Consideration of a problem indicated in FFIoT report

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Introduction

- This document has been arranged to explain a possible problem in wired/wireless bridged network for factories, which is indicated in the Flexible Factory IoT (FFIoT) report[1].
- The network should be tolerant to rapid changes in link/path quality. 802.1Qcc address this issue [2] and more enfacement may be required with consideration of the anticipated problem.

[1] 1-18-0025-04-ICne-pre-draft-update-to-1-18-0002-05-icne-wired-wireless-flexible-factories-iot.pdf
[2] Bandwidth availability parameter management, 802.1Qcc, Draft 2.3.(Section 34.3.3)

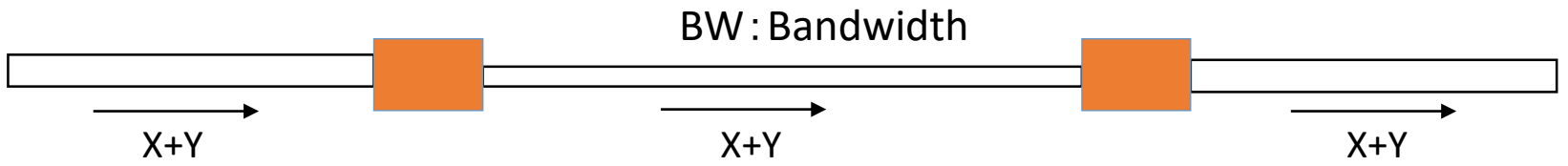
Problem

bridge

link

X: Data rate of application X
Y: Data rate of application Y

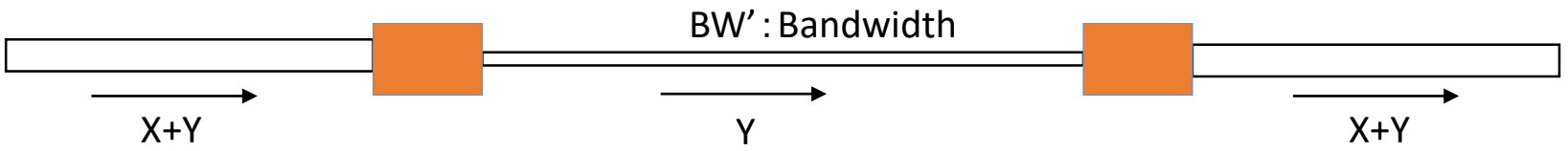
(1) Data rate X+Y < BW



X+Y < BW

Under Initial (good) condition

(2) When BW decreases to BW' (< X+Y), both applications X and Y stop.



X+Y > BW'
X > BW'
Y < BW'

Should stop both X and Y?
or should stop only X?

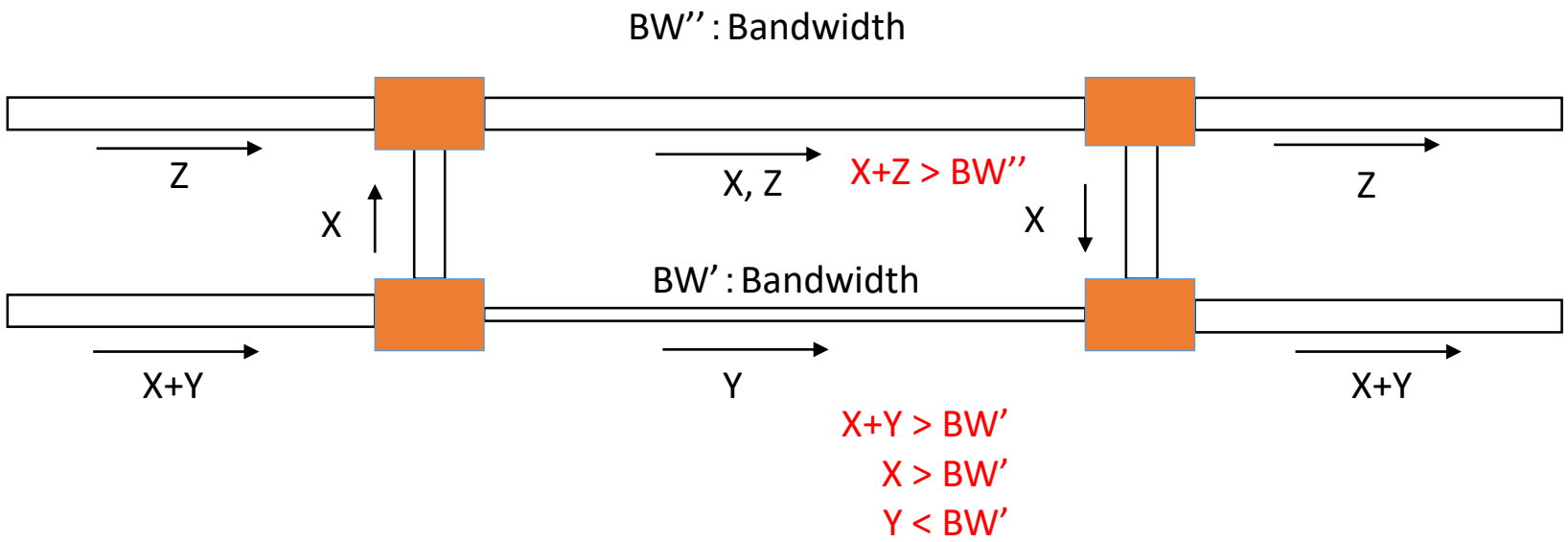
Solution

bridge

link

X: Data rate of application X
Y: Data rate of application Y
Z: Data rate of application Z

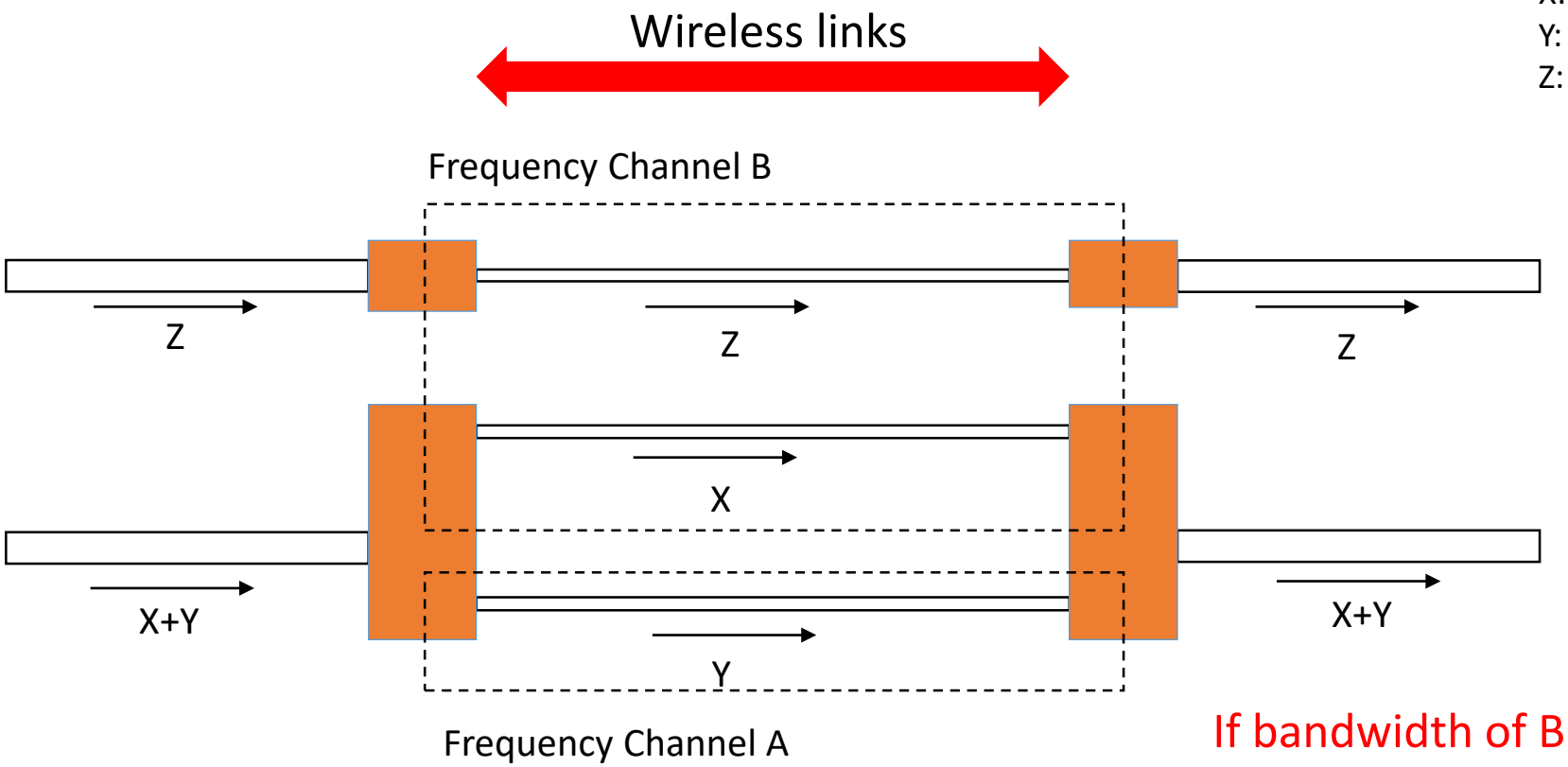
(3) In case that another path exists.



Need to know data rates (as data attributes), not traffic types, for control of data flow.

Solution for wireless

(4) Wireless case



bridge

link

X: Data rate of application X
Y: Data rate of application Y
Z: Data rate of application Z

If bandwidth of B is not sufficient, should stop Z if priority of Z is lower.

What are data attributes?

Definitions (from FFIoT report)

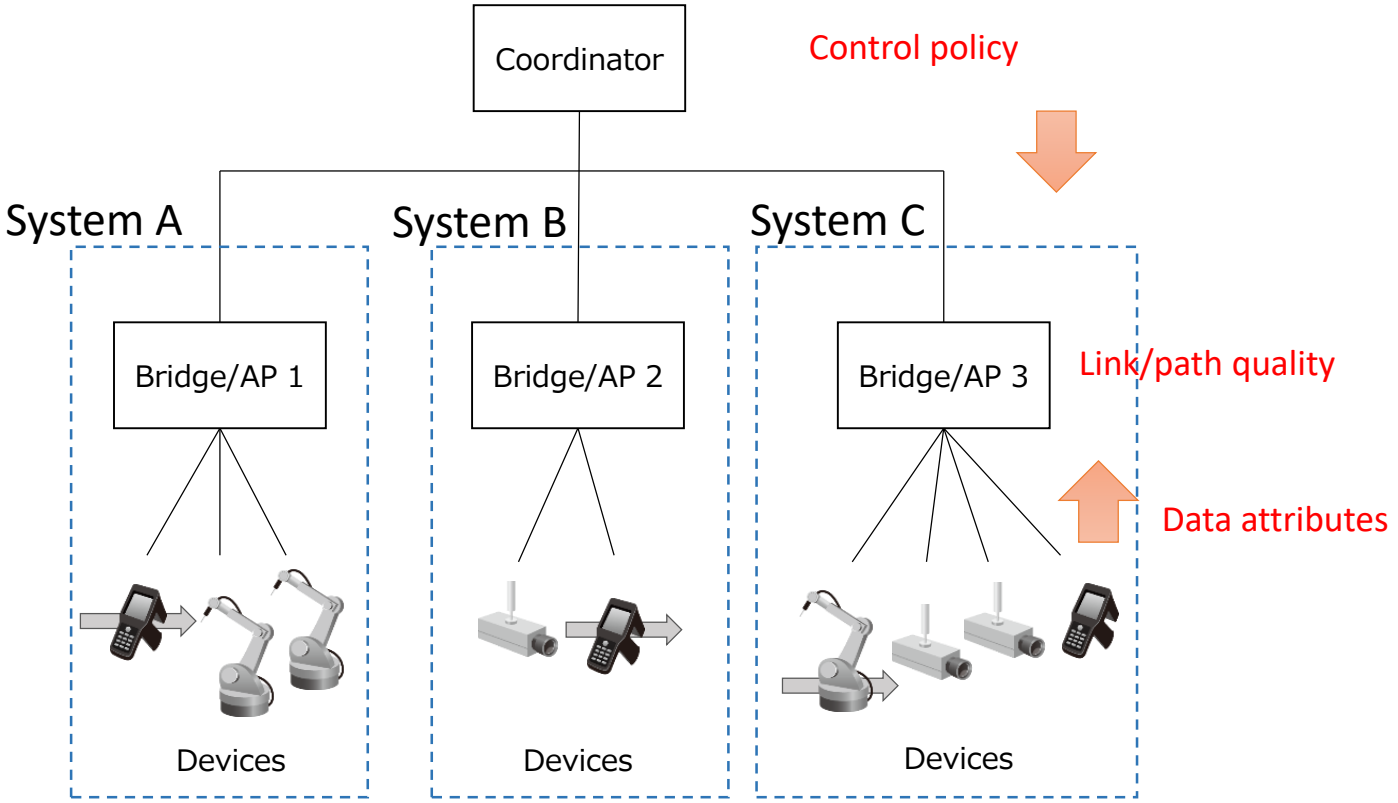
Data attributes: common information including various requirements, e.g. data rates (or data size at an application level and data frequency), latency, affordability of packet loss.

Data attributes are information to be used at bridges/APs for

1. Control of data flows across wireless links.
2. Joint coordination of frequency channel and forwarding paths.
3. Spatial control for wireless links, i.e. power and antenna directivity.

Changed from bandwidth to data rates written in red.

Coordination of distributed systems

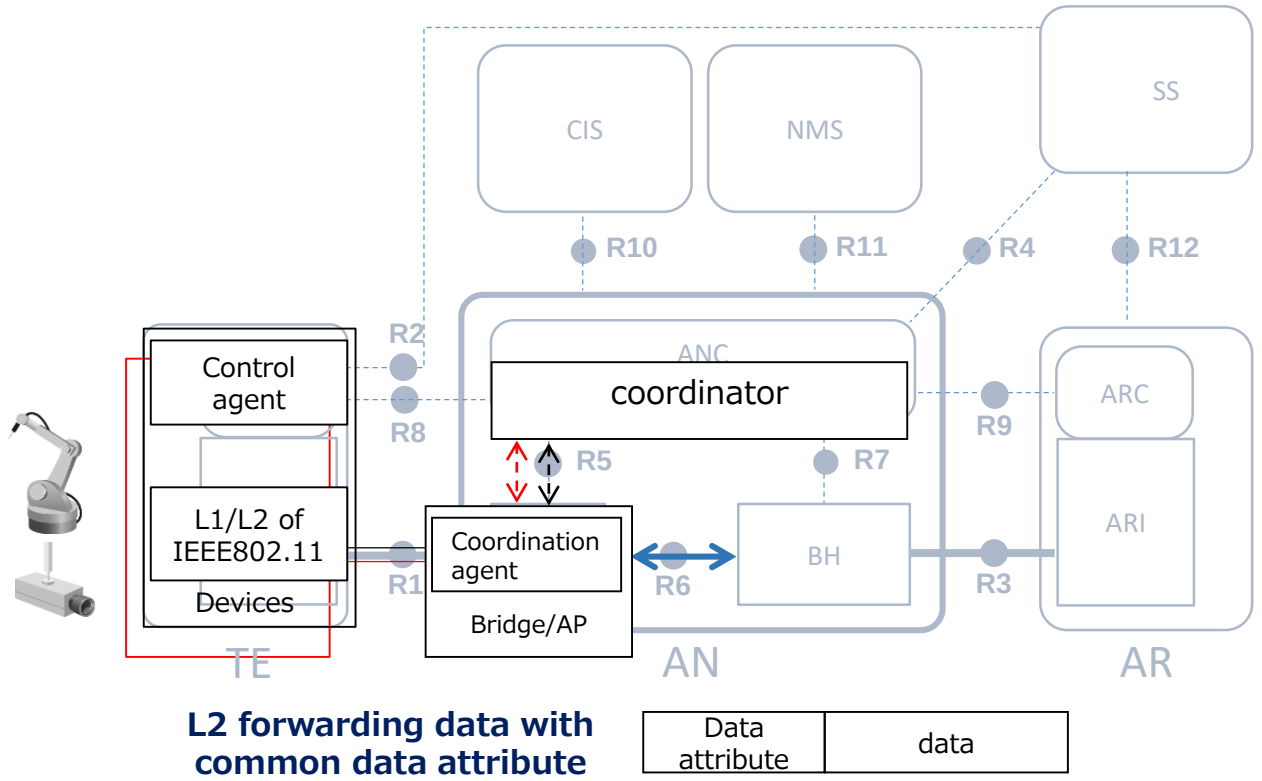


Each system operates autonomously to adapt to short-term fluctuation of wireless links.

- For autonomous operation at each system, bridges/AP should be intelligent to consider control policy, link/path quality and data attributes..

* Dynamic: change with long-term wireless environment, using applications.

Reference model



[1] 1-18-0025-04-ICne-pre-draft-update-to-1-18-0002-05-icne-wired-wireless-flexible-factories-iot.pdf