Project: IEEE P802.15 WG for Wireless Personal Area Networks (WPANs)

Submission Title: [Addition to document "15-09-0490-01-004g-merged-proposal-for-fhss-to-tg4": A method for supporting communication with legacy devices]
Date Submitted: [July, 2009]

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Abstract: [This document describes an additional mechanism for legacy device support to the Merged Proposal for FHSS to TG4g]
Purpose: [For consideration of inclusion into 802.15.4 PHY draft amendment]

Objectives

1. Propose the addition of a mechanism for legacy device support to merged proposal for FHSS, document ID *15-09-0490-01-004g-merged-proposal-for-fhss-to-tg4*

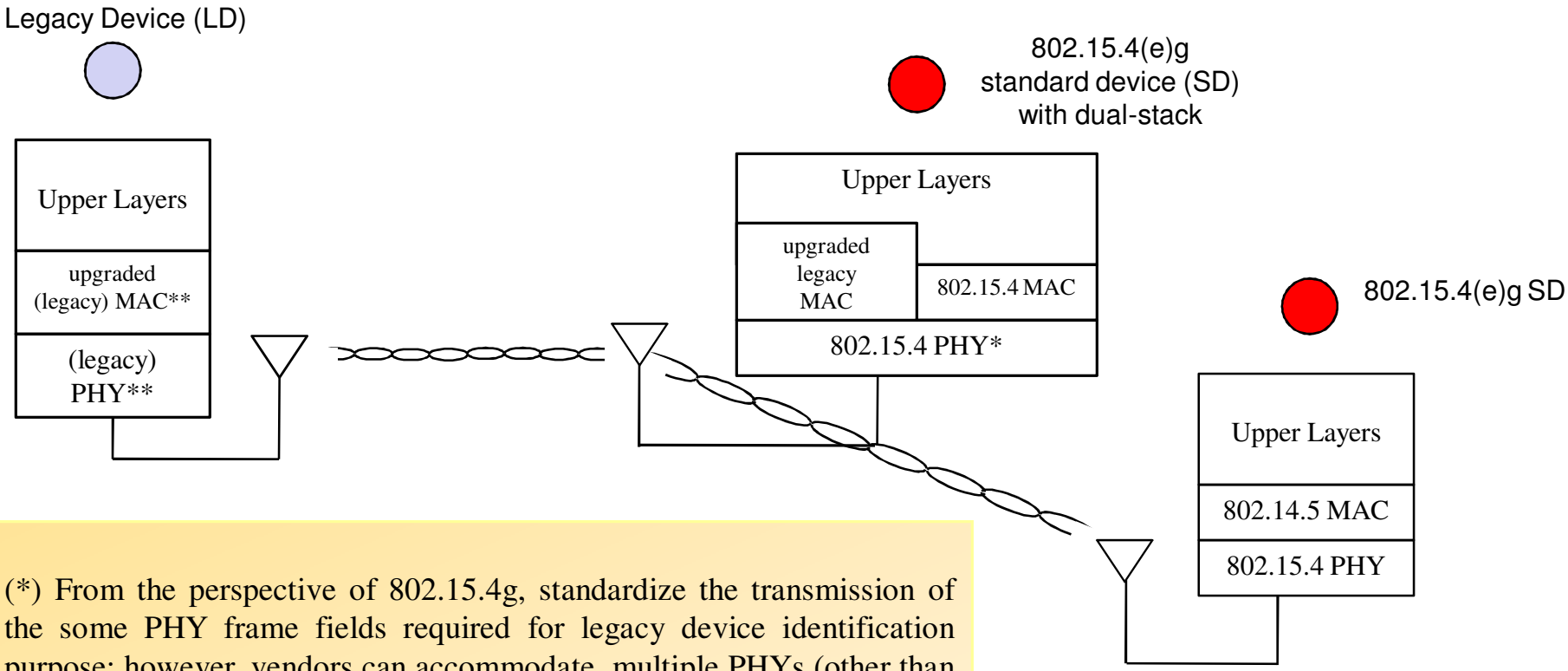
2. Propose a method for supporting *any* legacy device
   - ✓ existing and ongoing deployments will not become obsolete
   - ✓ simultaneous (and parallel) operation of *any* system based on legacy and standard devices, respectively

3. *Minimize* the impact of legacy device support on the standard and *not encumber* the choice of the "best" technology

Support for legacy devices

- Over-the-air upgrade of legacy devices affected by 802.15.4g support
  - ✓ only legacy devices that can accommodate radio parameter changes, while not altering (transmission link) communication performance
- Let system implementations deciding if standard devices support or not legacy devices
  - ✓ standard devices can support legacy devices by dual-stacking (proprietary layers and 802.15.4(e)g layers) rather than bridging
- Make standard PHY able to recognize if legacy devices are present on the field
- Use a standard information overhead, for legacy device identification, that
  - ✓ is modulated with the most common 2-(G)FSK scheme
  - ✓ has the lowest acceptable and robust data rate (40 Kbps – as defined by PAR)
  - ✓ is transmitted with respect to all PHY & MAC parameters, as will be defined by 802.15.4(e)g: channel spacing, channel bandwidth, etc.

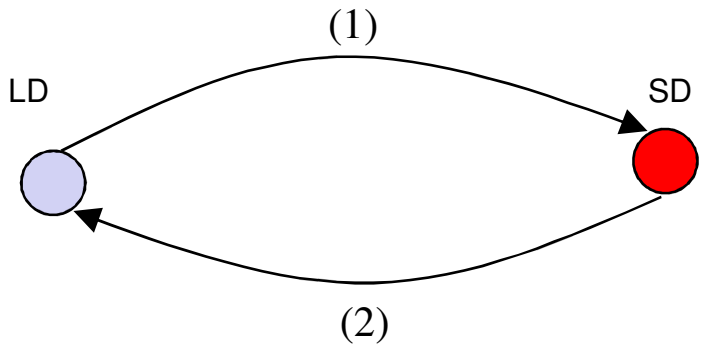
Support for legacy devices (cont'd)



(*) From the perspective of 802.15.4g, standardize the transmission of the some PHY frame fields required for legacy device identification purpose; however, vendors can accommodate multiple PHYs (other than 15.4g) on such devices, based on their legacy system parameters; for flexibility, this should be a vendor prerogative

(**) over-the-air upgrade the legacy MAC that will further (re-)configure legacy PHY to deal with radio parameter changes for supporting legacy device identification

Support for legacy devices (cont'd)



- Start of Frame Delimiter (SFD)
  - indicates whether there is a data rate change or not
  - also indicates whether or not there is a legacy device
  - has three defined values :
    - 0xAA52 = no data rate change
    - 0xAA2D = data rate change prior to PHR
    - xxxxxxx = legacy device (with no data rate change)

Proposed PPDU structure: see document "15-09-0490-01-004g-merged-proposal-for-fhss-to-tg4" for further details

PPDU & No data rate change:

SYNCH	SFD1	PHR	P-SDU

PPDU & Data rate changes:

SYNCH	SFD2	DRI	Settling delay*	ESHR*	PHR	P-SDU

PPDU & Legacy device ID:

1 octet

SYNCH	SFD3	*PHY_Type*	Settling delay*	PHR	P-SDU

LD to SD - (1) :

SYNCH	SFD3	*PHY_Type*	Settling delay*	PHR	P-SDU

SD to LD - (2) :

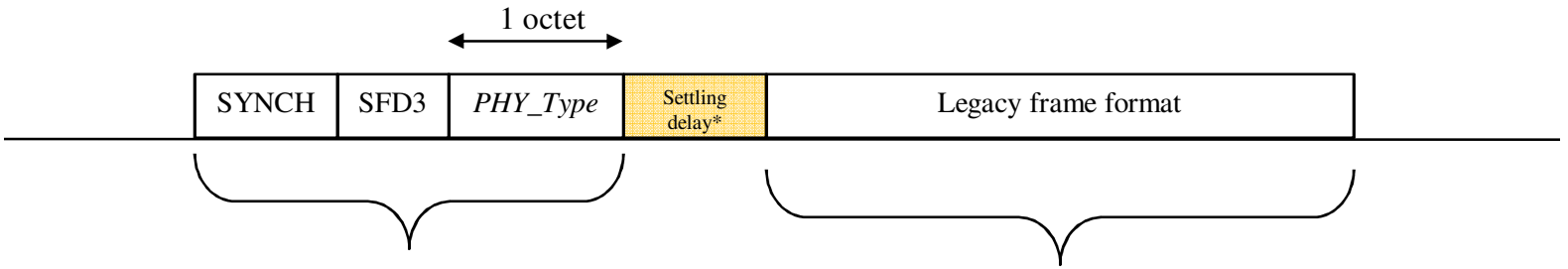
SYNCH	SFD3	*PHY_Type**	PHR	P-SDU

(*) = Designates optional fields

Support for legacy devices (cont'd)

PPDU format supporting legacy devices, modulation, data rate, PHY parameters,…

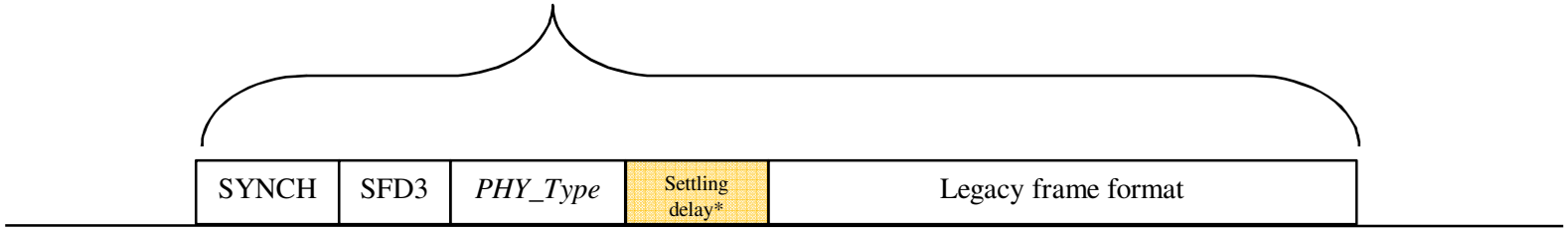
User case A:
"Shim" legacy
PHY upgrade



- most common modulation: 2-(G)FSK
- lowest acceptable and robust data rate
- transmitted with respect to all parameters as defined by 802.15.4(e)g (PHY+MAC), e.g., channel spacing, channel bandwidth

- data sent with respect to a specific legacy PHY
- legacy PHY to be defined by each vendor but not standardized

User case B:
Full legacy
PHY upgrade



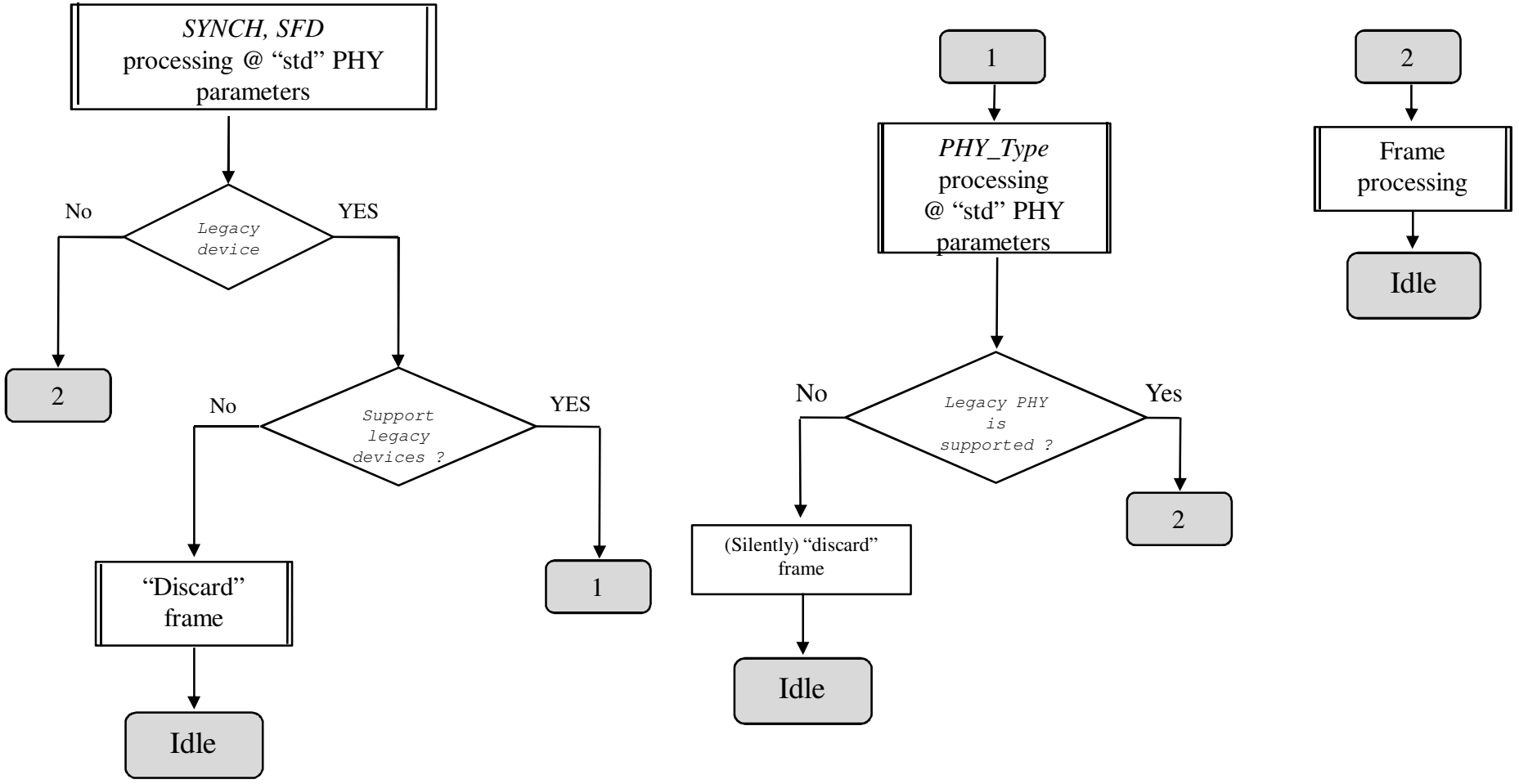
PIB: *PHY_Type* values

- An example of assigning *PHY_Type* values

***PHY_Type* Value**	**Vendor**	**Notice**
0-4	A	Vendor defined PHY & PHY parameters
5-9	B	Vendor defined PHY & PHY parameters
10-14	C	Vendor defined PHY & PHY parameters
15-19	D	Vendor defined PHY & PHY parameters
20-24	…	Vendor defined PHY & PHY parameters
25-29	…	…
…	…	…

Support legacy devices with 802.15.4g PHY

802.15.4g devices receiving frames from legacy device



Advantages

- ✓ Minimum impact on standard development
  - minimum on-air cost, minimum complexity and can be ignored where not necessary
- ✓ Does not require "bridging everywhere" to support legacy devices
  - where possible just over-the-air upgrade the legacy devices
- ✓ Opens up for multi-vendor interoperability
  - open platform by stacking up multi-vendor protocols on top of a common PHY (and MAC)
- ✓ Provides extensibility
  - further versions of the 802.15.4g PHY standard (different modulation) can be supported