EDAQ*sys*

ECG Data Acquisition and Monitoring System

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Outline of presentation

- Introduction
- Motivation
- Scope
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- Present status
- Roadmap ahead
- Conclusion

Introduction

- EDAQsys

  It is a hardware and software system to enable integration of analog ECG machines with the Telemedicine Technology.

- Hardware Subsystem
  - Acquires ECG signals
  - Displays them locally
  - Can transmit them to a local or remote computer
- Software Subsystem
  - Stores the data transmitted by the hardware
  - The stored data can be later retrieved and displayed graphically

Motivation

- **Contribute to improve the health scenario in India**

  Our 1 billion population is predominantly rural and widely distributed in distant geographical locations

  - **Inadequate health and medical facilities**
  - **Wide disparity in terms of**
    - **Health care infrastructure**
    - **Facility**
    - **Funds**
    - **Manpower**

Motivation

Adaptation of telemedicine technology is a viable solution

- **ECG monitoring system is a very commonly used clinical system**
  - **It can be used for Tele-diagnostics**
  - **Analog ECG machines are widely used in rural areas**

The proposed system is to create an interface to integrate analog ECG machines with the Telemedicine technology.

Scope

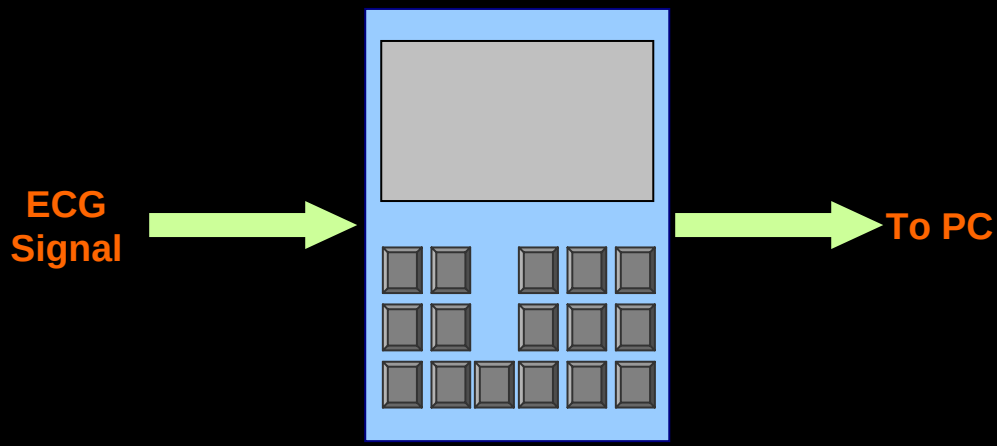
- EDAQsys will be a handheld device
- It's use is targeted in rural and interior areas
  - It can be used with little training
    - The use and operation of the system is very easy
  - It bridges the physical distance between patient and doctor or specialist
    - ECG data can be acquired locally and transmitted to some larger hospital or center

Scope

- It is a handy equipment
  - Can be easily carried anywhere
  - Operates on battery and requires no power supply
- It will be a low-cost equipment

Description

- EDAQsys consists of two subsystems
  - Hardware subsystem
  - Software subsystem



Hardware Subsystem

- **Functionalities**
  - **Signal Acquisition**
    - We are acquiring signals from a standard ECG machine
    - Sampling Rate – 300 samples/ sec
    - EDAQsys acquires 4 cycles of the ECG signal (1024 samples)
  - **Signal Storage & Display**
    - The acquired signal is stored in a RAM on the system
    - Data from RAM is displayed on a CRO
      - In future, graphical LCD will be used

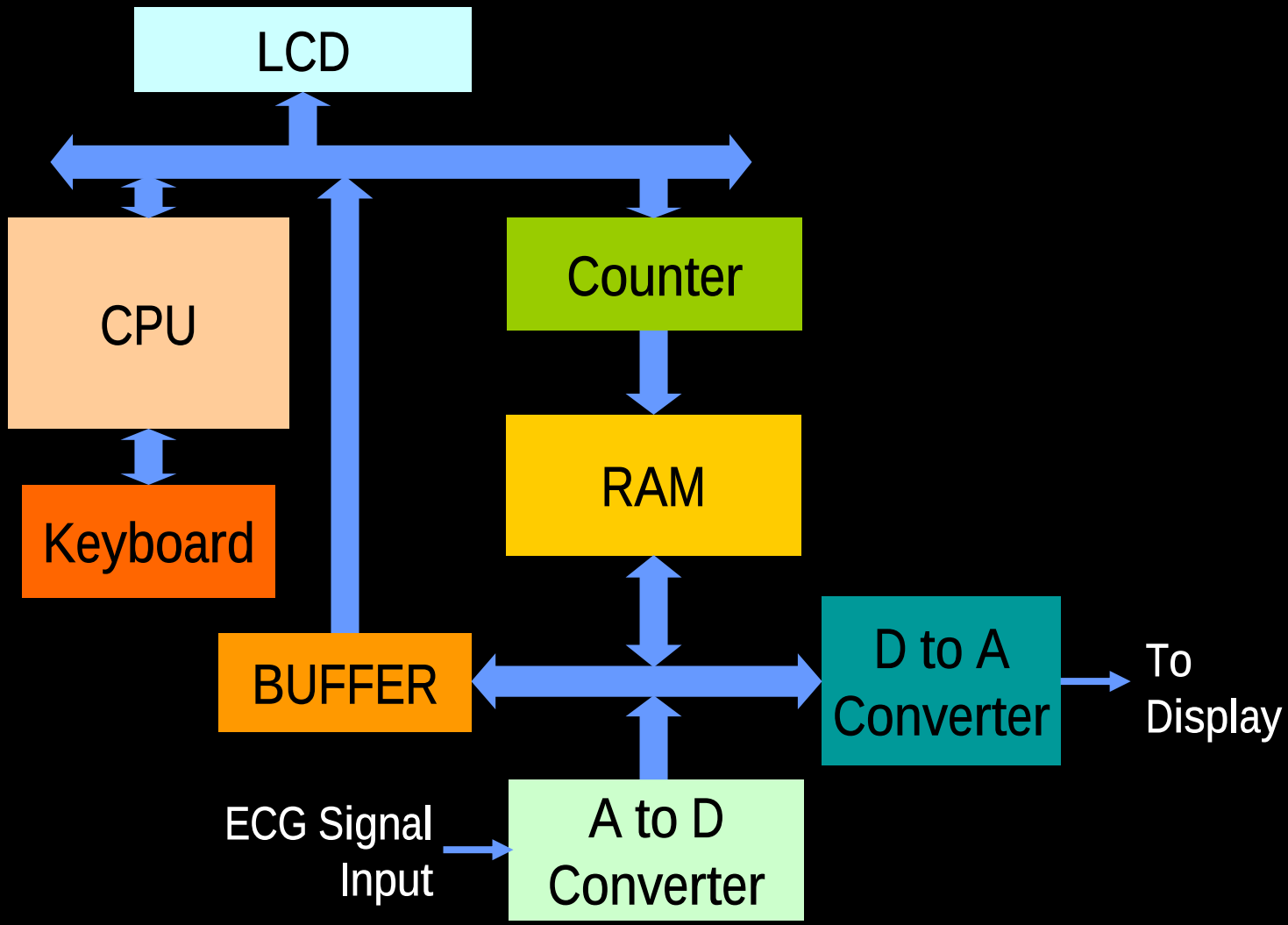
Hardware Subsystem

- Display can be changed to freeze mode for
  - Close observation
  - Transmission of data stored in RAM to PC

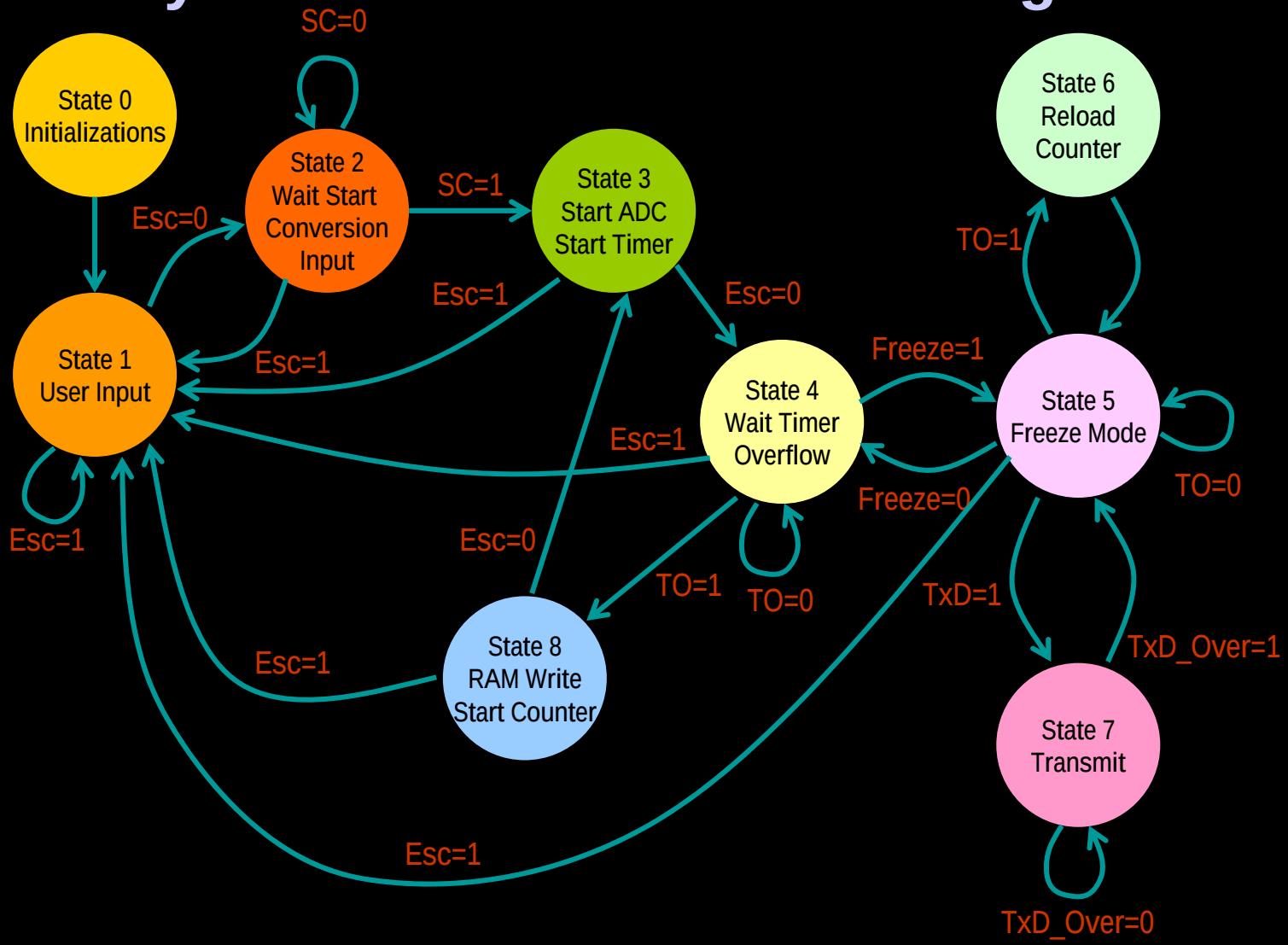
Signal Transmission

- Serial port communication (RS232C) is used
- Patient Id, Channel No and 1024 bytes of data is transmitted

Hardware Subsystem Block Diagram



Hardware Subsystem – State Transition Diagram



Software Subsystem

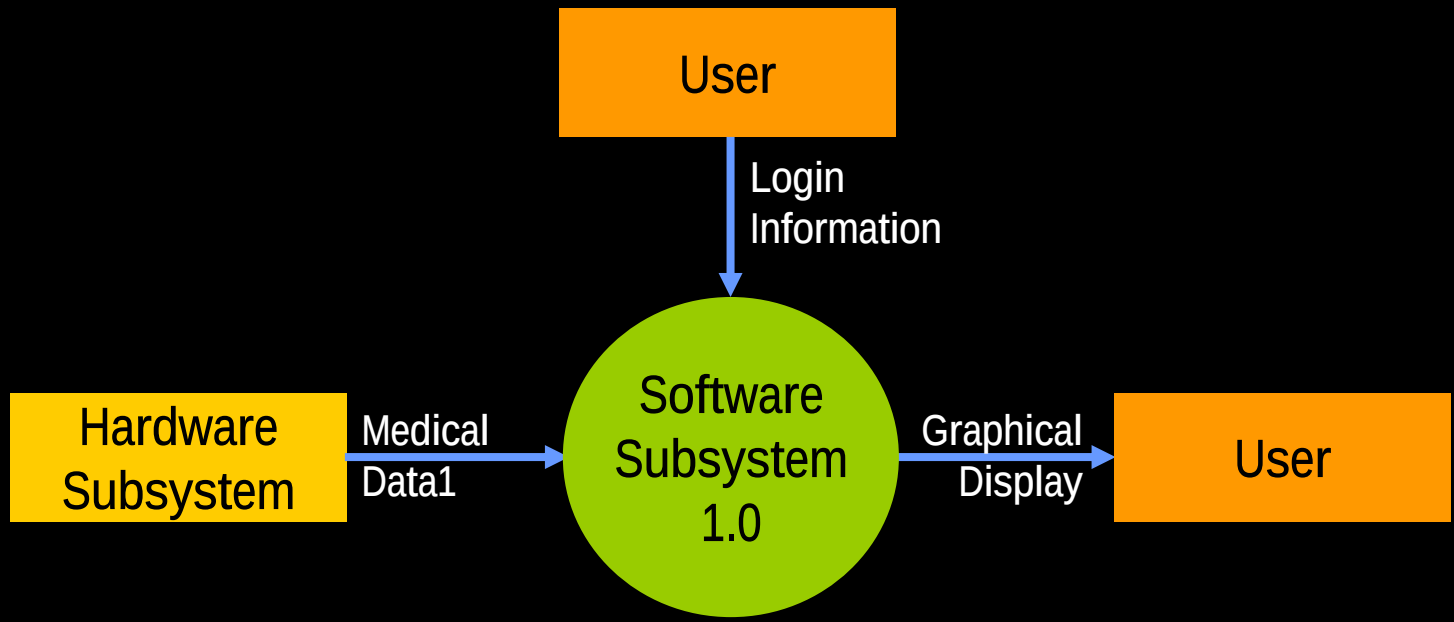
- **Functionalities**
  - **Receive & Store Data**
    - **The software receives data transmitted by the hardware**
    - **It attaches date and time stamp to the data received**
    - **It stores the data in a database**

Software Subsystem

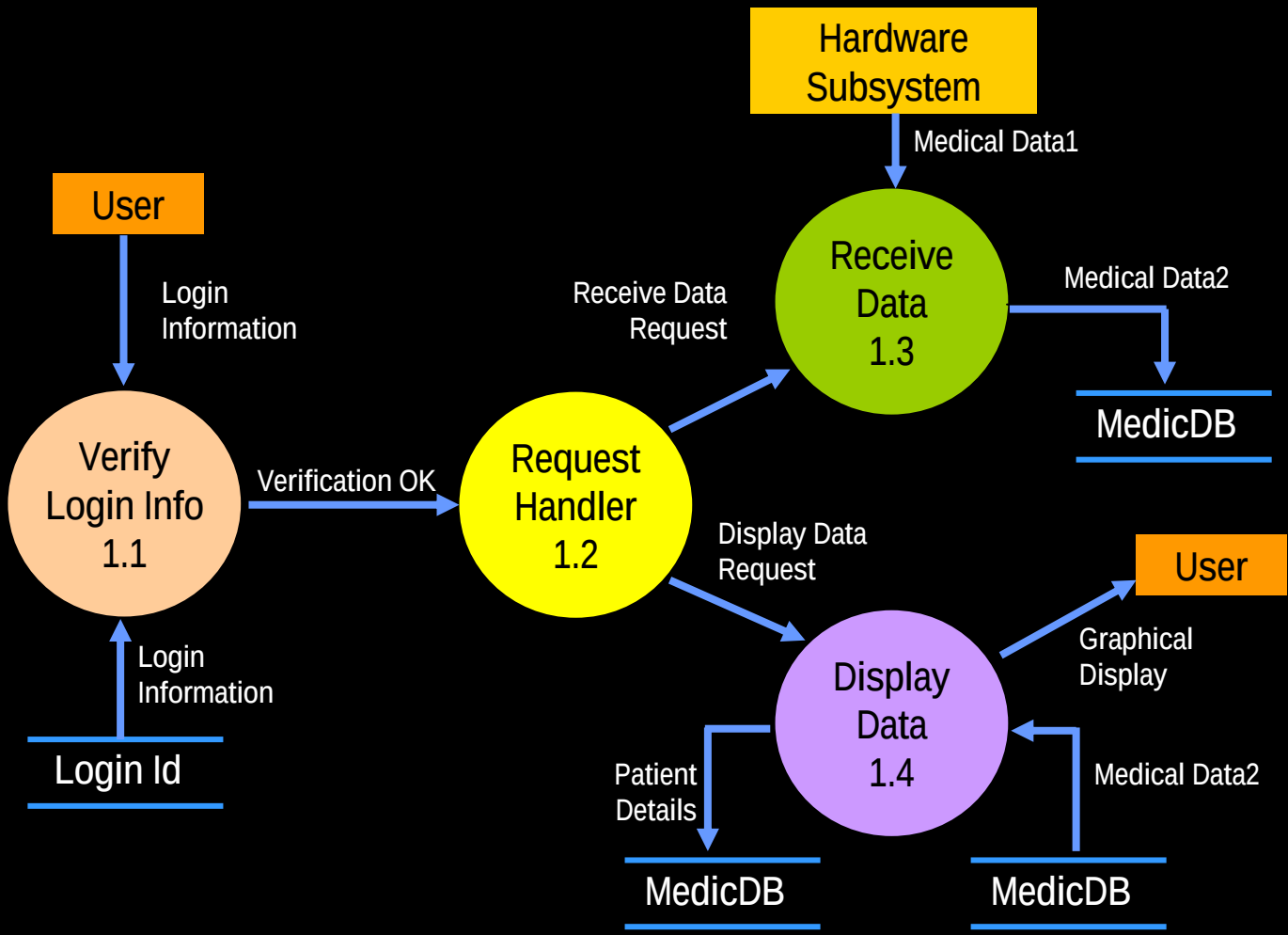
Display Data

- Data can be retrieved from the database by specifying
  - Patient Id
  - Date
  - Time
  - Channel No
- Retrieved data is displayed graphically

Software Subsystem – DFD Level 0



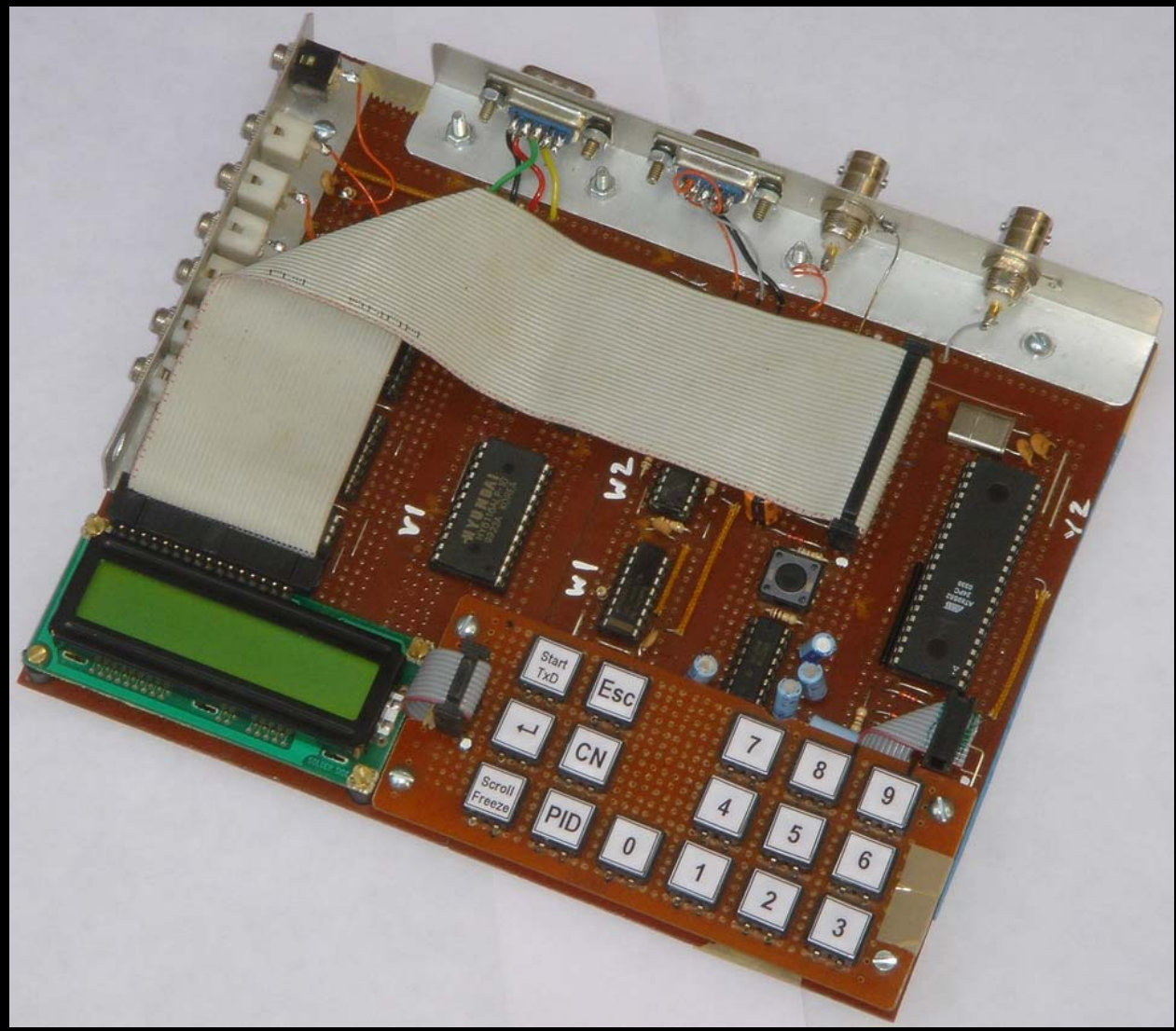
Software Subsystem – DFD Level 1



Present Status

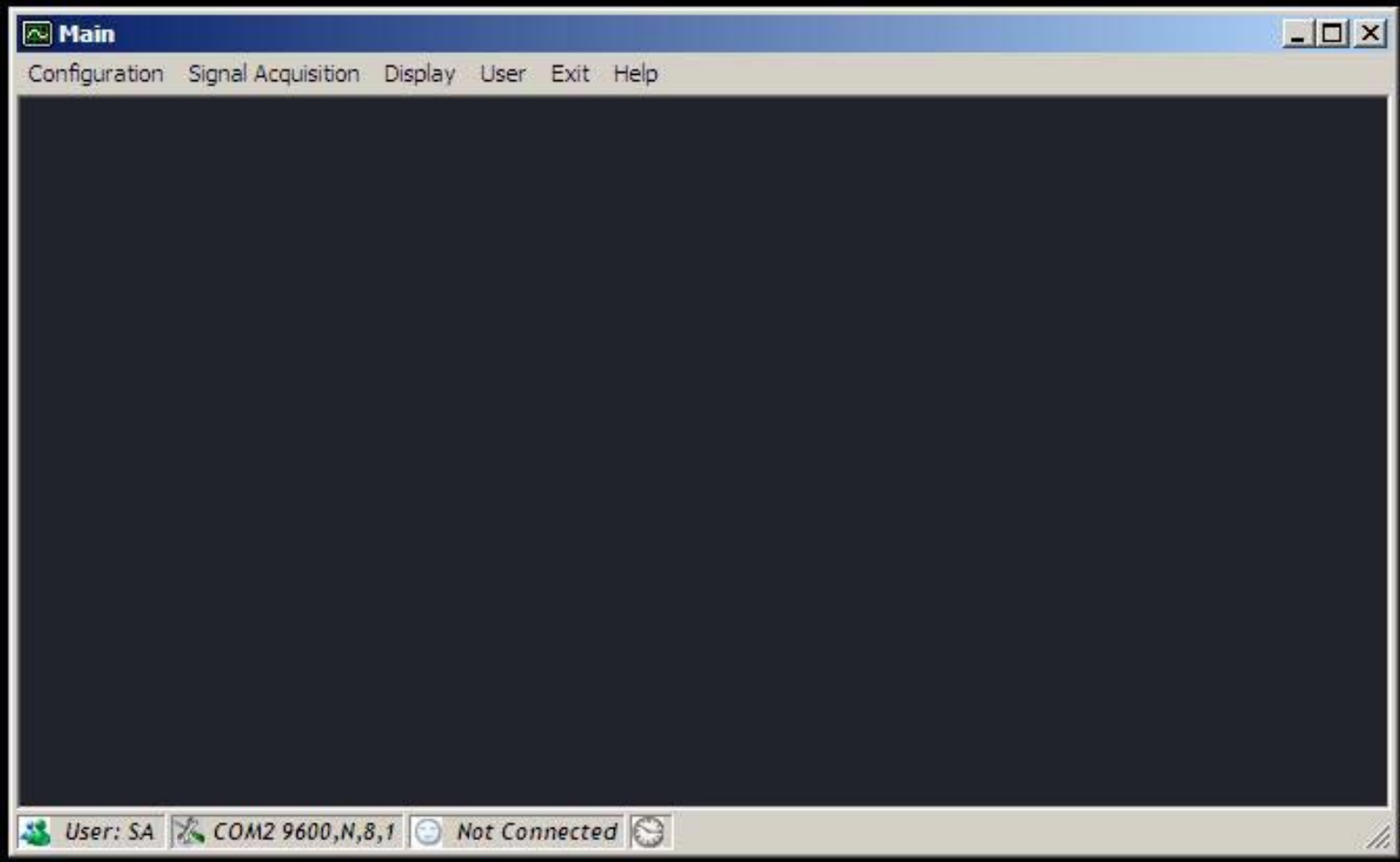
- A microcontroller based implementation is ready.
- Currently
  - Hardware subsystem of EDAQsys
    - Acquires signal
    - Displays signal locally on a CRO
    - Transmits signal to a local PC
  - Software subsystem of EDAQsys
    - Receives & stores signal
    - Displays graphically the stored signal

Present Status- Hardware Subsystem



Present Status- Hardware Subsystem

Present Status- Software Screenshot



Present Status- Software Screenshot

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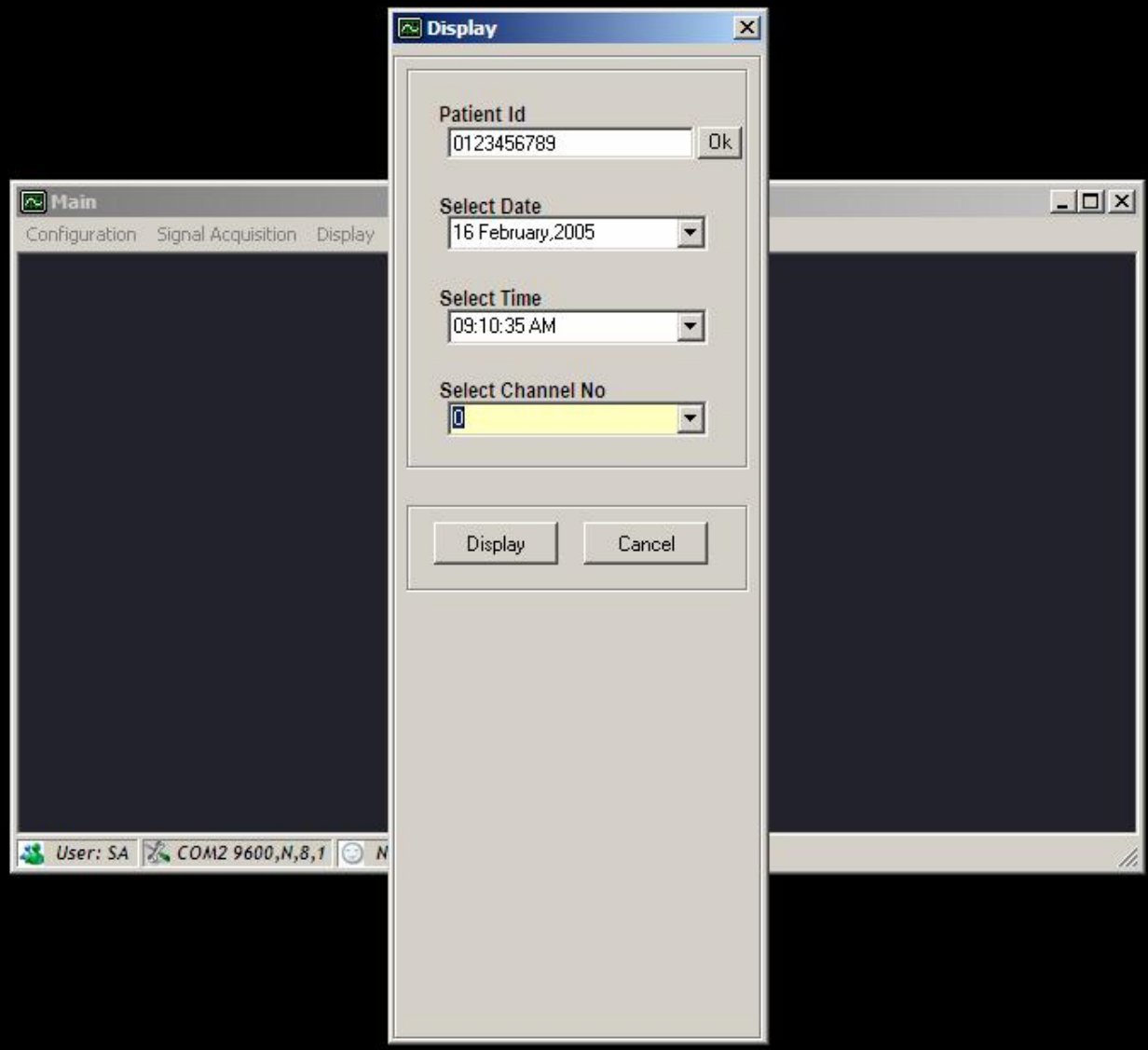
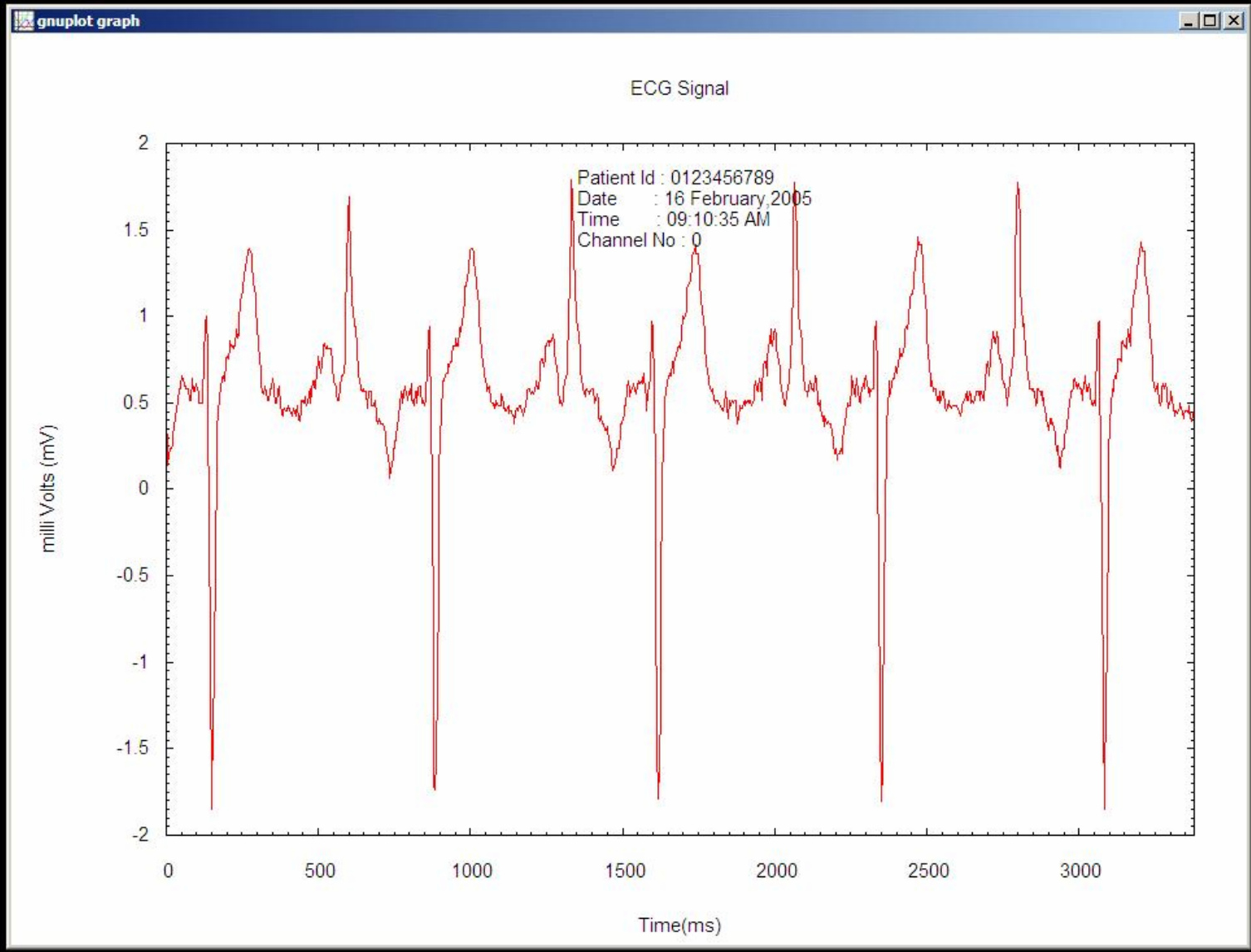


Present Status- Software Screenshot



Roadmap Ahead

- FPGA based implementation of the basic system
- Use of a graphical LCD instead of CRO for display
- Transmission of signal to a remote PC using a dial up modem
- Optical isolation of power supply and data communication interface
- Development of analog subsystem to replace the analog ECG machine

Roadmap Ahead

- Acquisition of signals other than ECG
- ASIC based implementation of EDAQsys

Conclusion

- Indian medical and healthcare facilities have the following constraints
  - Wide disparity in the availability
  - Lack of trained personals and doctors in rural/ interior areas
  - Lack of fund
- EDAQsys addresses all the above problems
  - It is a mobile device
  - It's handling and operation is very easy and simple
  - It is a low-cost system

Conclusion

- EDAQsys is a commercially viable project
  - This work is being supported by a grant from Ministry of Human Resources Development, Government of India.

Thank You