UNIVERSITI MALAYSIA PERLIS

UniMAP SMART CAMPUS

www.unimap.edu.my

UniMAP SMART CAMPUS

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Foreword By The Vice Chancellor

Assalamualaikum Warahmatullahi Wabarakatuh

Salam Ilmu Keikhlasan Kecemerlangan UniMAP

Alhamdulillah, let us express praise and gratitude to Allah Aza Wajalla for the blessings and mercy, as well as peace be upon the great Prophet Muhammad SAW and his companions.

First of all, I would like to express my appreciation and gratitude to the Digital Development and Management Center (DMDC) for the initiative to develop and publish this Smart Campus booklet. Indeed, this initiative is in line with the UniMAP Digital Transformation agenda.

I believe that being in the Fourth Industrial Revolution (IR 4.0) where the technology dominates our way of life, it is an obligation for UniMAP to move in line with the technological change. UniMAP is embarking on a transformation to elevate the university from conventional to smart university. Various decisions need to be made to implement the best solution for the university including in terms of technology selection, system usage maximization, and university unification. Such importance is to ensure that all of us are clear with the goals and targets outlined.

To be a smart university, numerous innovations need to be evaluated, contemplated and implemented. This booklet gives an overview on the problems arise due to the system's drawbacks. The results obtained from our researches have outlined solutions that InsyaAllah will resolve the problems as well as turn this university into a smart university.

I hope that this booklet will promote an efficient working process, save time and reduce bureaucracy for the UniMAP community for both staff and students which in turn I believe will help improve the quality of life for the university community.

May this booklet bring benefits to us. InsyaAllah.

Prof. Ir. Ts. Dr. R Badlishah Ahmad
Vice Chancellor of UniMAP

Chief Digital Officer's Message

Bismillahirrahmaniirrahim
In the name of Allah the most Beneficent and the most Merciful

When I was appointed as the Chief Digital Officer (CDO) in UniMAP, the first thing that came to my mind was to further improve and develop the existing facilities and infrastructures to aid the digital transformation of the university in tandem with the initiatives of the education ministry and government.

Therefore, Smart Campus is one of my targets to ensure the successful implementation of the digital transformation agenda in UniMAP and follows Malaysia's mission in leading the way in the Industrial Revolution 4.0 paradigm, which requires transformation and evolution towards complete digitization.

UniMAP has taken proactive steps in implementing and transforming various technologies to transform the university into a digitally connected campus that will surely benefit students, faculties, and the surrounding communities.

One of the initiatives is creating a cashless campus. This was implemented during last year's convocation ceremony. We hope that this initiative will encourage students to be digitally-savvy and be more engaged in university life as well as to be able to compete successfully in today's digital economy. On top of that, this initiative will also make transactions seamless and boost revenues.

UniMAP is expected to implement many more technologies that are planned to fully transform the university into a smart campus. UniMAP recognizes that being a smart campus can improve the quality of life and strengthen its mission in research and teaching, in line with the Industrial Revolution 4.0. This is the road to a smart campus that we have to reach and therefore, we need to work together to accomplish this mission. Implementation of any strategies will only succeed with the cooperation and commitment of all members of this university, especially the staffs and students so that we can accomplish this mission in the near future.

As CDO, I am here to listen and to learn. To learn from the good practice you share across your network and to learn from the practical steps you recommend to deliver change. I welcome any recommendations to make us a better smart campus. Thank you.

Prof. Ir. Dr. Anuar Mat Safar
Chief Digital Officer
Digital Management and Development Centre (DMDC)

Introduction

Smart campus is an evolving trend that enables educational institutions to integrate digital technologies with physical infrastructures at the campus. The vision of a smart campus relies on a diverse stack of technological capabilities, innovated for more efficient facilities, to improve decision-making processes and enhance the quality of life. Nonetheless, one campus cannot implement every existing technology, nor should it. Every campus should understand its technological needs in order to make the right decisions for their campus. Hence, designing a smart campus requires selection of the right technology, maximizing the use of systems, as well as having a connected campus to ensure that the entire campus can work together to achieve the shared goal.

In order to transform UniMAP to a smart connected campus, various innovations have been suggested and implemented. For example, Big data, blockchain and dashboard have been employed for the purpose of monitoring, planning, data collecting and optimizing resources in the operation of the university for better decision making. Furthermore, utilization of Mobile Apps & online systems of UniMAP Apps, as well as development of e-forms & e-DOMAS in order to have a centralized dashboard that can display critical information have also help improve efficiency in the monitoring and decision-making process.

Besides that, services and infrastructures have been enhanced with Smart Attendance System, Smart Lighting System, IoT Based Electrical Metering System, Gateless and Asset Tracking system, Cashless, eSubmission and Assessment for thesis and assignments, and so forth. The integration of these systems is to enhance the quality of life, especially for the students and management teams. At the same time, to ensure campus sustainability, the concepts of Low Carbon Campus, Zero Waste Campus and Biodiversity Campus are also taken into account along with these transformations.

A smart campus provides colleges and universities with technological advancements to refine the quality of classroom instruction and student learning. A smart campus offers a variety of smart, technological solutions that add value to student learning and their time on campus. When people, devices and applications on campus share a common technology infrastructure, they can interact with each other to enable experiences and efficiencies that were not possible before. The campus becomes a platform for innovation, thanks to IoT data and how it is used to enhance or create new services and efficiencies.

Big Data, Blockchain & Dashboard

1. UniMAP knowledge Lake (Big Data)
2. UniMAP e-scroll Blockchain
3. Free Open Source Software (FOSS) Policy
4. UniMAP Dashboard

Mobile Apps & Online System Development

1. UniMAP Apps
2. e-Form
3. e-DOMAS

Services & Infrastructure

1. Smart Lighting System For UniMAP Campus
2. IoT Based Electrical Metering System
3. Smart Monitoring System Using RFID (Gateless and Asset Tracking)
4. Cashless
5. Common Platform for API - APPS/Software Development
6. IP Phone, Video Conferencing &Campus Wide CCTV
7. Improved Email services
8. Enhancing eLearning system & Smart Classroom – Moodle
9. eSubmission and Assessment (Thesis, Assignments)
10. Electric Buggy/Bus

Sustainability

1. Climate Action Plan: Low Carbon Campus
2. Pollution: Zero Waste Campus
3. Preservation of Ecosystem: Campus Biodiversity

Section A

Online System, Big Data & Blockchain

Projects : 1. UniMAP knowledge Lake (Big Data)
2. UniMAP e-scroll Blockchain
3. Free Open Source Software (FOSS) Policy

Associate Professor Dr. Shahrul Nizam Yaakob (Project Leader)
Associate Professor Ir. Ts. Dr. Mohd Nazri Mohd Warip
Ts. Mohd Fitri Edros

1. UniMAP Knowledge Lake (Big Data)

Problem Statements

a) The top management of the university faces difficulties in knowing the strategic information of the University for Decision making. This is because the existing data operates separately for each department and the data are not consolidated.
b) There is a need for these data to be consolidated into one data warehouse for the purpose of monitoring, planning, data collection and optimizing resources in university operations.

Objectives

a) Promote seamless data sharing between all information systems.
b) Coordinate data management, data processing, data analysis and business intelligence to support strategic planning for the use of Top Management in decision making.
c) Consolidate University-level data including staff, student, administration, human resources, talent management, academic, research, public data, corporate, government, student affairs, finance, facility / maintenance information system and ISO standards.
d) Conduct analysis and provide regular reports on university data.

Timeline

UniMAP Knowledge Lake (Big Data)

JAN 2020 – JUN 2020

- Server And Vmware Installation
- Etl Tools Deployment
- Etl Tools Testing
- Data Warehouse Development
- Data Mart Preparation (Data Source)
- Undergraduate Module
- Postgraduate Module
- Student's Affair Module
- Residental College Module

JULY 2020 – SEPT 2020

- Financial Module
- Human Resource Module
- R&D Module
- Sabatical Module
- Health Module

OCT 2020 – DEC 2020

- Hardware Preparation and Installation
- Data Gateway Software Installation and Configuration
- Big Data Infrastructure Testing

JAN 2021 — APR 2021

- Development of Model Dashboard - Postgraduate Module
- TOT Session for Digital Center Technical Staff
- Formation of Knowledge Agenda Secretariat
- TOT Session for assistant registrar from Other Department

MAY 2021 — JULY 2021

- Dashboard Development base on priority
- Dashboard can be viewed by Top Level Management (University Management Committee & Board of Directors)

AUG 2021 — DEC 2021

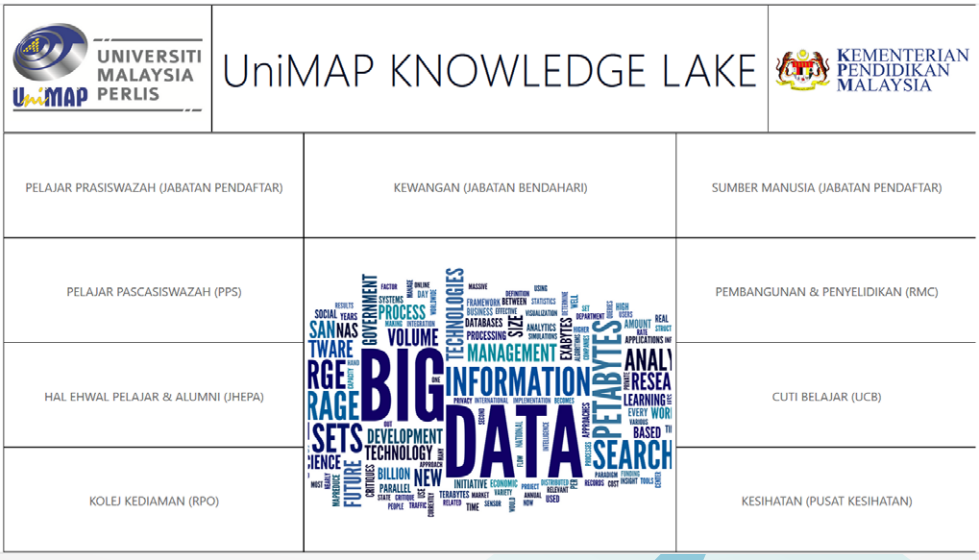
- Expansion of Dashboard access to Head of Department
- Analytic Data
- API integration

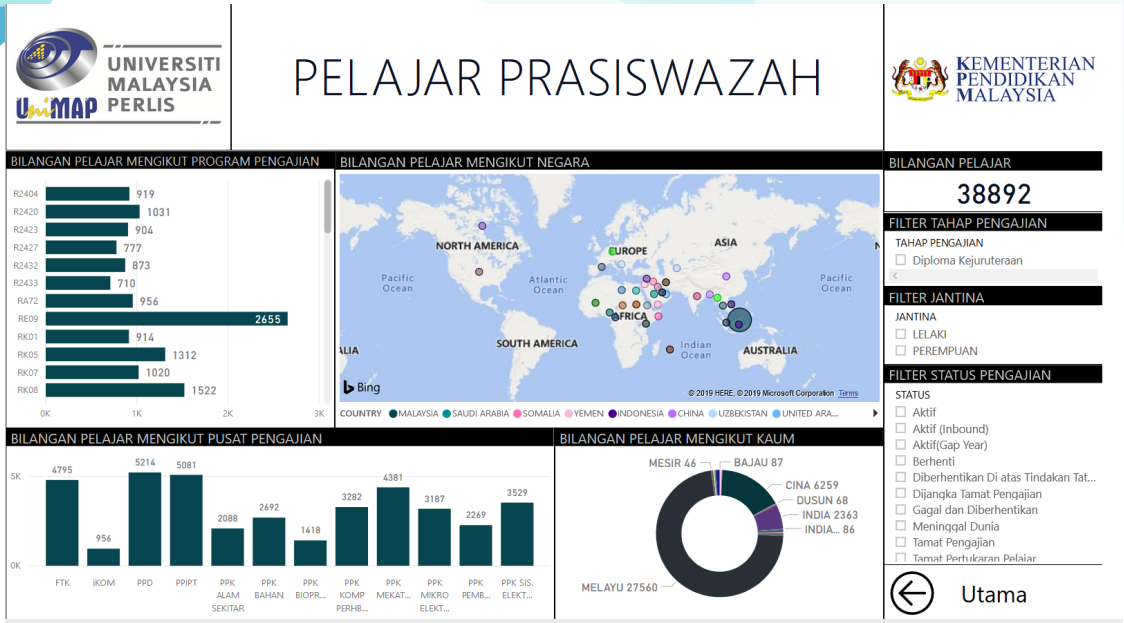
Budget (Big Data) RM350, 000.00

NO	SOFTWARE	YEAR 1	YEAR 2	PRICE
1	ETL TOOL - Microsoft SQL Server Integration Services	RM60,000.00	RM60,000.00	RM120,000.00
2	Analytic Software Microsoft Power BI	RM15,000.00	RM15,000.00	RM30,000.00
3	Training			RM30,000.00

Description	Hardisk 10K RPM	Hardisk SATA	CPU	RAM	PRICE
ETL Server	14.4 TB	480GB	16 Core	480GB	RM80,000.00
Data Warehouse Server	14.4 TB	480GB	16 Core	480GB	RM60,000.00
Server					RM30,000.00

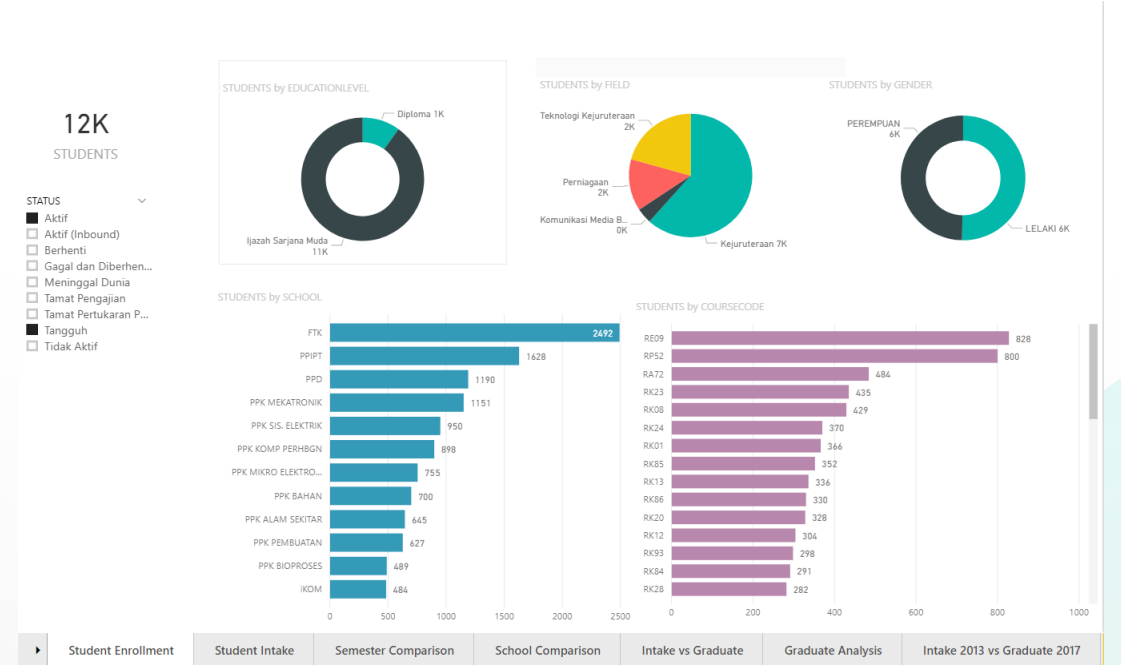
Outcomes / Prototype Project





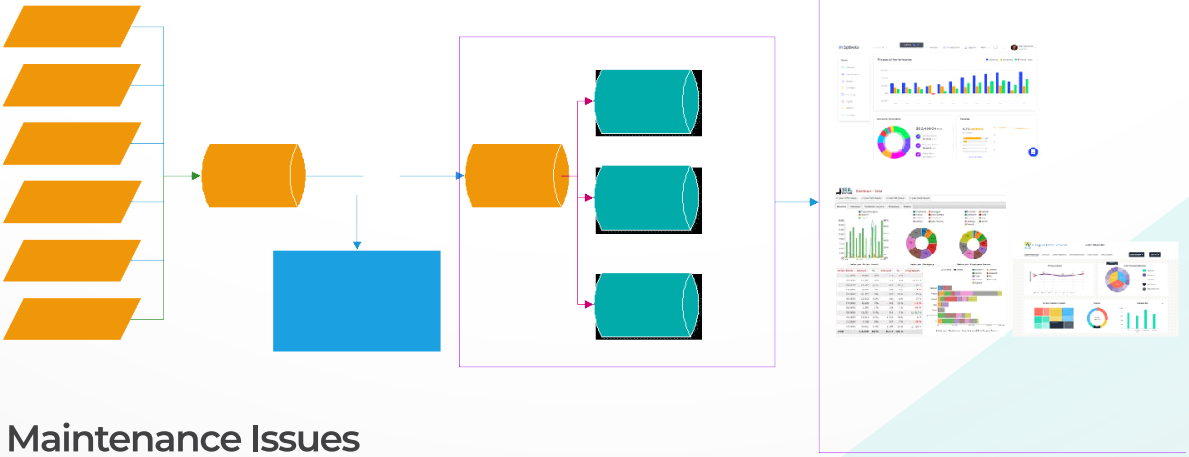
Firefox Version 71.0

Microsoft Windows 10 Home Single Language 32-bit Build 6.2.9200



Microsoft Power BI Desktop Version 2.75.5649.961 (19.11)

Microsoft Windows 10 Home Single Language 32-bit Build 6.2.9200



Maintenance Issues

a) ETL Software license has to be renewed annually.
b) Microsoft Power BI software analytic license has to be renewed annually.
c) Maintenance cost of server and operating systems for security updates (patching).
d) Expensive fee for Data Science Course for technical staff.

2. UniMAP e-Scroll Blockchain

Problem Statements

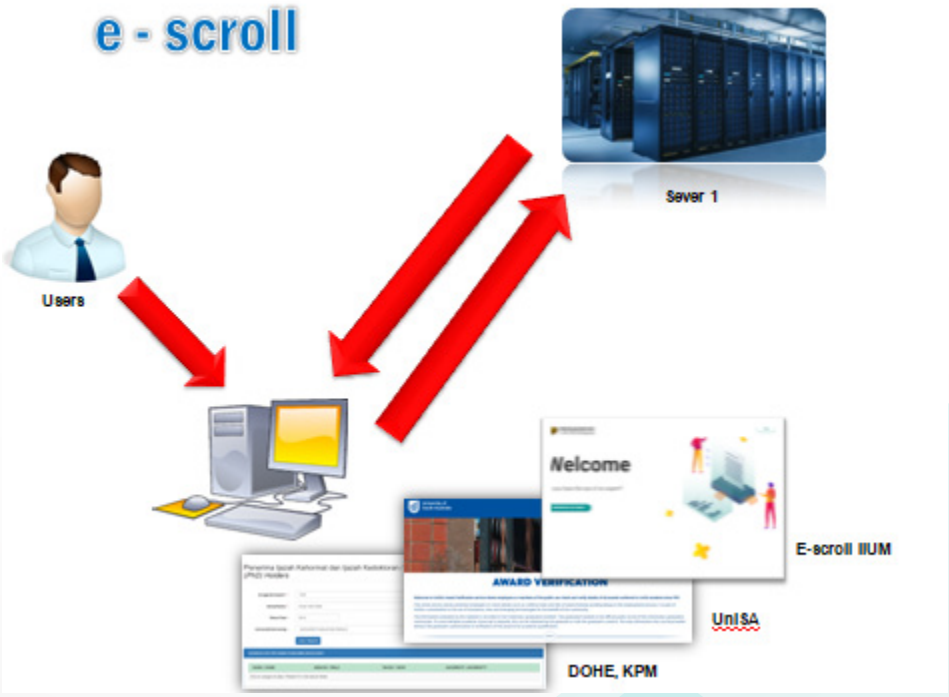
a) What if nature disasters happening to data center like what happening to UMK data center at Kelantan?
b) Hackers attack our data center.

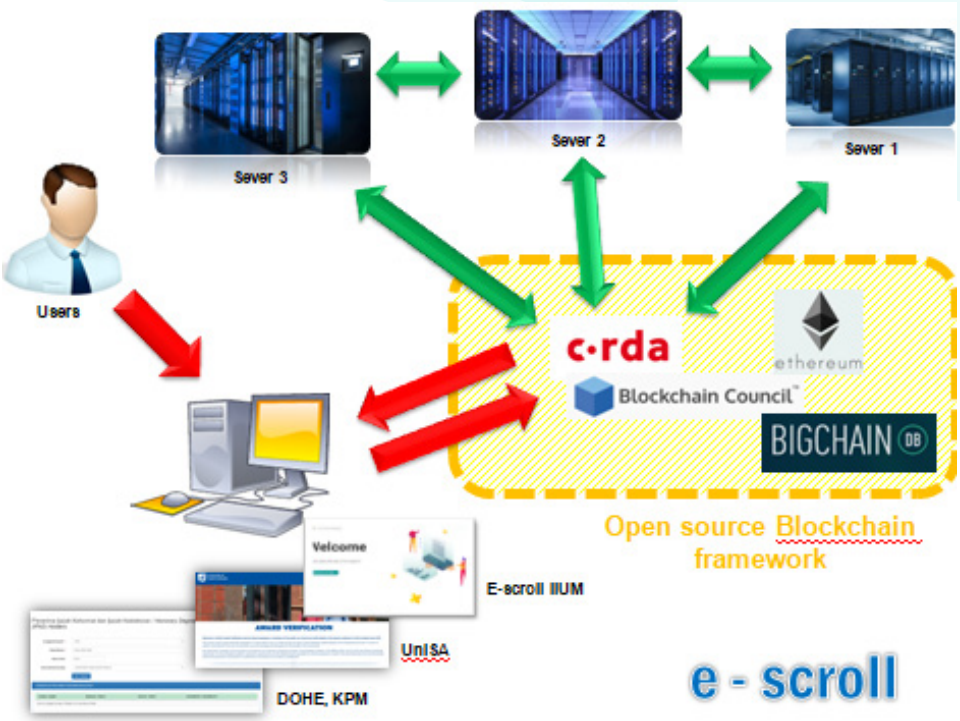
Objectives

a) To find which Blockchain technology that suitable used by UniMAP
b) To decide which database that can be used or can be safeguard by Blockchain technology (e.g. certificate for graduated student, staff information)

Projects

a) Create an expert member to evaluate which current Blockchain technology that can be used.
b) Execute the proposed/interested blockchain technology at UniMAP for specific application (e-scroll).




Sever 3
Sever 2
Sever 1
Users
c·rda
ethereum
Blockchain Council
BIGCHAIN DB
Open source Blockchain framework
Welcome
E-scroll IIUM
UniSA
DOHE, KPM
e - scroll

3. Free Open Source Software (FOSS) Policy

Objectives

a) Provide a framework relating to best practice principles to support the use of FOSS in UniMAP.
b) Designing and planning the FOSS implementation plan for UniMAP
c) Encourage and provide awareness of FOSS in organizations. (FOSS initiative)
d) Provide a cohesive approach to FOSS training at UniMAP

Outcomes

a) Total cost of ownership can be reduced.
b) The freedom to choose software can be improved.
c) Interoperability between systems can be improved.
d) The development of knowledge-based staff in FOSS.

Section B :

Mobile Apps, Dashboard and System Development

Projects : 1. UniMAP Dashboard
2. UniMAP Application
3. e-Form
4. e- Document Management System (e-domas)

Associate Professor Dr. Mohd Azrik Roslan (Project Leader)
Associate Professor Dr. Azremi Abdullah Al Hadi
Associate Professor Dr. Ammar Zakaria

1. UniMAP Dashboard

Problem Statements

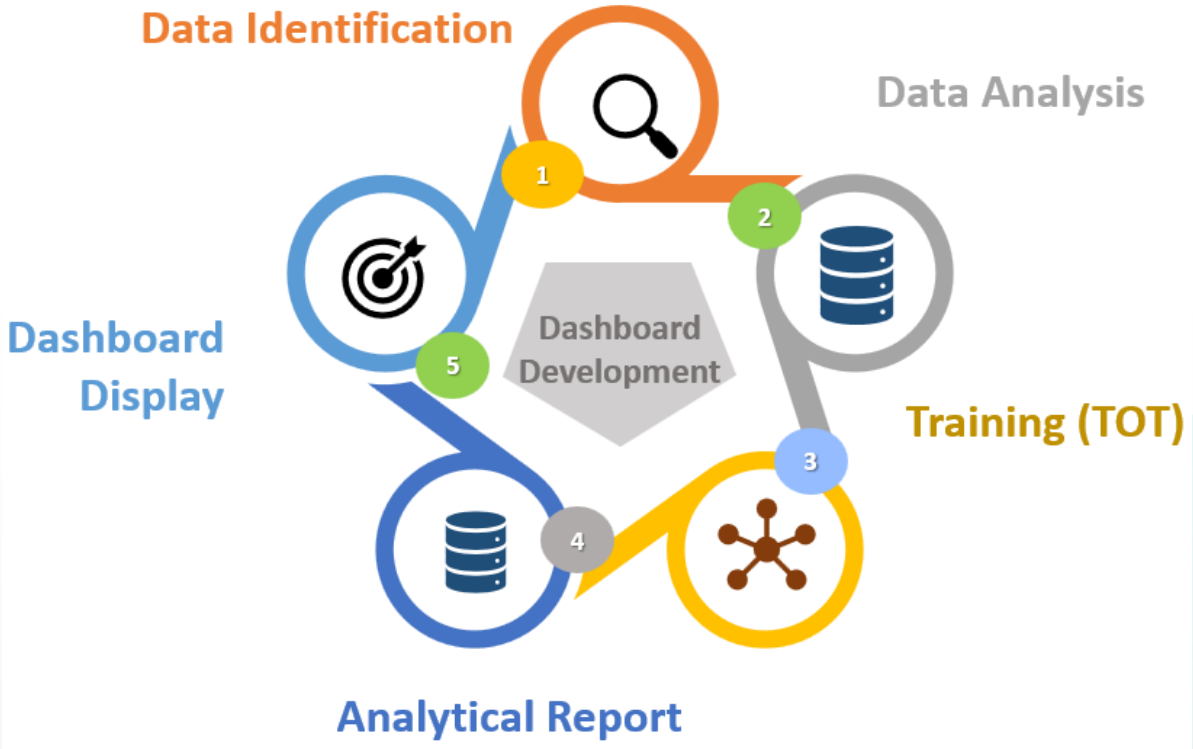
a) Non-centralized information
b) Lots of unprocessed information
c) Information takes long time to acquire
d) Will incur delay in decision making process

Objectives

a) To have a centralized dashboard that can display critical information that can be used for efficient monitoring and decision making process.
b) To provide comprehensive insight performance.
c) To improve decision making process

NO	DEPARTMENT	DATA SUGGESTIONS
1	Registrar	Human Resource Study leave Student Performance Status Students and staffs statistics
2	Academic and International Affairs	Academic statistics
3	Student Affairs & Alumni	Pillars Sismi
4	Research & Innovation	MyRA Patent and IP statistics Innovation statistics
5	Bursar	Debit reports
6	Library	Debit reports
7	Centre for Strategy and Quality Management	QS, THE, Ranking and Rating ISO Audit performance
8	Centre for Entrepreneurship, Industry & Community Network	MOU, MOA Industry statistic Industrial Training Statistic Industrial Labs
9	University Health Centre	Student and Staffs health statistics Drugs statistics
10	Development Department	Assets and facilities statistics Disposal statistics Energy Consumption statistics Transportation statistics

NO	Department	Data Suggestions
11	Academic Management Centre	International Mobilities Collaborations Statistic
12	Centre for Sustainable Academic Leadership (LEAD)	Blended Learning Statistics
13	Student Housing Centre	Residental Statistics
14	Sport and Recreation Centre	Statistics of Sports assets and facilities Statistics of sports tournament
15	UniMAP Press	Statistics of publication



Timeline

Process	Duration	Departments
Data Identification	2 Months	Data Owner
Data Analysis	3 Months	DMDC
Data Identification	1 Month	DMDC
Training (TOT)	3 Months	Data Owner
Analytical Report	3 Months	DMDC
Integration	3 Months	DMDC
Dashboard Development (Web Based)		DMDC
Mobile Apps Development	2 Months	DMDC
System Development (Data Entry Digitalization)	4 Months	DMDC

Budget

No.	Item	Budget
1	Training (TOT)	RM30, 000
2	Mobile Apps Development	RM10, 000
3	System Development (Data Entry Digitalization)	RM30, 000

2. UniMAP Application

Problem Statements

a) UniMAP has many systems but all of them are not integrated.
b) Staff and students need to login multiple times to access different system

Objectives

a) To enable a single login for multiple system

Suggestions

a) All systems in UniMAP can be accessed using a single login.
b) All available system will be linked in UniMAP Apps
c) ICT already develops UniMAP Apps but it is not a single login.

Application Available

3. e - Form

Problem Statements

a) Some procedures in UniMAP are still using manual form.
b) It is difficult for the student to go around the campus to get their form approved.
c) Using manual form, it is difficult to trace the progress (approval) of the form.

Objectives

a) To simplify procedures in UniMAP by having an online form.
b) To ensure easy tracking of approval for related procedures.

e-Form (Academic)

No	e-Form	Status
1	*Borang HEA-06: Borang Penilaian Kursus*	Completed
2	*Borang HEA (A) - 01[b] - Borang Penawaran Kursus Baharu*	Testing
3	*Borang HEA (B) - 07 Borang Permohonan Tangguh Pengajian*	Not yet started
4	*Borang HEA (B) - 01 [a] Borang Permohonan Pengecualian Kredit*	Not yet started
5	*Borang HEA (B) - 06 Borang Permohonan Pertukaran Program Pengajian*	Not yet started
6	*Borang HEA (B) - 08 Borang Permohonan Berhenti Daripada Pengajian*	Not yet started
7	*Borang HEA (B) - 09 Borang Penamatan Pengajian Pelajar*	Not yet started
8	*Borang HEA (B) - 10 Borang Rayuan Kemasukan Semula*	Not yet started
9	Travel Mileage claims	Not yet started
10	*Tuntutan wang sendiri*	Not yet started
11	RND Online Form -Grant Application -Asset Registration for Research grant -Graduate Research Assistant (GRA)	Not yet started
12	Booking Driver Application	Not yet started

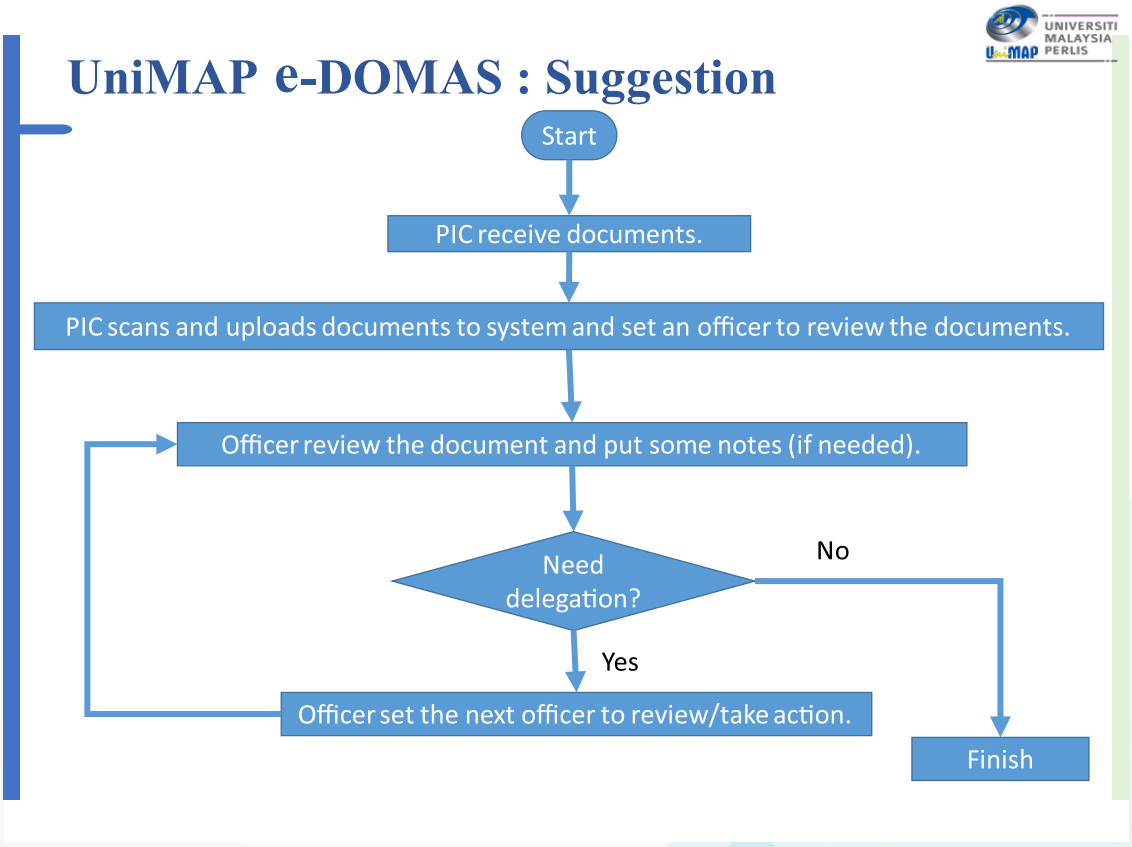
4. E-Document Management System (e-DOMAS)

Problem Statements

a) Departments / divisions face problems in managing documents (especially letters, forms etc) flow.
b) Difficult to trace the movement of documents.
c) So, documents missing in transportation.
d) Important instruction and information cannot be delivered to the correct person.

Objectives

a) To have efficient document management system
b) To have digitized documentation system
c) To support paperless initiative



Section C :

Services & Infrastructure

Projects : 1. Infrastructure
2. Services
3. Security & Access Management

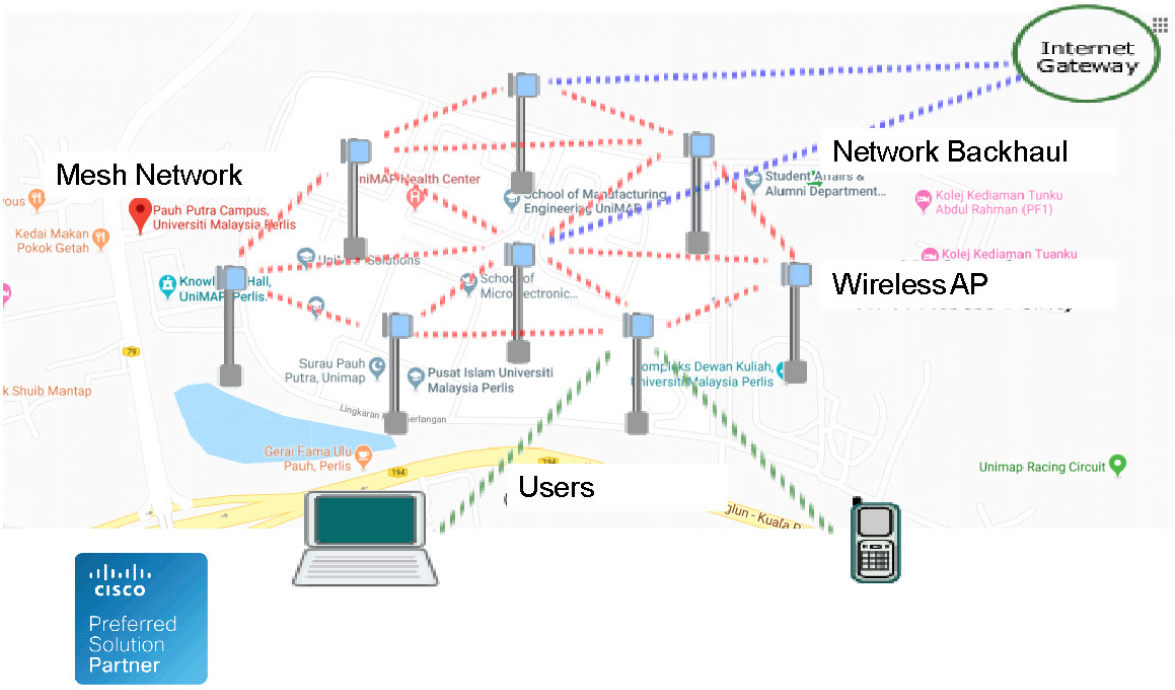
Associate Professor Dr. Latifah Munirah Kamaruddin (Project Leader)
Associate Professor Ir. Dr. Ruslizam Daud
Associate Professor Dr. Muzammil Jusoh
Associate Professor Dr. Haziah Abdul Hamid
Dr. Muhammad Izuan Fahmi Romli

1. Infrastructures
Problem Statements

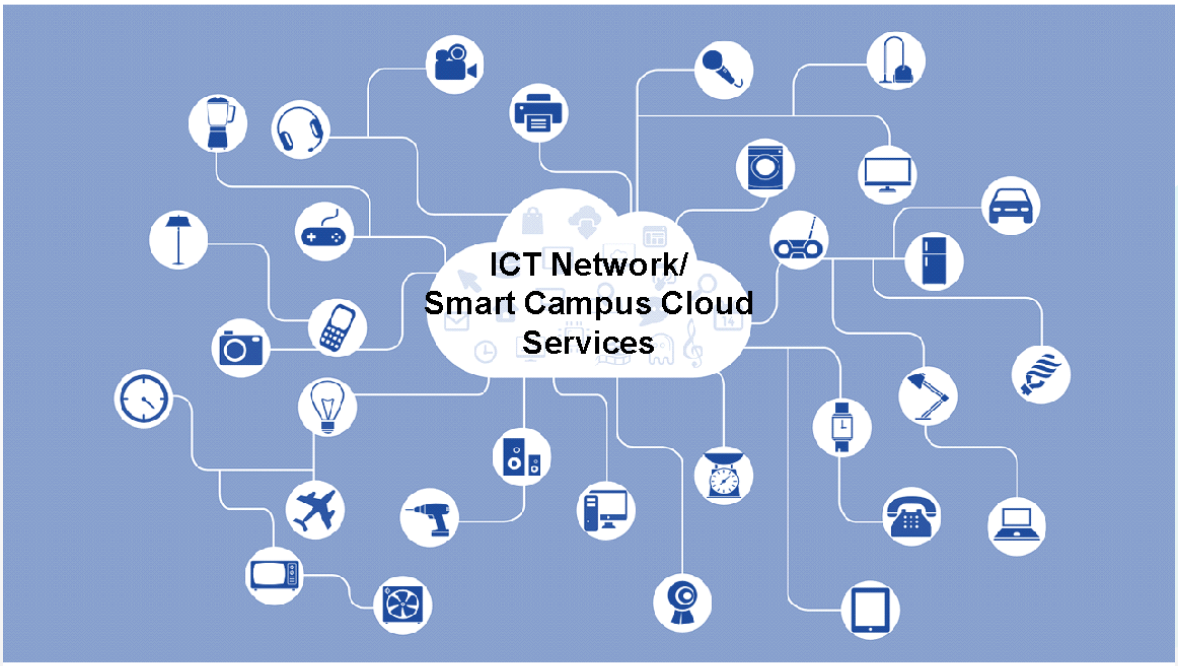
Current Infrastructure and platform unable to cater the stakeholder's requirements

a) Network Infrastructure
b) No centralized API/Database that cater Smart campus APPS
c) Academic Services (Classroom timetable managements, attendance system, Rooms book, vehicles availability and booking, Exam matters, etc)
d) Security (Community Security, Emergency Rescue, Guard System Managements) and Access Management (RFID, QR code, etc)
e) Urban Mobility (Parking Space, Live traffic Monitoring), Hospitality Services (Catering Service, Staff Selling System, Local Storage System, EV Bus)
f) Event Management (Digital Signage, Webcast)

No	Project Title	PIC	Completion Date	Description
1	Network Infrastructure - Transforming UniMAP to Smart Connected Campus	DMDC / Development department	Q2/2020	Solid Network Infrastructure is Critical for enabling Smart Campus – otherwise standalone
2	Common Platform for API - APPS/Software Development	DMDC	Q2/2020	Enable seamless integration and access to the database for any new development for smart campus by researchers and Students
3	IP Phone & Video Conferencing	DMDC / Development department	Q2/2021	Reduce cost Current: Fixed line: RM44,000/month
4	Campus Wide CCTV	DMDC / Development department / CEASTech	Q3/2021	Security and Safety

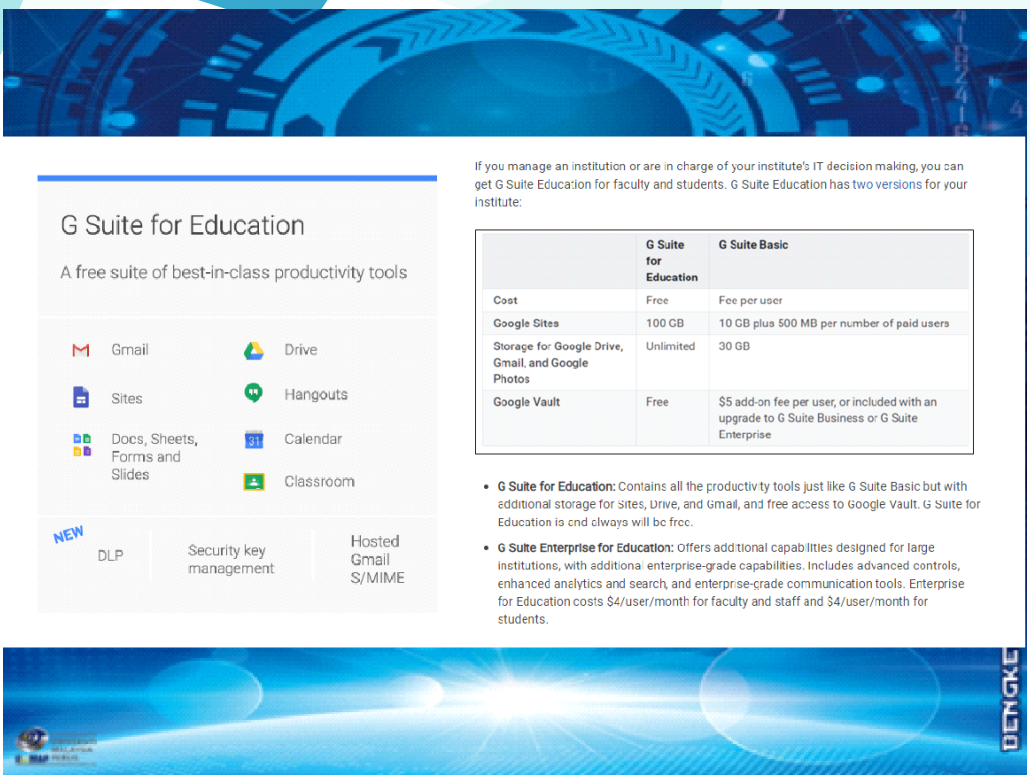

Internet Gateway
Network Backhaul
Mesh Network
Wireless AP
Users
Pauh Putra Campus, Universiti Malaysia Perlis
Kedai Makan Pokok Getah
Surau Pauh Putra, Unimap
Pusat Islam Universiti Malaysia Perlis
Gerai Fama Ulu Pauh, Perlis
Unimap Racing Circuit
Kolej Kediaman Tunku Abdul Rahman (PF1)
Kolej Kediaman Tuanku
cisco
Preferred Solution Partner

API


ICT Network/
Smart Campus Cloud
Services

2. Academic Services Project

No	Project Title	PIC	Completion Date	Description
1	Centralized Software Management - VPN	DMDC	Q2/2020	Enable License Sharing (MATLAB, EDS, CST) between department for cost optimizations
2	Improved Email services – i.e. Gsuite Education	DMDC	Q4/2020	Increase efficiency and flexibility in teaching and learning
3	Enhancing eLearning system & Smart Classroom – Moodle	LEAD	Q3/2020	Enable Real-time knowledge sharing (Class, Industry, international collaborators, VIVA,etc)
4	eSubmission and Assessment (Thesis, Assignments)	LEAD	Q1/2021	Paperless
5	eForm	DMDC	Q1/2021	Accept electronic Approval (Claim, Leave, etc)

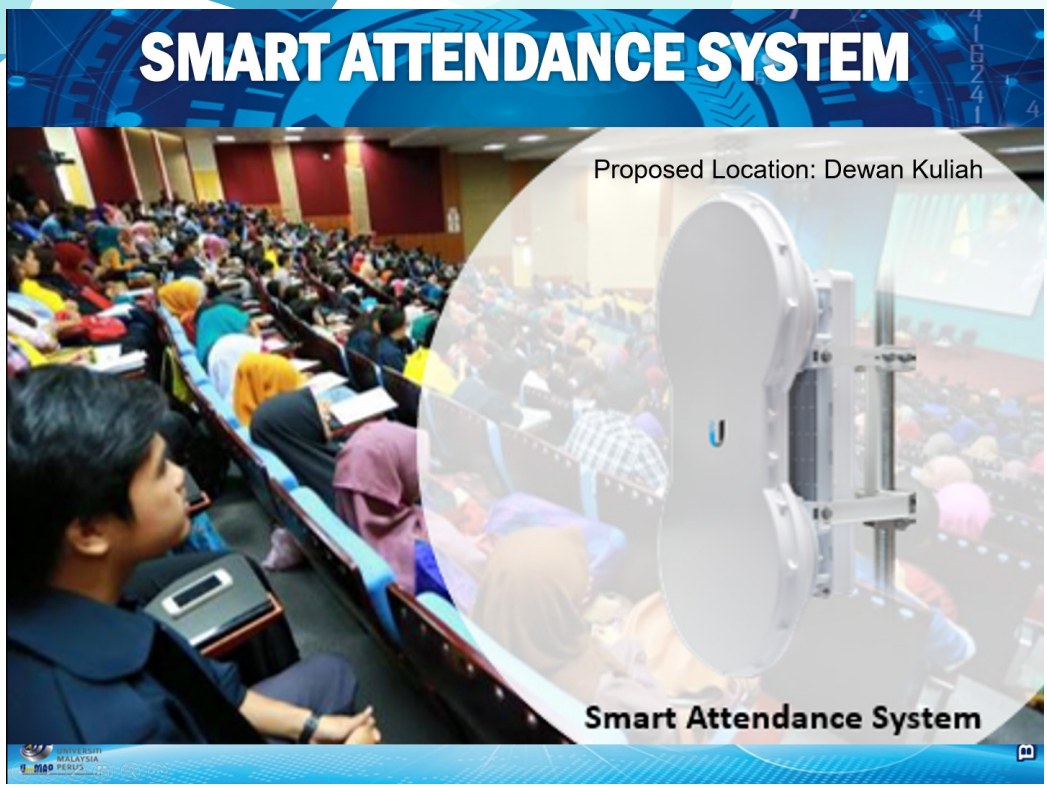


Proposed Academic Services Project

No	Project Title	PIC	TIMELINE	Description
1	Cashless	Prof. Dr. Mohd Fo'ad Sakdan, Deputy Vice Cansellor (HEPA)	Continuous Process	Enables cashless transactions
2	Urban Mobility	Open for Pitching (Lecturer/FYP)		This project focuses on student mobility tracking, transportation, parking management.
3	Community Security	Open for Pitching (Lecturer/FYP)		Guard calling and management system, Virtual Guard, Face recognition
4	Emergency Rescue	Open for Pitching (Lecturer/FYP)		Panic Notification, Emergency Support system
5	Hygiene & Sanitation	Open for Pitching (Lecturer/FYP)		Cleaner Management System, Drainage and Toilet Monitoring
6	Hospitality	Open for Pitching (Lecturer/FYP)		Catering, Lodging Services, Staff Services, OKU Services
7	Event Management	Open for Pitching (Lecturer/FYP)		Bulletin board, event registration

3. Proposed Security & Access Management

No	Project Title	PIC	BUDGET	DURATION	Description
1	Smart Monitoring System Using RFID (Access Control and Attendance System)	Assoc. Prof. Dr.Muzammil & Assoc. Prof. Dr.Ammar	RM240,000	6 Month	To extend the gateless project to Students Hostel and PPK Attendance System: Pilot to be deploy at Kompleks Dewan Kuliah
2	(iTrack – implemented to certain vehicles)	CEASTech	RM70, 000	6 Month	Bus Management System and Apps Development – With AR/AI
3	Electric Buggy/Bus	Faculty of Electrical Engineering Technology	RM116, 000	1.5 Years	Hybrid Buggy with supercapacitor with energy optimization and tracking
4	Smart Streetlight	CEASTech	RM120, 000	6 Month	Dimming to save Power by ½ and Double Lifetime Pilot at Jalan Protocol – LED Light Number of Light: 48
5	Access Management System (Smart Parking)	Faculty of Electronic Engineering Technology	RM200, 000	6 Month	Parking management and organization.

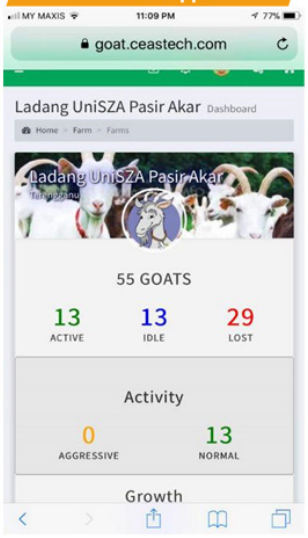


SMART ATTENDANCE SYSTEM

Smart Farming System
(IoT + 4th Industry Revolution)

Smart Sensing

Cloud Analytics + MobileApps

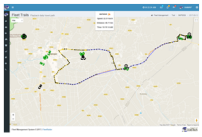


iTrack - Vehicle
Fleet Management System

- Wireless Connectivity
- Driver Behaviour Monitoring
- Online Monitoring
- Nation Wide Coverage
- Real-time Update
- Tamper Proof
- Smart Phone based device (New)

GPS Tracking Device

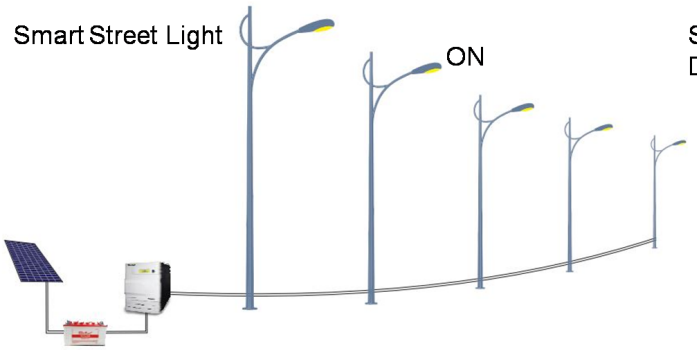
GPS Tracking Device + IMU



Various Applications

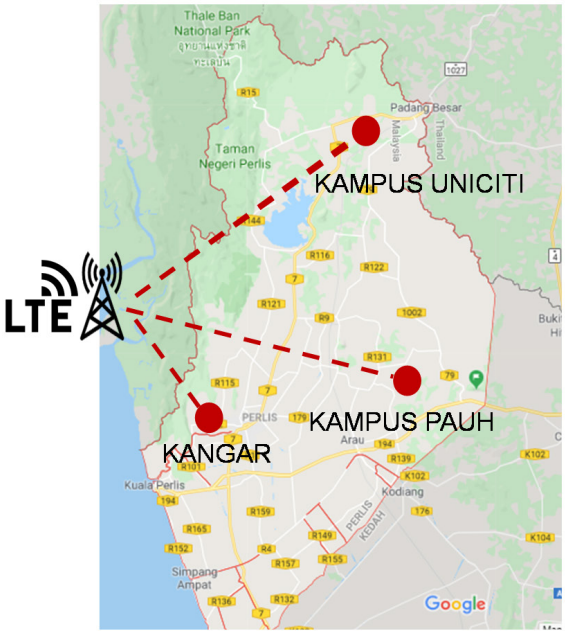
- Asset Management
- Driver Performance Statistics
- Maintenance Planning and Scheduling

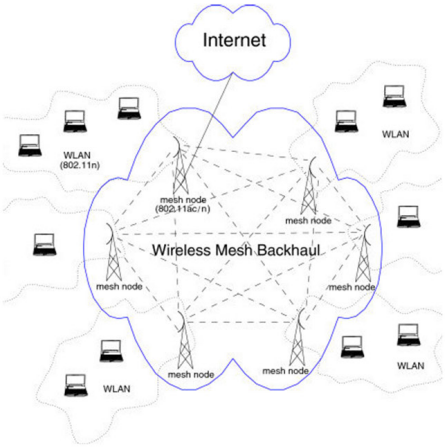
15



1. One in three or alternate street light switch off
   (To save money and energy – reduce battery capacity)
2. Alternating - One in three street light switch
   (To prolong the lifetime of the light bulb)
3. Connected system allow fast maintenance

Transforming UniMAP to Smart Connected Campus

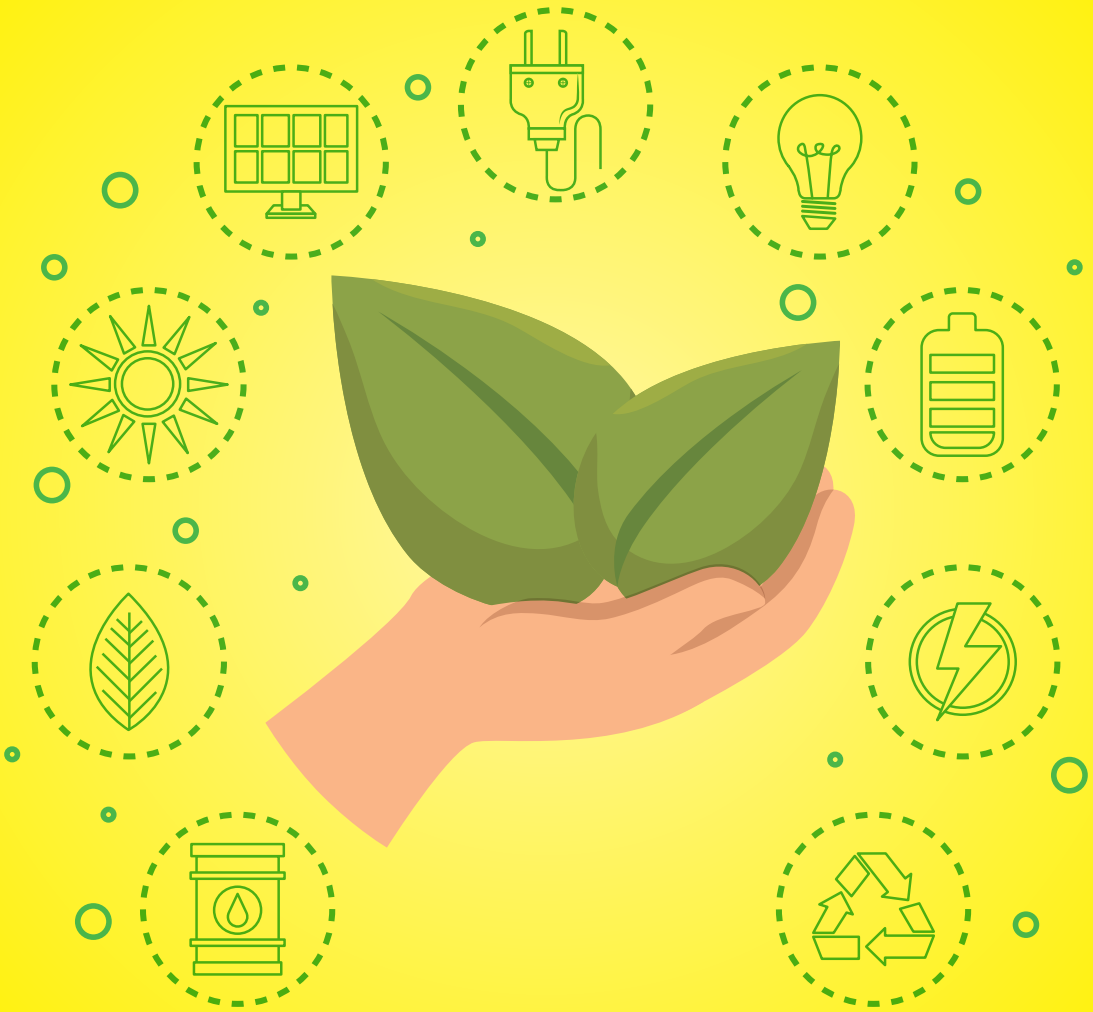




Section D :

Sustainability

Dr. Siti Khadijah Za'aba (Project Leader)
Associate Professor Ir. Dr. Rizalafande Che Ismail
Mr. Saifol Nizal Sharif



Problem Statement

Addressing Global Issues
(Sustainable Development Goals)

a) Climate Action Plan: Low Carbon Campus
b) Pollution: Zero Waste Campus
c) Preservation of Ecosystem: Campus Biodiversity

Objectives

a) Low Carbon Campus: Carbon Reduction
b) Zero Waste Campus: Reduce waste to landfill
c) Biodiversity Campus: Air and Water Quality

Low Carbon Campus	Zero Waste Campus	Campus Biodiversity
Carbon Footprint Assessment	Waste Management	Air quality
Energy Management	Recycling Activities	Water quality
Renewable Energy Projects	No single use plastic	
Building Management System	Paperless Management System	
Carbon Sequestration		

Timeline and Budget

Projects	Timeline	Budget	PIC
Low Carbon Campus		**RM85,000.00**	
Carbon Footprint Assessment	6 months	RM5,000.00	Faculty of Civil Engineering Technology
Energy Management	ASAP	RM75,000.00 1) Training and Awareness RM15,000.00 2) Setting up system RM15,000.00 3) Energy Audit (Baseline and target setting) RM20,000.00 4) ASEAN Energy Management Scheme (AEMAS) Evaluation and Certification RM25,000.00	Faculty of Civil Engineering Technology
Renewable Energy Projects	1 year (Rooftop Solar Panel (Net Energy Metering)	RM15,000.00 Rooftop Solar Panel (Net Energy Metering)	Development Department
Building Management System			Development Department
Carbon Sequestration	1 year	RM5,000.00	Deputy Vice Chancellor Student Affairs & Alumni
Zero Waste Campus		**RM63,000.00**	
Waste Management	1 year (organic waste to compost, recycling (RFL), disposed, electronic waste)	RM15,000.00	COSCEM, Development Department, COSHE
Recycling Activities	1 year	RM12,000.00	COSCEM
No single use plastic	No single use plastic (policy, campaign)	RM10,000.00	COSCEM
Paperless Management System		RM6,000.00	DMDC
Campus Biodiversity	No single use plastic (policy, campaign)	**RM70,000.00**	COSCEM
Air quality	1 year	RM20,000.00	PTj
Water quality	1 year	RM30,000.00	Faculty of Civil Engineering Technology
	Biodiversity audit (2 years)	RM20,000.00	

Outcomes Projects

Low Carbon Campus
a) Reduction of CO2, Monetary savings

Zero Waste Campus
a)Reduction of CO2, Income thru recycling activities, community and international collaboration, SDG

Campus Biodiversity
a) SDG (Sustainable Development Goal)
b) All data will be reported annually as UniMAP commitment to the Sustainable Development Goal (SDG) and also as part of academic contribution

Maintenance Issue

a) All of the projects suggested are continuous projects which requires maintenance at least RM10k per project per year

Acknowledgement
Appreciation Thanks To

The Vice Chancellor Office
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Academic Management Centre (AMC)
Digital Management and Development Centre (DMDC)
Faculty of Electrical Engineering Technology
Faculty of Electronic Engineering Technology
Faculty of Mechanical Engineering Technology
Faculty of Chemical Engineering Technology
Faculty of Civil Engineering Technology
Center for Energy Management and Sustainable Campus (COSCEM)
Development Department
Syarikat SongketMail Sdn.Bhd.
Cisco