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A Smart Building System Integrated with An Edge Computing Algorithm and IoT Mesh Networks

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Introduction

- ✤ A smart building system integrated with the emerging edge computing technology and IoT Mesh networks:
 - > First we fabricated 4 IoT Mesh Boards using the **CSRmesh** solution
 - Second we established a mesh network with one IoT host/server and three devices. (The BLE mesh technology is not standardized yet, only a few venters provide such solutions.)
 - > The next step is to develop the data analysis algorithm at the network edge and to connect to the GoKit cloud service with a GizWits V3.0 board.

Analysis & Feedback Algorithm

- Algorithm has five different phases.
 - Fetching data through sensors To gather data information with sensor networks.
 - Data processing & Analysis
 - Autonomous decision execution Process will be executed automatically without human interruption, based on the previous phase analysis.
 - Feedback controller Data transferred to Data processing & Analysis phase to complete concurrent and iterative process, if necessary.



System neutralization – System will be neutralized when system no longer requires process execution but data fetching and processing will not be stopped.



Data processing & Analysis

- After fetching data different measurement will be carefully observed in this phase like frequent data fluctuation, steady data information, garbage values etc. There will be three categories to process data based on time sensitiveness.
 - > Most time sensitive data are priority and will be executed first by all



extending the connection area to cover an entire farm or factory.

Fig. 2 Cloud-fog-IoT system architecture

- The System Architecture can be split into three stages.
 - IoT Mesh Network One host / server is wirelessly connected with three devices using the CSRmesh Technology.
 - Edge Node Edge node is implemented between cloud server and IoT mesh network which contains data analysis & feedback algorithms.
 - > Cloud Server Host/server is connected to external GoKit cloud

- means.
- A bit less sensitive data which can wait a bit and will be communicated to edge computation part and rest of the process will be handled over there.
- The last category will be the one where data does not require to be processed immediately, which can wait for some time, will be sent to data server. In the case, when such data is required, it will be processed followed by restore the data to data server after completion of process.

Conclusion and Future Work

- So far we have successfully, created IoT mesh network with sensors and host / server module. We were also able to gather the data information from the sensor network.
- Our future work will focus on developing the edge computing algorithms and connecting to the Gokit cloud service using the GizWits V3.0 board.



(h) GizWits V3.0 board

To show our efforts, we also developed a web page (sceweb.sce.uhcl.edu/Xiaokun -> FC) where valuable

server with GizWits V3.0 to keep data like sensor readings and feedback control the IoT network.

Use Cases

- Smart Building We plan to setup this prototype in our college campus building. A personal computer will be used as an edge server to connect with both the IoT host and the GizWits board. The IoT host is in charge of the IoT network monitor and control, and the GizWits board is adopted to connect to the GoKit cloud.
- Smart Agriculture System contains humidity, temperature, and light sensors, agriculture filed thus can have the best out of it along with the algorithm, which can let system work totally autonomous and take most efficient decisions. All the calculation and execution is done by system and there is no human interruption.

information will be visible and project demo will be visual too.



Fig. 4 A CSRmesh demo on UHCL campus