EE4500 – Design Project

IoT Stream

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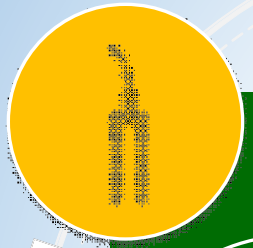
AUSTRALIA

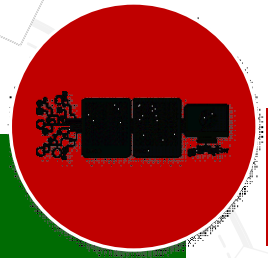
Sensing

PH2019: Introduction to Electromagnetism Optics and Early Quantum
EE3010: Digital Signal Processing
EE3901: Sensor Technologies

Actuation

EE3600: Automatic Control I





Data Analytics

MA3405: Statistical Data Mining for Big Data

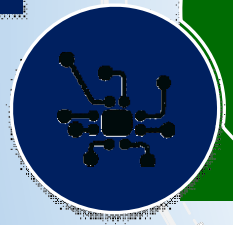
INTERNET of THINGS

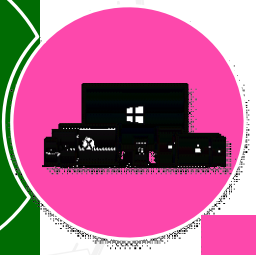
IoT Systems

EG3000:Introduction to Systems Engineering and Project Management
EE4500: Design Project
CC4510: Digital System Design

Electronics

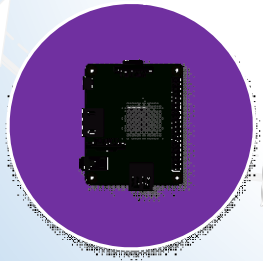
EG1012: Electric Circuits
EE2201: Circuit Theory
EE2300: Electronics I





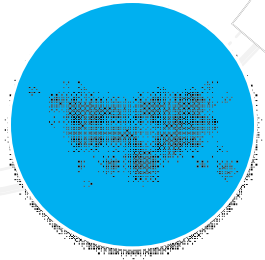
Software

EG1002: Computing and Sensors
CP1404: Programming II
CP3406: Mobile Computing



Edge Devices

CC2510: Digital Logic and Computing Methods
CC2511: Embedded Systems Design
CC3501: Computer Interfacing and Control



Connectivity

EE3700: Communication Systems Principles
CP3404: Information Security

Research Skills

EG4011: Thesis Part 1 of 2
EG4012: Thesis Part 2 of 2

Capstone

The essence of the Internet of Things is the integration of devices, systems, and information. You have developed the skills in sensor technologies, embedded systems, communications, control and automation, and data analytics through the past subjects. The design project allows you to integrate all those knowledge in a complete form with a capstone project.

Technical content

- Cloud architecture
- RESTful API
- LoRaWAN
- The Things Network
- Amazon Web Services

Ideas are “a dime a dozen.”

The second part of the subject will be “how to propose an idea with both technological advantages and business opportunities, write a funding application to attract business investors, and develop prototypes of your new inventions”.

Assessments

#	Activity	When	Group	Individual
1	Project proposal – EOI	Week 3	10%	
2	Labs	Week 1-4		35%
3	Architecture quiz	Week 6		10%
4	Project presentation	Week 7	25%	
4	Project report	Week 7		20%
	Totals		**35%**	**65%**

Requirements

- Overall 50% or above
- Attend specified events – or arrange absence in advance
- Demonstrate a ***reasonable attempt*** on all assessment items

Housekeeping

Lecturer/Tutor	Bruce Belson
Coordinator	Mohan Jacob
Lecture	Monday 11:00 – 13:00
Lecture	Wednesday 9:00 – 10:00
Tutorial	Wednesday 10:00 – 11:00
Lab	Wednesday 16:00 – 18:00

Amazon Web Services – Academy & Certification

AWS Certifications

- Cloud Practitioner
- Associate
  - Architect
  - Data Engineer
  - Developer
  - SysOps
- Specialty
  - Machine Learning
  - Security

AWS Certified Cloud Practitioner

The AWS Certified Cloud Practitioner validates foundational, high-level understanding of AWS Cloud, services, and terminology. This is a good starting point on the AWS Certification journey for individuals with no prior IT or cloud experience switching to a cloud career. *Additional exam preparation resources and hands-on experience recommended before taking the AWS exam.*

Learn more about the exam

AWS Certified Solutions Architect - Associate

AWS Certified Solutions Architect - Associate showcases knowledge and skills in AWS technology, across a wide range of AWS services. The focus of this certification is on the design of cost and performance optimized solutions, demonstrating a strong understanding of the AWS Well-Architected Framework. *Additional exam preparation resources and hands-on experience recommended before taking the AWS exam.*

Learn more about the exam

AWS Certified Machine Learning - Specialty

This credential helps organizations identify and develop talent with critical skills for implementing cloud initiatives. Earning AWS Certified Machine Learning - Specialty validates expertise in building, training, tuning, and deploying machine learning (ML) models on AWS. *Additional exam preparation resources and hands-on experience recommended before taking the AWS exam.*

Learn more about the exam

AWS Certified Data Engineer - Associate

This credential validates skills and knowledge in core data-related AWS services, ability to ingest and transform data, orchestrate data pipelines while applying programming concepts, design data models, manage data life cycles, and ensure data quality. *Additional exam preparation resources and hands-on experience needed before taking the AWS exam.*

Learn more about the exam

AWS Certified Security - Specialty

AWS Certified Security-Specialty validates your expertise in creating and implementing security solutions in the AWS Cloud. This certification also validates your understanding of specialized data classifications and AWS data protection mechanisms. *Additional exam preparation resources and hands-on experience recommended before taking the AWS exam.*

Learn more about the exam

AWS Certified Developer - Associate

AWS Certified Developer - Associate showcases knowledge and understanding of core AWS services, uses, and basic AWS architecture best practices, and proficiency in developing, deploying, and debugging cloud-based applications by using AWS. *Additional exam preparation resources and hands-on experience recommended before taking the AWS exam.*

Learn more about the exam

AWS Certified SysOps Administrator - Associate

This credential helps organizations identify and develop talent with critical skills for implementing cloud initiatives. Earning AWS Certified SysOps Administrator - Associate validates experience in deploying, managing, and operating workloads on AWS. *Additional exam preparation resources and hands-on experience recommended before taking the AWS exam.*

Learn more about the exam

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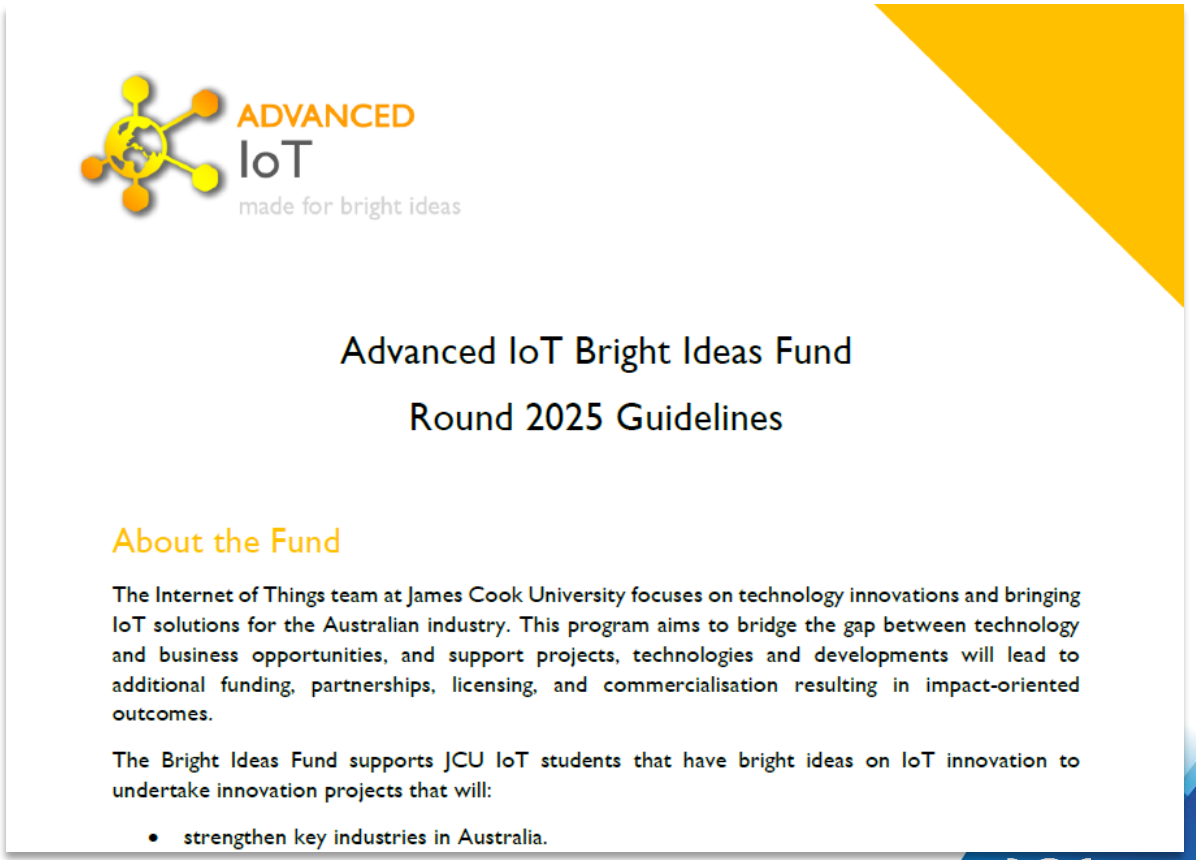
Advanced IoT Bright Ideas Fund

- Stage 1: $100 for additional hardware or software for your proof-of-concept.
- Stage 2: $25k - $250k vis Sandpit-2-Seed funding from JCU Connect (under certain IP agreement).
- Criteria:
  - Well-defined problem
  - Breakthrough technology
  - Valuable solution
  - Customer Appeal
  - Sizable Market
  - Manageable Risk
  - Exceptional Team



ADVANCED IoT
made for bright ideas

Advanced IoT Bright Ideas Fund

Round 2025 Guidelines

About the Fund

The Internet of Things team at James Cook University focuses on technology innovations and bringing IoT solutions for the Australian industry. This program aims to bridge the gap between technology and business opportunities, and support projects, technologies and developments will lead to additional funding, partnerships, licensing, and commercialisation resulting in impact-oriented outcomes.

The Bright Ideas Fund supports JCU IoT students that have bright ideas on IoT innovation to undertake innovation projects that will:

- strengthen key industries in Australia.

Final Report

- Problem
- Current situation
- Competitors
- Technology
- Solution
- Preliminary results
- Conclusion
- Path to adoption

Schedule

Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7
Introduction	AWS Introduction	AWS Global Infrastructure Overview	AWS Compute	AWS Storage	AWS Certification Walhthrough	
RESTful APIs	Cloud concepts overview	AWS Networking and Connectivity		AWS Databases	Subject Wrap	
	LoRaWAN & TTN		Web development			
Business Models (BMC/VP)	Value Proposition Design	Project Review & Feedback	3D Printing	Project Review	Architecture Quiz	
Setup LoRaWAN Gateway	LoRaWAN Node	IoT Database	IoT Dashboard			Presentation

Legend
In-person lectorials
Activities
On-line lectures
Labs

Sensor deployment in Jan 2024

- Cane Farm
  - Signal interrupted by cane and by trees
  - Farm machinery
- Atherton Tablelands
  - Challenging conditions
  - Hot, Wet & Muddy
- Agricultural
  - Reliable
  - Simple to use
  - Privacy

Sensors

- Atmospheric
- Soil
- Weather
- Water
- Sound & vision

They all need to communicate their data

LoRaWAN

- Low power ✓
- Secure ✓
- Low cost ✓
  - High complexity ✗
- Long range ✓
  - Line-of-sight ✗

Deployment

	A	B	C	D	E	F	G	H	I	J	K	L
1	ttn_id	dev_eui	join_eui	frequency	lorawan_v	lorawan_p	app_key	at_pin	ota_pin	serial	latitude	longitude
2	eui-a8404	A84041996	A8404100(	AU_915_92	MAC_V1_0	RP001_V1_	785979F34	OA42FF	DB657AF0	LA66N7186	-17.1083	145.3518
3	eui-a8404	A8404115(	A8404100(	AU_915_92	MAC_V1_0	RP001_V1_	341747724	B12D5F	CF44D816(	LA66N7186	-17.1084	145.3505
4	eui-a8404	A84041F3(	A8404100(	AU_915_92	MAC_V1_0	RP001_V1_	E9EFAB80:	5437CB	F497F175(	LA66N7186	-17.1088	145.3476
5	eui-a8404	A840412F4	A8404100(	AU_915_92	MAC_V1_0	RP001_V1_	33A295A5:	AD7051	9FA898171	LA66N7186	-17.1096	145.3483
6	eui-a8404	A840417E(	A8404100(	AU_915_92	MAC_V1_0	RP001_V1_	7AEC2BD0	90D031	F92196EB(	LA66N7186	-17.1096	145.3483
7	eui-a8404	A840415C:	A8404100(	AU_915_92	MAC_V1_0	RP001_V1_	C721AEBC	78E659	A2854F3A:	LA66N7186	-17.1142	145.3528
8												

nodes_for_losant_v3

One list to rule them all

THE THINGS NETWORK

LOSANT

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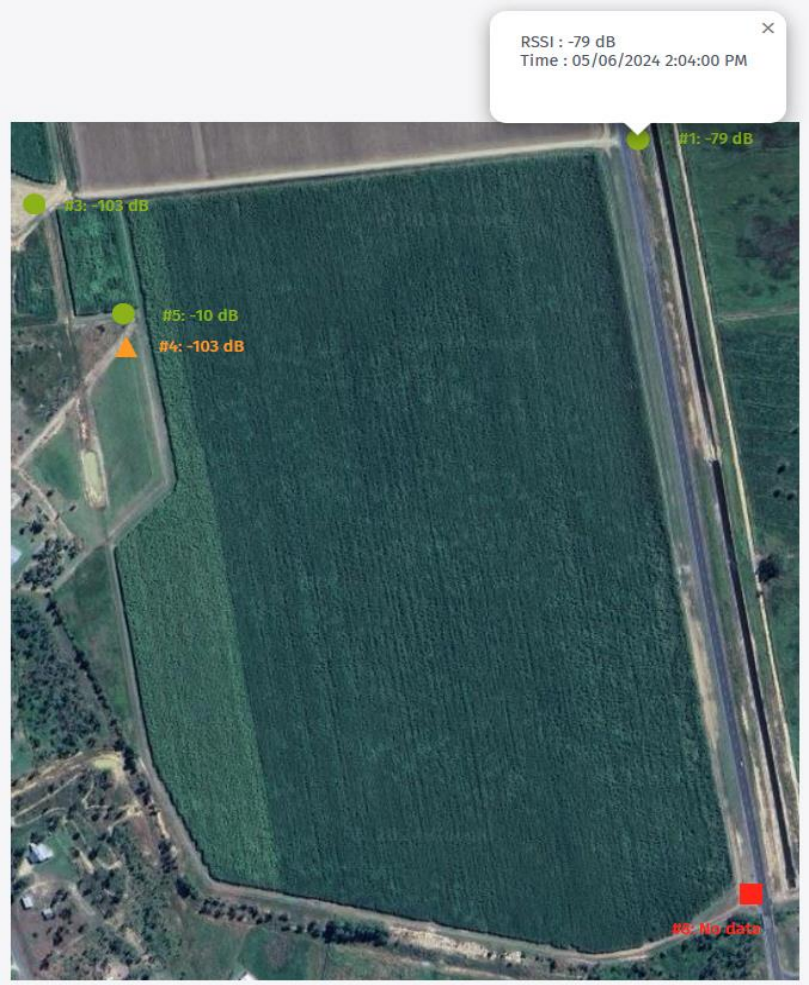
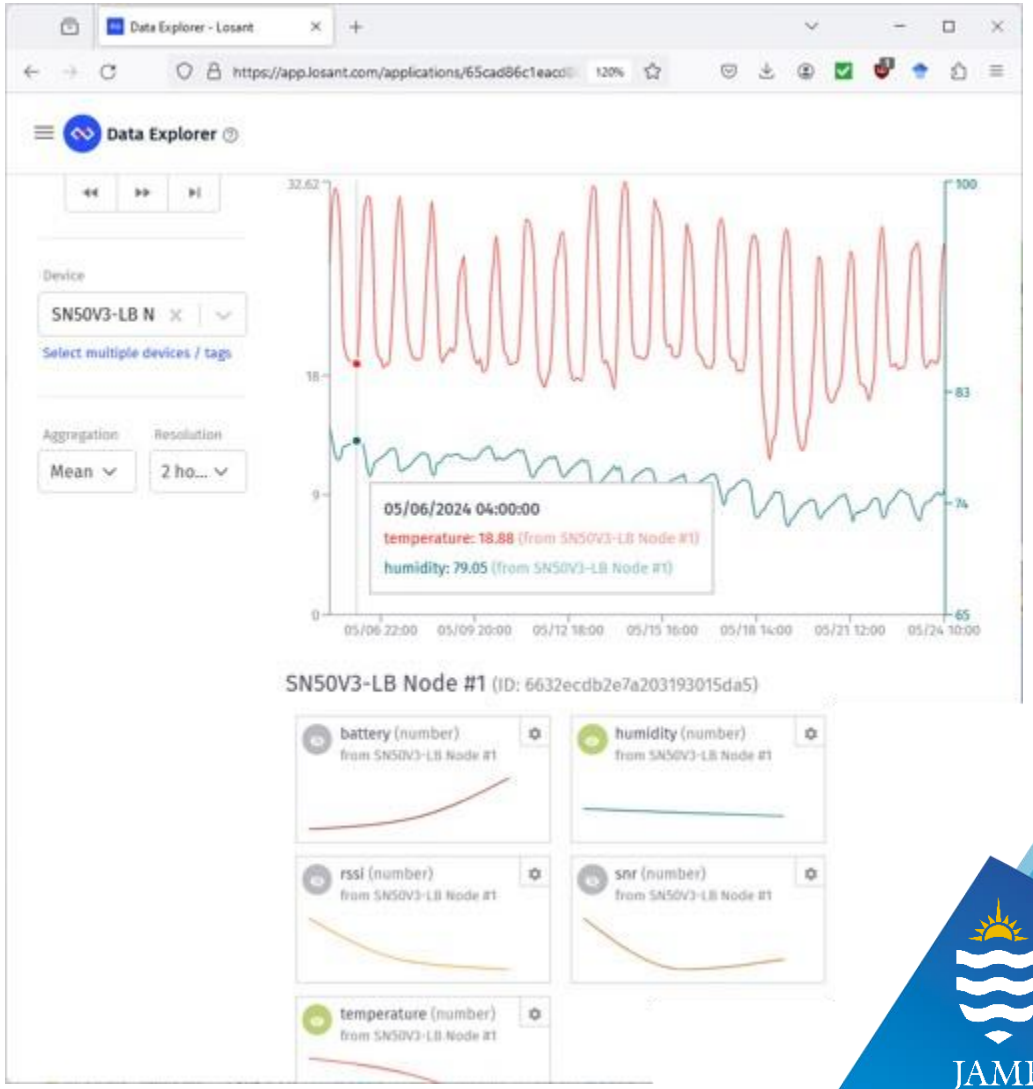
Installed at cane farm





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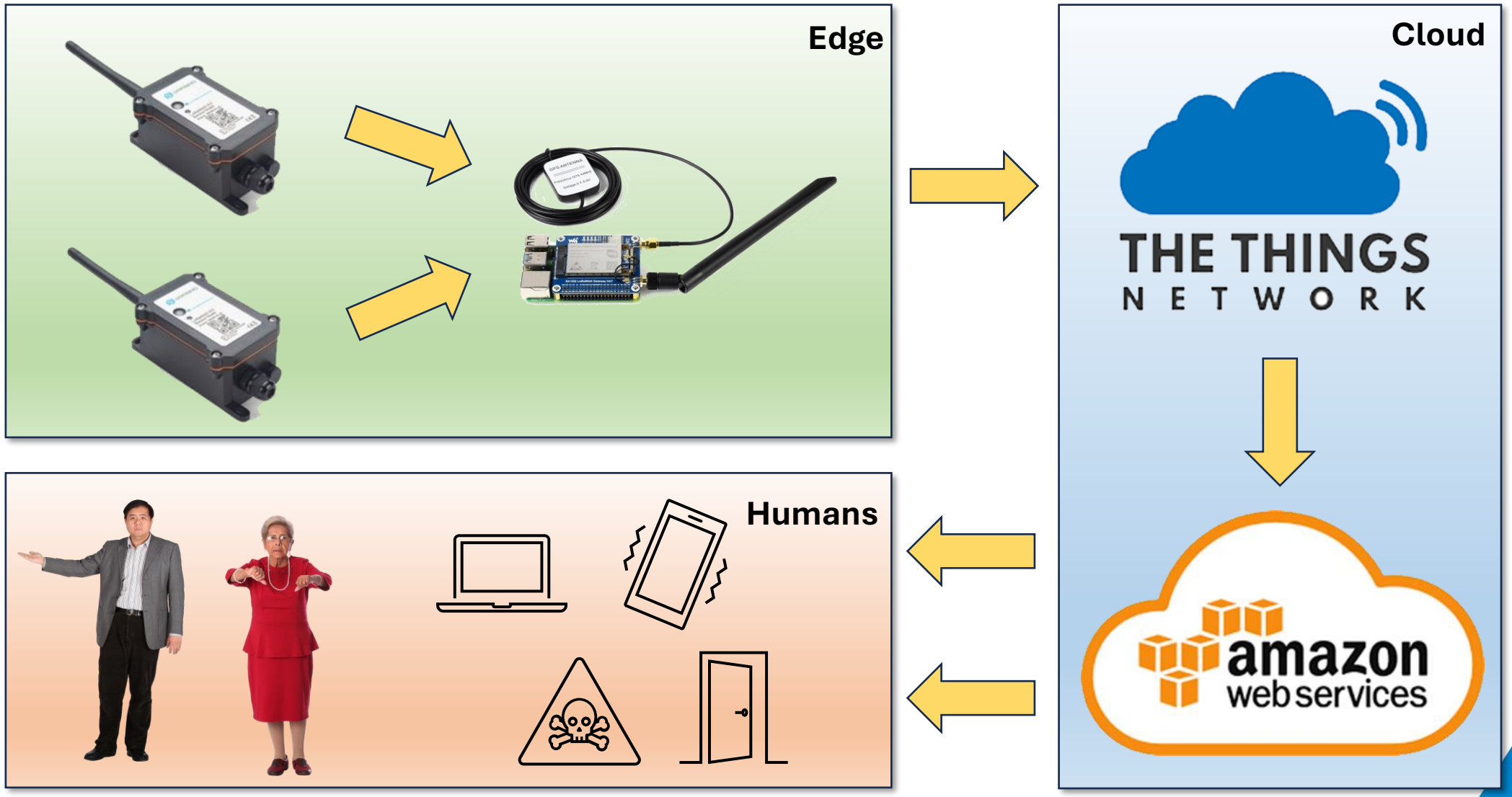
Labs

- Set up and connect LoRaWAN Gateway
- Configure LoRaWAN node and connect to network via gateway
- Set up LoRaWAN node sensors using I^2C and update firmware
  - Optimise battery usage
- Set up cloud services integration
  - Scalable, Secure, Robust
  - Economical & flexible
  - User-friendly

IoT Network



Raspberry Pi LoRaWAN Gateway

- Raspberry Pi
  - Linux
- LoRaWAN Gateway hat
  - SX1302
  - SX1250 radio
  - GPS
  - Aerial
  - LoRaWAN Station firmware

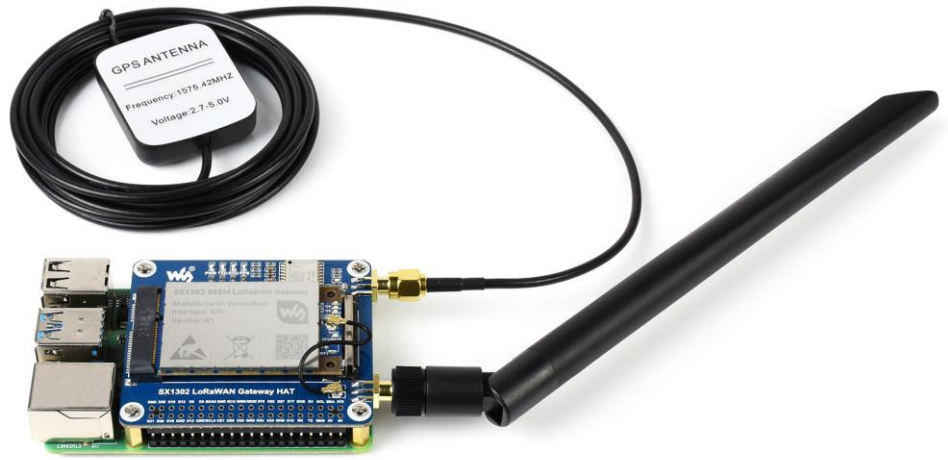


Image: Waveshare

Pi Pico LoRaWAN node hat

- Pi Pico
  - Programmed in C
  - Uses Pi Pico SDK
- LoRaWAN hat
  - SX1262 LoRa module
  - Aerial
  - Rechargeable battery
  - LoRaWAN firmware

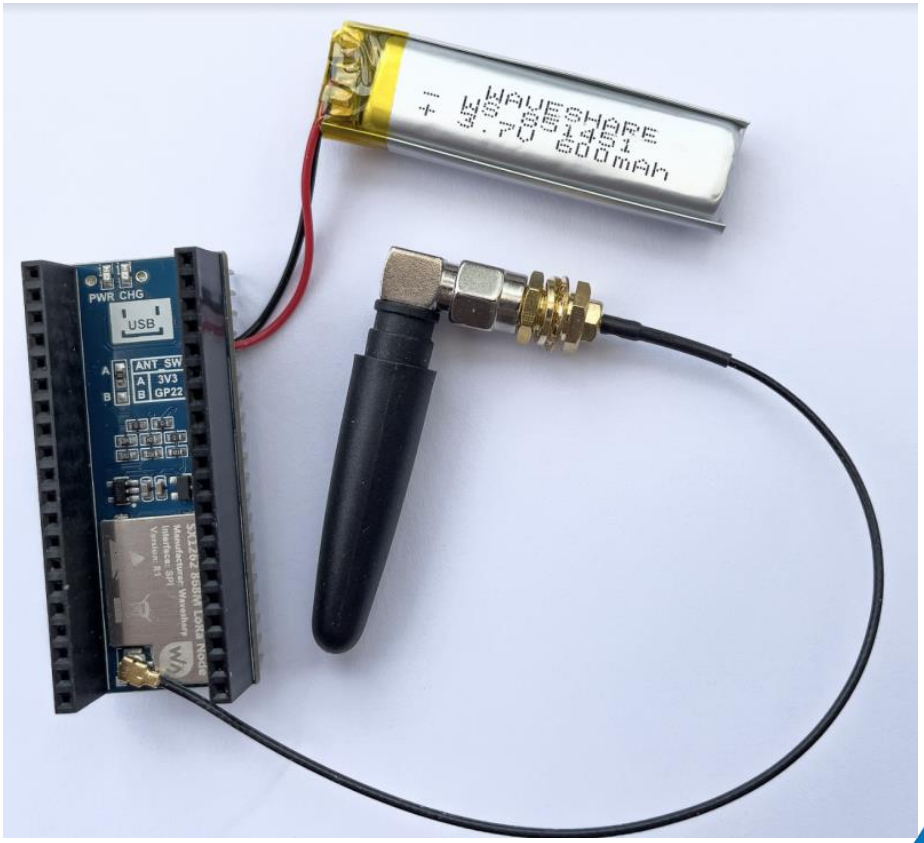


Image: Raspberry Pi 2024

EE4500 – Design Project

Next – RESTful APIs

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