

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

```

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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}${after}", 10),
66 // public ...
67 // public: ...
68 (new Regex(@"(?<newLineAndIndent>\r?\n?[
   ↳ \t]*) (?<before>[^\{\\(\r\n)*) (?<access>private|protected|public) [
   ↳ \t]+(?! [^\{\\(\r\n)*(interface|class|struct) [^\{\\(\r\n)*[\\(\r\n)]"),
   ↳ "${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(@"class ([a-zA-Z0-9]+)<([a-zA-Z0-9]+)>([^\{]+){", "template <typename $2>
   ↳ class $1$3{", 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 TProduct> class IFactory { public:
83 (new Regex(@"interface (?<interface>[a-zA-Z0-9]+)<(?!<typeParameters>[a-zA-Z0-9
   ↳ ,]+)>(?!<whitespace>[^\{]+){", "template <typename...> class ${interface};
   ↳ template <typename ${typeParameters}> class
   ↳ ${interface}<${typeParameters}>${whitespace}{ + Environment.NewLine + "
   ↳ public:", 0),
84 // template <typename TObject, TProperty, TValue>
85 // template <typename TObject, typename TProperty, TValue>
86 (new Regex(@"(?<before>template <((, )?typename [a-zA-Z0-9]+)+,
   ↳ )(?<typeParameter>[a-zA-Z0-9]+)(?<after>(>|,))"), "${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}${before}",
   ↳ 10),
93 // /*~extensionMethod~BuildExceptionString~*/...sb.BuildExceptionString(exception.In
   ↳ nerException, level +
   ↳ 1);
94 // /*~extensionMethod~BuildExceptionString~*/...BuildExceptionString(sb,
   ↳ exception.InnerException, level + 1);
95 (new Regex(@"(?<before>\/\*~extensionMethod~(?<name>[a-zA-Z0-9]+)~\*/(?:.|\\n)+\\W) (?<var
   ↳ iable>[_a-zA-Z0-9]+)\\. \k<name>\\(", "${before}${name}(${variable}, ",
   ↳ 50),
96 // Remove markers
97 // /*~extensionMethod~BuildExceptionString~*/
98 //

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99     (new Regex(@"/*~extensionMethod~[a-zA-Z0-9]+~\*/", "", 0),
100     // (this
101     // (
102     (new Regex(@"\((this ", "(", 0),
103     // public: static readonly EnsureAlwaysExtensionRoot Always = new
104     → EnsureAlwaysExtensionRoot();
105     // public: inline static EnsureAlwaysExtensionRoot Always;
106     (new Regex(@"(?:<access>(private|protected|public): )?static readonly
107     → (?<type>[a-zA-Z0-9]+) (?<name>[a-zA-Z0-9_]+) = new \k<type>\(\);",
108     → "${access}inline static ${type} ${name};", 0),
109     // public: static readonly string ExceptionContentsSeparator = "---";
110     // public: inline static const char* ExceptionContentsSeparator = "---";
111     (new Regex(@"(?:<access>(private|protected|public): )?(const|static readonly) string
112     → (?<name>[a-zA-Z0-9_]+) = ""(?:<string>(\\"|\\r\\n))+"";", "${access}inline
113     → static const char* ${name} = \\"${string}\\";", 0),
114     // private: const int MaxPath = 92;
115     // private: inline static const int MaxPath = 92;
116     (new Regex(@"(?:<access>(private|protected|public): )?(const|static readonly)
117     → (?<type>[a-zA-Z0-9]+) (?<name>[_a-zA-Z0-9_]+) = (?<value>[~;\\r\\n]+);",
118     → "${access}inline static const ${type} ${name} = ${value};", 0),
119     // ArgumentNotNull(EnsureAlwaysExtensionRoot root, TArgument argument) where
120     → TArgument : class
121     // ArgumentNotNull(EnsureAlwaysExtensionRoot root, TArgument* argument)
122     (new Regex(@"(?:<before> [a-zA-Z]+\\((([a-zA-Z *],)+, |)))(?:<type>[a-zA-Z]+)(?:<after>(\\
123     → [a-zA-Z *,]+)\\)) [\\r\\n]+where \k<type> : class)", "${before}${type}*${after}",
124     → 0),
125     // protected: abstract TElement GetFirst();
126     // protected: virtual TElement GetFirst() = 0;
127     (new Regex(@"(?:<access>(private|protected|public): )?abstract
128     → (?<method>[~;\\r\\n]+);", "${access}virtual ${method} = 0;", 0),
129     // TElement GetFirst();
130     // virtual TElement GetFirst() = 0;
131     (new Regex(@"([\\r\\n]+[ ]+)((?!return)[a-zA-Z0-9]+ [a-zA-Z0-9]+(\\(\\|\\r\\n)*))([
132     → ]*[\\r\\n]+)", "$1virtual $2 = 0$3", 1),
133     // protected: readonly TreeElement[] _elements;
134     // protected: TreeElement _elements[N];
135     (new Regex(@"(?:<access>(private|protected|public): )?readonly
136     → (?<type>[a-zA-Z<0-9]+)(\\[\\])+ (?<name>[_a-zA-Z0-9_]+);", "${access}${type}
137     → ${name}[N];", 0),
138     // protected: readonly TElement Zero;
139     // protected: TElement Zero;
140     (new Regex(@"(?:<access>(private|protected|public): )?readonly
141     → (?<type>[a-zA-Z<0-9]+) (?<name>[_a-zA-Z0-9_]+);", "${access}${type} ${name};",
142     → 0),
143     // internal
144     //
145     (new Regex(@"(\\W)internal\\s+", "$1", 0),
146     // static void NotImplementedException(ThrowExtensionRoot root) => throw new
147     → NotImplementedException();
148     // static void NotImplementedException(ThrowExtensionRoot root) { return throw new
149     → NotImplementedException(); }
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+throw([~;\\r\\n]+);)",
153     → "$1$2$3$4$5$6$7$8($9) { throw$10; }", 0),
154     // SizeBalancedTree(int capacity) => a = b;
155     // SizeBalancedTree(int capacity) { a = b; }
156     (new Regex(@"(^\\s+)(private|protected|public)?(?: )?(template \\<[^\\r\\n]+\\> )?(static
157     → )?(override )?(void )?([a-zA-Z0-9]+\\(((\\|\\r\\n)*))\\s+=>\\s+([~;\\r\\n]+);",
158     → "$1$2$3$4$5$6$7$8($9) { $10; }", 0),
159     // int SizeBalancedTree(int capacity) => a;
160     // int SizeBalancedTree(int capacity) { return a; }
161     (new Regex(@"(^\\s+)(private|protected|public)?(?: )?(template \\<[^\\r\\n]+\\> )?(static
162     → )?(override )?([a-zA-Z0-9]+
163     → )([a-zA-Z0-9_+\\(((\\|\\r\\n)*))\\s+=>\\s+([~;\\r\\n]+);)", "$1$2$3$4$5$6$7$8($9) {
164     → return $10; }", 0),
165     // () => Integer<TElement>.Zero,
166     // () { return Integer<TElement>.Zero; },
167     (new Regex(@"\\(\\)\\s+=>\\s+(?:<expression>[~()];\\r\\n]+\\(((\\|\\r\\n)*\\)\\s+=>\\s+(?:<parent>|
168     → hesis>\\)|[~();\\r\\n]*?)?)?([~()];\\r\\n)*(?:<after>,|\\);)", "()" { return
169     → ${expression}; }${after}", 0),
170     // => Integer<TElement>.Zero;
171     // { return Integer<TElement>.Zero; }
172     (new Regex(@"\\)\\s+=>\\s+([~;\\r\\n]+?);", ") { return $1; }", 0),
173     // () { return avlTree.Count; }
174     // [&]()-> auto { return avlTree.Count; }

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147 (new Regex(@"(?<before>, |\\)\(\) { return (?<expression>[~;\r\n]+); }"),
148     ↳ "${before}[&]() -> auto { return ${expression}; }", 0),
149 // Count => GetSizeOrZero(Root);
150 // GetCount() { return GetSizeOrZero(Root); }
151 (new Regex(@"(\\W)([A-Z][a-zA-Z]+)\\s+=>\\s+([~;\r\n]+);"), "$1Get$2() { return $3; }",
152     ↳ 0),
153 // ArgumentInRange(const char* message) { const char* messageBuilder() { return
154     ↳ message; }
155 // ArgumentInRange(const char* message) { auto messageBuilder = [&]() -> const char*
156     ↳ { return message; };
157 (new Regex(@"(?<before>\\W[_a-zA-Z0-9]+\\(([^\\]\\n)*\\)[\\s\\n]*{([\\s\\n]*([^{}]|\\n)*?(\\r?\\n)|
158     ↳ ?[ \\t]*)(?<returnType>[_a-zA-Z0-9*:] +[_a-zA-Z0-9*:] *)
159     ↳ (?<methodName>[_a-zA-Z0-9]+)\\((?<arguments>[^\\]\\n)*\\)\\s*{(?<body>("[^"\\n]+"|
160     ↳ [^}]|\\n)+?)}"), "${before}auto ${methodName} = [&]() -> ${returnType}
161     ↳ {${body}};", 10),
162 // Func<TElement> treeCount
163 // std::function<TElement()> treeCount
164 (new Regex(@"Func<([a-zA-Z0-9]+)> ([a-zA-Z0-9]+)"), "std::function<$1()> $2", 0),
165 // Action<TElement> free
166 // std::function<void(TElement)> free
167 (new Regex(@"Action<([a-zA-Z0-9]+)> ([a-zA-Z0-9]+)"), "std::function<void($1)> $2",
168     ↳ 0),
169 // Predicate<TArgument> predicate
170 // std::function<bool(TArgument)> predicate
171 (new Regex(@"Predicate<([a-zA-Z0-9]+)> ([a-zA-Z0-9]+)"), "std::function<bool($1)>
172     ↳ $2", 0),
173 // var
174 // auto
175 (new Regex(@"(\\W)var(\\W)"), "$1auto$2", 0),
176 // unchecked
177 //
178 (new Regex(@"[\\r\\n]{2}\\s*?unchecked\\s*?$"), "", 0),
179 // throw new InvalidOperationException
180 // throw std::runtime_error
181 (new Regex(@"throw new (InvalidOperationException|Exception)"), "throw
182     ↳ std::runtime_error", 0),
183 // void RaiseExceptionIgnoredEvent(Exception exception)
184 // void RaiseExceptionIgnoredEvent(const std::exception& exception)
185 (new Regex(@"(\\(| ) (System\\.Exception|Exception) (|\\))"), "$1const
186     ↳ std::exception&$3", 0),
187 // EventHandler<Exception>
188 // EventHandler<std::exception>
189 (new Regex(@"(\\W) (System\\.Exception|Exception) (\\W)"), "$1std::exception$3", 0),
190 // override void PrintNode(TElement node, StringBuilder sb, int level)
191 // void PrintNode(TElement node, StringBuilder sb, int level) override
192 (new Regex(@"override ([a-zA-Z0-9 \\*\\+]+)\\(([^\\]\\r\\n|\\n)+?\\)"), "$1$2 override", 0),
193 // return (range.Minimum, range.Maximum)
194 // return {range.Minimum, range.Maximum}
195 (new Regex(@"(?<before>return\\s*)\\((?<values>[^\\]\\n)+\\)\\((?!\\() (?<after>\\W)"),
196     ↳ "${before}${values}}${after}", 0),
197 // string
198 // const char*
199 (new Regex(@"(\\W)string(\\W)"), "$1const char*$2", 0),
200 // System.ValueTuple
201 // std::tuple
202 (new Regex(@"(?<before>\\W) (System\\.)?ValueTuple(?:\\s*=) (?<after>\\W)"),
203     ↳ "${before}std::tuple${after}", 0),
204 // sbyte
205 // std::int8_t
206 (new Regex(@"(?<before>\\W) ((System\\.)?SB|sbyte(?:\\s*=) (?<after>\\W)"),
207     ↳ "${before}std::int8_t${after}", 0),
208 // short
209 // std::int16_t
210 (new Regex(@"(?<before>\\W) ((System\\.)?Int16|short(?:\\s*=) (?<after>\\W)"),
211     ↳ "${before}std::int16_t${after}", 0),
212 // int
213 // std::int32_t
214 (new Regex(@"(?<before>\\W) ((System\\.)?I|i)nt(32)?(?:\\s*=) (?<after>\\W)"),
215     ↳ "${before}std::int32_t${after}", 0),
216 // long
217 // std::int64_t
218 (new Regex(@"(?<before>\\W) ((System\\.)?Int64|long(?:\\s*=) (?<after>\\W)"),
219     ↳ "${before}std::int64_t${after}", 0),
220 // byte
221 // std::uint8_t

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204 (new Regex(@"(?<before>\W)((System\.)?Byte|byte)(?!\\s*)(?<after>\W)",
    ↪ "${before}std::uint8_t${after}", 0),
205 // ushort
206 // std::uint16_t
207 (new Regex(@"(?<before>\W)((System\.)?UInt16|ushort)(?!\\s*)(?<after>\W)",
    ↪ "${before}std::uint16_t${after}", 0),
208 // uint
209 // std::uint32_t
210 (new Regex(@"(?<before>\W)((System\.)?UI|ui)nt(32)?(?!\\s*)(?<after>\W)",
    ↪ "${before}std::uint32_t${after}", 0),
211 // ulong
212 // std::uint64_t
213 (new Regex(@"(?<before>\W)((System\.)?UInt64|ulong)(?!\\s*)(?<after>\W)",
    ↪ "${before}std::uint64_t${after}", 0),
214 // char*[] args
215 // char* args[]
216 (new Regex(@"([_a-zA-Z0-9:\*]?)\\[\\] ([a-zA-Z0-9]+)", "$1 $2[]", 0),
217 // @object
218 // object
219 (new Regex(@"@([_a-zA-Z0-9]+)", "$1", 0),
220 // float.MinValue
221 // std::numeric_limits<float>::min()
222 (new Regex(@"(?<before>\W)(?<type>std::[a-z0-9_]+float|double)\\.MinValue(?<after>\W)",
    ↪ )), "${before}std::numeric_limits<${type}>::min()${after}",
    ↪ 0),
223 // double.MaxValue
224 // std::numeric_limits<float>::max()
225 (new Regex(@"(?<before>\W)(?<type>std::[a-z0-9_]+float|double)\\.MaxValue(?<after>\W)",
    ↪ )), "${before}std::numeric_limits<${type}>::max()${after}",
    ↪ 0),
226 // using Platform.Numbers;
227 //
228 (new Regex(@"([\\r\\n]{2}|^\\s*?using [\\.a-zA-Z0-9]+;\\s*?$)", "", 0),
229 // struct TreeElement { }
230 // struct TreeElement { };
231 (new Regex(@"(struct|class) ([a-zA-Z0-9]+)(\\s+){([\\sa-zA-Z0-9;:_]+?)}([~;])", "$1
    ↪ $2$3{$4};$5", 0),
232 // class Program { }
233 // class Program { };
234 (new Regex(@"(struct|class) ([a-zA-Z0-9]+[~\\r\\n]*)([\\r\\n]+(?<indentLevel>[\\t
    ↪ ]*))?\\{([\\S\\s]+?[\\r\\n]+\\k<indentLevel>)\\}([~;]|$)", "$1 $2$3{$4};$5", 0),
235 // class SizedBinaryTreeMethodsBase : GenericCollectionMethodsBase
236 // class SizedBinaryTreeMethodsBase : public GenericCollectionMethodsBase
237 (new Regex(@"class ([a-zA-Z0-9]+) : ([a-zA-Z0-9]+)", "class $1 : public $2", 0),
238 // class IProperty : ISetter<TValue, TObj>, IProvider<TValue, TObj>
239 // class IProperty : public ISetter<TValue, TObj>, IProvider<TValue, TObj>
240 (new Regex(@"(?<before>class [a-zA-Z0-9]+ : ((public [a-zA-Z0-9]+(<[a-zA-Z0-9
    ↪ ,]+>)?, )+)?(?<inheritedType>(?!public)[a-zA-Z0-9]+(<[a-zA-Z0-9
    ↪ ,]+>)?(?<after>(, [a-zA-Z0-9]+(?!>)|[ \\r\\n]+))", "${before}public
    ↪ ${inheritedType}${after}", 10),
241 // Insert scope borders.
242 // ref TElement root
243 // ~!root!~ref TElement root
244 (new Regex(@"(?<definition>(?!\\() (ref [a-zA-Z0-9]+|[a-zA-Z0-9]+(?<ref>))
    ↪ (?<variable>[a-zA-Z0-9]+)(?=\\)|, | =))", "~!${variable}!~${definition}", 0),
245 // Inside the scope of ~!root!~ replace:
246 // root
247 // *root
248 (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),
249 // Remove scope borders.
250 // ~!root!~
251 //
252 (new Regex(@"~!(?<pointer>[a-zA-Z0-9]+)!~)", "", 5),
253 // ref auto root = ref
254 // ref auto root =
255 (new Regex(@"ref ([a-zA-Z0-9]+) ([a-zA-Z0-9]+) = ref(\\W)", "$1* $2 =$3", 0),
256 // *root = ref left;
257 // root = left;
258 (new Regex(@"\\*([a-zA-Z0-9]+) = ref ([a-zA-Z0-9]+)(\\W)", "$1 = $2$3", 0),
259 // (ref left)
260 // (left)
261 (new Regex(@"\\(ref ([a-zA-Z0-9]+)(\\)|\\(|,)", "($1$2", 0),
262 // ref TElement

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263 // TElement*
264 (new Regex(@"( | \()ref ([a-zA-Z0-9]+) ", "$1$2* ", 0),
265 // ref sizeBalancedTree.Root
266 // &sizeBalancedTree->Root
267 (new Regex(@"ref ([a-zA-Z0-9]+)\.([a-zA-Z0-9\*]+)", "&$1->$2", 0),
268 // ref GetElement(node).Right
269 // &GetElement(node)->Right
270 (new Regex(@"ref ([a-zA-Z0-9]+)\((([a-zA-Z0-9\*]+)\)\.([a-zA-Z0-9]+)",
    → "&$1($2)->$3", 0),
271 // GetElement(node).Right
272 // GetElement(node)->Right
273 (new Regex(@"([a-zA-Z0-9]+)\((([a-zA-Z0-9\*]+)\)\.([a-zA-Z0-9]+)", "$1($2)->$3", 0),
274 // [Fact]npublic: static void SizeBalancedTreeMultipleAttachAndDetachTest()
275 // public: TEST_METHOD(SizeBalancedTreeMultipleAttachAndDetachTest)
276 (new Regex(@"\[Fact\] \[s\n\]+(public: )?(static )?void ([a-zA-Z0-9]+)\(\)\)", "public:
    → TEST_METHOD($3)", 0),
277 // class TreesTests
278 // TEST_CLASS(TreesTests)
279 (new Regex(@"class ([a-zA-Z0-9]+)Tests)", "TEST_CLASS($1)", 0),
280 // Assert.Equal
281 // Assert::AreEqual
282 (new Regex(@"(Assert)\.Equal)", "$1::AreEqual", 0),
283 // Assert.Throws
284 // Assert::ExpectException
285 (new Regex(@"(Assert)\.Throws)", "$1::ExpectException", 0),
286 // $"Argument {argumentName} is null."
287 // std::string("Argument
    → ").append(Platform::Converters::To<std::string>(argumentName)).append(" is
    → null.").data()
288 (new Regex(@"\$""(?<left>\\""| [^""\r\n])*){(?<expression>[_a-zA-Z0-9]+)}{(?<right>\\
    → ""| [^""\r\n])*)""",
    → "std::string(\$\"${left}\").append(Platform::Converters::To<std::string>(${expres
    → sion})).append(\$\"${right}\").data()",
    → 10),
289 // $"
290 // "
291 (new Regex(@"\$"""), "\"", 0),
292 // std::string(std::string("[").append(Platform::Converters::To<std::string>(Minimum
    → )),append(",
    → ").data()).append(Platform::Converters::To<std::string>(Maximum)).append("]").da
    → ta()
293 // std::string("[").append(Platform::Converters::To<std::string>(Minimum)).append(",
    → ").append(Platform::Converters::To<std::string>(Maximum)).append("]").data()
294 (new Regex(@"std::string\((?<begin>std::string\(""\\""| [^"""])*""\)\.append\((Platf
    → orm::Converters::To<std::string>\([^\n]+\)| [^\n]+\))\)\.data\(\)\.append()",
    → "${begin}.append", 10),
295 // Console.WriteLine("...")
296 // printf("...\n")
297 (new Regex(@"Console\.WriteLine\(""([^\n\r\n]+)""\)", "printf(\$\"$1\\n\\n\"", 0),
298 // TElement Root;
299 // TElement Root = 0;
300 (new Regex(@"(\\r?\\n[\\t ]+)(private|protected|public)?(:
    → )?([a-zA-Z0-9: _]+(?<return>)) ([a-zA-Z0-9]+);", "$1$2$3$4 $5 = 0;", 0),
301 // TreeElement _elements[N];
302 // TreeElement _elements[N] = { {0} };
303 (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),
304 // auto path = new TElement[MaxPath];
305 // TElement path[MaxPath] = { {0} };
306 (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),
307 // bool Equals(Range<T> other) { ... }
308 // bool operator==(const Key &other) const { ... }
309 (new Regex(@"(?<before>\\r?\\n[^\n]+bool )Equals\(((?<type>[^\n]+)
    → (?<variable>[a-zA-Z0-9]+)\\)(?<after>\\s|\\n)*{)", "${before}operator==(const
    → ${type} &${variable}) const${after}", 0),
310 // Insert scope borders.
311 // class Range { ... public: override const char* ToString() { return ...; }
312 // class Range {/*~Range~/ ... public: override const char* ToString() { return
    → ...; }
313 (new Regex(@"(?<classDeclarationBegin>\\r?\\n(?<indent>[\\t ]*)(struct|class)
    → (?<type>[a-zA-Z0-9]+(<((?!s*:\\s*) [^\n])>?)(\\s*:\\s*[^\n]+)?[\\t ]*(\\r?\\n)?[\\t
    → ]*{)(?<middle>((?!class|struct).|\\n)+)?(?<toStringDeclaration>(?(access>(private|
    → |protected|public): )override const char* ToString\\(\\))",
    → "${classDeclarationBegin}/*~${type}~/${middle}${toStringDeclaration}", 0),
314 // Inside the scope of ~!_exceptionsBag!~ replace:

```

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315 // public: override const char* ToString() { return ...; }
316 // public: operator std::string() const { return ...; } \n \n public: friend
    ↳ std::ostream & operator <<(std::ostream &out, const A &obj) { return out <<
    ↳ (std::string)obj; }
317 (new Regex(@"(?<scope>/\*~(?<type>[_a-zA-Z0-9<>:~\s/])~\*/)(?<separator>.\|\n)(?<before>
    ↳ ((?!/\*~\k<type>~\*/)(.\|\n))*?)(?<toStringDeclaration>\r?\n(?<indent>[
    ↳ \t]*)?(?<access>(private|protected|public): )?override const char\* 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),
318 // Remove scope borders.
319 // /*~Range~*/
320 //
321 (new Regex(@"/*~[_a-zA-Z0-9<>:~\s/]", "", 0),
322 // private: static readonly ConcurrentBag<std::exception> _exceptionsBag = new
    ↳ ConcurrentBag<std::exception>();
323 // private: inline static std::mutex _exceptionsBag_mutex; \n \n private: inline
    ↳ static std::vector<std::exception> _exceptionsBag;
324 (new Regex(@"(?<begin>\r?\n?(?<indent>[ \t]+))(?<access>(private|protected|public):
    ↳ )?static readonly ConcurrentBag<(?<argumentType>[~;\r\n]+)>
    ↳ (?<name>[_a-zA-Z0-9]+) = new ConcurrentBag<\k<argumentType>>\(\);)",
    ↳ "${begin}private: inline static std::mutex ${name}_mutex;" + Environment.NewLine
    ↳ + Environment.NewLine + "${indent}${access}inline static
    ↳ std::vector<${argumentType}> ${name};", 0),
325 // public: static IReadOnlyCollection<std::exception> GetCollectedExceptions() {
    ↳ return _exceptionsBag; }
326 // public: static std::vector<std::exception> GetCollectedExceptions() { return
    ↳ std::vector<std::exception>(_exceptionsBag); }
327 (new Regex(@"(?<access>(private|protected|public): )?static
    ↳ IReadOnlyCollection<(?<argumentType>[~;\r\n]+)> (?<methodName>[_a-zA-Z0-9]+)\(\)
    ↳ { return (?<fieldName>[_a-zA-Z0-9]+); }", "${access}static
    ↳ std::vector<${argumentType}> ${methodName}() { return
    ↳ std::vector<${argumentType}>(${fieldName}); }", 0),
328 // public: static event EventHandler<std::exception> ExceptionIgnored =
    ↳ OnExceptionIgnored; ... };
329 // ... public: static inline Platform::Delegates::MulticastDelegate<void(void*,
    ↳ const std::exception&> ExceptionIgnored = OnExceptionIgnored; };
330 (new Regex(@"(?<begin>\r?\n(\r?\n)?(?<halfIndent>[
    ↳ \t]+)\k<halfIndent>)(?<access>(private|protected|public): )?static event
    ↳ EventHandler<(?<argumentType>[~;\r\n]+)> (?<name>[_a-zA-Z0-9]+) = (?<defaultDele
    ↳ gate>[_a-zA-Z0-9]+); (?<middle>.\|\n)+?) (?<end>\r?\n\k<halfIndent>});)",
    ↳ "${middle}" + Environment.NewLine + Environment.NewLine +
    ↳ "${halfIndent}${halfIndent}${access}static inline
    ↳ Platform::Delegates::MulticastDelegate<void(void*, const ${argumentType}&)>
    ↳ ${name} = ${defaultDelegate};${end}", 0),
331 // Insert scope borders.
332 // class IgnoredExceptions { ... private: inline static std::vector<std::exception>
    ↳ _exceptionsBag;
333 // class IgnoredExceptions { /*~_exceptionsBag~*/ ... private: inline static
    ↳ std::vector<std::exception> _exceptionsBag;
334 (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),
335 // Inside the scope of ~!_exceptionsBag!~ replace:
336 // _exceptionsBag.Add(exception);
337 // _exceptionsBag.push_back(exception);
338 (new Regex(@"(?<scope>/\*~(?<fieldName>[_a-zA-Z0-9]+)~\*/)(?<separator>.\|\n)(?<befor
    ↳ e>((?!/\*~\k<fieldName>~\*/)(.\|\n))*?)\k<fieldName>\.Add)",
    ↳ "${scope}${separator}${before}${fieldName}.push_back", 10),
339 // Remove scope borders.
340 // /*~_exceptionsBag~*/
341 //
342 (new Regex(@"/*~[_a-zA-Z0-9]+~\s/)", "", 0),
343 // Insert scope borders.
344 // class IgnoredExceptions { ... private: static std::mutex _exceptionsBag_mutex;
345 // class IgnoredExceptions { /*~_exceptionsBag~*/ ... private: static std::mutex
    ↳ _exceptionsBag_mutex;
346 (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),

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347 // Inside the scope of ~!_exceptionsBag!~ replace:
348 // return std::vector<std::exception>(_exceptionsBag);
349 // std::lock_guard<std::mutex> guard(_exceptionsBag_mutex); return
    → std::vector<std::exception>(_exceptionsBag);
350 (new Regex(@"(?<scope>/\*~(?<fieldName>[_a-zA-Z0-9]+)~\*/)(?<separator>.\|\\n)(?<before>
    → e((?!/\*~\k<fieldName>~\*/)(.\|\\n))*?){(?<after>((?!lock_guard)[^{};\\r\\n])*\k<f
    → ieldName>[~;}\\r\\n*};)"), "${scope}${separator}${before}{
    → std::lock_guard<std::mutex> guard(${fieldName}_mutex);${after}", 10),
351 // Inside the scope of ~!_exceptionsBag!~ replace:
352 // _exceptionsBag.Add(exception);
353 // std::lock_guard<std::mutex> guard(_exceptionsBag_mutex); \\r\\n
    → _exceptionsBag.Add(exception);
354 (new Regex(@"(?<scope>/\*~(?<fieldName>[_a-zA-Z0-9]+)~\*/)(?<separator>.\|\\n)(?<before>
    → e((?!/\*~\k<fieldName>~\*/)(.\|\\n))*?){(?<after>((?!lock_guard)([^{};]|\\n))*?\r
    → ?\\n(?<indent>[ \t]*)\k<fieldName>[~;}\\r\\n*};)"),
    → "${scope}${separator}${before}{\" + Environment.NewLine +
    → "${indent}std::lock_guard<std::mutex> guard(${fieldName}_mutex);${after}", 10),
355 // Remove scope borders.
356 // /*~_exceptionsBag~*/
357 //
358 (new Regex(@"/*~[_a-zA-Z0-9]+~\*/"), "", 0),
359 // Insert scope borders.
360 // class IgnoredExceptions { ... public: static inline
    → Platform::Delegates::MulticastDelegate<void(void*, const std::exception&)>
    → ExceptionIgnored = OnExceptionIgnored;
361 // class IgnoredExceptions {/*~ExceptionIgnored~*/ ... public: static inline
    → Platform::Delegates::MulticastDelegate<void(void*, const std::exception&)>
    → ExceptionIgnored = OnExceptionIgnored;
362 (new Regex(@"(?<classDeclarationBegin>\r?\\n(?<indent>[ \t ]*)class [^\\r\\n]+\\r\\n[ \t
    → ]*)(?<middle>((?!class)\\.\\n)+?)(?<eventDeclaration>(?(<access>(private|protected|
    → |public): )static inline
    → Platform::Delegates::MulticastDelegate<(?(<argumentType>[~;\\r\\n]+)>
    → (?(<name>[_a-zA-Z0-9]+) = (?(<defaultDelegate>[_a-zA-Z0-9]+);)");),
    → "${classDeclarationBegin}/*~${name}~*/${middle}${eventDeclaration}", 0),
363 // Inside the scope of ~!ExceptionIgnored!~ replace:
364 // ExceptionIgnored.Invoke(NULL, exception);
365 // ExceptionIgnored(NULL, exception);
366 (new Regex(@"(?<scope>/\*~(?<eventName>[a-zA-Z0-9]+)~\*/)(?<separator>.\|\\n)(?<before>
    → >((?!/\*~\k<eventName>~\*/)(.\|\\n))*?\k<eventName>\\.Invoke"),
    → "${scope}${separator}${before}${eventName}", 10),
367 // Remove scope borders.
368 // /*~ExceptionIgnored~*/
369 //
370 (new Regex(@"/*~[a-zA-Z0-9]+~\*/"), "", 0),
371 // Insert scope borders.
372 // auto added = new StringBuilder();
373 // /*~sb~*/std::string added;
374 (new Regex(@"(auto|(System\\.Text\\.)?StringBuilder) (?(<variable>[a-zA-Z0-9]+) = new
    → (System\\.Text\\.)?StringBuilder\\(\\);)", "/*~${variable}~*/std::string
    → ${variable};", 0),
375 // static void Indent(StringBuilder sb, int level)
376 // static void Indent(/*~sb~*/StringBuilder sb, int level)
377 (new Regex(@"(?<start>, |\\() (System\\.Text\\.)?StringBuilder
    → (?(<variable>[a-zA-Z0-9]+) (?(<end>, |\\))"), "${start}/*~${variable}~*/std::string&
    → ${variable}${end}", 0),
378 // Inside the scope of ~!added!~ replace:
379 // sb.ToString()
380 // sb.data()
381 (new Regex(@"(?<scope>/\*~(?<variable>[a-zA-Z0-9]+)~\*/)(?<separator>.\|\\n)(?<before>
    → ((?!/\*~\k<variable>~\*/)(.\|\\n))*?\k<variable>\\.ToString\\(\\)",
    → "${scope}${separator}${before}${variable}.data()", 10),
382 // sb.AppendLine(argument)
383 // sb.append(Platform::Converters::To<std::string>(argument)).append(1, '\\n')
384 (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>(${argument})).append(1, '\\n')",
    → 10),
385 // sb.Append('\\t', level);
386 // sb.append(level, '\\t');
387 (new Regex(@"(?<scope>/\*~(?<variable>[a-zA-Z0-9]+)~\*/)(?<separator>.\|\\n)(?<before>
    → ((?!/\*~\k<variable>~\*/)(.\|\\n))*?\k<variable>\\.Append\\('(?(<character>[^\r\\n]
    → +)', (?(<count>[^\n], \\r\\n)+)\\)"),
    → "${scope}${separator}${before}${variable}.append(${count}, '${character}'))", 10),
388 // sb.Append(argument)

```



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// sb.append(Platform::Converters::ToString(argument))
(new Regex(@"(?<scope>/\*~(?<variable>[a-zA-Z0-9]+)~\*/)(?<separator>.\|\\n)(?<before>
((?!/\*~\k<variable>~\*/)(.\\n))*?)\k<variable>\.Append\(((?<argument>[^\],\\r\\n)
+))\"),
    @"${scope}${separator}${before}${variable}.append(Platform::Converters::To<std::s
tring>(${argument}))",
    10),
// Remove scope borders.
// /*~sb~*/
//
(new Regex(@"/*~[a-zA-Z0-9]+~*/", "", 0),
// Insert scope borders.
// auto added = new HashSet<TElement>();
// ~!added!~std::unordered_set<TElement> added;
(new Regex(@"auto (?<variable>[a-zA-Z0-9]+) = new
    HashSet<(?<element>[a-zA-Z0-9]+)>\(\(\);\"",
    @"~!${variable}!~std::unordered_set<${element}> ${variable};\"", 0),
// Inside the scope of ~!added!~ replace:
// added.Add(node)
// added.insert(node)
(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),
// Inside the scope of ~!added!~ replace:
// added.Remove(node)
// added.erase(node)
(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(${argument})", 10),
// if (added.insert(node)) {
// if (!added.contains(node)) { added.insert(node);
(new Regex(@"if \\((?<variable>[a-zA-Z0-9]+)\\.insert\\(((?<argument>[a-zA-Z0-9]+)\\)\\)(?
    <separator>[\\t ]*\\r\\n\\)(?<indent>[\\t ]*){\"", "if
    (!${variable}.contains(${argument}))${separator}${indent}{\" +
    Environment.NewLine + "${indent}    ${variable}.insert(${argument});\"", 0),
// Remove scope borders.
// ~!added!~
//
(new Regex(@"~!~[a-zA-Z0-9]+!~\"", "", 5),
// Insert scope borders.
// auto random = new System.Random(0);
// std::srand(0);
(new Regex(@"[a-zA-Z0-9\\.]+ (([a-zA-Z0-9]+) = new
    (System\\.)?Random\\((([a-zA-Z0-9]+)\\));\"", "~~!$!~std::srand($3);\"", 0),
// Inside the scope of ~!random!~ replace:
// random.Next(1, N)
// (std::rand() % N) + 1
(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),
// Remove scope borders.
// ~!random!~
//
(new Regex(@"~!~[a-zA-Z0-9]+!~\"", "", 5),
// Insert method body scope starts.
// void PrintNodes(TElement node, StringBuilder sb, int level) {
// void PrintNodes(TElement node, StringBuilder sb, int level) {/*method-start*/
(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*/${end}\"",
    0),
// Insert method body scope ends.
// {/*method-start*/...}
// {/*method-start*/.../*method-end*/}
(new Regex(@"\\{\\/*method-start*/(?<body>((?<bracket>\\{)|(?!<-bracket>\\})|[^\\{\\}]*)+)
    \\}", "{/*method-start*/${body}/*method-end*/\"",
    0),
// Inside method bodies replace:
// GetFirst(
// this->GetFirst(
(new Regex(@"(?<separator>(\\(|\\|([\\W])|return ))(?<!(\\->|\\*
    ))(?<method>(?!sizeof)[a-zA-Z0-9]+)\\(((?!\\)\\{)\\)",
    @"${separator}this->${method}(", 1),

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(new Regex(@"(?<scope>\/\*method-start\*\/)(?<before>((?!\/\*method-end\*\/)(.|\n))*?)(
    ?<separator>[W](?!(:|\.|->)))(?<method>(?!sizeof)[a-zA-Z0-9]+\)((?!\\
    \{)(?<after>(.|\n))*?)(?<scopeEnd>\/\*method-end\*\/)"),
    "${scope}${before}${separator}this->${method}(${after}${scopeEnd}", 100),
// Remove scope borders.
// /*method-start*/
//
(new Regex(@"\/\*method-(start|end)\*\/"), "", 0),
// Insert scope borders.
// const std::exception& ex
// const std::exception& ex/*~ex~*/
(new Regex(@"(?<before>\\(| )(?<variableDefinition>(const )?(std::)?exception&?
    (?<variable>[_a-zA-Z0-9]+))(?<after>\\W)"),
    "${before}${variableDefinition}/*~${variable}~*/${after}", 0),
// Inside the scope of ~!ex!~ replace:
// ex.Message
// ex.what()
(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),
// Remove scope borders.
// /*~ex~*/
//
(new Regex(@"\/\*~[_a-zA-Z0-9]+~\*\/"), "", 0),
// throw new ArgumentNullException(argumentName, message);
// throw std::invalid_argument(std::string("Argument
    ").append(argumentName).append(" is null: ").append(message).append("."));
(new Regex(@"throw new
    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),
// throw new ArgumentException(message, argumentName);
// throw std::invalid_argument(std::string("Invalid ").append(argumentName).append("
    argument: ").append(message).append("."));
(new Regex(@"throw new
    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),
// throw new ArgumentOutOfRangeException(argumentName, argumentValue,
    messageBuilder());
// 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("."));
(new Regex(@"throw new ArgumentOutOfRangeException\\((?<argument>[a-zA-Z]*[Aa]rgument
    [a-zA-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(${message}).append\\(\\.\\.\\)");", 0),
// throw new NotSupportedException();
// throw std::logic_error("Not supported exception.");
(new Regex(@"throw new NotSupportedException\\(\\);"), "throw std::logic_error\\("Not
    supported exception.\\)");", 0),
// throw new NotImplementedException();
// throw std::logic_error("Not implemented exception.");
(new Regex(@"throw new NotImplementedException\\(\\);"), "throw std::logic_error\\("Not
    implemented exception.\\)");", 0),
// Insert scope borders.
// const std::string& message
// const std::string& message/*~message~*/
(new Regex(@"(?<before>\\(| )(?<variableDefinition>(const )?((std::)?string&?|char\\*)
    (?<variable>[_a-zA-Z0-9]+))(?<after>\\W)"),
    "${before}${variableDefinition}/*~${variable}~*/${after}", 0),
// Inside the scope of /*~message~*/ replace:
// Platform::Converters::To<std::string>(message)
// message
(new Regex(@"(?<scope>\/\*~(?<variable>[_a-zA-Z0-9]+)~\*\/)(?<separator>.|\\n)(?<before>
    >((?!\/\*~\k<variable>~\*\/)(.|\n))*?)(Platform::Converters::To<std::string>\\(\k<v
    ariable>\\)"), "${scope}${separator}${before}${variable}",
    10),

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```
// Remove scope borders.
// /*~ex~/
//
(new Regex(@"/*~[_a-zA-Z0-9]+~*/"), "", 0),
// Insert scope borders.
// class Range<T> {
// class Range<T> {/*~type~Range~/
(new Regex(@"(?<classDeclarationBegin>\r?\n(?:\t | )*(struct|class)
→ (?<type>[_a-zA-Z0-9]+((?!\:|\s)[^\n])+))?(\\s*:\\s*[^\n])?[\t ]*(\r?\n)?[\t
→ ]*{")", "${classDeclarationBegin}/*~type~${type}~/", 0),
// Inside the scope of /*~type~Range<T>~/ insert inner scope and replace:
// public: static implicit operator std::tuple<T, T>(Range<T> range)
// public: operator std::tuple<T, T>(Range<T> range) {/*~variable~Range<T>~/
(new Regex(@"(?<scope>/\s*\s*(?<type>[^\n\s]+)\s*/)(?<separator>.\n)(?<before>((
→ ?!/\s*\s*\k<type>~\s*/)(.\n))*)(?<access>(private|protected|public): )static
→ implicit operator (?<targetType>[^\n\s]+\s*)(?<argumentDeclaration>\k<type>
→ (?<variable>[_a-zA-Z0-9]+))(?<after>)\\s*\n\s*{")",
→ "${scope}${separator}${before}${access}operator
→ ${targetType}${argumentDeclaration}${after}/*~variable~${variable}~/", 10),
// Inside the scope of /*~variable~range~/ replace:
// range.Minimum
// this->Minimum
(new Regex(@"(?<scope>[/\s*\s*(?<variable>[^\n\s]+)\s*/)(?<separator>.\n)(?<be
→ fore>(?!<beforeExpression>(?!<bracket>{)|(?!<-bracket>}|{|\n})*?)\k<variable>\.
→ (?<field>[_a-zA-Z0-9]+)(?<after>(|;|}|
→ |\n)))(?<afterExpression>(?!<bracket>{)|(?!<-bracket>}|{|\n})*?)")",
→ "${scope}${separator}${before}this->${field}${after}", 10),
// Remove scope borders.
// /*~ex~/
//
(new Regex(@"/*~[^\n]+~*/"), "", 0),
}.Cast<ISubstitutionRule>().ToList();

public static readonly IList<ISubstitutionRule> LastStage = new List<SubstitutionRule>
{
    // ICounter<int, int> c1;
    // ICounter<int, int>* c1;
    (new Regex(@"(?<abstractType>I[A-Z] [_a-zA-Z0-9]+(?!>[\r\n]+))?)
→ (?<variable>[_a-zA-Z0-9]+);", "${abstractType}* ${variable};", 0),
    // (expression)
    // expression
    (new Regex(@"(\(| \|)(([_a-zA-Z0-9_]*:)+)(\)| \|;|\\)")), "$1$2$3", 0),
    // (method(expression))
    // method(expression)
    (new Regex(@"(?<firstSeparator>(\(|
→ ))\(((?<method>[_a-zA-Z0-9_->*:]+)\(((?<expression>((?<parenthesis>\(|(?<-parent
→ hesis>)|[_a-zA-Z0-9_->*:]*)+)(?<parenthesis>(?!))\))\)(?<lastSeparator>(|
→ |;|\\)))")", "${firstSeparator}${method}(${expression})${lastSeparator}", 0),
    // .append(".")
    // .append(1, '.');
    (new Regex(@"\..append\\(\"\"([^\"]|\\\")\"\"\\)", ".append(1, '$1')", 0),
    // return ref _elements[node];
    // return &_elements[node];
    (new Regex(@"return ref ([_a-zA-Z0-9]+)\[([_a-zA-Z0-9_]*+)\];", "return &$1[$2];",
→ 0),
    // null
    // nullptr
    (new Regex(@"(?<before>\r?\n[^\r\n]*(\"\\\"|\"\"\\\r\n)*\"\"[^\r\n]*)(?<=\\W)null
→ (?<after>\\W)", "${before}nullptr${after}",
→ 10),
    // default
    // 0
    (new Regex(@"(?<before>\r?\n[^\r\n]*(\"\\\"|\"\"\\\r\n)*\"\"[^\r\n]*)(?<=\\W)defa
→ ult(?<after>\\W)", "${before}0${after}",
→ 10),
    // object x
    // void *x
    (new Regex(@"(?<before>\r?\n[^\r\n]*(\"\\\"|\"\"\\\r\n)*\"\"[^\r\n]*)(?<=\\W)([O|
→ o]bject|System\\.Object) (?<after>\\w)", "${before}void *${after}",
→ 10),
    // <object>
    // <void*>
    (new Regex(@"(?<before>\r?\n[^\r\n]*(\"\\\"|\"\"\\\r\n)*\"\"[^\r\n]*)(?<=\\W)(?!
→ \\w)([O|o]bject|System\\.Object) (?<after>\\W)", "${before}void*${after}",
→ 10),
    // ArgumentException
```

```

530 // std::invalid_argument
531 (new Regex(@"(?<before>\r?\n[~""\r\n]*("(\\"|~""\r\n))*""[~""\r\n]*)(?<=\\W)(Sys_
    ↪ tem\\.)?ArgumentNullException(?<after>\\W)"),
    ↪ "${before}std::invalid_argument${after}", 10),
532 // struct Range<T> : IEquatable<Range<T>> {
533 // struct Range<T> {
534 (new Regex(@"(?<before>(struct|class) (?<type>[a-zA-Z0-9]+(<[~\n]+>?)) :
    ↪ IEquatable<\k<type>>(?(after>\\s|\\n)*{)"), "${before}${after}", 0),
535 // #region Always
536 //
537 (new Regex(@"(~|\\r?\\n)[ \\t]*#(region|endregion)[~\\r\\n]*(\\r?\\n|$)"), "", 0),
538 // // #define ENABLE_TREE_AUTO_DEBUG_AND_VALIDATION
539 //
540 (new Regex(@"\\|\\/\\/ [ \\t]*#define [ \\t]+[_a-zA-Z0-9]+[ \\t]*"), "", 0),
541 // #if USEARRAYPOOL\\r\\n#endif
542 //
543 (new Regex(@"#if [a-zA-Z0-9]+\\s+#endif"), "", 0),
544 // [Fact]
545 //
546 (new Regex(@"(?<firstNewLine>\\r?\\n|\\A)(?<indent>[\\t
    ↪ ]+)[\\[a-zA-Z0-9]+(\\((?<expression>(?(parenthesis>\\)|(?<-parenthesis>\\))|~(\\r
    ↪ \\n)*+)(?(parenthesis)(?!))\\)?\\[ \\t]*(\\r?\\n\\k<indent>)?"),
    ↪ "${firstNewLine}${indent}", 5),
547 // \\n ... namespace
548 // namespace
549 (new Regex(@"(\\S[\\r\\n]{1,2})?[\\r\\n]+namespace"), "$1namespace", 0),
550 // \\n ... class
551 // class
552 (new Regex(@"(\\S[\\r\\n]{1,2})?[\\r\\n]+class"), "$1class", 0),
553 // \\n\\n\\n
554 // \\n\\n
555 (new Regex(@"\\r?\\n[ \\t]*\\r?\\n[ \\t]*\\r?\\n"), Environment.NewLine +
    ↪ Environment.NewLine, 50),
556 // {\\n\\n
557 // {\\n
558 (new Regex(@"{[ \\t]*\\r?\\n[ \\t]*\\r?\\n"), "{" + Environment.NewLine, 10),
559 // \\n\\n}
560 // {\\n
561 (new Regex(@"\\r?\\n[ \\t]*\\r?\\n(?<end>[ \\t]*)"), Environment.NewLine + "${end}", 10),
562 }.Cast<ISubstitutionRule>().ToList();
563
564 public CSharpToCppTransformer(IList<ISubstitutionRule> extraRules) :
    ↪ base(FirstStage.Concat(extraRules).Concat(LastStage).ToList()) { }
565
566 public CSharpToCppTransformer() : base(FirstStage.Concat(LastStage).ToList()) { }
567 }
568 }

```

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(const char* args[])
30     {
31         printf("Hello, world!\n");
32     }
33 };";
34     var transformer = new CSharpToCppTransformer();
35     var actualResult = transformer.Transform(helloWorldCode);
36     Assert.Equal(expectedResult, actualResult);
37 }
38 }
39 }
```

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