

1503008

by Emyr Dyer

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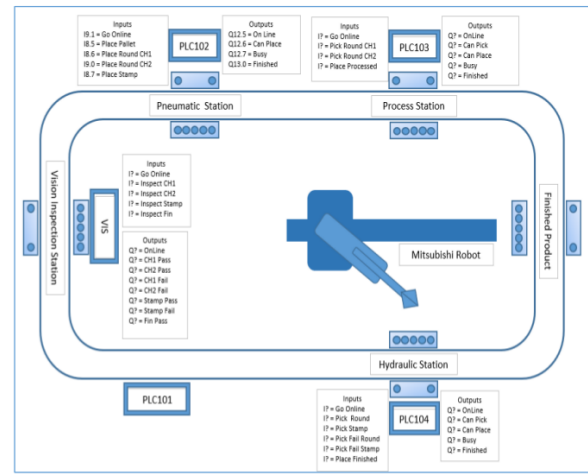
Prifysgol Cymru
Y Drindod Dewi Sant
University of Wales
Trinity Saint David

Automation Browser Application - Project Presentation 1

Emyr Wyn Dyer

CIM System

- Used as a engineering demonstrator
- Controlled by a Siemens S7-1200
- Each linked to own SIMATIC HMI
- Main PLC linked to 12-inch SIMATIC



The Problem

- Accessibility to Interface
- Usually Addressed by SCADA
- SCADA is costly



Constraints

- Who owns the IP?
- Commissioned by the College
- Ethical Considerations
- Health & Safety and Personal Security of Individuals
- Reduce Carbon Footprint
- Re-use hardware

Functional Design Specification

- Utilise the S7-1200 Webserver feature
- No flicker to reduce risk of epileptic seizures
- Equal in performance to existing HMI
- Independent LAN
- Password

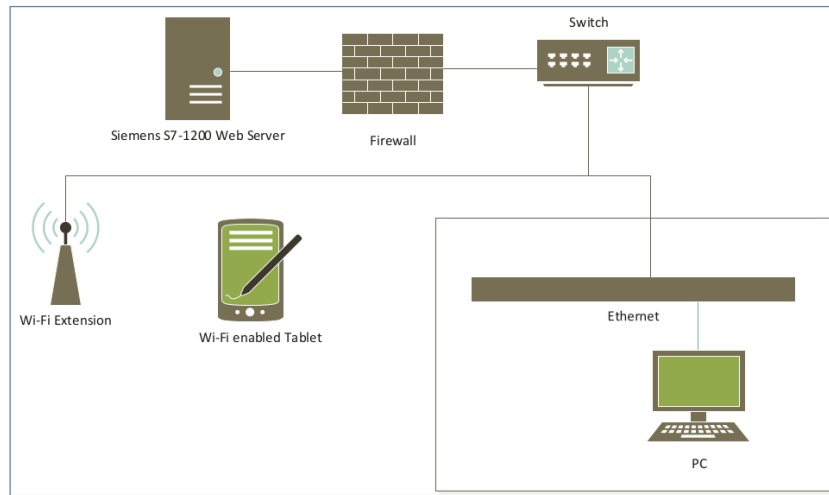
Project risks

- Missed aspects and quirks of technology
- Poor evaluation of competition
- Mounting costs
- Skill development
- Time lost through illness

Health and Safety

- The Health and Safety at Work act 1974
- Electricity at Work regulations (1989)
- Display Screen Equipment Regulations (1992)

All Solutions



SOLUTION 1 – WINCC SCADA

- Advantage – Uses Profinet
- Disadvantage – Expensive at £2,511 for basic licence with 200 tags

1. The Physical Layer	Cisco Switch, Wireless Extension via Extender/Access Point or Wireless Router
2. The Data Link Layer	LAN (Local Area Network)
3. The Network Layer	IPv4 (Internet Protocol Version 4)
4. The Transport Layer	TCP (Transmission Control Protocol, Open Communication Block)
5. The Session Layer	PAP (Password Authentication Protocol)
6. The Presentation Layer	Transport Layer Security (Data Encryption)
7. The Application Layer	WinCC (Code Structure), DHCP (IP Addressing for Network Devices)

SOLUTION 2 – HTML WEBPAGES

- Advantage – Open Source Technology
- Disadvantage – Can affect PLC performance (lag)

1. The Physical Layer	Cisco Switch, Wireless Extension via Extender/Access Point or Wireless Router
2. The Data Link Layer	LAN (Local Area Network)
3. The Network Layer	IPv4 (Internet Protocol Version 4)
4. The Transport Layer	TCP (Transmission Control Protocol,
5. The Session Layer	Open Communication Block)
6. The Presentation Layer	PAP (Password Authentication Protocol)
7. The Application Layer	JSON (Handle PLC Variable data), Transport Layer Security (Data Encryption), HTML and JavaScript/Query(Code Structure), AJAX (Data Requests), DHCP (IP Addressing for Network

SOLUTION 3 – Android Studio Application

- Advantage – Access to Android device features
- Disadvantage – Cloud computing features may compromise security

1. The Physical Layer	Cisco Switch, Wireless Extension via Extender/Access Point or Wireless Router
2. The Data Link Layer	LAN (Local Area Network)
3. The Network Layer	IPv4 (Internet Protocol Version 4)
4. The Transport Layer	TCP (Transmission Control Protocol, Open Communication Block)
5. The Session Layer	PAP (Password Authentication Protocol)
6. The Presentation Layer	JSON (Handle PLC Variable data), Transport Layer Security (Data Encryption)
7. The Application Layer	C++ (Code Structure), AJAX (Data Requests), DHCP (IP Addressing for Network Devices)

Comparisons

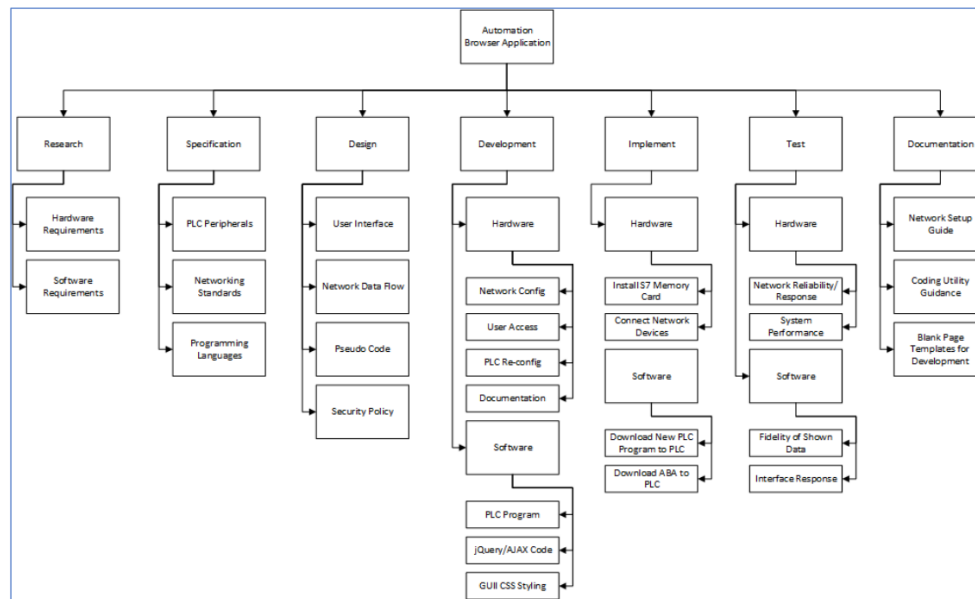
Aspect	Solution 1	Solution 2	Solution 3
Cost	£2,511 minimum (1 Point)	£169 (12 MB Memory Card) (3 Points)	Use own Smartphone and Tablet for testing (5 Points)
Compatibility	Total Siemens Compatibility (5 Points)	Built-in and manufacturer recommended technology used (5 Points)	Built-in technology used but with unconventional development software (3 Points)
Theoretical Performance	Development Software (WinCC) made for Siemens PLCs (5 Points)	Using AJAX and JSON (5 Points)	Temperamental Android hardware characteristics (1 Point)
Total Points	11 Points	13 Points	8 Points

Test planning

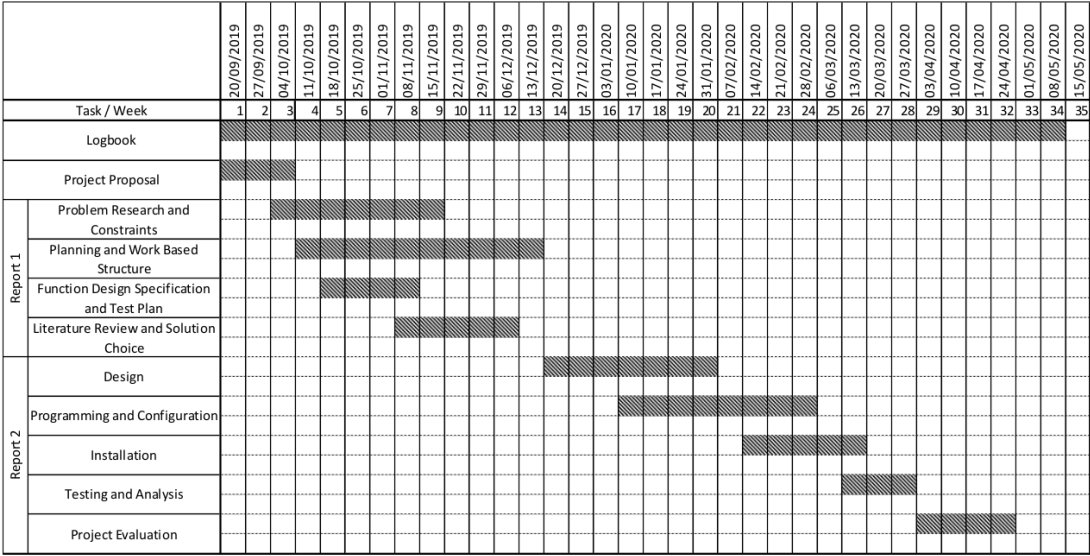
4.2 TEST PLAN

Test No.: _____ Date of Test: ____/____/____				
Test Step	Test Description	Target	Actual	Pass/Fail and Comment
1	Does the ABA start? Tested by opening Address/Shortcut to ABA.	ABA Opens		
2	Measure response time between the PLC and User Input and Feedback to ABA	= or < 1 second		
3	There should be at least 1 page per CIM System Station. Are all Stations represented in the ABA?	1 Page minimum per Station		
4	Readings displayed are accurate to values read and stored in the PLC. Achieved by comparing ABA to online connection to PLC through Step7.	Values are within 1%		
5	Do the Security Measures perform as expected? Security measure rejects login attempts after failure.	Login rejected		
6	Does the ABA at any point lose connection to the CIM System? Measured by desynchronization of values between PLC and ABA.	Continuous Connection		
7	When Operating are there any failures to proceed. (CIM System stops without warning)	No unexpected stoppages		
8	When ABA is running, are there any failures to Start or Stop the CIM System?	Starts and Stops on command		

Work Breakdown Structure



Gantt Chart



FINAL GRADE

GENERAL COMMENTS

60/100**Instructor**

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GRADING FORM: NEW CSG-RUBRIC

**EMYR
DYER****60****1. ENGAGEMENT WITH LITERATURE**

Engagement in research, for project background (/5) Some references made to standards. Evidence of research was demonstrated, particularly for wider issues such as ethical engineering (4/5) Engagement in research, for review of solutions (/5) Some evidence provided. Limited evidence of this in the presentation due to running out of time (2/5) Total = 6/10

6**2. KNOWLEDGE AND UNDERSTANDING**

Project background (/5) Good details given on CIM system for use by college students. Need stated for SCADA or equivalent. Project explained as a modification to the existing CIM system at Coleg Sir Gar (3/5) Project risks, health and safety etc (/5) Good list and explanations offered. Ethical engineering explained in some detail, limited assessment of risks to the project success. (4/5) Response to questions

14

1, 4, 7 and 8 (/10) Good responses given. Some limited answers to the ethical engineering questions; mentioned AJAX and ISO9001. (7/10) Total = 14/20

3. COGNITIVE AND INTELLECTUAL

 Problem Definition and constraints (/10) Briefly explained. A generic description which lacked detail and didn't address any specifics (5/10) Functional Design Specification (/10) Good list given, briefly explained. Explained use of S7-1200 webserver (7/10) Test planning (/10) Listed and explained in a table. An 8 stage test schedule was explained, although some performance metrics were vague. (5/10) Response to questions 2 and 6 (/5) Good responses given. Details of these questions were covered in the presentation itself (3/5) Total = 20/35 **20**

4. PRACTICAL APPLICATION

 Critical choice and justification of final solution (/10) Briefly stated but little time given to explanation. Ran out of time, unable to cover this in the presentation. (3/10) Project Planning and working breakdown structure (/10) WBS and Gantt chart explained. Gantt chart should be more detailed. Evidence of planning through a simple Gantt chart and a complex WBS (6/10) Response to questions 3 and 5 (/5) Good responses given. Questions on code of conduct and management techniques were well answered. (4/5) Total = 13/25 **13**

5. TRANSFERABLE SKILLS

 All sections: Quality of the presentation slides – (/5) Very good. Most slides were generally readable and well presented. (4/5) All sections: Quality of the delivery style – (/5) Very good but over ran by 1 minute. Slightly nervous, as to be expected, but confidently presented. Too much time spent on ethical engineering meant no time to cover the technical aspects. (3/5) Total = 7/10 **7**