

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}: ${before}" , null, 0),
38             // public: static bool CollectExceptions { get; set; }
39             // public: inline static bool CollectExceptions;
40             (new Regex(@"(?<access>(private|protected|public): ) (?<before>(static )? [^\r\n]+
41             ↪ ) (?<name>[a-zA-Z0-9]+) {[~;]}*(?<=\\W) get; [~;]}*(?<=\\W) set; [~;]}*") ,
42             ↪ "${access}inline ${before}${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]+\\)"),
    ↳ "/*~extensionMethod~${name}~*/$0", null, 0),
54 // Move all markers to the beginning of the file.
55 (new Regex(@"\A(?<before>[^\r\n]+\r?\n(.|\n)+)(?<marker>/\*~extensionMethod~(?<name>[a-zA-Z0-9]+)~\*/)", "${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 // public: inline static EnsureAlwaysExtensionRoot Always;
68 (new Regex(@"(?<access>(private|protected|public): )?static readonly
    ↳ (?<type>[a-zA-Z0-9]+) (?<name>[_a-zA-Z0-9_]+) = new \k<type>\(\);"),
    ↳ "${access}inline static ${type} ${name};", null, 0),
69 // public: static readonly string ExceptionContentsSeparator = "---";
70 // public: inline static const char* ExceptionContentsSeparator = "---";
71 (new Regex(@"(?<access>(private|protected|public): )?static readonly string
    ↳ (?<name>[a-zA-Z0-9_]+) = ""(?:<string>(\\"| [^\r\n]))+"";", "${access}inline
    ↳ static const char* ${name} = \"${string}\";", null, 0),
72 // private: const int MaxPath = 92;
73 // private: static const int MaxPath = 92;
74 (new Regex(@"(?<access>(private|protected|public): )?(const|static readonly)
    ↳ (?<type>[a-zA-Z0-9]+) (?<name>[_a-zA-Z0-9_]+) = (?<value>[^\r\n]+);"),
    ↳ "${access}static const ${type} ${name} = ${value};", null, 0),
75 // ArgumentNotNull(EnsureAlwaysExtensionRoot root, TArgument argument) where
    ↳ TArgument : class
76 // ArgumentNotNull(EnsureAlwaysExtensionRoot root, TArgument* argument)
77 (new Regex(@"(?<before> [a-zA-Z]+)(([a-zA-Z *,,]+, |))(?<type>[a-zA-Z]+)(?<after>(|
    ↳ [a-zA-Z *,,]+)))[ \r\n]+where \k<type> : class)", "${before}${type}*${after}",
    ↳ null, 0),
78 // protected: abstract TElement GetFirst();
79 // protected: virtual TElement GetFirst() = 0;
80 (new Regex(@"(?<access>(private|protected|public): )?abstract
    ↳ (?<method>[^\r\n]+);"), "${access}virtual ${method} = 0;", null, 0),
81 // TElement GetFirst();
82 // virtual TElement GetFirst() = 0;
83 (new Regex(@"([^\r\n]+[ ]+)((?!return)[a-zA-Z0-9]+ [a-zA-Z0-9]+\([^\]\r\n]*\))(\;|
    ↳ ]*\r\n+)", "$1virtual $2 = 0$3", null, 1),
84 // protected: readonly TreeElement[] _elements;
85 // protected: TreeElement _elements[N];
86 (new Regex(@"(?<access>(private|protected|public): )?readonly
    ↳ (?<type>[a-zA-Z0-9]+)([^\]]+) (?<name>[_a-zA-Z0-9_]+);"), "${access}${type}
    ↳ ${name}[N];", null, 0),
87 // protected: readonly TElement Zero;
88 // protected: TElement Zero;
89 (new Regex(@"(?<access>(private|protected|public): )?readonly
    ↳ (?<type>[a-zA-Z0-9]+) (?<name>[_a-zA-Z0-9_]+);"), "${access}${type} ${name};",
    ↳ null, 0),
90 // internal
91 //
92 (new Regex(@"(\W)internal\s+"), "$1", null, 0),
93 // static void NotImplementedException(ThrowExtensionRoot root) => throw new
    ↳ NotImplementedException();
94 // static void NotImplementedException(ThrowExtensionRoot root) { return throw new
    ↳ NotImplementedException(); }
95 (new Regex(@"(^\s+)(private|protected|public)?(: )?(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$8($9) { throw$10; }", null, 0),
96 // SizeBalancedTree(int capacity) => a = b;
97 // 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+(?<expression>[~() ,;\r\n]+(\(((?<parenthesis>\()|(?<-parent
   ↳ hesis>~\)|[~() ,;\r\n]*~)?[~() ,;\r\n]*)(?<after>,|~);)"), "()" { return
   ↳ ${expression}; }${after}", 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(@"(?<before>, |)\(\)\{ return (?<expression>[~;\r\n]+); }"),
   ↳ "${before}[&]() -> auto { return ${expression}; }", 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 { }

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// struct TreeElement{ };
(new Regex(@"(struct|class) ([a-zA-Z0-9]+)(\s+){([\sa-zA-Z0-9;:_]+?)}([\~;])", "$1
→ $2$3{$4};$5", null, 0),
// class Program { }
// class Program { };
(new Regex(@"(struct|class) ([a-zA-Z0-9]+[~\r\n]*)([\r\n]+(?<indentLevel>[\t
→ ]*)?)\{([\S\s]+?[~\r\n]+\k<indentLevel>\})([\~;]|$)", "$1 $2$3{$4};$5", null, 0),
// class SizedBinaryTreeMethodsBase : GenericCollectionMethodsBase
// class SizedBinaryTreeMethodsBase : public GenericCollectionMethodsBase
(new Regex(@"class ([a-zA-Z0-9]+) : ([a-zA-Z0-9]+)", "class $1 : public $2", null,
→ 0),
// class IProperty : ISetter<TValue, TObj>, IProvider<TValue, TObj>
// class IProperty : public ISetter<TValue, TObj>, IProvider<TValue, TObj>
(new Regex(@"(?<before>class [a-zA-Z0-9]+ : ((public [a-zA-Z0-9]+(<[a-zA-Z0-9
→ ,]+)?, )+)?)(?<inheritedType>(?!public) [a-zA-Z0-9]+(<[a-zA-Z0-9
→ ,]+)?)(?<after>([a-zA-Z0-9]+(?!>)|[\r\n]+))", "${before}public
→ ${inheritedType}${after}", null, 10),
// Insert scope borders.
// ref TElement root
// ~!root!~ref TElement root
(new Regex(@"(?<definition>(?!<= |\() (ref [a-zA-Z0-9]+|[a-zA-Z0-9]+(?<!=ref))
→ (?<variable>[a-zA-Z0-9]+)(?<= | | =))", "~!${variable}!~${definition}", null,
→ 0),
// Inside the scope of ~!root!~ replace:
// root
// *root
(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),
// Remove scope borders.
// ~!root!~
//
(new Regex(@"~!(?<pointer>[a-zA-Z0-9]+)!~", "", null, 5),
// ref auto root = ref
// ref auto root =
(new Regex(@"ref ([a-zA-Z0-9]+) ([a-zA-Z0-9]+) = ref(\\W)", "$1* $2 =$3", null, 0),
// *root = ref left;
// root = left;
(new Regex(@"\\*([a-zA-Z0-9]+) = ref ([a-zA-Z0-9]+)(\\W)", "$1 = $2$3", null, 0),
// (ref left)
// (left)
(new Regex(@"\\(ref ([a-zA-Z0-9]+)(\\)|\\(|,)", "($1$2", null, 0),
// ref TElement
// TElement*
(new Regex(@"( |\\()ref ([a-zA-Z0-9]+) ", "$1$2* ", null, 0),
// ref sizeBalancedTree.Root
// &sizeBalancedTree->Root
(new Regex(@"ref ([a-zA-Z0-9]+)\\.([a-zA-Z0-9\\*]+)", "&$1->$2", null, 0),
// ref GetElement(node).Right
// &GetElement(node)->Right
(new Regex(@"ref ([a-zA-Z0-9]+)\\((([a-zA-Z0-9\\*]+)\\)\\.([a-zA-Z0-9]+)",
→ "&$1($2)->$3", null, 0),
// GetElement(node).Right
// GetElement(node)->Right
(new Regex(@"([a-zA-Z0-9]+)\\((([a-zA-Z0-9\\*]+)\\)\\.([a-zA-Z0-9]+)", "$1($2)->$3",
→ null, 0),
// [Fact]\\npublic: static void SizeBalancedTreeMultipleAttachAndDetachTest()
// public: TEST_METHOD(SizeBalancedTreeMultipleAttachAndDetachTest)
(new Regex(@"\\[Fact\\][\\s\\n]+(public: )?(static )?void ([a-zA-Z0-9]+)\\(\\)", "public:
→ TEST_METHOD($3)", null, 0),
// class TreesTests
// TEST_CLASS(TreesTests)
(new Regex(@"class ([a-zA-Z0-9]+)Tests", "TEST_CLASS($1)", null, 0),
// Assert.Equal
// Assert::AreEqual
(new Regex(@"Assert\\.Equal", "Assert::AreEqual", null, 0),
// $"Argument {argumentName} is null."
// ((std::string)"Argument ").append(argumentName).append(" is null.").data()
(new Regex(@"\\$""(?<left>(\\""|\\~""\\r\\n)*){(?<expression>[_a-zA-Z0-9]+)}{(?<right>(\\
→ \\""|\\~""\\r\\n)*)}""",
→ "((std::string)$\\"${left}\\").append(${expression}).append("\\${right}\\").data()",
→ null, 10),
// $"
// "
(new Regex(@"\\$""", "\\\"", null, 0),
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219 // Console.WriteLine("...")
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 // private: static readonly ConcurrentBag<std::exception> _exceptionsBag = new
→ ConcurrentBag<std::exception>();
232 // private: inline static std::mutex _exceptionsBag_mutex; \n\n private: inline
→ static std::vector<std::exception> _exceptionsBag;
233 (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};", null, 0),
234 // public: static IReadonlyCollection<std::exception> GetCollectedExceptions() {
→ return _exceptionsBag; }
235 // public: static std::vector<std::exception> GetCollectedExceptions() { return
→ std::vector<std::exception>(_exceptionsBag); }
236 (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}>(${fieldName}); }", null, 0),
237 // public: static event EventHandler<std::exception> ExceptionIgnored =
→ OnExceptionIgnored; ... };
238 // ... public: static inline Platform::Delegates::MulticastDelegate<void(void*,
→ const std::exception&> ExceptionIgnored = OnExceptionIgnored; };
239 (new Regex(@"(?<begin>\r?\n(\r?\n)?(?<halfIndent>[
→ \t]+)\k<halfIndent>)(?<access>(private|protected|public): )?static event
→ EventHandler<(?<argumentType>[~;\r\n]+)> (?<name>[_a-zA-Z0-9]+) = (?<defaultDele_
→ gate>[_a-zA-Z0-9]+); (?<middle>(.|\n)+?) (?<end>\r?\n\k<halfIndent>);)",
→ "${middle}" + Environment.NewLine + Environment.NewLine +
→ "${halfIndent}${halfIndent}${access}static inline
→ Platform::Delegates::MulticastDelegate<void(void*, const ${argumentType}&)>
→ ${name} = ${defaultDelegate};${end}", null, 0),
240 // Insert scope borders.
241 // class IgnoredExceptions { ... private: inline static std::vector<std::exception>
→ _exceptionsBag;
242 // class IgnoredExceptions {/*~_exceptionsBag~/ ... private: inline static
→ std::vector<std::exception> _exceptionsBag;
243 (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}",
→ null, 0),
244 // Inside the scope of ~!_exceptionsBag!~ replace:
245 // _exceptionsBag.Add(exception);
246 // _exceptionsBag.push_back(exception);
247 (new Regex(@"(?<scope>/\~*(?<fieldName>[_a-zA-Z0-9]+)\~*/)(?<separator>.\|\\n)(?<befor_
→ e>((?!/\~*\k<fieldName>\~*/)(.|\n))*?)\k<fieldName>\.Add"),
→ "${scope}${separator}${before}${fieldName}.push_back", null, 10),
248 // Remove scope borders.
249 // /*~_exceptionsBag~/
250 //
251 (new Regex(@"/\~*[_a-zA-Z0-9]+\~*/"), "", null, 0),
252 // Insert scope borders.
253 // class IgnoredExceptions { ... private: static std::mutex _exceptionsBag_mutex;
254 // class IgnoredExceptions {/*~_exceptionsBag~/ ... private: static std::mutex
→ _exceptionsBag_mutex;
255 (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}", null,
→ 0),

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256 // Inside the scope of ~!_exceptionsBag!~ replace:
257 // return std::vector<std::exception>(_exceptionsBag);
258 // std::lock_guard<std::mutex> guard(_exceptionsBag_mutex); return
    ↳ std::vector<std::exception>(_exceptionsBag);
259 (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);${after}", null, 10),
260 // Inside the scope of ~!_exceptionsBag!~ replace:
261 // _exceptionsBag.Add(exception);
262 // std::lock_guard<std::mutex> guard(_exceptionsBag_mutex); \r\n
    ↳ _exceptionsBag.Add(exception);
263 (new Regex(@"(?<scope>/\*~(?<fieldName>[_a-zA-Z0-9]+)~\*/)(?<separator>.\|\n)(?<before>
    ↳ e>((?!/\*~\k<fieldName>~\*/)(.\|\n))*?){(?<after>((?!lock_guard)([~{};]\|\n))*~\r
    ↳ ?\n(?<indent>[ \t])*~\k<fieldName>[~;}\r\n]*;)" ),
    ↳ "${scope}${separator}${before}{
    ↳ " + Environment.NewLine +
    ↳ "${indent}std::lock_guard<std::mutex> guard(${fieldName}_mutex);${after}", null,
    ↳ 10),
264 // Remove scope borders.
265 // /*~_exceptionsBag~*/
266 //
267 (new Regex(@"/*~[_a-zA-Z0-9]+~\*/"), "", null, 0),
268 // Insert scope borders.
269 // class IgnoredExceptions { ... public: static inline
    ↳ Platform::Delegates::MulticastDelegate<void(void*, const std::exception&)>
    ↳ ExceptionIgnored = OnExceptionIgnored;
270 // class IgnoredExceptions {/*~ExceptionIgnored~*/ ... public: static inline
    ↳ Platform::Delegates::MulticastDelegate<void(void*, const std::exception&)>
    ↳ ExceptionIgnored = OnExceptionIgnored;
271 (new Regex(@"(?<classDeclarationBegin>\r?\n(?<indent>[ \t ]*)class [^{\r\n]+\r\n[ \t
    ↳ ]*{)(?<middle>((?!class).\|\n)+?)(?<eventDeclaration>(?(<access>(private|protected|
    ↳ public): )static inline
    ↳ Platform::Delegates::MulticastDelegate<(?(<argumentType>[~;\r\n]+)>
    ↳ (?(<name>[_a-zA-Z0-9]+) = (?(<defaultDelegate>[_a-zA-Z0-9]+);)" ),
    ↳ "${classDeclarationBegin}/*~${name}~*/${middle}${eventDeclaration}", null, 0),
272 // Inside the scope of ~!ExceptionIgnored!~ replace:
273 // ExceptionIgnored.Invoke(NULL, exception);
274 // ExceptionIgnored(NULL, exception);
275 (new Regex(@"(?<scope>/\*~(?<eventName>[_a-zA-Z0-9]+)~\*/)(?<separator>.\|\n)(?<before>
    ↳ >((?!/\*~\k<eventName>~\*/)(.\|\n))*?)\k<eventName>\.Invoke)",
    ↳ "${scope}${separator}${before}${eventName}", null, 10),
276 // Remove scope borders.
277 // /*~ExceptionIgnored~*/
278 //
279 (new Regex(@"/*~[_a-zA-Z0-9]+~\*/"), "", null, 0),
280 // Insert scope borders.
281 // auto added = new StringBuilder();
282 // /*~sb~*/std::string added;
283 (new Regex(@"(auto|(System\.Text\.)?StringBuilder) (?(<variable>[_a-zA-Z0-9]+) = new
    ↳ (System\.Text\.)?StringBuilder\(\);)", "/*~${variable}~*/std::string
    ↳ ${variable};", null, 0),
284 // static void Indent(StringBuilder sb, int level)
285 // static void Indent(/*~sb~*/StringBuilder sb, int level)
286 (new Regex(@"(?<start>, \\\() (System\.Text\.)?StringBuilder
    ↳ (?(<variable>[_a-zA-Z0-9]+) (?(<end>, \\\))" ), "${start}/*~${variable}~*/std::string&
    ↳ ${variable}${end}", null, 0),
287 // Inside the scope of ~!added!~ replace:
288 // sb.ToString()
289 // sb.data()
290 (new Regex(@"(?<scope>/\*~(?<variable>[_a-zA-Z0-9]+)~\*/)(?<separator>.\|\n)(?<before>
    ↳ ((?!/\*~\k<variable>~\*/)(.\|\n))*?)\k<variable>\.ToString\(\)",
    ↳ "${scope}${separator}${before}${variable}.data()", null, 10),
291 // sb.AppendLine(argument)
292 // sb.append(argument).append('\n')
293 (new Regex(@"(?<scope>/\*~(?<variable>[_a-zA-Z0-9]+)~\*/)(?<separator>.\|\n)(?<before>
    ↳ ((?!/\*~\k<variable>~\*/)(.\|\n))*?)\k<variable>\.AppendLine\((?(<argument>[^\r\n]+)\r\n\)",
    ↳ "${scope}${separator}${before}${variable}.append(${argument}).append(1, '\\n')",
    ↳ null, 10),
294 // sb.Append('t', level);
295 // sb.append(level, 't');
296 (new Regex(@"(?<scope>/\*~(?<variable>[_a-zA-Z0-9]+)~\*/)(?<separator>.\|\n)(?<before>
    ↳ ((?!/\*~\k<variable>~\*/)(.\|\n))*?)\k<variable>\.Append\('(?(<character>[^\r\n]
    ↳ +)'\, (?(<count>[^\r\n]+\r\n)+)\)",
    ↳ "${scope}${separator}${before}${variable}.append(${count}, '${character}'))",
    ↳ null, 10),

```

```

297 // sb.Append(argument)
298 // sb.append(argument)
299 (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(${argument})", null,
    ↳ 10),
300 // Remove scope borders.
301 // /\~*sb\~*/
302 //
303 (new Regex(@"\/\~*[a-zA-Z0-9]+\~*\/"), "", null, 0),
304 // Insert scope borders.
305 // auto added = new HashSet<TElement>();
306 // ~!added!~std::unordered_set<TElement> added;
307 (new Regex(@"auto (?<variable>[a-zA-Z0-9]+) = new
    ↳ HashSet<(?<element>[a-zA-Z0-9]+)>\(\(\);",
    ↳ "~!${variable}!~std::unordered_set<${element}> ${variable};", null, 0),
308 // Inside the scope of ~!added!~ replace:
309 // added.Add(node)
310 // added.insert(node)
311 (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),
312 // Inside the scope of ~!added!~ replace:
313 // added.Remove(node)
314 // added.erase(node)
315 (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),
316 // if (added.insert(node)) {
317 // if (!added.contains(node)) { added.insert(node);
318 (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),
319 // Remove scope borders.
320 // ~!added!~
321 //
322 (new Regex(@"~![a-zA-Z0-9]+!~"), "", null, 5),
323 // Insert scope borders.
324 // auto random = new System.Random(0);
325 // std::srand(0);
326 (new Regex(@"[a-zA-Z0-9\.]+ ([a-zA-Z0-9]+) = new
    ↳ (System\.)?Random\((([a-zA-Z0-9]+\)\)\);", "~!$1!~std::srand($3);", null, 0),
327 // Inside the scope of ~!random!~ replace:
328 // random.Next(1, N)
329 // (std::rand() % N) + 1
330 (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),
331 // Remove scope borders.
332 // ~!random!~
333 //
334 (new Regex(@"~![a-zA-Z0-9]+!~"), "", null, 5),
335 // Insert method body scope starts.
336 // void PrintNodes(TElement node, StringBuilder sb, int level) {
337 // void PrintNodes(TElement node, StringBuilder sb, int level) { /*method-start*/
338 (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}", null,
    ↳ 0),
339 // Insert method body scope ends.
340 // { /*method-start*/...}
341 // { /*method-start*/... /*method-end*/}
342 (new Regex(@"\{\/\~*method-start\~*\/ (?(body>((?<bracket>\{) | (?<-bracket>\}) | [^\{\}]*))
    ↳ \}"), "{ /*method-start*/ ${body} /*method-end*/}", null,
    ↳ 0),
343 // Inside method bodies replace:
344 // GetFirst(
345 // this->GetFirst(
346 ((new Regex(@"(?<separator>(\(| |([\\W]) |return )) (?!(->|\\*
    ↳ )) (?(method>(?!sizeof) [a-zA-Z0-9]+\)\((?!\\) \{)"),
    ↳ "${separator}this->${method}(", null, 1),

```



```

347 (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),
348 // Remove scope borders.
349 // /*method-start*/
350 //
351 (new Regex(@"/*method-(start|end)\*/"), "", null, 0),
352 // Insert scope borders.
353 // const std::exception& ex
354 // const std::exception& ex/*~ex~*/
355 (new Regex(@"(?<before>\(|\s)(?<variableDefinition>(const\s)?(std::)?exception&?
    ↳ (?<variable>[_a-zA-Z0-9]+\s)(?<after>\W)"),
    ↳ "${before}${variableDefinition}/*~${variable}~*/${after}", null, 0),
356 // Inside the scope of ~!ex!~ replace:
357 // ex.Message
358 // ex.what()
359 (new Regex(@"(?<scope>/\*~(?<variable>[_a-zA-Z0-9]+\s)~\*/)(?<separator>.\|\n)(?<before>
    ↳ >((?!/\*~\k<variable>\s\*/)(.|\n))*?)\k<variable>\.Message"),
    ↳ "${scope}${separator}${before}${variable}.what()", null, 10),
360 // Remove scope borders.
361 // /*~ex~*/
362 //
363 (new Regex(@"/*~[_a-zA-Z0-9]+\s~\*/"), "", null, 0),
364 // throw new ArgumentNullException(argumentName, message);
365 // throw std::invalid_argument(((std::string)"Argument
    ↳ ").append(argumentName).append(" is null: ").append(message).append("."));
366 (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),
367 // throw new ArgumentException(message, argumentName);
368 // throw std::invalid_argument(((std::string)"Invalid
    ↳ ").append(argumentName).append(" argument: ").append(message).append("."));
369 (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),
370 // throw new NotSupportedException();
371 // throw std::logic_error("Not supported exception.");
372 (new Regex(@"throw new NotSupportedException\(\);", "throw std::logic_error(\"Not
    ↳ supported exception.\");", null, 0),
373 // throw new NotImplementedException();
374 // throw std::logic_error("Not implemented exception.");
375 (new Regex(@"throw new NotImplementedException\(\);", "throw std::logic_error(\"Not
    ↳ implemented exception.\");", null, 0),
376 }.Cast<ISubstitutionRule>().ToList();
377
378 public static readonly IList<ISubstitutionRule> LastStage = new List<SubstitutionRule>
379 {
380     // ICounter<int, int> c1;
381     // ICounter<int, int>* c1;
382     (new Regex(@"(?<abstractType>I[A-Z][a-zA-Z0-9]+(<[^\r\n]+>)?
    ↳ (?<variable>[_a-zA-Z0-9]+\s);", "${abstractType}* ${variable};", null, 0),
    ↳ // (expression)
    ↳ // expression
    ↳ (new Regex(@"(\(|\s)\(((a-zA-Z0-9_\*:]+)\s)(\s|;|\\)"), "$1$2$3", null, 0),
    ↳ // (method(expression))
    ↳ // method(expression)
    ↳ (new Regex(@"(?<firstSeparator>\(|\s
    ↳ ))\(((?<method>[a-zA-Z0-9_\*:]+)\s)\(((?<expression>((?<parenthesis>\(|\s(?<-parent
    ↳ hesis>\)|[a-zA-Z0-9_\*:]+)\s)(?<parenthesis>(?!))\s)\s)(?<lastSeparator>(\s|
    ↳ |;|\\)"))", "${firstSeparator}${method}(${expression})${lastSeparator}", null, 0),
    ↳ // return ref _elements[node];
    ↳ // return &elements[node];
    ↳ (new Regex(@"return ref ([a-zA-Z0-9]+\s)\s\(((a-zA-Z0-9_\*:]+)\s);", "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

```



```

397         (new Regex(@"(?<before>\r?\n[~""\r\n]*("(\\" | [~""\r\n])*~""\r\n)*)(?<=\\W)defa_
    ↪ ult(?<after>\\W)", "${before}0${after}", null,
    ↪ 10),
398     // object x
399     // void *x
400     (new Regex(@"(?<before>\r?\n[~""\r\n]*("(\\" | [~""\r\n])*~""\r\n)*)(?<=\\W)([O|_
    ↪ object|System\\.Object) (?<after>\\w)", "${before}void *${after}", null,
    ↪ 10),
401     // #region Always
402     //
403     (new Regex(@"(\\|\\r?\\n)[ \\t]*#(region|endregion)[\\r\\n]*(\\r?\\n|$)", "", null, 0),
404     // // #define ENABLE_TREE_AUTO_DEBUG_AND_VALIDATION
405     //
406     (new Regex(@"\\|\\|/[ \\t]*#define[ \\t]+[_a-zA-Z0-9]+[ \\t]*"), "", null, 0),
407     // #if USEARRAYPOOL\\r\\n#endif
408     //
409     (new Regex(@"#if [a-zA-Z0-9]+\\s+#endif", "", null, 0),
410     // [Fact]
411     //
412     (new Regex(@"(?<firstNewLine>\\r?\\n|\\A)(?<indent>[\\t
    ↪ ]+)[\\|][a-zA-Z0-9]+(\\((?<expression>(\\(?<parenthesis>\\)|(?<-parenthesis>\\))|\\(\\r
    ↪ \\n)*+)(?<parenthesis>(?!))\\)?\\| [ \\t]*(\\r?\\n\\k<indent>)?"),
    ↪ "${firstNewLine}${indent}", null, 5),
413     // \\n ... namespace
414     // namespace
415     (new Regex(@"(\\S[\\r\\n]{1,2})?[\\r\\n]+namespace)", "$1namespace", null, 0),
416     // \\n ... class
417     // class
418     (new Regex(@"(\\S[\\r\\n]{1,2})?[\\r\\n]+class)", "$1class", null, 0),
419     }.Cast<ISubstitutionRule>().ToList();
420
421     public CSharpToCppTransformer(IList<ISubstitutionRule> extraRules) :
    ↪ base(FirstStage.Concat(extraRules).Concat(LastStage).ToList()) { }
422
423     public CSharpToCppTransformer() : base(FirstStage.Concat(LastStage).ToList()) { }
424 }
425 }

```

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;
class Program
20 {
21     public static void Main(string[] args)
22     {
23         Console.WriteLine("Hello, world!");
24     }
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
35             var transformer = new CSharpToCppTransformer();
36             var actualResult = transformer.Transform(helloWorldCode, new Context(null));
37             Assert.Equal(expectedResult, actualResult);
38         }
39     }
40 }

```


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