



Award #: 1931408

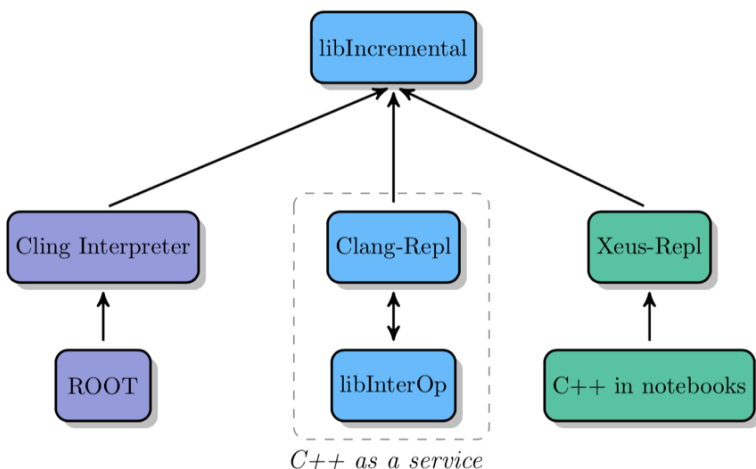
CSSI Element: C++ as a service - rapid software development and dynamic interoperability with Python and beyond

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libIncremental Design



Our approach is to generalize a high-energy physics analysis tool (“Cling”) to a general-purpose and fully functional tool that becomes part of LLVM/Clang

CaaS programming model

```
In [1]: struct S { double val = 1.; };  
  
In [2]: from libInterop import std  
python_vec = std.vector(S)(1)  
  
In [3]: print(python_vec[0].val)  
1  
  
In [4]: class Derived(S)  
def __init__(self):  
    self.val = 0  
res = Derived()  
  
In [5]: __global__ void sum_array(int n, double *x, double *sum) {  
    for (int i = 0; i < n; i++) *sum += x[i];  
}  
// Init N=1M and x[i] = 1.f. Run kernel on 1M elements on the GPU.  
sum_array<<<1, 1>>>(N, x, &res.val);
```

CaaS aims to provide programmers and data scientists a simple and general solution to language interoperability:

- Advance the interpretative technology to provide scientists a state-of-the-art C++ execution environment
- Enable functionality which can provide dynamic, native-like, runtime interoperability between C++ and Python
- Allow seamless utilization of heterogeneous hardware (e.g., hardware accelerators)
- Enable rapid application development even to those with a complex codebase