

ECE 484 Project Proposal

Limitations of WiFi with the use of Multiple Devices

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The project that the team proposes is to explore components of the usage of multiple devices on one wireless network, and the limitations and potential problems caused by having too many devices. Possible devices that can be examined during this project are the Amazon Alexa, Google Home, and/or IoT devices.

Given that more and more devices are becoming “connected” and the increased use of these devices, especially IoT devices, being used in elderly care; what is the current, realistic limitation on the connection density of these devices.

Areas of interest that the team wishes to explore with this project are the broadband capabilities, speed limitations, and signal error associated with multiple simultaneous connections in close proximity.

To start this project, there has to be a set or standard device and network to be examined. Possible frequencies that the team would like to evaluate are 900MHz and 2.4GHz.

Examples of communication protocols in those ranges include WiFi, BLE, Z-Wave, Zigbee, LoRa. For each protocol the team can research the amount of devices a network can carry before speed is affected, and the signal error for a particular device evaluated as each additional device is added.

To model the behavior, Matlab Simulink will be used.

Some resources the team has found are listed below.

1. The IEEE standards for each protocol
2. E. D. Ngangue Ndihi and S. Cherkaoui, "On Enhancing Technology Coexistence in the IoT Era: ZigBee and 802.11 Case," in *IEEE Access*, vol. 4, pp. 1835-1844, 2016.
3. R. Natarajan, P. Zand and M. Nabi, "Analysis of coexistence between IEEE 802.15.4, BLE and IEEE 802.11 in the 2.4 GHz ISM band," *IECON 2016 - 42nd Annual Conference of the IEEE Industrial Electronics Society*, Florence, 2016, pp. 6025-6032.
4. A. Marinčić, A. Kerner and D. Šimunić, "Interoperability of IoT wireless

technologies in ambient assisted living environments," *2016 Wireless Telecommunications Symposium (WTS)*, London, 2016, pp. 1-6.

5. D. C. Yacchirema, C. E. Palau and M. Esteve, "Enable IoT interoperability in ambient assisted living: Active and healthy aging scenarios," *2017 14th IEEE Annual Consumer Communications & Networking Conference (CCNC)*, Las Vegas, NV, 2017, pp. 53-58.