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import network
import time

def connect_to_wpa_enterprise(ssid, username, password):
    """
    Connect the ESP32 to a WPA/WPA2 Enterprise WiFi network.
    Args:
        ssid (str): The SSID of the WiFi network.
        username (str): The enterprise username.
        password (str): The enterprise password.
    """
    wlan = network.WLAN(network.STA_IF) # Set up station mode
    wlan.active(True)

    # Configure WPA Enterprise settings
    wlan.config(pm=0xa11140) # Power management mode for improved stability
    wlan.config(eap=network.EAP_PEAP, username=username, password=password)
    # Set EAP method and credentials

    # Connect to the specified SSID
    print(f"Connecting to network: {ssid}...")
    wlan.connect(ssid)

    # Wait for connection
    start_time = time.time()
    while not wlan.isconnected():
        print("Connecting...")
        time.sleep(1)
        if time.time() - start_time > 15: # Timeout after 15 seconds
            print("Failed to connect: Timeout")
            return False

    # Connection established
    print("Connected to network")
    print("Network Config:", wlan.ifconfig())
    return True

# Replace these with your WPA/WPA2 Enterprise credentials
SSID = "YourEnterpriseSSID"
USERNAME = "YourUsername"
PASSWORD = "YourPassword"

# Main program
try:
    connected = connect_to_wpa_enterprise(SSID, USERNAME, PASSWORD)
    if connected:
        print("Successfully connected to the WiFi network!")
    else:
        print("Failed to connect to the WiFi network.")
except Exception as e:
    print("An error occurred:", e)

```

Prompt :

For ESP32 in Micropython code used to connect to WiFi Enterprise we use power managment function: `wlan.config(pm=0xa11140)` .

What means the hexa value in this function ?

The hexadecimal value 0xa11140 used in the `wlan.config(pm=0xa11140)` function for ESP32 in MicroPython corresponds to a specific **power management mode**. The value determines how the ESP32 handles power-saving features while maintaining a WiFi connection. Let's break it down:

Power Management in WiFi:

Power management in WiFi allows the device to conserve energy by entering low-power states when full operation is unnecessary, such as during idle periods. The ESP32's pm (power management) configuration provides a mechanism to adjust this behavior.

Understanding the Hexadecimal Value (0xa11140):

The pm value is a bitmask, where each bit or group of bits enables or configures specific features of the ESP32's power-saving behavior.

- 0xa11140 in hexadecimal translates to a 24-bit value: 101000010001000101000000 in binary.
- Each bit or combination of bits represents a specific feature or setting related to power management.

Common Meanings for pm Flags:

1. Automatic Power-Saving Mode (PSP):

- Enables the ESP32 to dynamically switch between active and power-saving modes.

2. Modem Sleep:

- Allows the ESP32's radio/modem to power down when not actively transmitting or receiving data.

3. Light Sleep:

- Puts the ESP32 into a low-power state while maintaining WiFi connectivity.

4. Deep Sleep:

- Saves the most power by shutting down most subsystems but requires reinitialization upon waking.

Hexadecimal 0xa11140 Likely Indicates:

- A combination of **enabled modem sleep** and **optimized radio behavior** for maintaining a stable connection during power-saving states.
- Designed to reduce power consumption while minimizing connection interruptions in a WPA/WPA2 Enterprise environment, which can involve higher processing loads for authentication and data encryption.

Why Use 0xa11140?

- It is a predefined value that works well in most scenarios requiring stable WiFi connections with WPA/WPA2 Enterprise.

- The value balances performance and power efficiency by keeping the device active enough to handle enterprise authentication and maintain the connection without unnecessary power drain.

Other Common pm Values:

- **0x0:** No power management (maximum power consumption).
- **0x1:** Basic power management enabled (modem sleep, less aggressive savings).
- **0xa11140:** Aggressive power saving while maintaining connectivity (enterprise environments).

Adjusting Power Management:

You can experiment with different pm values to find the best balance between power savings and WiFi connection stability for your specific use case. However, 0xa11140 is a safe default for WPA/WPA2 Enterprise networks.