



**AUTOMATIC CHOCOLATE  
VENDING MACHINE  
USING MUCOS RTOS  
(ACVM)**



## Design steps:

1. Requirements.
2. Specifications.
3. Specifications Modeling Using UML.
4. ACVM Hardware Architecture.

# 1.Requirements:

■ The requirements of the machine can be shown below:

## 1.purpose:

- To sell chocolate through an ACVM from which children can automatically purchase the chocolate.
- The payment is by inserting the coins of appropriate amount into a coin slot.

## 2.Inputs:

- Coins.
- User commands.

## 3.Signals,events and notification:

- Each port generates an interrupt on receiving a coin at input.
- Each port interrupt starts an ISR, which increases value of amount .
- Each selected menu choice sends a notification to the system.

#### 4.Outputs :

- Chocolate.
- Refund.
- Display of the menu for GUIs, time and date, welcome messages.

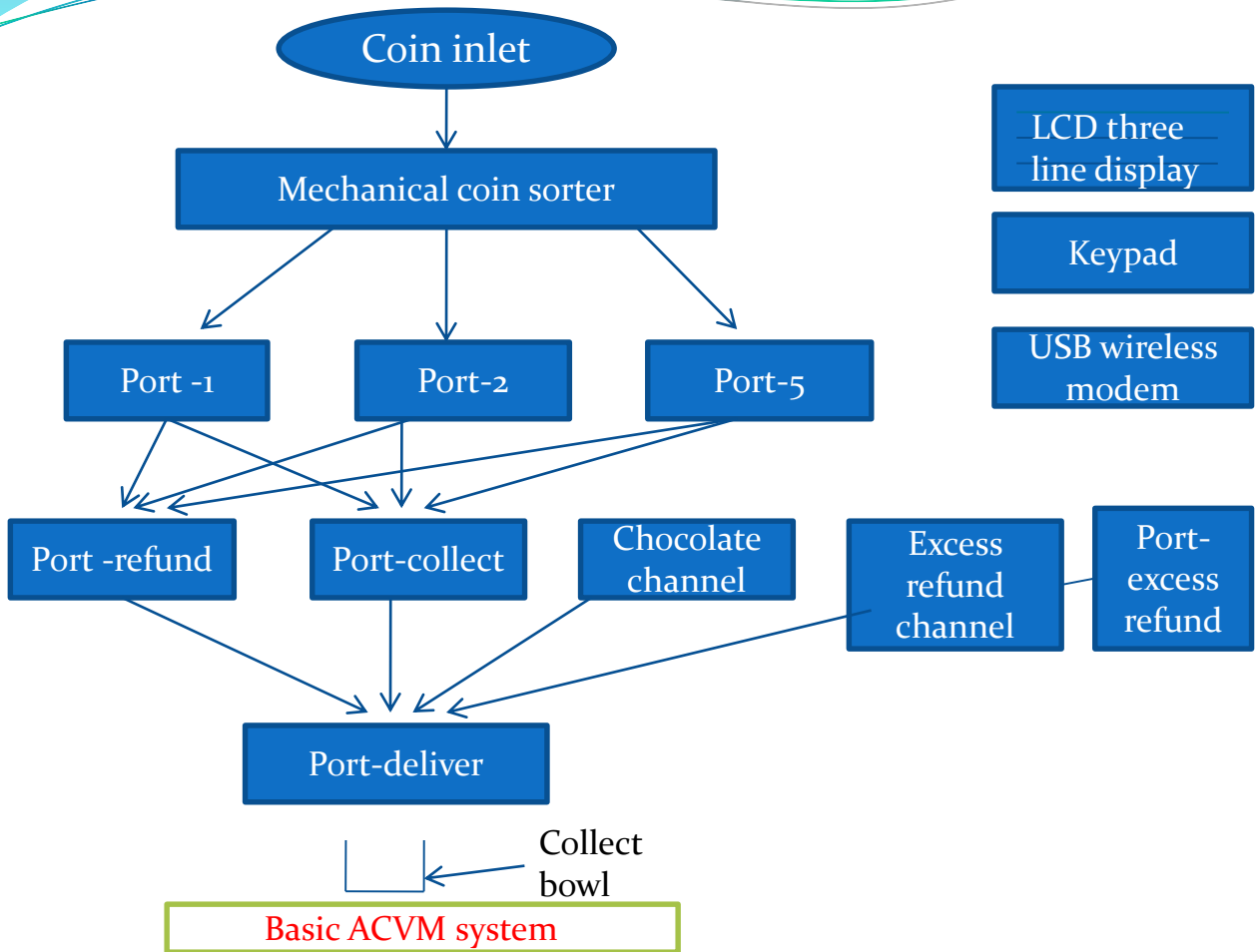
#### 5.Functions of the system:


- A child sends commands to the system using GUIs.
- The GUIs consists of the LCD, keypad and touch screen.
- The child insert the coins for the cost of chocolate and the machine delivers the chocolate.
- If the coins are of more amount than cost of chocolate, the excess amount is refunded along with chocolate.
- USB wireless modem enables communication to ACVM owner.

#### 6.Design metrics:

- Power dissipation: As required by mechanical units and display.
- Process deadline: Machine waits for a maximum of 30sec for the coin and the machine should deliver the chocolate within 60sec.

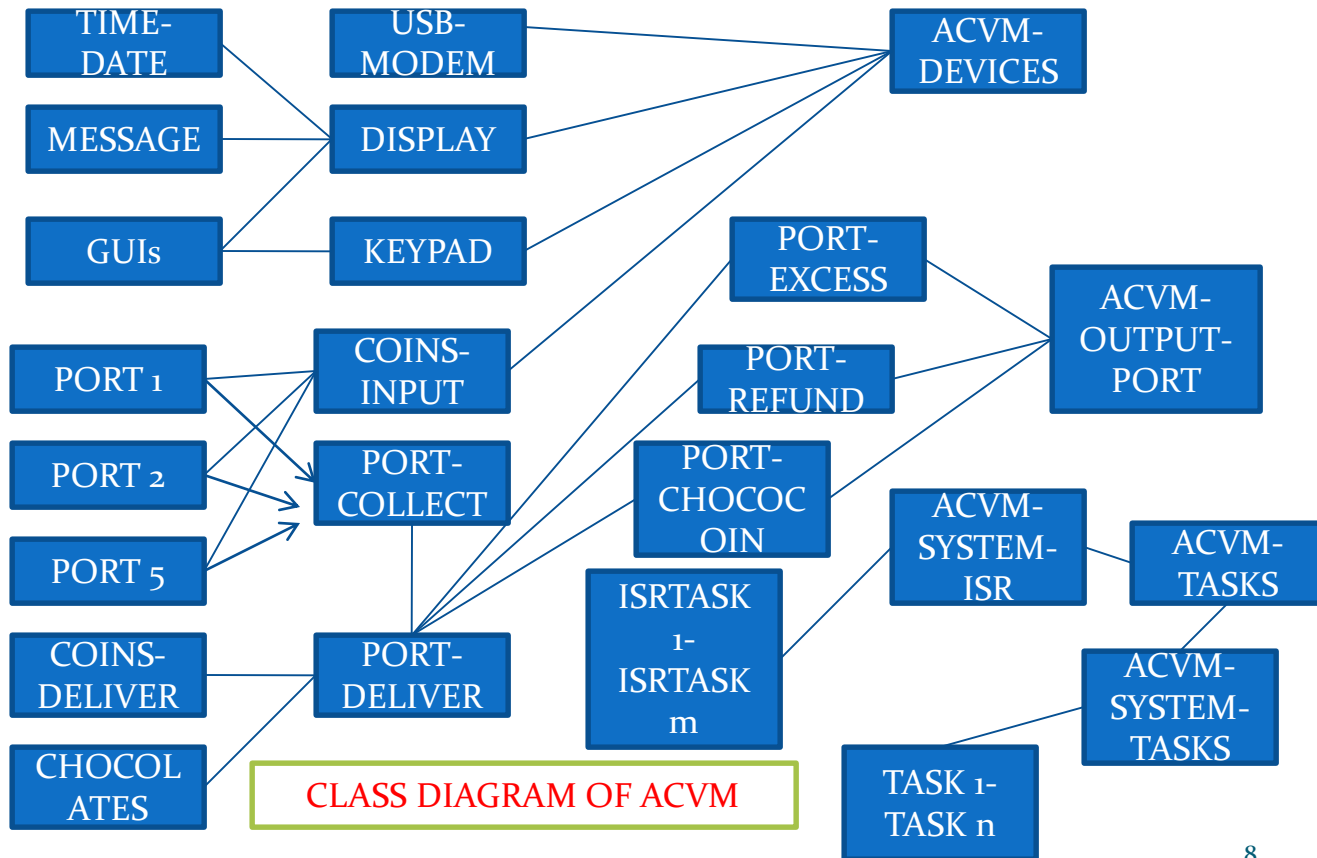
# 2. Specifications :



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- The above diagram shows basic ACVM system
  - There is into which a child inserts the coins for buying a chocolate.
  - Whenever a coin is inserted , a mechanical system directs each coin of value Rs 1 or 2 or 5 to port-1,port-2 and port-5 respectively.
  - When port is receives a coin the port is generates an interrupt.
  - The interrupt signal sends to the corresponding read-ports for reading the coin value at the ports to increase the value of amount.
  - The machine should have an LCD, keypad and touch screen.

- Let the interface port be called port-display.
- LCD displays the message in three lines ,time and date in right hand bottom side.
- ACVM has a bowl from where the buyer collect the chocolate through a port for deliver.
- Let this port be called port-deliver.
- The buyer also collect the full refund or excess amount at the bowl.
- It should also possible to reprogram the codes in the system ROM or flash ROM whenever the following happens.
  1. The price of chocolate increases.
  2. The message lines or menus need to be change.
  3. Machine features change.
- MUCOS be the RTOS used in the ACVM.

# 3. Specifications Modeling Using UML:





## ■ UML:

- UML is a unified(common) modeling language for any general system for which object oriented analysis.
- UML modeling is by class diagrams, state diagrams, object diagrams and sequence diagrams.

## ■ Class diagram:

- A class diagram shows how the classes and objects of a class relate.
- Rectangular boxes show the classes and arrows show the class hierarchy.
- ACVM system can be modeled by three class diagrams.

1. ACVM-DEVICES.
2. ACVM-OUTPUT-PORTS.
3. ACVM-TASKS.

## 1.ACVM-Devices:

- ACVM –Device is an abstract class from which the number of extended classes is derived for the device to handle ACVM mechanism.
- The device are keypad, display device, wireless USB and coin input device.

## 2.ACVM-Output-port:

- ACVM-Output-ports is an abstract class from which the number of extended classes is derived for handling output ports at ACVM.

## 3.ACVM-Tasks:

- ACVM-Tasks extends the two classes.

A)ACVM-System-Tasks.      B)ACVM-System-ISR.

### A)ACVM-System-Tasks:

- ACVM-System-Tasks in an abstract class from which we assume that n extended classes Tasks<sub>1</sub> –Tasks<sub>n</sub> are derived.
- Task-1 to Task-n are the n tasks at the ACVM.

## B)ACVM-System-ISR:

- ACVM-System-ISR is an abstract class from which we assume that m classes are extended.
- ISR-Task-1 to ISR-Task-M are extended classes for ISR handling tasks at ACVM.

## 4.ACVM Hardware Architecture:

- ACVM specifications are shown below.
- Micro controller 8051MX.This version enables use of RAM and ROM larger than 64KB.
- 8MB ROM for application codes and RTOS codes for scheduling the tasks.
- 64KB RAM for storing temporary variables and stack.
- 64KB flash memory part of the ROM store user preferences, contact data, user date of birth and answers of FAQs.

- A 1microsec resolution timer is obtained by programming 8051 timers T0 interrupts service routine.
- Eight hardware interrupts with 8interrupt vectors are used for servicing the hardware interrupts.
- A TCP/IP port provides internet broadband connection through a wireless USB modem, for remotely controlling the ACVM and for retrieving the ACVM status reports by the owner.
- Internal circuits are driven by a supply of 5v,50mA for electronic and 12v, 2A for mechanical systems.

