?<before> [a-zA-Z]+\((([a-zA-Z *,]+, |))(?<type>[a-zA-Z]+)(?<after>(|
143   ↳ [a-zA-Z *,]+)\)) [ \r\n]+where \k<type> : class"), "${before}${type}*${after}",
144   ↳ 0),
145 // protected: abstract TElement GetFirst();
146 // protected: virtual TElement GetFirst() = 0;
147 (new Regex(@"(?<access>(private|protected|public): )?abstract
148   ↳ (?<method>[^\r\n]+);"), "${access}virtual ${method} = 0;", 0),
149 // TElement GetFirst();
150 // virtual TElement GetFirst() = 0;
151 (new Regex(@"(?<before>[ \r\n]+ [ ]+)(?<methodDeclaration>(?!return) [a-zA-Z0-9]+
152   ↳ [a-zA-Z0-9]+\(([\^\r\n]*\)) (?<after>; [ ]*\r\n)+"), "${before}virtual
153   ↳ ${methodDeclaration} = 0${after}", 1),
154 // protected: readonly TreeElement[] _elements;
155 // protected: TreeElement _elements[N];
156 (new Regex(@"(?<access>(private|protected|public): )?readonly
157   ↳ (?<type>[a-zA-Z<>0-9]+)([ \[\]]+) (?<name>[_a-zA-Z0-9]+);"), "${access}${type}
158   ↳ ${name}[N];", 0),
159 // protected: readonly TElement Zero;
160 // protected: TElement Zero;
161 (new Regex(@"(?<access>(private|protected|public): )?readonly
162   ↳ (?<type>[a-zA-Z<>0-9]+) (?<name>[_a-zA-Z0-9]+);"), "${access}${type} ${name};",
163   ↳ 0),
164 // internal
165 //
166 (new Regex(@"(\W)internal\s+", "$1", 0),
167 // static void NotImplementedException(ThrowExtensionRoot root) => throw new
168   ↳ NotImplementedException();

```

```

137 // static void NotImplementedException(ThrowExtensionRoot root) { return throw new
138     ↳ NotImplementedException(); }
139 (new Regex(@"(^s+)(private|protected|public)?(: )?(template \<[^>\r\n]+\> )?(static
140     ↳ )?(override )?([a-zA-Z0-9]+
141     ↳ )([a-zA-Z0-9]+\)(([^\(\r\n)*)\)\s+=>\s+throw([^\r\n]+);"),
142     ↳ "$1$2$3$4$5$6$7$8($9) { throw$10; }", 0),
143 // SizeBalancedTree(int capacity) => a = b;
144 // SizeBalancedTree(int capacity) { a = b; }
145 (new Regex(@"(^s+)(private|protected|public)?(: )?(template \<[^>\r\n]+\> )?(static
146     ↳ )?(override )?(void )?([a-zA-Z0-9]+\)(([^\(\r\n)*)\)\s+=>\s+([^\r\n]+);"),
147     ↳ "$1$2$3$4$5$6$7$8($9) { $10; }", 0),
148 // int SizeBalancedTree(int capacity) => a;
149 // int SizeBalancedTree(int capacity) { return a; }
150 (new Regex(@"(^s+)(private|protected|public)?(: )?(template \<[^>\r\n]+\> )?(static
151     ↳ )?(override )?([a-zA-Z0-9]+
152     ↳ )([a-zA-Z0-9]+\)(([^\(\r\n)*)\)\s+=>\s+([^\r\n]+);"), "$1$2$3$4$5$6$7$8($9) {
153     ↳ return $10; }", 0),
154 // OnDispose = (manual, wasDisposed) =>
155 // OnDispose = [&](auto manual, auto wasDisposed)
156 (new Regex(@"(?<variable>[a-zA-Z_][a-zA-Z0-9_]*) (?<operator>\s*[\+=\s*])\(((?<firstArg_
157     ↳ ument>[a-zA-Z_][a-zA-Z0-9_]*) ,
158     ↳ (?<secondArgument>[a-zA-Z_][a-zA-Z0-9_]*)\)\s*=>"),
159     ↳ "$${variable}${operator}[&](auto ${firstArgument}, auto ${secondArgument})", 0),
160 // () => Integer<TElement>.Zero;
161 // () { return Integer<TElement>.Zero; },
162 (new Regex(@"\(\)\s+=>\s+(?<expression>[^\(\); \r\n]+(\(((?<parenthesis>\(|(?<-parent_
163     ↳ hesis>\)|[^\(\); \r\n]*)*)?)[^\(\); \r\n]*(?<after>,|);)"), "()" { return
164     ↳ ${expression}; }${after}", 0),
165 // ~DisposableBase() => Destruct();
166 // ~DisposableBase() { Destruct(); }
167 (new Regex(@"~(?<class>[a-zA-Z_][a-zA-Z0-9_]*)\(\)\s+=>\s+([^\r\n]+?);"),
168     ↳ "~${class}() { $1; }", 0),
169 // => Integer<TElement>.Zero;
170 // { return Integer<TElement>.Zero; }
171 (new Regex(@"\)\s+=>\s+([^\r\n]+?);"), ") { return $1; }", 0),
172 // () { return avlTree.Count; }
173 // [&]()-> auto { return avlTree.Count; }
174 (new Regex(@"(?<before>, |\(\)\s+ { return (?<expression>[^\r\n]+); }"),
175     ↳ "$${before}[&]()-> auto { return ${expression}; }", 0),
176 // Count => GetSizeOrZero(Root);
177 // Count() { return GetSizeOrZero(Root); }
178 (new Regex(@"(\W)([A-Z][a-zA-Z]+\)\s+=>\s+([^\r\n]+);"), "$1$2() { return $3; }", 0),
179 // Insert scope borders.
180 // interface IDisposable { ... }
181 // interface IDisposable { /*~start~interface~IDisposable~*/ ...
182     ↳ /*~end~interface~IDisposable~*/
183 (new Regex(@"(?<classDeclarationBegin>\r?\n(?<indent>[\t ]*)interface[\t
184     ↳ ]*(?<type>[a-zA-Z_][a-zA-Z0-9_]*(<[^\<>\n]*?)[^\{]*\{ (?<middle>(.|\n)*) (?<beforeE_
185     ↳ nd>(?<=\r?\n)\k<indent>)(?<end>})"),
186     ↳ "$${classDeclarationBegin}/*~start~interface~${type}~*/${middle}${beforeEnd}/*~en_
187     ↳ d~interface~${type}~*/${end}",
188     ↳ 0),
189 // Inside the scope replace:
190 // /*~start~interface~IDisposable~*/ ... bool IsDisposed { get; } ...
191     ↳ /*~end~interface~IDisposable~*/
192 // /*~start~interface~IDisposable~*/ ... virtual bool IsDisposed() = 0;
193     ↳ /*~end~interface~IDisposable~*/
194 (new Regex(@"(?<before>(?<typeScopeStart>/\/*~start~interface~(?<type>[^\n\*]+)~\/*/)
195     ↳ (.|\n)+?)(?<propertyDeclaration>(?(access>(private|protected|public):
196     ↳ )?(?(propertyType>[a-zA-Z_][a-zA-Z0-9_]*<[^\<>\n]*?)(?<property>[a-zA-Z_][a-zA-Z0-9_]*
197     ↳ )?(?<blockOpen>[\n\s]*{[\n\s]*)(\[[^\n]+\][\n\s]*)?get; (?<blockClose>[\n\s]*)))(?<
198     ↳ after>(.|\n)+?(?<typeScopeEnd>/\/*~end~interface~\k<type>~\/*/))"),
199     ↳ "$${before}virtual ${propertyType} ${property}() = 0;${after}", 20),
200 // Remove scope borders.
201 // /*~start~interface~IDisposable~*/
202 //
203 (new Regex(@"/*~[^\n\*]+\n+(\n/*~[^\n\*]+\n)*~\/*/"), "", 0),
204 // public: T Object { get; }
205 // public: const T Object;
206 (new Regex(@"(?<before>[^\r]\r?\n[ \t]*) (?<access>(private|protected|public):
207     ↳ )?(?(type>[a-zA-Z_][a-zA-Z0-9_]*<[^\<>\n]*?)(?<property>[a-zA-Z_][a-zA-Z0-9_]*
208     ↳ )?(?<blockOpen>[\n\s]*{[\n\s]*)(\[[^\n]+\][\n\s]*)?get; (?<blockClose>[\n\s]*)))(?<a_
209     ↳ fter>[\n\s]*))", "${before}${access}const
210     ↳ ${type} ${property};${after}", 2),
211 // public: bool IsDisposed { get => _disposed > 0; }
212 // public: bool IsDisposed() { return _disposed > 0; }

```

180
181
182
183
184
185
186
187
188
189
190
191
192
193
194
195
196
197
198
199
200
201
202
203
204
205
206
207
208
209
210
211
212
213
214
215
216
217
218
219
220
221
222
223
224
225
226
227
228
229
230

```
(new Regex(@"(?<before>[^\r]\r?\n[ \t]*)?(?<access>(private|protected|public):
)??(?<virtual>virtual )?bool
-> (?<property>[a-zA-Z_][a-zA-Z0-9_]*)?(?<blockOpen>[\n\s]*{[\n\s]*}\([^\n]+\)[\n\s]
->]*)?get\s*=>\s*(?<expression>[^\n]+);(?<blockClose>[\n\s]*{[\n\s]*})",
-> "${before}${access}${virtual}bool ${property}(){${blockOpen}return
-> ${expression};${blockClose}", 2),
// protected: virtual std::string ObjectName { get => GetType().Name; }
// protected: virtual std::string ObjectName() { return GetType().Name; }
(new Regex(@"(?<before>[^\r]\r?\n[ \t]*)?(?<access>(private|protected|public):
)??(?<virtual>virtual )?(?<type>[a-zA-Z_][a-zA-Z0-9_:<]<]*)
-> (?<property>[a-zA-Z_][a-zA-Z0-9_]*)?(?<blockOpen>[\n\s]*{[\n\s]*}\([^\n]+\)[\n\s]
->]*)?get\s*=>\s*(?<expression>[^\n]+);(?<blockClose>[\n\s]*{[\n\s]*})",
-> "${before}${access}${virtual}${type} ${property}(){${blockOpen}return
-> ${expression};${blockClose}", 2),
// ArgumentInRange(string message) { string messageBuilder() { return message; }
// ArgumentInRange(string message) { auto messageBuilder = [&]() -> string { return
-> message; };
(new Regex(@"(?<before>\W[_a-zA-Z0-9]+\((^\)\n)*\)[\s\n]*{[\s\n]*{([^\}]+\n)*?(\r?\n)
->?[ \t]*}?(?<returnType>[_a-zA-Z0-9*:]++[_a-zA-Z0-9*:]*)
-> (?<methodName>[_a-zA-Z0-9+]++)\((?<arguments>[^\)\n]*\)\s*{(?<body>("[^""\n]+""|
->[^\}]+\n)+?)})", "${before}auto ${methodName} = [&]() -> ${returnType}
-> {${body}};", 10),
// Func<TElement> treeCount
// std::function<TElement()> treeCount
(new Regex(@"Func<([a-zA-Z0-9]+)> ([a-zA-Z0-9]+)", "std::function<$1()> $2", 0),
// Action<TElement> free
// std::function<void(TElement)> free
(new Regex(@"Action<(?<typeParameters>[a-zA-Z0-9]+(,
-> ([a-zA-Z0-9]+))*)>?(?<after>| (?<variable>[a-zA-Z0-9]+))",
-> "std::function<void(${typeParameters})>${after}", 0),
// Predicate<TArgument> predicate
// std::function<bool(TArgument)> predicate
(new Regex(@"Predicate<([a-zA-Z0-9]+)> ([a-zA-Z0-9]+)", "std::function<bool($1)>
-> $2", 0),
// var
// auto
(new Regex(@"(\W)var(\W)", "$1auto$2", 0),
// unchecked
//
(new Regex(@"[\r\n]{2}\s*?unchecked\s*?$)", "", 0),
// throw new
// throw
(new Regex(@"(\W)throw new(\W)", "$1throw$2", 0),
// void RaiseExceptionIgnoredEvent(Exception exception)
// void RaiseExceptionIgnoredEvent(const std::exception& exception)
(new Regex(@"\\(|, )(System\\.Exception|Exception)( |\\))", "$1const
-> std::exception&$3", 0),
// EventHandler<Exception>
// EventHandler<std::exception>
(new Regex(@"(\W)(System\\.Exception|Exception)(\W)", "$1std::exception$3", 0),
// override void PrintNode(TElement node, StringBuilder sb, int level)
// void PrintNode(TElement node, StringBuilder sb, int level) override
(new Regex(@"override ([a-zA-Z0-9 \*+]+)\((^\)\r\n+?)\)", "$1$2 override", 0),
// return {range.Minimum, range.Maximum}
// return {range.Minimum, range.Maximum}
(new Regex(@"(?<before>return\s*)\(((?<values>[^\)\n]+\n+)\)\)(?!\\)(?<after>\W)",
-> "${before}${values}${after}", 0),
// string
// std::string
(new Regex(@"(?<before>\W)(?!::)string(?<after>\W)",
-> "${before}std::string${after}", 0),
// System.ValueTuple
// std::tuple
(new Regex(@"(?<before>\W)(System\\.)?ValueTuple(?:\s*=\|\\)(?<after>\W)",
-> "${before}std::tuple${after}", 0),
// sbyte
// std::int8_t
(new Regex(@"(?<before>\W)((System\\.)?SB|sb)yte(?:\s*=\|\\)(?<after>\W)",
-> "${before}std::int8_t${after}", 0),
// short
// std::int16_t
(new Regex(@"(?<before>\W)((System\\.)?Int16|short)(?!\\s*=\|\\)(?<after>\W)",
-> "${before}std::int16_t${after}", 0),
// int
// std::int32_t
```

```

231 (new Regex(@"(?<before>\W)((System\.)?I|i)nt(32)?(?!\s*=\|()\ (?<after>\W)"),
232     ↳ "${before}std::int32_t${after}", 0),
233 // long
234 (new Regex(@"(?<before>\W)((System\.)?Int64|long)(?! \s*=\|()\ (?<after>\W)"),
235     ↳ "${before}std::int64_t${after}", 0),
236 // byte
237 (new Regex(@"(?<before>\W)((System\.)?Byte|byte)(?! \s*=\|()\ (?<after>\W)"),
238     ↳ "${before}std::uint8_t${after}", 0),
239 // ushort
240 (new Regex(@"(?<before>\W)((System\.)?UInt16|ushort)(?! \s*=\|()\ (?<after>\W)"),
241     ↳ "${before}std::uint16_t${after}", 0),
242 // uint
243 (new Regex(@"(?<before>\W)((System\.)?UI|ui)nt(32)?(?!\s*=\|()\ (?<after>\W)"),
244     ↳ "${before}std::uint32_t${after}", 0),
245 // ulong
246 (new Regex(@"(?<before>\W)((System\.)?UInt64|ulong)(?! \s*=\|()\ (?<after>\W)"),
247     ↳ "${before}std::uint64_t${after}", 0),
248 // char*[] args
249 (new Regex(@"([_a-zA-Z0-9:\*]?)\[\] ([a-zA-Z0-9]+)", "$1 $2[]", 0),
250 // float.MinValue
251 (new Regex(@"(?<before>\W)(?<type>std::[a-z0-9_]+|float|double)\.MinValue(?<after>\W|
252     ↳ )"), "${before}std::numeric_limits<${type}>::lowest()${after}",
253     ↳ 0),
254 // double.MaxValue
255 (new Regex(@"(?<before>\W)(?<type>std::[a-z0-9_]+|float|double)\.MaxValue(?<after>\W|
256     ↳ )"), "${before}std::numeric_limits<${type}>::max()${after}",
257     ↳ 0),
258 // using Platform.Numbers;
259 //
260 (new Regex(@"([\r\n]{2}|^)\s*?using [\.a-zA-Z0-9]+;\s*?$)", "", 0),
261 // class SizedBinaryTreeMethodsBase : GenericCollectionMethodsBase
262 // class SizedBinaryTreeMethodsBase : public GenericCollectionMethodsBase
263 (new Regex(@"(struct|class) ([a-zA-Z0-9]+)(<[a-zA-Z0-9 ,]+>)? : ([a-zA-Z0-9]+)",
264     ↳ "$1 $2$3 : public $4", 0),
265 // System.IDisposable
266 // System::IDisposable
267 (new Regex(@"(?<before>System(::[a-zA-Z_]\w*)*)\. (?<after>[a-zA-Z_]\w*)"),
268     ↳ "${before}::${after}", 20),
269 // class IProperty : ISetter<TValue, TObjct>, IProvider<TValue, TObjct>
270 // class IProperty : public ISetter<TValue, TObjct>, public IProvider<TValue,
271     ↳ TObjct>
272 (new Regex(@"(?<before>(interface|struct|class) [a-zA-Z_]\w* : ((public
273     ↳ [a-zA-Z_][\w:]*(<[a-zA-Z0-9 ,]+>)?,
274     ↳ )+)?(?<inheritedType>(?!public)[a-zA-Z_][\w:]*(<[a-zA-Z0-9 ,]+>)?(?<after>(,
275     ↳ [a-zA-Z_][\w:]*(!>)|[ \r\n]+)))", "${before}public ${inheritedType}${after}",
276     ↳ 10),
277 // interface IDisposable {
278 // class IDisposable { public:
279 (new Regex(@"(?<before>\r?\n)(?<indent>[ \t]*)interface
280     ↳ (?<interface>[a-zA-Z_]\w*)(?<typeDefinitionEnding>[~{}+]{")
281     ↳ "${before}${indent}class ${interface}${typeDefinitionEnding}{\" +
282     ↳ Environment.NewLine + "      public:", 0),
283 // struct TreeElement { }
284 // struct TreeElement { };
285 (new Regex(@"(struct|class) ([a-zA-Z0-9]+)(\s+){([\sa-zA-Z0-9;:_]+?)}([^;])", "$1
286     ↳ $2$3{$4};$5", 0),
287 // class Program { }
288 // class Program { };
289 (new Regex(@"(?<type>struct|class)
290     ↳ (?<name>[a-zA-Z0-9]+[^\r\n]*) (?<beforeBody>[\r\n]+(?<indentLevel>[ \t
291     ↳ ]*)?)\{(?<body>[ \S\s]+?[ \r\n]+\k<indentLevel>)\}(?<afterBody>[^\;}|$)\"", "${type}
292     ↳ ${name}${beforeBody}${body}};${afterBody}", 0),
293 // Insert scope borders.
294 // ref TElement root
295 // ~!root!~ref TElement root
296 (new Regex(@"(?<definition>(?!<= \|()\ (ref [a-zA-Z0-9]+|[a-zA-Z0-9]+(?<ref>))
297     ↳ (?<variable>[a-zA-Z0-9]+)(?<=\\|, | =)\"", "~!${variable}!~${definition}", 0),
298 // Inside the scope of ~!root!~ replace:

```

```

282 // root
283 // *root
284 (new Regex(@"(?<definition>~!(?<pointer>[a-zA-Z0-9]+)!~ref [a-zA-Z0-9]+
→ \k<pointer>(=?\)|,| =)) (?<before>((?<!~!\k<pointer>!~)(.\n))*?) (?<prefix>(\W
→ |\\())\k<pointer>(=?<suffix>( |\\)|;|,))"),
→ "$${definition}$$before}$$prefix}*$$pointer}$$suffix}", 70),
285 // Remove scope borders.
286 // ~!root!~
287 //
288 (new Regex(@"~!(?<pointer>[a-zA-Z0-9]+)!~"), "", 5),
289 // ref auto root = ref
290 // ref auto root =
291 (new Regex(@"ref ([a-zA-Z0-9]+) ([a-zA-Z0-9]+) = ref(\W)"), "$1* $2 =$3", 0),
292 // *root = ref left;
293 // root = left;
294 (new Regex(@"\*([a-zA-Z0-9]+) = ref ([a-zA-Z0-9]+)(\W)"), "$1 = $2$3", 0),
295 // (ref left)
296 // (left)
297 (new Regex(@"\ (ref ([a-zA-Z0-9]+)(\)|\(|,))"), "($1$2", 0),
298 // ref TElement
299 // TElement*
300 (new Regex(@"( |\\())ref ([a-zA-Z0-9]+) "), "$1$2* ", 0),
301 // ref sizeBalancedTree.Root
302 // &sizeBalancedTree->Root
303 (new Regex(@"ref ([a-zA-Z0-9]+)\.([a-zA-Z0-9\*]+)"), "&$1->$2", 0),
304 // ref GetElement(node).Right
305 // &GetElement(node)->Right
306 (new Regex(@"ref ([a-zA-Z0-9]+)\((([a-zA-Z0-9\*]+)\)\)\.([a-zA-Z0-9]+)"),
→ "&$1($2)->$3", 0),
307 // GetElement(node).Right
308 // GetElement(node)->Right
309 (new Regex(@"([a-zA-Z0-9]+)\((([a-zA-Z0-9\*]+)\)\)\.([a-zA-Z0-9]+)"), "$1($2)->$3", 0),
310 // [Fact]npublic: static void SizeBalancedTreeMultipleAttachAndDetachTest()
311 // public: TEST_METHOD(SizeBalancedTreeMultipleAttachAndDetachTest)
312 (new Regex(@"\[Fact\\]\[s\\n\]+(public:)?(static)?void ([a-zA-Z0-9]+)\\(\\)"), "public:
→ TEST_METHOD($3)", 0),
313 // class TreesTests
314 // TEST_CLASS(TreesTests)
315 (new Regex(@"class ([a-zA-Z0-9]+Tests)"), "TEST_CLASS($1)", 0),
316 // Assert.Equal
317 // Assert::AreEqual
318 (new Regex(@"(?<type>Assert)\\. (?<method>(Not)?Equal)"), "${type}::Are${method}", 0),
319 // Assert.Throws
320 // Assert::ExpectException
321 (new Regex(@"(Assert)\\.Throws"), "$1::ExpectException", 0),
322 // Assert.True
323 // Assert::IsTrue
324 (new Regex(@"(Assert)\\. (True|False)"), "$1::Is$2", 0),
325 // $"Argument {argumentName} is null."
326 // std::string("Argument
→ ").append(Platform::Converters::To<std::string>(argumentName)).append(" is
→ null.")
327 (new Regex(@"\$""(?<left>\\""| [^""\r\n])*){(?<expression>[_a-zA-Z0-9]+)}(?<right>\\_
→ ""| [^""\r\n])*"""),
→ "std::string(\$\"${left}\").append(Platform::Converters::To<std::string>(${expres_
→ sion})).append(\$\"${right}\")",
→ 10),
328 // $"
329 // "
330 (new Regex(@"\$""""), "\"", 0),
331 // std::string(std::string("[").append(Platform::Converters::To<std::string>(Minimum)
→ )).append(",
→ ").append(Platform::Converters::To<std::string>(Maximum)).append("]")
332 // std::string("[").append(Platform::Converters::To<std::string>(Minimum)).append(",
→ ").append(Platform::Converters::To<std::string>(Maximum)).append("]")
333 (new Regex(@"std::string\\((?<begin>std::string\\(""\\""| [^""])""\\)\\.append\\((Platf_
→ orm::Converters::To<std::string>\\([~]\\n\\+)| [~]\\n\\+))\\)\\)\\.append"),
→ "${begin}.append", 10),
334 // Console.WriteLine("...")
335 // printf("...\\n")
336 (new Regex(@"Console\\.WriteLine\\(""([~""\\r\\n\\+)]""\\)"), "printf(\$\"$1\\n\\n\"", 0),
337 // TElement Root;
338 // TElement Root = 0;
339 (new Regex(@"(?<before>\\r?\\n[\\t ]+)(?<access>(private|protected|public)(:
→ )?)?(?<type>[a-zA-Z0-9:]+(?<!return)) (?<name>[_a-zA-Z0-9]+);"),
→ "${before}$$access}$$type} $$name} = 0;", 0),

```



```

340 // TreeElement _elements[N];
341 // TreeElement _elements[N] = { {0} };
342 (new Regex(@"(\\r?\\n[\\t ]+)(private|protected|public)?(: )?([a-zA-Z0-9]+)
→ ([_a-zA-Z0-9]+)\\[([_a-zA-Z0-9]+)\\];\"", "$1$2$3$4 $5[$6] = { {0} };\"", 0),
343 // auto path = new TElement[MaxPath];
344 // TElement path[MaxPath] = { {0} };
345 (new Regex(@"(\\r?\\n[\\t ]+)[a-zA-Z0-9]+ ([a-zA-Z0-9]+) = new
→ ([a-zA-Z0-9]+)\\[([_a-zA-Z0-9]+)\\];\"", "$1$3 $2[$4] = { {0} };\"", 0),
346 // bool Equals(Range<T> other) { ... }
347 // bool operator ==(const Key &other) const { ... }
348 (new Regex(@"(?<before>\\r?\\n[\\t ]+bool )Equals\\((?<type>[\\n]+)
→ (?<variable>[a-zA-Z0-9]+)\\)(?<after>(\\s|\\n)*\\)", "${before}operator ==(const
→ ${type} &${variable}) const${after}", 0),
349 // Insert scope borders.
350 // class Range { ... public: override std::string ToString() { return ...; }
351 // class Range { /*~Range<T>~*/ ... public: override std::string ToString() { return
→ ...; }
352 (new Regex(@"(?<classDeclarationBegin>\\r?\\n(?<indent>[\\t ]*)template <typename
→ (?<typeParameter>[~<>\\n]+> (struct|class)
→ (?<type>[a-zA-Z0-9]+<\\k<typeParameter>>)(\\s*:\\s*[~{\\n]+)?[\\t ]*(\\r?\\n)?[\\t
→ ]*(?<middle>((?!class|struct)\\.\\n)+?)?(?<toStringDeclaration>(\\s*<access>(private|
→ |protected|public): )override std::string ToString\\(\\))\"",
→ "${classDeclarationBegin}/*~${type}~*/${middle}${toStringDeclaration}", 0),
353 // Inside the scope of ~!Range!~ replace:
354 // public: override std::string ToString() { return ...; }
355 // public: operator std::string() const { return ...; }\\n\\npublic: friend
→ std::ostream & operator <<(std::ostream &out, const A &obj) { return out <<
→ (std::string)obj; }
356 (new Regex(@"(?<scope>/\\s*(?<type>[a-zA-Z0-9<>:]+)~\\s*/)(?<separator>\\.\\n)(?<before>
→ ((?!/\\s*~\\k<type>~\\s*/)(\\.\\n)*)?(?<toStringDeclaration>\\r?\\n(?<indent>[
→ \\t ]*)(?<access>(private|protected|public): )override std::string ToString\\(\\)
→ (?<toStringMethodBody>[~{\\n]+))\"", "${scope}${separator}${before}" +
→ Environment.NewLine + "${indent}${access}operator std::string() const
→ ${toStringMethodBody}" + Environment.NewLine + Environment.NewLine +
→ "${indent}${access}friend std::ostream & operator <<(std::ostream &out, const
→ ${type} &obj) { return out << (std::string)obj; }\"", 0),
357 // Remove scope borders.
358 // /*~Range~*/
359 //
360 (new Regex(@"/\\s*~[a-zA-Z0-9<>:]+~\\s*/", "", 0),
361 // private: inline static ConcurrentBag<std::exception> _exceptionsBag;
362 // private: inline static std::mutex _exceptionsBag_mutex; \\n\\n private: inline
→ static std::vector<std::exception> _exceptionsBag;
363 (new Regex(@"(?<begin>\\r?\\n(?<indent>[\\t ]+))?(?<access>(private|protected|public):
→ )?inline static ConcurrentBag<(\\s*<argumentType>[~;\\r\\n]+)>
→ (?<name>[_a-zA-Z0-9]+);\"", "${begin}private: inline static std::mutex
→ ${name}_mutex;" + Environment.NewLine + Environment.NewLine +
→ "${indent}${access}inline static std::vector<${argumentType}> ${name};\"", 0),
364 // public: static IReadonlyCollection<std::exception> GetCollectedExceptions() {
→ return _exceptionsBag; }
365 // public: static std::vector<std::exception> GetCollectedExceptions() { return
→ std::vector<std::exception>(_exceptionsBag); }
366 (new Regex(@"(?<access>(private|protected|public): )?static
→ IReadonlyCollection<(\\s*<argumentType>[~;\\r\\n]+)> (?<methodName>[_a-zA-Z0-9]+)\\(\\)
→ { return (?<fieldName>[_a-zA-Z0-9]+); }\"", "${access}static
→ std::vector<${argumentType}> ${methodName}() { return
→ std::vector<${argumentType}>({${fieldName}}); }\"", 0),
367 // public: static event EventHandler<std::exception> ExceptionIgnored =
→ OnExceptionIgnored; ... };
368 // ... public: static inline Platform::Delegates::MulticastDelegate<void(void*,
→ const std::exception>> ExceptionIgnored = OnExceptionIgnored; };
369 (new Regex(@"(?<begin>\\r?\\n(\\r?\\n)?(?<halfIndent>[
→ \\t ]+\\k<halfIndent>)(?<access>(private|protected|public): )?static event
→ EventHandler<(\\s*<argumentType>[~;\\r\\n]+)> (?<name>[_a-zA-Z0-9]+) = (?<defaultDele
→ gate>[_a-zA-Z0-9]+);(?<middle>(\\.\\n)+?)?(?<end>\\r?\\n\\k<halfIndent>});\"",
→ "${middle}" + Environment.NewLine + Environment.NewLine +
→ "${halfIndent}${halfIndent}${access}static inline
→ Platform::Delegates::MulticastDelegate<void(void*, const ${argumentType}&>
→ ${name} = ${defaultDelegate};${end}", 0),
370 // public: event Disposal OnDispose;
371 // public: Platform::Delegates::MulticastDelegate<Disposal> OnDispose;
372 (new Regex(@"(?<begin>(\\s*<access>(private|protected|public): )?(static )?)event
→ (?<type>[a-zA-Z][:_a-zA-Z0-9]+) (?<name>[_a-zA-Z][_a-zA-Z0-9]+);\"",
→ "${begin}Platform::Delegates::MulticastDelegate<${type}> ${name};\"", 0),
373 // Insert scope borders.

```



```

374 // class IgnoredExceptions { ... private: inline static std::vector<std::exception>
    ↳ _exceptionsBag;
375 // class IgnoredExceptions {/*~_exceptionsBag~*/ ... private: inline static
    ↳ std::vector<std::exception> _exceptionsBag;
376 (new Regex(@"(?<classDeclarationBegin>\r?\n(?<indent>[\t ]*)class [^{\r\n}]+\r\n[\t
    ↳ ]*)(?<middle>((?!class)\.|\n)+?)(?<vectorFieldDeclaration>(?(access)(private|pro
    ↳ tected|public): )inline static std::vector<(?(argumentType)[^;\r\n]+)>
    ↳ (?(fieldName>[_a-zA-Z0-9]+);)"),
    ↳ "$${classDeclarationBegin}/*~${fieldName}~*/${middle}${vectorFieldDeclaration}",
    ↳ 0),
377 // Inside the scope of ~!_exceptionsBag!~ replace:
378 // _exceptionsBag.Add(exception);
379 // _exceptionsBag.push_back(exception);
380 (new Regex(@"(?<scope>/\s*(?<fieldName>[_a-zA-Z0-9]+)~\s*/)(?<separator>.\|\n)(?<before>
    ↳ e>((?!/\s*\k<fieldName>~\s*/)(\|\n))*?)\k<fieldName>\.Add"),
    ↳ "$${scope}${separator}${before}${fieldName}.push_back", 10),
381 // Remove scope borders.
382 // /*~_exceptionsBag~*/
383 //
384 (new Regex(@"/\s*~[_a-zA-Z0-9]+~\s*/"), "", 0),
385 // Insert scope borders.
386 // class IgnoredExceptions { ... private: static std::mutex _exceptionsBag_mutex;
387 // class IgnoredExceptions {/*~_exceptionsBag~*/ ... private: static std::mutex
    ↳ _exceptionsBag_mutex;
388 (new Regex(@"(?<classDeclarationBegin>\r?\n(?<indent>[\t ]*)class [^{\r\n}]+\r\n[\t
    ↳ ]*)(?<middle>((?!class)\.|\n)+?)(?<mutexDeclaration>private: inline static
    ↳ std::mutex (?(fieldName>[_a-zA-Z0-9]+) _mutex;)",
    ↳ "$${classDeclarationBegin}/*~${fieldName}~*/${middle}${mutexDeclaration}", 0),
389 // Inside the scope of ~!_exceptionsBag!~ replace:
390 // return std::vector<std::exception>(_exceptionsBag);
391 // std::lock_guard<std::mutex> guard(_exceptionsBag_mutex); return
    ↳ std::vector<std::exception>(_exceptionsBag);
392 (new Regex(@"(?<scope>/\s*(?<fieldName>[_a-zA-Z0-9]+)~\s*/)(?<separator>.\|\n)(?<before>
    ↳ e>((?!/\s*\k<fieldName>~\s*/)(\|\n))*?){(?<after>((?!lock_guard)[^{};\r\n])*\k<f
    ↳ ieldName>[~;}\r\n]*;)", "$${scope}${separator}${before}{
    ↳ std::lock_guard<std::mutex> guard($${fieldName}_mutex);$${after}", 10),
393 // Inside the scope of ~!_exceptionsBag!~ replace:
394 // _exceptionsBag.Add(exception);
395 // std::lock_guard<std::mutex> guard(_exceptionsBag_mutex); \r\n
    ↳ _exceptionsBag.Add(exception);
396 (new Regex(@"(?<scope>/\s*(?<fieldName>[_a-zA-Z0-9]+)~\s*/)(?<separator>.\|\n)(?<before>
    ↳ e>((?!/\s*\k<fieldName>~\s*/)(\|\n))*?){(?<after>((?!lock_guard)([~{};]\|\n))*?\r
    ↳ ?\n(?<indent>[\t ]*)\k<fieldName>[~;}\r\n]*;)",
    ↳ "$${scope}${separator}${before}{\" + Environment.NewLine +
    ↳ \"$${indent}std::lock_guard<std::mutex> guard($${fieldName}_mutex);$${after}", 10),
397 // Remove scope borders.
398 // /*~_exceptionsBag~*/
399 //
400 (new Regex(@"/\s*~[_a-zA-Z0-9]+~\s*/"), "", 0),
401 // Insert scope borders.
402 // class IgnoredExceptions { ... public: static inline
    ↳ Platform::Delegates::MulticastDelegate<void(void*, const std::exception&)>
    ↳ ExceptionIgnored = OnExceptionIgnored;
403 // class IgnoredExceptions {/*~ExceptionIgnored~*/ ... public: static inline
    ↳ Platform::Delegates::MulticastDelegate<void(void*, const std::exception&)>
    ↳ ExceptionIgnored = OnExceptionIgnored;
404 (new Regex(@"(?<classDeclarationBegin>\r?\n(?<indent>[\t ]*)class [^{\r\n}]+\r\n[\t
    ↳ ]*)(?<middle>((?!class)\.|\n)+?)(?<eventDeclaration>(?(access)(private|protected
    ↳ |public): )static inline
    ↳ Platform::Delegates::MulticastDelegate<(?(argumentType)[^;\r\n]+)>
    ↳ (?(name>[_a-zA-Z0-9]+) = (?(defaultDelegate>[_a-zA-Z0-9]+);)"),
    ↳ "$${classDeclarationBegin}/*~${name}~*/${middle}${eventDeclaration}", 0),
405 // Inside the scope of ~!ExceptionIgnored!~ replace:
406 // ExceptionIgnored.Invoke(NULL, exception);
407 // ExceptionIgnored(NULL, exception);
408 (new Regex(@"(?<scope>/\s*(?<eventName>[_a-zA-Z0-9]+)~\s*/)(?<separator>.\|\n)(?<before>
    ↳ >((?!/\s*\k<eventName>~\s*/)(\|\n))*?)\k<eventName>\.Invoke"),
    ↳ "$${scope}${separator}${before}${eventName}", 10),
409 // Remove scope borders.
410 // /*~ExceptionIgnored~*/
411 //
412 (new Regex(@"/\s*~[_a-zA-Z0-9]+~\s*/"), "", 0),
413 // Insert scope borders.
414 // auto added = new StringBuilder();
415 // /*~sb~*/std::string added;

```

```

416 (new Regex(@"(auto|(System\.Text\.)?StringBuilder) (?<variable>[a-zA-Z0-9]+) = new
    ↳ (System\.Text\.)?StringBuilder\(\);"), "/~*${variable}~/std::string
    ↳ ${variable};", 0),
417 // static void Indent(StringBuilder sb, int level)
418 // static void Indent(/*~sb~/StringBuilder sb, int level)
419 (new Regex(@"(?<start>, |\()(System\.Text\.)?StringBuilder
    ↳ (?<variable>[a-zA-Z0-9]+)(?<end>,|\))"), "${start}/*~*${variable}~/std::string&
    ↳ ${variable}${end}", 0),
420 // Inside the scope of ~!added!~ replace:
421 // sb.ToString()
422 // sb
423 (new Regex(@"(?<scope>/\~*(?<variable>[a-zA-Z0-9]+)~\~/)(?<separator>.\|\\n)(?<before>
    ↳ ((?!/\~*\k<variable>~\~/)(.\|\\n))*?)\k<variable>\.ToString\(\)"),
    ↳ "${scope}${separator}${before}${variable}", 10),
424 // sb.AppendLine(argument)
425 // sb.append(Platform::Converters::To<std::string>(argument)).append(1, '\\n')
426 (new Regex(@"(?<scope>/\~*(?<variable>[a-zA-Z0-9]+)~\~/)(?<separator>.\|\\n)(?<before>
    ↳ ((?!/\~*\k<variable>~\~/)(.\|\\n))*?)\k<variable>\.AppendLine\((?<argument>[^\|\\n],\|
    ↳ r\\n)+\\)"),
    ↳ "${scope}${separator}${before}${variable}.append(Platform::Converters::To<std::s
    ↳ tring>(${argument})).append(1, '\\n')",
    ↳ 10),
427 // sb.Append('\\t', level);
428 // sb.append(level, '\\t');
429 (new Regex(@"(?<scope>/\~*(?<variable>[a-zA-Z0-9]+)~\~/)(?<separator>.\|\\n)(?<before>
    ↳ ((?!/\~*\k<variable>~\~/)(.\|\\n))*?)\k<variable>\.Append\('(?!<character>[^\r\\n]
    ↳ +)', (?<count>[^\|\\n],\r\\n)+\\)"),
    ↳ "${scope}${separator}${before}${variable}.append(${count}, '${character}')" , 10),
430 // sb.Append(argument)
431 // sb.append(Platform::Converters::To<std::string>(argument))
432 (new Regex(@"(?<scope>/\~*(?<variable>[a-zA-Z0-9]+)~\~/)(?<separator>.\|\\n)(?<before>
    ↳ ((?!/\~*\k<variable>~\~/)(.\|\\n))*?)\k<variable>\.Append\((?<argument>[^\|\\n],\r\\n]
    ↳ +)\\)"),
    ↳ "${scope}${separator}${before}${variable}.append(Platform::Converters::To<std::s
    ↳ tring>(${argument}))",
    ↳ 10),
433 // Remove scope borders.
434 // /*~sb~/
435 //
436 (new Regex(@"/*~*[a-zA-Z0-9]+~*/"), "", 0),
437 // Insert scope borders.
438 // auto added = new HashSet<TElement>();
439 // ~!added!~std::unordered_set<TElement> added;
440 (new Regex(@"auto (?<variable>[a-zA-Z0-9]+) = new
    ↳ HashSet<(?<element>[a-zA-Z0-9]+)>\(\);"),
    ↳ "~!${variable}!~std::unordered_set<${element}> ${variable};", 0),
441 // Inside the scope of ~!added!~ replace:
442 // added.Add(node)
443 // added.insert(node)
444 (new Regex(@"(?<scope>~!(?<variable>[a-zA-Z0-9]+)!~)(?<separator>.\|\\n)(?<before>((?<
    ↳ !~!\k<variable>!~)(.\|\\n))*?)\k<variable>\.Add\((?<argument>[a-zA-Z0-9]+)\\)"),
    ↳ "${scope}${separator}${before}${variable}.insert(${argument})", 10),
445 // Inside the scope of ~!added!~ replace:
446 // added.Remove(node)
447 // added.erase(node)
448 (new Regex(@"(?<scope>~!(?<variable>[a-zA-Z0-9]+)!~)(?<separator>.\|\\n)(?<before>((?<
    ↳ !~!\k<variable>!~)(.\|\\n))*?)\k<variable>\.Remove\((?<argument>[a-zA-Z0-9]+)\\)"),
    ↳ "${scope}${separator}${before}${variable}.erase(${argument})", 10),
449 // if (added.insert(node)) {
450 // if (!added.contains(node)) { added.insert(node);
451 (new Regex(@"if \\((?<variable>[a-zA-Z0-9]+)\\.insert\\((?<argument>[a-zA-Z0-9]+)\\)\\)(?
    ↳ <separator>[\\t ]*[\\r\\n]+)(?<indent>[\\t ]*){"), "if
    ↳ (!${variable}.contains(${argument})) ${separator}${indent}{ " +
    ↳ Environment.NewLine + "${indent}    ${variable}.insert(${argument});", 0),
452 // Remove scope borders.
453 // ~!added!~
454 //
455 (new Regex(@"~![a-zA-Z0-9]+!~"), "", 5),
456 // Insert scope borders.
457 // auto random = new System::Random(0);
458 // std::srand(0);
459 (new Regex(@"[a-zA-Z0-9\\.]+ ([a-zA-Z0-9]+) = new
    ↳ (System::)?Random\\((([a-zA-Z0-9]+)\\)");), "~!$1!~std::srand($3);", 0),
460 // Inside the scope of ~!random!~ replace:
461 // random.Next(1, N)
462 // (std::rand() % N) + 1

```

```

463 (new Regex(@"(?<scope>~!(?<variable>[a-zA-Z0-9]+)!~)(?<separator>.\|\\n)(?<before>((?<
    ↳ !~!\k<variable>!~)(.\|\\n))*?)\k<variable>\.Next\((?<from>[a-zA-Z0-9]+),
    ↳ (?<to>[a-zA-Z0-9]+\)\)", "${scope}${separator}${before}(std::rand() % ${to}) +
    ↳ ${from}", 10),
464 // Remove scope borders.
465 // ~!random!~
466 //
467 (new Regex(@"~![a-zA-Z0-9]+!~"), "", 5),
468 // Insert method body scope starts.
469 // void PrintNodes(TElement node, StringBuilder sb, int level) {
470 // void PrintNodes(TElement node, StringBuilder sb, int level) { /*method-start*/
471 (new Regex(@"(?<start>\r?\n[\\t ]+)(?<prefix>((private|protected|public): )?(virtual
    ↳ )?[a-zA-Z0-9:_]+
    ↳ )?(?<method>[a-zA-Z][a-zA-Z0-9]*)\\((?<arguments>[^\)]*)\\)(?<override>(
    ↳ override)?)(?<separator>[\\t\\r\\n]*)\\((?<end>[~])")", "${start}${prefix}${method}
    ↳ (${arguments})${override}${separator}{ /*method-start*/${end}",
    ↳ 0),
472 // Insert method body scope ends.
473 // { /*method-start*/...}
474 // { /*method-start*/... /*method-end*/}
475 (new Regex(@"{ /\*method-start\*/ (?<body>((?<bracket>\\{) | (?<-bracket>\\}) | [^\{\\}]*)+ )
    ↳ \\})", "{ /*method-start*/${body} /*method-end*/",
    ↳ 0),
476 // Inside method bodies replace:
477 // GetFirst(
478 // this->GetFirst(
479 (new
    ↳ Regex(@"(?<scope>\/\*method-start\*/)(?<before>((?!\/\*method-end\*/)(.\|\\n))*?) (?
    ↳ <separator>[\\W](?!(:|\\.|->|throw\\s+)))(?<method>(?!sizeof)[a-zA-Z0-9]+)\\((?!\\
    ↳ \\{)(?<after>(.\|\\n))*?) (?<scopeEnd>\/\*method-end\*/)",
    ↳ "${scope}${before}${separator}this->${method}(${after}${scopeEnd}", 100),
480 // Remove scope borders.
481 // /*method-start*/
482 //
483 (new Regex(@"\/\*method-(start|end)\\*/"), "", 0),
484 // Insert scope borders.
485 // const std::exception& ex
486 // const std::exception& ex/*~ex~*/
487 (new Regex(@"(?<before>\\(| )(?<variableDefinition>(const )?(std::)?exception&?
    ↳ (?<variable>[_a-zA-Z0-9]+)) (?<after>\\W)"),
    ↳ "${before}${variableDefinition}/*~${variable}~*/${after}", 0),
488 // Inside the scope of ~!ex!~ replace:
489 // ex.Message
490 // ex.what()
491 (new Regex(@"(?<scope>\/\*~(?<variable>[_a-zA-Z0-9]+)~\*/)(?<separator>.\|\\n)(?<before>
    ↳ >((?!\/\*~\k<variable>~\*/)(.\|\\n))*?) (Platform::Converters::To<std::string>\\(\k<
    ↳ variable>\\.Message\\) | \k<variable>\\.Message)"),
    ↳ "${scope}${separator}${before}${variable}.what()", 10),
492 // Remove scope borders.
493 // /*~ex~*/
494 //
495 (new Regex(@"\/\*~[_a-zA-Z0-9]+~\*/"), "", 0),
496 // throw ObjectDisposedException(objectName, message);
497 // throw std::runtime_error(std::string("Attempt to access disposed object
    ↳ ").append(objectName).append(": ").append(message).append("."));
498 (new Regex(@"throw ObjectDisposedException\\((?<objectName>[a-zA-Z_][a-zA-Z0-9_]*),
    ↳ (?<message>[a-zA-Z0-9_]*[Mm]essage[a-zA-Z0-9_]*\\(\\)?| [a-zA-Z_][a-zA-Z0-9_]*\\)\\)
    ↳ ;")", "throw std::runtime_error(std::string(\"Attempt to access disposed object
    ↳ \").append(${objectName}).append(\" : \").append(${message}).append(\".\"));",
    ↳ 0),
499 // throw ArgumentNullException(argumentName, message);
500 // throw std::invalid_argument(std::string("Argument
    ↳ ").append(argumentName).append(" is null: ").append(message).append("."));
501 (new Regex(@"throw
    ↳ ArgumentNullException\\((?<argument>[a-zA-Z]*[Aa]rgument[a-zA-Z]*),
    ↳ (?<message>[a-zA-Z]*[Mm]essage[a-zA-Z]*\\(\\)?\\)\\)";", "throw
    ↳ std::invalid_argument(std::string(\"Argument \").append(${argument}).append(\"
    ↳ is null: \").append(${message}).append(\".\"));", 0),
502 // throw ArgumentException(message, argumentName);
503 // throw std::invalid_argument(std::string("Invalid ").append(argumentName).append("
    ↳ argument: ").append(message).append("."));
504 (new Regex(@"throw
    ↳ ArgumentException\\((?<message>[a-zA-Z]*[Mm]essage[a-zA-Z]*\\(\\)?\\),
    ↳ (?<argument>[a-zA-Z]*[Aa]rgument[a-zA-Z]*\\)\\)";", "throw
    ↳ std::invalid_argument(std::string(\"Invalid \").append(${argument}).append(\"
    ↳ argument: \").append(${message}).append(\".\"));", 0),

```

```

505 // throw ArgumentOutOfRangeException(argumentName, argumentValue, messageBuilder());
506 // throw std::invalid_argument(std::string("Value
    ↳ [").append(Platform::Converters::To<std::string>(argumentValue)).append("] of
    ↳ argument [").append(argumentName).append("] is out of range:
    ↳ ").append(messageBuilder()).append("."););
507 (new Regex(@"throw ArgumentOutOfRangeException\(((?<argument>[a-zA-Z]*[Aa]rgument[a-z]
    ↳ A-Z)*([Nn]ame[a-zA-Z]*)?)",
    ↳ (?<argumentValue>[a-zA-Z]*[Aa]rgument[a-zA-Z]*([Vv]alue[a-zA-Z]*)?)",
    ↳ (?<message>[a-zA-Z]*[Mm]essage[a-zA-Z]*(\(\(\)?)\);)", "throw
    ↳ std::invalid_argument(std::string("Value
    ↳ [").append(Platform::Converters::To<std::string>(${argumentValue})).append("\]
    ↳ of argument [").append(${argument}).append("\] is out of range:
    ↳ \").append(${message}).append("\.\");", 0),
508 // throw NotSupportedException();
509 // throw std::logic_error("Not supported exception.");
510 (new Regex(@"throw NotSupportedException\(\);", "throw std::logic_error(\"Not
    ↳ supported exception.\");", 0),
511 // throw NotImplementedException();
512 // throw std::logic_error("Not implemented exception.");
513 (new Regex(@"throw NotImplementedException\(\);", "throw std::logic_error(\"Not
    ↳ implemented exception.\");", 0),
514 // Insert scope borders.
515 // const std::string& message
516 // const std::string& message/*~message~/
517 (new Regex(@"(?<before>\(|\s)(?<variableDefinition>(const\s)?((std::)?string&?|char\*)
    ↳ (?<variable>[_a-zA-Z0-9]+)))(?<after>\W)",
    ↳ "${before}${variableDefinition}/*~${variable}~/${after}", 0),
518 // Inside the scope of /*~message~/ replace:
519 // Platform::Converters::To<std::string>(message)
520 // message
521 (new Regex(@"(?<scope>\/\s*(?<variable>[_a-zA-Z0-9]+)~\s*)(?<separator>.\|\n)(?<before>
    ↳ >((?!\/\s*\k<variable>~\s*)(.\|\n))*?)Platform::Converters::To<std::string>\(\k<v
    ↳ ariable>\)", "${scope}${separator}${before}${variable}",
    ↳ 10),
522 // Remove scope borders.
523 // /*~ex~/
524 //
525 (new Regex(@"\/\s*[_a-zA-Z0-9]+~\s\/", "", 0),
526 // Insert scope borders.
527 // std::tuple<T, T> tuple
528 // std::tuple<T, T> tuple/*~tuple~/
529 (new Regex(@"(?<before>\(|\s)(?<variableDefinition>(const\s)?(std::)?tuple<[^\n]+&?
    ↳ (?<variable>[_a-zA-Z0-9]+)))(?<after>\W)",
    ↳ "${before}${variableDefinition}/*~${variable}~/${after}", 0),
530 // Inside the scope of ~!ex!~ replace:
531 // tuple.Item1
532 // std::get<1-1>(tuple)
533 (new Regex(@"(?<scope>\/\s*(?<variable>[_a-zA-Z0-9]+)~\s*)(?<separator>.\|\n)(?<before>
    ↳ >((?!\/\s*\k<variable>~\s*)(.\|\n))*?)\k<variable>\.Item(?<itemNumber>\d+)(?<afte
    ↳ r>\W)",
    ↳ "${scope}${separator}${before}std::get<${itemNumber}-1>(${variable})${after}",
    ↳ 10),
534 // Remove scope borders.
535 // /*~ex~/
536 //
537 (new Regex(@"\/\s*[_a-zA-Z0-9]+~\s\/", "", 0),
538 // Insert scope borders.
539 // class Range<T> {
540 // class Range<T> {/*~type~Range<T>~/
541 (new Regex(@"(?<classDeclarationBegin>\r?\n(?<indent>[\t ]*)(template\s*<[^\<>\n]*>
    ↳ )?(struct|class)
    ↳ (?<fullType>(?(<typeName>[a-zA-Z0-9]+)([^\n:]*\s*)?)\s*:\s*[^\n]+)?[\t
    ↳ ]*(\r?\n)?[\t ]*{)\"",
    ↳ "${classDeclarationBegin}/*~type~${typeName}~${fullType}~/", 0),
542 // Inside the scope of /*~type~Range<T>~/ insert inner scope and replace:
543 // public: static implicit operator std::tuple<T, T>(Range<T> range)
544 // public: operator std::tuple<T, T>() const {/*~variable~Range<T>~/
545 (new Regex(@"(?<scope>\/\s*~type~(?<typeName>[^\n\*]+)~(?<fullType>[^\n\*]+)~\s\/)(?<
    ↳ separator>.\|\n)(?<before>((?!\/\s*~type~\k<typeName>~\k<fullType>~\s\/)(.\|\n))*?)
    ↳ (?<access>(private|protected|public): )static implicit operator
    ↳ (?<targetType>[^\(\n]+)\(((?<argumentDeclaration>\k<fullType>
    ↳ (?<variable>[a-zA-Z0-9]+)))(?<after>\s*\n?\s*{)\"",
    ↳ "${scope}${separator}${before}${access}operator ${targetType}()
    ↳ const${after}/*~variable~${variable}~/", 10),
    ↳ // Inside the scope of /*~type~Range<T>~/ replace:

```

```

547 // public: static implicit operator Range<T>(std::tuple<T, T> tuple) { return new
    ↳ Range<T>(std::get<1-1>(tuple), std::get<2-1>(tuple)); }
548 // public: Range(std::tuple<T, T> tuple) : Range(std::get<1-1>(tuple),
    ↳ std::get<2-1>(tuple)) { }
549 (new Regex(@"(?<scope>\/\~type~(?<typeName>[~\n\*]+)~(?<fullType>[~\n\*]+)~\*/)(?<
    ↳ separator>.\n)(?<before>((?!\/\~type~\k<typeName>~\k<fullType>~\*/)(.\n))*?)(
    ↳ ?<access>(private|protected|public): )static implicit operator
    ↳ (\k<fullType>|\k<typeName>)\((?<arguments>[~\n\*]+)\)(\s|\n)*{(\s|\n)*return
    ↳ (new )?(\k<fullType>|\k<typeName>)\((?<passedArguments>[~\n\*]+)\);(\s|\n)*"}),
    ↳ "${scope}${separator}${before}${access}${typeName}(${arguments}) :
    ↳ ${typeName}(${passedArguments}) { }", 10),
550 // Inside the scope of /*~variable~range~/ replace:
551 // range.Minimum
552 // this->Minimum
553 (new Regex(@"(?<scope>{\/\~variable~(?<variable>[~\n\*]+)~\*/)(?<separator>.\n)(?<be
    ↳ fore>(?(beforeExpression>(?(bracket>{)|(?(<-bracket>})|[\~{}]\n)*?)\k<variable>\.
    ↳ (?(field>[_a-zA-Z0-9]+)(?<after>(,|;|}|
    ↳ |\\))?(?<afterExpression>(?(bracket>{)|(?(<-bracket>})|[\~{}]\n)*?)")),
    ↳ "${scope}${separator}${before}this->${field}${after}", 10),
554 // Remove scope borders.
555 // /*~ex~/
556 //
557 (new Regex(@"\/\~[~\n\*]+[~\n\*]+~\*/"), "", 0),
558 // Insert scope borders.
559 // namespace Platform::Ranges { ... }
560 // namespace Platform::Ranges {/*~start~namespace~Platform::Ranges~/ ...
    ↳ /*~end~namespace~Platform::Ranges~/}
561 (new Regex(@"(?<namespaceDeclarationBegin>\r?\n(?<indent>[\t ]*)namespace
    ↳ (?<namespaceName>(?(namePart>[a-zA-Z][a-zA-Z0-9]+)(?(nextNamePart>:[a-zA-Z][a-z
    ↳ A-Z0-9]+))(\s|\n)*)(?(middle>(\.|\n)*)(?(end>(?(<=\r?\n)\k<indent>}{?!;))"),
    ↳ "${namespaceDeclarationBegin}/*~start~namespace~${namespaceName}~/${middle}/*~e
    ↳ nd~namespace~${namespaceName}~/${end}",
    ↳ 0),
562 // Insert scope borders.
563 // class Range<T> { ... };
564 // class Range<T> {/*~start~type~Range<T>~T~/ ... /*~end~type~Range<T>~T~/};
565 (new Regex(@"(?<classDeclarationBegin>\r?\n(?<indent>[\t ]*)template <typename
    ↳ (?<typeParameter>[~\n\*]+> (struct|class)
    ↳ (?(type>[a-zA-Z0-9]+<\k<typeParameter>>)(\s*:\s*[~\n\*]+)?[\t ]*(\r?\n)?[\t
    ↳ ]*(?(middle>(\.|\n)*)(?(endIndent>(?(<=\r?\n)\k<indent>){!(;))"}),
    ↳ "${classDeclarationBegin}/*~start~type~${type}~${typeParameter}~/${middle}${end}
    ↳ Indent}/*~end~type~${type}~${typeParameter}~/${end}",
    ↳ 0),
566 // Inside the scope replace:
567 // /*~start~namespace~Platform::Ranges~/ ... /*~start~type~Range<T>~T~/ ...
    ↳ public: override std::int32_t GetHashCode() { return {Minimum,
    ↳ Maximum}.GetHashCode(); } ... /*~end~type~Range<T>~T~/ ...
    ↳ /*~end~namespace~Platform::Ranges~/
568 // /*~start~namespace~Platform::Ranges~/ ... /*~start~type~Range<T>~T~/ ...
    ↳ /*~end~type~Range<T>~T~/ ... /*~end~namespace~Platform::Ranges~/ namespace std
    ↳ { template <typename T> struct hash<Platform::Ranges::Range<T>> { std::size_t
    ↳ operator()(const Platform::Ranges::Range<T> &obj) const { return {Minimum,
    ↳ Maximum}.GetHashCode(); } }; }
569 (new Regex(@"(?<namespaceScopeStart>\/\~start~namespace~(?<namespace>[~\n\*]+)~\*/)
    ↳ (?<betweenStartScopes>(\.|\n)+)(?<typeScopeStart>\/\~start~type~(?<type>[~\n\*]+)
    ↳ )~(?<typeParameter>[~\n\*]+)~\*/)(?<before>(\.|\n)+)?(?<hashMethodDeclaration>\r
    ↳ ?\n[ \t]*(?<access>(private|protected|public): )override std::int32_t
    ↳ GetHashCode\(\)(\s|\n)*{(\s*(?(methodBody>[~\n\*]+[~\n\*])\s*)\s*)?(?<after>(\.|\n
    ↳ )+)?)(?<typeScopeEnd>\/\~end~type~\k<type>~\k<typeParameter>~\*/)(?<betweenEndSco
    ↳ pes>(\.|\n)+)(?<namespaceScopeEnd>\/\~end~namespace~\k<namespace>~\*/)}\r?\n"),
    ↳ "${namespaceScopeStart}${betweenStartScopes}${typeScopeStart}${before}${after}${
    ↳ typeScopeEnd}${betweenEndScopes}${namespaceScopeEnd}} + Environment.NewLine +
    ↳ Environment.NewLine + "namespace std" + Environment.NewLine + "{" +
    ↳ Environment.NewLine + "    template <typename ${typeParameter}>" +
    ↳ Environment.NewLine + "        struct hash<${namespace}::${type}>" +
    ↳ Environment.NewLine + "        {" + Environment.NewLine + "            std::size_t
    ↳ operator()(const ${namespace}::${type} &obj) const" + Environment.NewLine + "
    ↳ {" + Environment.NewLine + "
    ↳ /*~start~method~/${methodBody}/*~end~method~/ + Environment.NewLine + "
    ↳ }" + Environment.NewLine + "        };" + Environment.NewLine + "}" +
    ↳ Environment.NewLine, 10),
570 // Inside scope of /*~start~method~/ replace:
571 // /*~start~method~/ ... Minimum ... /*~end~method~/
572 // /*~start~method~/ ... obj.Minimum ... /*~end~method~/

```

```

573 (new Regex(@"(?<methodScopeStart>/\/*~start~method~/\*)(?<before>.+(\[|,
    ↳ ))(?<name>[a-zA-Z][a-zA-Z0-9]+)(?<after>[\n\.\\(a-zA-Z0-9]((?!/\/*~end~method~/\*/
    ↳ )[-\n]))+)(?<methodScopeEnd>/\/*~end~method~/\*/)"),
    ↳ "$${methodScopeStart}${before}obj.$${name}$${after}$${methodScopeEnd}", 10),
574 // Remove scope borders.
575 // /\/*~start~type~Range<T>~/
576 //
577 (new Regex(@"\/\/*~[^\*\n]+(~[^\*\n])+\/*~/"), "", 0),
578 // class Disposable<T> : public Disposable
579 // class Disposable<T> : public Disposable<>
580 (new Regex(@"(?<before>(struct|class) (?<type>[a-zA-Z][a-zA-Z0-9]*)(<[^<>\n]+> :
    ↳ (?<access>(private|protected|public) )?\k<type>)(?<after>\b(?:<)"))),
    ↳ "$${before}<>$${after}", 0),
581 // Insert scope borders.
582 // class Disposable<T> : public Disposable<> { ... };
583 // class Disposable<T> : public Disposable<>
    ↳ {/\/*~start~type~Disposable~Disposable<T>~Disposable~Disposable<>~/ ...
    ↳ /\/*~end~type~Disposable~Disposable<T>~Disposable~Disposable<>~/};
584 (new Regex(@"(?<classDeclarationBegin>\r?\n(?<indent>[\t ]*)template[\t
    ↳ ]*(?<typeParameters>[^\n]*)>[\t ]*(struct|class)[\t
    ↳ ]+(?<fullType>(?(type)>[a-zA-Z][a-zA-Z0-9]*)(<[^<>\n]*>)?)[\t ]*: [\t
    ↳ ]*(?<access>(private|protected|public) [\t
    ↳ ]+)?(?(fullBaseType)>(?(baseType)>[a-zA-Z][a-zA-Z0-9]*)(<[^<>\n]*>)?)[\t
    ↳ ]*(\r?\n)?[\t
    ↳ ]*{ } (?<middle>(.|\n)*)(?<beforeEnd>(?(= \r?\n)\k<indent>)(?<end>});")],
    ↳ "$${classDeclarationBegin}/\/*~start~type~$${type}~$${fullType}~$${baseType}~$${fullBas
    ↳ eType}~/ $${middle}$${beforeEnd}/\/*~end~type~$${type}~$${fullType}~$${baseType}~$${full
    ↳ BaseType}~/ $${end}",
    ↳ 0),
585 // Inside the scope replace:
586 // /\/*~start~type~Disposable~Disposable<T>~Disposable~Disposable<>~/ ... ) : base(
    ↳ ... /\/*~end~type~Disposable~Disposable<T>~Disposable~Disposable<>~/
587 // /\/*~start~type~Disposable~Disposable<T>~Disposable~Disposable<>~/ ... ) :
    ↳ Disposable<>( /\/*~end~type~Disposable~Disposable<T>~Disposable~Disposable<>~/
588 (new Regex(@"(?<before>(?(typeScopeStart>/\/*~start~type~(?(types>(?(type>[^\n\*]+)~
    ↳ (?(fullType>[^\n\*]+)~\k<type>~(?(fullBaseType>[^\n\*]+))~\*/)(.|\n)+?)\s*:\s
    ↳ )base(?<after>\(((.|\n)+?(?(typeScopeEnd>/\/*~end~type~\k<types>~\*/)))"),
    ↳ "$${before}$${fullBaseType}$${after}", 20),
589 // Inside the scope replace:
590 // /\/*~start~type~Disposable~Disposable<T>~X~X<>~/ ... ) : base( ...
    ↳ /\/*~end~type~Disposable~Disposable<T>~X~X<>~/
591 // /\/*~start~type~Disposable~Disposable<T>~X~X<>~/ ... ) : X(
    ↳ /\/*~end~type~Disposable~Disposable<T>~X~X<>~/
592 (new Regex(@"(?<before>(?(typeScopeStart>/\/*~start~type~(?(types>(?(type>[^\n\*]+)~
    ↳ (?(fullType>[^\n\*]+)~(?(baseType>[^\n\*]+)~(?(fullBaseType>[^\n\*]+))~\*/)(.
    ↳ |\n)+?)\s*:\s)sbase(?<after>\(((.|\n)+?(?(typeScopeEnd>/\/*~end~type~\k<types>~\*/
    ↳ )))"), "$${before}$${baseType}$${after}",
    ↳ 20),
593 // Inside the scope replace:
594 // /\/*~start~type~Disposable~Disposable<T>~X~X<>~/ ... public: Disposable(T object)
    ↳ { Object = object; } ... public: Disposable(T object) : Disposable(object) { }
    ↳ ... /\/*~end~type~Disposable~Disposable<T>~X~X<>~/
595 // /\/*~start~type~Disposable~Disposable<T>~X~X<>~/ ... public: Disposable(T object)
    ↳ { Object = object; } /\/*~end~type~Disposable~Disposable<T>~X~X<>~/
596 (new Regex(@"(?<before>(?(typeScopeStart>/\/*~start~type~(?(types>(?(type>[^\n\*]+)~
    ↳ (?(fullType>[^\n\*]+)~(?(baseType>[^\n\*]+)~(?(fullBaseType>[^\n\*]+))~\*/)(.
    ↳ |\n)+?(?(constructor>(?(access>(private|protected|public): [\t
    ↳ ]*)?\k<type>\(((?<arguments>[^\(\n)]+)\)\s*{ [^{}]\n]+}) (.|\n)+?) (?(duplicateConstru
    ↳ ctor>(?(access>(private|protected|public): [\t
    ↳ ]*)?\k<type>\(((?<arguments>[^\(\n)]+)\)\s*{ [^{}]\n]+}) (?(after>(.|\n)+?(?(typeS
    ↳ copeEnd>/\/*~end~type~\k<types>~\*/)))"), "$${before}$${after}",
    ↳ 20),
597 // Remove scope borders.
598 // /\/*~start~type~Disposable~Disposable<T>~Disposable~Disposable<>~/
599 //
600 (new Regex(@"\/\/*~[^\*\n]+(~[^\*\n])+\/*~/"), "", 0),
601 // Insert scope borders.
602 // private: inline static const AppDomain _currentDomain = AppDomain.CurrentDomain;
603 // private: inline static const AppDomain _currentDomain =
    ↳ AppDomain.CurrentDomain; /\/*~app-domain~_currentDomain~/
604 (new Regex(@"(?<declaration>(?(access>(private|protected|public): [\t ]*)?(inline[\t
    ↳ ]+)?(static[\t ]+)?(const[\t ]+)?AppDomain[\t
    ↳ ]+(?<field>[a-zA-Z][a-zA-Z0-9_]*)[\t ]*= [\t ]*AppDomain\\.CurrentDomain;")),
    ↳ "$${declaration}/\/*~app-domain~$${field}~/", 0),

```



```

605 // Inside the scope replace:
606 // /*~app-domain~_currentDomain~*/ ... _currentDomain.ProcessExit += OnProcessExit;
607 // /*~app-domain~_currentDomain~*/ ... std::atexit(OnProcessExit);
608 (new Regex(@"(?<before>(?<fieldScopeStart>/\*~app-domain~(?<field>[^\n\*]+)~\*/)(.|\n)+?)\k<field>\.ProcessExit[\t ]*\+=[\t ]*(?<eventHandler>[a-zA-Z_][a-zA-Z0-9_]*)");, "${before}std::atexit(${eventHandler});/*~process-exit-handler~${eventHandler}~*/", 20),
609 // Inside the scope replace:
610 // /*~app-domain~_currentDomain~*/ ... _currentDomain.ProcessExit -= OnProcessExit;
611 // /*~app-domain~_currentDomain~*/ ... /* No translation. It is not possible to
612   ↳ unsubscribe from std::atexit. */
613 (new Regex(@"(?<before>(?<fieldScopeStart>/\*~app-domain~(?<field>[^\n\*]+)~\*/)(.|\n)+?)\k<field>\.ProcessExit[\t ]*\-=[\t ]*(?<eventHandler>[a-zA-Z_][a-zA-Z0-9_]*)");, "${before}/* No translation. It is not possible to unsubscribe from std::atexit. */", 20),
614 // Inside the scope replace:
615 // /*~process-exit-handler~OnProcessExit~*/ ... static void OnProcessExit(void
616   ↳ *sender, EventArgs e)
617 // /*~process-exit-handler~OnProcessExit~*/ ... static void OnProcessExit()
618 (new Regex(@"(?<before>(?<fieldScopeStart>/\*~process-exit-handler~(?<handler>[^\n\*]+)~\*/)(.|\n)+?)static[\t ]+void[\t ]+\k<handler>\(\(\)\n\+\)");, "${before}", 20),
619 // Remove scope borders.
620 // /*~app-domain~_currentDomain~*/
621 (new Regex(@"/*~[^\n\*]+(~[^\n\*]+)*~\*/"), "", 0),
622 // AppDomain.CurrentDomain.ProcessExit -= OnProcessExit;
623 // /* No translation. It is not possible to unsubscribe from std::atexit. */
624 (new Regex(@"AppDomain\.CurrentDomain\.ProcessExit -= ([a-zA-Z_][a-zA-Z0-9_]*)");, "/* No translation. It is not possible to unsubscribe from std::atexit. */", 0),
625 }.Cast<ISubstitutionRule>().ToList();
626
627 public static readonly IList<ISubstitutionRule> LastStage = new List<SubstitutionRule>
628 {
629     // IDisposable disposable
630     // IDisposable &disposable)
631     (new Regex(@"(?<argumentAbstractType>I[A-Z][a-zA-Z0-9]+(<[^\r\n]+>)?)(?<argument>[_a-zA-Z0-9]+)(?<after>,|\))");, "${argumentAbstractType}
632   ↳ &${argument}${after}", 0),
633     // ICounter<int, int> c1;
634     // ICounter<int, int>* c1;
635     (new Regex(@"(?<abstractType>I[A-Z][a-zA-Z0-9]+(<[^\r\n]+>)?)(?<variable>[_a-zA-Z0-9]+)(?<after> = null)?");, "${abstractType}
636   ↳ *${variable}${after}";, 0),
637     // (expression)
638     // expression
639     (new Regex(@"(\(|\)|\((([a-zA-Z0-9_\*:]*)\)|\(|\;|\)|)");, "$1$2$3", 0),
640     // method(expression)
641     // method(expression)
642     (new Regex(@"(?<firstSeparator>(\(|\)|\(((?<method>[a-zA-Z0-9_\*:]*)\)|\(((?<expression>((?<parenthesis>\(|(?<-parent_
643   ↳ hesis>)\)|[a-zA-Z0-9_\*:]*)\)|(?<parenthesis>(?!))\)|\)|\(((?<lastSeparator>(\(|\;|\)|)");, "${firstSeparator}${method}${expression}${lastSeparator}", 0),
644     // .append(".")
645     // .append(1, '.');
646     (new Regex(@"\.(append\("([^\"]|\\\"")*"")");, ".append(1, '$1')", 0),
647     // return ref _elements[node];
648     // return &elements[node];
649     (new Regex(@"return ref ([a-zA-Z0-9_\*:]*)\((([a-zA-Z0-9_\*:]*)\)|\);");, "return &$1[$2];", 0),
650     // ((1, 2))
651     // ({1, 2})
652     (new Regex(@"(?<before>\(|\)|\(((?<first>[^\n()]+),(?<second>[^\n()]+)\)(?<after>\(|\)|\);");, "${before}${first},
653   ↳ ${second}${after}", 10),
654     // {1, 2}.GetHashCode()
655     // Platform::Hashing::Hash(1, 2)
656     (new Regex(@"{(?<first>[^\n{}]+), (?<second>[^\n{}]+)}\.GetHashCode\(\)");, "Platform::Hashing::Hash(${first}, ${second})", 10),
657     // range.ToString()
658     // Platform::Converters::To<std::string>(range).data()
659     (new Regex(@"(?<before>\W)(?<variable>[_a-zA-Z][a-zA-Z0-9_\*:]*)\.ToString\(\)");, "${before}Platform::Converters::To<std::string>(${variable}).data()", 10),
660     // new
661     //

```

```

657 (new Regex(@"(?<before>\r?\n[~""\r\n]*("""\|~""\r\n))*""[~""\r\n]*)(?<=\W)new\
    ↪ s+)", "${before}",
    ↪ 10),
658 // x == null
659 // x == nullptr
660 (new Regex(@"(?<before>\r?\n[~""\r\n]*("""\|~""\r\n))*""[~""\r\n]*)(?<=\W)(?<v
    ↪ ariable>[_a-zA-Z][_a-zA-Z0-9]+)(?<operator>\s*(==|!=)\s*)null(?<after>\W)",
    ↪ "${before}${variable}${operator}nullptr${after}", 10),
661 // null
662 // {}
663 (new Regex(@"(?<before>\r?\n[~""\r\n]*("""\|~""\r\n))*""[~""\r\n]*)(?<=\W)null
    ↪ (?<after>\W)", "${before}{}${after}",
    ↪ 10),
664 // default
665 // 0
666 (new Regex(@"(?<before>\r?\n[~""\r\n]*("""\|~""\r\n))*""[~""\r\n]*)(?<=\W)defa
    ↪ ult(?<after>\W)", "${before}0${after}",
    ↪ 10),
667 // object x
668 // void *x
669 (new Regex(@"(?<before>\r?\n[~""\r\n]*("""\|~""\r\n))*""[~""\r\n]*)(?<=\W)(?!
    ↪ @)(object|System\.Object) (?<after>\w)", "${before}void *${after}",
    ↪ 10),
670 // <object>
671 // <void*>
672 (new Regex(@"(?<before>\r?\n[~""\r\n]*("""\|~""\r\n))*""[~""\r\n]*)(?<=\W)(?!
    ↪ @)(object|System\.Object) (?<after>\W)", "${before}void*${after}",
    ↪ 10),
673 // @object
674 // object
675 (new Regex(@"@([_a-zA-Z0-9]+)", "$1", 0),
676 // this->GetType().Name
677 // typeid(this).name()
678 (new Regex(@"(this->GetType\(\)\.Name)", "typeid($1).name()", 0),
679 // ArgumentException
680 // std::invalid_argument
681 (new Regex(@"(?<before>\r?\n[~""\r\n]*("""\|~""\r\n))*""[~""\r\n]*)(?<=\W)(Sys
    ↪ tem\.)?ArgumentException(?<after>\W)",
    ↪ "${before}std::invalid_argument${after}", 10),
682 // InvalidOperationException
683 // std::runtime_error
684 (new Regex(@"(\W)(InvalidOperationException|Exception)(\W)",
    ↪ "$1std::runtime_error$3", 0),
685 // ArgumentException
686 // std::invalid_argument
687 (new Regex(@"(\W)(ArgumentException|ArgumentOutOfRangeException)(\W)",
    ↪ "$1std::invalid_argument$3", 0),
688 // template <typename T> struct Range : IEquatable<Range<T>>
689 // template <typename T> struct Range {
690 (new Regex(@"(?<before>template <typename (?<typeParameter>[~\n]+)> (struct|class)
    ↪ (?<type>[_a-zA-Z0-9]+<[~\n]+>)) : (public
    ↪ )?IEquatable<\k<type>>(?!<after>(\s|\n)*{)\"", "${before}${after}", 0),
691 // public: delegate void Disposal(bool manual, bool wasDisposed);
692 // public: delegate void Disposal(bool, bool);
693 (new Regex(@"(?<before>(?!<access>(private|protected|public): )delegate
    ↪ (?<returnType>[_a-zA-Z][_a-zA-Z0-9:]+)
    ↪ (?<delegate>[_a-zA-Z][_a-zA-Z0-9:]+)\(((?!<leftArgumentType>[_a-zA-Z][_a-zA-Z0-9:]+)
    ↪ )*(?!<argumentType>[_a-zA-Z][_a-zA-Z0-9:]+)
    ↪ (?<argumentName>[_a-zA-Z][_a-zA-Z0-9:]+)(?!<after>(,
    ↪ (?<rightArgumentType>[_a-zA-Z][_a-zA-Z0-9:]+)
    ↪ (?<rightArgumentName>[_a-zA-Z][_a-zA-Z0-9:]+))*\);)\"",
    ↪ "${before}${argumentType}${after}", 20),
694 // public: delegate void Disposal(bool, bool);
695 // using Disposal = void(bool, bool);
696 (new Regex(@"(?<access>(private|protected|public): )delegate
    ↪ (?<returnType>[_a-zA-Z][_a-zA-Z0-9:]+)
    ↪ (?<delegate>[_a-zA-Z][_a-zA-Z0-9:]+)\(((?!<argumentTypes>[~\(\)\n]*\))\);)", "using
    ↪ ${delegate} = ${returnType}(${argumentTypes});", 20),
697 // <4-1>
698 // <3>
699 (new Regex(@"(?<before><)4-1(?<after>>)", "${before}3${after}", 0),
700 // <3-1>
701 // <2>
702 (new Regex(@"(?<before><)3-1(?<after>>)", "${before}2${after}", 0),
703 // <2-1>
704 // <1>

```

```

705         (new Regex(@"(?<before><)2-1(?<after>>)", "${before}1${after}", 0),
706         // <1-1>
707         // <0>
708         (new Regex(@"(?<before><)1-1(?<after>>)", "${before}0${after}", 0),
709         // #region Always
710         //
711         (new Regex(@"(^\r?\n)[ \t]*#(region|endregion)[^\r\n]*(\r?\n|$)", "", 0),
712         // //define ENABLE_TREE_AUTO_DEBUG_AND_VALIDATION
713         //
714         (new Regex(@"\\\/[ \t]*#define[ \t]+[_a-zA-Z0-9]+[ \t]*"), "", 0),
715         // #if USEARRAYPOOL\r\n#endif
716         //
717         (new Regex(@"#if [a-zA-Z0-9]+\s+endif", "", 0),
718         // [Fact]
719         //
720         (new Regex(@"(?<firstNewLine>\r?\n|\A)(?<indent>[ \t
→      ]+)\[[a-zA-Z0-9]+\((?<expression>((?<parenthesis>\()|(?<-parenthesis>\))|[^()\r\
→      \n]*)+)(?<parenthesis>(?!))\)?\][ \t]*(\r?\n\k<indent>)?"),
→      "${firstNewLine}${indent}", 5),
721         // \A \n ... namespace
722         // \Anamespace
723         (new Regex(@"(\A)(\r?\n)+namespace", "$1namespace", 0),
724         // \A \n ... class
725         // \Aclass
726         (new Regex(@"(\A)(\r?\n)+class", "$1class", 0),
727         // \n\n\n
728         // \n\n
729         (new Regex(@"\r?\n[ \t]*\r?\n[ \t]*\r?\n"), Environment.NewLine +
→      Environment.NewLine, 50),
730         // {\n\n
731         // {\n
732         (new Regex(@"{[ \t]*\r?\n[ \t]*\r?\n"), "{" + Environment.NewLine, 10),
733         // \n\n}
734         // \n}
735         (new Regex(@"\r?\n[ \t]*\r?\n(?<end>[ \t]*)"), Environment.NewLine + "${end}", 10),
736     }.Cast<ISubstitutionRule>().ToList();
737
738     public CSharpToCppTransformer(IList<ISubstitutionRule> extraRules) :
→      base(FirstStage.Concat(extraRules).Concat>LastStage).ToList()) { }
739
740     public CSharpToCppTransformer() : base(FirstStage.Concat>LastStage).ToList()) { }
741 }
742 }

```

1.2 ./csharp/Platform.RegularExpressions.Transformer.CSharpToCpp.Tests/CSharpToCppTransformerTests.cs

```

1  using Xunit;
2
3  namespace Platform.RegularExpressions.Transformer.CSharpToCpp.Tests
4  {
5      public class CSharpToCppTransformerTests
6      {
7          [Fact]
8          public void EmptyLineTest()
9          {
10             // This test can help to test basic problems with regular expressions like incorrect
→          syntax
11             var transformer = new CSharpToCppTransformer();
12             var actualResult = transformer.Transform("");
13             Assert.Equal("", actualResult);
14         }
15
16         [Fact]
17         public void HelloWorldTest()
18         {
19             const string helloWorldCode = @"using System;
20 class Program
21 {
22     public static void Main(string[] args)
23     {
24         Console.WriteLine("Hello, world!");
25     }
26 }";
27             const string expectedResult = @"class Program
28 {
29     public: static void Main(std::string args[])
30     {
31         printf("Hello, world!\n");
32     }

```

```
33     };";
34
35     var transformer = new CSharpToCppTransformer();
36     var actualResult = transformer.Transform(helloWorldCode);
37     Assert.Equal(expectedResult, actualResult);
38 }
39 }
```

Index

./csharp/Platform.RegularExpressions.Transformer.CSharpToCpp.Tests/CSharpToCppTransformerTests.cs, 17

./csharp/Platform.RegularExpressions.Transformer.CSharpToCpp/CSharpToCppTransformer.cs, 1