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DECENTRALIZED TRUST MANAGEMENT SYSTEM FOR VANETS

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DOMAINS

Mobile Domain

- Includes vehicles equipped with On-Board Units (OBUs)
- Comprises mobile devices like smartphones and laptops

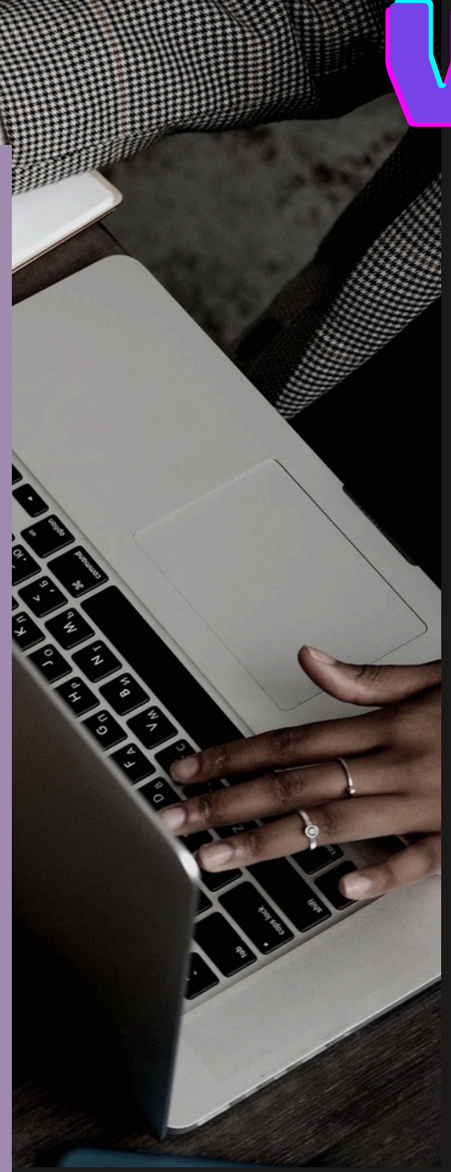
Infrastructure Domain

- Roadside infrastructure: Stationary units like Road-Side Units (RSUs), traffic lights, and cameras
- Central infrastructure: Traffic Management Centre

Generic Domain

- Internet infrastructure
- Private networks and computing resources

VANET COMMUNICATION



01 System ARCHITECTURE

VEHICLE-TO-VEHICLE (V2V);

- Direct communication between vehicles
- Used for safety applications and data dissemination

VEHICLE-TO-INFRASTRUCTURE (V2I):

- Communication between vehicles and roadside units
- Provides internet access and traffic information

IN-VEHICLE COMMUNICATION:

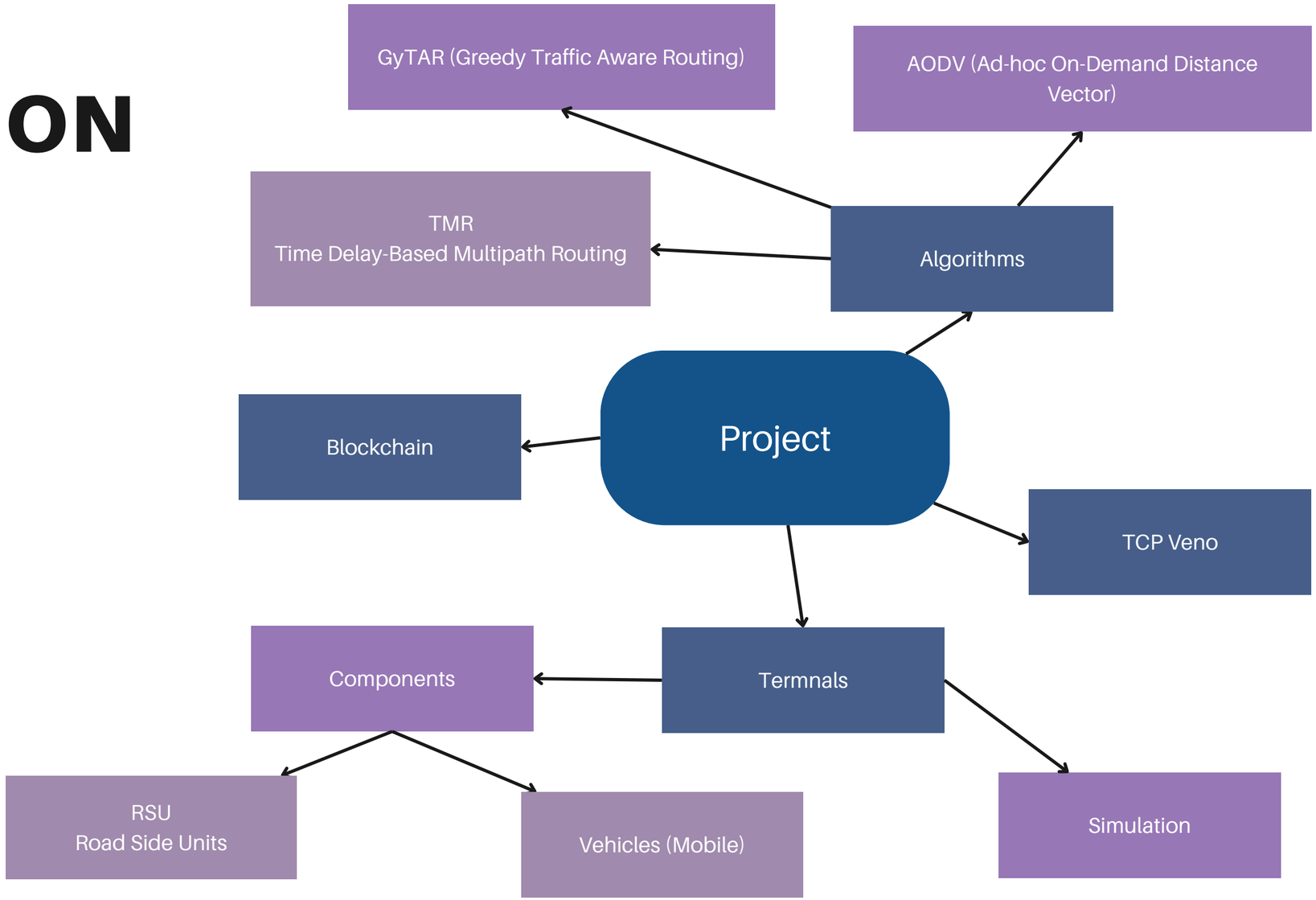
Data exchange within the vehicle

VEHICLE-TO-BROADBAND CLOUD (V2B):

- Communication via wireless broadband networks (3G/4G)

01 System ARCHITECTURE

MODULES IDENTIFICATION



Various modules the project was divided into for ease of understanding and decribing

02 Modules Identification

MODULES DESCRIPTION

BLOCKCHAIN

- Implements a decentralized ledger for secure data storage
- Ensures data integrity and traceability in the VANET

CONFIGURATION MODULE (CONFIG)

Contains editable simulation parameters

Allows easy adjustment of network characteristics, vehicle properties, and simulation duration

Modules

RSU MODULE (RSU.PY)

- Implements Road Side Unit functionality
- Handles V2I communication and data relay
- Manages connected vehicles within its range

VEHICLE MODULE (VEHICLE.PY)

Simulates individual vehicles in the VANET

Implements V2V and V2I communication

Manages vehicle movement, data transmission, and decision-making

REQUIREMENT MODULE

Specifies hardware and software dependencies

Lists necessary libraries and tools for running the simulation

02 Modules Description

TCP VENO

Key Features:

1. Distinguishes between congestion and random losses
2. Adjusts congestion window more effectively
3. Maintains higher throughput in lossy networks

Benefits for VANETs:

1. Better performance in dynamic vehicular environments
2. Improved stability in wireless communications
3. Reduced unnecessary congestion window reductions

02 Modules Description

Implementation:

1. Used in vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) communications
2. Enhances overall network efficiency and reliability

ALGORITHMS

02 Modules Description

1. GyTAR (Greedy Traffic Aware Routing):
   - Designed for city environments
   - Uses real-time traffic density for routing decisions
   - Dynamically selects junction nodes for packet forwarding
2. TMR (Time Delay-Based Multipath Routing):
   - Focuses on minimizing packet transmission time
   - Uses Round Trip Time (RTT) to select optimal routes
   - Adapts to changing VANET topologies
3. AODV (Ad-hoc On-Demand Distance Vector):
   - Reactive routing protocol for mobile ad-hoc networks
   - Discovers routes only when needed
   - Uses sequence numbers to ensure route freshness
   - Performs route maintenance to handle link failures

03 Software Required

LIBRARIES

These libraries cover core dependencies, network simulation, cryptography for blockchain, and utility functions necessary for the project.

1	python-socketio	5	cryptography
2	numpy	6	typing-extensions
3	statistics	7	python-dateutil
4	simpy	8	The Project is coded in Python Language

PARTIAL IMPLEMENTATION

- Implemented core VANET components:
    a. Vehicle communication module
    b. RSU module
- Routing algorithms (TMR, GyTAR, AODV)
- Basic simulation environment
- Implemented malicious vehicle detection and isolation
- Measured V2V and V2I communication delays
- Used TCP Veno for congestion control

THANK YOU SO MUCH!