



# Tutorial 1 - Return to C++

## Introduction to the NanoTekSpice project

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*Abstract:* *NanoTekSpice is a digital electronic simulator made with a graph. These exercices show you leads to explore, to do your project.*

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# Chapter I

# Electronic Simulator

NanoTekSpice being a digital electronic simulator with a graph, the first thing to do is to discover what is digital electronic...

The website http://logic.ly/demo/ is an online digital electronic simulator. It allows you to put components on display, to add links and to simulate. The project you will make is pretty close to this, with additionnal and real components.

Digital Electronic features three states: true, false and undefined. On logic.ly, true makes the wire blue, undefined grey and false white.

Undefined is a state which happened to be everywhere when you initialize a circuit. Input states may make undefined states disappeir if the logic of the circuit allows it.

It works the same way as C variables. Here are a few examples:

```
1  bool a = 1;
2  bool b;
3  bool c;
4
5  c = a && b;
6  // c is undefined because b is undefined and
7  // a is true, so the result of c depends only of b.
8
9  bool a = 0;
10 bool b;
11 bool c;
12
13 c = a && b;
14 // c is false, because false AND anything is always false.
15
16 bool a = 1;
17 bool b;
18 bool c;
19
20 c = a || b;
21 // c is true because 1 OR anything is always true.
22
```

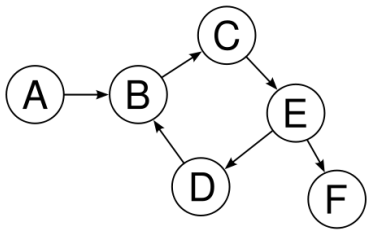
```
23 bool a = 0;
24 bool b;
25 bool c;
26
27 c = a || b;
28 // c is undefined because b is undefined and
29 // a is false, so the resultat of c depends only of b
```

# Chapter II

# Create a graph

A graph is a data structure that imply nodes being linked without any kind of specific shape.

- A tree implies a structure: there is always a root node with children, children are also roots to other children...
- A linked list implies a strucutre: there is one node, linked to another which can be linked again.




A graph only implies that there is links between nodes. Because of this, a tree is a graph and a linked list is also a graph.

A graph can be oriented or not. If it is, it means that links are not reversible by default. For example, if A is linked to B, it does not mean that B is linked to A.

In a graph, a node can also be linked to itself.

- Declare and implement the class `Component` that respects the following criteria:
  - It represents a component with inputs and outputs. It may contains states.
  - It can be built with a value and can have inner states.
  - It can be executed and return a result.
  - I can be linked to other Components.
- Declare and implement the class `Circuit`. This class must manipulate `Component` and must possess these characteristics:
  - You can add and remove components inside the graph.
  - You can launch a simulation.
  - You can manipulate a circuit as a Component.
- Declare and implement the class `Parser`. This class must manipulate `Circuit` and must possess these characteristics:
  - Parser takes a file path as parameter and a circuit to fill.
  - Parser must throw exceptions on error with a correct type.

`Having to build a graph does not means that it must be exclusive. Do not hesitate to use other kind of containers aside if it can makes your development easier.`

# Chapter III

# Conclusion

We wish that you enjoyed this topic, that ourselves we enjoyed writing for you.

Your feedbacks are very important to us and they allow to improve our course material. This is why we have high expectations from your feedbacks.

If you think that some points of this document are obscures, or if some explanations are not clear enough, or if you find some spelling mistakes please mention it. You just need to send an email to: koala@epitech.eu.


If you want to go beyond this C++ tutorial, we recommend the book: "Effective C++"


If you have doubt on the syntax, we recommend the book: "The C++ Programming Language"


There are also many c++ books that you can borrow at the Koalab. Feel free to stop by and ask question to the Koalas. They are always delighted to help people.