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Santa Clara University

Santa Clara University

Department of Computer Engineering

Internet of Things Research Lab



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Santa Clara University blends high-tech innovation with a social consciousness. Located in the heart of Silicon Valley, SCU pursues new technology, encourage creativity, engage with our communities, and share an entrepreneurial mindset.

The [SCU IoT Research Lab](#) from the **Department of Computer Engineering** focuses on the design and development of low-power wireless communication protocols, edge and fog computing, and software-defined networking. We are primarily interested in mission-critical IoT applications such as medical monitoring and industrial control. The research lab is collaborating various companies in Silicon Valley including Intel, Cisco, Cypress, and Broadcom. In addition to developing new theoretical concepts and algorithms, we follow an empirical approach towards the design and evaluation of IoT systems.

READY FOR:



OPEN IDEAS



x2 CHALLENGES

Researchers

Innovators

3 / 6
months

A NGI initiative



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 825183.

Partners





CHALLENGE #3 - SCU-WIFI-01

→ Towards WiFi for IoT Applications

GOALS

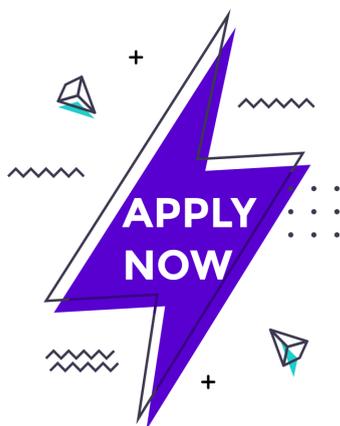
The main objective of this challenge is to design, develop, and evaluate mechanisms to enhance the reliability, energy efficiency, and timeliness of 802.11 communication when used in mission critical applications such as medical monitoring and industrial process control.

DETAILS

The deployment of WiFi access points in the residential, enterprise, and public environments offers a low-cost and scalable infrastructure for IoT communication. Compared to cellular communication, WiFi operates in unlicensed bands and does not require a subscription. Unfortunately, the widespread development and usage of this technology have resulted in communication hiccups and lower energy efficiency of stations, especially in the presence of interference or the background traffic generated by conventional user devices such as phones. For example, streaming voice and video traffic result in longer delay and higher power consumption of IoT devices. To address these concerns, new power management, traffic scheduling, roaming, and channel status prediction mechanisms must be developed for stations and access points. Besides, coordination and cooperation of access points in large-scale and dense deployments are essential to enhance performance.

SKILLS REQUIRED

Fundamental concepts of wireless communication; 802.11 standards and protocols; Linux networking concepts; Software-defined networking concepts; Linux kernel development; C/C++, Python.



Researchers	
	Innovators
AI	Blockchain
Big Data	IoT
5G	Cybersecurity
Cloud/Edge	Interactive
Hyper- connectivity	Human Internet



CHALLENGE #4 - SCU-FOG-02

→ Allocation of Fog Resource to IoT Edge Devices

GOALS

The main objective of this challenges is to design and develop software tools and algorithms for the allocation of fog resources to edge devices based on application requirements.

DETAILS

IoT edge devices are usually resources constrained in terms of processing, memory, and energy. Therefore, cloud or fog computing resources are required to accomplish processing tasks. However, the communication delay with cloud platforms and the increasing number of IoT devices necessities the need to use computing platforms closer to the edge devices. In this research we address the problem of allocating fog resources to edge devices. The two layers are connected using SDN switches or wireless access points. At a high level, the allocation requires instantiating containers on fog nodes and allocating reserved bandwidth between the two parties. In addition to benefiting from existing technologies such as OpenFlow and 'Kubernetes and designing new APIs around them, the development of heuristic resource allocation algorithms is essential.

SKILLS REQUIRED

Linux, C++/Python, SDN, OpenVswitch, wireless communication.

