Our Journey Through the Perils of AOT Compilation

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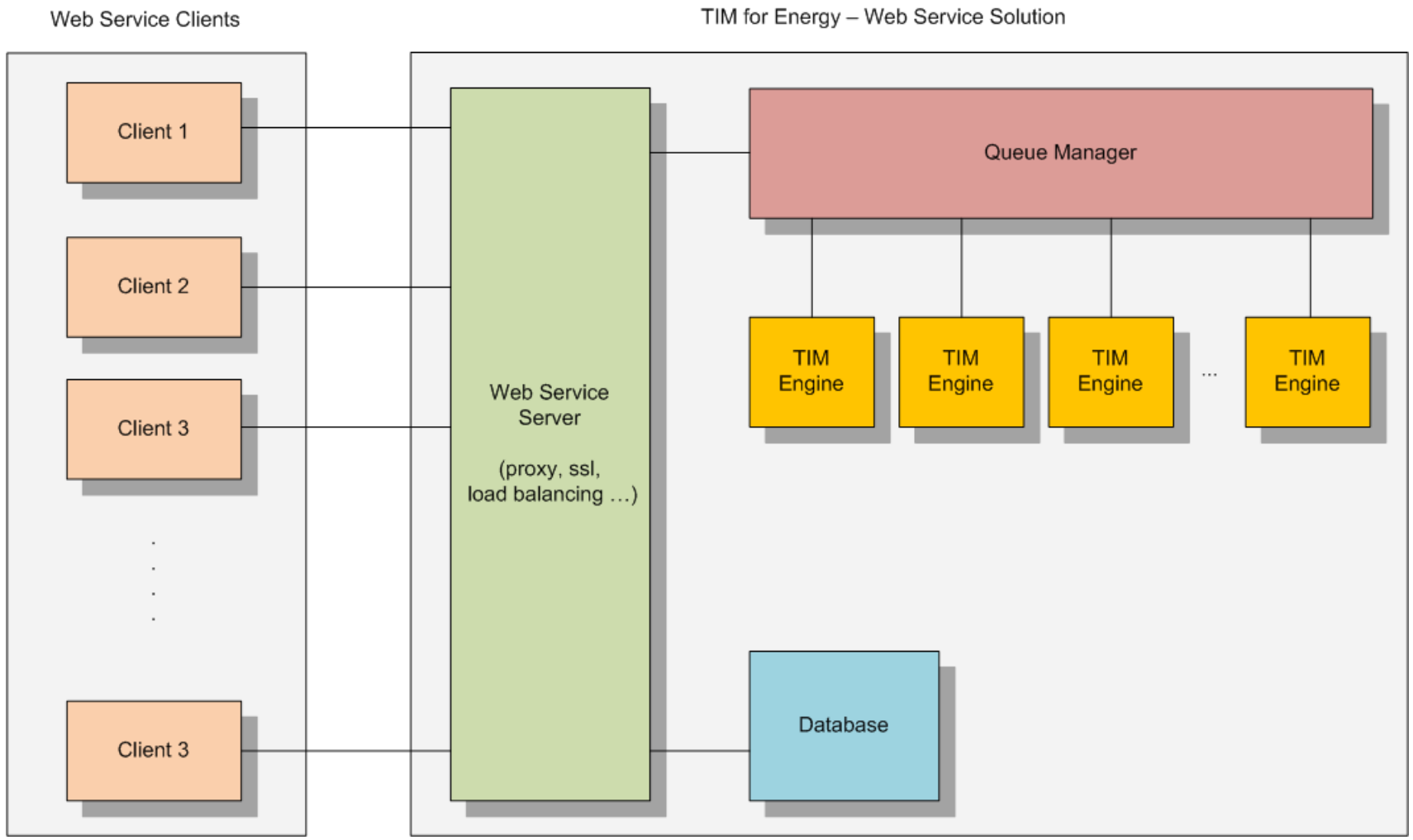
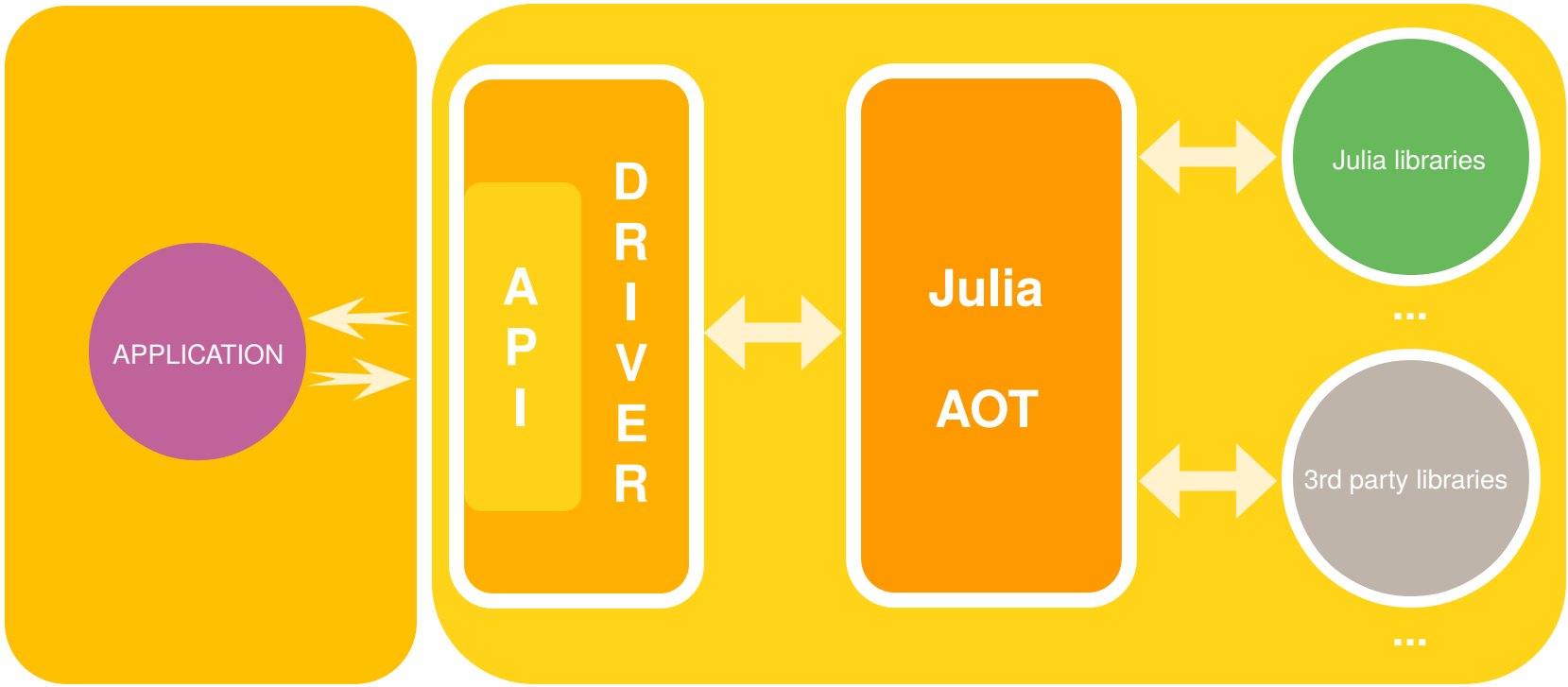
Introduction

Why AOT ?

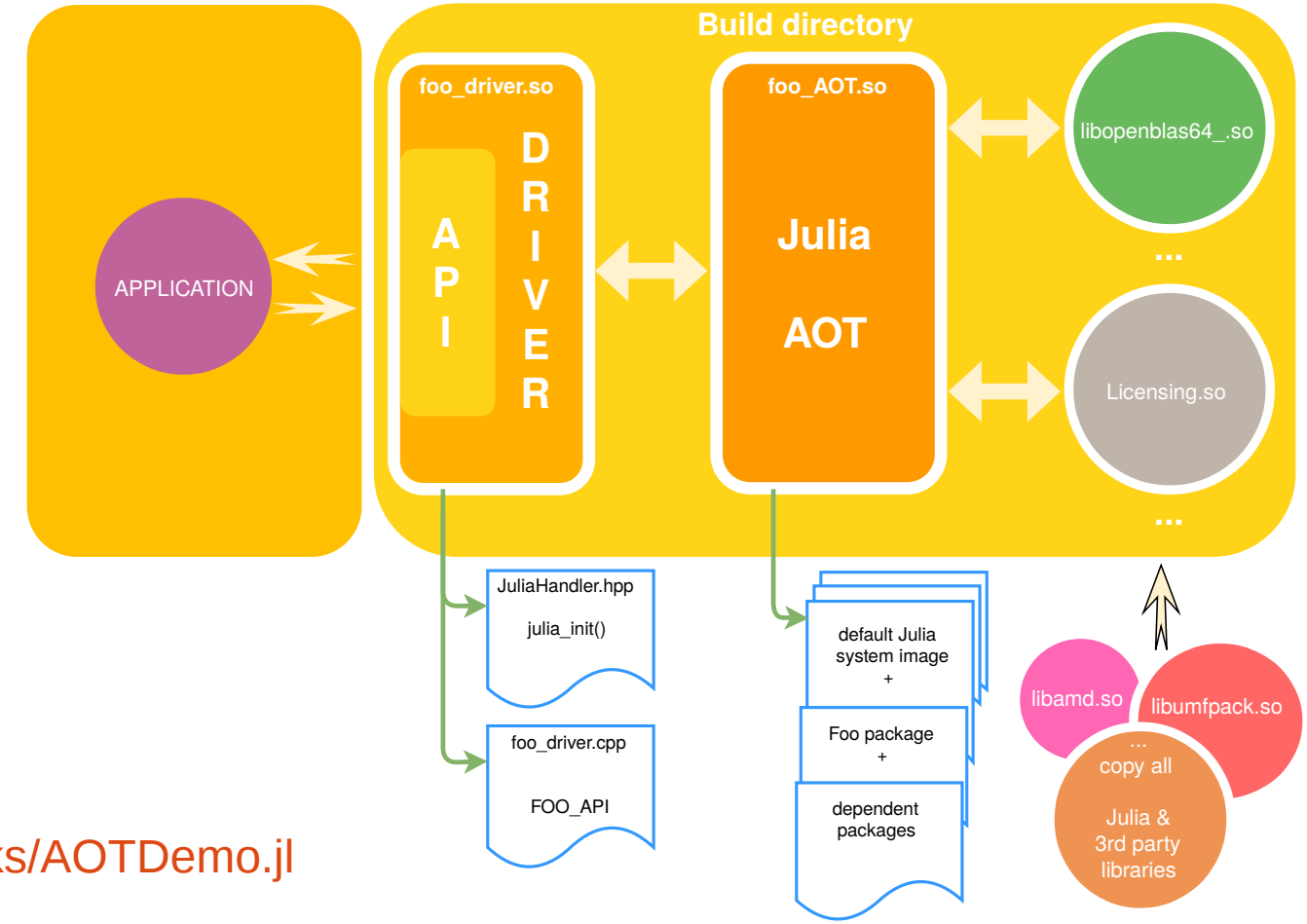
TIM Overall Architecture



Our AOT scheme



Our AOT scheme



See github.com/TangentWorks/AOTDemo.jl

Prerequisites

I. installed package PackageCompiler.jl

II. your Julia code in foo.jl (module, ...)

foo.jl

```
struct Data
  name::String
  values::Vector{Float64}
end

function bar(data::Vector{Data})
  doSomething(data)
  return 0
end
```

1. step: Create C API + driver

foo.h

```
struct Data {
  wchar_t* name;
  double*  valuesPtr;
  size_t   valuesLen;
};

FOO_API int __stdcall FOO_bar(struct Data* data, const size_t dataLen);
```

foo_driver.cpp

```
extern "C" {
  extern int jl_FOO_bar(foo::Data *data, const size_t dataLen);
}

FOO_API int FOO_bar(Data *data, const size_t dataLen) {
  return jl_FOO_bar(data, dataLen);
}
```

2. step: Create Julia program to compile

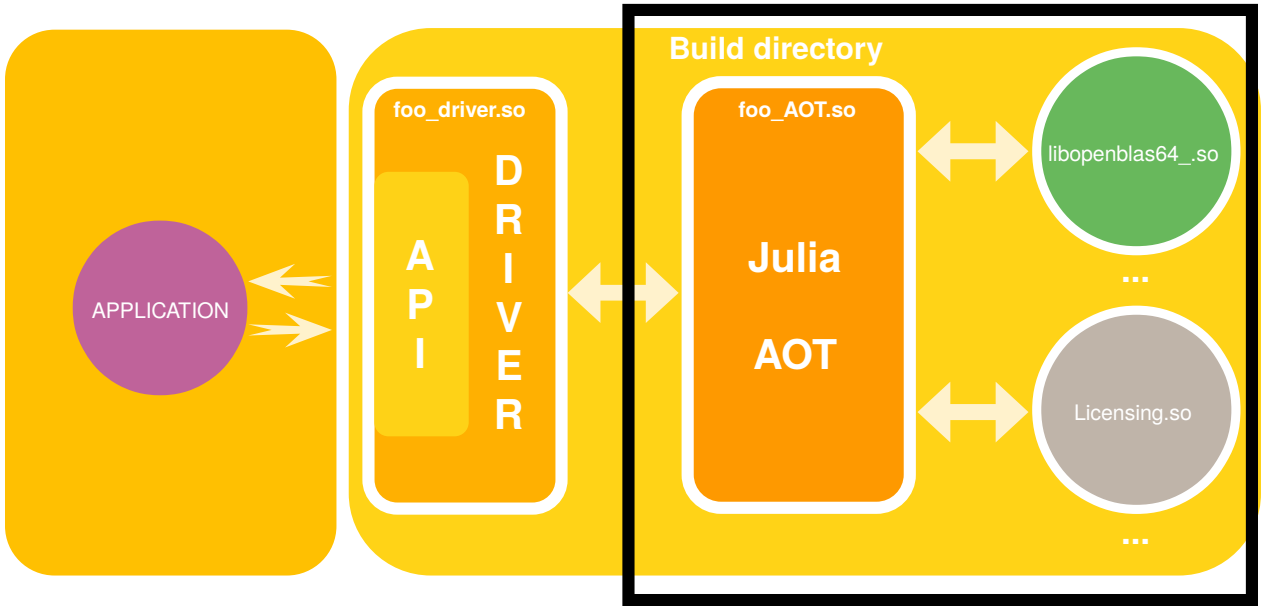
foo_AOT.jl

```
struct CData
  name::Ptr{Cwchar_t}
  valuesPtr::Ptr{Cdouble}
  valuesLen::Csize_t
end

Base.@ccallable function jl_FOO_bar(dataPtr::Ptr{CData}, dataLen::Csize_t)::Cint
  data = Vector{Data}(unsafe_wrap(Array, dataPtr, dataLen))
  Foo.bar(data)
end
```

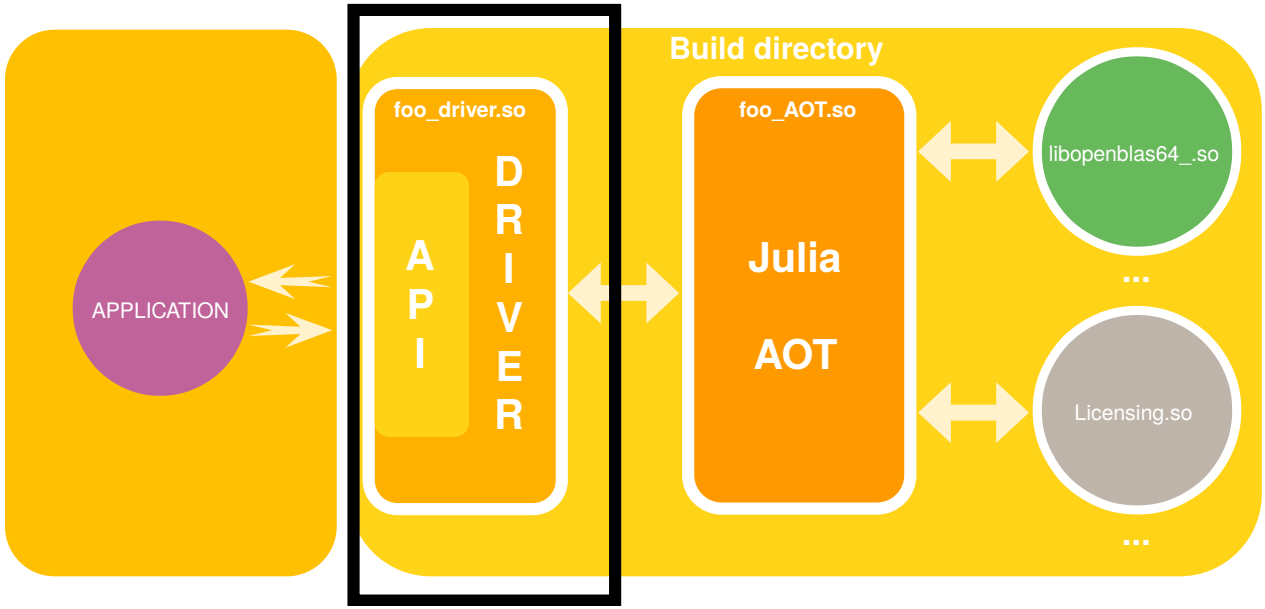
3. step: Compile Julia program (using PackageCompiler.jl)

```
$ julia juliac.jl -vcasj --cc-flags=-Wl,-rpath,'$ORIGIN' --compile=all foo_AOT.jl
```



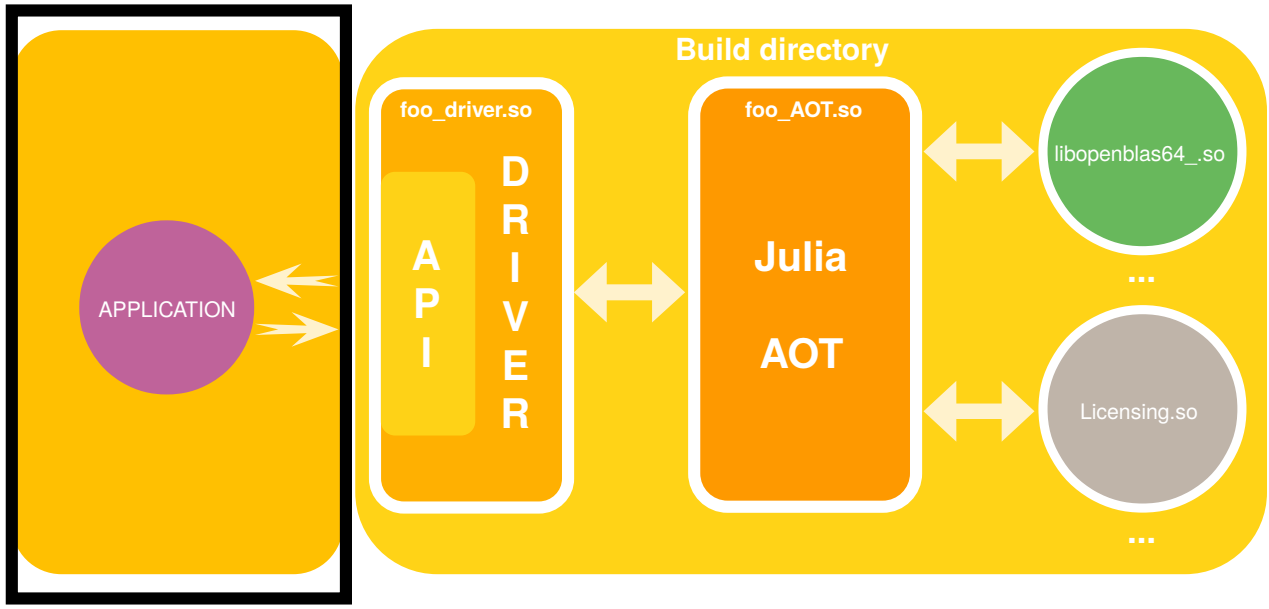
4. step: Compile C driver

```
$ g++ -shared -o foo_driver.so ../driver/foo_driver.cpp -std=c++11
-I/path/to/your/julia/include/julia -DJULIA_ENABLE_THREADING=1
-fPIC -Wl,--export-dynamic -m64 foo_AOT.so '-Wl,-rpath,$ORIGIN'
```



5. step: Compile app

```
$ g++ -o app ../app/app.cpp -std=c++11 -fPIC -m64 foo_driver.so '-Wl,-rpath,$ORIGIN'
-fuse-ld=gold
```



Performance of AOT vs. JIT

AOT - compiled on local machine	~ 36 s
AOT - compiled on different machine	~ 35 s
JIT - first run (warm up)	~ 41 s
JIT - second run	~ 36 s

Note: BLAS 40%

Summary

github.com/TangentWorks/AOTDemo.jl

Thank you.

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