

# Industrial Wireless LAN System Compatible with Asynchronous Communication

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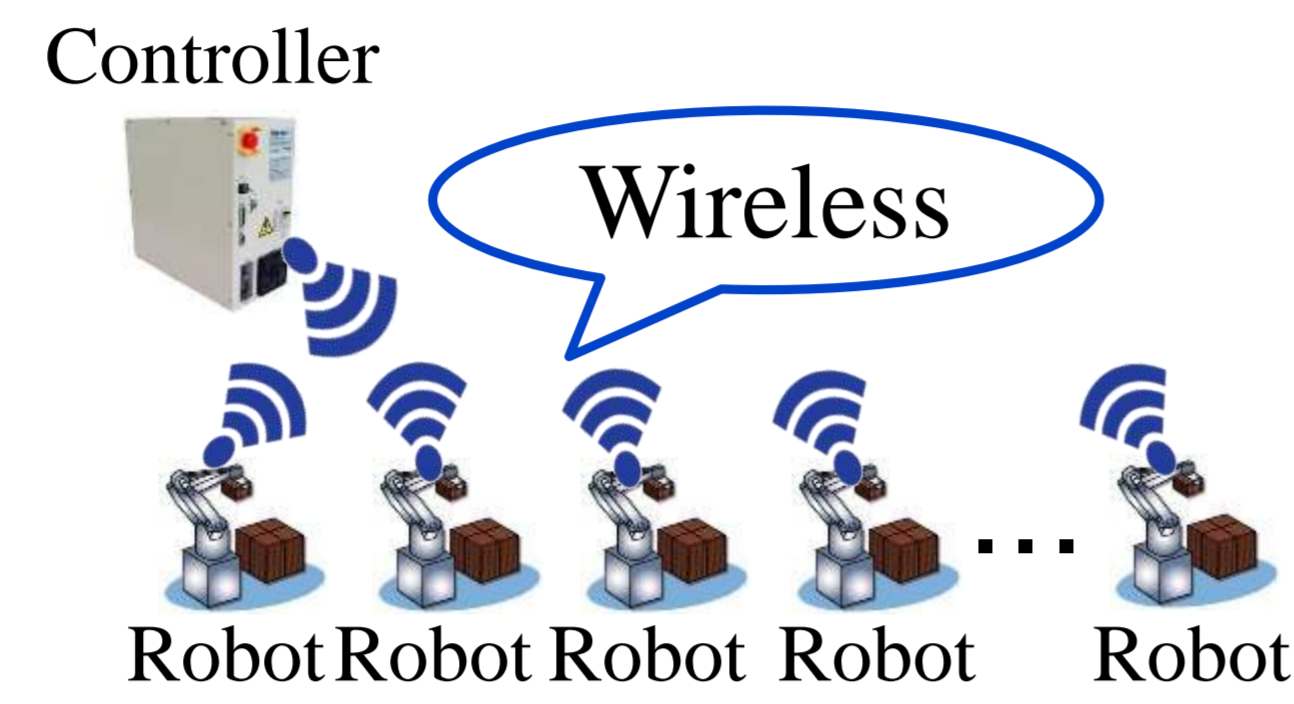
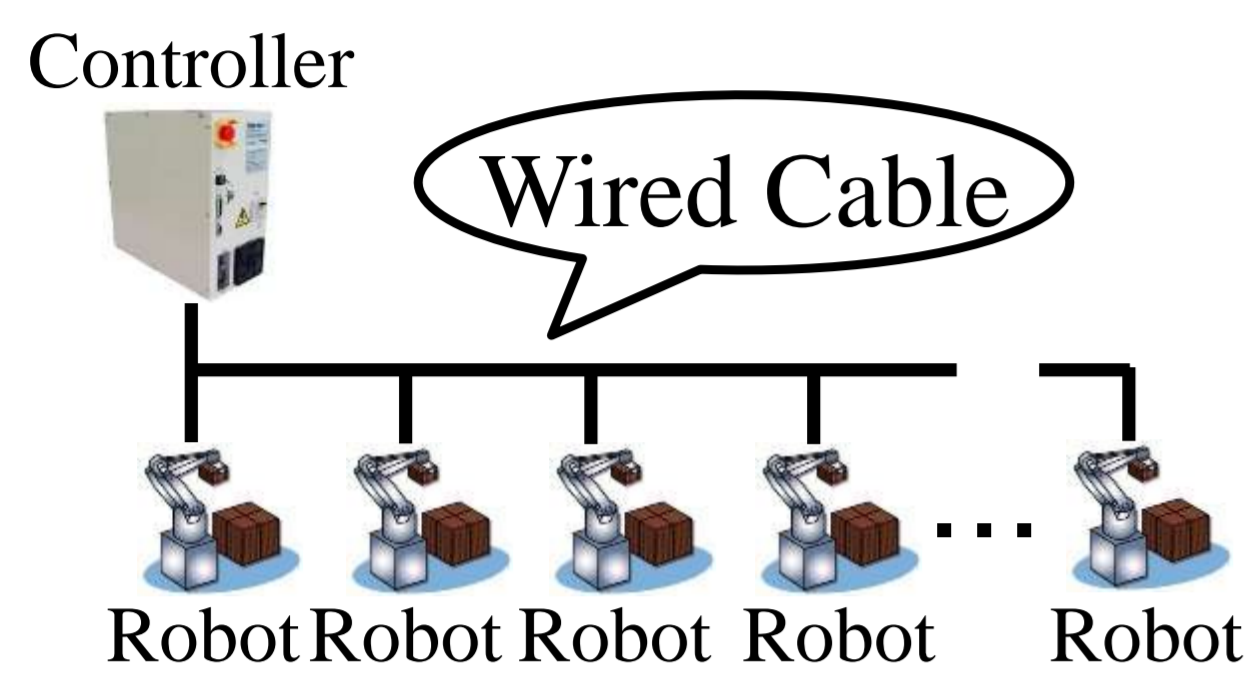
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## 1. Background and Purpose

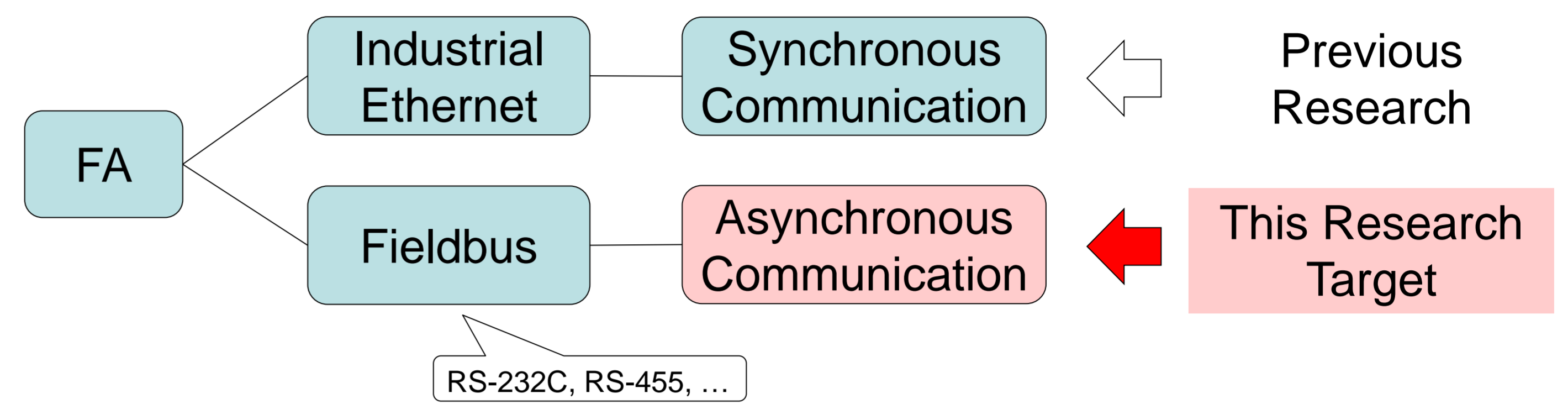
### FA: Factory Automation

- Maintenance cost
- Limitation of setup

### Wireless Communication System based on Wi-Fi

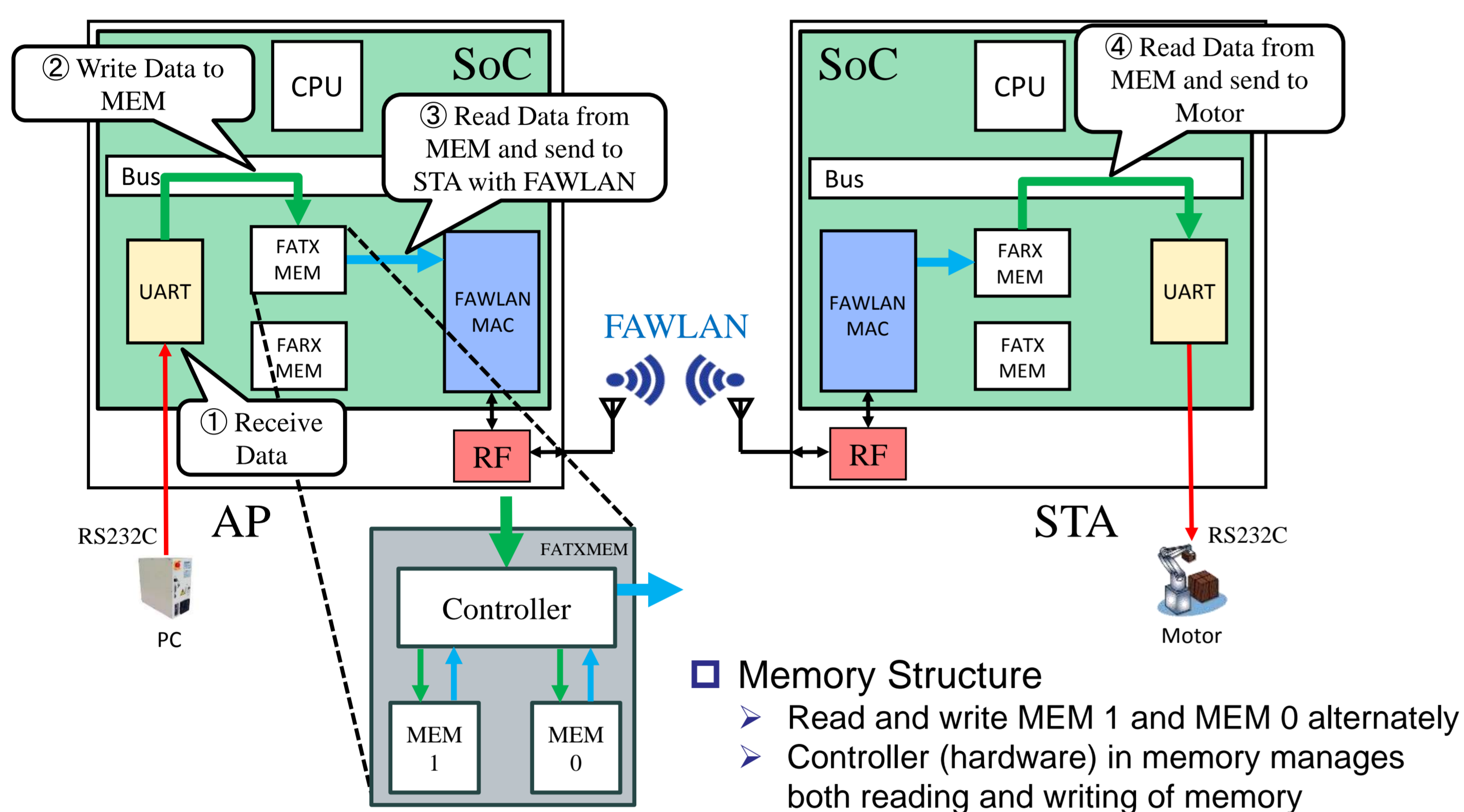


### FA Communication Standard



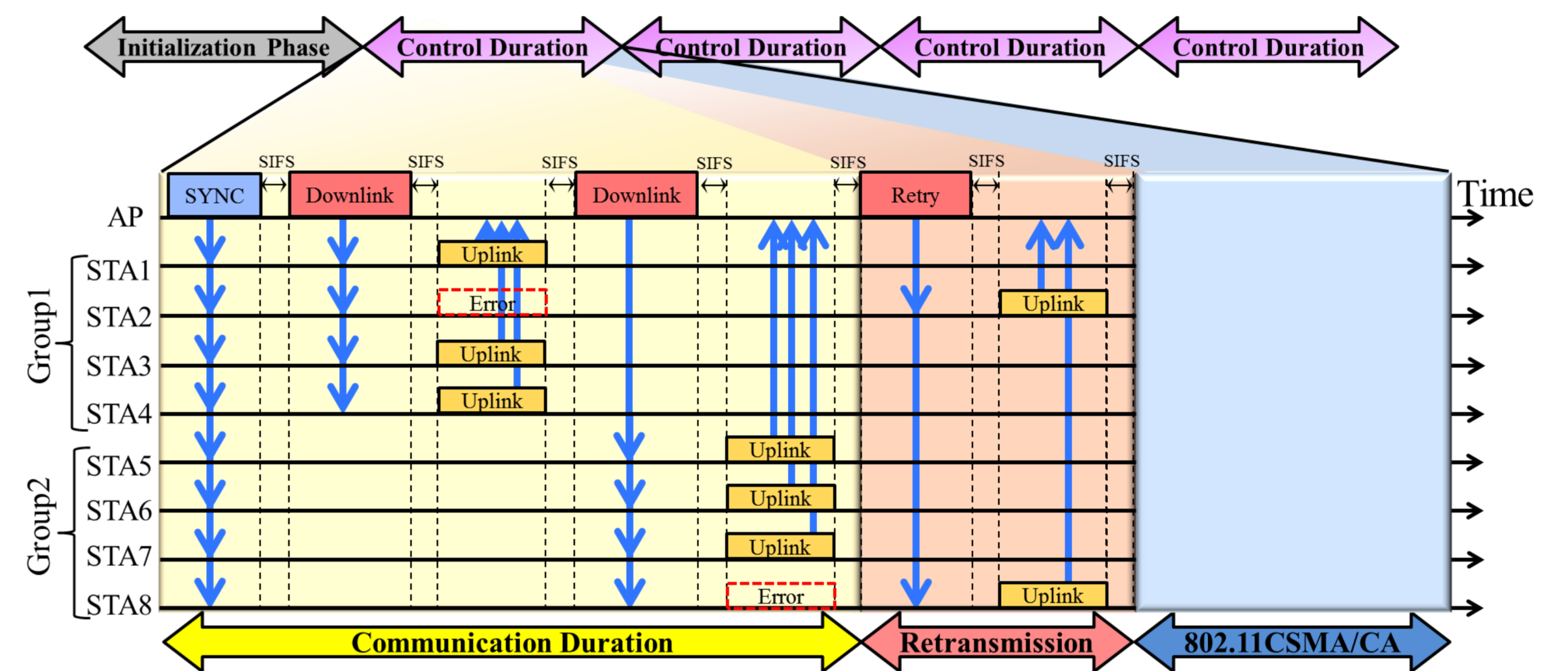
## 2. Industrial Wireless LAN System

### System Architecture and Data Flow



- Memory Structure
  - Read and write MEM 1 and MEM 0 alternately
  - Controller (hardware) in memory manages both reading and writing of memory

### Communication Protocol

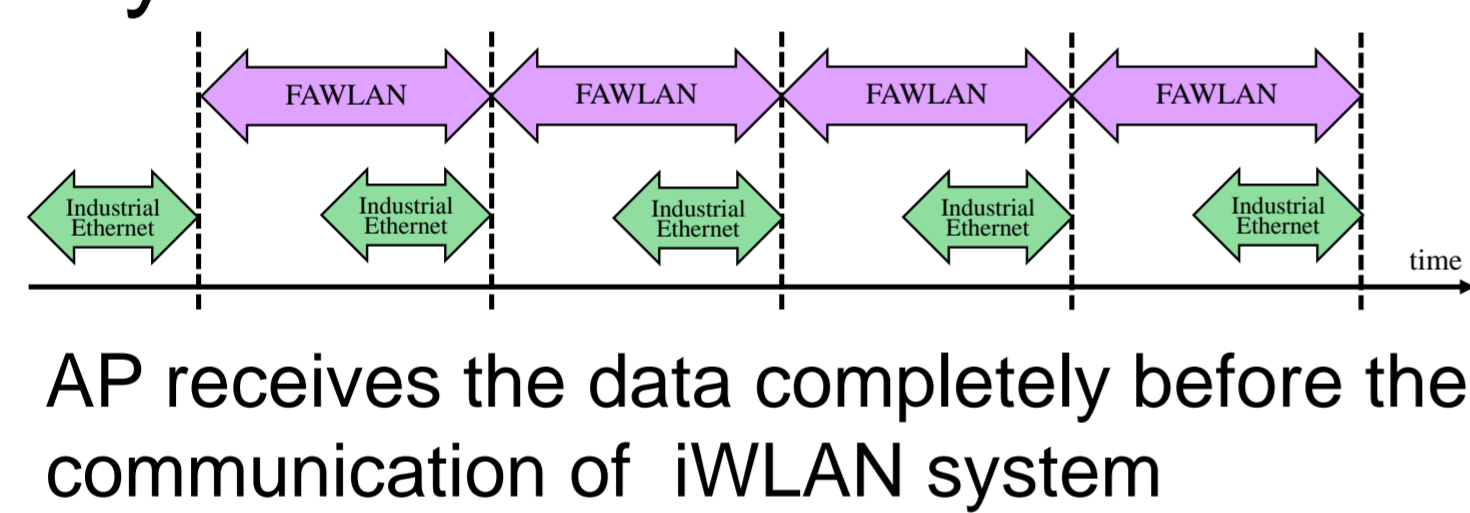


- Control Duration
  - Cyclic Communication
- Synchronous Communication
  - AP and STAs
- Interrupt
  - End of Every Control Duration
  - From MAC to CPU

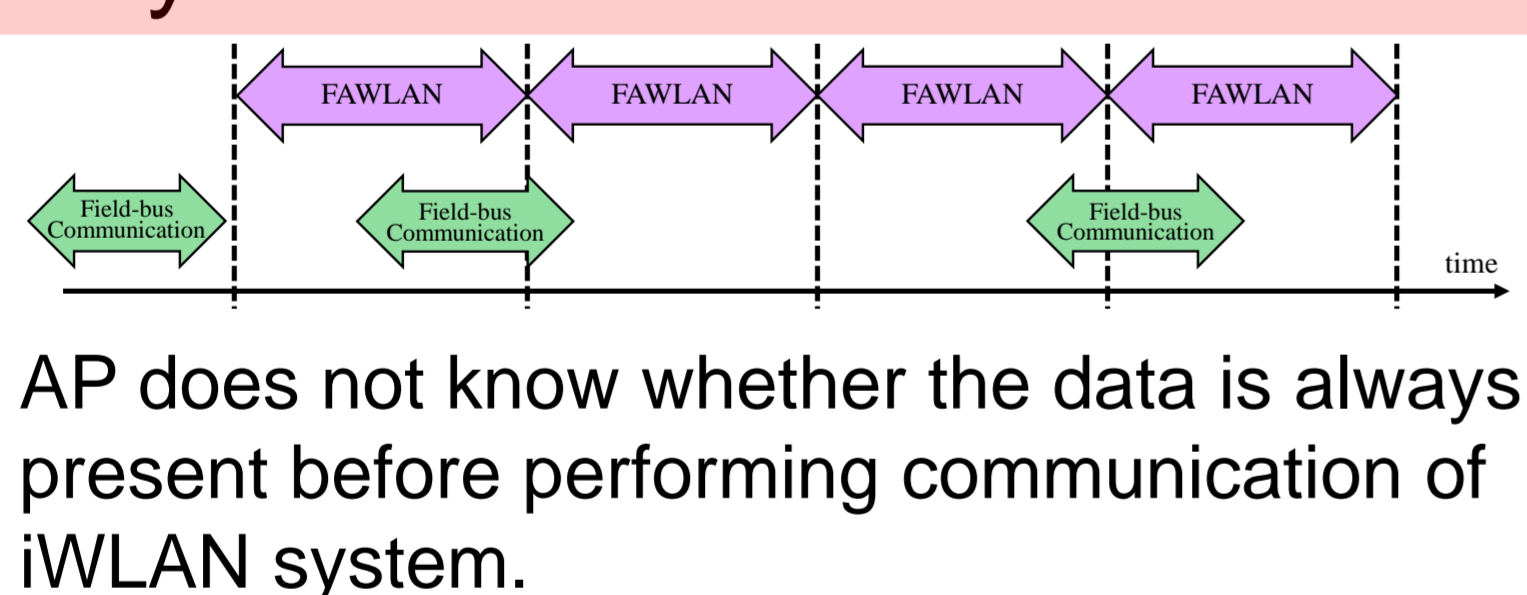
## 3. Proposed Asynchronous Communication Protocol

### Communication Protocol

#### Synchronous

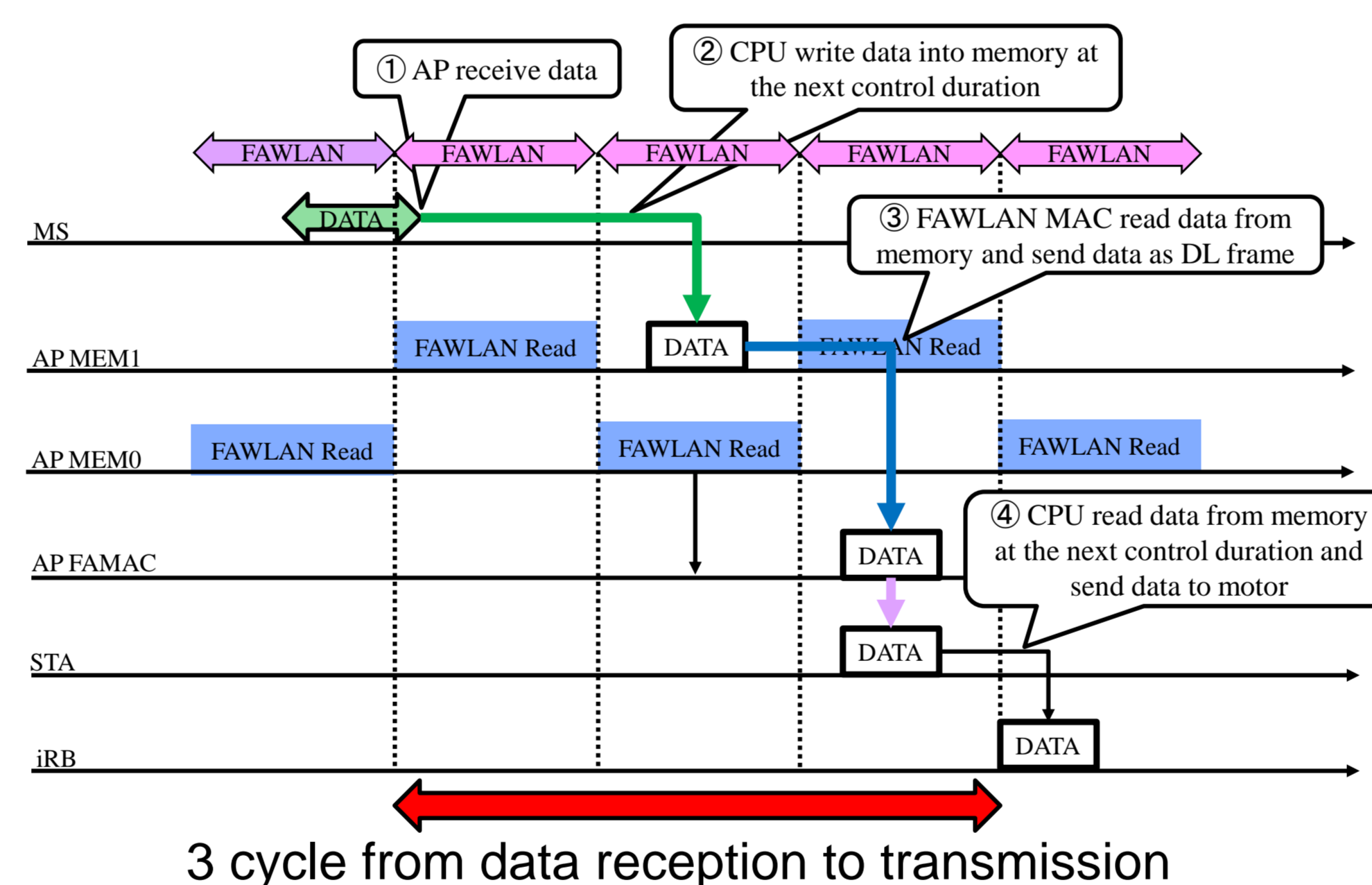


#### Asynchronous

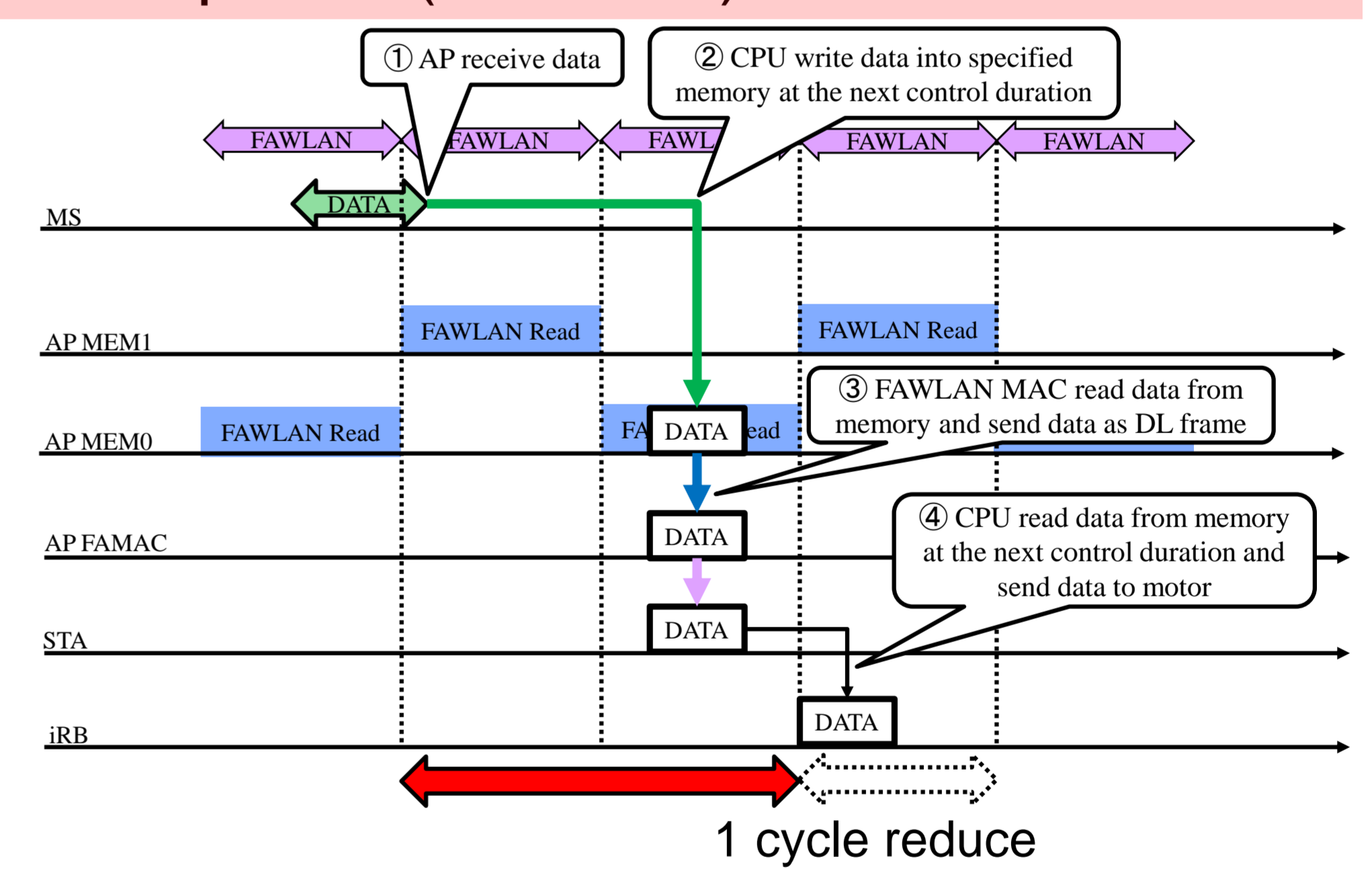


### Memory Write Technique

#### Conventional

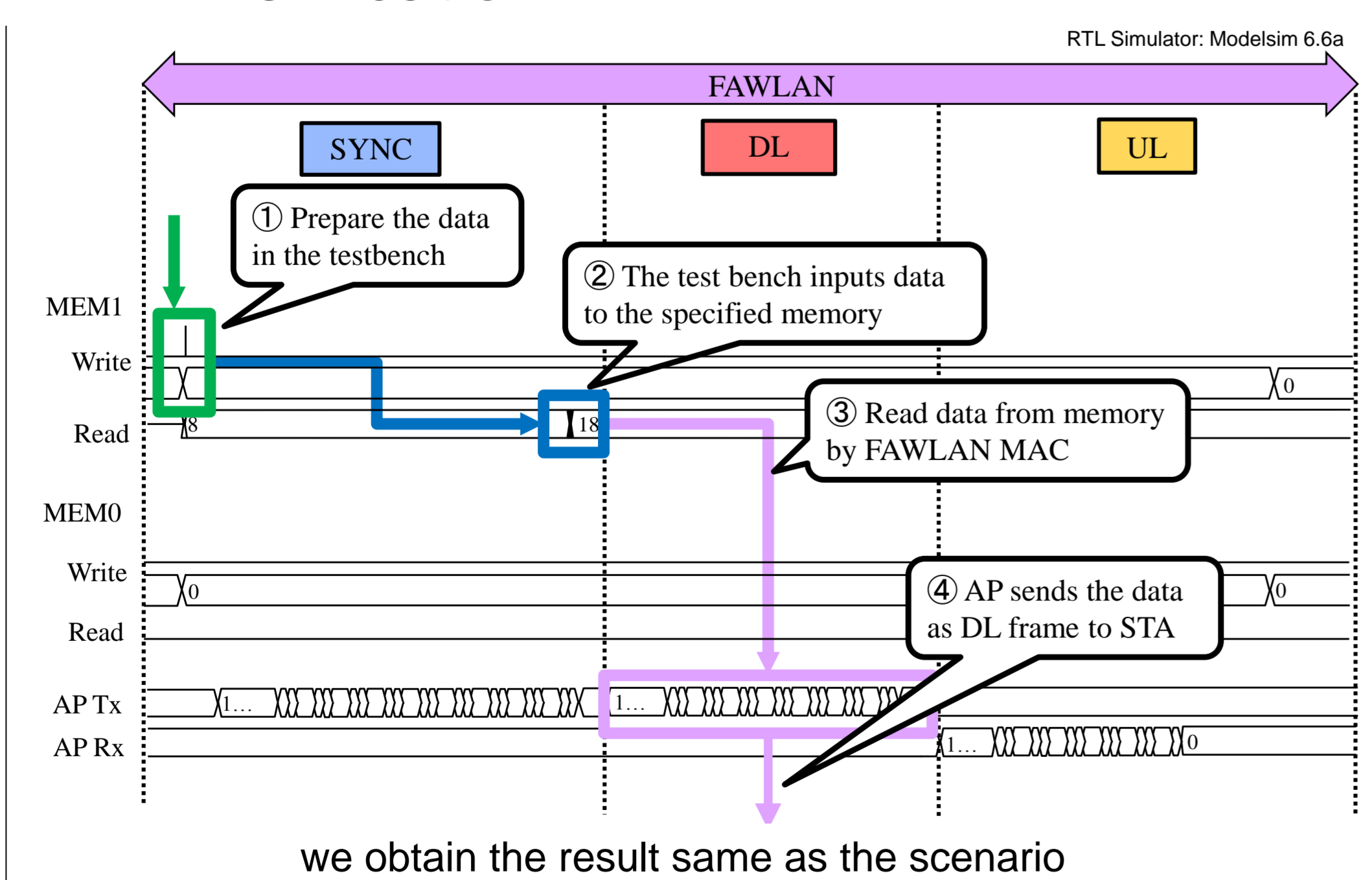


#### Proposed (Scenario)



## 4. RTL Verification and FPGA Implementation

### RTL Verification



### FPGA Implementation

#### Synthesis Result

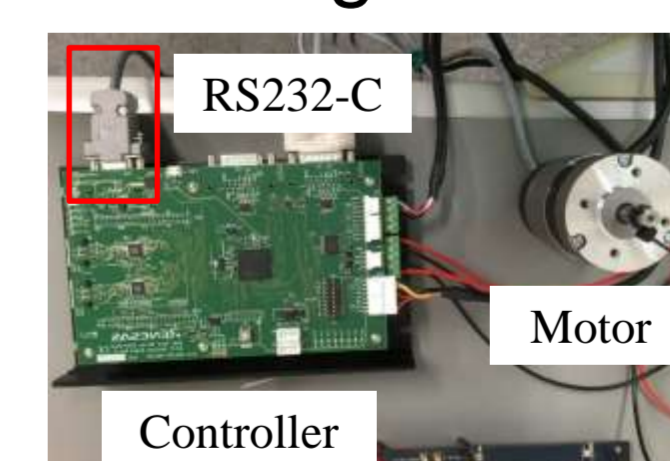
Resource	AP	STA
LUTs	650440	47289(7.3%)
DSP	960	5(0.5%)
Memory(bit)	33294000	801920(2.4%)
Registers	650440	27114(4.2%)

#### Verification Environment



We connect AP and STAs with blue cable

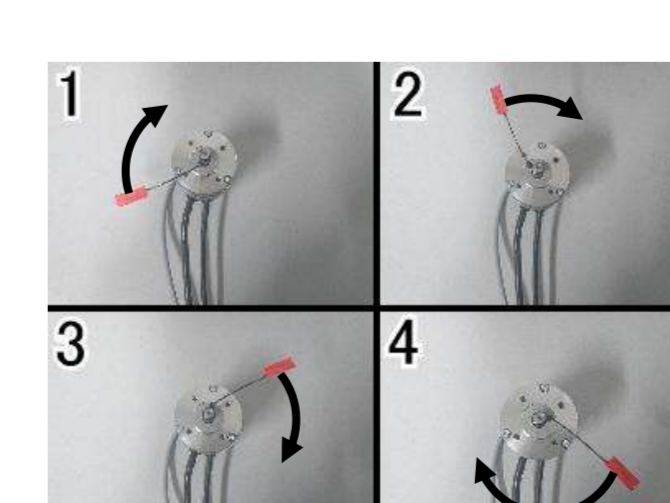
#### Existing Wired System



Motor: Sponder Motion MB057GA140+  
Micro Controller: RENESAS Dual axis Motion Controller RZ/T1 Biplane Board Rev F

The motor has RS-232C interface and is controlled by asynchronous communication.

#### Motor Control Result



Since the axis of the motor is rotating in order of 1 → 2 → 3 → 4, we confirm that the iRB can be controlled by using the proposed system.

## 5. Conclusion

- We proposed a high-speed asynchronous multi-user iWLAN transmission protocol to communicate with iRBs with low delay.
- The proposed iWLAN system has been designed in RTL and implemented into FPGA platform.
- The proposed protocol has been verified in either computer simulation or FPGA prototypes.