

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

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

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

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107 (new Regex(@"(^\\s+)(template <[^>\\r\\n]+>)?(static)?(override)?(void
    ↳ )?([a-zA-Z0-9]+)\\(((\\r\\n)*\\)\\s+=>\\s+([~;\\r\\n]+);)", "$1$2$3$4$5$6($7) { $8;
    ↳ }", null, 0),
108 // int SizeBalancedTree(int capacity) => a;
109 // int SizeBalancedTree(int capacity) { return a; }
110 (new Regex(@"(^\\s+)(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) {
    ↳ return $8; }", null, 0),
111 // () => Integer<TElement>.Zero,
112 // () { return Integer<TElement>.Zero; },
113 (new Regex(@"\\(\\)\\s+=>\\s+([~;\\r\\n]+?);", "()" { return $1; };", null, 0),
114 // => Integer<TElement>.Zero;
115 // { return Integer<TElement>.Zero; }
116 (new Regex(@"\\(\\)\\s+=>\\s+([~;\\r\\n]+?);", ") { return $1; };", null, 0),
117 // () { return avlTree.Count; }
118 // [&]()-> auto { return avlTree.Count; }
119 (new Regex(@"", "\\(\\) { return ([~;\\r\\n]+); }", " [&]()-> auto { return $1; };",
    ↳ null, 0),
120 // Count => GetSizeOrZero(Root);
121 // GetCount() { return GetSizeOrZero(Root); }
122 (new Regex(@"\\(\\W)([A-Z][a-zA-Z]+)\\s+=>\\s+([~;\\r\\n]+);", "$1Get$2() { return $3; };",
    ↳ null, 0),
123 // Func<TElement> treeCount
124 // std::function<TElement()> treeCount
125 (new Regex(@"Func<([a-zA-Z0-9]+)> ([a-zA-Z0-9]+)", "std::function<$1()> $2", null,
    ↳ 0),
126 // Action<TElement> free
127 // std::function<void(TElement)> free
128 (new Regex(@"Action<([a-zA-Z0-9]+)> ([a-zA-Z0-9]+)", "std::function<void($1)> $2",
    ↳ null, 0),
129 // Predicate<TArgument> predicate
130 // std::function<bool(TArgument)> predicate
131 (new Regex(@"Predicate<([a-zA-Z0-9]+)> ([a-zA-Z0-9]+)", "std::function<bool($1)>
    ↳ $2", null, 0),
132 // var
133 // auto
134 (new Regex(@"\\(\\W)var\\(\\W)", "$1auto$2", null, 0),
135 // unchecked
136 //
137 (new Regex(@"[\\r\\n]{2}\\s*?unchecked\\s*?$)", "", null, 0),
138 // throw new InvalidOperationException
139 // throw std::runtime_error
140 (new Regex(@"throw new (InvalidOperationException|Exception)", "throw
    ↳ std::runtime_error", null, 0),
141 // void RaiseExceptionIgnoredEvent(Exception exception)
142 // void RaiseExceptionIgnoredEvent(const std::exception& exception)
143 (new Regex(@"\\(\\(|\\)(System\\.Exception|Exception)(\\|\\))", "$1const
    ↳ std::exception&$3", null, 0),
144 // EventHandler<Exception>
145 // EventHandler<std::exception>
146 (new Regex(@"\\(\\W)(System\\.Exception|Exception)\\(\\W)", "$1std::exception$3", null, 0),
147 // override void PrintNode(TElement node, StringBuilder sb, int level)
148 // void PrintNode(TElement node, StringBuilder sb, int level) override
149 (new Regex(@"override ([a-zA-Z0-9 \\*+]+)\\(\\(\\r\\n\\)+?\\)", "$1$2 override", null,
    ↳ 0),
150 // string
151 // const char*
152 (new Regex(@"\\(\\W)string\\(\\W)", "$1const char*$2", null, 0),
153 // sbyte
154 // std::int8_t
155 (new Regex(@"\\(\\W)sbyte\\(\\W)", "$1std::int8_t$2", null, 0),
156 // uint
157 // std::uint32_t
158 (new Regex(@"\\(\\W)uint\\(\\W)", "$1std::uint32_t$2", null, 0),
159 // char*[] args
160 // char* args[]
161 (new Regex(@"([a-zA-Z0-9:~*+]?)\\[\\] ([a-zA-Z0-9]+)", "$1 $2[]", null, 0),
162 // @object
163 // object
164 (new Regex(@"@([a-zA-Z0-9]+)", "$1", null, 0),
165 // using Platform.Numbers;
166 //
167 (new Regex(@"([\\r\\n]{2}|~)\\s*?using [\\a-zA-Z0-9]+;\\s*?$)", "", null, 0),
168 // struct TreeElement { }
169 // struct TreeElement { };
170 (new Regex(@"(struct|class) ([a-zA-Z0-9]+)\\(\\s+){([\\sa-zA-Z0-9;:_]+?)}([~;])", "$1
    ↳ $2$3{$4};$5", null, 0),

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171 // class Program { }
172 // class Program { };
173 (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),
174 // class SizedBinaryTreeMethodsBase : GenericCollectionMethodsBase
175 // class SizedBinaryTreeMethodsBase : public GenericCollectionMethodsBase
176 (new Regex(@"class ([a-zA-Z0-9]+) : ([a-zA-Z0-9]+)", "class $1 : public $2", null,
→ 0),
177 // class IProperty : ISetter<TValue, TObject>, IProvider<TValue, TObject>
178 // class IProperty : public ISetter<TValue, TObject>, IProvider<TValue, TObject>
179 (new Regex(@"(?<before>class [a-zA-Z0-9]+ : ((public [a-zA-Z0-9]+(<[a-zA-Z0-9
→ ,]+>)?, )+)?(?<inheritedType>(?!public) [a-zA-Z0-9]+(<[a-zA-Z0-9
→ ,]+>)?(?<after>([a-zA-Z0-9]+(?>)|[\r\n]+)))", "${before}public
→ ${inheritedType}${after}", null, 10),
180 // Insert scope borders.
181 // ref TElement root
182 // ~!root!~ref TElement root
183 (new Regex(@"(?<definition>(?!<=|\\() (ref [a-zA-Z0-9]+|[a-zA-Z0-9]+(?<!ref))
→ (?<variable>[a-zA-Z0-9]+)(?!<=|\\(|=))", "~!${variable}!~${definition}", null,
→ 0),
184 // Inside the scope of ~!root!~ replace:
185 // root
186 // *root
187 (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),
188 // Remove scope borders.
189 // ~!root!~
190 //
191 (new Regex(@"~!(?!<pointer>[a-zA-Z0-9]+)!~", "", null, 5),
192 // ref auto root = ref
193 // ref auto root =
194 (new Regex(@"ref ([a-zA-Z0-9]+) ([a-zA-Z0-9]+) = ref(\\W)", "$1* $2 = $3", null, 0),
195 // *root = ref left;
196 // root = left;
197 (new Regex(@"\\*([a-zA-Z0-9]+) = ref ([a-zA-Z0-9]+)(\\W)", "$1 = $2$3", null, 0),
198 // (ref left)
199 // (left)
200 (new Regex(@"\\(ref ([a-zA-Z0-9]+)(\\)|\\(|,))", "($1$2", null, 0),
201 // ref TElement
202 // TElement*
203 (new Regex(@"(\\()ref ([a-zA-Z0-9]+) ", "$1$2* ", null, 0),
204 // ref sizeBalancedTree.Root
205 // &sizeBalancedTree->Root
206 (new Regex(@"ref ([a-zA-Z0-9]+)\\.([a-zA-Z0-9\\*]+)", "&$1->$2", null, 0),
207 // ref GetElement(node).Right
208 // &GetElement(node)->Right
209 (new Regex(@"ref ([a-zA-Z0-9]+)\\((([a-zA-Z0-9\\*]+)\\)\\.([a-zA-Z0-9]+)",
→ "&$1($2)->$3", null, 0),
210 // GetElement(node).Right
211 // GetElement(node)->Right
212 (new Regex(@"([a-zA-Z0-9]+)\\((([a-zA-Z0-9\\*]+)\\)\\.([a-zA-Z0-9]+)", "$1($2)->$3",
→ null, 0),
213 // [Fact]\\npublic static void SizeBalancedTreeMultipleAttachAndDetachTest()
214 // TEST_METHOD(SizeBalancedTreeMultipleAttachAndDetachTest)
215 (new Regex(@"\\[Fact\\][\\s\\n]+(static)?void ([a-zA-Z0-9]+)\\(\\)", "TEST_METHOD($2)",
→ null, 0),
216 // class TreesTests
217 // TEST_CLASS(TreesTests)
218 (new Regex(@"class ([a-zA-Z0-9]+)Tests", "TEST_CLASS($1)", null, 0),
219 // Assert.Equal
220 // Assert::AreEqual
221 (new Regex(@"Assert\\.Equal", "Assert::AreEqual", null, 0),
222 // $"Argument {argumentName} is null."
223 // ((std::string)"Argument ").append(argumentName).append(" is null.").data()
224 (new Regex(@"\\$""(?<left>\\\\"""|\\~""\\r\\n)*){(?<expression>[_a-zA-Z0-9]+)}{(?<right>\\
→ \\""|\\~""\\r\\n)*)""",
→ "((std::string)$\\"${left}\\").append("${expression}").append("\\${right}\\").data()",
→ null, 10),
225 // $"
226 // "
227 (new Regex(@"\\$""", "\\\"", null, 0),
228 // Console.WriteLine("...")
229 // printf("...\n")
230 (new Regex(@"Console\\.WriteLine\\("""([~""\\r\\n]+)""\\)", "printf(\"$1\\n\")", null, 0),
231 // TElement Root;

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232 // TElement Root = 0;
233 (new Regex(@"(\\r?\\n[\\t ]+)([a-zA-Z0-9:_]+(?<return)) ([_a-zA-Z0-9]+);"), "$1$2 $3 =
    ↪ 0;", null, 0),
234 // TreeElement _elements[N];
235 // TreeElement _elements[N] = { {0} };
236 (new Regex(@"(\\r?\\n[\\t ]+)([a-zA-Z0-9]+) ([_a-zA-Z0-9]+)\\([([_a-zA-Z0-9]+)\\];"),
    ↪ "$1$2 $3[$4] = { {0} };", null, 0),
237 // auto path = new TElement[MaxPath];
238 // TElement path[MaxPath] = { {0} };
239 (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[$4] = { {0} };", null, 0),
240 // Insert scope borders.
241 // auto added = new StringBuilder();
242 // /*~sb~*/std::string added;
243 (new Regex(@"(auto|(System\\.Text\\.)?StringBuilder) (?<variable>[a-zA-Z0-9]+) = new
    ↪ (System\\.Text\\.)?StringBuilder\\(\\);", "/*~${variable}~*/std::string
    ↪ ${variable};", null, 0),
244 // static void Indent(StringBuilder sb, int level)
245 // static void Indent(/*~sb~*/StringBuilder sb, int level)
246 (new Regex(@"(?<start>, |\\() (System\\.Text\\.)?StringBuilder
    ↪ (?<variable>[a-zA-Z0-9]+) (?<end>, |\\))", "${start}/*~${variable}~*/std::string&
    ↪ ${variable}${end}", null, 0),
247 // Inside the scope of ~!added!~ replace:
248 // sb.ToString()
249 // sb.data()
250 (new Regex(@"(?<scope>/\\*~(?<variable>[a-zA-Z0-9]+)~\\*/) (?<separator>.|\\n) (?<before>
    ↪ ((?!/\\*~\\k<variable>~\\*/)(.|\\n))*?) \\k<variable>\\.ToString\\(\\)",
    ↪ "${scope}${separator}${before}${variable}.data()", null, 10),
251 // sb.AppendLine(argument)
252 // sb.append(argument).append('\\n')
253 (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(${argument}).append('\\n')",
    ↪ null, 10),
254 // sb.Append('\\t', level);
255 // sb.append(level, '\\t');
256 (new Regex(@"(?<scope>/\\*~(?<variable>[a-zA-Z0-9]+)~\\*/) (?<separator>.|\\n) (?<before>
    ↪ ((?!/\\*~\\k<variable>~\\*/)(.|\\n))*?) \\k<variable>\\.Append\\(' (?<character>[\\r\\n]
    ↪ +)', (?<count>[\\n], \\r\\n]+)\\)",
    ↪ "${scope}${separator}${before}${variable}.append(${count}, '${character}']",
    ↪ null, 10),
257 // sb.AppendLine(argument)
258 // sb.append(argument)
259 (new Regex(@"(?<scope>/\\*~(?<variable>[a-zA-Z0-9]+)~\\*/) (?<separator>.|\\n) (?<before>
    ↪ ((?!/\\*~\\k<variable>~\\*/)(.|\\n))*?) \\k<variable>\\.Append\\((?<argument>[\\n], \\r\\n]
    ↪ +)\\)", "${scope}${separator}${before}${variable}.append(${argument})", null,
    ↪ 10),
260 // Remove scope borders.
261 // /*~sb~*/
262 //
263 (new Regex(@"/\\*~(?<pointer>[a-zA-Z0-9]+)~\\*/"), "", null, 0),
264 // Insert scope borders.
265 // auto added = new HashSet<TElement>();
266 // ~!added!~std::unordered_set<TElement> added;
267 (new Regex(@"auto (?<variable>[a-zA-Z0-9]+) = new
    ↪ HashSet<(?<element>[a-zA-Z0-9]+)>\\(\\);",
    ↪ "/*~${variable}!~std::unordered_set<${element}> ${variable};", null, 0),
268 // Inside the scope of ~!added!~ replace:
269 // added.Add(node)
270 // added.insert(node)
271 (new Regex(@"(?<scope>~!(?<variable>[a-zA-Z0-9]+)!~) (?<separator>.|\\n) (?<before>((?<
    ↪ !~!\\k<variable>!~)(.|\\n))*?) \\k<variable>\\.Add\\((?<argument>[a-zA-Z0-9]+)\\)",
    ↪ "${scope}${separator}${before}${variable}.insert(${argument})", null, 10),
272 // Inside the scope of ~!added!~ replace:
273 // added.Remove(node)
274 // added.erase(node)
275 (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(${argument})", null, 10),
276 // if (added.insert(node)) {
277 // if (!added.contains(node)) { added.insert(node);
278 (new Regex(@"if \\((?<variable>[a-zA-Z0-9]+)\\.insert\\((?<argument>[a-zA-Z0-9]+)\\)\\) (?
    ↪ <separator>[\\t ]*[\\r\\n]+) (?<indent>[\\t ]*){", "if
    ↪ (!${variable}.contains(${argument})) ${separator}${indent}{ " +
    ↪ Environment.NewLine + "${indent} ${variable}.insert(${argument});", null, 0),

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279 // Remove scope borders.
280 // ~!added!~
281 //
282 (new Regex(@"~!(?<pointer>[a-zA-Z0-9]+)!~"), "", null, 5),
283 // Insert scope borders.
284 // auto random = new System.Random(0);
285 // std::srand(0);
286 (new Regex(@"[a-zA-Z0-9\.] + ([a-zA-Z0-9]+) = new
→ (System\.)?Random\((([a-zA-Z0-9]+)\);", "~!$1!~std::srand($3);", null, 0),
287 // Inside the scope of ~!random!~ replace:
288 // random.Next(1, N)
289 // (std::rand() % N) + 1
290 (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}", null, 10),
291 // Remove scope borders.
292 // ~!random!~
293 //
294 (new Regex(@"~!(?<pointer>[a-zA-Z0-9]+)!~"), "", null, 5),
295 // Insert method body scope starts.
296 // void PrintNodes(TElement node, StringBuilder sb, int level) {
297 // void PrintNodes(TElement node, StringBuilder sb, int level) { /*method-start*/
298 (new Regex(@"(?<start>\r?\n[\t ]+)(?<prefix>((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*/${end}", null,
→ 0),
299 // Insert method body scope ends.
300 // { /*method-start*/...}
301 // { /*method-start*/... /*method-end*/}
302 (new Regex(@"{ /*method-start*/(?<body>((?<bracket>\{)|(?<-bracket>\})|[\^\{\}]*))+
→ \}", " /*method-start*/${body} /*method-end*/", null,
→ 0),
303 // Inside method bodies replace:
304 // GetFirst(
305 // this->GetFirst(
306 // (new Regex(@"(?<separator>(\(| |([\\W]) |return ))(?<!(->|\\*
→ )))(?<method>(?!sizeof)[a-zA-Z0-9]+)\(((?!\\) \{)",
→ "${separator}this->${method}(", null, 1),
307 (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),
308 // Remove scope borders.
309 // /*method-start*/
310 //
311 (new Regex(@"\/ /*method-(start|end)\/"), "", null, 0),
312 // throw new ArgumentNullException(argumentName, message);
313 // throw std::invalid_argument(((std::string)"Argument
→ ").append(argumentName).append(" is null: ").append(message).append("."));
314 (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),
315 // throw new ArgumentException(message, argumentName);
316 // throw std::invalid_argument(((std::string)"Invalid
→ ").append(argumentName).append(" argument: ").append(message).append("."));
317 (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),
318 // throw new NotSupportedException();
319 // throw std::logic_error("Not supported exception.");
320 (new Regex(@"throw new NotSupportedException\(\);", "throw std::logic_error(\"Not
→ supported exception.\");", null, 0),
321 // throw new NotImplementedException();
322 // throw std::logic_error("Not implemented exception.");
323 (new Regex(@"throw new NotImplementedException\(\);", "throw std::logic_error(\"Not
→ implemented exception.\");", null, 0),
324 }.Cast<ISubstitutionRule>().ToList();
325
326 public static readonly IList<ISubstitutionRule> LastStage = new List<SubstitutionRule>
327 {
328     // ICounter<int, int> c1;

```



```
22     {
23         printf("Hello, world!\n");
24     }
25 };";
26     var transformer = new CSharpToCppTransformer();
27     var actualResult = transformer.Transform(helloWorldCode, new Context(null));
28     Assert.Equal(expectedResult, actualResult);
29 }
30 }
31 }
```



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