

Unit Introduction

B-00P-400



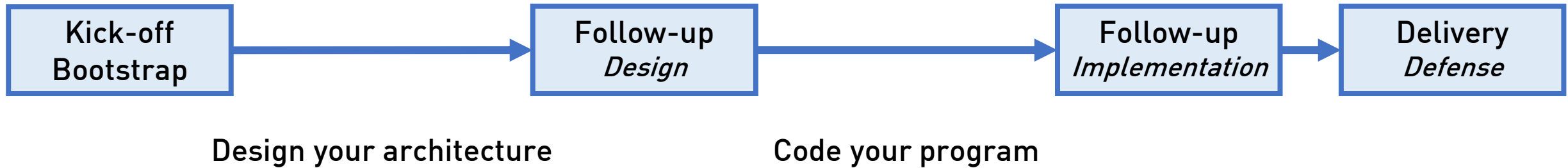
WHAT YOU KNOW

- 3 weeks C++ seminar
- Object-oriented concepts
 - Objects and classes
 - Inheritance
 - Interfaces
- C++ language features
- C++ library features

WHAT YOU DON'T KNOW

- 1+ month projects
- Object-oriented design
 - Abstractions
 - Polymorphism
 - Encapsulations
- More C++ language features
- More C++ library features

METHODOLOGY & ORGANISATION

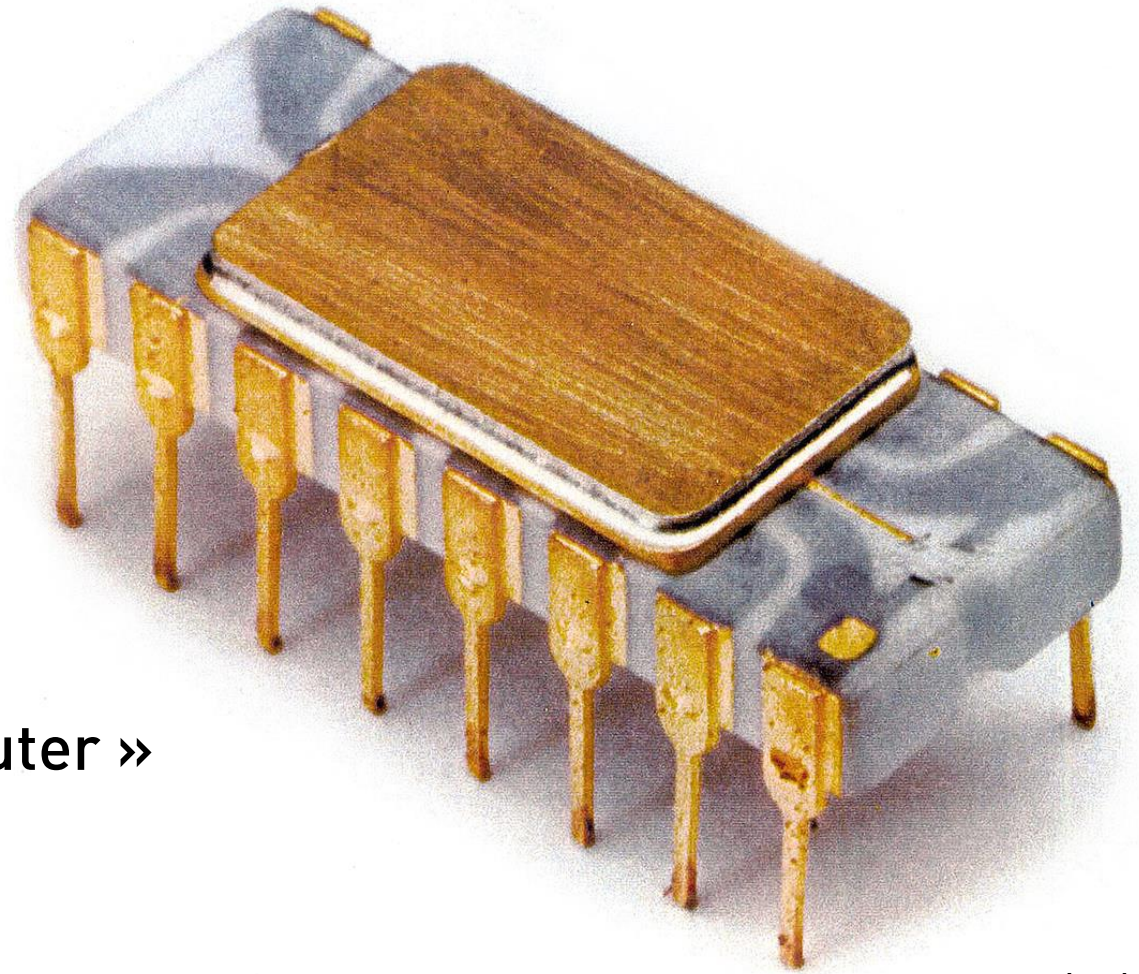


NANOTEKSPICE

Duration : 4 weeks

Group size : 1-2 students

Language : C++



« Using a computer to simulate a computer »

Intel 4004

ARCADE

Duration : 5 weeks
Group size : 2-3 students
Language : C++

« How to play to any game on any graphic environment »



NanoTekSpice

B-00P-400

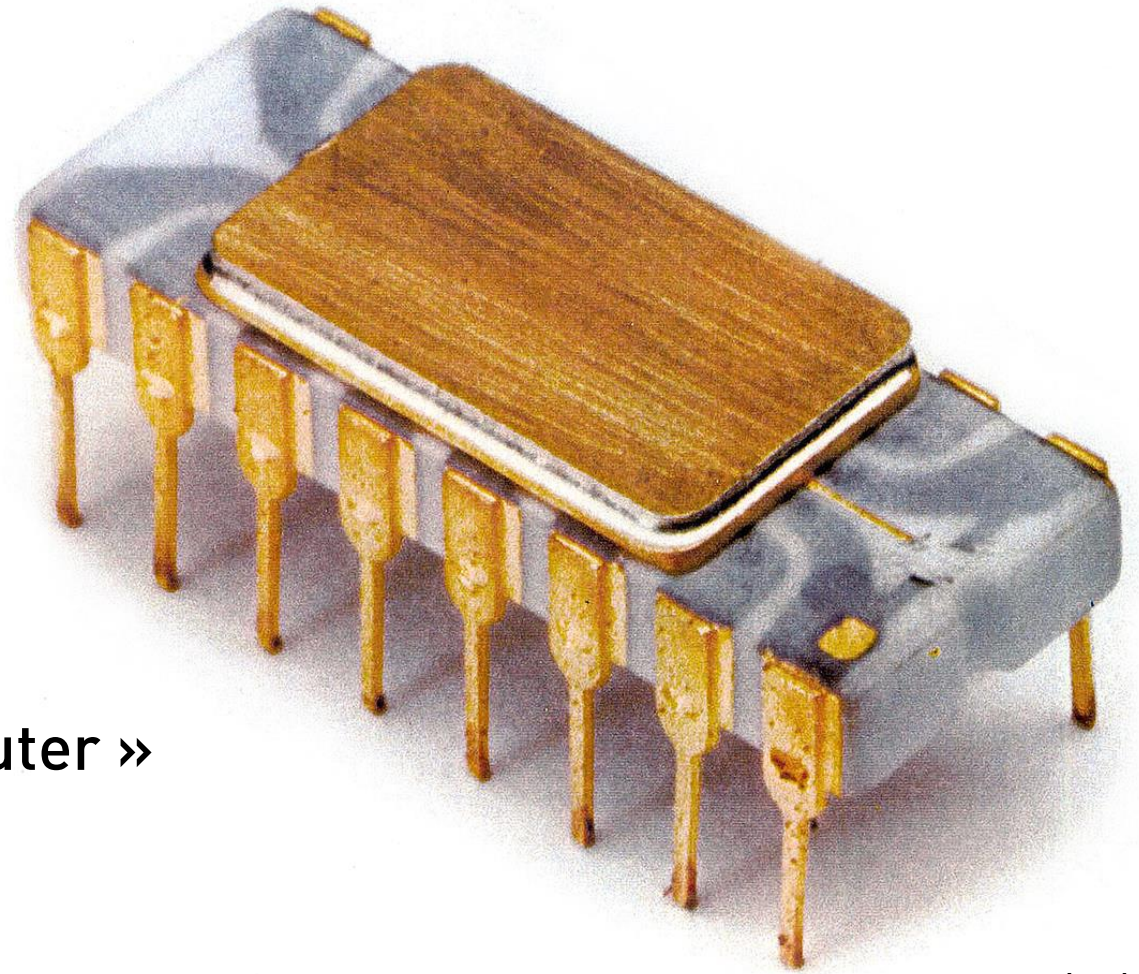
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NANOTEKSPICE

Duration : 4 weeks

Group size : 1-2 students

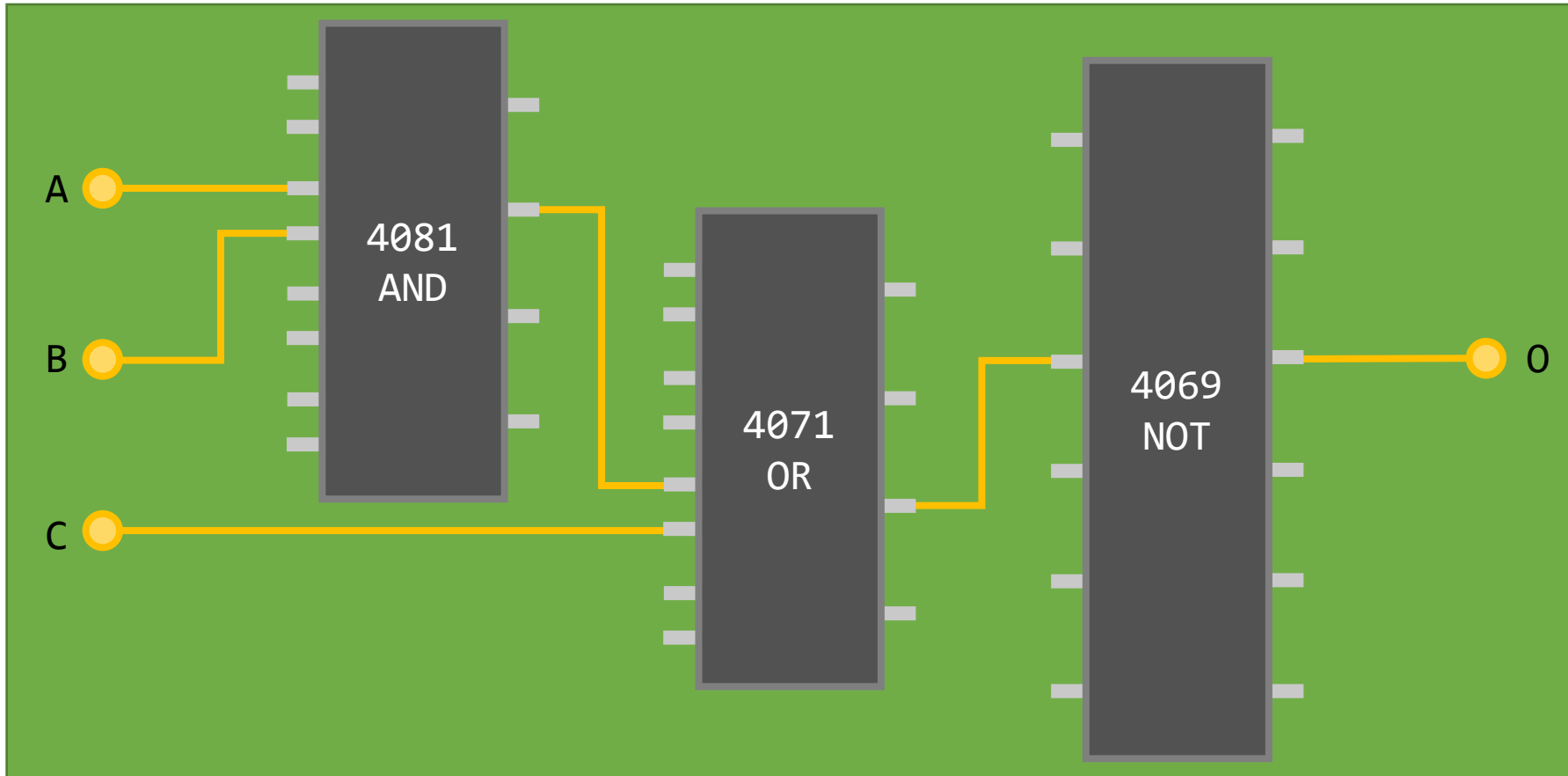
Language : C++



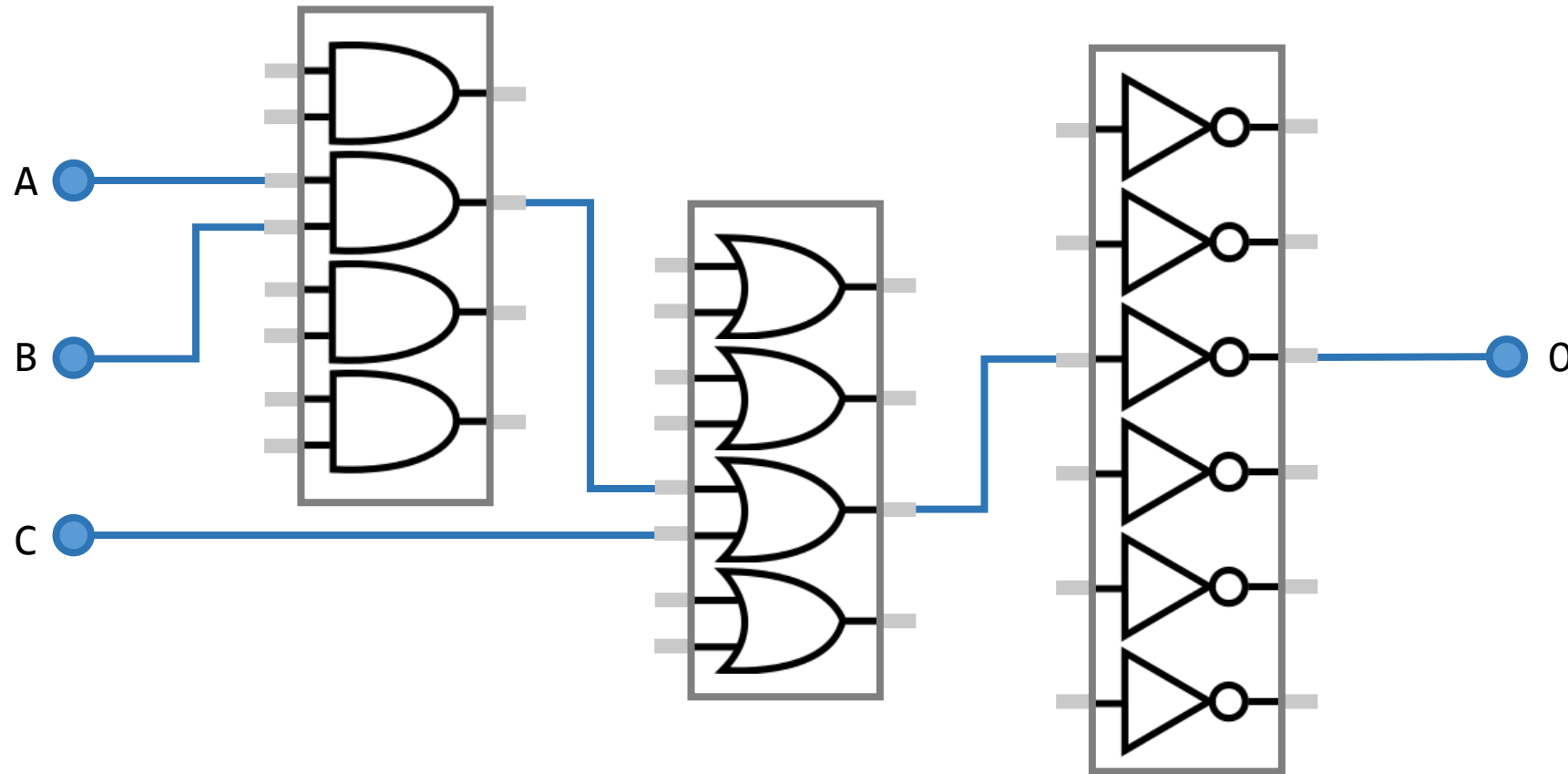
Intel 4004

« Using a computer to simulate a computer »

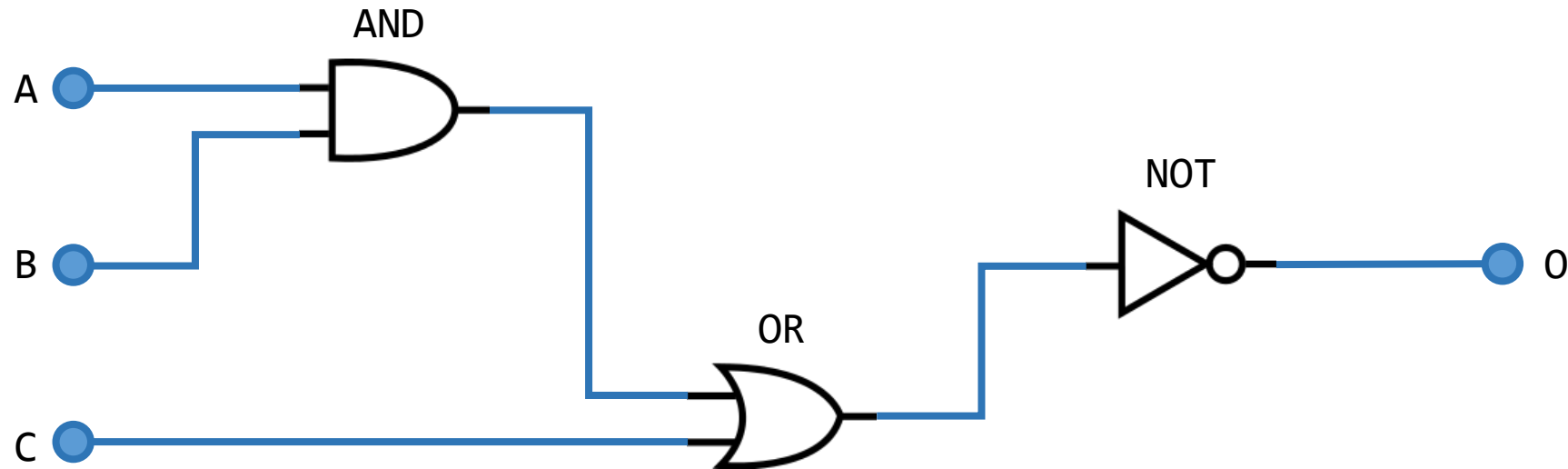
CIRCUIT EXAMPLE



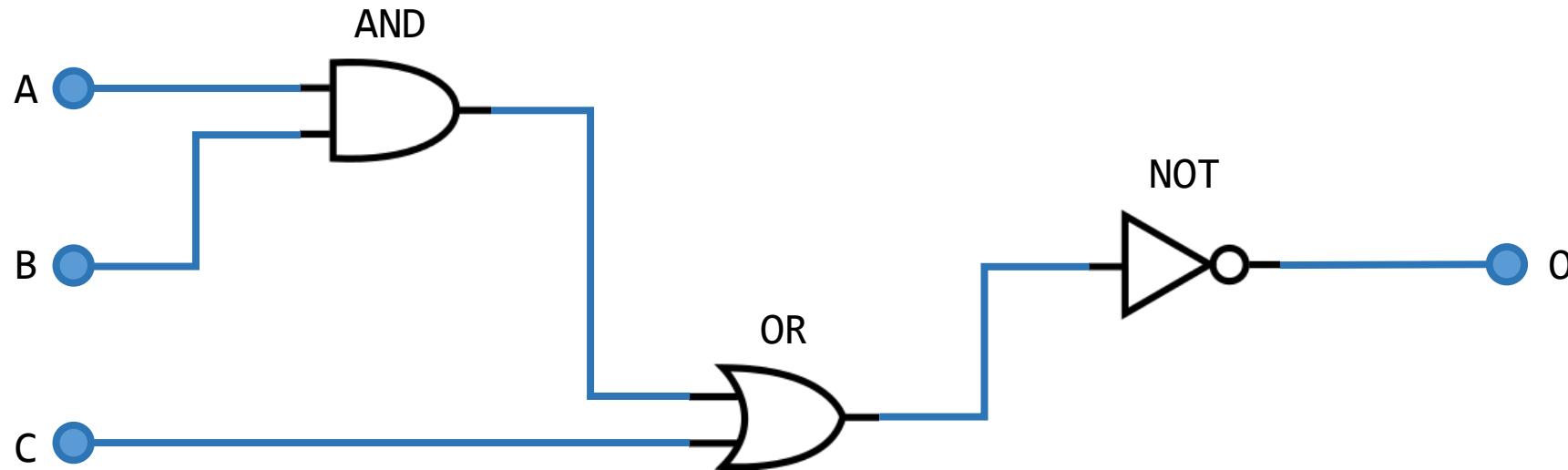
CIRCUIT EXEMPLE



CIRCUIT EXAMPLE

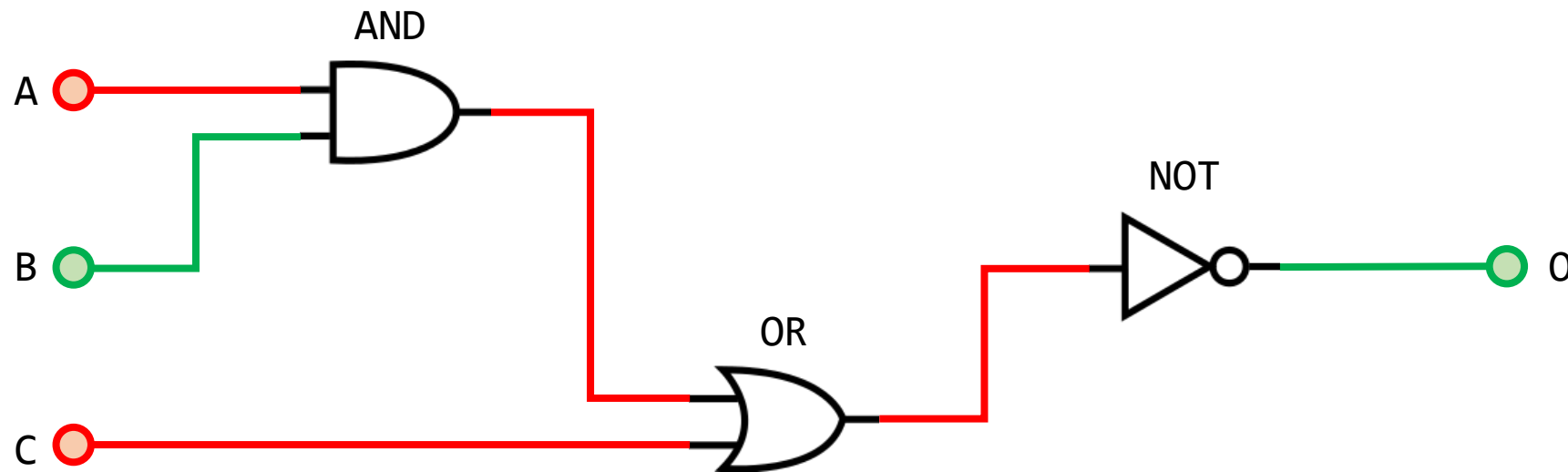


CIRCUIT EXAMPLE



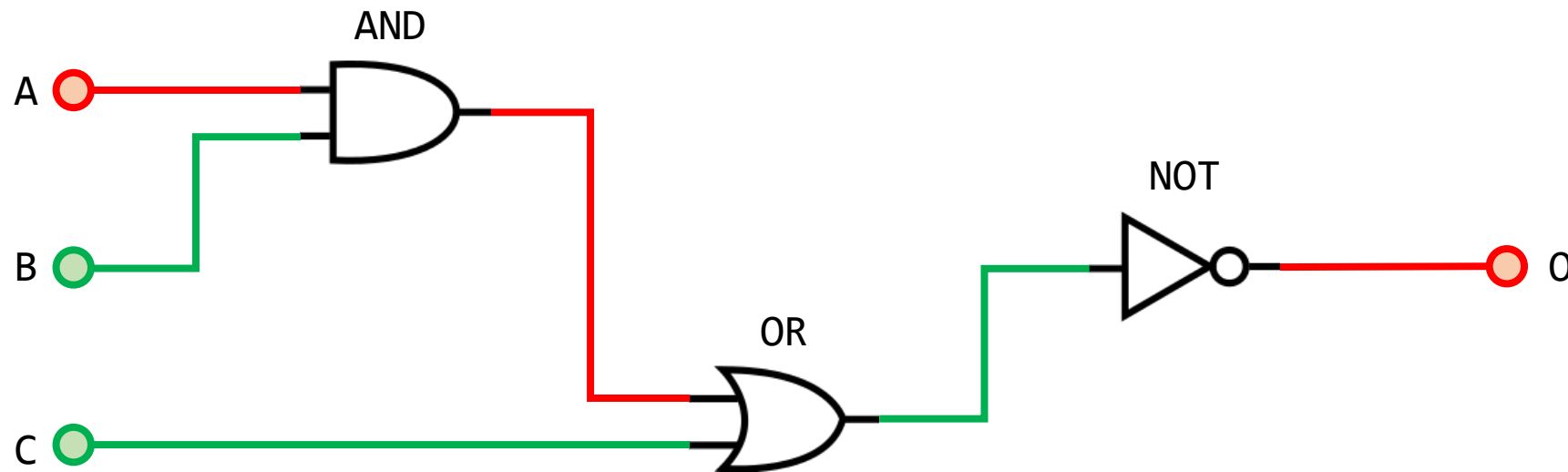
A	B	C	O
0	0	0	1
0	0	1	0
0	1	0	1
0	1	1	0
1	0	0	1
1	0	1	0
1	1	0	0
1	1	1	0

CIRCUIT EXAMPLE



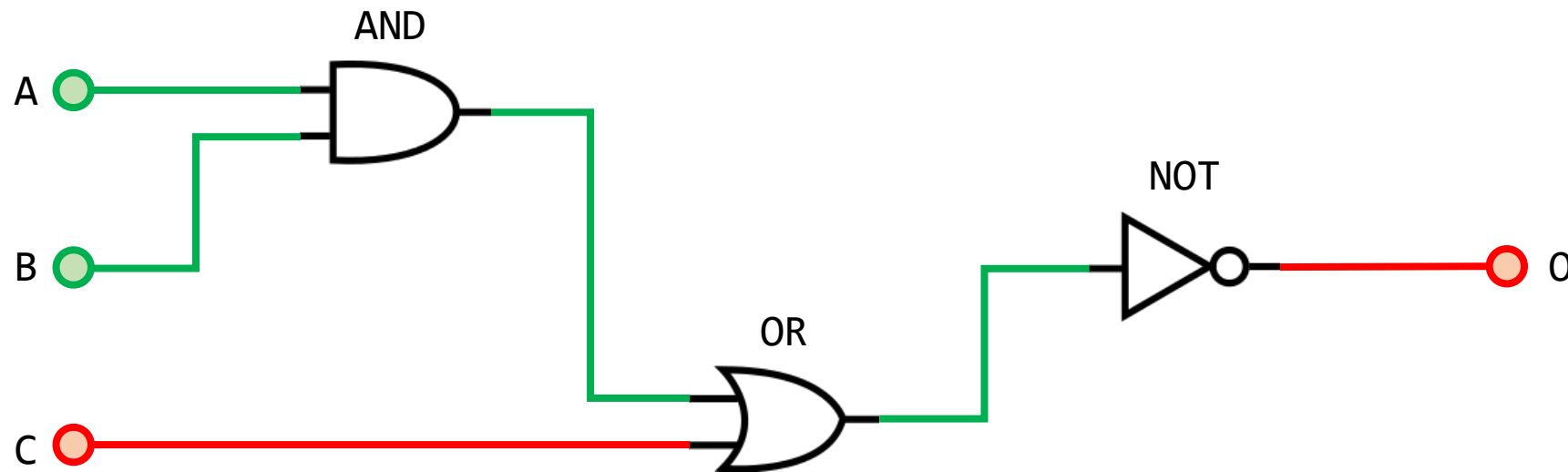
A	B	C	O
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0	0	1	0
0	1	0	1
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1	0	1	0
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CIRCUIT EXAMPLE



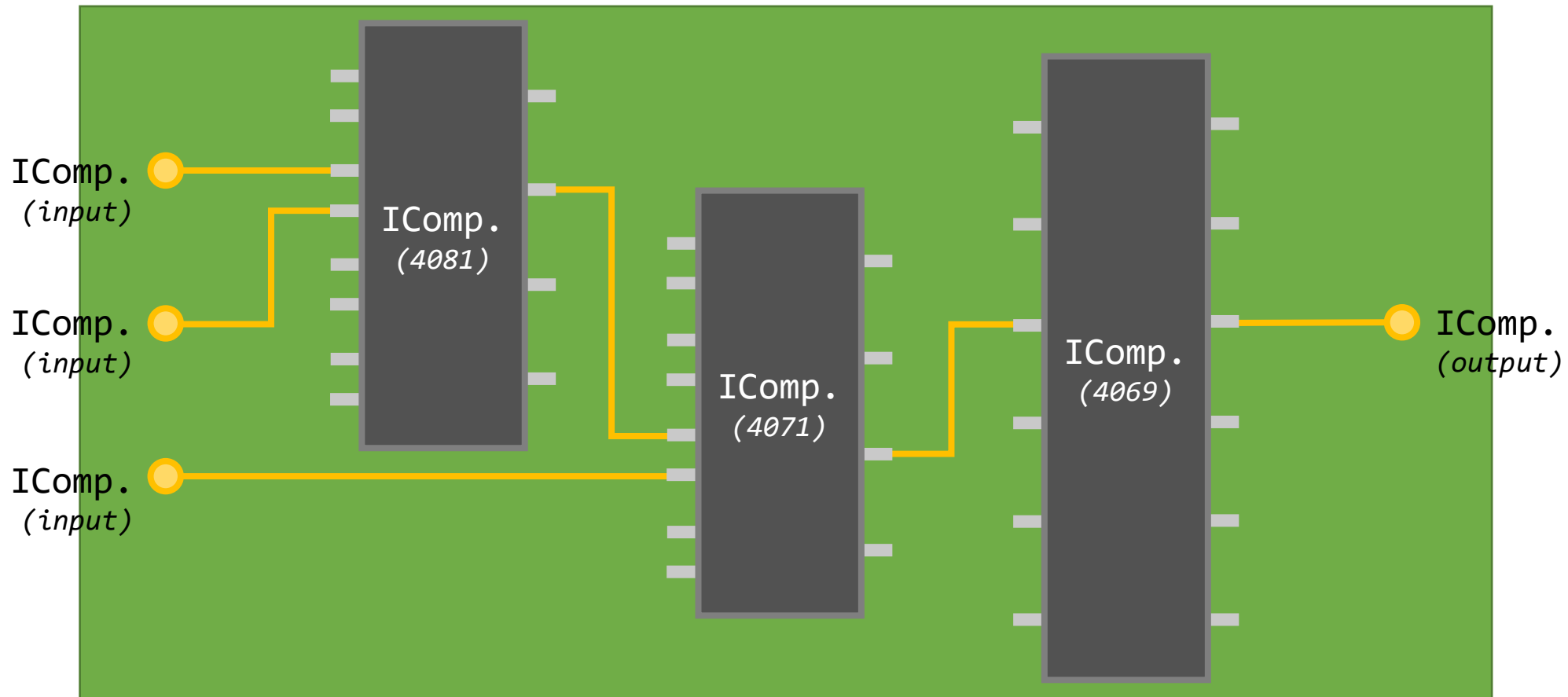
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0	1	0	1
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CIRCUIT EXAMPLE



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1	1	0	0
1	1	1	0

COMPONENT INTERFACE



COMPONENT INTERFACE

- A component interface must handle any component :
 - Is updated each tick
 - Can be requested the current value of an output pin
 - Can be linked to any other components
 - Does not contain information specific to a component
- Your program is agnostic :
 - Manipulates components through their interfaces
 - All components are used the same way
- Create a component factory :
 - During parsing, translate a component name to a component object
 - See factory **design pattern**
 - std::unique_ptr<IComponent> createComponent(const std::string& type);

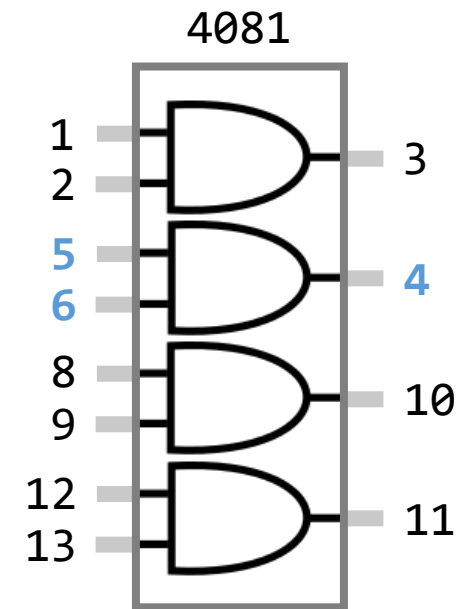
COMPONENT INTERFACE

```
namespace nts
{
    class IComponent
    {
    public:
        virtual ~IComponent() = default;

        virtual void          simulate(std::size_t tick) = 0;
        virtual nts::Tristate compute(std::size_t pin) = 0;
        virtual void          setLink(std::size_t pin, nts::IComponent& other,
                                     std::size_t otherPin) = 0;
        virtual void          dump() const = 0;
    };
}
```


COMPONENT EXAMPLE : 4081 AND Gates

- **simulate :**
 - Does nothing, no information held in component
- **compute :**
 - Return logical state of a pin
 - Example : when computing pin 4, recursively compute components pins linked to pins 5 and 6
- **setLink :**
 - Create a link between two components pins
 - A component can be linked to itself
 - A link works both ways



COMPONENT EXAMPLE : input

- `simulate` :
 - Hold two states : current and next
 - Assign held value to pin 1
- `compute` :
 - Return value assign to pin 1
 - Defaulted to U (undefined)
- `setLink` :
 - Create a link between two components pins
 - A component can be linked to itself
 - A link works both ways

input 

```
./nanotekspice ...  
// input is U  
> input=1  
// input is U  
> simulate  
// input is 1
```

The background is an abstract composition of sharp, angular, and overlapping blue shapes, creating a sense of depth and movement. The colors range from deep navy blue to lighter, almost white highlights where the shapes intersect.

QUESTIONS ?

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