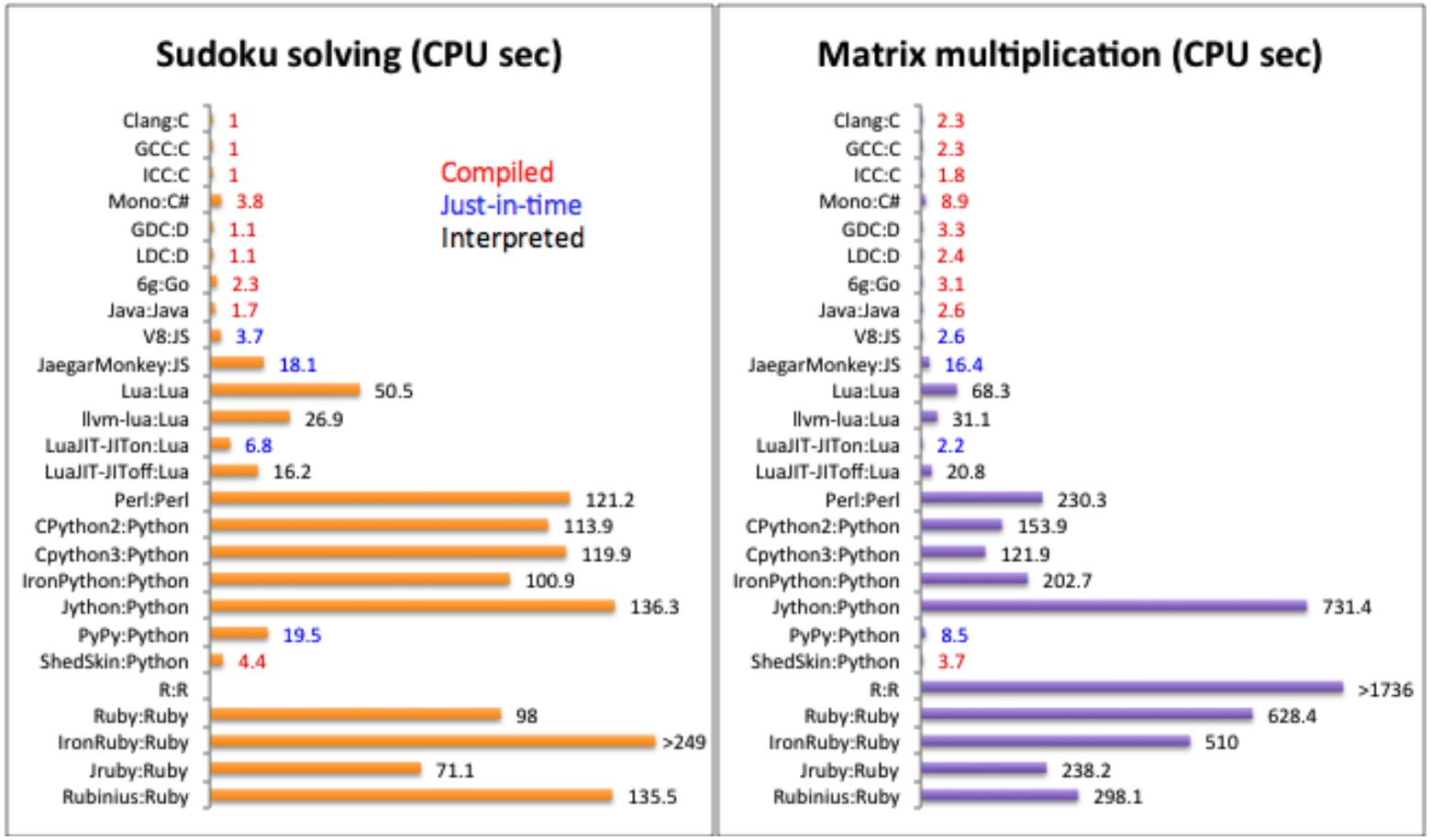
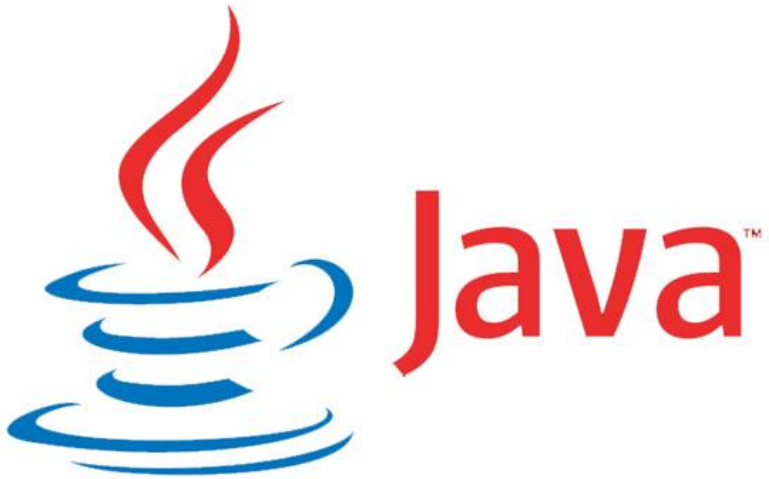
# swig 를 이용한 성능개선용 C++ 모듈 랩핑

# Is python slow?

# C/C++ == Speed




출처: https://attractivechaos.github.io/plb/




# Java Native Interface, JNI

# 먼저 랩퍼 클래스를 만든다

```
public class HelloJNI {
   static {
      System.loadLibrary("hello");
   }

   private native void sayHello();

   public static void main(String[] args) {
      new HelloJNI().sayHello();  // invoke the native method
   }
}
```

# 그걸 컴파일하면 헤더파일이 나온다

```
/* DO NOT EDIT THIS FILE - it is machine generated */
#include <jni.h>
/* Header for class HelloJNI */

#ifndef _Included_HelloJNI
#define _Included_HelloJNI
#ifdef __cplusplus
extern "C" {
#endif
/*
 * Class:     HelloJNI
 * Method:    sayHello
 * Signature: ()V
 */
JNIEXPORT void JNICALL Java_HelloJNI_sayHello(JNIEnv *, jobject);

#ifdef __cplusplus
}
#endif
#endif
```

# 헤더파일의 시그네처를 복붙한다

```c
#include <jni.h>
#include <stdio.h>
#include "HelloJNI.h"

// Implementation of native method sayHello() of HelloJNI class
JNIEXPORT void JNICALL Java_HelloJNI_sayHello(JNIEnv *env, jobject thisObj) {
   printf("Hello World!\n");
   return;
}
```


python API

#include <Python.h>

# 그냥 쓰면 된다

```python
from ctypes import cdll
lib = cdll.LoadLibrary('./libfoo.so')

def main():
    lib.func()

if __name__ == "__main__":
    main()
```

```c
#include <stdio.h>

void function()
{
    printf("Hello, World!");
}
```

# 하지만 데이터를 Python API 로 직접 파싱 및 생성해야 한다

```c
static PyObject *
function(PyObject *self, PyObject *args)
{
    const char *command;
    int sts;

    if (!PyArg_ParseTuple(args, "s", &command))
        return NULL;
    sts = system(command);
    if (sts < 0) {
        PyErr_SetString(SpamError, "System command failed");
        return NULL;
    }
    return PyLong_FromLong(sts);
}
```

# Platform Invoke
# P/Invoke

# DLL 을 만든 다음 Pinvoke 로 랩핑한다

```
#include <stdio.h>

__declspec(dllexport) void HelloWorld ()
{
    printf("Hello, World!\n");
}
```

```
[DllImport("DllMain.dll", CallingConvention = CallingConvention.Cdecl)]
public static extern void HelloWorld();
```

각 언어를 위해 특별히 코드를 작성해야 하기도 한다.

타입 간에 마샬링을 직접 해줘야 하는 경우도 있다

랩핑을 해줘야 하는 경우도 있다

swig / swig

Watch 125 | Unstar 1,373 | Fork 439

Code | Issues 198 | Pull requests 52 | Projects 0 | Wiki | Pulse | Graphs

SWIG is a software development tool that connects programs written in C and C++ with a variety of high-level programming languages. http://www.swig.org

19,641 commits | 17 branches | 51 releases | 121 contributors

Branch: master | New pull request | Create new file | Upload files | Find file | Clone or download

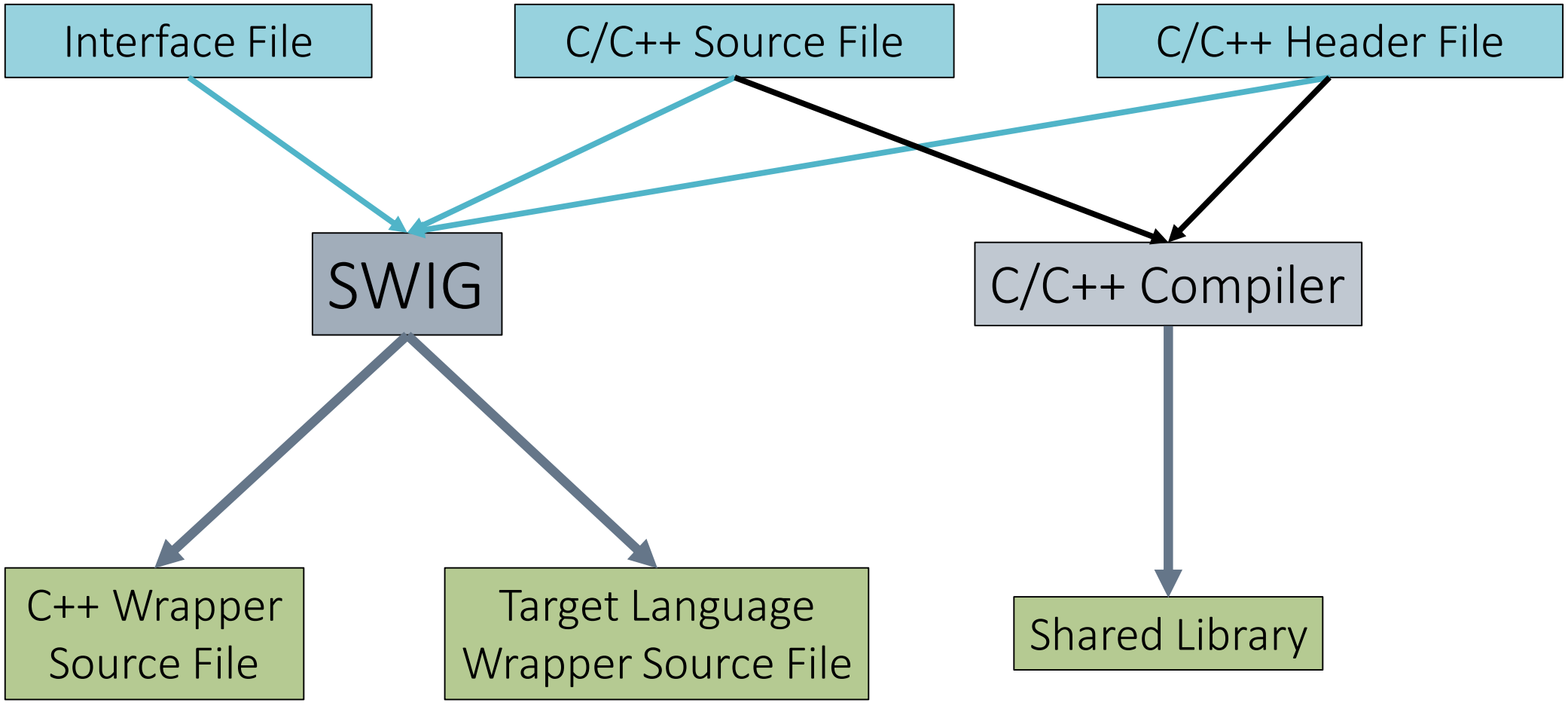
wsfulton Remove differences from lua example compared to Python version — Latest commit 1730210 11 hours ago

| | | |
|---|---|---|
| CCache | whitespace fix | 8 months ago |
| Doc | Bump version to 3.0.13 | 10 days ago |
| Examples | Remove differences from lua example compared to Python version | 10 hours ago |
| Lib | Redid the source and the text to check for SCM_MAJOR_VERSION >= 2 | 11 days ago |
| Source | Warning fix for visual c++ | 3 days ago |
| Tools | Improve nuget installed message on Appveyor | 3 days ago |
| Win | The great merge | 14 years ago |

## Code Generation

SWIG currently generates wrapper code for twenty three different target languages:

- Allegro CL
- C#
- CFFI
- CLISP
- Chicken
- D
- Go
- Guile
- Java
- Javascript
- Lua
- Modula-3
- Mzscheme
- OCAML
- Octave
- Perl
- PHP
- Python
- R
- Ruby
- Scilab
- Tcl
- UFFI


Interface File
C/C++ Source File
C/C++ Header File
SWIG
C/C++ Compiler
C++ Wrapper Source File
Target Language Wrapper Source File
Shared Library

# Header.h

```
#pragma once
#include <string>

class TestClass
{
private:
    std::string _person;
public:
    void eventRecieveData(std::string const&);
    std::string getData() const;
};
```

# Test.i

```
%module ConsoleApp
%{
#include "Header.h"
%}
%include "std_string.i"
%include "Header.h"
```

```
C:\Users\User> swig –csharp Test.i
```

# Why  Should I Use This????

# TestClass.cs

```
public class TestClass : global::System.IDisposable {
  private global::System.Runtime.InteropServices.HandleRef swigCPtr;
  protected bool swigCMemOwn;

  internal TestClass(global::System.IntPtr cPtr, bool cMemoryOwn) {
    swigCMemOwn = cMemoryOwn;
    swigCPtr = new global::System.Runtime.InteropServices.HandleRef(this, cPtr);
  }

  internal static global::System.Runtime.InteropServices.HandleRef getCPtr(TestClass obj) {
    return (obj == null) ? new global::System.Runtime.InteropServices.HandleRef(null, global::System.IntPtr.Zero) : obj.swigCPtr;
  }

  ~TestClass() {
    Dispose();
  }

  public virtual void Dispose() {
    lock(this) {
      if (swigCPtr.Handle != global::System.IntPtr.Zero) {
        if (swigCMemOwn) {
          swigCMemOwn = false;
          ConsoleAppPINVOKE.delete_TestClass(swigCPtr);
        }
        swigCPtr = new global::System.Runtime.InteropServices.HandleRef(null, global::System.IntPtr.Zero);
      }
      global::System.GC.SuppressFinalize(this);
    }
  }

  public void eventRecieveData(string arg0) {
    ConsoleAppPINVOKE.TestClass_eventRecieveData(swigCPtr, arg0);
    if (ConsoleAppPINVOKE.SWIGPendingException.Pending) throw ConsoleAppPINVOKE.SWIGPendingException.Retrieve();
  }

  public string getData() {
    string ret = ConsoleAppPINVOKE.TestClass_getData(swigCPtr);
    return ret;
  }

  public TestClass() : this(ConsoleAppPINVOKE.new_TestClass(), true) {
  }

}
```

# ConsoleAppPInvoke.cs

# 예외처리가 매우 확실하다

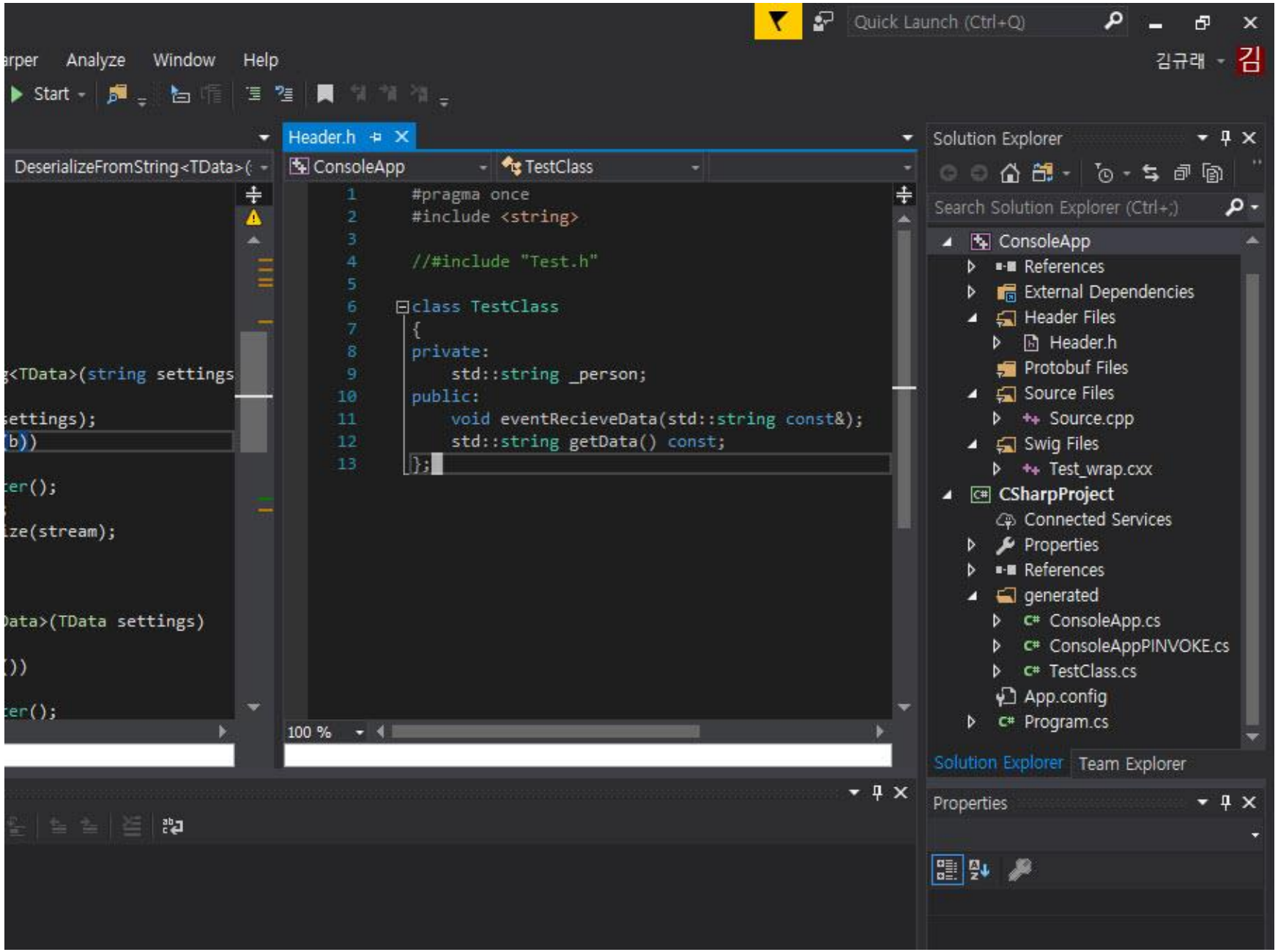
~~100프로~~ 터진다

```
public delegate void ExceptionDelegate(string message);
public delegate void ExceptionArgumentDelegate(string message, string paramName);

static ExceptionDelegate applicationDelegate = new ExceptionDelegate(SetPendingApplicationException);
static ExceptionDelegate arithmeticDelegate = new ExceptionDelegate(SetPendingArithmeticException);
static ExceptionDelegate divideByZeroDelegate = new ExceptionDelegate(SetPendingDivideByZeroException);
static ExceptionDelegate indexOutOfRangeDelegate = new ExceptionDelegate(SetPendingIndexOutOfRangeException);
static ExceptionDelegate invalidCastDelegate = new ExceptionDelegate(SetPendingInvalidCastException);
static ExceptionDelegate invalidOperationDelegate = new ExceptionDelegate(SetPendingInvalidOperationException);
static ExceptionDelegate ioDelegate = new ExceptionDelegate(SetPendingIOException);
static ExceptionDelegate nullReferenceDelegate = new ExceptionDelegate(SetPendingNullReferenceException);
static ExceptionDelegate outOfMemoryDelegate = new ExceptionDelegate(SetPendingOutOfMemoryException);
static ExceptionDelegate overflowDelegate = new ExceptionDelegate(SetPendingOverflowException);
static ExceptionDelegate systemDelegate = new ExceptionDelegate(SetPendingSystemException);

static ExceptionArgumentDelegate argumentDelegate = new ExceptionArgumentDelegate(SetPendingArgumentException);
static ExceptionArgumentDelegate argumentNullDelegate = new ExceptionArgumentDelegate(SetPendingArgumentNullException);
static ExceptionArgumentDelegate argumentOutOfRangeDelegate = new ExceptionArgumentDelegate(SetPendingArgumentOutOfRangeException);
```

# 개발사이클이 엄청 짧아진다



## 하지만 물론 단점도 있다

툴이 지원하는 C/C++ 기능들에 함정이 엄청 많다

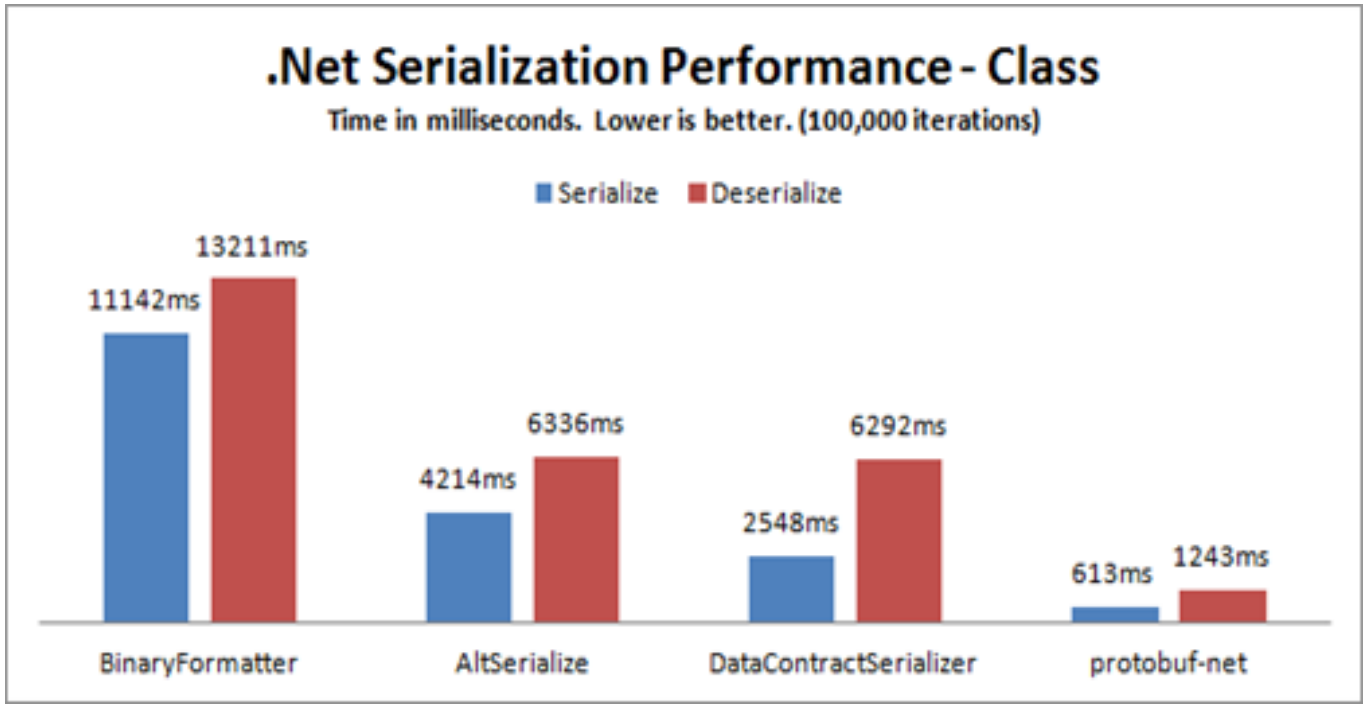
툴이 지원하는 C/C++ 기능들이 한정적이다

언어별로 툴이 처리하는 방식이 다르다

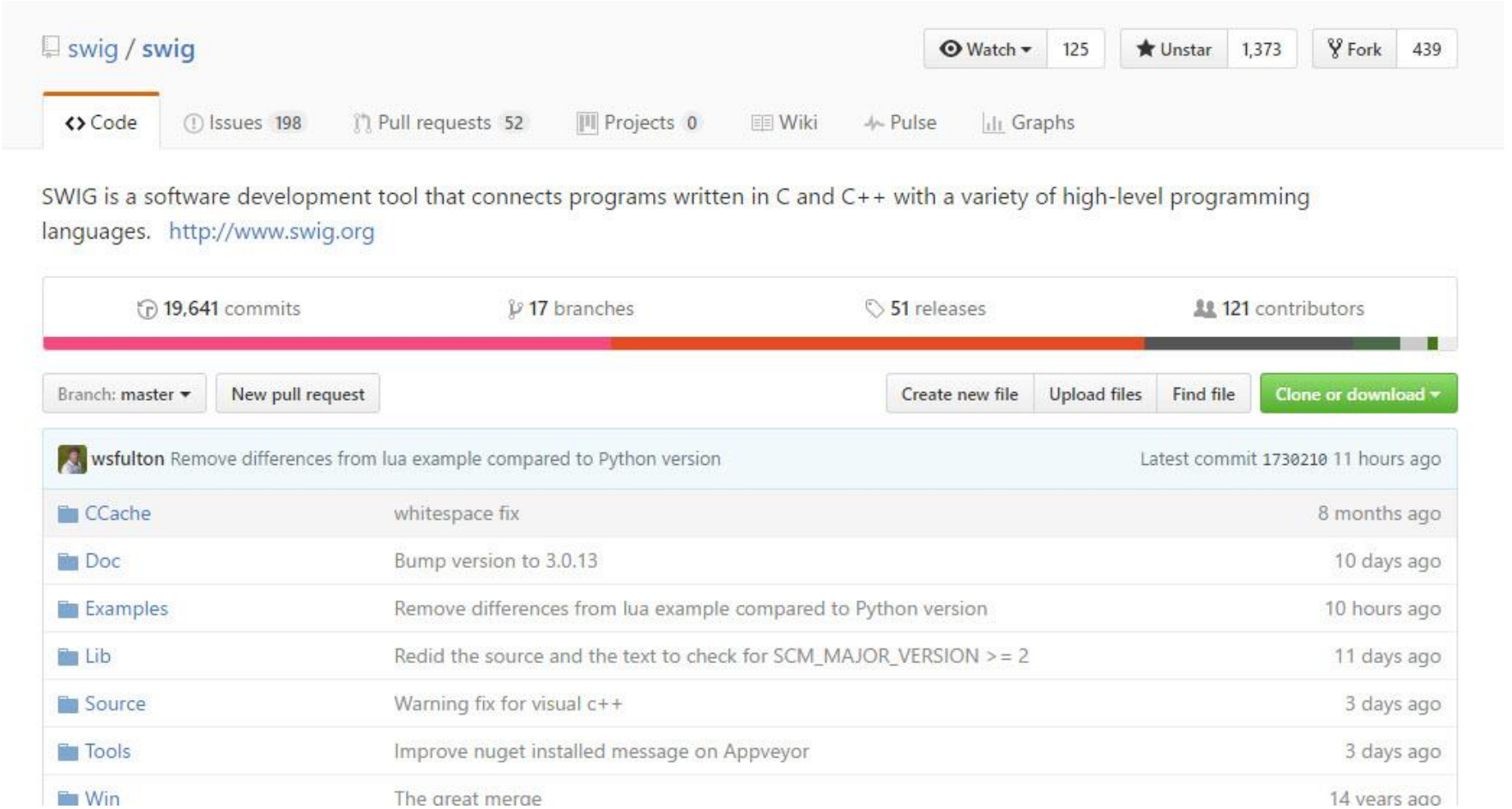
레퍼런스 겁나 길다... 진짜로..

**사용하기 위해서는 Swig 가 지원하는 범위와, 처리하는 방법을 잘 파악해야 한다**

std::auto_ptr
std::deque
std::list
std::map
std::set
std::string
std::vector
std::array
std::shared_ptr




출처: http://www.techmikael.com/2010/01/net-serialization-performance.html


swig / swig
Watch 125
Unstar 1,373
Fork 439
Code
Issues 198
Pull requests 52
Projects 0
Wiki
Pulse
Graphs
SWIG is a software development tool that connects programs written in C and C++ with a variety of high-level programming languages. http://www.swig.org
19,641 commits
17 branches
51 releases
121 contributors
Branch: master
New pull request
Create new file
Upload files
Find file
Clone or download
wsfulton Remove differences from lua example compared to Python version
Latest commit 1730210 11 hours ago
CCache whitespace fix 8 months ago
Doc Bump version to 3.0.13 10 days ago
Examples Remove differences from lua example compared to Python version 10 hours ago
Lib Redid the source and the text to check for SCM_MAJOR_VERSION >= 2 11 days ago
Source Warning fix for visual c++ 3 days ago
Tools Improve nuget installed message on Appveyor 3 days ago
Win The great merge 14 years ago

swig.org