

Power Optimization of Wifi Routers

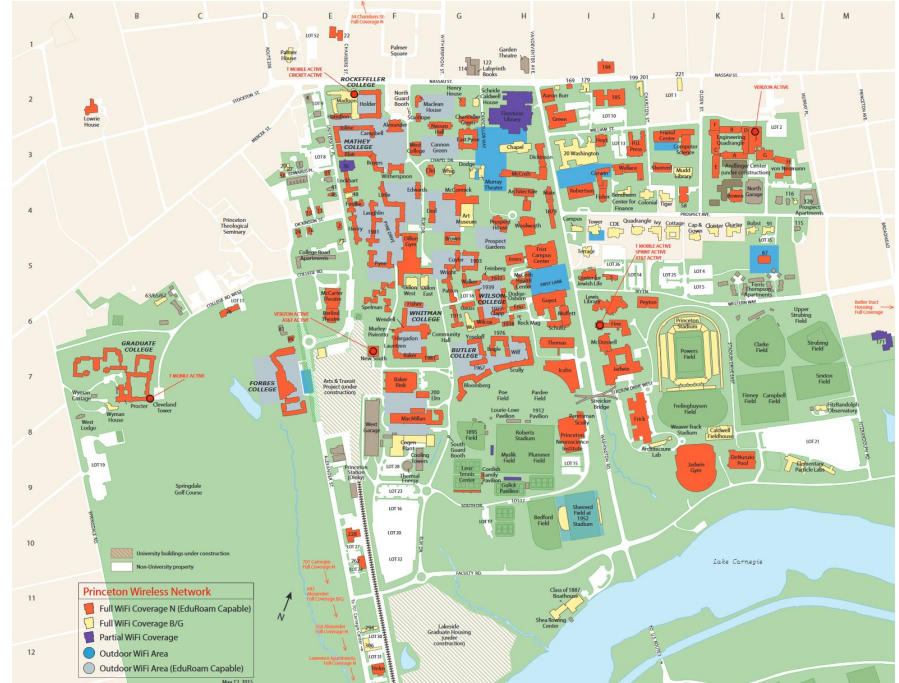
Winfred Darko

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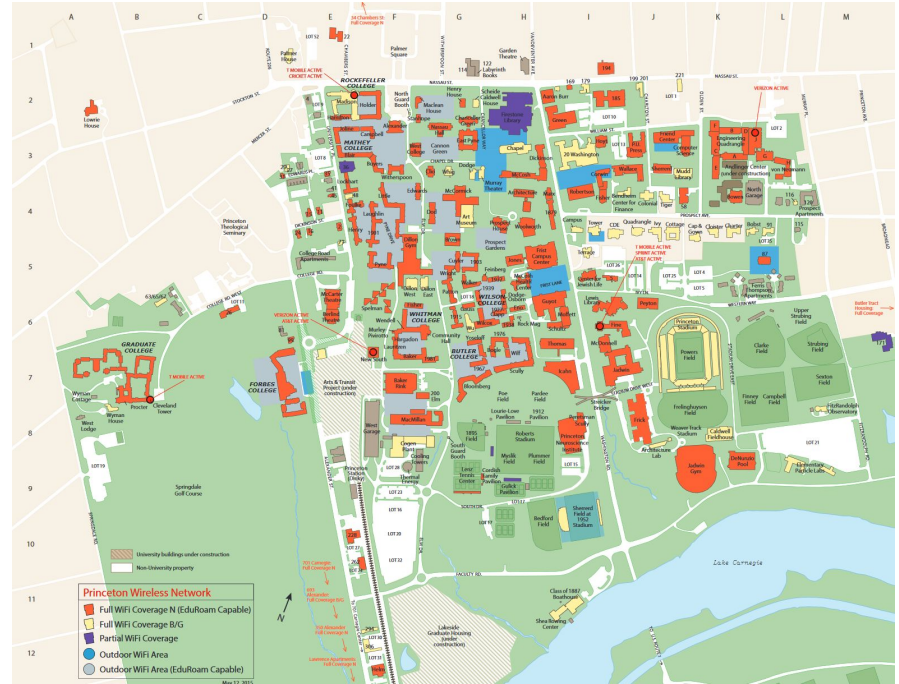
Motivation

- Ever-increasing density of wifi routers, with overlapping connections
- Put at full power, but most of the time not used to its capacity
- Excess power consumed by network



Goal

- Given network of overlapping wireless routers/APs
- Reduce excess router power usage in idle rooms
- Decrease wifi power usage in unused bedrooms, classrooms, etc.



Related Work

- Green WLANs (Jardosh, UC Santa Barbara)
 - Turn off overlapping routers except one, and increase transmit power to reach all neighbors
- TcP and DTcP: Possible, but requires real-time information from the router
- Is it possible to implement this with as little real time information as possible?

What is Success: (RoD) Standards

- The algorithm ensures the same amount of coverage as the coverage of the cluster of devices always on
- The algorithm allows for the performance rate of a fully-on cluster to be the same as the performance rate of the cluster using the algorithm
- Frequent client connections/disconnections are avoided.

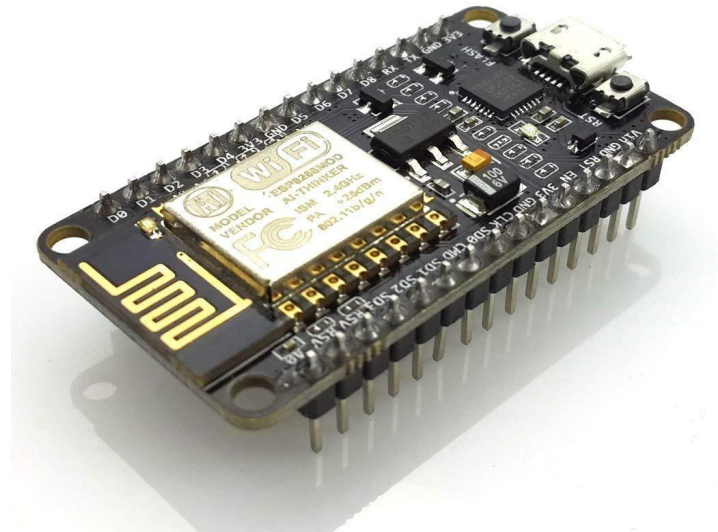
Approach

1. Determine Tx_min from dist_coverage
2. Determine wait_time
3. Set transmit power of AP to Tx_min
4. After wait_time has passed, check if STAs are connected or connecting to the AP for a time period of checking_interval.

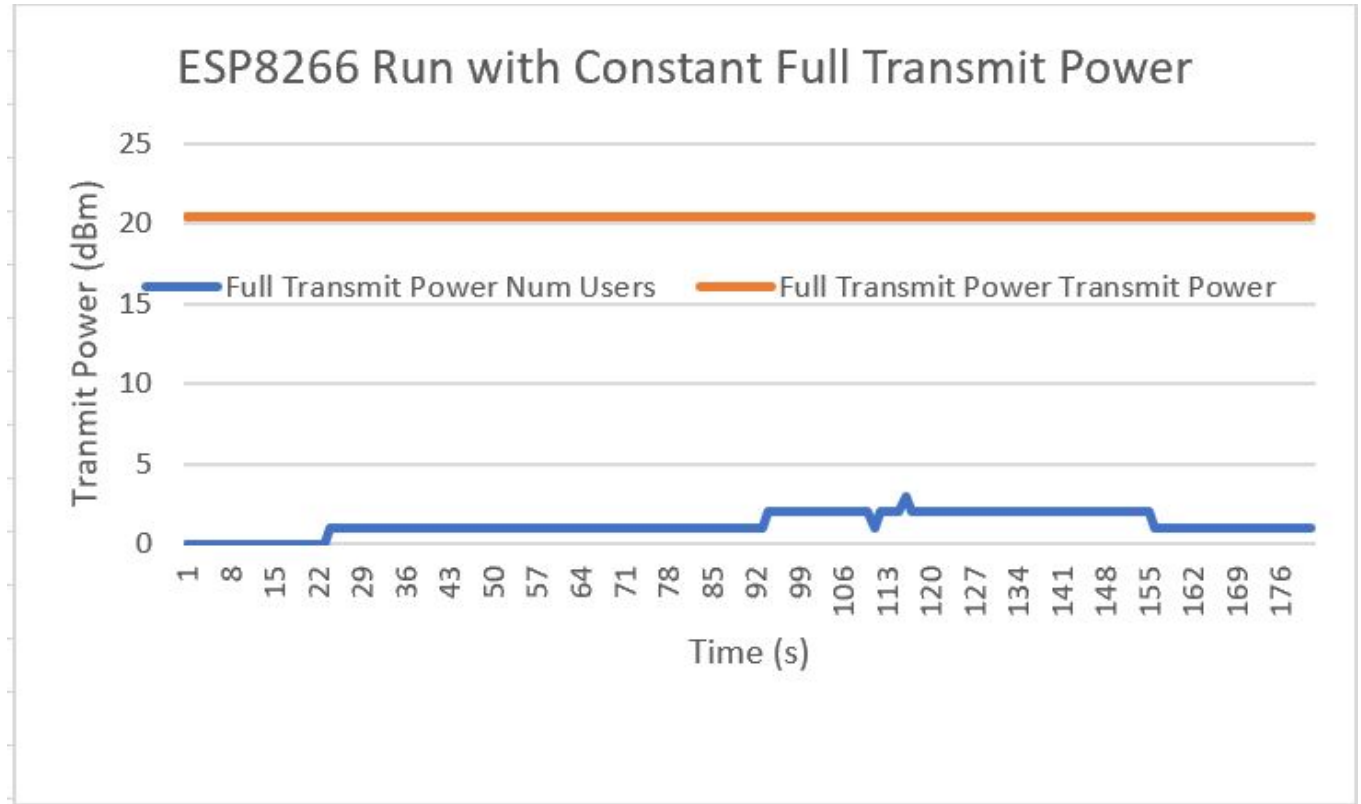
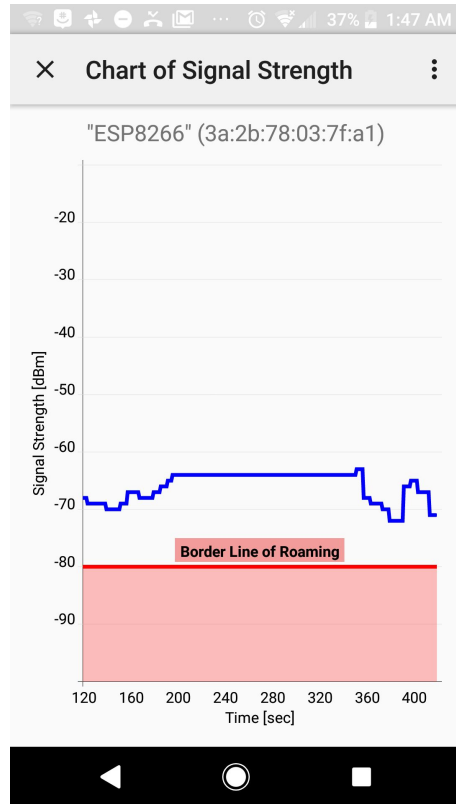
5. If the AP has 0 clients, set transmit power to 0.
6. If the AP has at least 1 client, set transmit power to Tx_min.
7. Return to 3.

Implementation

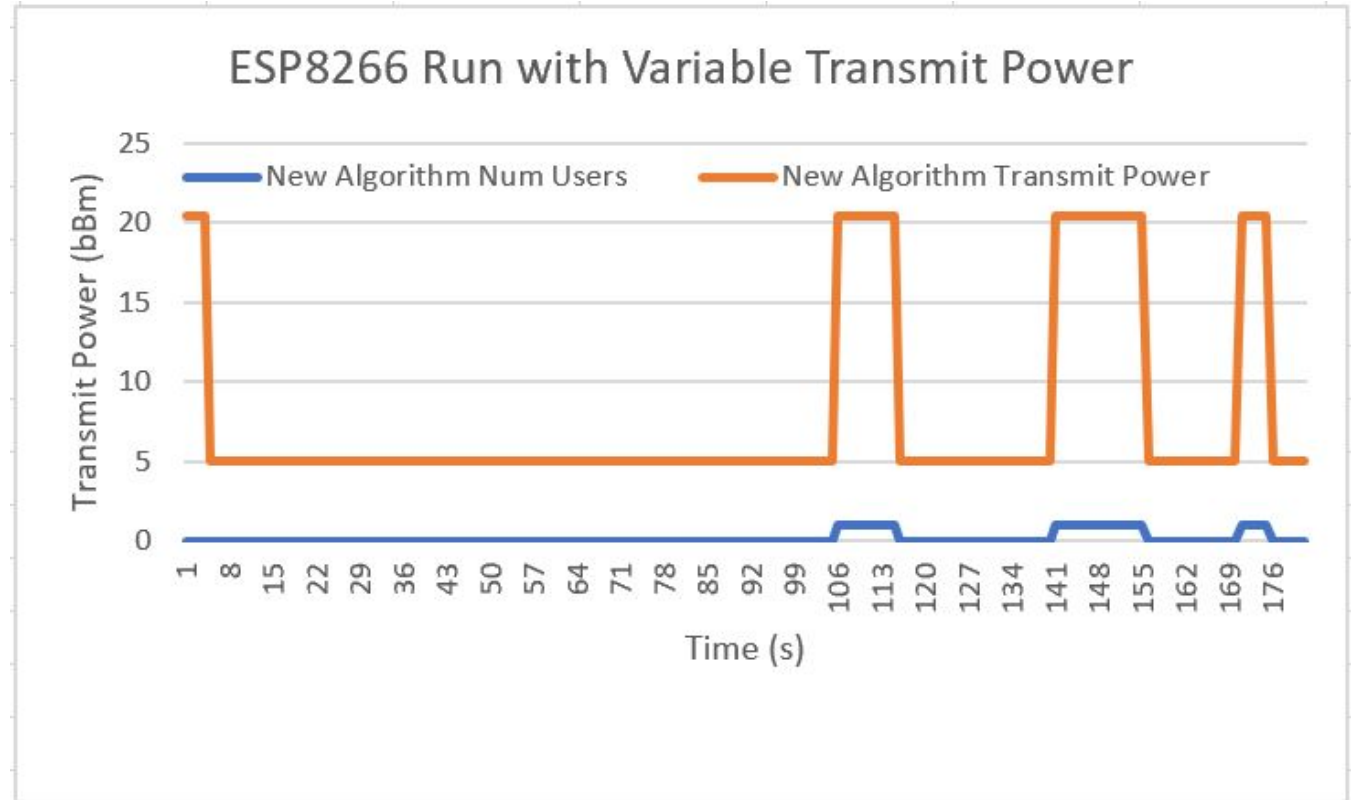
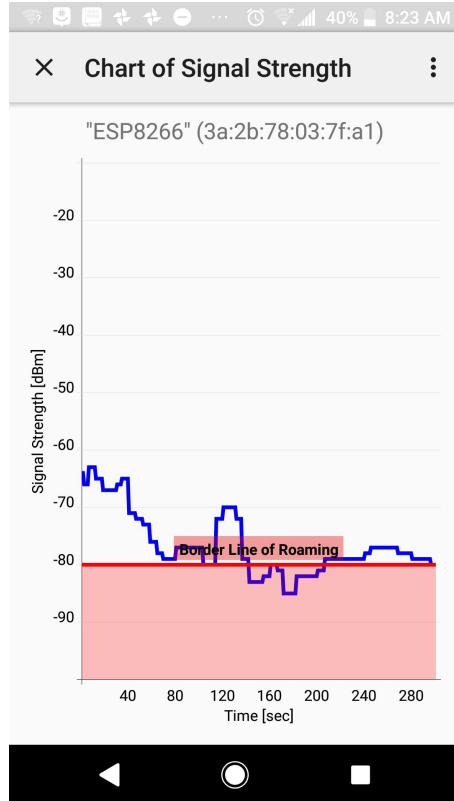
- Using ESP8266 wifi development board as AP
- Clients: Apple iPhone, a Sony Xperia X, and an Asus X00RD
- Tx_min = 20.5 dBm
- Wait_time = 5s
- Checking_interval = 1s



Run with Consistent Transmit Power



Run with Variable Transmit Power



Conclusion

- Process of turning off routers may reduces the power used by APs that are not used for a sustained amount of time,
- However, implementation of algorithm fails to provide reliable service, as holes in coverage exist

Future Work

- Clarify link between routers and the process by which clients determine access points to connect to
- Run experiments where wait_time and checking_time vary
- Determine if it is possible to decrease power usage with only access to the number of users connected and the ability to change the transmit power