



INTELLIGENT NETWORKS LABORATORY FOR WIRELESS & MOBILE INTERNET

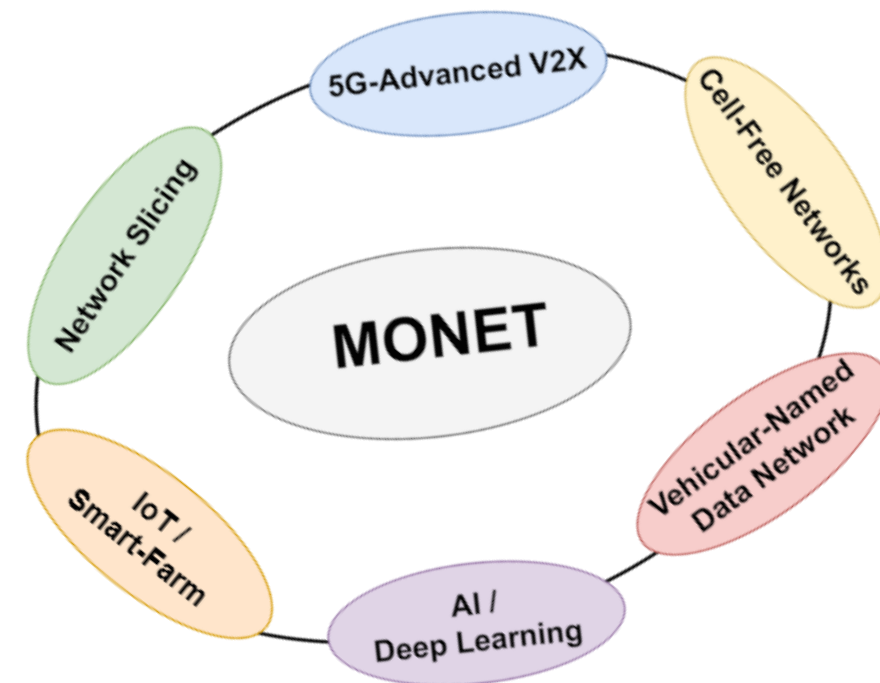
Research Director:

Prof. Dongkyun Kim

School of Computer Science and Engineering

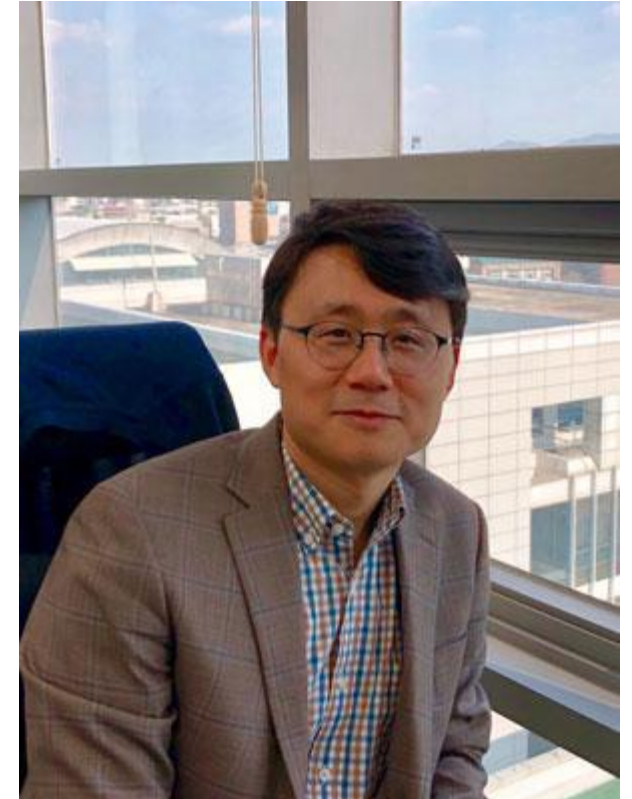
Kyungpook National University, Korea

Laboratory Website: <https://monet.knu.ac.kr/>



Prof. Dongkyun Kim

- Prof. Dongkyun Kim received the B.S. degree from Kyungpook National University, Daegu, South Korea; and the M.S. and Ph.D. degrees from Seoul National University, Seoul, South Korea. He was a Visiting Researcher with Georgia Institute of Technology, Atlanta, GA, USA, in 1999. He also performed a post doctorate program with the Department of Computer Engineering, University of California, Santa Cruz, CA, USA, in 2002. From 2015 to 2016, he was a visiting faculty at CSC Research Group, Georgia Institute of Technology, Atlanta, USA. Currently, Prof. Kim is with the School of Computer Science and Engineering, Kyungpook National University. His current research interests include connected cars, vehicular ad hoc networks, the Internet of Things (machine-to-machine/device-to-device), Wi-Fi networks (including Wi-Fi Direct), wireless mesh networks, wireless sensor networks, and future Internet. Prof. Kim has been with the Organizing Committee or the Technical Program Committee for many conferences of the IEEE and the Association for Computing Machinery. He has been doing many editorial duties for several well-reputed international journals.



Lab Members



Name: Malik Saad
Research: Resource Allocation in C-V2X /NR-V2X
Program: Post Doctor
Country of Origin: Pakistan



Name: Sunghyun Kim
Research: Wireless Networks
Program: Ph.D
Country of Origin: Korea



Name: Ashar Tariq
Research: Resource Management in Network Slices
Program: Combined Masters and Ph.D
Country of Origin: Pakistan



Name: Ayesha Siddiq
Research: Cell-Free Networks
Program: Ph.D
Country of Origin: Pakistan



Name: Mahnoor Ajmal
Research: Cell-Free Backhaul
Program: Ph.D
Country of Origin: Pakistan



Name: Deepak Singh
Research: O-RAN, VRU
Program: Ph.D
Country of Origin: India



Name: Haishan Yang
Research: Internet of Vehicles, Blockchain
Program: Masters
Country of Origin: China



Name: Youngjoon Yang
Research: V2X Communication, Edge Computing
Program: Masters
Country of Origin: Korea



Name: Su Kim
Research: V2X Communication, IoT, Vulnerable Road User Safety System
Program: Masters
Country of Origin: Korea



Name: Dyussebayeva Diana
Research: V2X communication, e-SPS (Enhanced Semi-persistent scheduling)
Program: Masters
Country of Origin: Kazakhstan



Name: Chaehyeon Kim
Research: V2X Communication, Edge Computing
Country of Origin: Korea



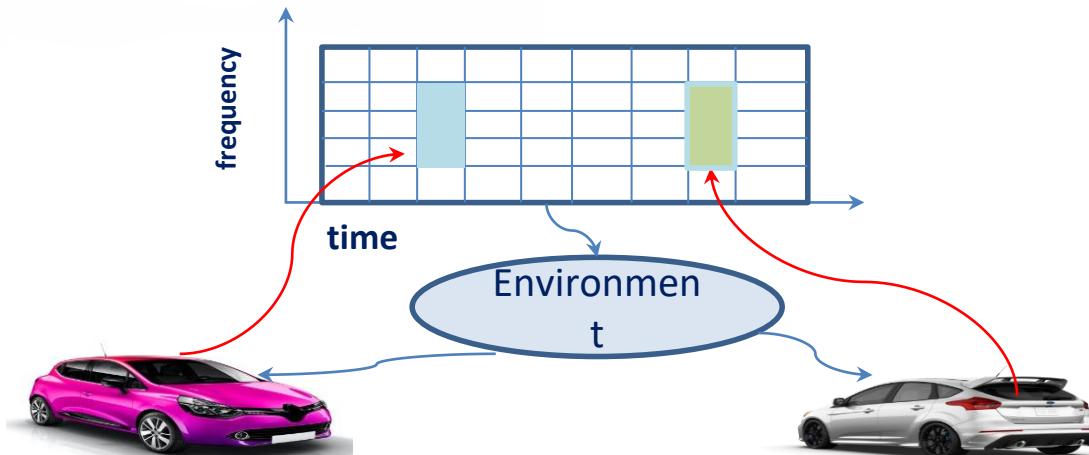
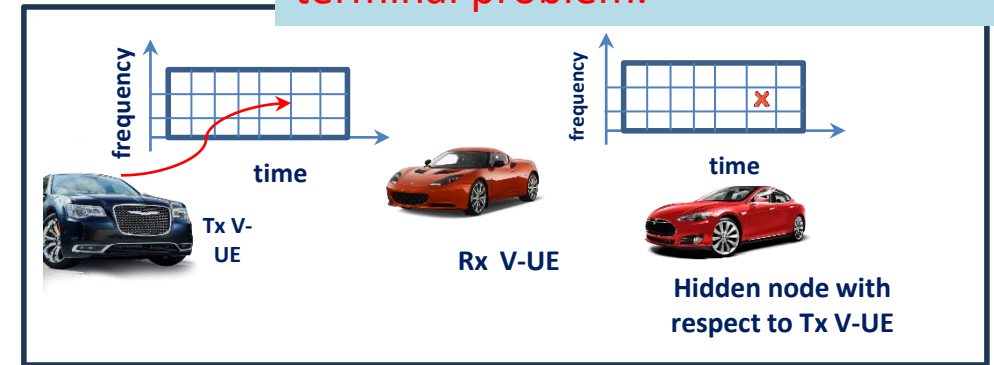
Name: Joohwan Park
Research: Vulnerable Road User Safety System
Program: Masters
Country of Origin: Korea

C-V2X / NR-V2X



- Vehicles communicate with each other for safety purpose to avoid collision.
- Leverages existing LTE networks for V2X network communications

The sensing nature of the SPS in NR-V2X is challenged by the **hidden terminal problem**.



Reinforcement Learning based Resource Allocation:

Due to the implicit relationship between the state and the reward function, the vehicles learn to select the optimal subchannel (resource) for transmission.

Network Slicing

- Partitioning of a physical network into several virtual subnetworks (network slice)
- Each subnetwork for different application
- Dedicated resources for each network slice

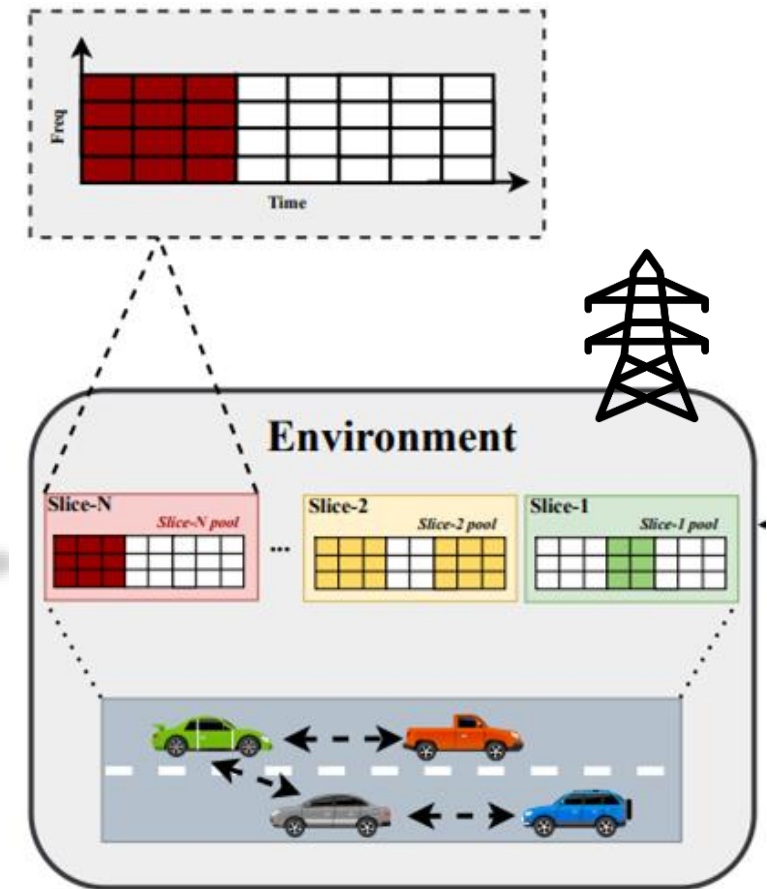


Slice-1:
Holographic
Communication

Slice-2:
Virtual Reality

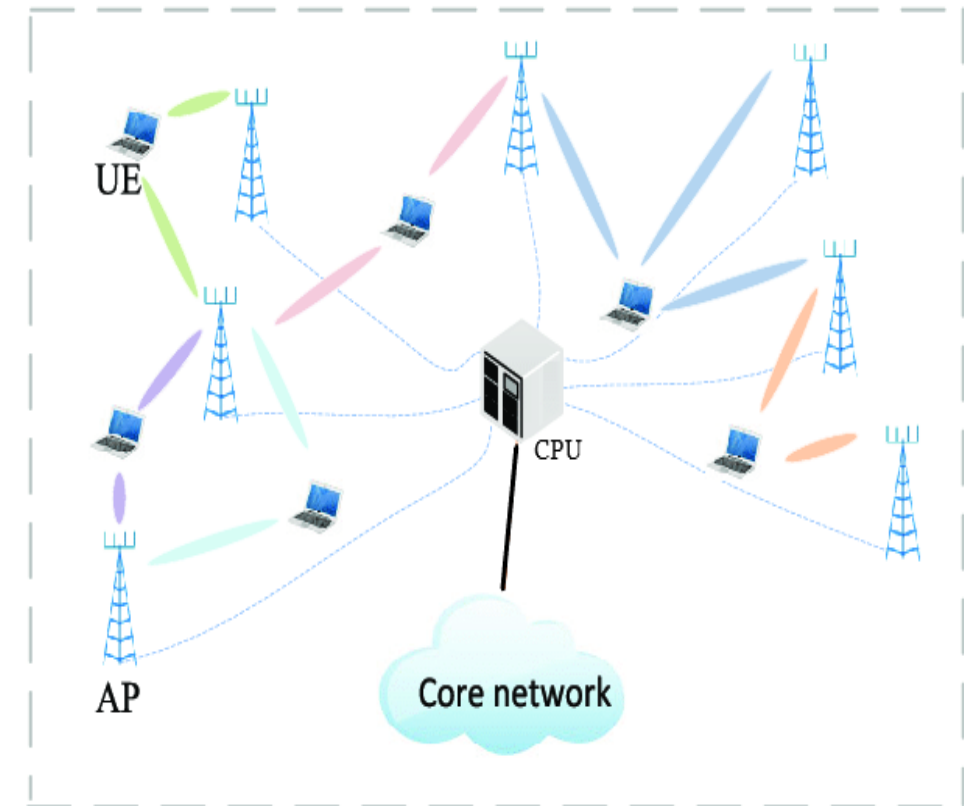


Slice:3:
Autonomous Driving



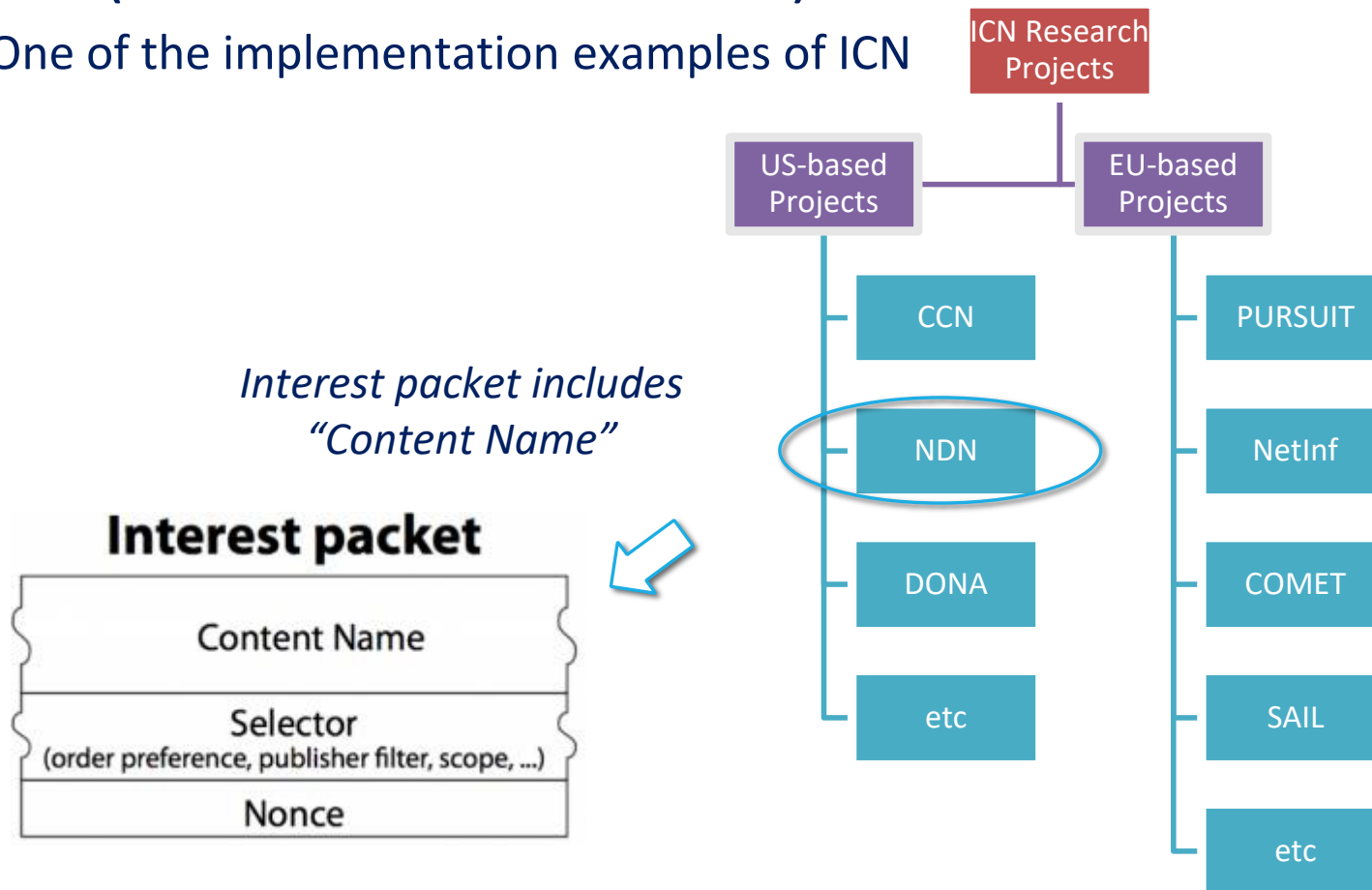
Cell-Free (CF) Networks

- No cell boundaries
- Distributed Access Points (APs)
 - APs are equipped with different number of antennas
- APs are connected to Central Processing Unit (CPU)
 - Wired connection between APs and CPU
 - Wireless connection between User Equipment (UE) and APs
 - Only CPU can satisfy data requests of UE
 - APs work as a relay to forward data requests between CPU and UE



Future Internet: Content-Centric / Name Data Networking (CCN/NDN)

- NDN (Named Data Networks)
 - One of the implementation examples of ICN

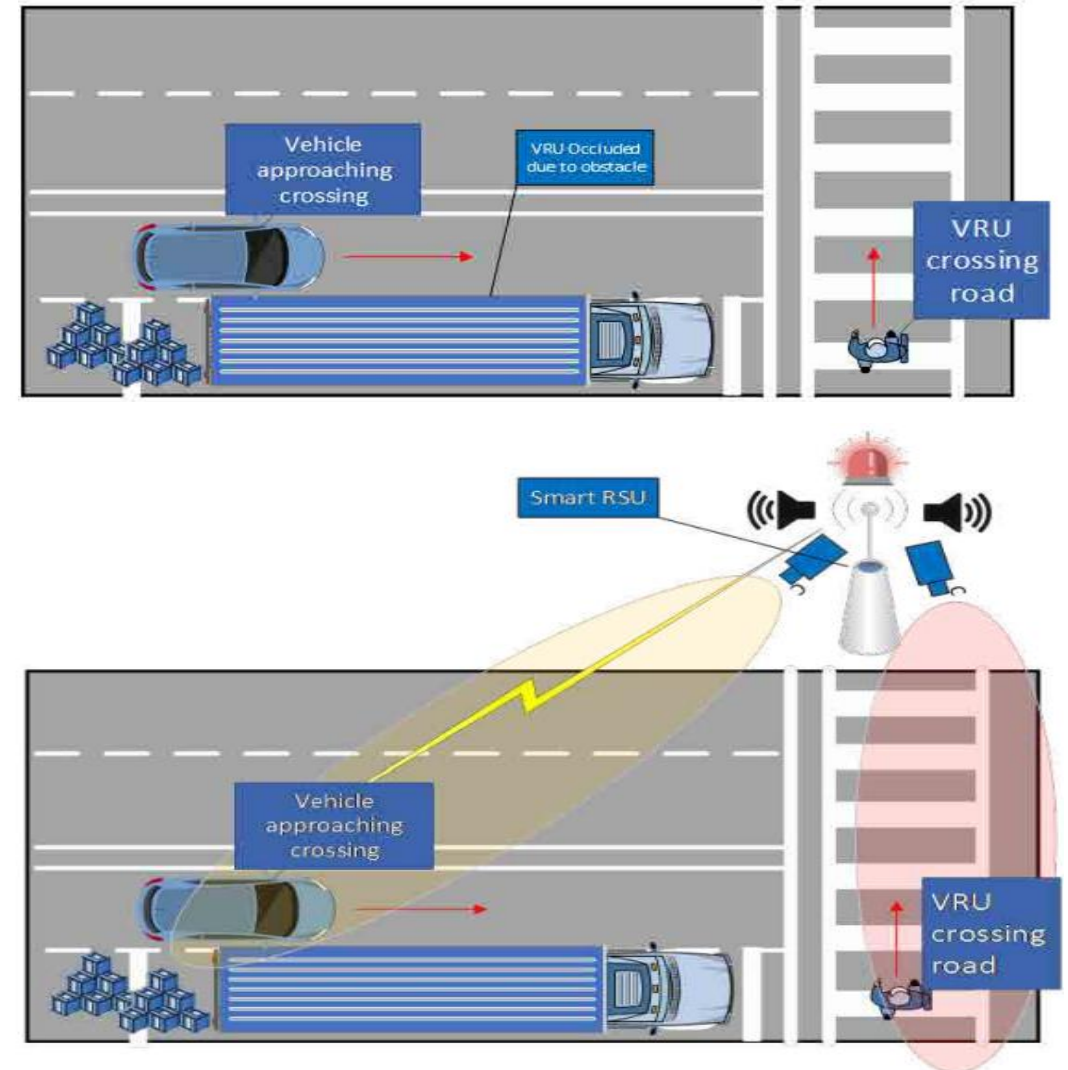


Vulnerable Road User (VRU)

VRU is occluded from vehicle's field of view

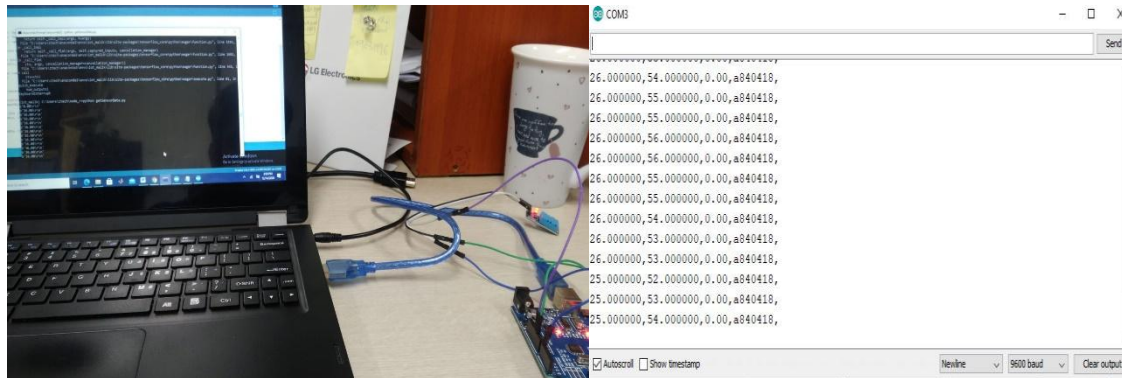
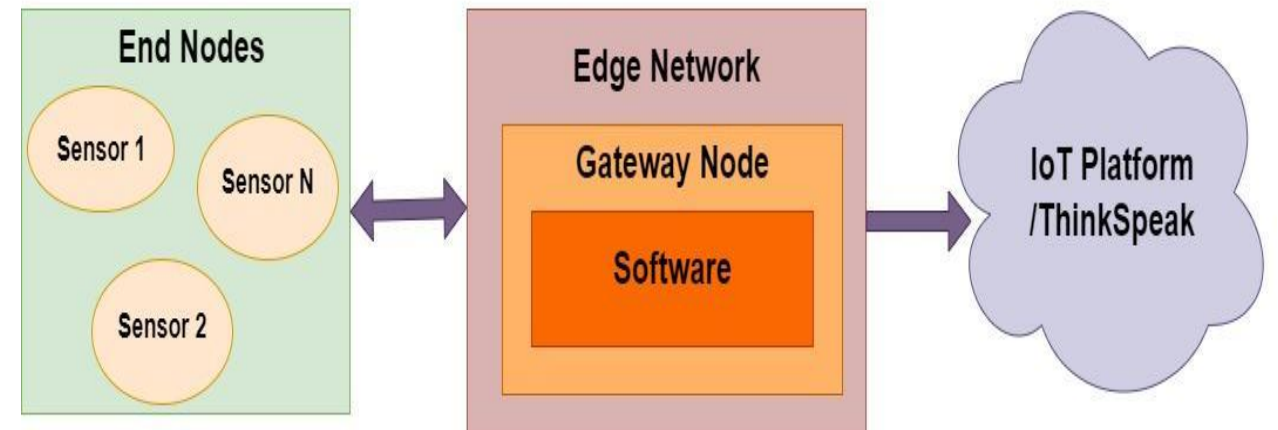
- VRU is at high-risk of being struck by the vehicle

- To avoid a collision between the VRU and the vehicle in such cases, a smart RSU is needed
 - RSU can perceive the environment information and send a notification message to approaching vehicles within the coverage range of the RSU

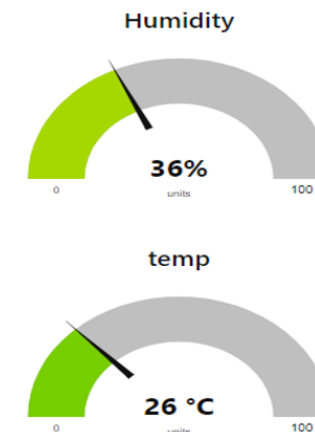


Smart Farm / IoT

- At the gateway, data is being stored in the database generated and moreover, it is being upload to the IoT server using WiFi and HTTP protocols.



- Machine learning is applied to predict the sensor data.



Graphical User Interface for a Display.

Domestic & International Collaborations



Mobile and Internet Systems
Laboratory, University College
Cork, Ireland



University of Waterloo,
Canada



Electronics and
Telecommunication Research
Institute (ETRI), Korea.



California State University, USA



Wireless and Signal Processing
Lab (WISP), Institute of Space
Technology, Pakistan



Free University of Bolzano, Italy



National University of Science
and Technology, Pakistan



Kuwait College of Science and
Technology (KCST), Kuwait



Qualcomm, San Diego, USA

Statistics

	Type	Total	Note
International	<u>Journal Papers</u>	105	SCI(16), SCIE(80), SCOPUS(4)
	<u>Editorials</u>	6	SCIE(6)
	<u>Conference Papers</u>	174	
	<u>Patents</u>	1	
	<u>Lecture Notes / Book Chapters</u>	19	
	<u>Books</u>	2	
Domestic	<u>Journal Papers</u>	21	
	<u>Conference Papers</u>	104	
	<u>Patents</u>	27	
	<u>Books</u>	2	
	<u>Software Registration</u>	49	
<u>Ph.D. Dissertations</u>		12	
<u>Master Thesis</u>		35	
Total Sum		557	SCI(16), SCIE(86), SCOPUS(4)

Contact

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