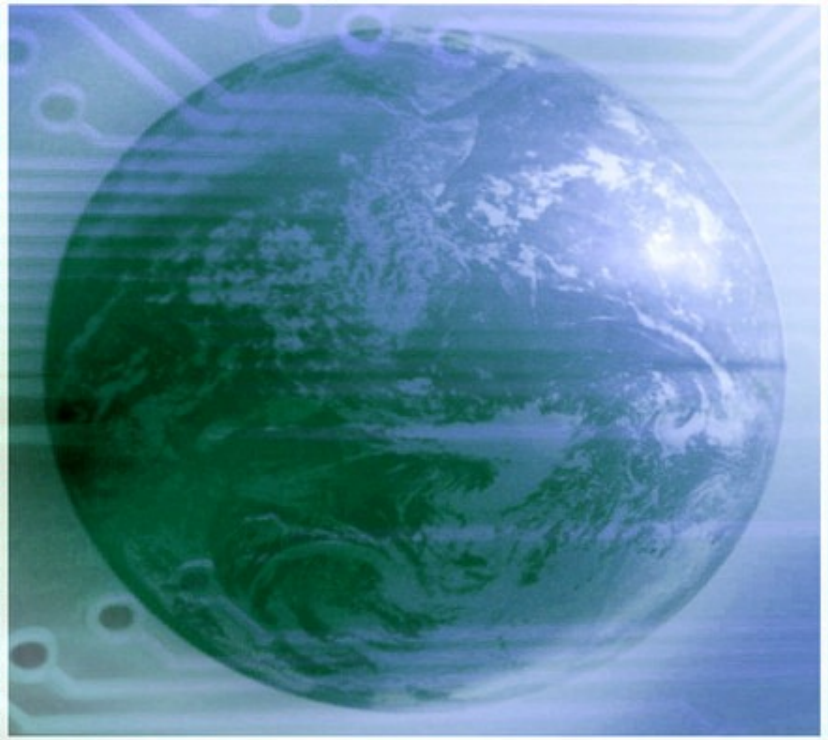
VM



TEAM:

Vasile Pais

Lucia Pais **Vlad Ureche**

MENTOR:

Nicolae Tapus

Politehnica University of Bucharest

Overview

- Project Purpose
- Facts and Figures
- Necessity
- Our Solution
- System Architecture
- Utility
- Further Development
- Conclusions

Project Purpose

- VM is meant to simulate electronic devices on a PC, enabling students to interact with them
- Students can create complex systems by simply connecting different parts
- It can interface with other real world devices

Facts and Figures

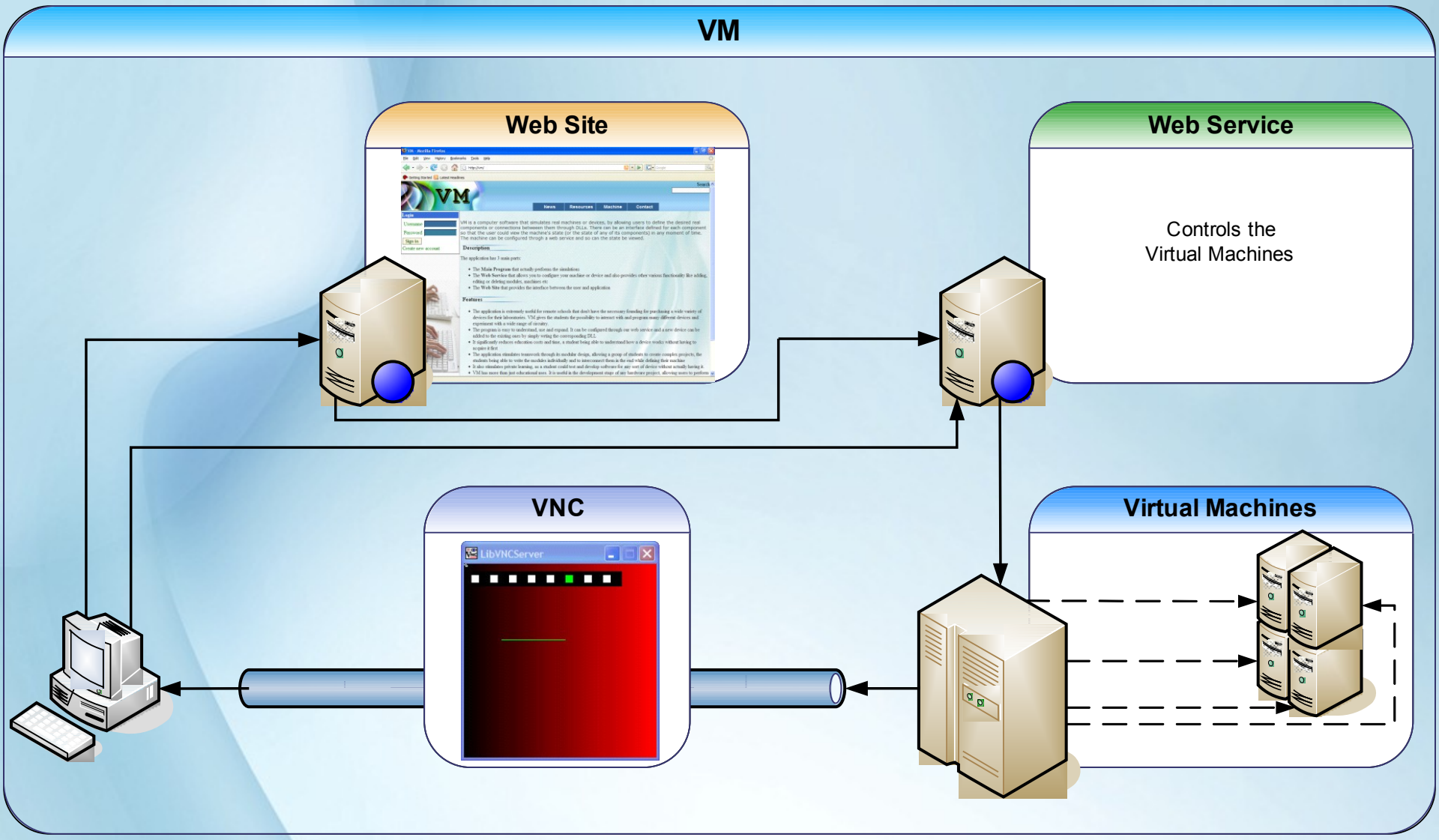
- Many electronics are **unavailable** or **unaffordable** for students
  - AT32AP7000 (Atmel 32-bit RISC microcontroller) costs 53$ according to Froogle, but surpasses 100$ a piece in Romania
- usually a **minimum quantity is imposed** on electronic components
- **order and delivery time** for electronics slows down the project

VM

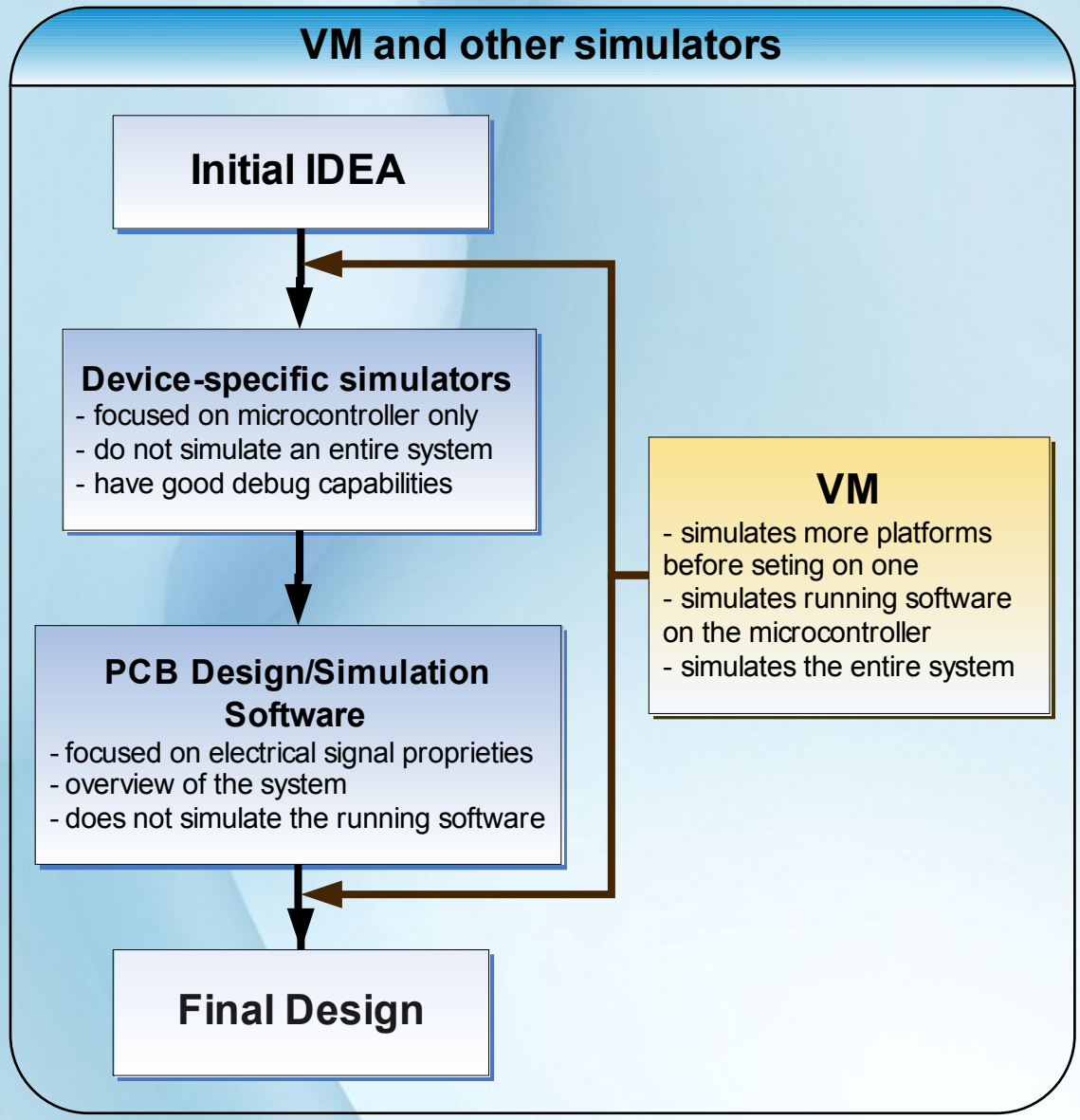
Necessity

- Enables people to work with devices that otherwise they couldn’t afford
- Helps in the education process by allowing students to :
  - develop software for different architectures
  - simulate the electronic parts needed for lab data processing
  - gain thorough understanding of how the system works by inspecting the system’s internal state
- Allows continuous software testing (by simulation) before the prototype hardware is available

Our Solution

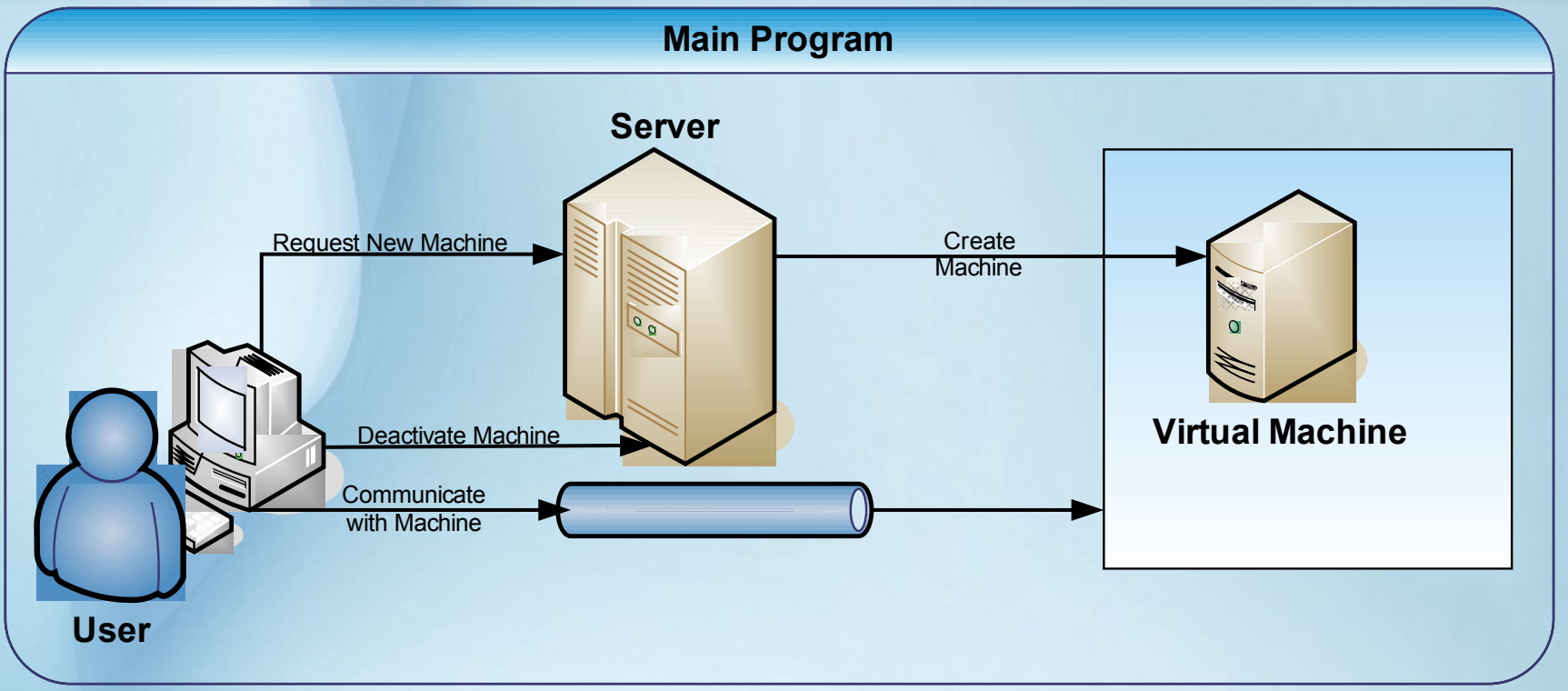


Our Solution



- VM is used before running the device specific simulators to ensure logical connection compatibility
- VM is used after the PCB design is complete to test the software/firmware for the device

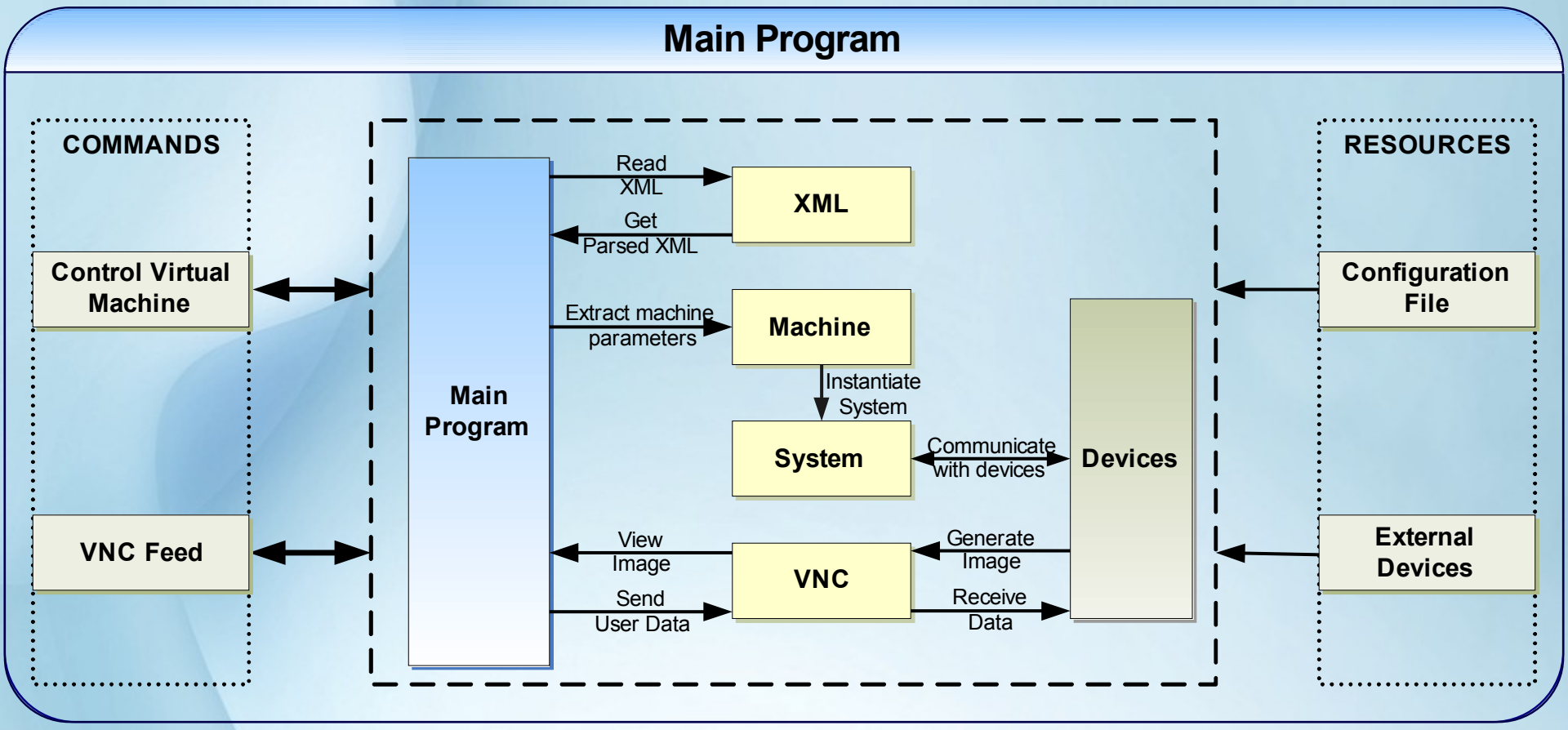
System Architecture



Innovation

- Hosted on a web server
- Program management can be done through web
- Allows the access of multiple users to the same device
- Uses the standard VNC protocol to visualize the results of the simulations

System Architecture



System Architecture

Main Program

Modular Architecture

- a module can be:
  - CPU
  - driver / latch
  - memory
  - button / switch
  - LED
  - LCD Display
  - wires – special BUS modules
  - others

- modules are stored in *.DLL libraries
- modules are instantiated at runtime according to the XML configuration file
- easy to create a new module – just implement an interface

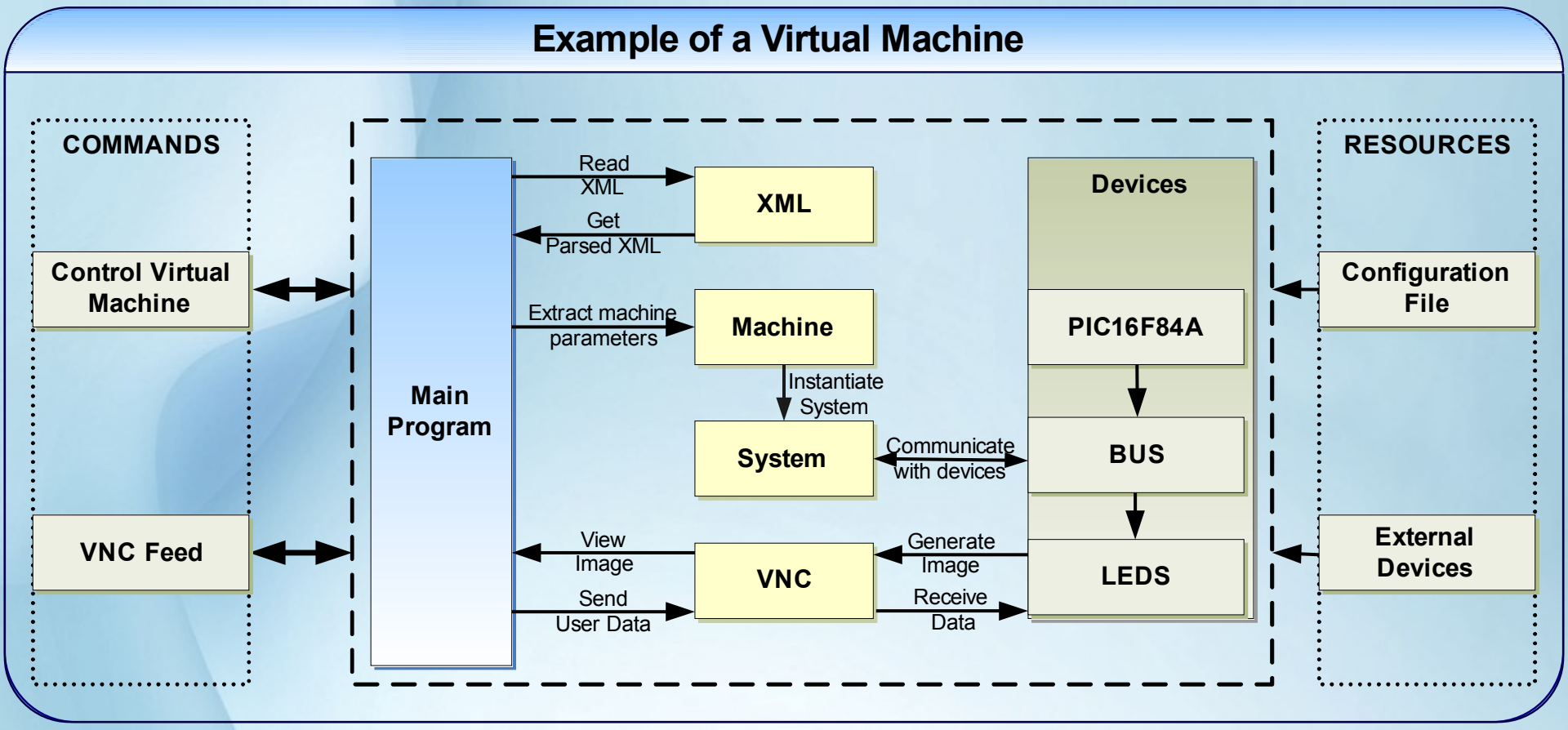
System Architecture

Main Program

The VNC Server

- **enables user interaction with the virtual machine over a local network or the internet**
- allows users to interact with the simulation:
  - push buttons, change switches' positions
  - view the LCD display/LEDs
  - view the system's reaction to external sensor readings
- VNC was chosen because it enables cross-platform cooperation
- Can be accessed through many devices including mobile phones with Microsoft Windows Mobile

System Architecture

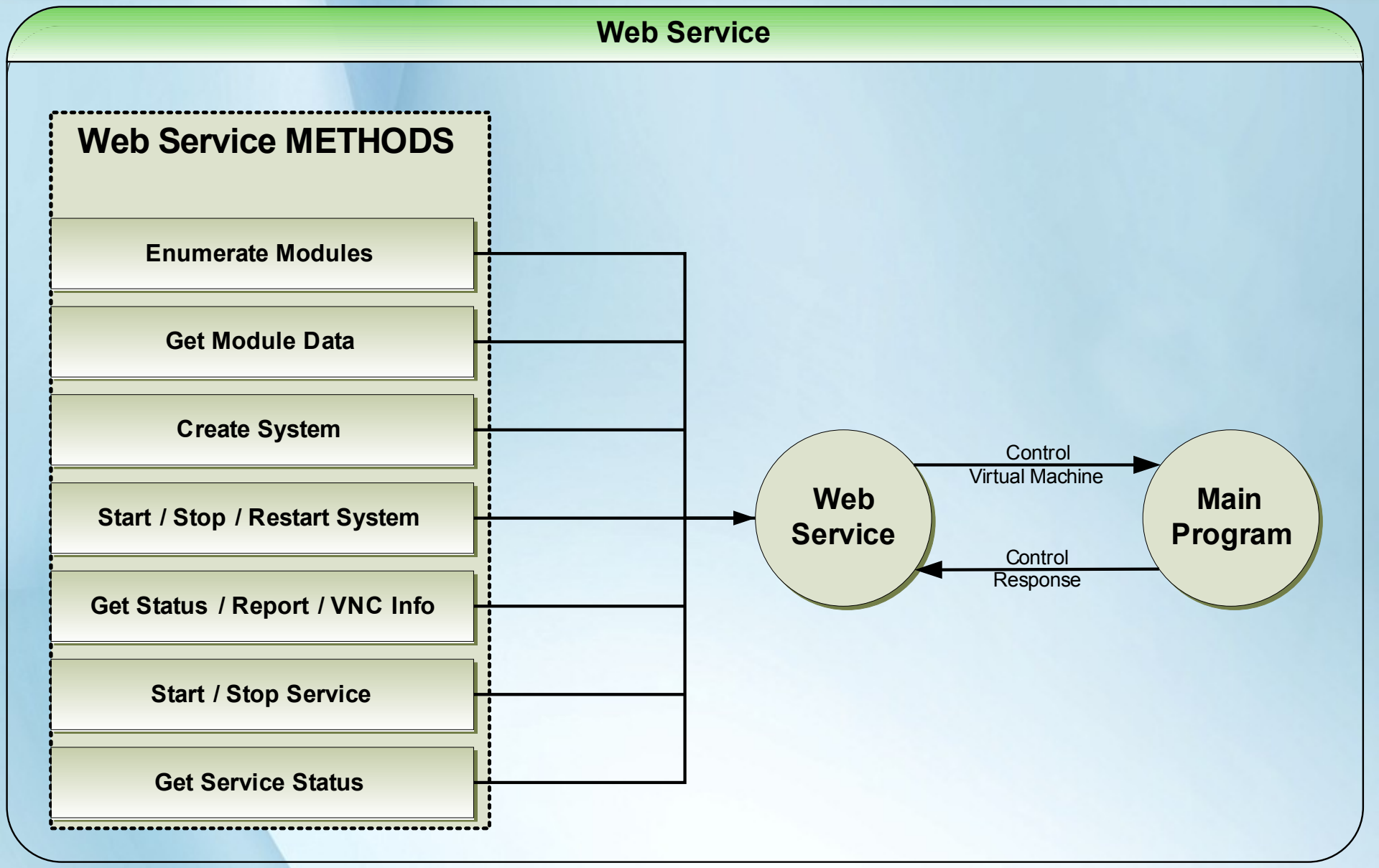


System Architecture

VM example – Implementing a PIC and LEDs

- Machine instantiates a System, PIC, BUS and LED modules and hands over the control to System
- System logically connects the PIC with the LEDs by using the special module BUS
- System generates the clock signal and regulates the data flow between the modules
- The status of the PIC can be observed on the LEDS being viewed through the VNC

System Architecture

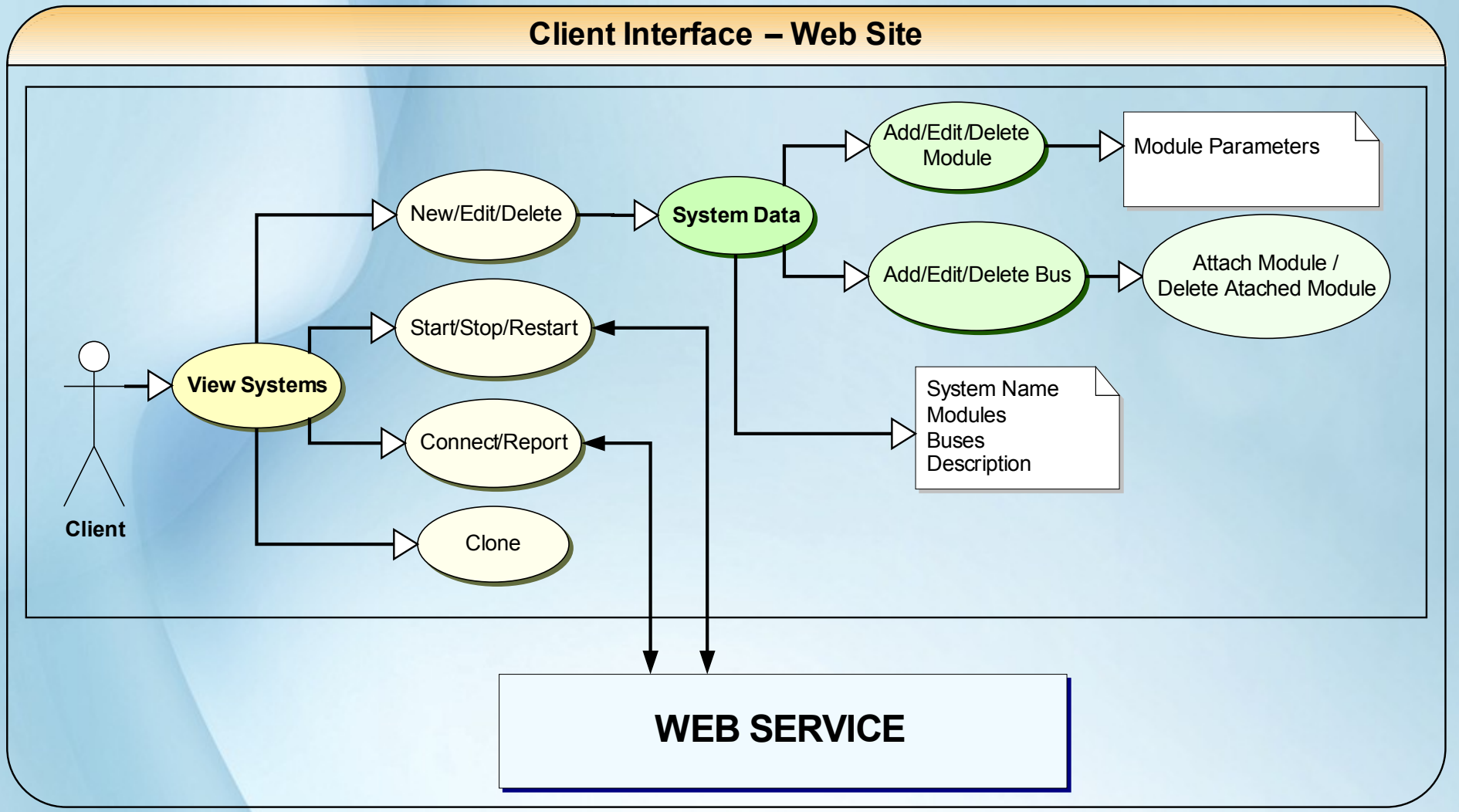


System Architecture

Web Service

- Provides the interface between the Client and Main Program
- Exports the methods used in XML format
- Provides the methods description through WSDL
- It can be used for creating and using virtual machines by any web client
- It is very easy to use

System Architecture



System Architecture

Web Site

- It facilitates the creation and management of the virtual machines
- Allows access to functions in the web service
- Makes the service available to anyone through the Internet
- It allows user management

Utility

Advantages	Disadvantages
Ease of education in electronics	Timing/synchronization delays are not simulated therefore timings have to be adjusted on the prototype board
Allows the students to better understand the inner workings of the modules with step-by-step program debugging	No electrical characteristics are simulated. For electric simulation (impedances, signal strength, signal form, currents) a circuit simulation toolkit should be used
Encourages team work through its modular design by allowing different students to concentrate on different parts of a project	No PCB routing and placement simulated. For physical parameters, (length, height, etc) optimized electromagnetically influences and optimized heat transfer a PCB layout tool should be used
Enables faster preparation of electronics projects	

Further Development

- Implement new modules that would allow defining new, more complex systems
- Implement new facilities for the machine management (VNC passwords etc)
- Implement new functionalities of the client in order to improve the interaction with the user

Conclusions

VM helps in:

- **easing electronics projects and teaching**
- **challenging students to Imagine and Create new gadgets**