Presentation Will Begin Shortly

4:00

WI-FI

MAR 7TH | Unboxing SiWx917 Wi-Fi 6 + Bluetooth LE Pro Kit

APR 11TH | How to Develop Wi-Fi 6 Software Applications with SiWx917 SoC

MAY 16TH | Measure Power and Throughput on the SiWx917 Wi-Fi SoC

JUN 20TH | Design Battery Based Wi-Fi Cameras with SiWx917

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Welcome

How to Measure Power and Throughput on the SiWx917 SoC

tech t▶lks

WI-FI

Agenda

01   **Overview of low-power features**

02   **Low power modes demo + QA**

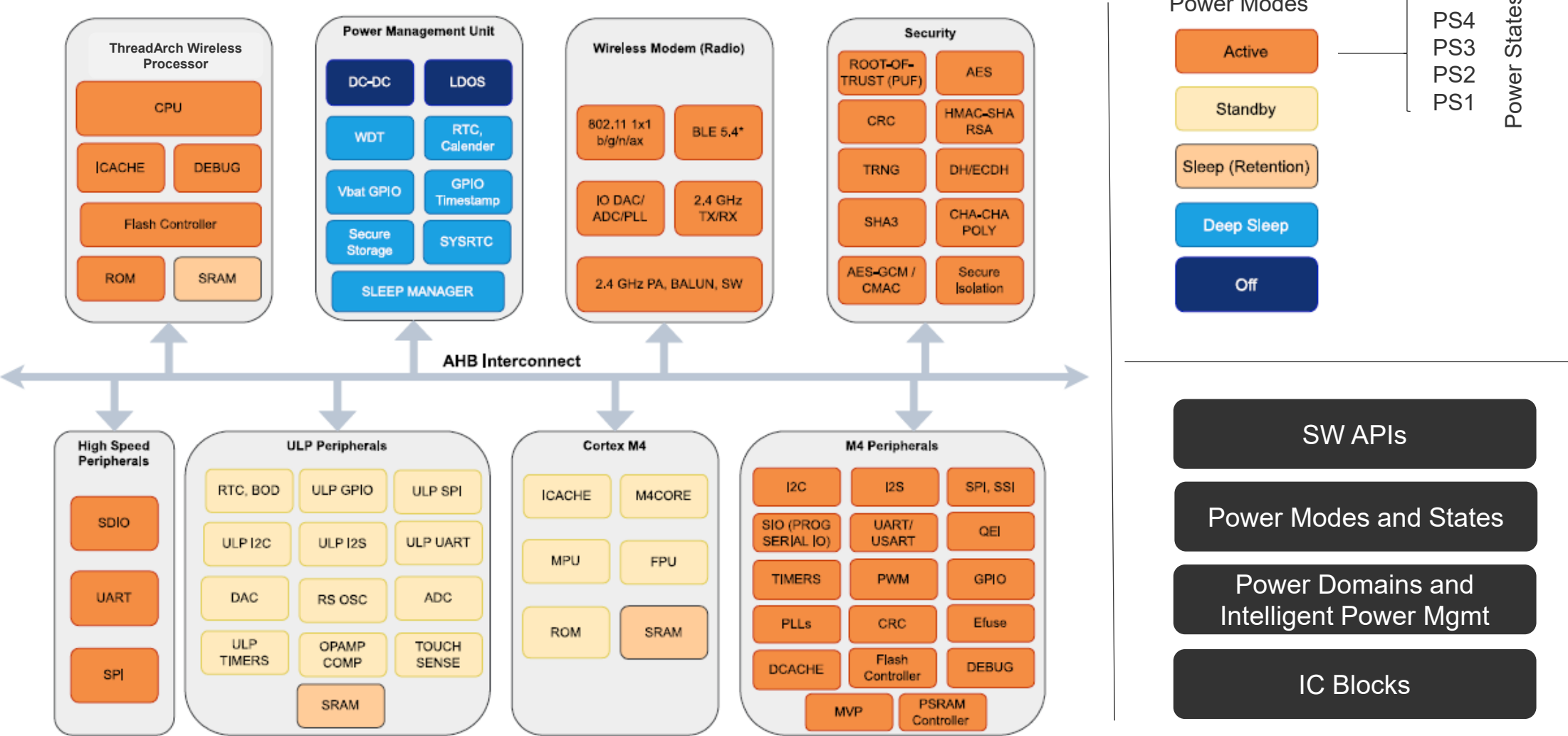**03**   **Throughput measurement demo + QA**

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Introducing SiWx917 Wi-Fi 6 and Bluetooth LE SoC

SiWx917

- **Ultra-Low Power**
  - Increases Battery life and Recharging Interval
- **IoT-Optimized Wireless Performance**
  - 2.4GHz: Long-range, low-power, effective wall penetration, high-throughput
- **Multiprotocol Co-Existence**
  - High-performance Wi-Fi 6 and Bluetooth Low Energy 5.4
- **Large Memory**
  - Up to 672kB RAM, 8MB Flash/PSRAM, 16MB External Flash/PSRAM
- **Single-Chip Matter over Wi-Fi Solution**
  - Wi-Fi, Bluetooth LE, and Matter in One Package
  - Certified Solution
- **Edge Computing + System Integration**
  - Separate Application MCU and Wireless Processor
  - Rich Peripherals, Sensor Hub, High GPIO Count, Large Memory
- **Robust Security**
  - A High Level of Security for the Device, Wi-Fi Protocol, and Networking

The Most IoT-Optimized Wi-Fi SoC

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Optimized for Low-Power IoT Designs - SiWx917 IC

ThreadArch Wireless Processor
- CPU
- ICACHE
- DEBUG
- Flash Controller
- ROM
- SRAM

Power Management Unit
- DC-DC
- LDOS
- WDT
- RTC, Calender
- Vbat GPIO
- GPIO Timestamp
- Secure Storage
- SYSRTC
- SLEEP MANAGER

Wireless Modem (Radio)
- 802.11 1x1 b/g/n/ax
- BLE 5.4*
- IO DAC/ADC/PLL
- 2.4 GHz TX/RX
- 2.4 GHz PA, BALUN, SW

Security
- ROOT-OF-TRUST (PUF)
- AES
- CRC
- HMAC-SHA RSA
- TRNG
- DH/ECDH
- SHA3
- CHA-CHA POLY
- AES-GCM / CMAC
- Secure Isolation

AHB Interconnect

High Speed Peripherals
- SDIO
- UART
- SPI

ULP Peripherals
- RTC, BOD
- ULP GPIO
- ULP SPI
- ULP I2C
- ULP I2S
- ULP UART
- DAC
- RS OSC
- ADC
- ULP TIMERS
- OPAMP COMP
- TOUCH SENSE
- SRAM

Cortex M4
- ICACHE
- M4CORE
- MPU
- FPU
- ROM
- SRAM

M4 Peripherals
- I2C
- I2S
- SPI, SSI
- SIO (PROG SERIAL IO)
- UART/ USART
- QEI
- TIMERS
- PWM
- GPIO
- PLLs
- CRC
- Efuse
- DCACHE
- Flash Controller
- DEBUG
- MVP
- PSRAM Controller

Power Modes
- Active
- Standby
- Sleep (Retention)
- Deep Sleep
- Off

Power States
- PS4
- PS3
- PS2
- PS1

- SW APIs
- Power Modes and States
- Power Domains and Intelligent Power Mgmt
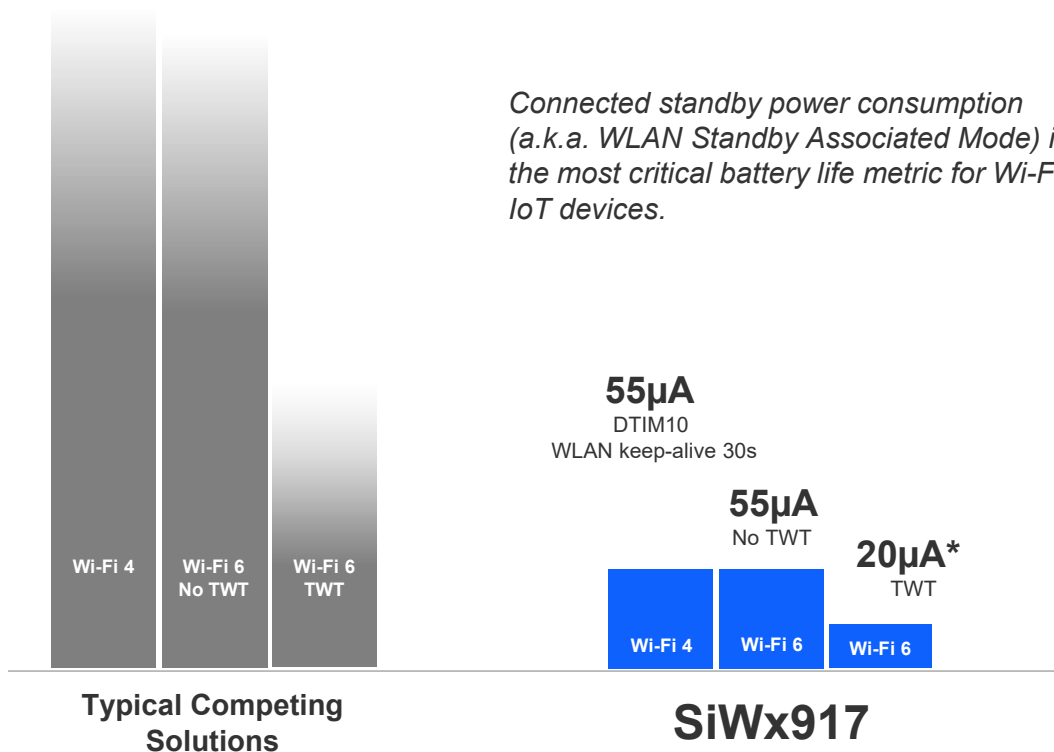- IC Blocks

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SiWx917: Lowest Wi-Fi Power – Longest IoT Battery Life

Wi-Fi Standby Current Consumption

Hundreds of µA

Connected standby power consumption (a.k.a. WLAN Standby Associated Mode) is the most critical battery life metric for Wi-Fi IoT devices.

Wi-Fi 4

Wi-Fi 6 No TWT

Wi-Fi 6 TWT

Typical Competing Solutions

55µA
DTIM10
WLAN keep-alive 30s

55µA
No TWT

20µA*
TWT

Wi-Fi 4

Wi-Fi 6

Wi-Fi 6

SiWx917

* Wi-Fi 6 TWT with auto-config feature enabled. TWT Rx latency 60s with 8ms wakeup duration. WLAN keep-alive every 60s. No TCP keepalive. 352kB SRAM retention. Does not include application MCU operation.
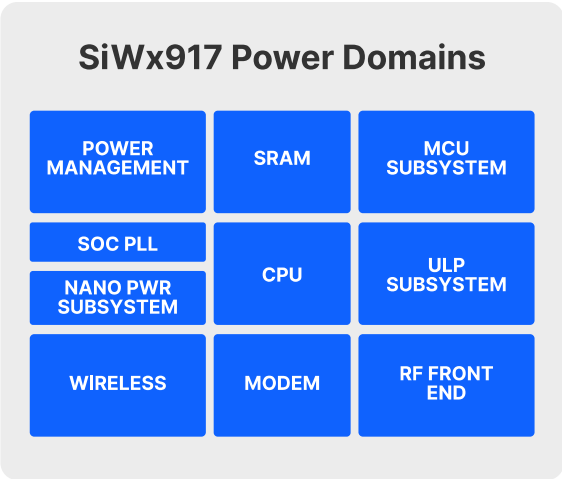
SiWx917 SoC Battery Life Estimation

2.5 Years

1000mAh

How the SiWx917 SoC battery life of up to 2.5 years was estimated:
- *Associated standby low-power mode*
- *SiWx917 SoC as TCP client maintains socket connection*
- *60 secs TCP keep-alive used. WLAN keep-alive 30 secs. 480kB SRAM retention*
- *TWT Auto Config feature enabled. TWT Rx latency 60 secs with 8ms wakeup duration*
- *Arm Cortex-M4 in sleep mode (PS4). 192kB SRAM retention*

- *Average current consumption for wireless and application **35µA at 3.3V***
- *Measurements are taken in optimal conditions (RF chamber)*
- *Battery capacity 1000mAh (example AAA rechargeable battery)*

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SiWx917 Intelligent Power Management

- **Flexible Power Optimization**
  - Multiple optimized power domains. Power management per domain.
  - Four Power Modes, each with Power States
  - Power States per domain for perfected optimization
  - Turn On/Off different portions of the IC to use power only where needed

- **Dynamic Gear Shifting**
  - Switch from one power state to another based on processing requirements via SW triggers
  - Fast wakeup time – e.g., 200usec from Sleep to Active in PS2

- **Dynamic Voltage/Frequency Scaling (DVFS)**
  - The system adjusts supply voltage per domain for different clock speeds automatically to reduce current draw while simplifying development

- **Symmetric SW Processing**
  - Can run the same code in Ultra-low-power and High-performance modes
  - Avoids the typical limitations of asymmetric dual-core designs: inter-core communication, limited instruction set of the smaller core, code incompatibility, code redundancy – Simplifies software development!

Power Modes	Power States	Functions
Active	PS4 PS3 PS2 PS1	Different voltage and CLK frequencies and SRAM PS1-ULP peripherals active
Standby	PS4 PS3 PS2	Different voltage and CLK frequencies and SRAM PS2 Sleep peripherals off
Sleep	PS4 PS3 PS2	CLK frequencies
Deep Sleep	PS0	No Retention

SiWx917 Power Domains

POWER MANAGEMENT	SRAM	MCU SUBSYSTEM
SOC PLL / NANO PWR SUBSYSTEM	CPU	ULP SUBSYSTEM
WIRELESS	MODEM	RF FRONT END

Lowest Power Wi-Fi 6 Connected Sleep: **20 µA***

MCU Subsystem Active current:
- 32 µA/MHz at 20MHz Low-Power mode
- 50 µA/MHz at 180MHz High-performance mode

* Wi-Fi 6 TWT with auto config feature enabled. TWT Rx latency 60s with 8ms wakeup duration. WLAN keep-alive every 60s. 352K RAM retention.

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TWT TCP Client Low Power Mode - Demo Introduction

- **Development tool: Pro Kit: SiWx917-PK6031A**
  - IC OPN: SiWG917M111MGT, QFN 7x7, 8MB Flash
- **11ax Access Point**
  - Linksys Model E7350
- **Iperf**
  - TCP Server
- **Simplicity Studio**
  - Development Environment
  - Energy Profiler
- **Application Configurations in SiWx91x**
  - ThreadArch Wireless Processor – 480KB RAM Retention
  - Cortex M4 Processor – 192KB RAM Retention
  - Auto TWT Rx Latency – 60 seconds
  - WLAN Keep Alive – 30 seconds
  - TCP Keep Alive – 60 seconds
- **Application Note**
  - AN1430: SiWG917 Low-Power Application Note

11ax Access Point
(TWT Enabled)

Ethernet

Wi-Fi

PC - iPerf TCP
Server

SiWx917 SoC
as TCP Client

SiWx91x
WiSeConnect™

PC running
Simplicity Studio
(Energy Profiler)

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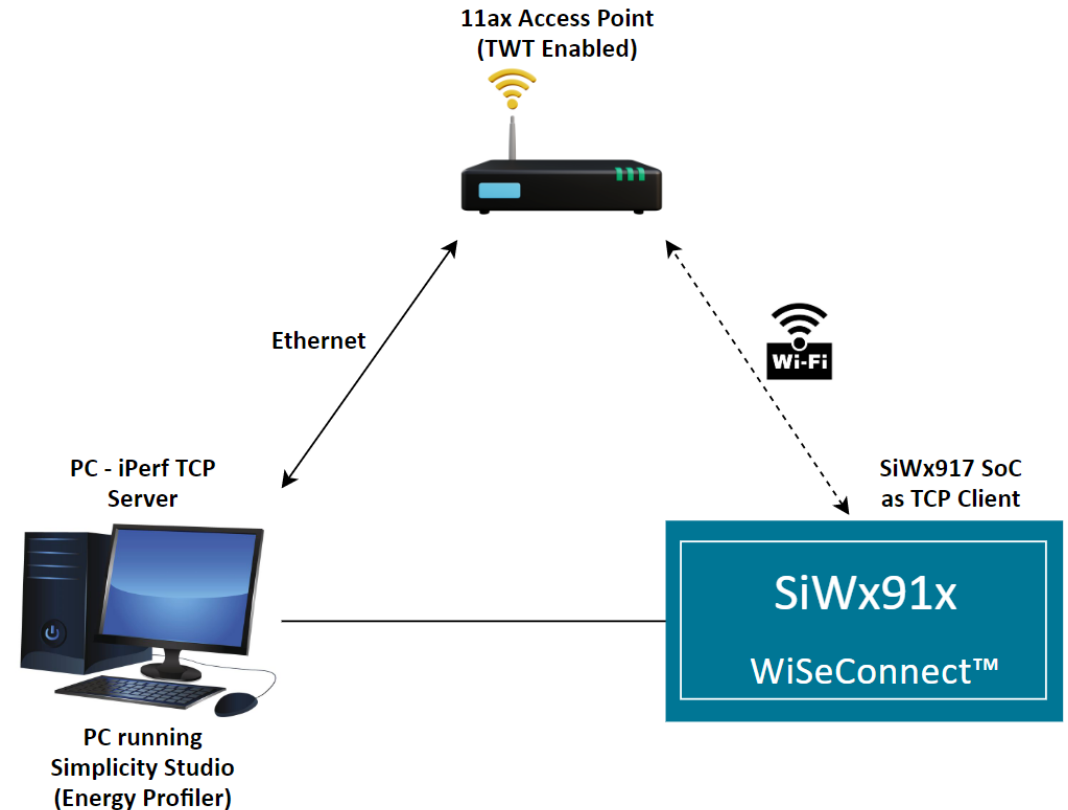
Low power mode demo

Sivathmika Manda
Senior Engineer, Product & System Apps

Q&A

WI-FI

Wi-Fi Throughput - Demo Introduction

- **Development tool: Pro Kit: SiWx917-PK6031A**
  - IC OPN: SiWG917M111MGT, QFN 7x7, 8MB Flash
- **Access Point**
  - Linksys Model E7350
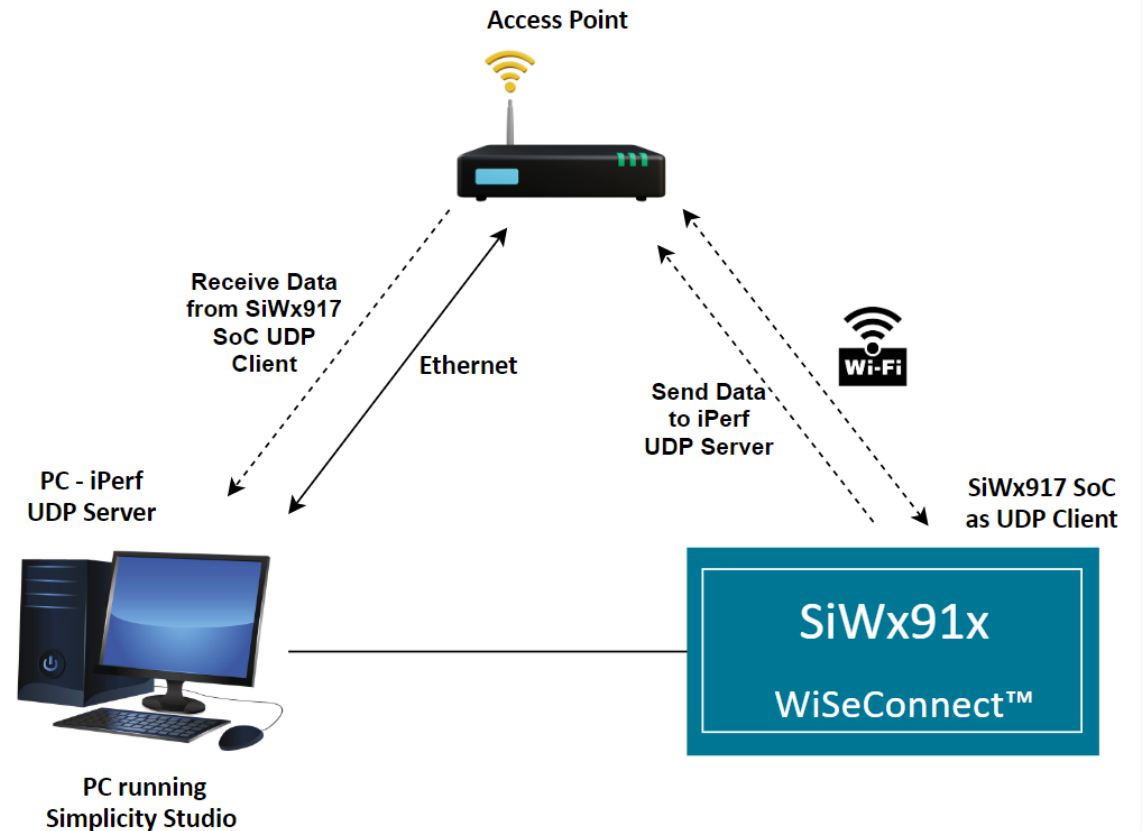- **Iperf**
  - UDP Server
- **Simplicity Studio**
  - Development Environment
- **Application Configurations**
  - SiWx917 SoC as UDP Client
- **Application Note**
  - AN1429: SiWx917 SoC Throughput

Access Point

Receive Data
from SiWx917
SoC UDP
Client

Ethernet

Send Data
to iPerf
UDP Server

Wi-Fi

PC - iPerf
UDP Server

SiWx917 SoC
as UDP Client

SiWx91x

WiSeConnect™

PC running
Simplicity Studio

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How to measure throughput demo

Sivathmika Manda
Senior Engineer, Product & System Apps

Q&A

WI-FI