Testing of the FELIX readout system

Two weeks around hardware and software!

Neutrino Platform

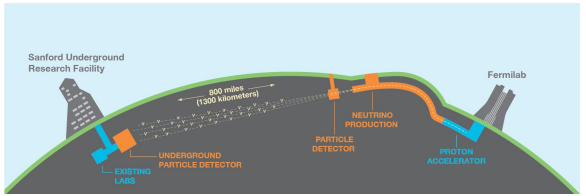
The CERN Neutrino Platform is CERN’s main contribution to a globally coordinated programme of neutrino research.

It includes the provision of a facility at CERN to allow the global community of neutrino experts to develop and prototype the next generation of neutrino detectors.

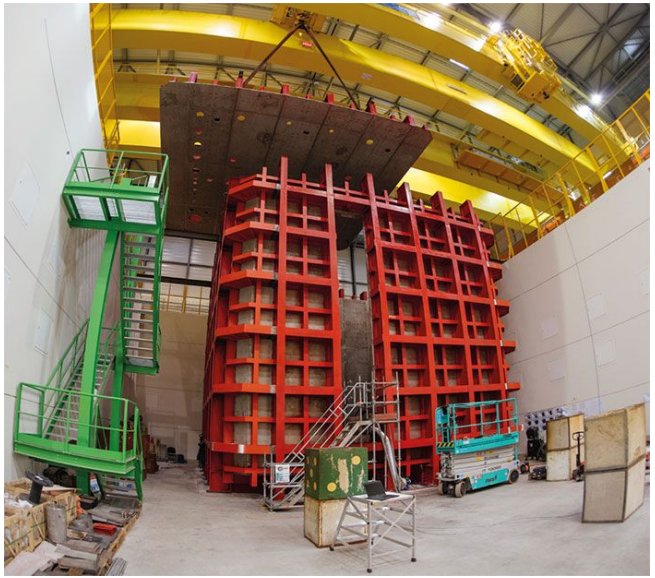
ProtoDUNE-SP

- One of the prototype detectors of the DUNE experiment. (The other one is the dual-phase TPC.)
- Located in the Neutrino Platform in Prevessin,

The prototype designed to test and validate the technologies and design that will be applied to the construction of the DUNE Far Detector.



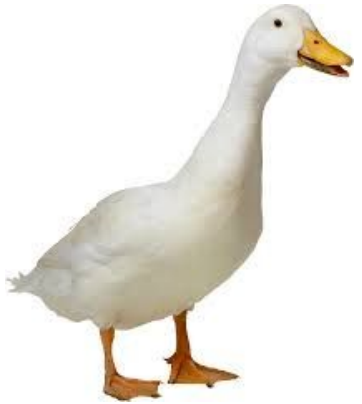
DEEP UNDERGROUND NEUTRINO EXPERIMENT



DAQ 1.

A **data acquisition system (DAQ)** is an information system that:

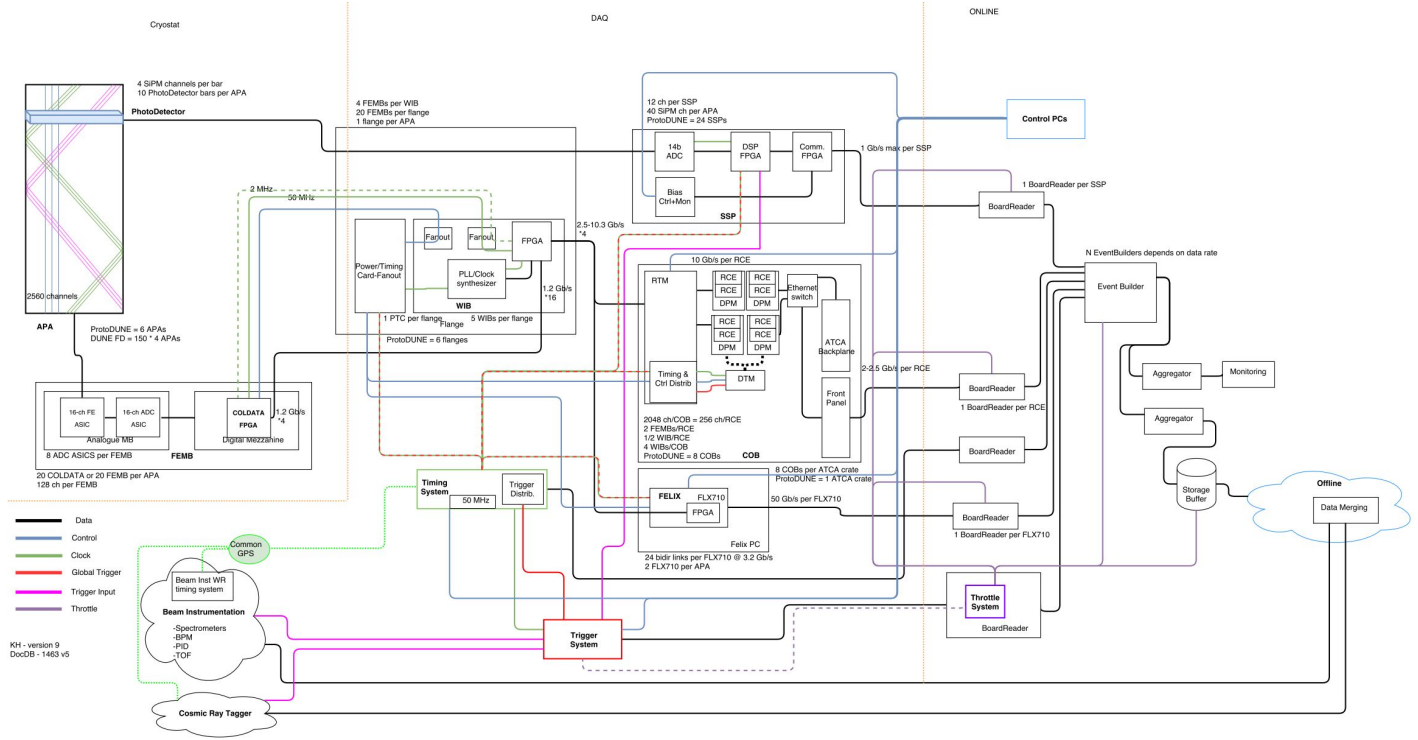
- collects,
- stores
- and distributes information.



It is used in industrial and commercial electronics, and environmental and scientific equipment to capture electrical signals or environmental conditions on a computer device.

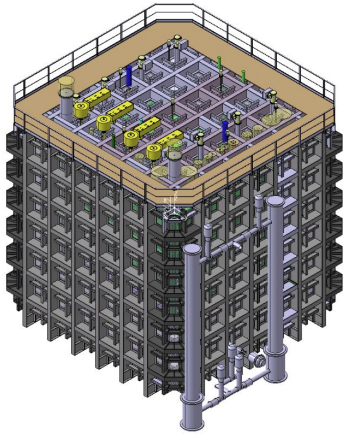
DAQ 2.

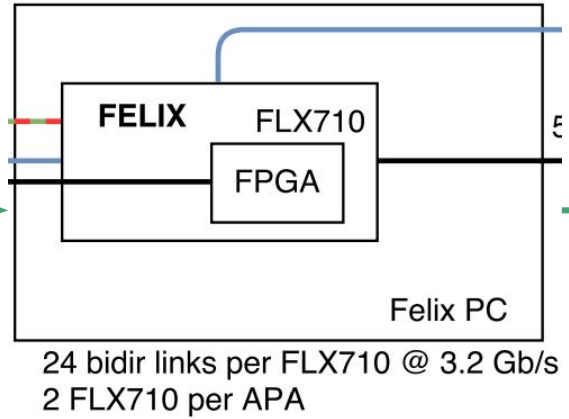
The first shock when we arrived:



DAQ 3.

We worked on the testing of the FELIX readout system, that is the bridge between the front-end electronics and the computing farm.

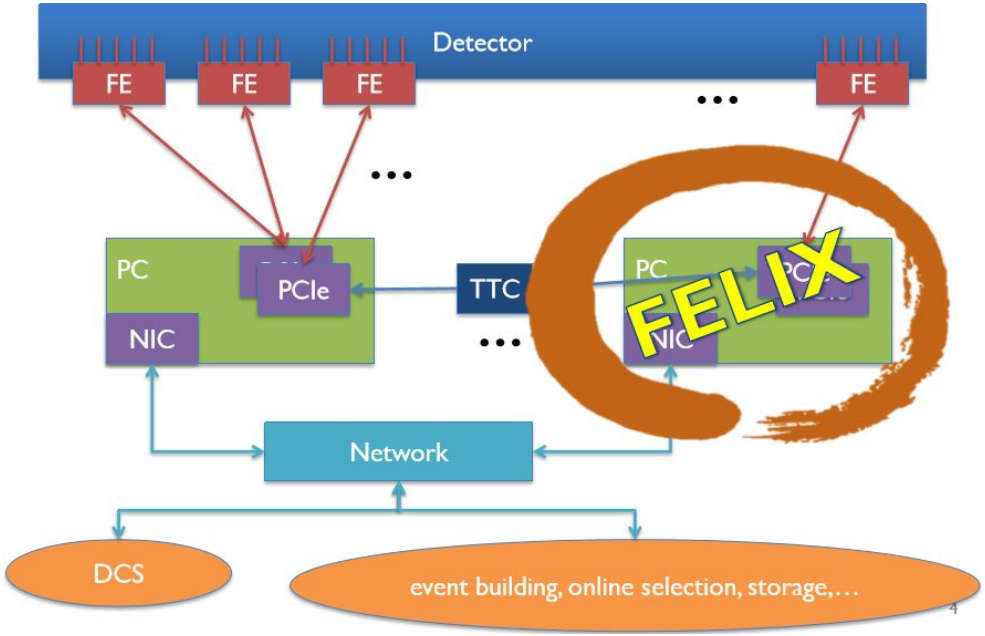




FELIX 1.

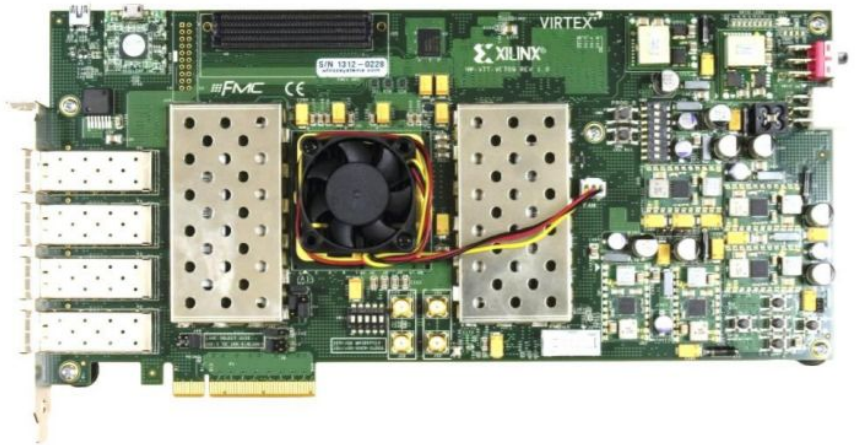
High-throughput network approach for interfacing to front end electronics for ATLAS upgrades.

- ProtoDUNE-SP proposing it to be used in the DAQ system.
- Collects data on optical links and propagate it to commodity, off the shelf (COTs) hardware and software solutions.



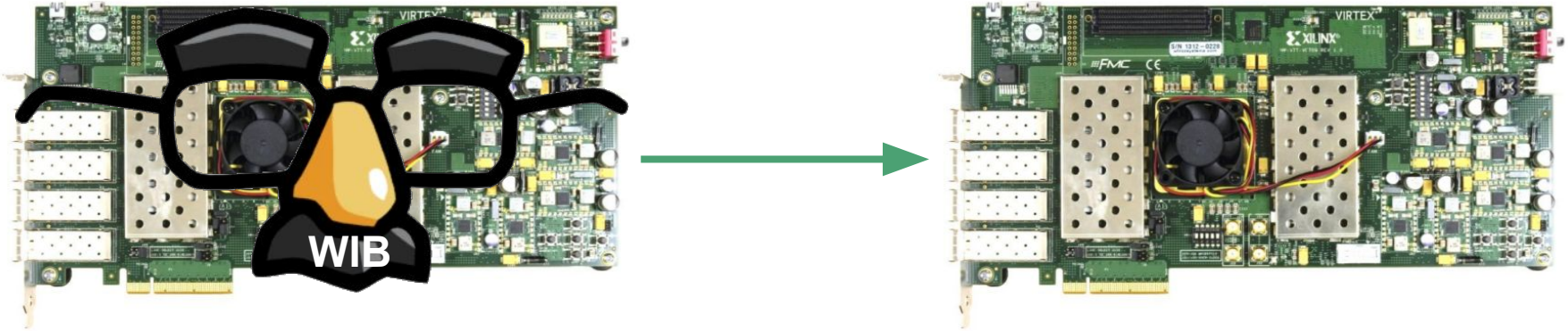
FELIX 2.

The FELIX cards we used were FPGA development boards, having optical links. Some boards called WIBs (Warm Interface Boards) are used to propagate the data from the cold electronics (FEMBs) to the FELIX.



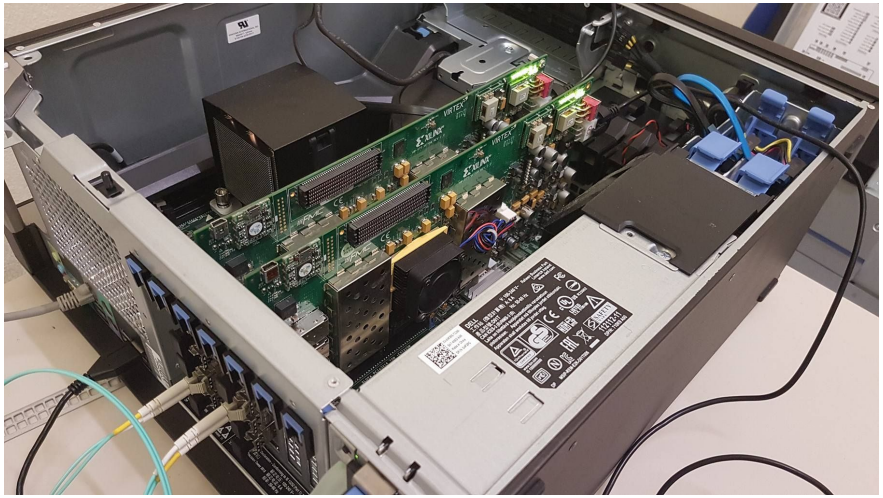
FELIX 3. - The test!

Our aim was to use one of the card to emulate a WIB and transmit data (in the WIB frame format that protoDUNE-SP uses), to the receiver card.



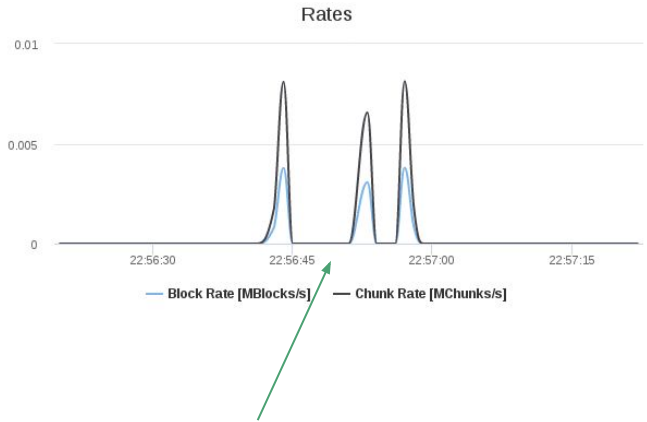
FELIX 4.

We want to ensure that sent data is received, and we receive it with the other card.

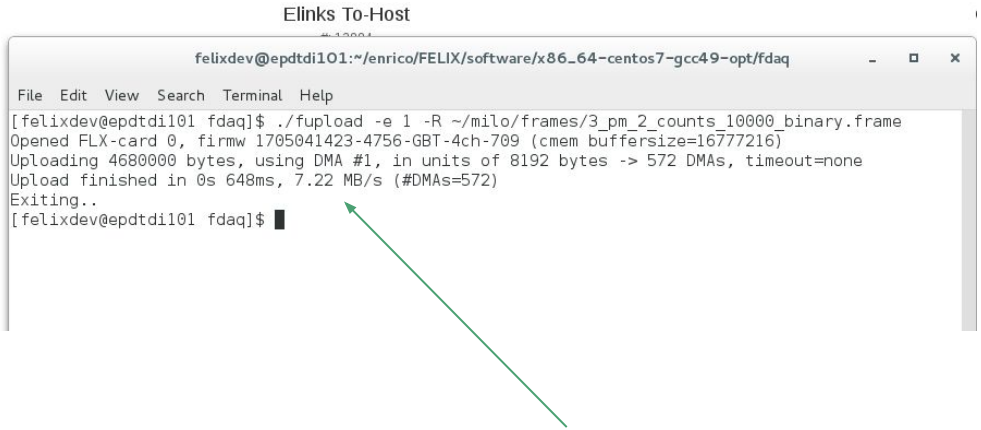


FELIX 5.

Uploading 3 times ~4MByte of WIB frames to Card-0, and then received by Card-1.



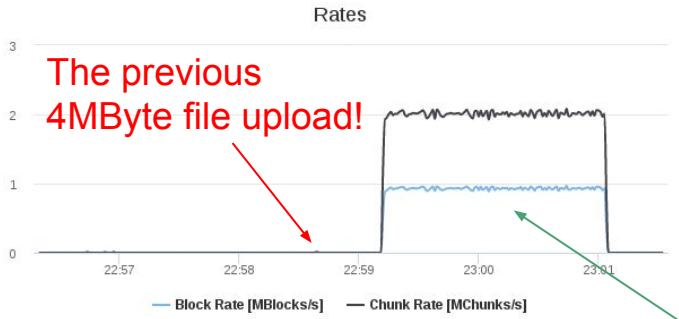
Received data on Card-1. 3x4MByte.

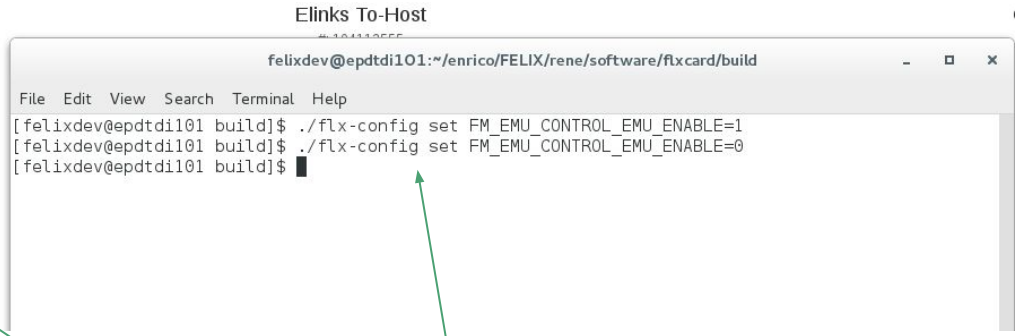


Upload to Card-0, then sent on GBT link.

FELIX 6.

Setting Card-0 to emulation mode, it transmits 1 Gb/s!





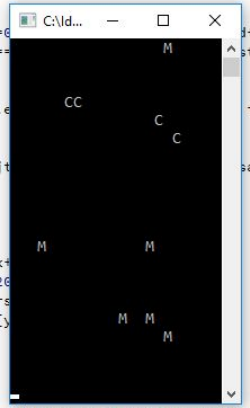
Switching data emulator on and off on Card-0.

Introduction to C++

C++ is very popular among programming languages.

The best way to learn a programming language is to understand basic concepts and practice coding!

```
92      while(true){
93          neo=alszok(neo);
94          sorszam[neo.first][neo.second]="M";
95          for(size_t i=0;i<egerhalmaz.size();i++){
96              sorszam[egerhalmaz[i].coord.first][egerhalmaz[i].coord.second]="M";
97          }
98
99
100         for(size_t ind=0                                    i++){
101           if(neo.first==                                    st && neo.second==sajthalmaz[ind].coord.second){
102
103
104             sajthalmaz.e                                     ind);
105           } else {
106
107             sorszam[sajt                                    sajthalmaz[ind].coord.second]="C";
108           }
109         }
110
111
112     for(int x=0;x<20; x+
113         for(int y=0;y<20
114             cout << sors
115             sorszam[x][y
116
117         }
118         cout << endl;
119     }
120     this_thread::sleep_for(chrono::milliseconds(40));
121     system("cls");
122     }
123     return 0;
124 }
```



We learned about variable types, made our own classes and understood the concept of inheritance!

We made a program where mice are running around in a 20x20 matrix and try to eat some cheese.

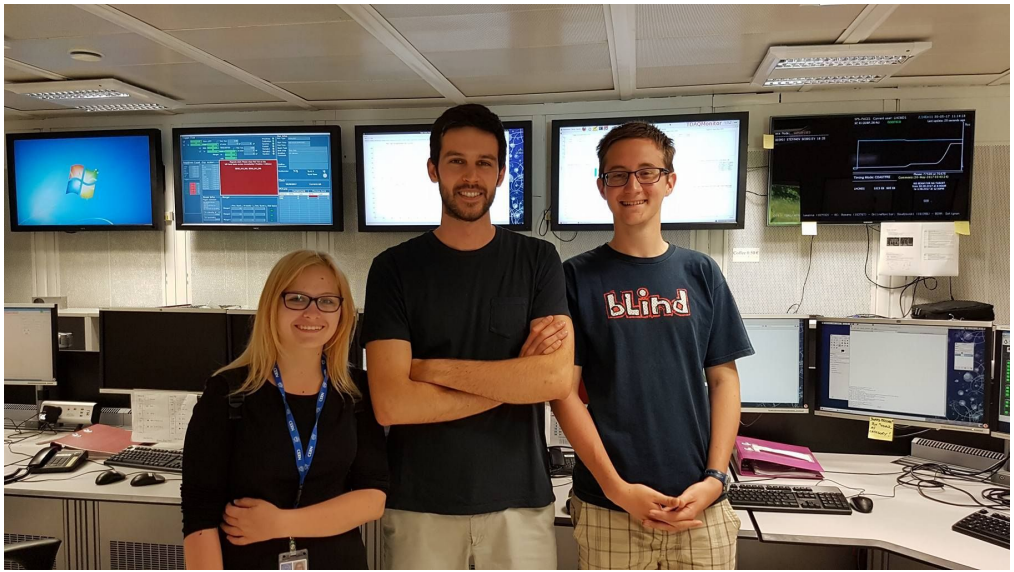
Visit to the Neutrino Platform

We had a look at the freshly installed racks!

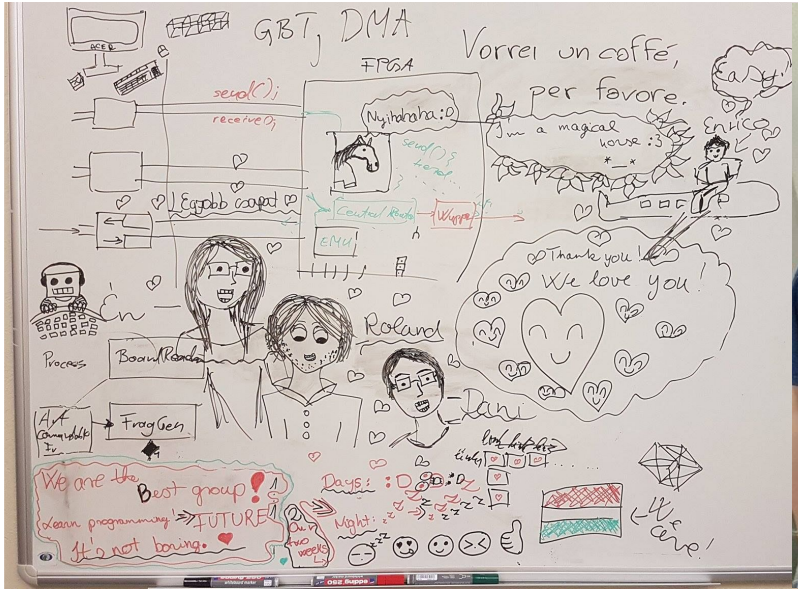
NA62

The experiment is designed to conduct precision tests of the Standard Model by studying rare decays of charged kaons.

During the visit we were setting up a logging facility for the DAQ computer farm.



Thank you for your attention!



We love croissant: