CEC Continuing Education Center

DesignNews

Techniques for Interfacing with Modern Sensors

DAY 5 : Leveraging C++ in Sensor Interfacing

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Webinar Logistics

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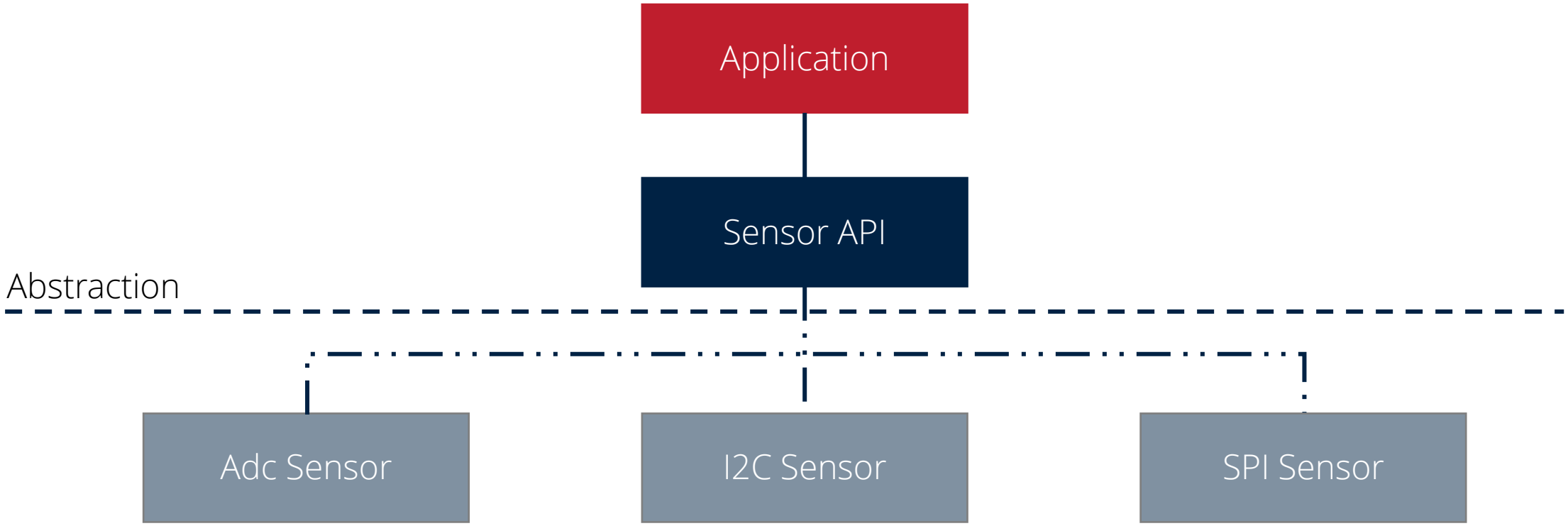
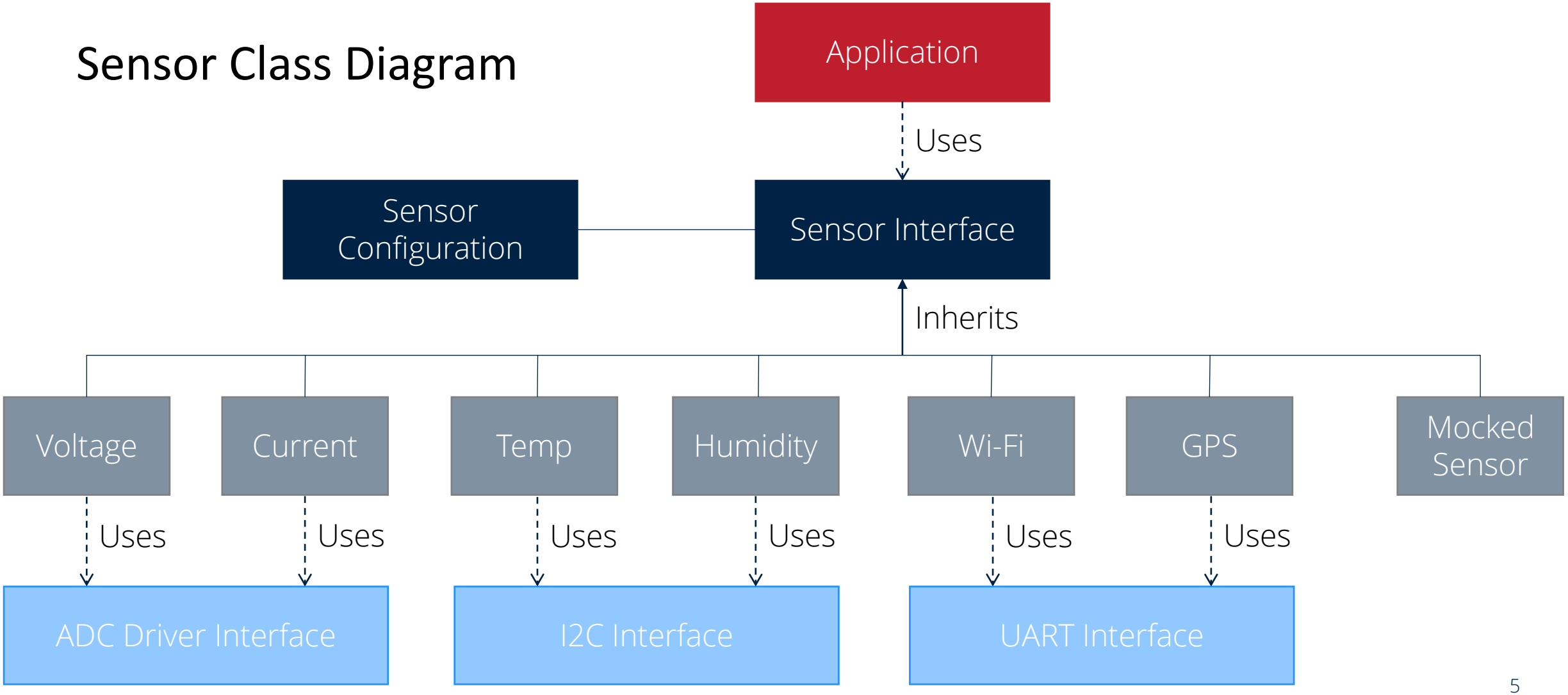
Course Sessions

- Introduction to Modern Sensor Interfacing
- Designing Sensor Interfaces
- Sensor Driver Techniques Part 1
- Sensor Driver Techniques Part 2
- Leveraging C++ in Sensor Interfacing

Sensor Interfacing



Sensor Class Diagram



Classes

```
class SensorInterface
{
    public:
        void Init();
        void Write();
        void Read();
}
```

Classes

```
void SensorInterface::Init()
{

?

}
```

```
void SensorInterface::Write()
{

?

}
```

Interfaces in C++

C++ does not have interfaces.

Virtual Functions:

- Member function which is declared within a base class and is re-defined by a derived class
- Must be defined in the derived class not the base class
- The virtual keyword is used to define in the base class

Interfaces Declaration in C++

Class name

```
class SensorInterface
{
    public:
        virtual void Init() = 0;
        virtual void Write() = 0;
        virtual void Read() = 0;
};
```

Inheriting the Interface

```
class Temperature: public SensorInterface
{
    public:
        void Init();
        void Write();
        void Read();
};
```

```
class Humidity: public SensorInterface
{
    public:
        void Init();
        void Write();
        void Read();
        void Calibrate();
};
```

Additional API

Defining the Interface

```
void Temperature :: Init(TempConfig_t &TempConfig)
{
    ...
}
```

which one?

```
void Temperature :: Init(TempConfig_t * TempConfig)
{
    ...
}
```

References vs Pointers

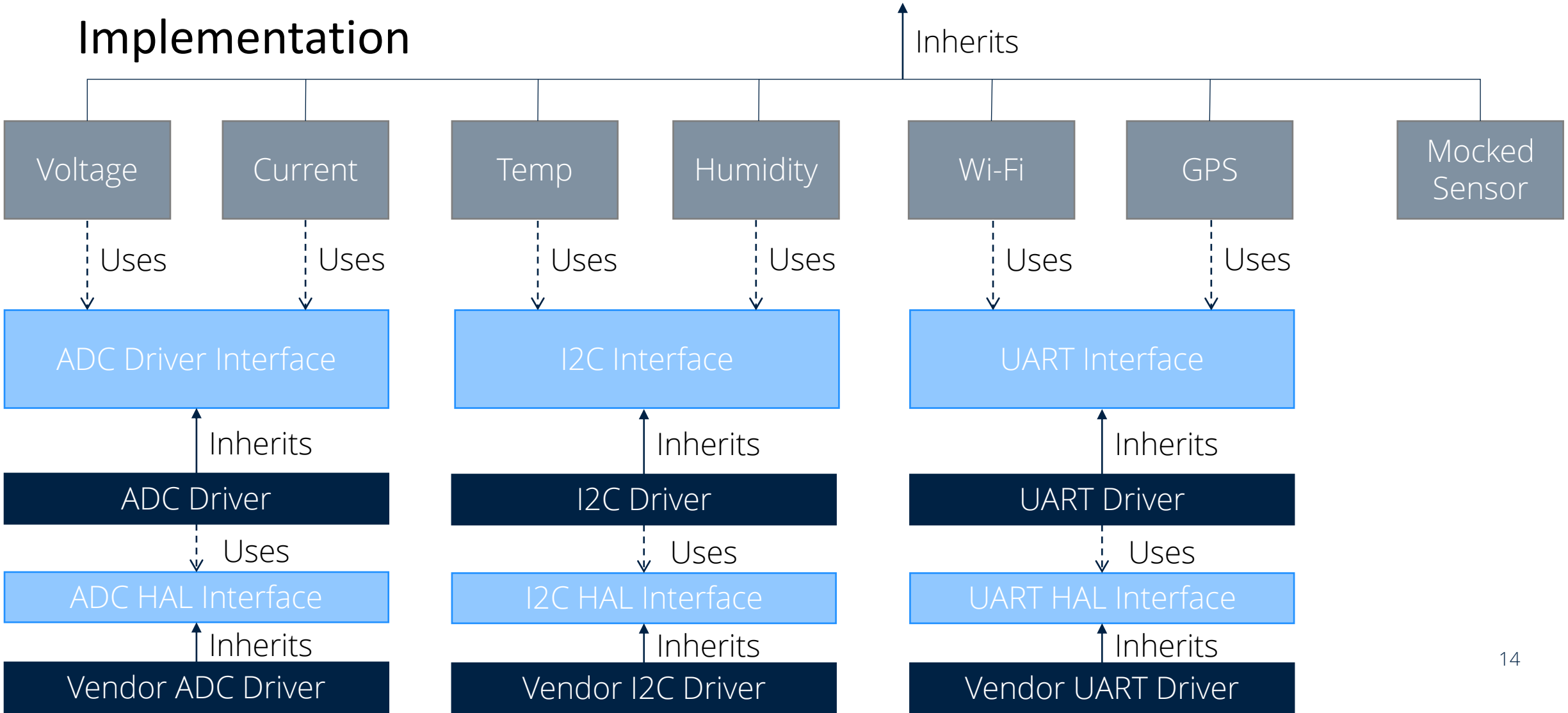
1) A pointer can be re-assigned while reference cannot and must be assigned at initialization only.
2) Pointer can be assigned NULL directly, whereas reference cannot.
3) Pointers can iterate over an array, we can use ++ to go to the next item that a pointer is pointing to.
4) A pointer is a variable that holds a memory address. A reference has the same memory address as the item it references.
5) A pointer to a class/struct uses '->'(arrow operator) to access its members whereas a reference uses a '.'(dot operator)
6) A pointer needs to be dereferenced with * to access the memory location it points to, whereas a reference can be used directly.

Source: https://www.geeksforgeeks.org/passing-by-pointer-vs-passing-by-reference-in-c/

Which should you use to pass the configuration, a pointer or a reference?

- Pointer
- Reference
- I don’t know

Implementation



How are you going to test these techniques out?

- On a development board
- Using a simulator
- In a test harness
- On a PC

Experimenting in a terminal

```
beningo@beningo-ESp32:~$ ./a.out
Initialize
Write
Read
beningo@beningo-ESp32:~$
```

```
class SensorInterface
{
    public:
        virtual void Init() = 0;
        virtual void Write() = 0;
        virtual void Read() = 0;
};
```

```
#include "sensorInterface.h"
#include <iostream>

using namespace std;

class Temperature: public SensorInterface {
    public:
        void Init();
        void Write();
        void Read();
};

void Temperature::Init() {
    cout << "Initialize\n";
}

void Temperature::Write() {
    cout << "Write\n";
}

void Temperature::Read() {
    cout << "Read\n";
}


main() {
    Temperature TempObj;

    TempObj.Init();
    TempObj.Write();
    TempObj.Read();
}
```

Thank you for attending

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  - Blog, White Papers, Courses
  - Embedded Bytes Newsletter
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