CarChain

Team Block Party

Domain: Car Registration

- The current technology landscape involves a centralised system maintained by each State (and Territory) government Registry.
- Information sharing between States and other organisations is made possible by APIs.
- This has several drawbacks e.g. each party must rely on the availability, performance and trustworthiness of the centralised system maintained by each State.
- A blockchain could be used to provide a unified, highly available business process for car registration.
- This will improve the interoperability between systems and provide a streamlined user experience.

Domain: How would it be achieved?

A decentalized system called "CarChain" has been proposed.

CarChain will be governed by a joint Government Business Enterprise (GBE).

The board of directors will include the relevant ministers from each State.

The GBE is responsible for:

- Determining the consensus policy
- Auditing of individual State's network for compliance with regulations
- Determining the PKI infrastructure requirements for each State
- Determining the number of Peers that each State should contribute to the network

Each State Government is responsible for:

- Building and operating the network Peers as dictated by the GBE
- Act as the Certificate Authority for certificate issuance and governance per State
- On-boarding of 3rd Party organisations that wish to use the Blockchain

Functional Requirements

ID	Description
F1	Car manufacturer should be able to add a new Vehicle.
F2	Citizen should be able to create a Registration Application.
F3	Citizen should be able to review Registration application status.
F4	Registry Employee should be able to review Registration Applications.
F5	Registry Employee should be able to change the status of Registration Application to "Approved" or "Rejected"
F6	Police Employee should be able to issue Violation against a registered Vehicle.
F7	Police should be able to view Registration history for a Vehicle.
F8	Citizen should be able to view Violation against their registered Vehicle.
F9	Citizen should be able to pay fines associated to a Violation.

Non-Functional Requirements

Integrity

- Car registration data cannot be modified by anyone.
- Only authorized organisations can add data to the registry.

Availability

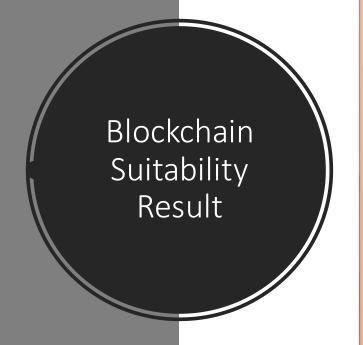
- High likelihood that data can be accessed at anytime.
- No single point of failure.

Interoperability

Appropriate
 authority in
 different states
 can interact with
 each other
 through a
 common
 underlying
 infrastructure.

Authenticity

 Only authorized organisations and trusted third parties to access the registry.



Blockchain

Multi-Party participations

- Allowing for equal participation from many parties
- Dealers
- Buyers
- Gov Employees

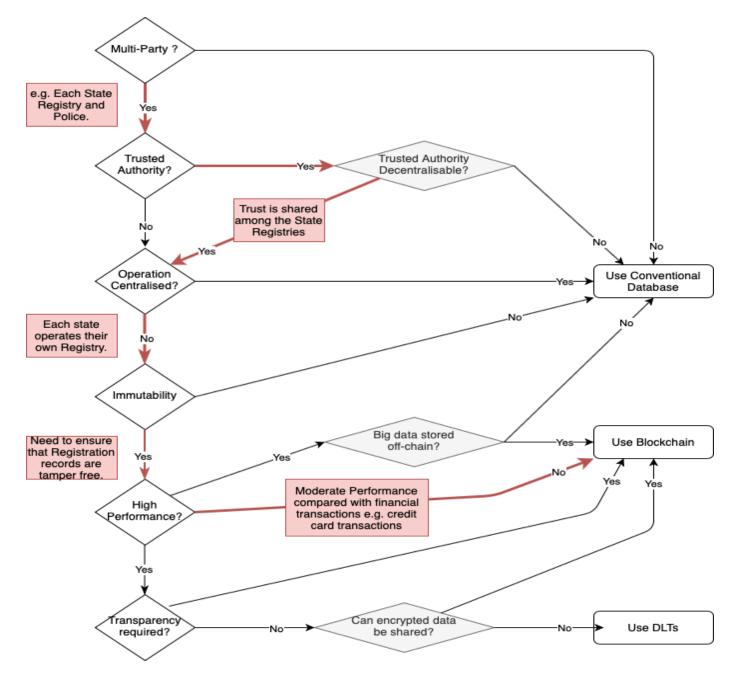
Data Integrity + Immutability

- Ensuring the car information input is correct
- Data not to be tampered with

High Performance

- Not essential
- Similar to current system, allowing for verification time



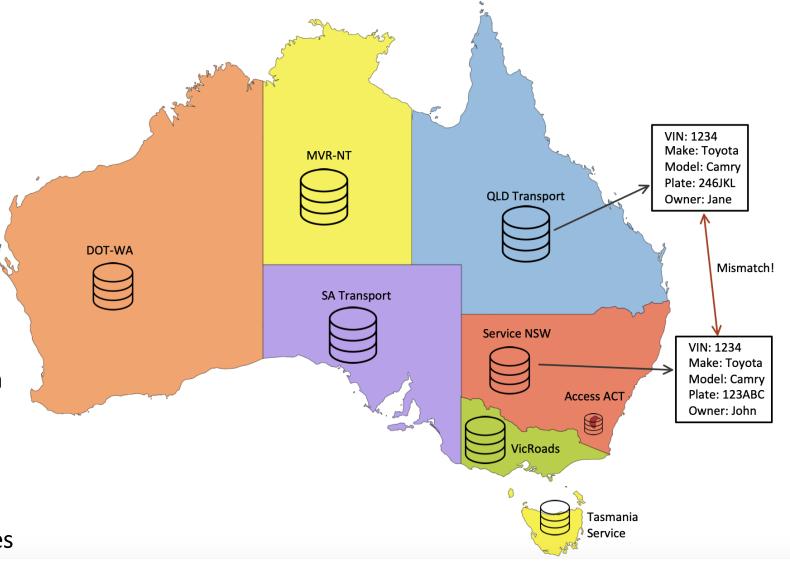




 Current Architecture is a decentralised series of information silos.

> Complete trust required between all the states

- Communication between databases done through APIs (not streamlined).
 - Different Meta-data between states



Architecture Design 1 – Cost Benefit Analysis

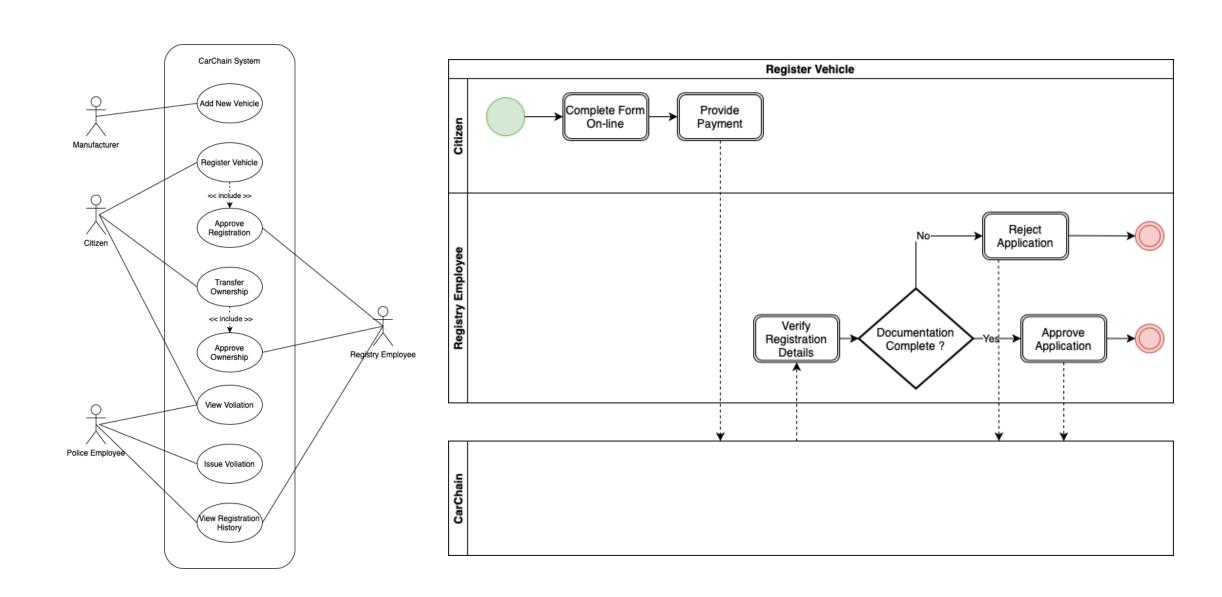
Costs

- Information inconsistency across states.
- Poor data integrity and prone to tampering.
- Poor data availability and transparency.
- Registration bogged down by slow paper-based process.

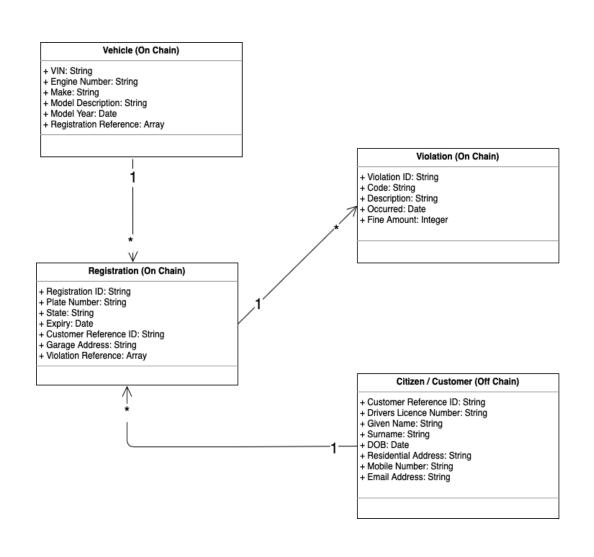
Benefits

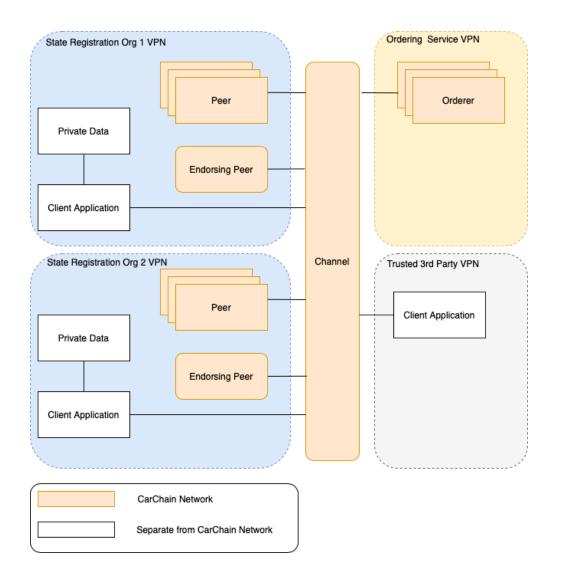
- Traditional databases are simple and cost effective.
- Good performance within each database and CRUD functionality.
- Relatively flexible system allows modification of system behaviour depending on state laws and regulation.

Architecture Design 2 – Use Case View



Architecture Design 2 – Physical View





Architecture Design Comparison

	Consortium Blockchain Architecture	Existing Architecture
Data Integrity and Security	$\Rightarrow \Rightarrow \Rightarrow$	
	Immutability from consensus protocols.	Vulnerable to tampering
Data availability	\Rightarrow	
	Replicated-Ledger based system.	'Multiple' points of failure.
Interoperability	$\Rightarrow \Rightarrow \Rightarrow$	
	Logically centralises information	Poor communication between each State's database.
Flexibility and Modifiability	Immutability makes system difficult to change.	Independence allows for flexibility
Cost Effectiveness	Complex to implement and manage.	Traditional Database System
Overall user-experience	Streamlined and online	Slow paper-based process

Development Plan

CarChain

Block Party

lock Party															
		Project Start:	14-J	lun-21											
		Display Week:	1		Jun 14, 2		Jun 21, 2021	Jun 28, 202	Jul 5, 20	Jul 12, 2	Jul 19, 20	Jul 26		g 2, 2021	
TASK	ASSIGNED	PROGRESS	START	END			21 22 23 24 2 M T W T F								
Feasibility Study	то	FROGRESS	START	END	101 1 00 1		<u> </u>	· w ·	101 1 00	101 1 00		101	3 101 1	W .	
	XP	100%	14 Jun 21	26-Jun-21											
Defining Functional Requirements		100%													
Defining Non-Functional Requirements	ХР	100%		26-Jun-21											
Determining Suitability	DB	100%	14-Jun-21	26-Jun-21											
Architechture Designs Comparison	LH & DW	100%	14-Jun-21	26-Jun-21											
Setting up work environment for Hyperledger Fabric															
Setting up VM for the team	LH	100%	24-Jun-21	29-Jun-21											
Team members familirising with working environment	Everyone ex LH	50%	26-Jun-21	2-Jul-21											
Managing Smart Contracts															
Vehicle Initiation	Shared	0%	3-Jul-21	6-Jul-21											
Registration	Shared	0%	7-Jul-21	10-Jul-21											
Violation Logging	Shared	0%	11-Jul-21	14-Jul-21											
Transfer	Shared	0%	15-Jul-21	18-Jul-21											
Node JS Application															
Registration Employee Portal	Shared	0%	16-Jul-21	19-Jul-21											
Self Service Portal	Shared	0%	20-Jul-21	23-Jul-21											
Police Portal	Shared	0%	24-Jul-21	27-Jul-21											
Manufacturer API	Shared	0%	28-Jul-21	31-Jul-21											
Packaging and Documentation															
Manufacturer API	Shared	0%	1-Aug-21	4-Aug-21											
			-	-											