CYBERNATED ROAD NETWORK MANAGEMENT

The Proposition

Over the years of evolution, Man has made multitude of breakthroughs and out-of-the world achievements such as the Large Hadron Collider, The international space station, cold fusion and quantum computing, But, While focusing on seemingly far-fetched futuristic goals, we often tend to neglect the contemporary predicaments. One such being, improper traffic management. Here we offer an overview of the current and future applications of AIoT to generate greater advancements in traffic flow, safety and sustainability by providing suitable solutions to narrow down the possible pitfalls and challenges that comes with its implementation.

Our Objectives

Interconnecting all the vehicles through a self-regulating colossal network thereby establishing an efficient form of traffic coordination.

Incorporation of decisive and predictive algorithms to simulate and manipulate such a dynamic network.

Digitalization of traffic lights and other modules.

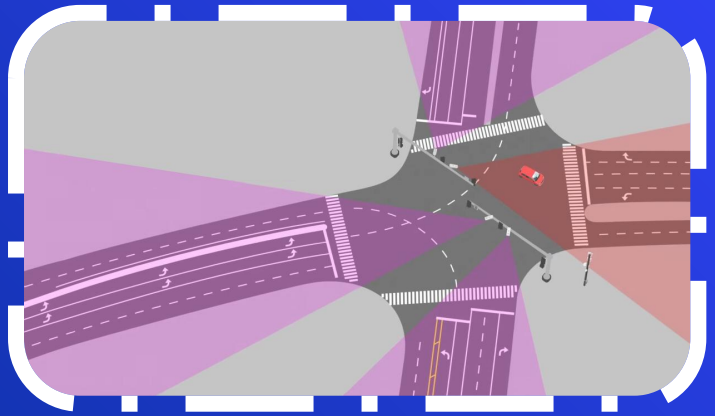
Direct intimation to the drivers through vehicle-integrable electronic devices.

The Implementation

It’s Quite a Long journey, But, the Destination’s worth it.
Take a look at the multitude of technologies involved in its implementation.

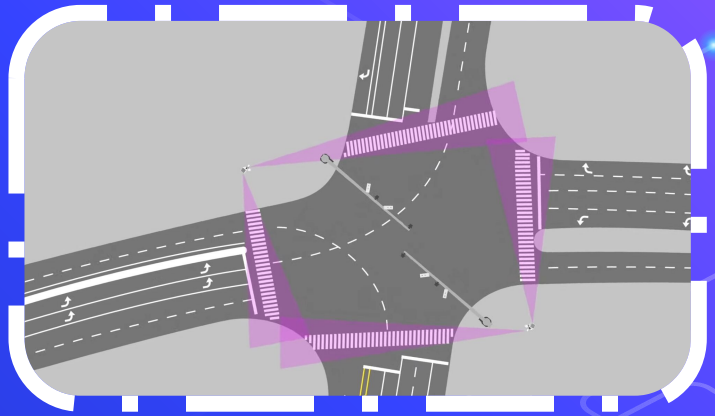
Conventional Technologies

Vision-based vehicle detection



It is a video-based detector that uses background subtraction techniques to find foreground objects in a video sequence. Experimental results show that the accuracy of the proposed vehicle counting system is around 96%.

Crosswalk detection



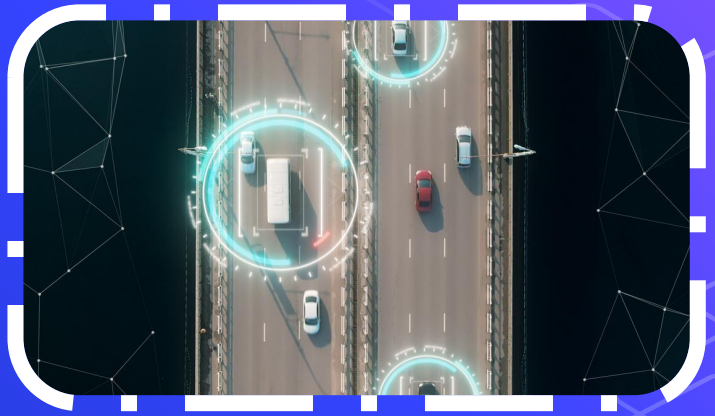
This detector can efficiently extract crosswalk regions under various illumination conditions, which can avoid the selection of thresholds according to the current environment situation and greatly improve the system flexibility and robustness.

Contemporary Technologies

Drone Assistance

Drones provide bird’s eye supervision and nimble assistance to eliminate blind spots. With their smooth maneuverability, speedy and time-critical results, thorough and detailed surveying, drones prove a resourceful substitute to conventional procedures.

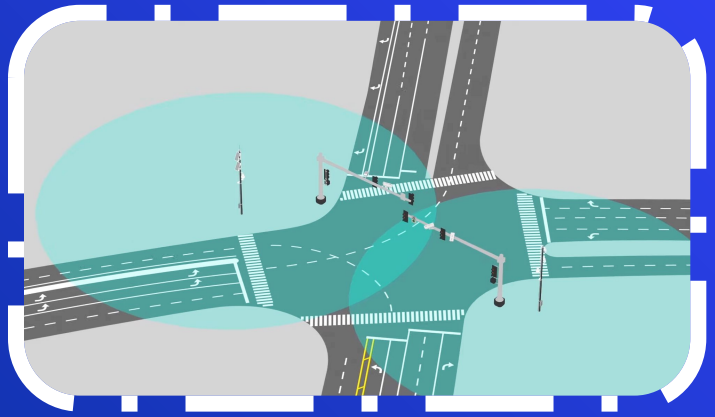
Smart Roadways with HSN



Smart pavements embedded with fibre optical cable technology and wireless connectivity could facilitate high speed seamless data flow. These roadways are also capable of detecting vehicle weight, size, speed, classifications etc.

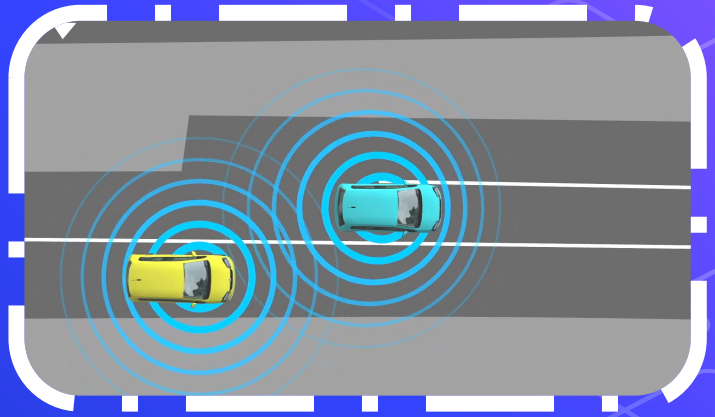
State-of-the-art Technologies

Road-Side Units



A special wireless communicating device located on the roadside that provides connectivity and information support to passing vehicles, including safety warnings and traffic statistics.

Onboard Units

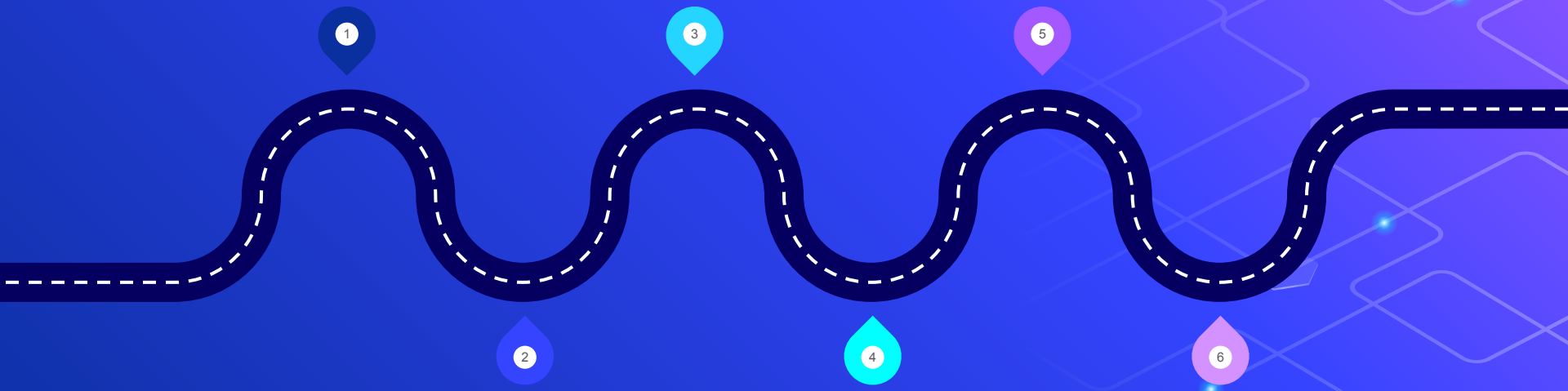


A transceiver that is normally mounted in or on a vehicle to facilitate Inter-vehicular communication and signal coordination with the roadside units. It is equipped with a user-interactive display.

Digitized Traffic Management Centers

DTMCs have to be established to incessantly monitor traffic signals, intersections, and roads and proactively deploy traffic management strategies to reduce congestion. They must be equipped with current generation servers to store traffic data and ultra high speed wifi to ensure uninterrupted connectivity. Each and every road network modules over a vast region could be directly accessed from these centers.

Challenges in Implementation



>> The Road to destiny is never a straight line

Role of AIoT

Back-End Objectives

Data

Collection of tremendous amounts of raw data through variable input sensors. Extracting and organising essential information from the raw data.

Algorithm

To develop pattern recognizing and decision making algorithms and to train such algorithms by feeding loads of information.

Processing

Real time video processing to derive valuable inputs like vehicle count, classifications and mobility.

Output

Self-sustainability and self-reliability of the network and ensured safety against cyber threats.

Core concepts of AIoT

PATTERN RECOGNITION

To recognize and retrace multitudes of paradigm associated with the traffic flow in variable situations.

DATA SCIENCE

To derive and organize valuable information from the accumulated raw data for further processing.

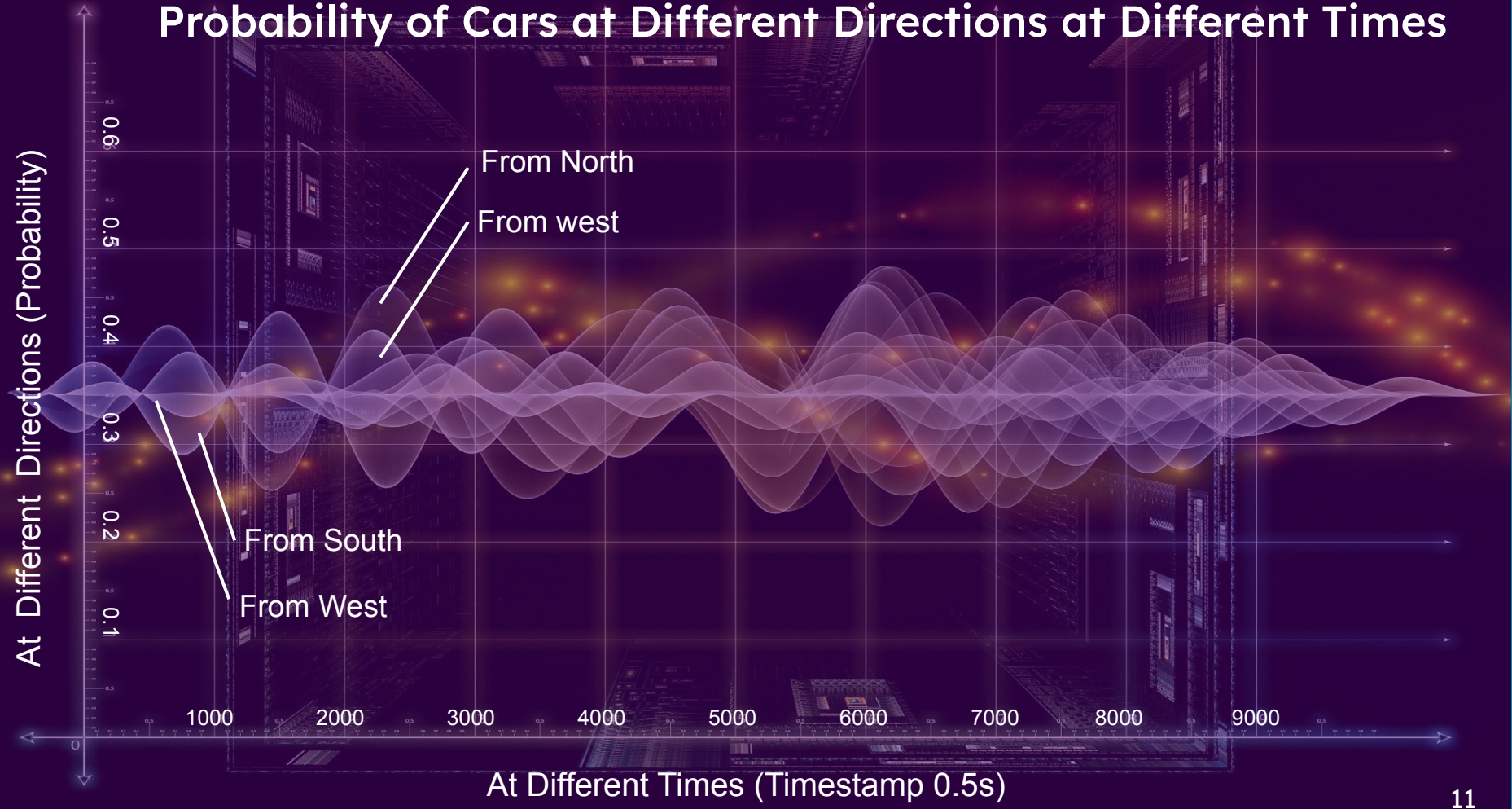
To create self-reliant algorithms that can learn from the collected data to make coherent decisions.

MACHINE LEARNING

To derive meaningful outputs from digital images, real-time video footages and other visual inputs

COMPUTER VISION

Probability of Cars at Different Directions at Different Times



World's Deadliest traffic

raffic by AI Controlled Algorithms

Historical traffic records: China 12 days, 62-mile-long

Peak traffic hour index by country

126 = 30 min trip >>> 68 minutes

108 = 30 min trip >>> 62 minutes

Bottlenecks - 21%

Figure 8's - 52.5%

slopes - 63%

City Grid - 7.35%

Individual Benefits

Always Green

Complete prevention of traffic jams through AIoT. Enabling the driver to avoid undesired red signals.

Time and Money

Overall reduction in the travelling time and cost due to a streamlined traffic flow.

Save Lives

Clearing out roadways for ambulances and fire-engines during emergencies while minimising traffic constraints for others.

Caution

Warning the drivers about potential hazards well in advance through intuitive visual aids. Emergency electronic breaks.

Assistance

Dynamic parking availability, virtual display for blind spots, Intersection crossing, instructions on road weather blockage and other sort of assistances. Can assist Level-4 Autonomous vehicle.

Social Benefits

- *Well-organised traffic network means decreased accidents.*
- *Efficient traffic flow will increase the productivity of socio-economic activities.*
- *Methodical assistance to disaster prevention and management.*
- *Energy-saving through indirect prevention of wasteful fuel-consumption.*
- *Mitigation of air and noise pollution.*

Hierarchical Network Topology

A Hierarchical network topology interconnects multiple units that are located on separate layers to form a larger network. Each layer concentrates on specified functions correlated with its locality.

Three-Layered segment of HNT

Master Layer

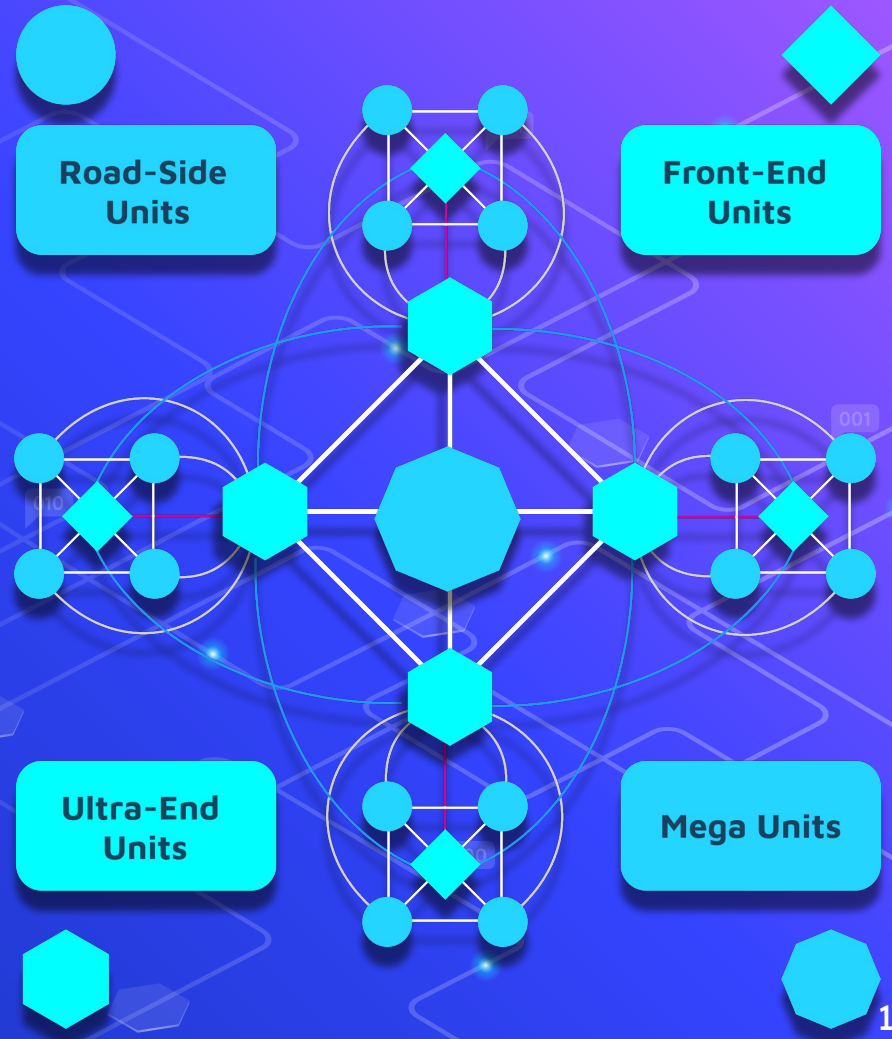
- Mega Units

Intermediate Layer

- Ultra End Units.

Ground Layer

- Front-End Units
- Road-Side Units.

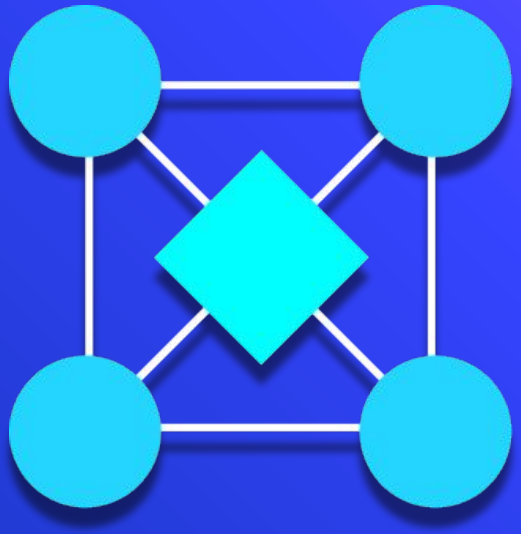


Road Side Units

The Spheres represent the Road-Side units which communicate with the onboard-units and other detectors. They are directly under the supervision of the Front-End units.

Front-End Units

The Diamonds represent the front-end units which process data collected from the road-side units and send relevant commands to the same. These two units together constitute the primary layer.



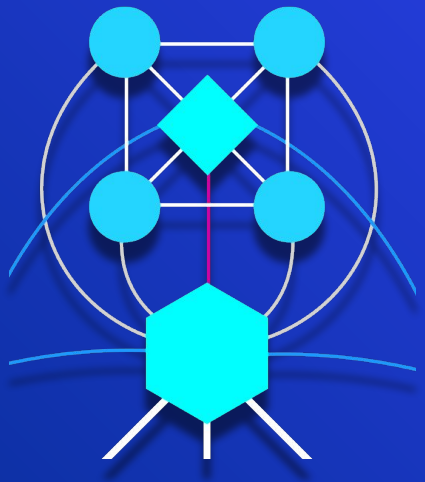
Ground Layer

Backup System

If any of the road-side units break down, the front-end unit will intimate the corresponding authorities. Also, this won't impair the rest of the network. Since every RSUs are directly connected with the FEU of that layer.

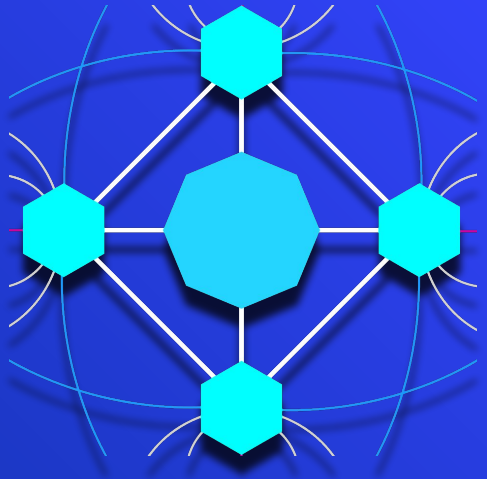
Ultra-End Units

The Front-end and the road-side units are also connected to an adjacent Ultra-End unit which occupies the second layer, here, represented by hexagons. A second layer network of UE units acts as a hub for several first layers for sharing information.



Mega Units

The third layer has the Mega unit, in here, represented by an octagon. A mega unit supervises several second layers and are physically located in the traffic management centers. It will have access to current generation servers to store and retrieve quickly.



Backup System

If any of the front-ends malfunction, the UE unit takes control over the individual road-side units of that particular layer. If any of the UE units malfunction, The closest neighboring UE unit will act an alternative.

Thanks!

You got anything on your mind?

It is not the answers that enlighten,
but the questions.