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Rebecca Silberstein

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WiFi network selection based on RSSI velocity

ABSTRACT

A mobile device typically connects to a WiFi network based on received signal strength indicator (RSSI). In some situations, e.g., when passing an access point at a relatively high speed, the RSSI may be high enough to connect, but only for a short period of time.

This disclosure describes techniques to select a WiFi network based on RSSI and the rate of change of RSSI (RSSI velocity). If the RSSI velocity for a WiFi network is beyond a certain threshold, the WiFi connection is determined to be temporary, and the device does not connect to the WiFi network. WiFi connections initiated with consideration for the RSSI velocity are more likely to remain connected for a usable duration of time.

KEYWORDS

- RSSI
- RSSI velocity
- WiFi network
- access point
- exponentially weighted moving average
- EWMA

BACKGROUND

A mobile device typically connects to a WiFi network based on the network received signal strength indicator (RSSI). In some situations, e.g., when approaching an access point at a relatively high speed, the RSSI is strong, but due to the rapid approach and subsequent departure, does not last long. Such phenomenon occurs, e.g., when a user drives past a WiFi access point (AP), or when a WiFi AP is driven past the user (e.g., the AP is in a bus), or both.

Current techniques for connecting to a WiFi network are based on RSSI. If the RSSI for a particular WiFi AP is above a threshold then the device connects to the AP. This decision is made without consideration for RSSI velocity which can lead to connections that are short-lived and unusable. These temporary and unnecessary connections waste power and other resources on the device.

DESCRIPTION

Per the techniques of this disclosure, a WiFi network is selected based upon RSSI and the RSSI velocity, e.g. rate of change of RSSI. If the RSSI velocity is beyond a certain threshold, the WiFi connection is determined as not likely to last and is therefore not made.

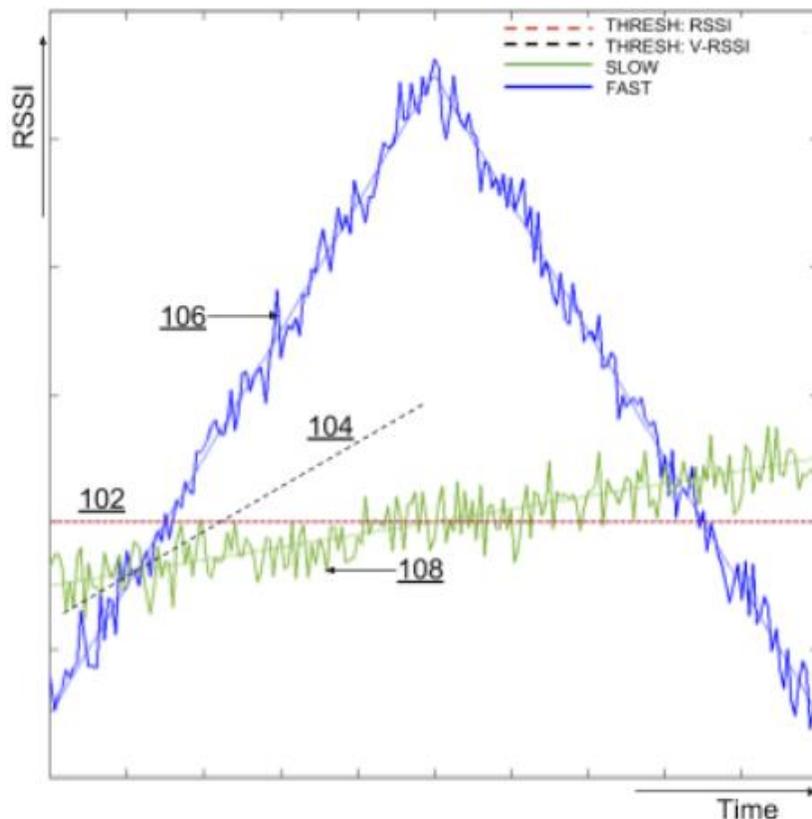


Fig. 1: Change of RSSI over time

Fig. 1 illustrates change over time of the RSSI for an AP, as measured at a mobile device. A mobile device that is moving fast with reference to the AP senses a rapid rise in RSSI (106). As the device passes the AP, the RSSI drops rapidly as well. A relatively slow-moving mobile senses a slow increase in RSSI (108) as it approaches the AP.

Per the techniques of this disclosure, a threshold THRESH-RSSI (102) is used to test for the strength of the RSSI, and a threshold THRESH-VRSSI (104) is used to test for the rate of change of strength (RSSI velocity). The mobile device attempts a connection to a WiFi network if the RSSI is above THRESH-RSSI and RSSI velocity is below THRESH-VRSSI. Thus, a connection is not attempted for the blue RSSI curve even though it crosses the THRESH-RSSI because its slope is above THRESH-VRSSI. On the other hand, a connection is made for the green RSSI curve once it crosses THRESH-RSSI since its slope is below THRESH-VRSSI.

The threshold is determined based upon a minimum usable time. Device and context-specific factors such as pending network requests, scheduled jobs/workloads, applications that are currently under execution (e.g., in the foreground), etc. can be used to determine the threshold.

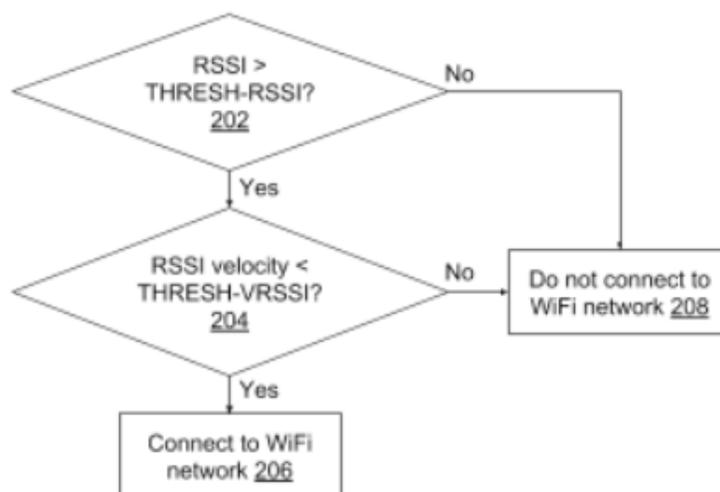


Fig. 2: Connecting to a WiFi network using RSSI and RSSI velocity

Fig. 2 illustrates selectively connecting to a WiFi network using RSSI and RSSI velocity, per techniques of this disclosure. The RSSI of a (new) WiFi network is measured (202). If the RSSI is below THRESH-RSSI, no connection is made (208). If the RSSI is above THRESH-RSSI, the velocity, e.g., rate of change, of the RSSI is measured and compared to THRESH-VRSSI (204). If the velocity of the RSSI is below THRESH-VRSSI, a connection is made to the WiFi network (206), else no connection is made (208). Further, historical RSSI and RSSI velocity can be used in combination with other factors to determine the minimum viable usable connection time and to determine if a connection should be made to the WiFi network.

To avoid wasting resources by scanning frequently, short, single-channel scans or probes are used to observe the RSSI and velocity thereof. These short, intentional scans or probes obtain values of RSSI parameters without wasting power or limiting data transmission (e.g., if the device is already connected to another WiFi network). Per the techniques, RSSI measurements may be smoothed using, e.g., an exponentially weighted moving average or other filtering technique, in order to obtain the RSSI and RSSI velocity. RSSI velocity is advantageously obtained using a time series of RSSI measurements.

Alternatively, RSSI velocity can be based on readings of on-board sensors such as GPS or inertial measurement units. However, such sensor-based RSSI velocity measurements do not reflect the speed of a moving access point. Still alternatively, certain rules relating to scanning for RSSI can be learned, e.g., using machine learning models. One such rule may be to not scan while the user is driving; however, this precludes the possibility of connecting to a hotspot within the user's vehicle.

The techniques of this disclosure provide a simple, low-complexity test to probe available WiFi networks to determine strength and reliability over time. Per the techniques, a device can

switch WiFi networks without thrashing between them, e.g., tearing down an existing good connection for an apparently excellent, but short-lived alternative. Disruption to or stalling of data flow is thereby reduced or eliminated.

CONCLUSION

This disclosure describes techniques to select a WiFi network based on RSSI and the rate of change of RSSI (RSSI velocity). If the RSSI velocity for a WiFi network is beyond a certain threshold, the WiFi connection is determined to be temporary, and the device does not connect to the WiFi network. WiFi connections initiated with consideration for the RSSI velocity are more likely to remain connected for a usable duration of time.