A Platform for Wi-Fi Analysis
- Software Defined Radio Platform -

- This product provides a way of analysis by using SDR[1] software platform. It provides visible analysis method of transmission packets and transmission channel characteristic change on Wi-Fi network.
- This product provides either detailed offline analysis (constellation and the CSI[2] transmission channel characteristic, etc), or real-time analysis upon the FPGA[3] hardware by using MATLAB software.
- It is available as a platform of the algorithm development and the wireless LAN system development (LSI development) with MATLAB code or RTL[4] code customization.

> [1]**SDR:** Software Defined Radio. [2]**CSI**：Channel State Information.
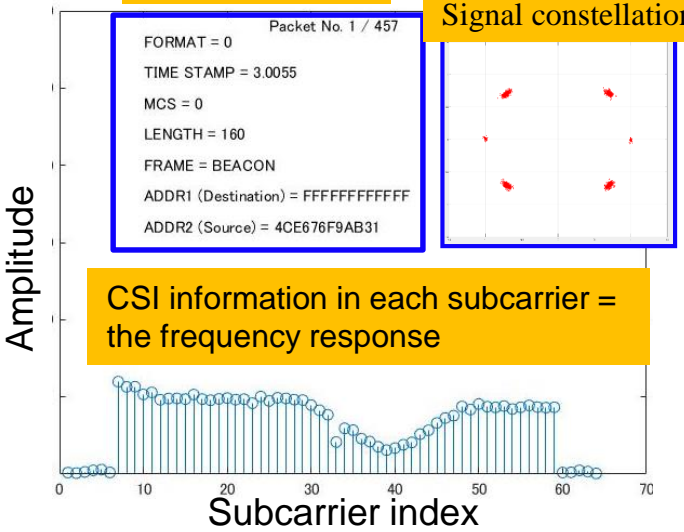> [3]**FPGA:** Field Programmable Gate Array. [4]**RTL**: Register Transfer Level

Wi-Fi signal capture
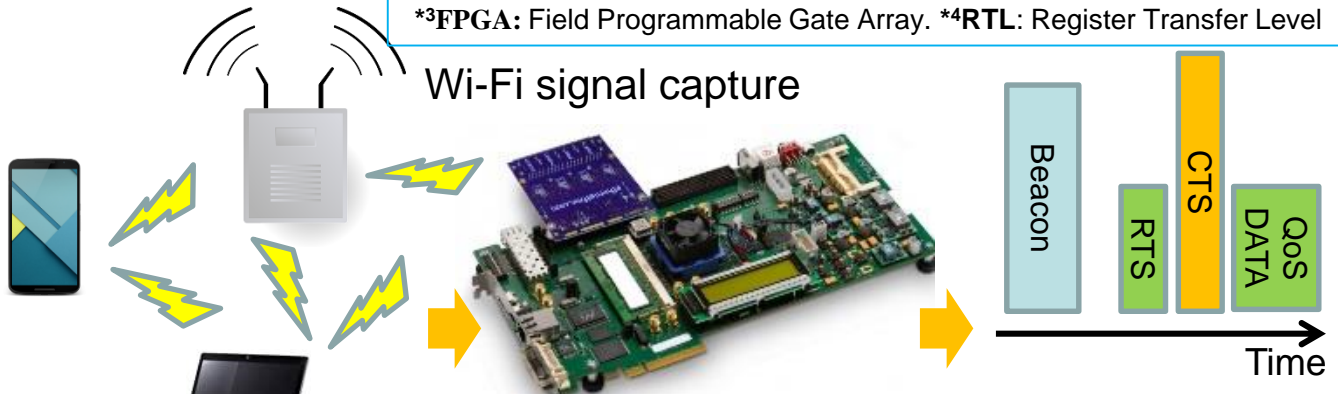
Wi-Fi network analyzes
(The header, the CSI
information analysis).

Beacon

RTS

CTS

QoS DATA

Time

Time	Type.	RSSI	..
312	Beacon	-52[dBm]	…
1028	RTS	-75[dBm]	…
…	…	…	…

Frame header information

Packet No. 1 / 457
FORMAT = 0
TIME STAMP = 3.0055
MCS = 0
LENGTH = 160
FRAME = BEACON
ADDR1 (Destination) = FFFFFFFFFFFF
ADDR2 (Source) = 4CE676F9AB31

Signal constellation

Amplitude

CSI information in each subcarrier = the frequency response

Subcarrier index

Specification

| Compatible standard	IEEE802.11a/n/ac/ax
Frequency band	2.4GHz/5.2GHz/5.6GHz
MIMO	2 antennas (4 antennas by option)
Bandwidth	20, 40, 80 [MHz]
Analysis result	Header information, RSSI, CSI, Constellation, etc
Applications	Wi-Fi network analysis Wi-Fi sensing (option) time synchronousness,positioning, etc

Radrix Co.Ltd
www.radrix.com
c/o Incubation Facility Kyushu Institute of Technology 680-4, Kawazu, Iizuka,Fukuoka,Japan.820-8502
TEL: 0948-29-7937
FAX: 0948-29-7692

- Contact about this product
email: support@radrix.com

Wi-Fi Analysis Applications and Examples

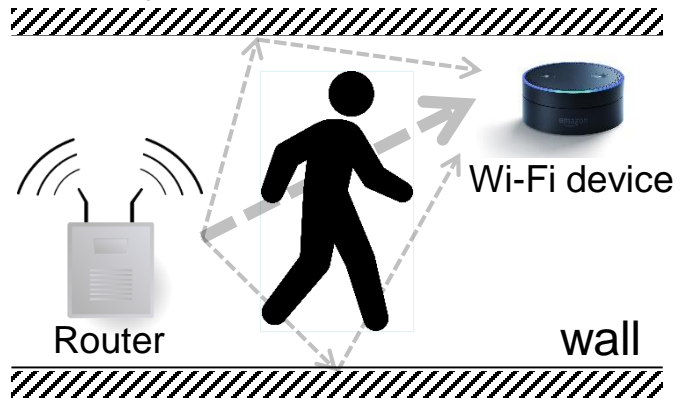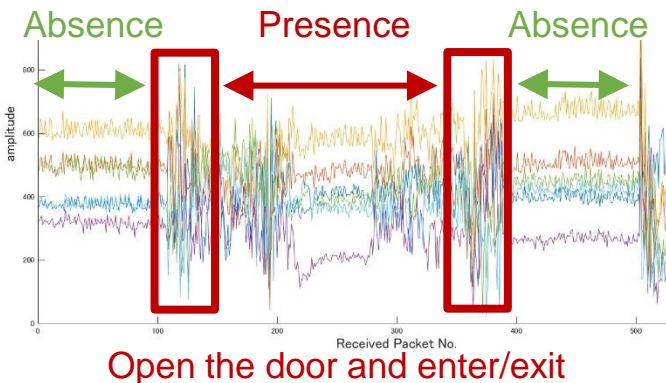## ● Experiment(Ex: Time synchronization using Wi-Fi)

Router
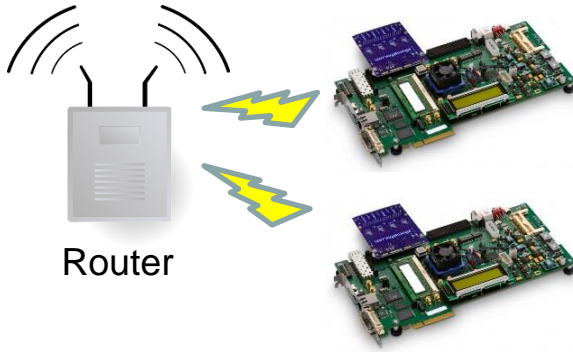
beacon which is regularly sent from the

In the experiment example, it implements the time synchronization of the sub microsecond among the terminals using the TSF information which is contained in the beacon and the reception time stamp information of the SDR*1 board.
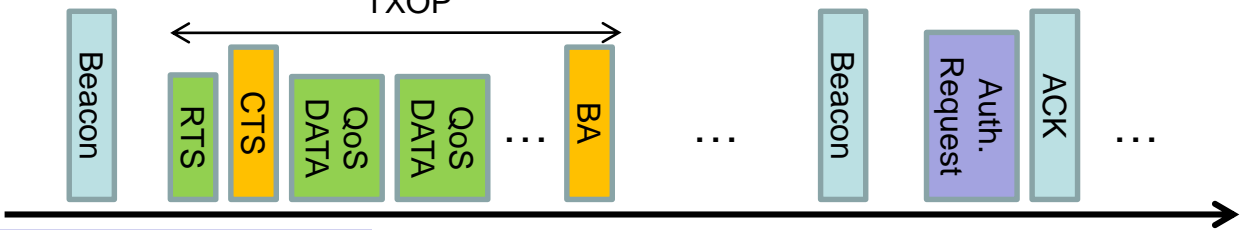
Possible to support a wide range of experiments by using FPGA*2 and MATLAB.

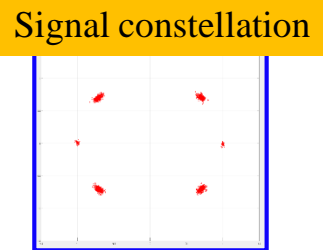## ● Wi-Fi sensing (Ex: The person detection system which used CSI*3)

Absence   Presence   Absence

amplitude

Received Packet No.

Open the door and enter/exit

Wi-Fi device

Router   wall

● Wi-Fi network analysis

Traffic analysis on Wi-Fi network

TXOP

Beacon | RTS | CTS | QoS DATA | QoS DATA | … | BA | … | Beacon | Auth. Request | ACK | …

Header analysis, EVM*4 evaluation, CSI analysis, etc.

Time	Type.	RSSI	DA	SA
312	Beacon	-52[dBm]	FFFF…	…
1028	RTS	-75[dBm]	XXXX…	…
1188	CTS	-51[dBm]	YYYY…	…
…	…	…	…	…

Signal constellation

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※It isn't possible to do the analysis of the encrypted data part.

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*1**SDR:** Software Defined Radio. *2**FPGA :** Field Programmable Gate Array.
*3 **CSI**：Channel State Information. *4**EVM**: Error Vector Magnitude.