Design Portfolio

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BACHELOR OF ENGINEERING

In

COMPUTER AND ELECTRONIC ENGINEERING

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Potchefstroom

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It all starts here ™

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NOORDWES-UNIVERSITEIT
POTCHEFSTROOM CAMPUS

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1.1.1 System Operational Architecture:

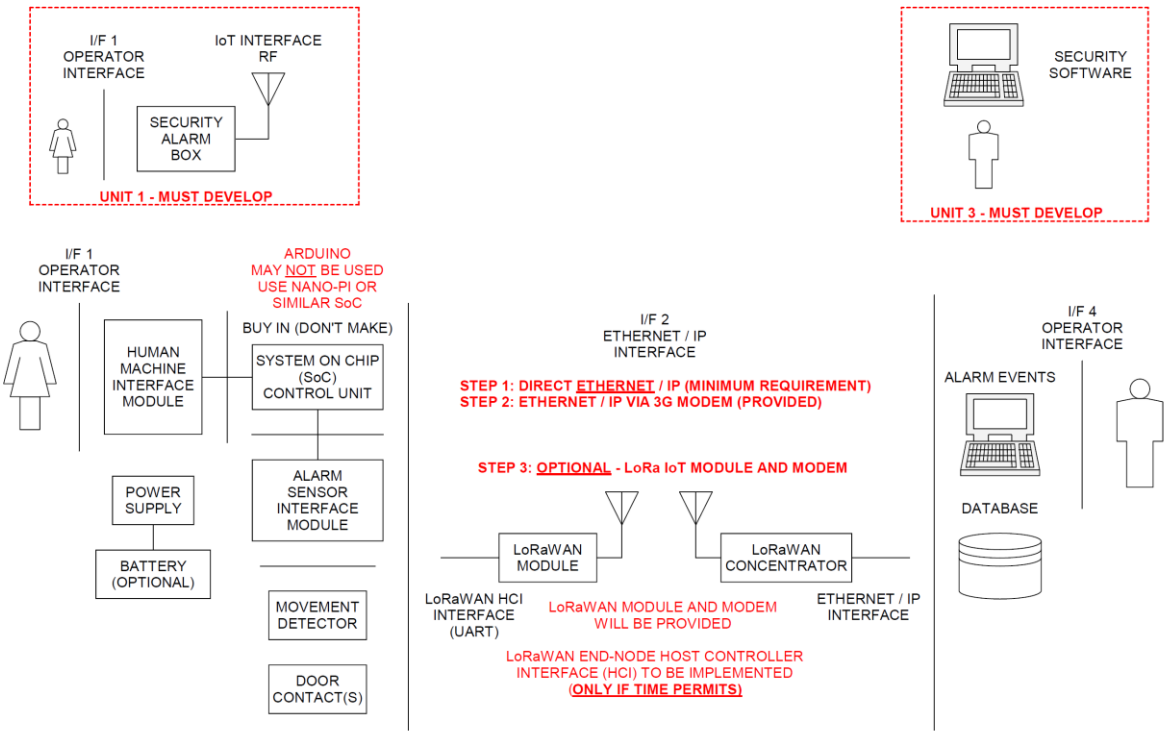


Figure 1: System Operational Architecture

1.1.2 System Operational Flow:

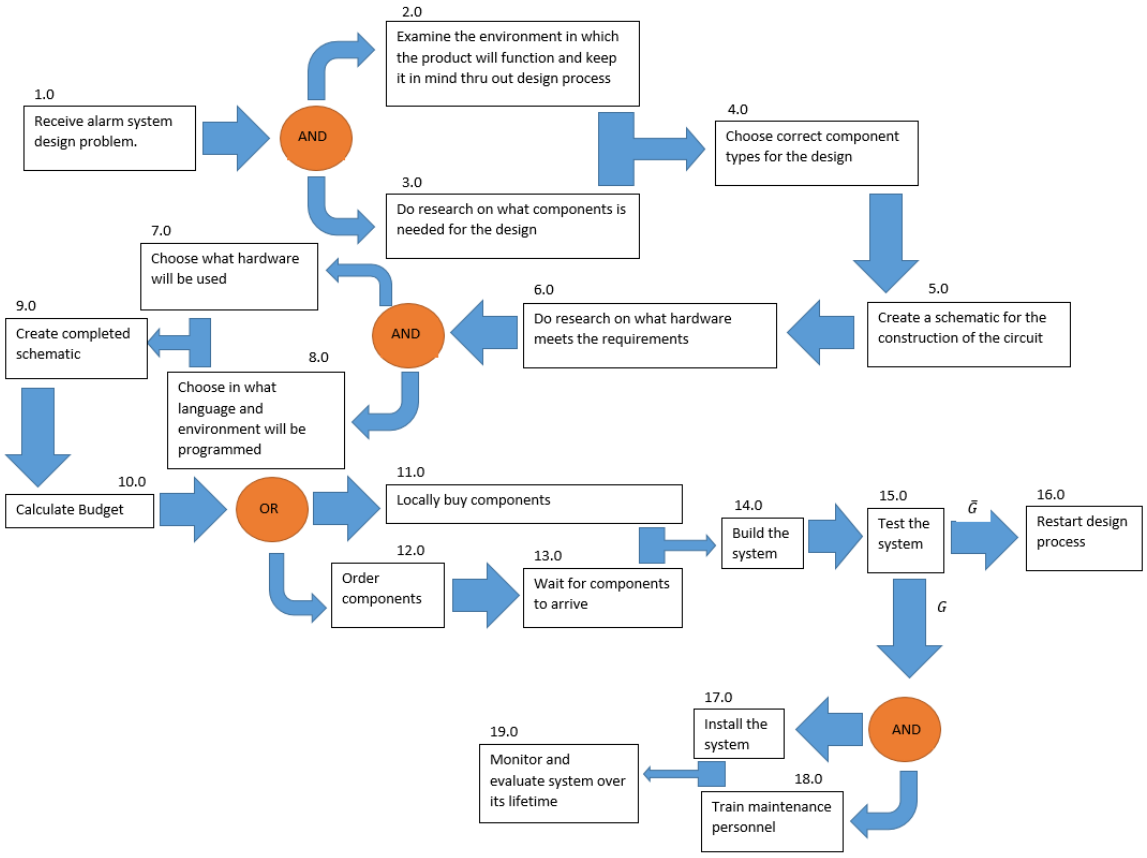


Figure 2: System Operational Flow

1.2 PHYSICAL REQUIREMENTS (FORM):

- The alarm panel as well as any sensors of the system must be IP54 rated.
- The alarm panel must be wall mountable
- The alarm panel must allow for wires to enter the panel without damaging the wires

1.3 INTERFACE REQUIREMENTS(FIT):

- The interface between the end user and the alarm will be both audio and visual, and be easily understandable
- All items on the functional architecture must be developed, apart from PIR and other sensors
- The single board computer (SBC) will be a Raspberry Pi

- The database server will initially be hosted on a laptop or student PC. Later implementation should be in the cloud, but cloud implementation is not a prerequisite to pass the module. However, clear proof must be provided that the database and monitoring software on the PC has been designed by following the design process
- An output will be provided to the Power Block to show that motion has been detected on an “outdoor sensor”
- The input power to the Alarm Panel will be provided from the Power Block and will be 12V at a maximum of 6W
- The Alarm Panel will provide its own internal voltages for the SBC and other components
- The IoT link will be a transparent GSM link that replaces the Ethernet. LoRaWAN can be used at the end of the project if time allows
- The interface between the incoming power and the internal power supply of the system will be a two-wire interface, positive and negative wire, to be connected to the system with screw in wire terminals.
- The placement on the wall cannot be too high as it will make it difficult for users to access the panels
- The placement cannot be to low either as it may become a risk for small children
- The placement should not be over pre-existing water pipes or wiring in the wall

1.4 ADITIONAL REQUIREMENTS:

1.4.1 Environmental Requirements:

- The alarm panel as well as any sensors of the system must be IP54 rated
- Will be made reasonably tamper proof
- Will be made from strong material to endure some wear
- The system must be protected against Electro Static Discharges, ESD.

1.4.2 Safety requirements

- The system will be grounded to ensure no electrical shocks can occur to an end user
- No open wires

- Not accessible to children
- No places where people can get shocked
- Closed box so that people who do not understand the device cannot tamper with it
- Reasonably tamper proof

1.43 Legislative Requirements (SAIDSA bylaw 25)

- Control equipment
  - Control panel installed min of 1.5 m form ceiling
  - Digital keypads must be of the data transfer technology type
  - Disarming delay no more than 30 seconds
- Signalling equipment
  - Signalling equipment will be positioned within the protected area
  - Not placed where telephone lines are vulnerable
- Maintenance
  - Inspect and test each detection device back to control panel
  - Inspecting alarm panel and transmitter
  - Inspect cables for visible damage

1.4.4 Usability Requirements:

- System must be easily operated with minimal training required to operate the system

- Compensation for mounting will be made for the control box

2 EXCEL PROJECT MANAGEMENT

Se additional document: Design 2017 - Project Management - Net 1 Bier .xlsx

3 ENGINEERING METHODS/SKILLS/TOOLS:

3.1 RANDOLPH BOCK

See additional Document: Design 2017 - Randolph ELO5 - Net1Bier.docx

3.2 ANTON DURANDT

3.2.1 SCOPE OF WORK:

- Design and implement a Direct ethernet / IP connection between SoC and Pc

- Design and implement an ethernet / IP connection via 3g between SoC and Pc

3.2.2 ASSUMPTIONS AND CONSTRAINS:

- Time constraint for use of LoRaWAN

3.3 FJ FOURIE

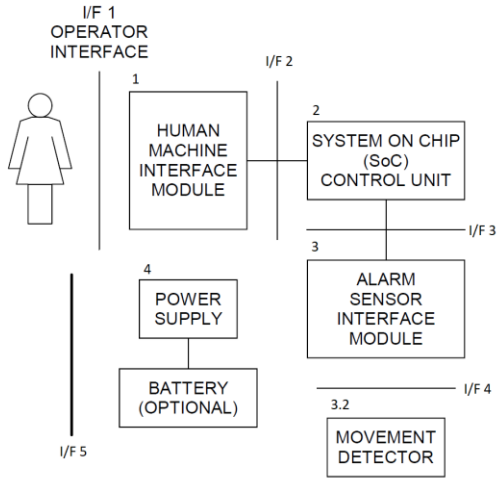
See additional Document: Design 2017 - FJ ELO5 - Net1Bier.docx

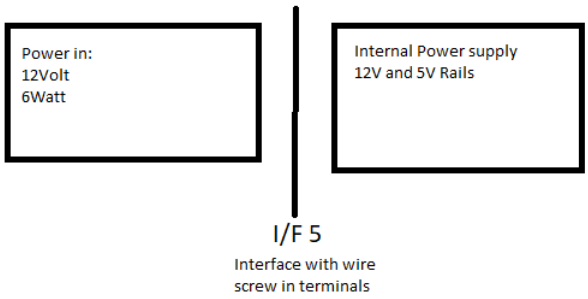
4 SUB-SYSTEM SPECIFICATION DOCUMENTS:

4.1 RANDOLPH BOCK

4.1.1 SUB-SYSTEM FUNCTIONAL ANALYSIS

4.1.2 SUB-SYSTEM INTERFACE DEFINITIONS





4.2 ANTON DURANDT

4.2.1 SUB-SYSTEM FUNCTIONAL ANALYSIS

4.2.2 SUB-SYSTEM INTERFACE DEFINITIONS

4.3 FJ FOURIE

4.3.1 SUB-SYSTEM FUNCTIONAL ANALYSIS

4.3.2 SUB-SYSTEM INTERFACE DEFINITIONS

5 DESIGN DOCUMENTATION:

5.1 SYSTEM DESIGN DOCUMAENTATION

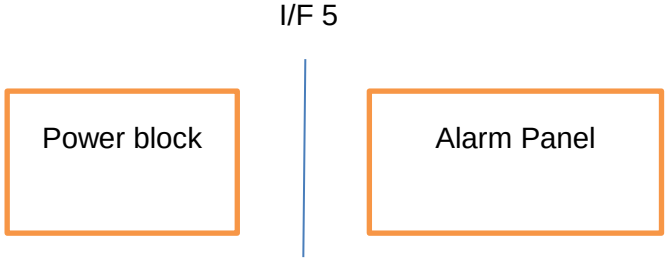
5.1.1 FINAL SYSTEM FUNCTIONAL DEFINITION:

5.1.2 SYSTEM CONCEPT DRAWINGS:

5.1.3 SYSTEM INTERFACE DEFINITIONS:

Interface control document (I/F 5)

This interface control document is the interaction between the power block and the alarm.



Electrical requirements

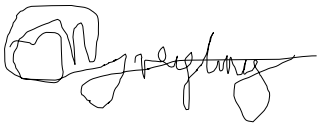
The power block will provide 12 V and 6 W power to the alarm panel.

Mechanical requirements:

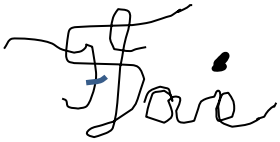
The mechanical interface will be a two-point screw terminal for both sides so that a wire can be connected between the two.

This document was signed in Potchefstroom on the date 2017/09/4 as an agreement between the EERI327/ INEM327 and REII327 students in regard to the power supply to the alarm panel. This document is binding until the end of the 3rd year design module 2017.

Representatives



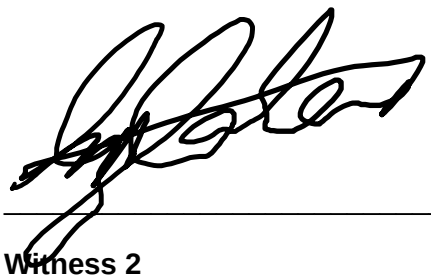
C.F. Greyling



FJ Fourie

Witnesses

Witness 1



Witness 2

5.1.4 SYSTEM INTEGRATION TESTING:

5.2 SUB-SYSTEM DESIGN DOCUMENTATION:

5.2.1 TECHNOLOGY SURVEY/DATASHEETS

5.2.2 APPLICATION NOTES

5.2.3 TRADE OFF STUDIES

Visual Human Machine interface (I/F 1):

	LCD Screen	LED's	7-Segment		Weight
Cost	3	10	7		0,5
Reliability	6	9	7		0,3
Ease of use	6	7	6		0,2
	4,5	9,1	6,8		

Input Human Machine interface (I/F 1):

	Remote	Turn key	Keypad		Weight
Cost	1	5	9		0,5
Reliability	2	2	8		0,3
Ease of use	7	9	6		0,2
	2,5	4,9	8,1		

5V Voltage regulator

	LM7805	LM371	usb1002		Weight
Efficiency	3	4	8		0,5
Cost	8	8	7		0,2
Reliability	7	8	9		0,3
	5,2	6	8,1		

5.2.4 DESIGN DRAWINGS:

5.2.5 BEHAVIOURAL MODELLING

5.2.6 DESIGN IMPLEMENTATION:

5.2.7 SUB-SYSTEM TEST AND EVALUATION: