Interoperability in Distributed Systems

CS 451 Lecture 2003

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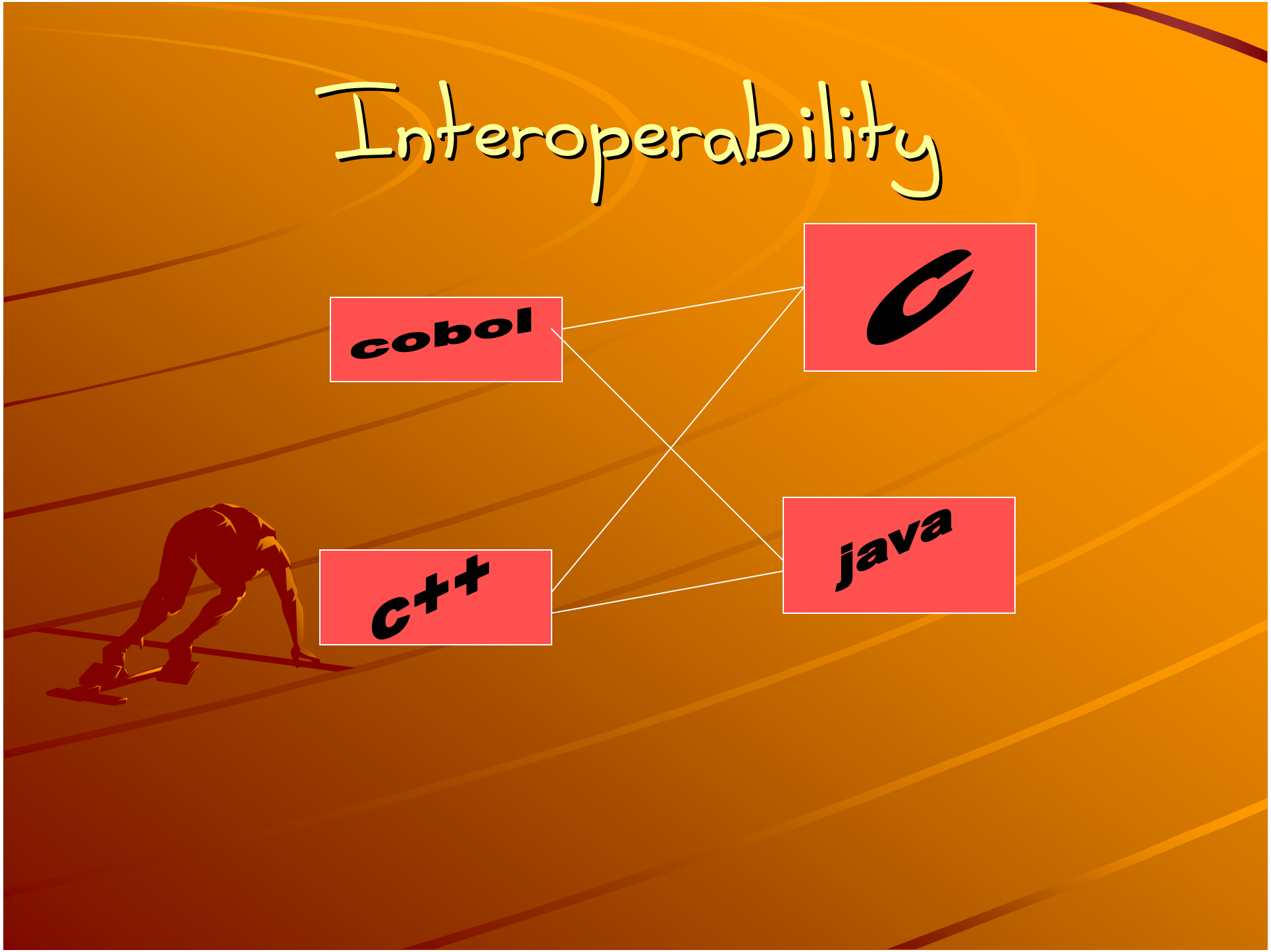
RPC not enough!

- Why?

Need to handle multiple programming languages for implementations (decouple communication from implementation)

RPC is only low level comm. Paradigms, but not a full fledged infrastructure for distributed applications development

Interoperability



Consequences of supporting Interoperability

- Interoperability vs. portability vs. Compatibility ?

Ideas for obtaining a basic architecture supporting interoperability?

- Type system
- Mappings

  CTS → LTS

  - C client stub
  - java client stub
  - cobol server stub
  - C server stub
  - C++ server stub ..

  LTS → CTS

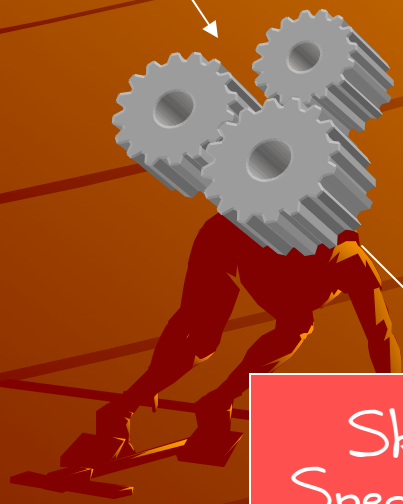
The solution

Interface Of Program A

use a standard language for describing interface

The solution : Export

Interface Of Program A

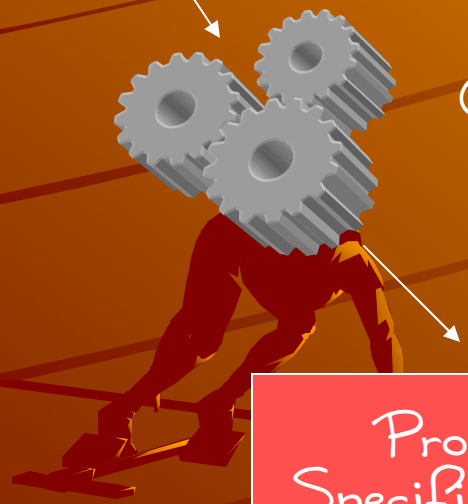


CTS to JAVA

Skeleton Specification → Skeleton Realization + Export Logic

The solution : Import

Interface Of Program A



CTS to C

Proxy Specification → Client Implementation + Import Logic

What constitutes an Interface Specification Language

- A Type system
  - Basic and aggregate types
  - Call semantics
  - Parameter directions
  - Reuse of types

control constructs excluded!

IDL: Types

Basic types: Int, bool, char, float,
Aggregate type specifiers [], Struct

Interface type: interface foo{ ..}
Function type: int f (int a, char c);

Direction specifiers:

int f (in int a, in char c, out char c, inout int b);

Exeptions e,e2;
Throwable exceptions: foo throws e;

Call semantics:

```
Interface I {
    One way f(int a);
}
```

Reuse through inheritance
interface J extends interface I { ...}

A Distributed System Infrastructure

- Basic Remoting Architecture with interoperability
- Added Services for Applications building
  - Location services
  - Activation services
  - Repositories
  - Event services
  - Persistence
  - Timing services
  - Transactions servers
  - ...

Example Distributed Systems Infrastructure

- CORBA
- COM/DCOM → .NET
- J2EE