Tennessee TECH

Cyber Attacks on Smart Farming Infrastructure

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Outline

- Background
- Network Attacks
- Deauthentication Attack
- Implications of Deauthentication Attack

Background

- Smart-Farming
  - Fulfill global food demand and supply
  - Boost productivity and maintain product quality
- A Smart-Farm, an attack vector
  - Target for foreign competitors
  - Limited investment in cybersecurity
  - Lack of resources

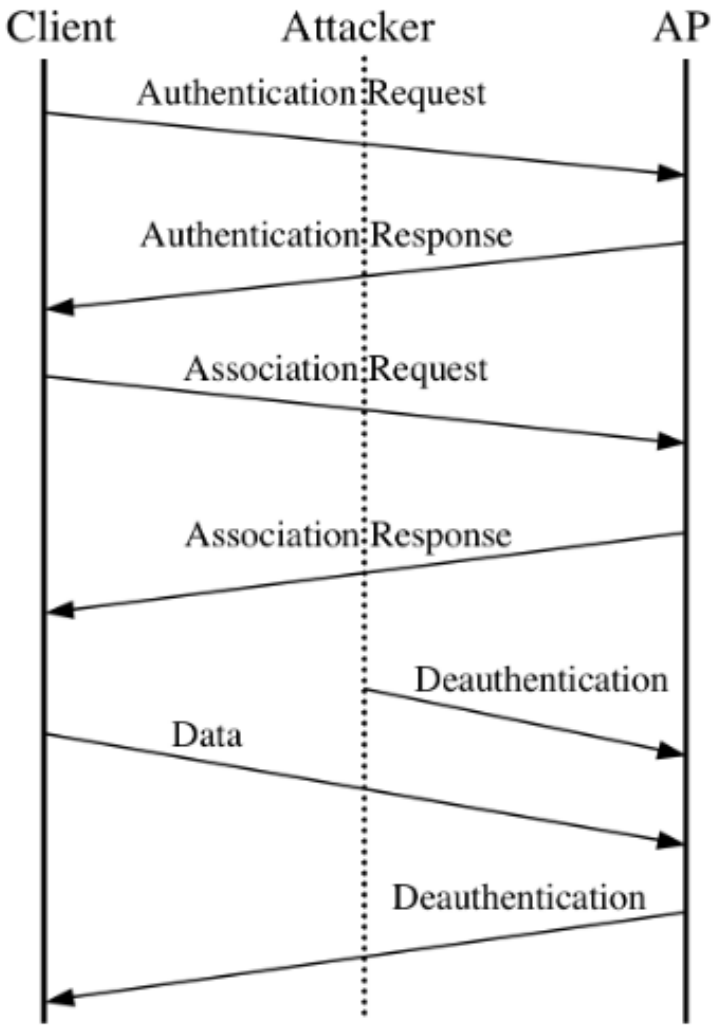
Research Objectives

- Explore different Cyberattacks
- Demonstrate a Cyberattack on a Smart Farming Architecture
- Analyze the attack and why it was possible so that it can be fixed

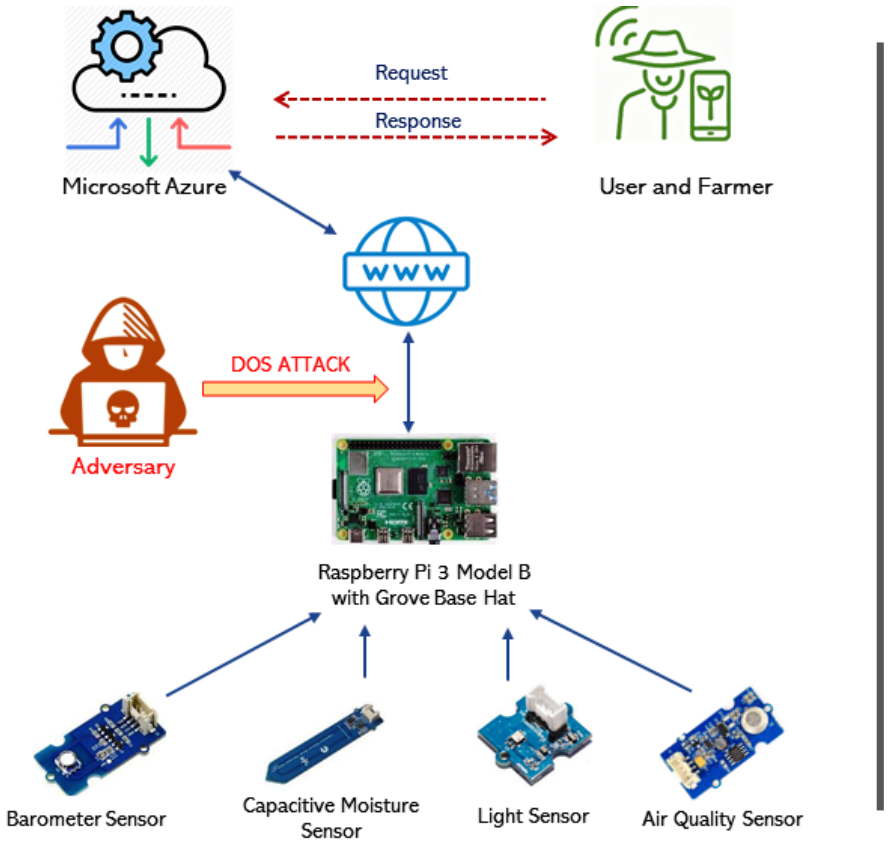
Network Attacks

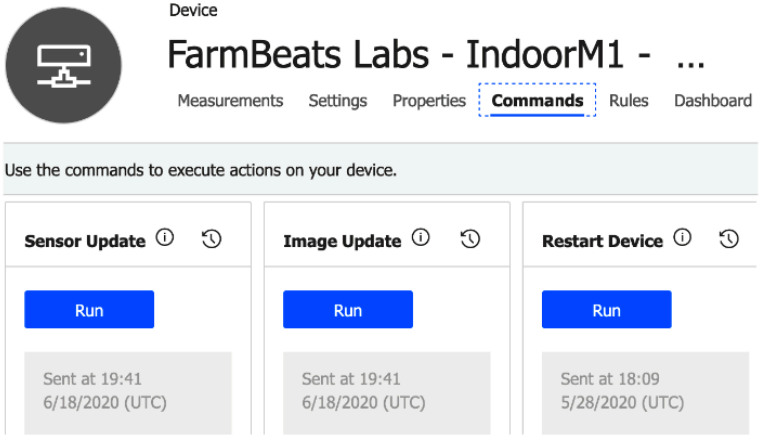
- Possible due to use of 802.11 protocol, not limited to Smart-Farm domain:
  - Password Cracking
  - Evil Twin Access Point
  - Key Reinstallation Attack
  - Kr00k - CVE-2019-15126
  - ARP Spoofing Attack
  - DNS Spoofing Attack

Deauthentication Attack

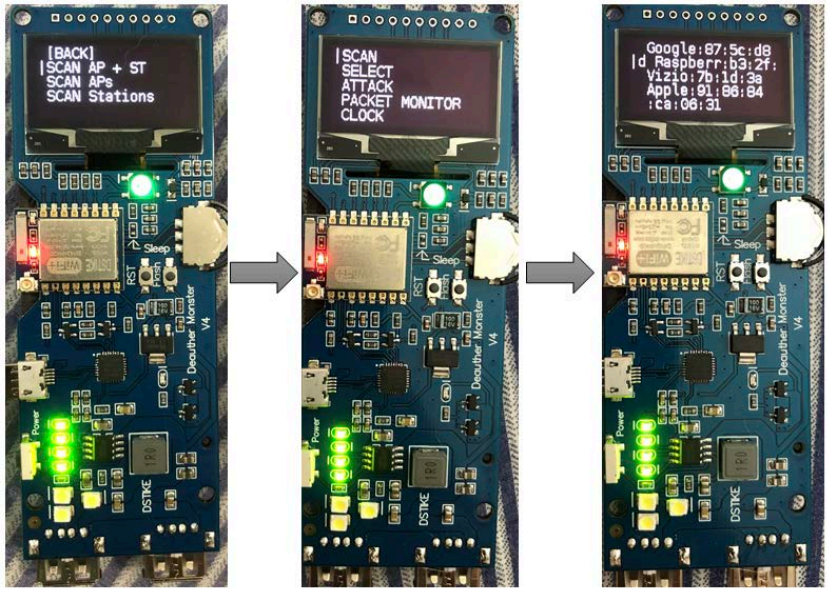


Set-up of the Architecture





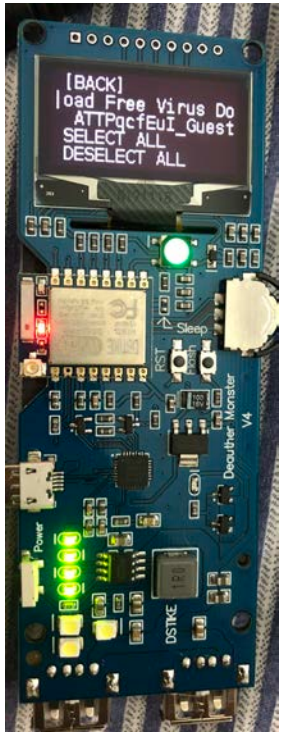
Steps of the Attack



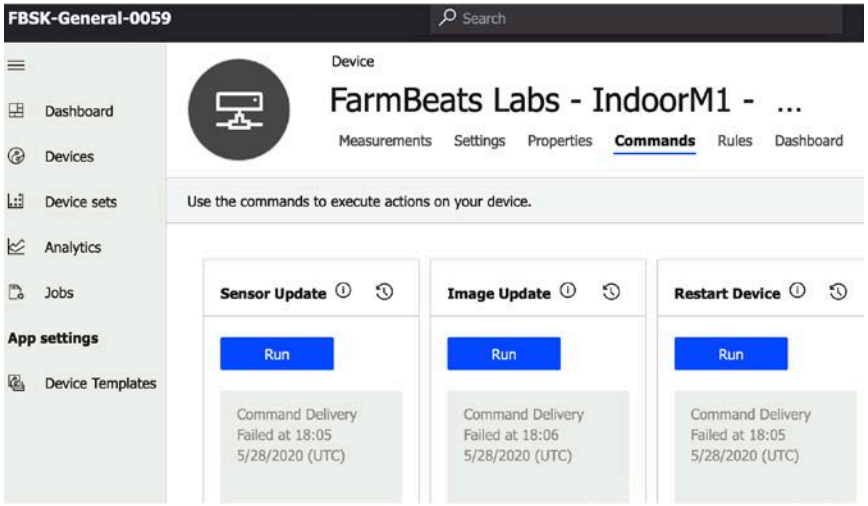
a). Scanning for Access Point and Stations

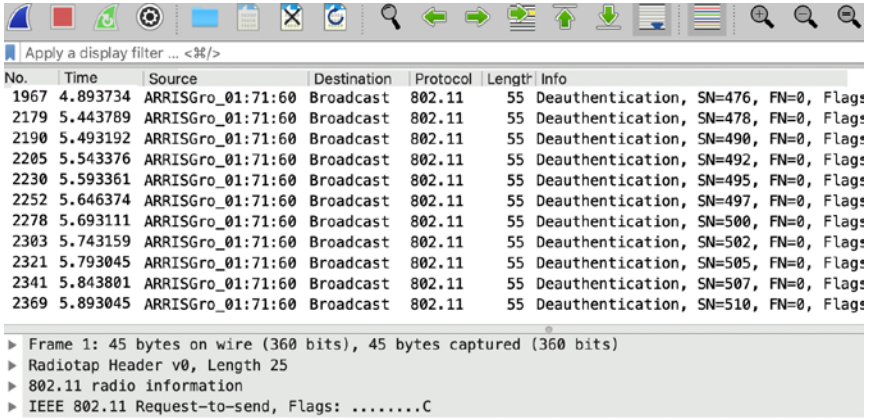
b). Main Menu

c). Select Raspberry Pi



Completion of the Attack





Implications of Deauthentication Attacks

- Sensor Data Obstruction
  - Obstruct real-time communication
  - Disrupt irrigation system’s decision
  - Damage crops, negatively affecting harvest
- Controlling Connected Devices
  - Gains access to entire smart-farm through evil twin access point or password cracking
  - Controlling agricultural drones to spray excessive fertilizers over the plants

Defense against Deauthentication Attacks

- Enabling IEEE 802.11w by encrypting management frames
- Reasonable priced 802.11w routers common in big companies
- Production cost: encryption capability issues
- 802.11w requires vendor to update code/firmware on both Aps and client side
- Raspberry Pi 3 Model B’s network interface card does not support encryption protocol required for protected management frames; however, Model B+ does

Conclusion

- Smart Farming has become popular and widely adopted
- Exposes new attack surfaces
- DoS attack on Smart-Farming Infrastructure
  - Deauthentication Attack
- Weakness of IEEE 802.11 protocol
- Successful attack has serious implications
- Future work, expand on other attacks and use other protocols