7502ICT: Fundamentals of Blockchain and DLTs

*Prof. V. Muthukkumarasamy (**Muthu**)*

Course Convenor
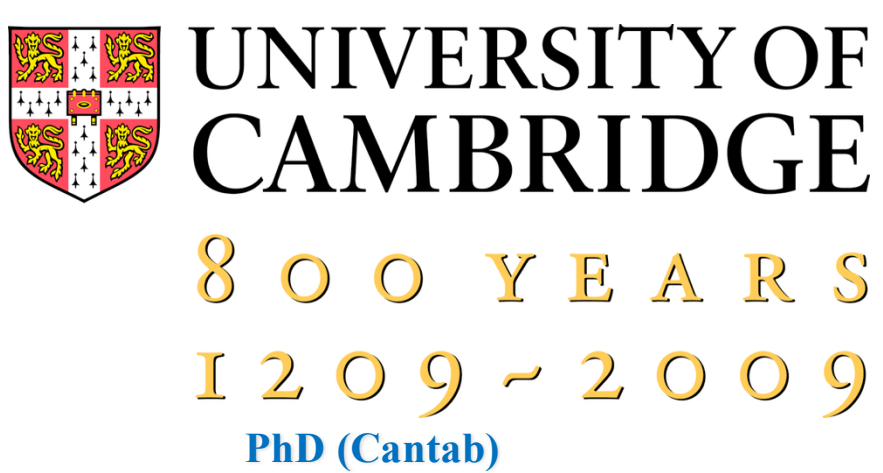*Group Leader/ Network Security & Blockchain Research*
B.Sc.Eng (Hons) (Peradeniya), PhD (Cambridge)

# Acknowledgement of Country

Griffith University acknowledges the Traditional Custodians of the land on which we are meeting today and pays respects to Elders, past and present, and extends that respect to all Aboriginal and Torres Strait Islander people.

Griffith UNIVERSITY
Queensland, Australia

UNIVERSITY OF CAMBRIDGE

800 YEARS
1209 ~ 2009

PhD (Cantab)

THE UNIVERSITY OF QUEENSLAND
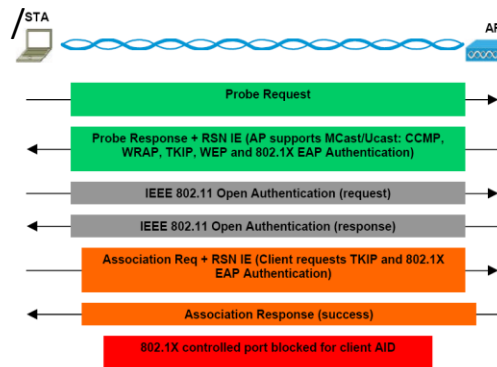AUSTRALIA

ST LUCIA CAMPUS

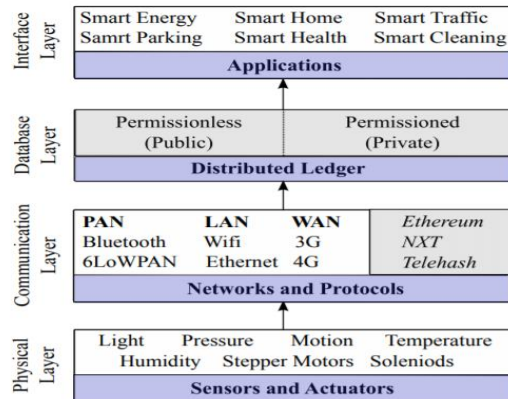University of Peradeniya
Sri Lanka

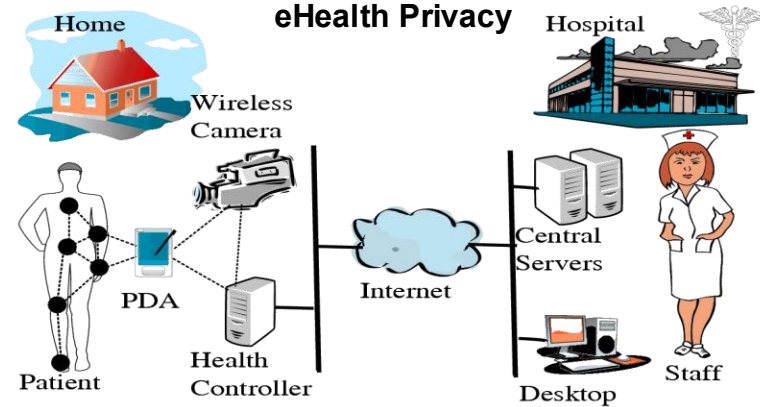B.Sc.Eng (1st Class Hons)

Sensor Networks: Scenarios and Applications
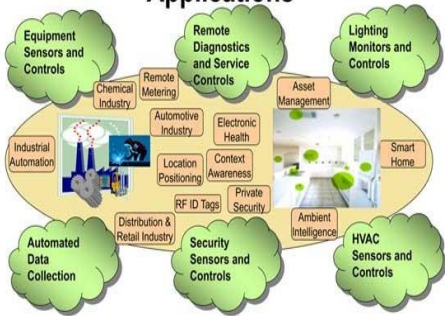
IDS/ IPS

eHealth Privacy

Blockchain for Smart Cities
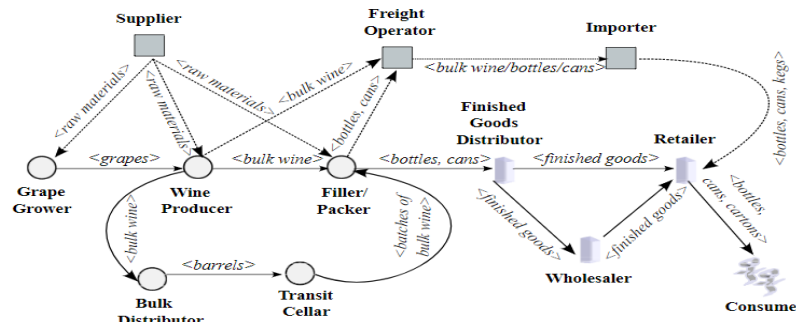
Wine Supply Chain Traceability
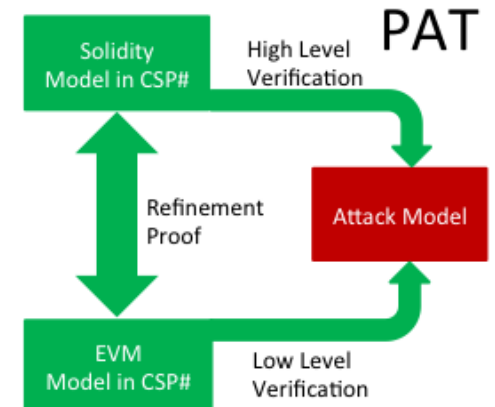
Smart Contract Verification

Learning Objectives

At the end of this part of the lecture you will have learnt:

- ✓ Contact details for your course convenor
- ✓ How to access the course website, assessments
- ✓ What this course aims to achieve
- ✓ What commitment is expected from you
- ✓ The assessment requirements for this course
- ✓ Online Assistant – AI Agent (Trial)
- ✓ How student feedback helps us to improve the course
- ✓ Academic misconduct & Plagiarism
- ✓ Recommended textbooks

Course Staff

Convenor, Lecturer & Tutor:

Prof V. Muthukkumarasamy

(Room: G09_1.60; Phone: 555 28256)

Email: v.muthu@griffith.edu.au

Course Information

Prerequisite: 7611ICT Computer Systems and Cyber Security

Credit point: 10 CP

Online classes: MS Teams

Course Website: Canvas

- ✓ Access Lecture Notes, Workshops, Assessments, Announcements, Course Profile, Submission Links, etc.

(keen interest in learning and active participation are needed)

Your Commitment

	Hours
Lectures	24
Workshops/ Discussions	24
Private Study and Preparation	102
Total	**150**

- ✓ Active participation at lectures and workshops are strongly recommended
- ✓ **It is found that there is a direct correlation between active participation and their overall performance in this course**

Timetable

Class	Time/Day	Place
Lecture	10 – 12noon Wednesday	MS Teams
Workshop (GC)	1 – 3pm Wednesday	G23_2.22
Consultation	*3 – 4pm Wednesday*	*MS Teams*
Workshop (NA)	10 – 12noon Thursday	N79_4.15
Workshop (OL)	2 – 4pm Thursday	via MS Teams

✓ Lectures & Workshop classes start from the 1st Week

Objectives

- ✓ This course provides the fundamental concepts and potential applications of blockchain and DLT

- ✓ The emphasis is on how these technologies provide immutability, provenance and enable decentralised operations without the need for a trusted third-party

- ✓ Use of DLT and smart contracts in FinTech, supply chain, digital product passport, cross-border

- ✓ asset transfer, and identity management will be discussed

Outcome

On completion of the course, the student will be able to:

✓ Describe the fundamental mechanisms enabling the operation of DLTs, and the properties of DLT

✓ Explain and identify the use of smart contracts in real-world applications, and analyse and discuss the opportunities and challenges in using DLTs

✓ Identify potential applications of DLT, and critically analyse the benefits of deploying DLT

✓ Describe different interoperability mechanisms, standards, and governance

Assessment

Assessment Item	Weight	Due Date
Assignment 1 (Oral presentation in Week 7 Workshop slot)	25%	Week 6 **29th Aug**
Assignment 2 (Presentation in Week 12 Workshop slot)	35%	Week 11 **3rd Oct**
Final Oral Exam	40%	13 – 15 Oct (slot to be booked)

Minimum Requirements for a Grade of Pass

- Final Oral Exam (40%)
  - Must achieve 40% in the final oral exam to become eligible to pass the course and;
  - In order to receive a Grade of Pass, student must obtain a minimum of 50% in the overall assessments.

- To become eligible for SUP exam, ALL pieces of assessments must have been submitted and the minimum overall Grade should be 3.

Expectations

- Regular active participation in the Lectures & Workshops

- Investment of 10 hrs/ week from Week 1

- You are encouraged to discuss any difficulties/ problems during the lecture, workshop, or consultation time at the earliest possible opportunity

- When sending email, please use the Canvas Inbox and include full details necessary (including your enrolment - GC/ NA/ OL)

- Communication from non-Griffith email account will not be responded

- No feedback on Assignment will be given 48 hrs before the submission deadline

Extension

Late Penalties

- Penalties apply to late submissions as per course outline

Extension

- To get extension for any of the assessment items, application needs to be lodged via: https://www.griffith.edu.au/students/assessment-exams-grades/assessment-applications

Feedback from Previous Students (1/2)

Student Experience of Course (SEC)

✓ Overall I am satisfied with the quality of this course: 4.8/ 5.0

1	It was a class where I could clearly see that the professor is not only teaching academics but also trying to cultivate the necessary talent.
2	The course engages the students to research more about the topics, and it is presented in an exciting way
3	This course is taught to enforce self management but it is laid out to keep students in check on their involvement in the course. This has kept myself engaged to meet the requirements of the course but it has also made the course enjoyable due to the engagement with peers.
4	I really enjoyed the interactive workshops that encourage students to chime into the lesson makes it a lot of fun.
5	This course provides an introduction to a research course, which is impressive for me. Throughout the investigation, I slightly understand what researchers is doing and get overwhelmed by its deep and vast academic field. It brings me a cue to think about my future study direction aside from course work in master's degree.

Student Experience of Teaching (SET)

✓ Overall I am satisfied with the teaching of this staff member: 5.0/5.0

1	Passionate and extensive knowledge, information related with the industries.
2	Mutu presents the program in a very practical and interesting way, asking questions and engaging all the students. He explains terms in different ways to make them easy to understand for everyone, even for those without an IT background.
3	Very different type of teaching and certainly not boring and very engaging! I wish more teachers taught like muthu
4	Very hands on teaching. Involved with all aspects of the course's lectures, workshops.
5	Dr Muthu taught me that you don't need to be an expert to learn a topic. They were able to breakdown very difficult concepts into consumable pieces which really assisted me on my understanding.

Online Assistant – AI Agent (Trial)

- A 24/7 Online Assistant - AI Agent is created to facilitate practicing your skills and enhance your learnings in this course

- Use the link in the Home Page to access this agent (this is the 1st time we are trailing)

- As you know the responses from AI-Agent may not be accurate. Thus, based on what you learned in the course, you should critically review the responses and reflect on it.

- You will have the opportunity to discuss and clarify your understanding and confirm the facts in your class.

- This is a trial and at times it may be bit slow. We will appreciate your feedback about your experience with this AI agent.

Plagiarism & Academic Misconduct

Do not do it!

https://www.griffith.edu.au/academic-integrity/academic-misconduct

What is plagiarism?

- It is cheating, and stealing

- It is an attempt to gain credit for something that is not your property, not your idea or not your work

- It is taking the intellectual contents produced by others and pretending that is your own production

- **If you didn't produce it, it is not yours**

Why plagiarise?

- Research indicates that plagiarism occurs when
    - Students plan poorly their time
    - Students do not use the resources available when dealing with an assignment
    - Students feel that there is a culture where they can get away with it
    - Students feel they are incapable of completing the task

Texts and Supporting Materials

- **Recommended Texts**

  - *Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, by Arvind Narayanan etal. Princeton University Press, 2016*

    (hard copy available via Library & draft version of the book may be available via Online: https://www.lopp.net/pdf/princeton_bitcoin_book.pdf)

  - *Mastering Blockchain, By Imran Bashir, 3rd Ed, Packt Publisher, 2020* (eBook are available via L@G or Library)

- **Additional References**

  - A number of online reference material will be provided during the course as appropriate to each topic
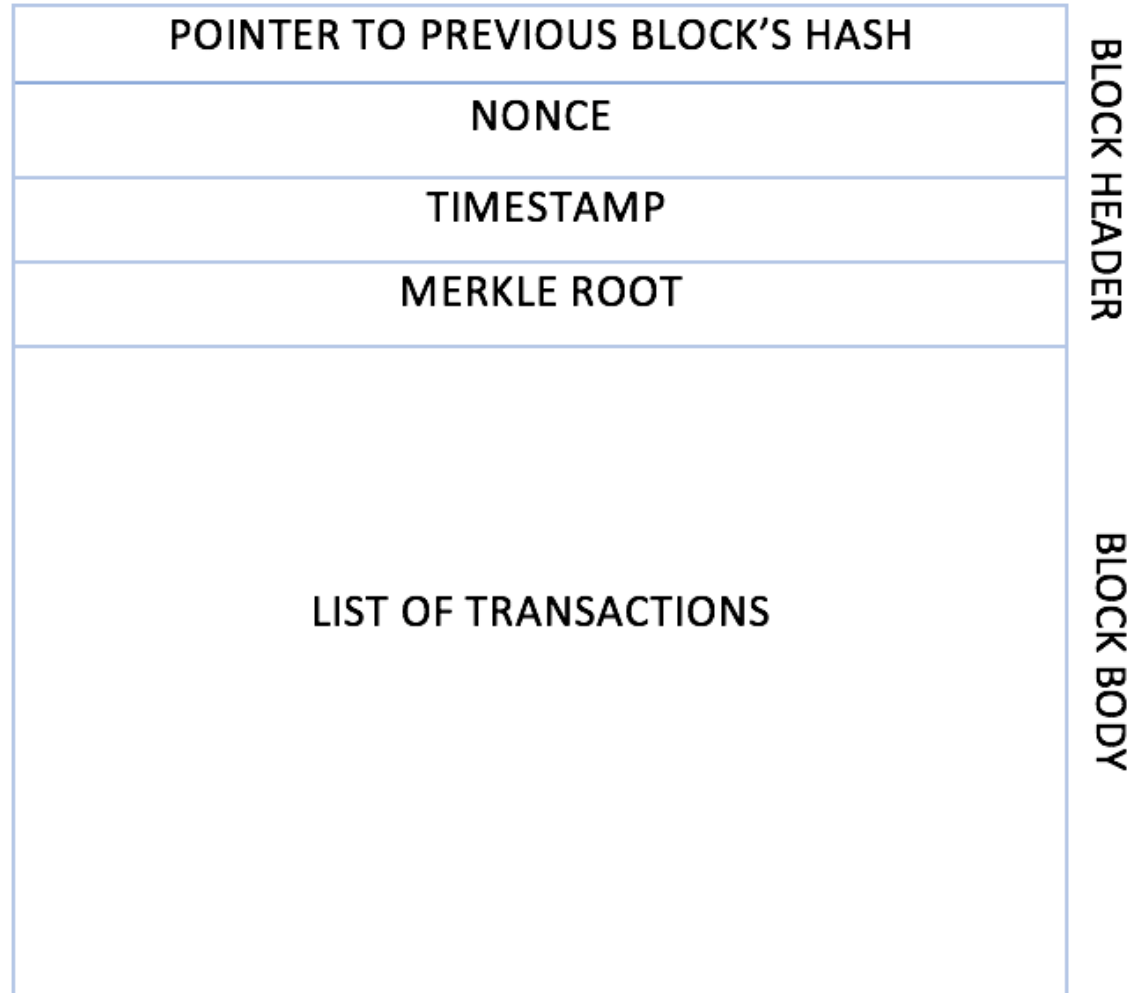
Content (order and actual topics may change)

- Overview: Blockchain and DLTs

- Fundamental Mechanisms of DLT

- Public Key Encryption, Consensus Mechanisms, Zero-Knowledge Proof

- Architecture, Smart Contracts

- Application Development and Use Cases

- Blockchain Integration for real world applications (DPP, FinTech, Metaverse)

Content (order and actual topics may change)…

- Smart Contract security, Security for XR, Supply Chain, AI and Blockchain, DID

- Interoperability Mechanisms, Scalability and Security Challenges

- Cross-chain Protocols and Platforms, Anomaly detection in digital asset transfer

- Blockchain Standards and Governance Model

- Future Directions for DLT Adoption and Challenges

Generic Structure of a Block

POINTER TO PREVIOUS BLOCK'S HASH	**BLOCK HEADER**
NONCE	
TIMESTAMP	
MERKLE ROOT	
LIST OF TRANSACTIONS	**BLOCK BODY**

Summary

- Course convenor, teaching staff & website details

- What is this course about?

- Assessment details

- What commitment is expected from you

- Online Assistant – AI Agent (Trial)

- Student feedback

- Course materials

- Course content overview

Quiz: True or False

✓ You need to attend the lecture and the workshop you are enrolled in from week 1

✓ This course has 3 Assessments

✓ The Final exam is an Oral exam in Week 13