

Introduction to LabVIEW and Implementation of ISA Architecture

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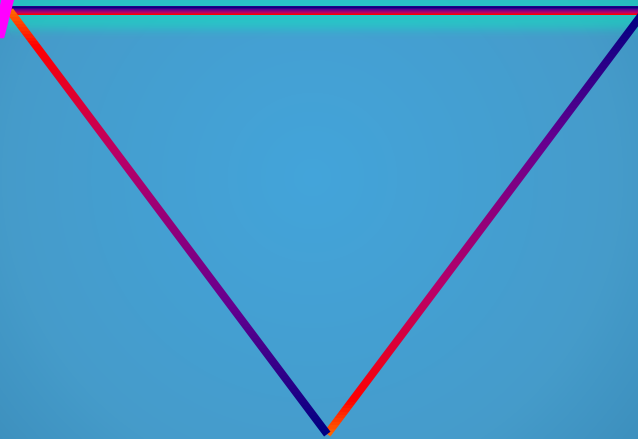
June 30, 2013



Introduction to LabVIEW and Implementation of ISA Architecture A new Challenge

LabVIEW

iLabs Shared
Architecture



ICEER 2013
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Challenge:

**Euronet Lab e-learning and
Online Labs Network for African Universities**

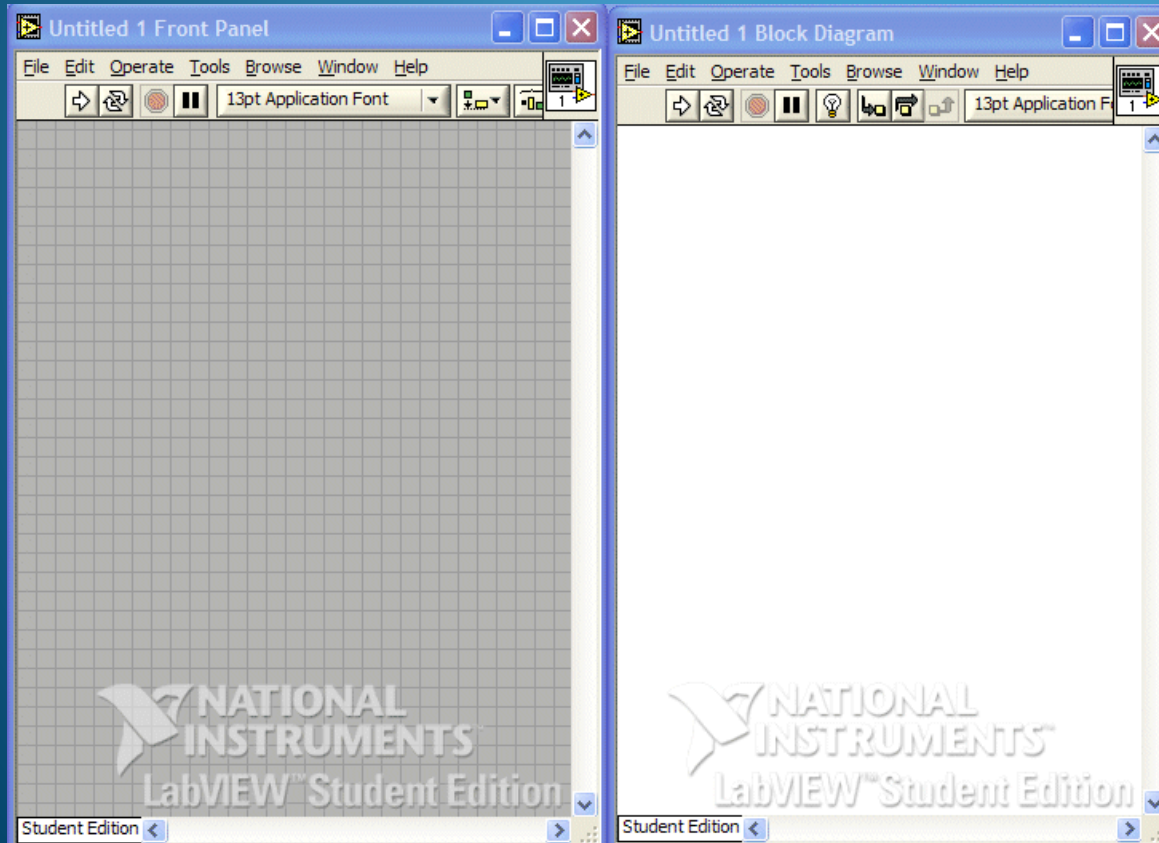
What is LabVIEW (1)?

LabVIEW is an analysis software, data acquisition and processing in real time, adding several functions in a single "package":

- Implementation of programming structures in a graphical environment (If, while, case, etc ...)
- Statistical treatment of data
- Interaction with other programs, namely:
 - Output in HTML
 - Output Reports in EXCEL
 - NI Multisim
- Simulation of electronic circuits
- Simulation of mathematical functions (type Matlab)
- Acquisition and signal processing in real time, by linking the physical hardware circuits outside the PC

Work environment in LabVIEW

VI - Virtual Instrument:



Is the typical file work in LabVIEW and has 2 windows:

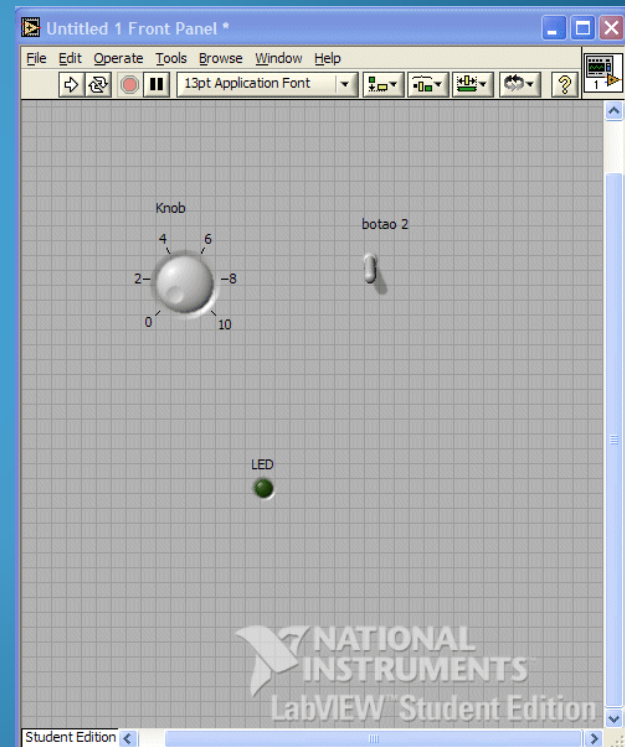
- The Front Panel (Front Panel)
- The Block Diagram (Block Diagram)

Work environment in LabVIEW

Front Panel and Block diagram

VI - means literally Virtual Instrument and lets you create measurement instruments and signal analysis systems

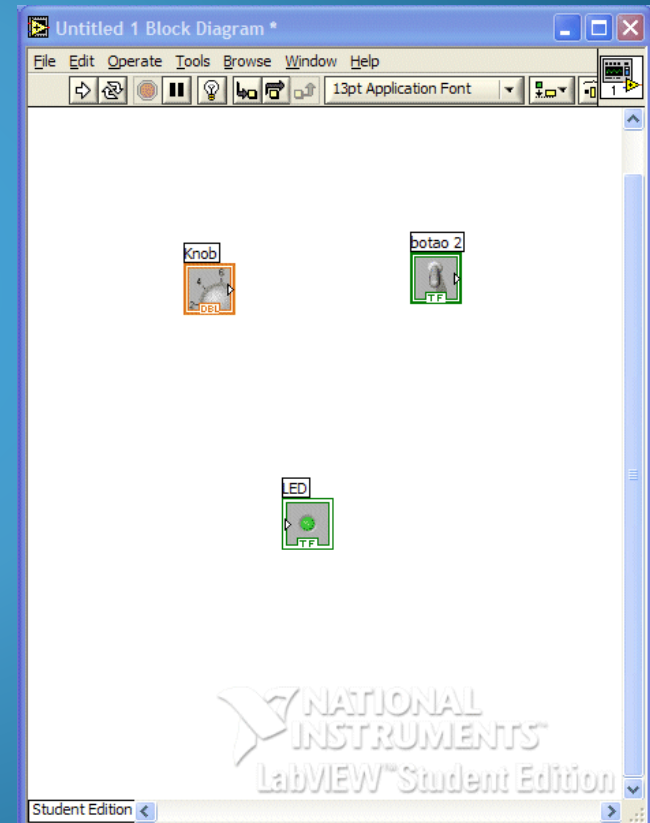
Any measuring instrument has a front panel where are the buttons and commands that we must handle to operate the device



Work environment in LabVIEW

Front Panel and Block diagram

In the "Block Diagram", appears the corresponding objects placed on the "Front Panel", and is logical connections.

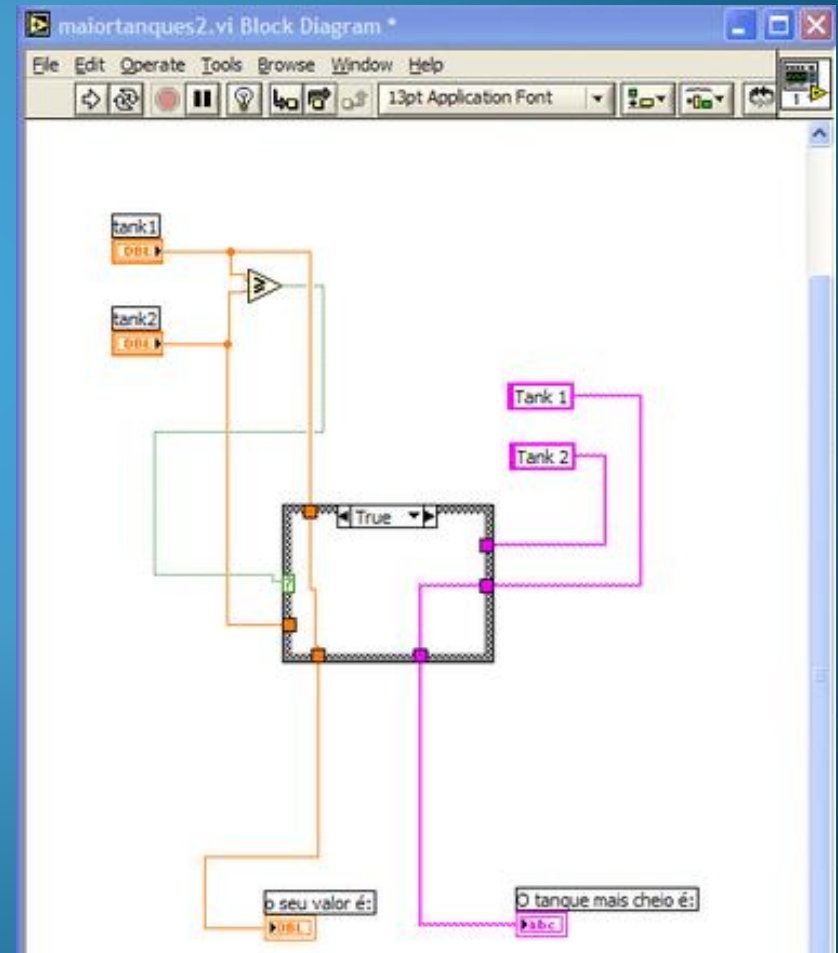


Work environment in LabVIEW

LabVIEW G - Language

The G-Language is the language used in LabVIEW to construct all the algorithmic structures.

This is an example of an IF structure

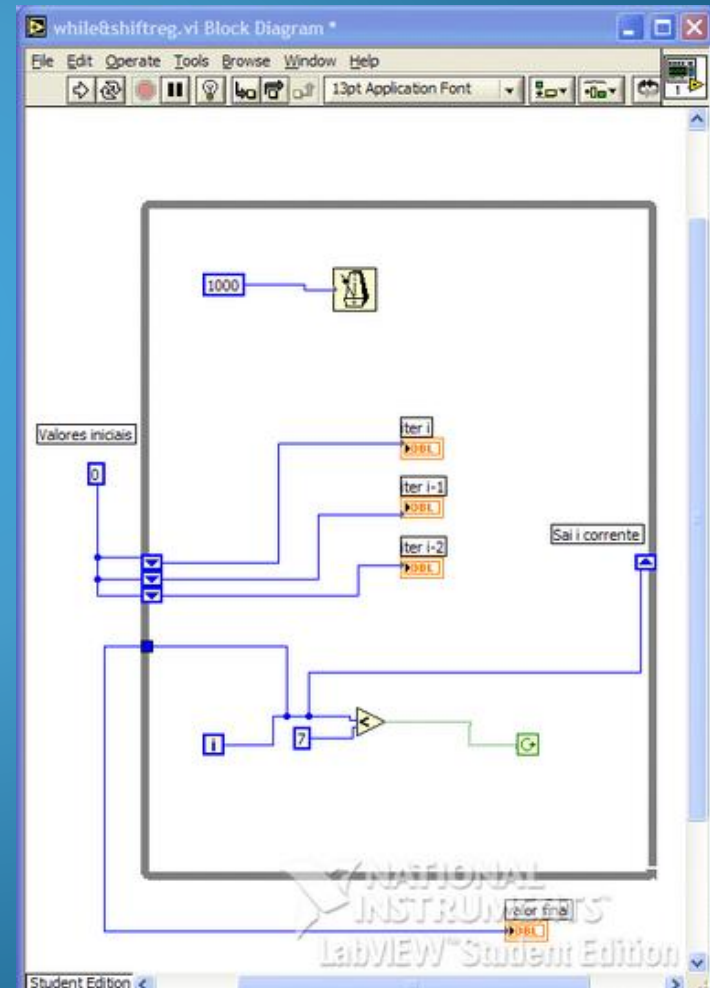


Work environment in LabVIEW

LabVIEW G - Language

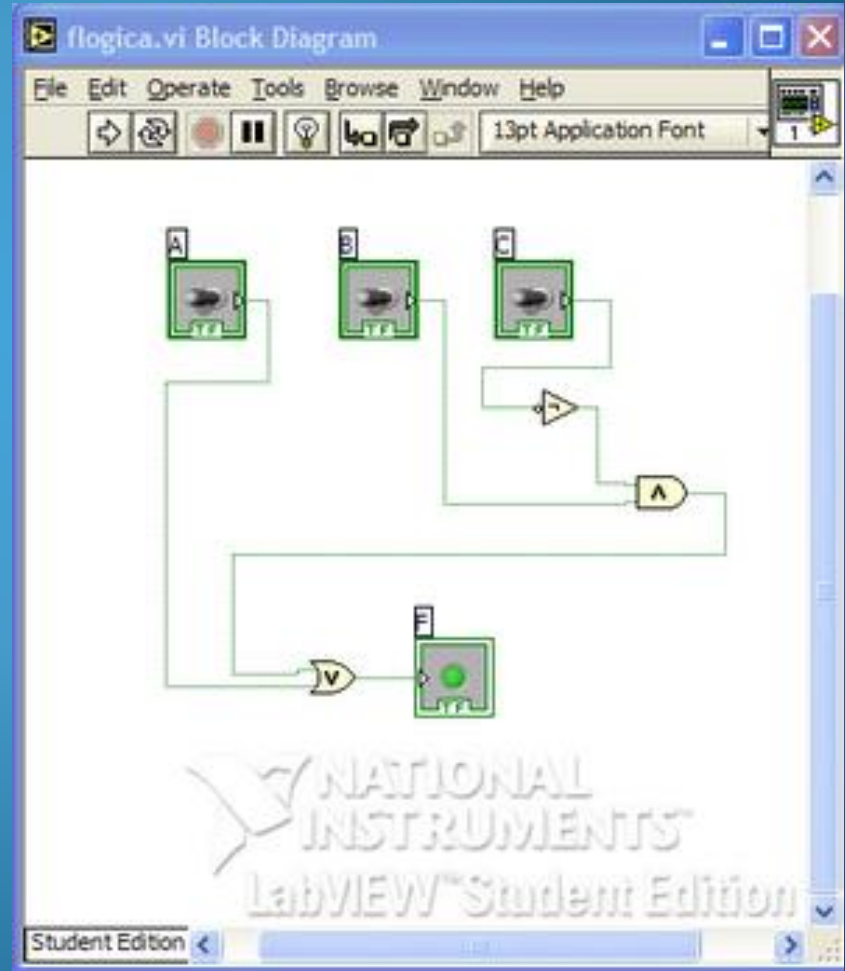
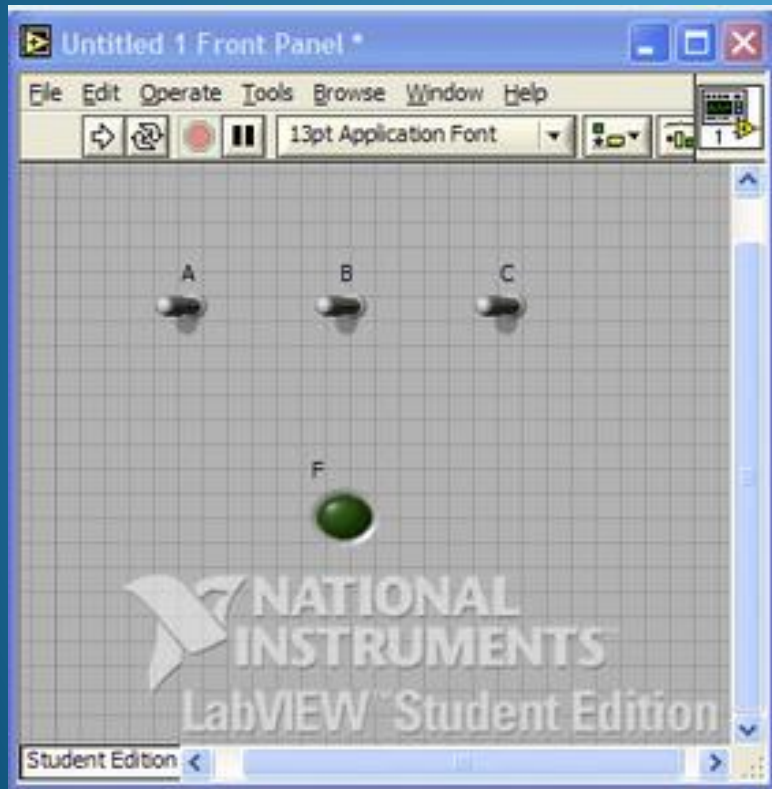
The G-Language is the language used in LabVIEW to construct all the algorithmic structures.

This is an example of a WHILE structure



Work environment in LabVIEW

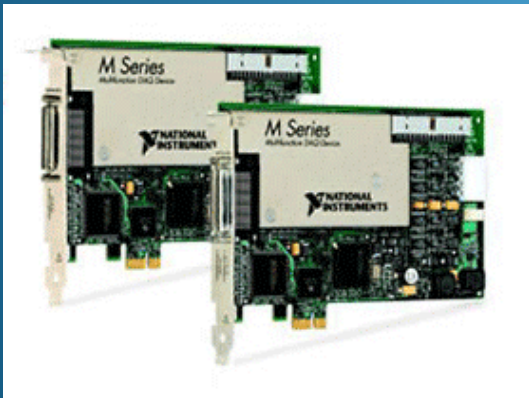
LabVIEW Circuit Simulation



Work environment in LabVIEW

LabVIEW Data Acquisition

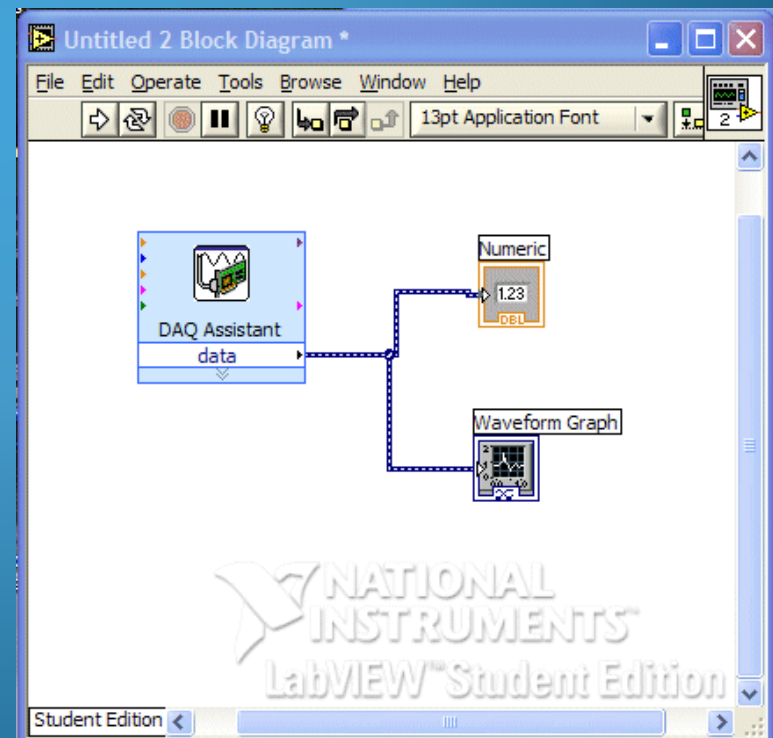
The data acquisition with LabVIEW is through interfaces on PCI Bus, or more recently via USB or network devices. This is how the information is acquired in "field" and then may be processed by the data processing system and internal LabVIEW and eventually sent to the "field" or hardware circuit.



Work environment in LabVIEW

LabVIEW Data Acquisition

The data acquisition with Labview using USB devices is done by simple and friendly programmable devices like DAQ – Data Acquisition Assistant.



iLabs Shared Architecture Overview

“The iLab Shared Architecture (ISA) is a web services based software framework that aims at providing access to online laboratories assuming that they share some characteristics.”

The iLab Shared Architecture (ISA) distinguishes the tasks of :

- using a specific lab that comprises an experiment
- managing users' accounts,
- user authentication
- other tasks that follow a lab session.

iLabs Shared Architecture

Advantages

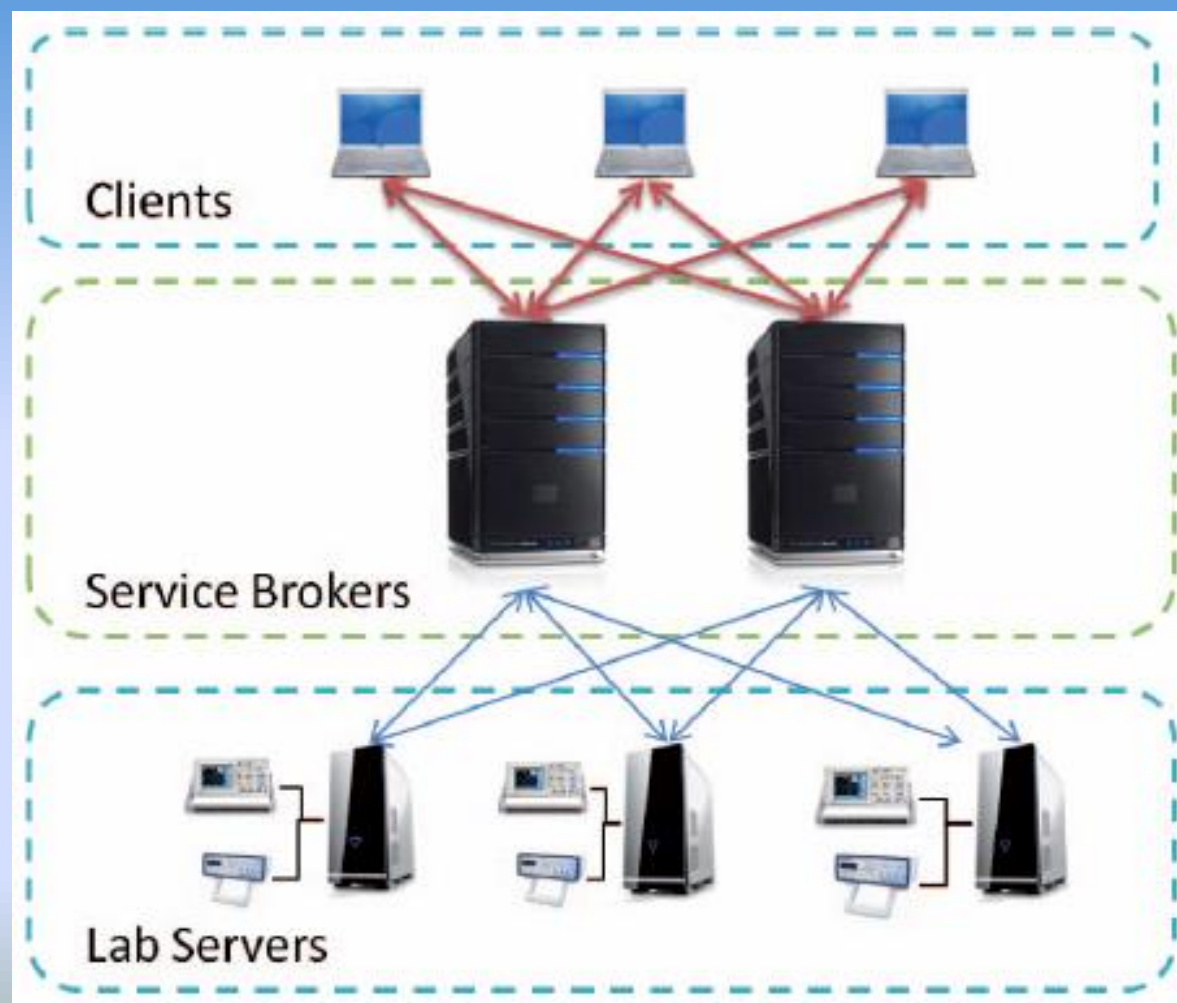
- The clear separation of roles is one of the main advantages of the iLab Shared Architecture. ISA does not focus in a specific type of laboratory but provides a set of general purpose functions for lab developers.
- ISA architecture is a distributed architecture that facilitates sharing Online Labs across institutions.
- The ISA architecture supports the use of a diverse number of laboratory hardware and software and is not compromised with client and server platforms

iLabs Shared Architecture

ISA Tiers

- **Client**
- **Service Broker**
- **Lab Server**

ISA Batched
multi Campus
Configuration



iLabs Shared Architecture

ISA Tiers : Client

- **Client:** Is the user that can be anywhere in the world, in his house, university, enterprise, laboratory etc... and obviously connected to the Internet.
- Is the user of the remote or online lab.

ISA Tiers: Service Broker

Service Broker and its communication process:

- The Service Broker is the **core of the architecture** and provides user authentication, authorization, experiment data storage and access to scheduling services.

iLabs Shared Architecture

ISA Tiers: Lab Server

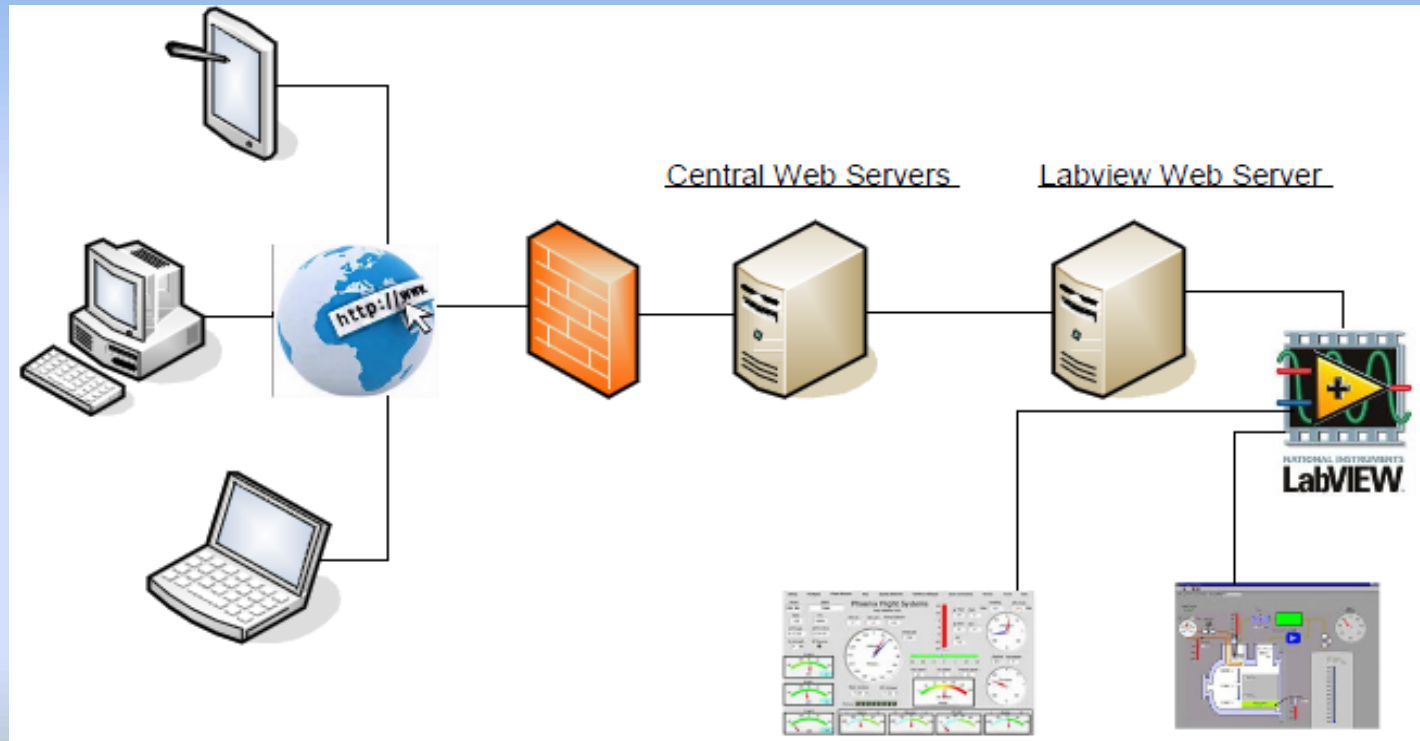
Lab Server: The Lab Server is the part of the architecture that executes the experiments.

The Lab Servers are resource providers, serving the Service Broker with experiment results and other services.



iLabs SA – Application Proposal :

Challenge: Euronet Lab Network based in LabVIEW Web Server



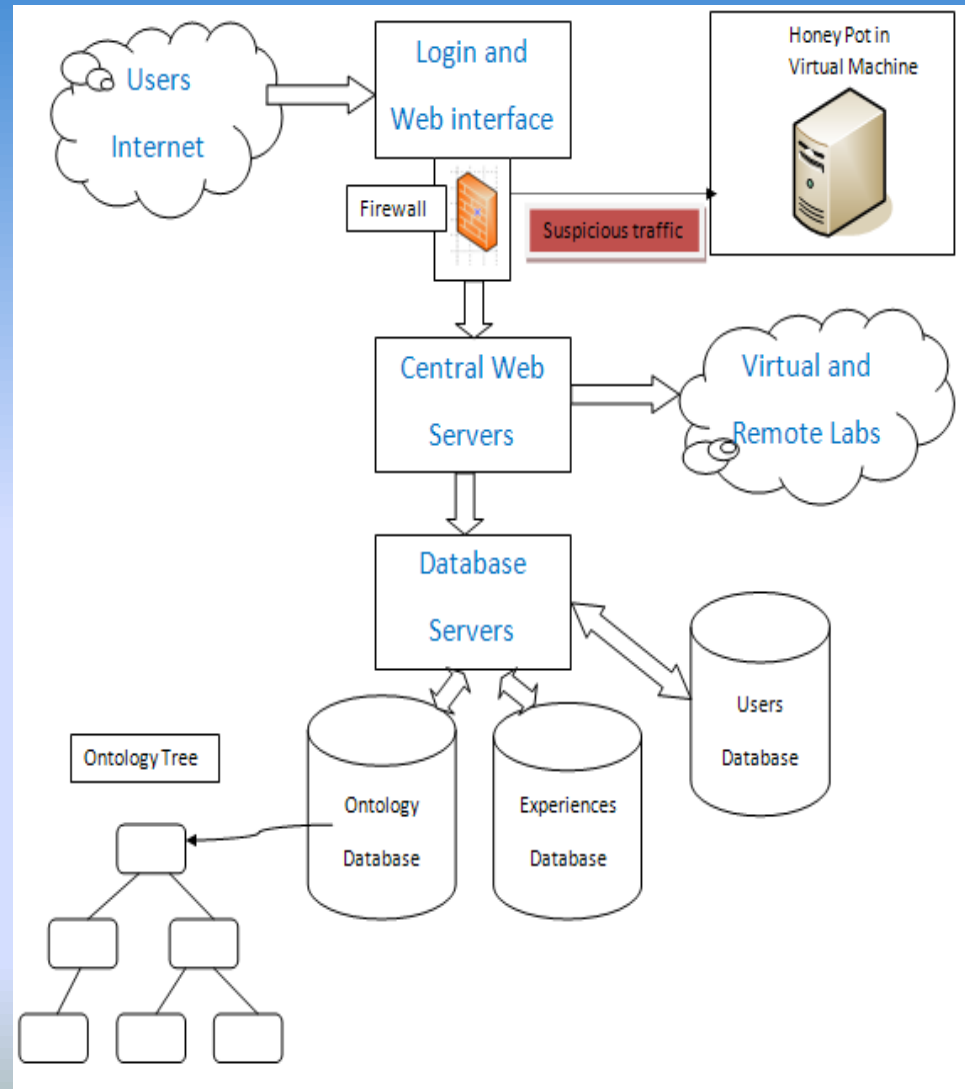
iLabs SA – Application Proposal :

Euronet Lab (1)

This ISA philosophy can be applied to the Euronet Lab Network....

The Login and Web interface and the Central WebServers develop the same function that the Service Bokers in ISA Architecture:

The “Login and Web Interface” block has the function of guarantee to the users a secure and efficient way of making login in the system, and also validate the login action “Central Web Servers”.

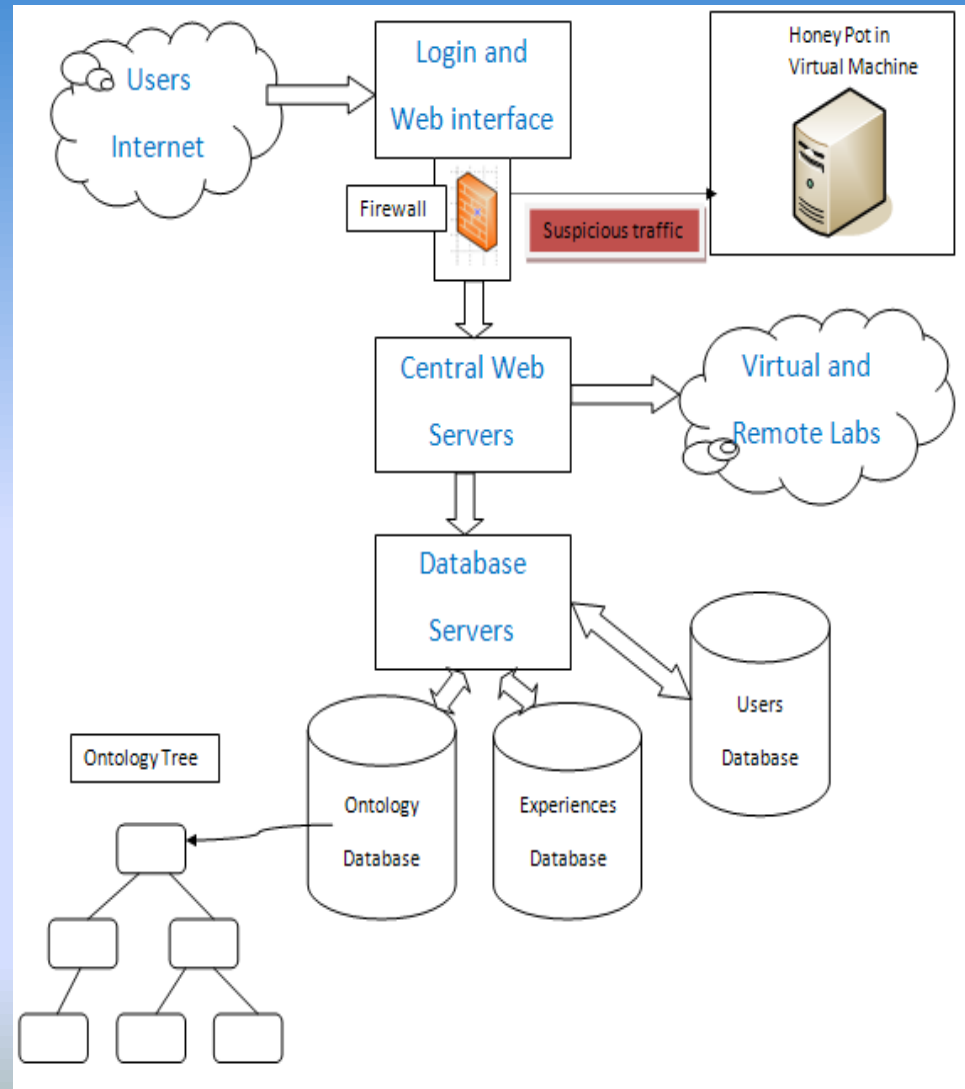


iLabs SA – Application Proposal :

Euronet Lab (2)

The block “**Central Web Servers**” as function of :

- Run the schedule system of labs/experiences,
- Associate the scheduled experience and time to the real system in the cloud on the internet
- Receive and direct the correct experiment/laboratory to the connections of the users received via “login and web” interface.

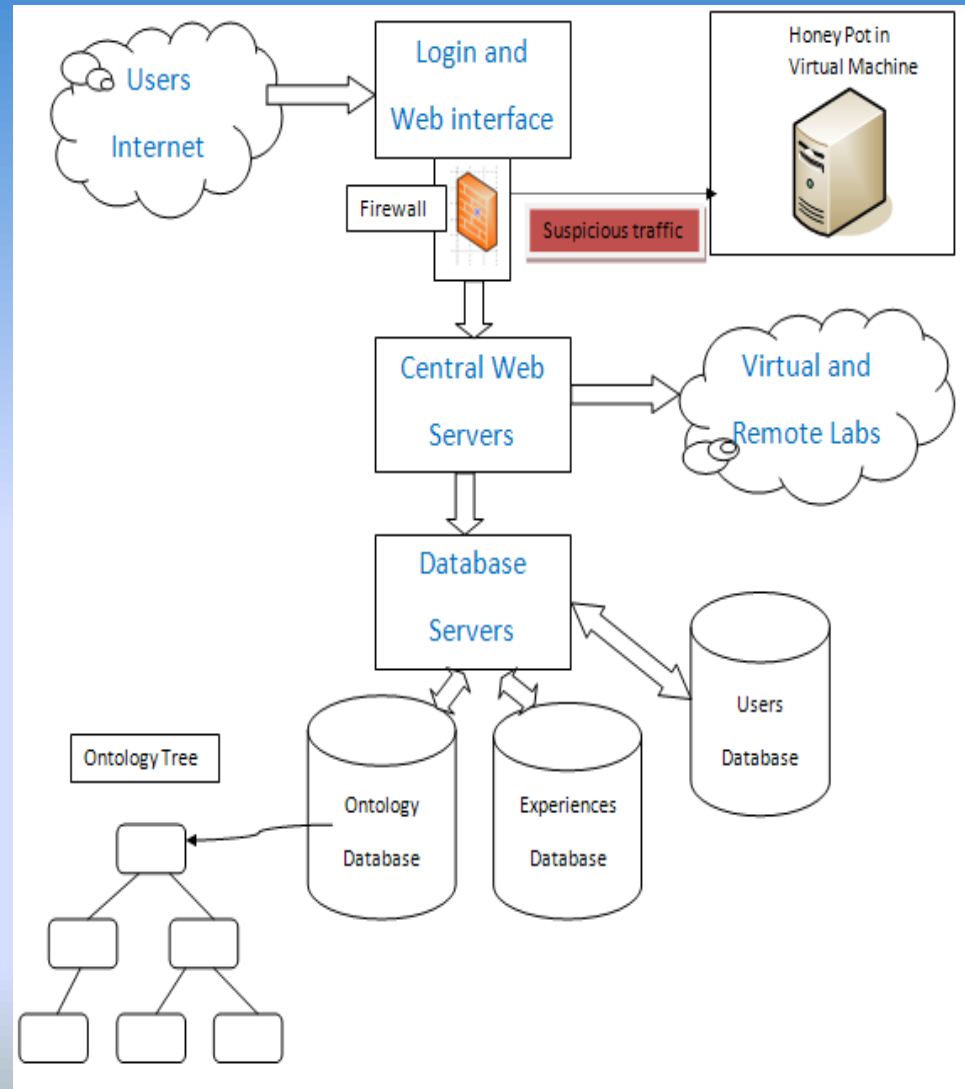


iLabs SA – Application Proposal :

Euronet Lab (3)

The block “**Database Servers**” has the function of connect the registered requests with the Databases:

- Ontology
- Users
- Experiences

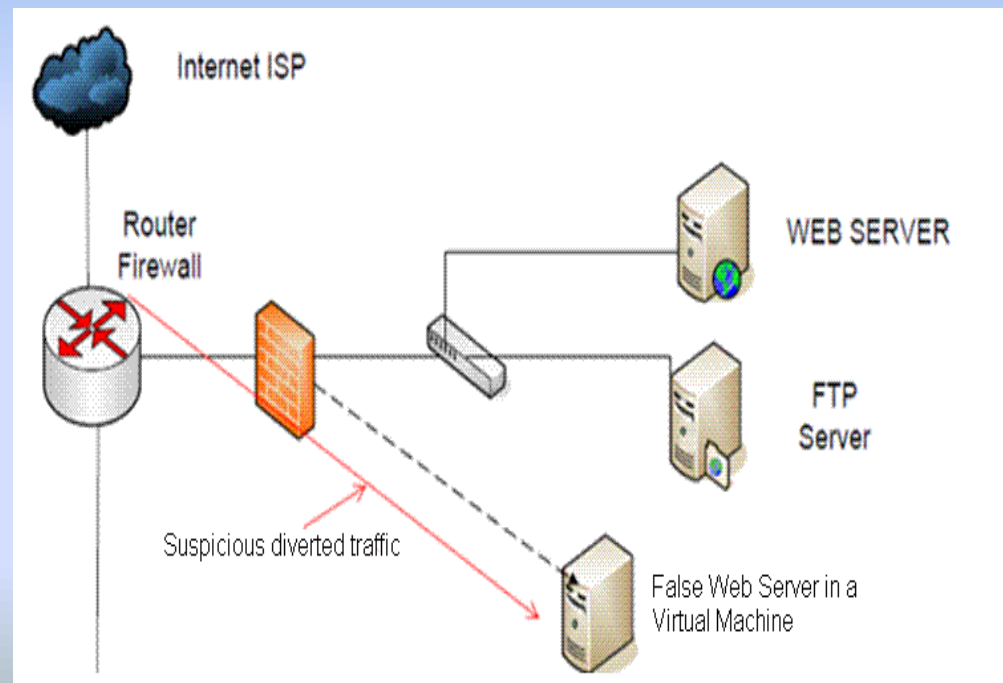


iLabs SA – Application Proposal :

Euronet Lab (4) - Security Issues

It is necessary to build and configure a DMZ (Demilitarized Zone) where the servers must be placed, that should be accessed from outside the network, the Web server and FTP Server.

To complete the security scheme in the Web Server Login System must be installed a virtual machine creating a false DMZ, in which must be installed a “Honey Pot” and the image (false image) of a virtual network, where hackers should be “trapped” when trying to attack the network.



iLabs S. Architecture and LabVIEW

Challenge: Create a E-learning and Online Labs Network for African Universities

With the implementation of this environment it will be possible in a very short time to have a network of Labview Virtual and Remote labs at the disposal of all African Universities and Colleges, providing their students with the most actual and efficient technology in laboratories within a very low budget, requiring only internet access, portables or tablet-pcs and web browsers.

iLabs S. Architecture and LabVIEW

Thank you for your attention

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