

## 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 : Transformer
11     {
12         public static readonly IList<ISubstitutionRule> FirstStage = new List<SubstitutionRule>
13         {
14             // // ...
15             //
16             (new Regex(@"(\r?\n)?[ \t]+//+.+"), "", null, 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]+\$"), "", null, 0),
21             // {\n\n\n
22             // {
23             (new Regex(@"{\s+[\r\n]+") , "{" + Environment.NewLine, null, 0),
24             // Platform.Collections.Methods.Lists
25             // Platform::Collections::Methods::Lists
26             (new Regex(@"(namespace[^\r\n]+?)\.([\r\n]+?)"), "$1::$2", null, 20),
27             // out TProduct
28             // TProduct
29             (new Regex(@"(?<before>(<|, ))(in|out)
30             → (?<typeParameter>[a-zA-Z0-9]+)(?<after>(>|,))"),
31             → "${before}${typeParameter}${after}", null, 10),
32             // public ...
33             // public: ...
34             (new Regex(@"(?<newLineAndIndent>\r?\n?[
35             → \t]*)(?<before>[^\{\\(\r\n)*](?<access>private|protected|public)[
36             → \t]+(?![^\{\\(\r\n)*](interface|class|struct)[^\{\\(\r\n)*][^\{\\(\r\n)*)"),
37             → "${newLineAndIndent}${access}: ${before}", null, 0),
38             // public: static bool CollectExceptions { get; set; }
39             // public: static bool CollectExceptions;
40             (new Regex(@"(?<before>(private|protected|public): (static )?[^\r\n]+
41             → )(?<name>[a-zA-Z0-9]+) {[^;]}*(?<=\\W)get; [^;]}*(?<=\\W)set; [^;]}*") ,
42             → "${before}${name};", null, 0),
43             // public abstract class
44             // class
45             (new Regex(@"((public|protected|private|internal|abstract|static)
46             → )*(?<category>interface|class|struct)", "${category}", null, 0),
47             // class GenericCollectionMethodsBase<TElement> {
48             // template <typename TElement> class GenericCollectionMethodsBase {
49             (new Regex(@"class ([a-zA-Z0-9]+)<([a-zA-Z0-9]+)>([^\{]+){", "template <typename $2>
50             → class $1$3{", null, 0),
51             // static void
52             → TestMultipleCreationsAndDeletions<TElement>(SizedBinaryTreeMethodsBase<TElement>
53             → tree, TElement* root)
54             // template<typename T> static void
55             → TestMultipleCreationsAndDeletions<TElement>(SizedBinaryTreeMethodsBase<TElement>
56             → tree, TElement* root)
57             (new Regex(@"static ([a-zA-Z0-9]+) ([a-zA-Z0-9]+)<([a-zA-Z0-9]+)>\\(((^\\)\\r\\n)+)\\)",
58             → "template <typename $3> static $1 $2($4)", null, 0),
59             // interface IFactory<out TProduct> {
60             // template <typename TProduct> class IFactory { public:
61             (new Regex(@"interface (?<interface>[a-zA-Z0-9]+)<(?!<typeParameters>[a-zA-Z0-9
62             → ,]+)>(?!<whitespace>[^\{]+){", "template <typename...> class ${interface};
63             → template <typename ${typeParameters}> class
64             → ${interface}<${typeParameters}>${whitespace}{ + Environment.NewLine + "
65             → public:", null, 0),
66             // template <typename TObject, TProperty, TValue>
67             // template <typename TObject, typename TProperty, TValue>
68             (new Regex(@"(?<before>template <((, )?typename [a-zA-Z0-9]+)+,
69             → )(?<typeParameter>[a-zA-Z0-9]+)(?<after>(,|>))", "${before}typename
70             → ${typeParameter}${after}", null, 10),
71             // Insert markers
72             // private: static void BuildExceptionString(this StringBuilder sb, Exception
73             → exception, int level)
74             // /*~extensionMethod~BuildExceptionString~*/private: static void
75             → BuildExceptionString(this StringBuilder sb, Exception exception, int level)

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53 (new Regex(@"private: static [^\r\n]+ (?<name>[a-zA-Z0-9]+)\(this [^\]\r\n]+\\)"),
54     ↳ "/*~extensionMethod~${name}~*/$0", null, 0),
55 // Move all markers to the beginning of the file.
56 (new Regex(@"\A(?<before>[^\r\n]+\r?\n(.|\n)+)(?<marker>/\*~extensionMethod~(?<name>[a-zA-Z0-9]+)~\*/)"), "${marker}${before}", null,
57     ↳ 10),
58 // /*~extensionMethod~BuildExceptionString~*/...sb.BuildExceptionString(exception.InnerException, level +
59     ↳ 1);
60 // /*~extensionMethod~BuildExceptionString~*/...BuildExceptionString(sb,
61     ↳ exception.InnerException, level + 1);
62 (new Regex(@"(?<before>/\*~extensionMethod~(?<name>[a-zA-Z0-9]+)~\*/(.|\n)+\W)(?<variable>[_a-zA-Z0-9]+\)\. \k<name>\(", "${before}${name}(${variable}", null,
63     ↳ 50),
64 // Remove markers
65 // /*~extensionMethod~BuildExceptionString~*/
66 //
67 (new Regex(@"/*~extensionMethod~[a-zA-Z0-9]+~\*/"), "", null, 0),
68 // (this
69 // (
70 (new Regex(@"\((this ", "(", null, 0),
71 // public: static readonly EnsureAlwaysExtensionRoot Always = new
72     ↳ EnsureAlwaysExtensionRoot();
73 // public: inline static EnsureAlwaysExtensionRoot Always;
74 (new Regex(@"(?<access>(private|protected|public): )?static readonly
75     ↳ (?<type>[a-zA-Z0-9]+) (?<name>[_a-zA-Z0-9_]+) = new \k<type>\(\);"),
76     ↳ "${access}inline static ${type} ${name};", null, 0),
77 // public: static readonly string ExceptionContentsSeparator = "---";
78 // public: inline static const char* ExceptionContentsSeparator = "---";
79 (new Regex(@"(?<access>(private|protected|public): )?static readonly string
80     ↳ (?<name>[a-zA-Z0-9_]+) = ""(?<string>(\\"|"[^\r\n"])+)"";"), "${access}inline
81     ↳ static const char* ${name} = \"${string}\";", null, 0),
82 // private: const int MaxPath = 92;
83 // private: static const int MaxPath = 92;
84 (new Regex(@"(?<access>(private|protected|public): )?(const|static readonly)
85     ↳ (?<type>[a-zA-Z0-9]+) (?<name>[_a-zA-Z0-9_]+) = (?<value>[^\r\n]+);"),
86     ↳ "${access}static const ${type} ${name} = ${value};", null, 0),
87 // ArgumentNotNull(EnsureAlwaysExtensionRoot root, TArgument argument) where
88     ↳ TArgument : class
89 // ArgumentNotNull(EnsureAlwaysExtensionRoot root, TArgument* argument)
90 (new Regex(@"(?<before> [a-zA-Z]+)(([a-zA-Z *,,]+, |))(?<type>[a-zA-Z]+)(?<after>(|
91     ↳ [a-zA-Z *,,]+)))[ \r\n]+where \k<type> : class)", "${before}${type}*${after}",
92     ↳ null, 0),
93 // protected: abstract TElement GetFirst();
94 // protected: virtual TElement GetFirst() = 0;
95 (new Regex(@"(?<access>(private|protected|public): )?abstract
96     ↳ (?<method>[^\r\n]+);"), "${access}virtual ${method} = 0;", null, 0),
97 // TElement GetFirst();
98 // virtual TElement GetFirst() = 0;
99 (new Regex(@"([\r\n]+[ ]+)((?!return)[a-zA-Z0-9]+ [a-zA-Z0-9]+\([^\]\r\n]*\))(\;|
100     ↳ ]*\[ \r\n]+)", "$1virtual $2 = 0$3", null, 1),
101 // protected: readonly TreeElement[] _elements;
102 // protected: TreeElement _elements[N];
103 (new Regex(@"(?<access>(private|protected|public): )?readonly
104     ↳ (?<type>[a-zA-Z<0-9]+)([\[\]]+) (?<name>[_a-zA-Z0-9_]+);"), "${access}${type}
105     ↳ ${name}[N];", null, 0),
106 // protected: readonly TElement Zero;
107 // protected: TElement Zero;
108 (new Regex(@"(?<access>(private|protected|public): )?readonly
109     ↳ (?<type>[a-zA-Z<0-9]+) (?<name>[_a-zA-Z0-9_]+);"), "${access}${type} ${name};",
110     ↳ null, 0),
111 // internal
112 //
113 (new Regex(@"(\W)internal\s+"), "$1", null, 0),
114 // static void NotImplementedException(ThrowExtensionRoot root) => throw new
115     ↳ NotImplementedException();
116 // static void NotImplementedException(ThrowExtensionRoot root) { return throw new
117     ↳ NotImplementedException(); }
118 (new Regex(@"(^s+)(private|protected|public)?(: )?(template \<[^^\r\n]+\> )?(static
119     ↳ )?(override )?([a-zA-Z0-9]+
120     ↳ )([a-zA-Z0-9_]+\((([^\(\r\n]*)\)\s+=>\s+throw([^\r\n]+);"),
121     ↳ "$1$2$3$4$5$6$7$8($9) { throw$10; }", null, 0),
122 // SizeBalancedTree(int capacity) => a = b;
123 // SizeBalancedTree(int capacity) { a = b; }

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98 (new Regex(@"(^s+)(private|protected|public)?(: )?(template \<[^>\r\n]+\> )?(static
   ↳ )?(override )?(void )?([a-zA-Z0-9]+)\((([^\(\r\n]*)\)\s+=>\s+([^\;\r\n]+);"),
   ↳ "$1$2$3$4$5$6$7$8($9) { $10; }", null, 0),
99 // int SizeBalancedTree(int capacity) => a;
100 // int SizeBalancedTree(int capacity) { return a; }
101 (new Regex(@"(^s+)(private|protected|public)?(: )?(template \<[^>\r\n]+\> )?(static
   ↳ )?(override )?([a-zA-Z0-9]+
   ↳ )([a-zA-Z0-9]+)\((([^\(\r\n]*)\)\s+=>\s+([^\;\r\n]+);"), "$1$2$3$4$5$6$7$8($9) {
   ↳ return $10; }", null, 0),
102 // () => Integer<TElement>.Zero,
103 // () { return Integer<TElement>.Zero; },
104 (new Regex(@"\(\)\s+=>\s+([^\;\r\n]+?);"), "( ) { return $1; }", null, 0),
105 // => Integer<TElement>.Zero;
106 // { return Integer<TElement>.Zero; }
107 (new Regex(@"\)\s+=>\s+([^\;\r\n]+?);"), ") { return $1; }", null, 0),
108 // () { return avlTree.Count; }
109 // [&]()-> auto { return avlTree.Count; }
110 (new Regex(@"", \(\) { return ([^\;\r\n]+); }"), ", [&]()-> auto { return $1; }",
   ↳ null, 0),
111 // Count => GetSizeOrZero(Root);
112 // GetCount() { return GetSizeOrZero(Root); }
113 (new Regex(@"(\W)([A-Z][a-zA-Z]+)\s+=>\s+([^\;\r\n]+);"), "$1Get$2() { return $3; }",
   ↳ null, 0),
114 // Func<TElement> treeCount
115 // std::function<TElement()> treeCount
116 (new Regex(@"Func<([a-zA-Z0-9]+)> ([a-zA-Z0-9]+)"), "std::function<$1()> $2", null,
   ↳ 0),
117 // Action<TElement> free
118 // std::function<void(TElement)> free
119 (new Regex(@"Action<([a-zA-Z0-9]+)> ([a-zA-Z0-9]+)"), "std::function<void($1)> $2",
   ↳ null, 0),
120 // Predicate<TArgument> predicate
121 // std::function<bool(TArgument)> predicate
122 (new Regex(@"Predicate<([a-zA-Z0-9]+)> ([a-zA-Z0-9]+)"), "std::function<bool($1)>
   ↳ $2", null, 0),
123 // var
124 // auto
125 (new Regex(@"(\W)var(\W)"), "$1auto$2", null, 0),
126 // unchecked
127 //
128 (new Regex(@"[\r\n]{2}\s*unchecked\s*?$"), "", null, 0),
129 // throw new InvalidOperationException
130 // throw std::runtime_error
131 (new Regex(@"throw new (InvalidOperationException|Exception)"), "throw
   ↳ std::runtime_error", null, 0),
132 // void RaiseExceptionIgnoredEvent(Exception exception)
133 // void RaiseExceptionIgnoredEvent(const std::exception& exception)
134 (new Regex(@"(\(|\ )(\System\.Exception|Exception)(\)|\))"), "$1const
   ↳ std::exception&$3", null, 0),
135 // EventHandler<Exception>
136 // EventHandler<std::exception>
137 (new Regex(@"(\W)(\System\.Exception|Exception)(\W)"), "$1std::exception$3", null, 0),
138 // override void PrintNode(TElement node, StringBuilder sb, int level)
139 // void PrintNode(TElement node, StringBuilder sb, int level) override
140 (new Regex(@"override ([a-zA-Z0-9 \*+]+)\((([^\(\r\n]+?)\))"), "$1$2 override", null,
   ↳ 0),
141 // string
142 // const char*
143 (new Regex(@"(\W)string(\W)"), "$1const char*$2", null, 0),
144 // sbyte
145 // std::int8_t
146 (new Regex(@"(\W)sbyte(\W)"), "$1std::int8_t$2", null, 0),
147 // uint
148 // std::uint32_t
149 (new Regex(@"(\W)uint(\W)"), "$1std::uint32_t$2", null, 0),
150 // char*[] args
151 // char* args[]
152 (new Regex(@"([_a-zA-Z0-9:\*]?)\[\] ([a-zA-Z0-9]+)"), "$1 $2[]", null, 0),
153 // @object
154 // object
155 (new Regex(@"@([_a-zA-Z0-9]+)"), "$1", null, 0),
156 // using Platform.Numbers;
157 //
158 (new Regex(@"([\r\n]{2}|^)\s*?using [\.a-zA-Z0-9]+;\s*?$"), "", null, 0),
159 // struct TreeElement { }
160 // struct TreeElement { };

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161 (new Regex(@"(struct|class) ([a-zA-Z0-9]+)(\s+){([\sa-zA-Z0-9;:_]+?)}([\^;])", "$1
    ↳ $2$3{$4};$5", null, 0),
162 // class Program { }
163 // class Program { };
164 (new Regex(@"(struct|class) ([a-zA-Z0-9]+)[^\r\n]*)([\r\n]+(?<indentLevel>[\t
    ↳ ]*)?)\{([\S\s]+?[\r\n]+\k<indentLevel>\}\}([\^;]|$)", "$1 $2$3{$4};$5", null, 0),
165 // class SizedBinaryTreeMethodsBase : GenericCollectionMethodsBase
166 // class SizedBinaryTreeMethodsBase : public GenericCollectionMethodsBase
167 (new Regex(@"class ([a-zA-Z0-9]+) : ([a-zA-Z0-9]+)", "class $1 : public $2", null,
    ↳ 0),
168 // class IProperty : ISetter<TValue, TObject>, IProvider<TValue, TObject>
169 // class IProperty : public ISetter<TValue, TObject>, IProvider<TValue, TObject>
170 (new Regex(@"(?<before>class [a-zA-Z0-9]+ : ((public [a-zA-Z0-9]+(<[a-zA-Z0-9
    ↳ ,]+>)?, )+)?(?<inheritedType>(?!public) [a-zA-Z0-9]+(<[a-zA-Z0-9
    ↳ ,]+>)?(?<after>(, [a-zA-Z0-9]+(?!>)|[\r\n]+)))", "${before}public
    ↳ ${inheritedType}${after}", null, 10),
171 // Insert scope borders.
172 // ref TELEMENT root
173 // ~!root!~ref TELEMENT root
174 (new Regex(@"(?<definition>(?!<= |\\() (ref [a-zA-Z0-9]+|[a-zA-Z0-9]+(?<ref))
    ↳ (?<variable>[a-zA-Z0-9]+)(?=\\|, | =))", "~!${variable}!~${definition}", null,
    ↳ 0),
175 // Inside the scope of ~!root!~ replace:
176 // root
177 // *root
178 (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}", null, 70),
179 // Remove scope borders.
180 // ~!root!~
181 //
182 (new Regex(@"~!(?<pointer>[a-zA-Z0-9]+)!~"), "", null, 5),
183 // ref auto root = ref
184 // ref auto root =
185 (new Regex(@"ref ([a-zA-Z0-9]+) ([a-zA-Z0-9]+) = ref(\\W)", "$1* $2 =$3", null, 0),
186 // *root = ref left;
187 // root = left;
188 (new Regex(@"*([a-zA-Z0-9]+) = ref ([a-zA-Z0-9]+)(\\W)", "$1 = $2$3", null, 0),
189 // (ref left)
190 // (left)
191 (new Regex(@"\\(ref ([a-zA-Z0-9]+)(\\|\\(|,))", "($1$2", null, 0),
192 // ref TELEMENT
193 // TELEMENT*
194 (new Regex(@"( |\\()ref ([a-zA-Z0-9]+) ", "$1$2* ", null, 0),
195 // ref sizeBalancedTree.Root
196 // &sizeBalancedTree->Root
197 (new Regex(@"ref ([a-zA-Z0-9]+)\\.([a-zA-Z0-9\\*]+)", "&$1->$2", null, 0),
198 // ref GetElement(node).Right
199 // &GetElement(node)->Right
200 (new Regex(@"ref ([a-zA-Z0-9]+)\\((([a-zA-Z0-9\\*]+)\\)\\.([a-zA-Z0-9]+)",
    ↳ "&$1($2)->$3", null, 0),
201 // GetElement(node).Right
202 // GetElement(node)->Right
203 (new Regex(@"([a-zA-Z0-9]+)\\((([a-zA-Z0-9\\*]+)\\)\\.([a-zA-Z0-9]+)", "$1($2)->$3",
    ↳ null, 0),
204 // [Fact] npublic: static void SizeBalancedTreeMultipleAttachAndDetachTest()
205 // public: TEST_METHOD(SizeBalancedTreeMultipleAttachAndDetachTest)
206 (new Regex(@"[Fact\\][\\s\\n]+(public: )?(static )?void ([a-zA-Z0-9]+)\\(\\)", "public:
    ↳ TEST_METHOD($3)", null, 0),
207 // class TreesTests
208 // TEST_CLASS(TreesTests)
209 (new Regex(@"class ([a-zA-Z0-9]+)Tests", "TEST_CLASS($1)", null, 0),
210 // Assert.Equal
211 // Assert::AreEqual
212 (new Regex(@"Assert\\.Equal", "Assert::AreEqual", null, 0),
213 // $Argument {argumentName} is null."
214 // ((std::string)"Argument ").append(argumentName).append(" is null.").data()
215 (new Regex(@"\\$""(?<left>(\\""|\\^""\\r\\n)*){(?<expression>[_a-zA-Z0-9]+)}{(?<right>(\\
    ↳ \\""|\\^""\\r\\n)*)""",
    ↳ "((std::string)$\\$${left}\\").append(${expression}).append("\\$${right}\\").data()",
    ↳ null, 10),
216 // $"
217 // "
218 (new Regex(@"\\$"""), "\\\"", null, 0),
219 // Console.WriteLine("...")

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220 // printf("...\n")
221 (new Regex(@"Console.WriteLine\(""([^\r\n]+)""\)", "printf(\"$1\\n\")", null, 0),
222 // TElement Root;
223 // TElement Root = 0;
224 (new Regex(@"(\\r?\\n[\\t ]+)(private|protected|public)?(:
→ )?([a-zA-Z0-9:~]+(?!return)) ([a-zA-Z0-9]+);"), "$1$2$3$4 $5 = 0;", null, 0),
225 // TreeElement _elements[N];
226 // TreeElement _elements[N] = { {0} };
227 (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} }";", null, 0),
228 // auto path = new TElement[MaxPath];
229 // TElement path[MaxPath] = { {0} };
230 (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[$4] = { {0} }";", null, 0),
231 // public: static event EventHandler<std::exception> ExceptionIgnored =
→ OnExceptionIgnored; ... };
232 // ... public: static inline Platform::Delegates::MulticastDelegate<void(void*,
→ const std::exception&> ExceptionIgnored = OnExceptionIgnored; };
233 (new Regex(@"(?<begin>\\r?\\n(\\r?\\n)?(?<halfIndent>[
→ \\t]+)\\k<halfIndent>)(?<access>(private|protected|public): )?static event
→ EventHandler<(?!<argumentType>[~;\\r\\n]+)> (?<name>[a-zA-Z0-9]+) = (?<defaultDele_
→ gate>[a-zA-Z0-9]+);(?<middle>(\\.\\n)+)?(?<end>\\r?\\n\\k<halfIndent>};)"),
→ "${middle}" + Environment.NewLine + Environment.NewLine +
→ "${halfIndent}${halfIndent}${access}static inline
→ Platform::Delegates::MulticastDelegate<void(void*, const ${argumentType}&>
→ ${name} = ${defaultDelegate};${end}", null, 0),
234 // Insert scope borders.
235 // class IgnoredExceptions { ... public: static inline
→ Platform::Delegates::MulticastDelegate<void(void*, const std::exception&>
→ ExceptionIgnored = OnExceptionIgnored;
236 //class IgnoredExceptions {/*ExceptionIgnored*/ ... public: static inline
→ Platform::Delegates::MulticastDelegate<void(void*, const std::exception&>
→ ExceptionIgnored = OnExceptionIgnored;
237 (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}", null, 0),
238 // Inside the scope of ~!ExceptionIgnored!~ replace:
239 // ExceptionIgnored.Invoke(NULL, exception);
240 // ExceptionIgnored(NULL, exception);
241 (new Regex(@"(?<scope>\\/*~(?<eventName>[a-zA-Z0-9]+)~\\/*)(?<separator>\\.\\n)(?<before>_
→ >((?!\\/*~\\k<eventName>~\\/*)(\\.\\n))*?)\\k<eventName>\\.Invoke"),
→ "${scope}${separator}${before}${eventName}", null, 10),
242 // Remove scope borders.
243 // /*ExceptionIgnored*/
244 //
245 (new Regex(@"\\/*~[a-zA-Z0-9]+~\\/*"), "", null, 0),
246 // Insert scope borders.
247 // auto added = new StringBuilder();
248 // /*sb~/std::string added;
249 (new Regex(@"(auto|(System\\.Text\\.)?StringBuilder) (?<variable>[a-zA-Z0-9]+) = new
→ (System\\.Text\\.)?StringBuilder(\\);"), "/*${variable}~/std::string
→ ${variable};", null, 0),
250 // static void Indent(StringBuilder sb, int level)
251 // static void Indent(/*sb~/StringBuilder sb, int level)
252 (new Regex(@"(?<start>, |\\() (System\\.Text\\.)?StringBuilder
→ (?<variable>[a-zA-Z0-9]+) (?<end>, |\\))"), "${start}/*${variable}~/std::string&
→ ${variable}${end}", null, 0),
253 // Inside the scope of ~!added!~ replace:
254 // sb.ToString()
255 // sb.data()
256 (new Regex(@"(?<scope>\\/*~(?<variable>[a-zA-Z0-9]+)~\\/*)(?<separator>\\.\\n)(?<before>_
→ ((?!\\/*~\\k<variable>~\\/*)(\\.\\n))*?)\\k<variable>\\.ToString(\\)",
→ "${scope}${separator}${before}${variable}.data()", null, 10),
257 // sb.AppendLine(argument)
258 // sb.append(argument).append('\\n')
259 (new Regex(@"(?<scope>\\/*~(?<variable>[a-zA-Z0-9]+)~\\/*)(?<separator>\\.\\n)(?<before>_
→ ((?!\\/*~\\k<variable>~\\/*)(\\.\\n))*?)\\k<variable>\\.AppendLine((?!<argument>[~\\,\\_
→ r\\n]+)\\)",
→ "${scope}${separator}${before}${variable}.append(${argument}).append('\\n')",
→ null, 10),
260 // sb.Append('\\t', level);
261 // sb.append(level, '\\t');

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262 (new Regex(@"(?<scope>/\*~(?<variable>[a-zA-Z0-9]+)~\*/)(?<separator>.\|\\n)(?<before>
    ↳ (((?!/\*~\k<variable>~\*/)(.\|\\n))*?)\k<variable>\.Append\('(?(character>[^\r\\n]
    ↳ +)', (?(count>[^\|,\\r\\n]+)\|\\n)\"),
    ↳ \"${scope}${separator}${before}${variable}.append(${count}, '${character}')\",
    ↳ null, 10),
263 // sb.Append(argument)
264 // sb.append(argument)
265 (new Regex(@"(?<scope>/\*~(?<variable>[a-zA-Z0-9]+)~\*/)(?<separator>.\|\\n)(?<before>
    ↳ (((?!/\*~\k<variable>~\*/)(.\|\\n))*?)\k<variable>\.Append\('(?(argument>[^\|,\\r\\n]
    ↳ +)\|\\n)\"), \"${scope}${separator}${before}${variable}.append(${argument})\", null,
    ↳ 10),
266 // Remove scope borders.
267 // /*~sb~*/
268 //
269 (new Regex(@"/*~[a-zA-Z0-9]+~\*/\"), \"\", null, 0),
270 // Insert scope borders.
271 // auto added = new HashSet<TElement>();
272 // ~!added!~std::unordered_set<TElement> added;
273 (new Regex(@"auto (?<variable>[a-zA-Z0-9]+) = new
    ↳ HashSet<(?(element>[a-zA-Z0-9]+)>\\(\\)\";\"),
    ↳ \"~!${variable}!~std::unordered_set<${element}> ${variable};\", null, 0),
274 // Inside the scope of ~!added!~ replace:
275 // added.Add(node)
276 // added.insert(node)
277 (new Regex(@"(?<scope>~!(?<variable>[a-zA-Z0-9]+)!~)(?<separator>.\|\\n)(?<before>((?<
    ↳ !~!\k<variable>!~)(.\|\\n))*?)\k<variable>\.Add\('(?(argument>[a-zA-Z0-9]+)\|\\n)\"),
    ↳ \"${scope}${separator}${before}${variable}.insert(${argument})\", null, 10),
278 // Inside the scope of ~!added!~ replace:
279 // added.Remove(node)
280 // added.erase(node)
281 (new Regex(@"(?<scope>~!(?<variable>[a-zA-Z0-9]+)!~)(?<separator>.\|\\n)(?<before>((?<
    ↳ !~!\k<variable>!~)(.\|\\n))*?)\k<variable>\.Remove\('(?(argument>[a-zA-Z0-9]+)\|\\n)\"),
    ↳ \"${scope}${separator}${before}${variable}.erase(${argument})\", null, 10),
282 // if (added.insert(node)) {
283 // if (!added.contains(node)) { added.insert(node);
284 (new Regex(@"if \\((?(variable>[a-zA-Z0-9]+)\\)\.insert\\((?(argument>[a-zA-Z0-9]+)\\)\\)(?
    ↳ <separator>[\\t ]*[\\r\\n]+)(?<indent>[\\t ]*){\"), \"if
    ↳ (!${variable}.contains(${argument})) ${separator}${indent}{\" +
    ↳ Environment.NewLine + \"${indent}    ${variable}.insert(${argument});\", null, 0),
285 // Remove scope borders.
286 // ~!added!~
287 //
288 (new Regex(@"~![a-zA-Z0-9]+!~\"), \"\", null, 5),
289 // Insert scope borders.
290 // auto random = new System.Random();
291 // std::srand(0);
292 (new Regex(@"[a-zA-Z0-9\\.]+ ([a-zA-Z0-9]+) = new
    ↳ (System\\.)?Random\\((([a-zA-Z0-9]+)\\)\\)\";\"), \"~!$1!~std::srand($3);\", null, 0),
293 // Inside the scope of ~!random!~ replace:
294 // random.Next(1, N)
295 // (std::rand() % N) + 1
296 (new Regex(@"(?<scope>~!(?<variable>[a-zA-Z0-9]+)!~)(?<separator>.\|\\n)(?<before>((?<
    ↳ !~!\k<variable>!~)(.\|\\n))*?)\k<variable>\.Next\\((?(from>[a-zA-Z0-9]+),
    ↳ (?(to>[a-zA-Z0-9]+)\|\\n)\"), \"${scope}${separator}${before}(std::rand() % ${to}) +
    ↳ ${from}\"), null, 10),
297 // Remove scope borders.
298 // ~!random!~
299 //
300 (new Regex(@"~![a-zA-Z0-9]+!~\"), \"\", null, 5),
301 // Insert method body scope starts.
302 // void PrintNodes(TElement node, StringBuilder sb, int level) {
303 // void PrintNodes(TElement node, StringBuilder sb, int level) {/*method-start*/
304 (new Regex(@"(?<start>\\r?\\n[\\t ]+)(?<prefix>((private|protected|public): )?(virtual
    ↳ )?[a-zA-Z0-9_:]+
    ↳ )?(?(method>[a-zA-Z][a-zA-Z0-9]*)\\((?(arguments>[^\|\\n]*)\\)(?<override>(
    ↳ override)?)(?<separator>[\\t\\r\\n]*)\\{?(?<end>[^\|\\n]*)\"), \"${start}${prefix}${method}
    ↳ (${arguments})${override}${separator}{/*method-start*/${end}\"), null,
    ↳ 0),
305 // Insert method body scope ends.
306 // {/*method-start*/...}
307 // {/*method-start*/.../*method-end*/}
308 (new Regex(@"{\\/*method-start\\*/(?(body>((?<bracket>\\{)|(?(<-bracket>\\})|[^\\{\\}])*+
    ↳ \\})\"), \"{/*method-start*/${body}/*method-end*/}\", null,
    ↳ 0),
309 // Inside method bodies replace:
310 // GetFirst(

```

```

// this->GetFirst(
// (new Regex(@"(?<separator>(\(|,|([\W])|return ))(?<!(->|\*
→ ))(?<method>(?!sizeof)[a-zA-Z0-9]+)\((?!\) \{)"),
→ $"{separator}this->${method}(", null, 1),
(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}", null, 100),
// Remove scope borders.
// /*method-start*/
//
(new Regex(@"/*method-(start|end)\*/"), "", null, 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(\".\"));";", null, 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(\".\"));";", null, 0),
// throw new NotSupportedException();
// throw std::logic_error("Not supported exception.");
(new Regex(@"throw new NotSupportedException\(\);"), "throw std::logic_error(\"Not
→ supported exception.\");";", null, 0),
// throw new NotImplementedException();
// throw std::logic_error("Not implemented exception.");
(new Regex(@"throw new NotImplementedException\(\);"), "throw std::logic_error(\"Not
→ implemented exception.\");";", null, 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}";", null, 0),
    // (expression)
    // expression
    (new Regex(@"(\(| )\(((a-zA-Z0-9_\*:]+)\)(,| |;|))"), "$1$2$3", null, 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}", null, 0),
    // return ref _elements[node];
    // return &_elements[node];
    (new Regex(@"return ref ([a-zA-Z0-9]+)\([([a-zA-Z0-9_\*:]+)\];"), "return &${1}[${2}];",
→ null, 0),
    // null
    // nullptr
    (new Regex(@"(?<before>\r?\n[~""\r\n]*(""\| [~""\r\n])*"["~""\r\n]*) (?<=\\W)null
→ (?<after>\\W)", $"{before}nullptr${after}", null,
→ 10),
    // default
    // 0
    (new Regex(@"(?<before>\r?\n[~""\r\n]*(""\| [~""\r\n])*"["~""\r\n]*) (?<=\\W)defa
→ ult(?<after>\\W)", $"{before}0${after}", null,
→ 10),
    // object x
    // void *x
    (new Regex(@"(?<before>\r?\n[~""\r\n]*(""\| [~""\r\n])*"["~""\r\n]*) (?<=\\W)([O|
→ object|System\\.Object) (?<after>\\w)", $"{before}void *${after}", null,
→ 10),
    // #region Always
    //
    (new Regex(@"(^\r?\n)[ \t]*#(region|endregion)[^\r\n]*(\r?\n|$)", "", null, 0),
    // //define ENABLE_TREE_AUTO_DEBUG_AND_VALIDATION
    //

```



```

360         (new Regex(@"\\/\\/[\t]*\#define[\t]+[_a-zA-Z0-9]+[\t]*"), "", null, 0),
361         // #if USEARRAYPOOL\r\n#endif
362         //
363         (new Regex(@"#if [a-zA-Z0-9]+\s+#endif"), "", null, 0),
364         // [Fact]
365         //
366         (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}", null, 5),
367         // \n ... namespace
368         // namespace
369         (new Regex(@"(\\S[\\r\\n]{1,2})?[\\r\\n]+namespace"), "$1namespace", null, 0),
370         // \n ... class
371         // class
372         (new Regex(@"(\\S[\\r\\n]{1,2})?[\\r\\n]+class"), "$1class", null, 0),
373     }.Cast<ISubstitutionRule>().ToList();
374
375     public CSharpToCppTransformer(IList<ISubstitutionRule> extraRules) :
→      base(FirstStage.Concat(extraRules).Concat(LastStage).ToList()) { }
376
377     public CSharpToCppTransformer() : base(FirstStage.Concat(LastStage).ToList()) { }
378 }
379 }

```

## 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("", new Context(null));
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, new Context(null));
36             Assert.Equal(expectedResult, actualResult);
37         }
38     }
39 }

```



## Index

./csharp/Platform.RegularExpressions.Transformer.CSharpToCpp.Tests/CSharpToCppTransformerTests.cs, 8

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