

Interface Definition Language

- Types are problematic:
 - Weakly typed C language: short / int / long
 - Architecture-specific data types
- IDL is a strongly typed language
 - Concretely defined sizes for base types
- IDL uses Network Data Representation (NDR)
 - Architecture-independent network transmissions

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Enumerated Types

- Enum keyword
 - Enums are transmitted as 16-bit values per default
 - [v1_enum] attribute generates 32-bit entities

```
Interface IWeek: IUnknown {
    typedef [v1_enum] enum DaysOfTheWeek
    {
        Monday, Tuesday, Wednesday, Thursday,
        Friday, Saturday, Sunday
    } DaysOfTheWeek;

    HRESULT Test(DaysOfTheWeek day);
}
```

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Directional Attributes

- Which variables need to sent to server?
- C++ does not indicate whether function changes pointer variables
- Attributes:
 - [in], [out], [in, out]
 - [in, out] models standard C++ behavior (extra network traffic)
 - [in] is default

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Arrays

- Fixed Arrays
- Conformant Arrays
 - Several attributes to define size of arrays and data transmitted:
 - First_is, last_is, length_is, max_is, min_is, size_is
 - Caller specifies actual number of elements at runtime
- Varying arrays
 - Server may return less than the full number of elements
 - Maximum number of elements is bounded
- Open arrays
 - Caller/callee control size of memory blocks separately
- Multidimensional Arrays

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Character Arrays

- Common programming practice...

- Special [string] attribute

```
HRESULT SendString1([in, string] wchar_t * myString);
HRESULT SendString2([in] int cLength, [in, size_is(cLength)]
    wchar_t * myString);
```

- Both versions are semantically equivalent
- Client calls:

```
wchar_t wszHello[] = L“My favourite String“;
pTest->SendString1( wszHello );
pTest->SendString2( wcslen( wszHello ), wszHello );
```

- Problem: send/receive a string (memory allocation)

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Pointers

- Full Pointers (problem of aliasing)

- Stub code maintains dictionary of marshaled pointers
- Avoid full pointers whenever possible

- Unique Pointers

- Can point to any location
- Can have the value null
- Can change from non-null to null and vice-versa during a call
- IDL ignores changes between non-null values during call
- No aliasing

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Pointers (contd.)

- **Reference Pointers**
 - Can point to any location
 - Cannot have the value null
 - No aliasing
 - Cannot change during a call
- **Interface Pointers**
 - C++ class and function pointers are off-limits to remote method calls
 - Access to code in different address spaces only through interface pointers
 - Problem: generic IF pointers, MIDL cannot generate stub code for void**
 - HRESULT GetInterfacePointer([out] IUnknown** ppvObject);
 - Client needs to call QueryInterface() afterwards

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Interface Pointers (contd.)

- **Use IDL attribute to identify type of IF pointer**
 - HRESULT GetInterfacePointer([in] REFIID riid, [out], iid_is(riid)] void** ppvObject);
 - Client calls:

```
IMyCustomInterface * pCustomInterface;  
pObject->GetInterfacePointer( IID_IMyCustomInterface,  
    (void**) pCustomInterface );
```
- **Special attributes to map non-remotable methods**
 - [local] – directs MIDL not to generate stub code (for DLLs)
 - [call_as] – directs MIDL to treat parameter types differently

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