IEEE P802.11  
Wireless LANs

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| Resolution to CIDs 3281 and 3282 | | | | |
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Abstract

This submission provides resolutions to the comments with CIDs 3281 and 3282 that were submitted during the third TGmc letter ballot in June 2014.

# CIDs 3281 and 3282

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| --- | --- | --- | --- | --- | --- |
| CID | Clause | Page | Line | Comment | Proposed Change |
| 3281 | 3.1 | 20 | 50 | Since its 2012 revision the 802.11 standard defines "WDS" as a \*vernacular\* term. The term WDS doesn't have any meaning anymore. This term is not specified at all and the standard does not explain how to establish, configure, or use a WDS. The term occurs in the definitions and abbreviations section only. It's not used anywhere else. Thus, it is not needed and is no longer required. | Delete the term WDS from the standard. |
| 3282 | 3.4 | 61 | 31 | Since its 2012 revision the 802.11 standard defines "WDS" as a \*vernacular\* term. The term WDS doesn't have any meaning anymore. This term is not specified at all and the standard does not explain how to establish, configure, or use a WDS. 802.11 should not list abbreviations just for fun. | Delete the term WDS from the standard. |

# Background

In the initial 802.11-1997 [1] standard the term “Wireless Distribution System” (WDS) appears within the list of abbreviations and acronyms. However, the standard explains term WDS neither in the definitions section nor elsewhere. The term remains an abbreviation standing on its own. The only technically related mentioning of the term WDS occurs in Table 2 of 802.11-1997. This table outlines the combinations of the To/From DS bits in data type frames and for the bit combination “11” it reads “Wireless distribution system (WDS) frame being distributed from one AP to another AP.” This sentence, however, is neither a technical specification nor an explanation of how to use a WDS. Thus, the term provides neither educational help nor any value for implementers.

In 2005 D. Engwer reports in submission 11-05/0710r0 [4] that the term Wireless Distribution System (WDS) “[…] is actually NOT defined and described and there is much confusion on this point. To prevent further confusion the author recommends reducing the use of or deprecating the term […].” Thus, within eight years after the 802.11 came into existence the definition of the term WDS has not been improved. This lack of specification caused severe confusion in the market. Vendors started implementing incompatible solutions to allow AP STAs to communicate to other AP STAs. However, because of the lack of any specification of how to encrypt and send frames from one to the other AP the standard failed on providing interoperable WDS behavior. In contrast, incompatible and malfunctioning WDS implementations have been sold and 802.11 users frustrated to be not able to combine independently developed products to operate a WDS. As a consequence, typical 802.11 repeaters found in the market implement non-AP STA and AP functionality to extend the range of an already deployed AP. The products that implement AP-to-AP communication to extend range are not generally compatible.

Ten years after ratification of the initial standard 802.11-2007 [2] adds the following definition

“**3.170 wireless distribution system (WDS):** A mechanism for wireless communication using a four address frame format specified in this standard. This standard describes such a frame format, but does not describe how such a mechanism or frame format would be used.”

Instead of finally providing a solution that enables interoperability this addition to the definition section does not add any useful information and only underlines the fact that manufacturers are left alone. This is diametrically opposed to the principal idea of standards enabling interoperability between independent implementations.

In 2008 J. Cardona et al. report in submission 11-08/0278r5 [5] that “[…] vendors had to get creative,” summarizing the fact that customers cannot chose among different solutions but have no alternative to buy products from their AP vendor in case they intend to operate a WDS. Without looking at further implications like the inability to securely operate an encrypted WDS in a standardized way, the submission explains that “There are two ways APs use WDS frames:

• Static WDS configuration  
Network managers manually enter a list of WDS-peers

• Dynamic WDS configuration (most commonly known as Lazy-WDS)‏  
Access Points automatically "discover" WDS peers.”

APs implementing the latter solution unsolicitedly forward multicast frames to any other device in range that these APs identified as WDS capable peers. Thus, airtime consumption is greatly increased and even if the neighboring device is operated by a separate entity it cannot prevent being addressed by so called “Lazy-WDS” APs. As a consequence, 802.11 TGs had to develop a workaround solution to prevent mesh STAs from being affected by this WDS procedure. No solution is available to prevent non-mesh STAs from being addressed by Lazy-WDS APs in case independent entities operate neighboring WDSs.

As a consequence the lack of specification prevents interoperability and even worse, causes misbehavior and inefficient use of the wireless medium. Therefore, in 2010 a comment was submitted calling for the removal of the term WDS from the standard. However, instead of alternatively resolving the issue by an appropriate technical solution respectively standard’s submissions, it was argued that Figure 8-38 (Authenticator state machines, part 2) of 802.11-2007 still uses the term and therefore the term shall be kept. In rephrasing the definition of the term WDS to

“**wireless distribution system (WDS):** Often used as a vernacular term for a mechanism for wireless communication among nonmesh stations (STAs) using a four address frame format.  
NOTE—This standard specifies such a frame format and its use only for a mesh basic service set (MBSS). Because of this, the term WDS is obsolete and subject to removal in a subsequent revision of this standard.”

it was generally admitted, however, that the term is of no value anymore. Figure 11-45 (Authenticator state machines, part 2) of 802.11-2012 [3] takes the role of Figure 8-38 of 802.11-2007 but Figure 11-45 no longer includes or mentions the term WDS. With Annex J (Formal description of a subset of MAC operation) being marked as informative in 802.11-2012 and finally deleted in P802.11-REVmc/D3.2 [6] no normative usage of the term WDS occurs in the standard anymore. Consequently, the term WDS shall be removed from the 802.11 standard in its entirety.

# Instructions to the technical editor:

Delete all occurrences of the term WDS in IEEE Std 802.11-2012 respectively P802.11-REVmc/D3.2 as shown in the following. Text marked strike out indicates text to delete:

**3.1 Definitions**

**~~wireless distribution system (WDS):~~** ~~Often used as a vernacular term for a mechanism for wireless communication among nonmesh stations (STAs) using a four address frame format.  
NOTE—This standard specifies such a frame format and its use only for a mesh basic service set (MBSS). Because of this, the term WDS is obsolete and subject to removal in a subsequent revision of this standard.~~

**3.4 Abbreviations and acronyms**

~~WDS wireless distribution system~~

**References:**

1. “IEEE Standard for Information Technology- Telecommunications and Information Exchange Between Systems—Local and Metropolitan Area Networks-Specific Requirements-Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications,” IEEE Std 802.11-1997, 1997.
2. “IEEE Standard for Information technology—Telecommunications and information exchange between systems—Local and metropolitan area networks—Specific requirements Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications,” IEEE Std 802.11-2007 (Revision of IEEE Std 802.11-1999), Jun. 12th, 2007.
3. “IEEE Standard for Information technology—Telecommunications and information exchange between systems Local and metropolitan area networks—Specific requirements Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications,” IEEE Std 802.11-2012 (Revision of IEEE Std 802.11-2007), Mar. 29th, 2012.
4. D. Engwer, “ʻWDSʼ Clarifications,” IEEE 802.11 submission 11-05/0710r0, Jul. 2005. [Online]. Available: <https://mentor.ieee.org/802.11/dcn/05/11-05-0710-00-000m-wds-clarifications.doc>
5. J. Cardona et al., “Avoiding Interactions with Lazy-WDS Equipment,” IEEE 802.11 submission 11-08/0278r5, Mar. 2008. [Online]. Available: <https://mentor.ieee.org/802.11/dcn/08/11-08-0278-05-000s-avoiding-interactions-with-lazy-wds-equipment.ppt>
6. “Draft Standard for Information technology—Telecommunications and information exchange between systems Local and metropolitan area networks—Specific requirements Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications,” IEEE P802.11-REVmc/D3.2 (Revision of IEEE Std 802.11-2012 as amended by IEEE Std 802.11ae-2012, IEEE Std 802.11aa-2012, IEEE Std 802.11ad-2012, IEEE Std 802.11ac-2013, and IEEE Std 802.11af-2013), September 2014.