IEEE P802.11  
Wireless LANs

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| Proposed 802.11az Functional Requirements | | | | |
| Date: 2016-03-15 | | | | |
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### Abstract

This submission proposes the 802.11az Functional Requirements as derived from the 802.11az PAR and CSD and also from analyzing the 802.11az use case document .

1. **Introduction**
   1. **Purpose**

This document proposes requirements for solutions addressing functionality to be provided by the 802.11az amendment, referred to as the TGaz Functional Requirements (FRs).

* 1. **Scope**

The scope for deriving functional requirements is set by the P802.11az PAR and CSD , as well as by the TGaz use case document .

The functional requirements as stated in this document cover the following aspects of 802.11az:

1. System performance
2. Bands of Operation
3. Backward compatibility and Coexistence
4. Compliance to PAR
   1. **Notation**

Requirements are identified by a preceding unique number in the format of “TGaz R*n*” , where *n* is an integer number representing the ID of the requirements.

1. **Functional Requirements**

All range and positioning measurement and medium usage performance improvements for 2.4Ghz band shall be compared with FTM executed using 802.11n over the same bandwidth and deployment scenario using SISO.

All range measurement and positioning performance improvements for 5Ghz band shall be compared with FTM executed using 802.11ac over the same bandwidth and deployment scenario using SISO.

All range measurement and positioning performance improvements for the 60Ghz band shall be compared with FTM executed using 802.11ad over the same bandwidth and deployment scenario.

The TGaz use cases are described in the TGaz Usage Models document [Ref-5]

* 1. **System Performance**
     1. **Range Measurement and coverage**

1. For the purpose of simulation, 802.11az shall use 802.11n/11ac channel model D NLOS with 20MHz, 40MHz, 80MHz and 160MHz bandwidths. Other channel models may be used if they become available and are deemed applicable. [Ref-3]
2. The 802.11az range measurement protocol shall support legacy REVmc Fine Timing Measurement in order to interoperate with legacy peers that do not support the 802.11az range measurement protocol. [Ref-3]
3. The 802.11az range measurement protocol shall have a mechanism to obtain a range measurement that is more accurate than that obtained using legacy REVmc Fine Timing Measurement under the same conditions. [Ref-3]
4. The 802.11az range measurement protocol shall support concurrent sessions in order for an Initiator to be able to perform range measurements with multiple Responders (each operating in the same or different channels). [Ref-3]
5. The 802.11az range measurement protocol shall support range measurement in both the associated and the unassociated modes. [Ref-3]
6. The 802.11az range measurement protocol shall support range measurement with an upper bound error of <TBD> m for 90% of uniformly sampled measurements. [Ref-3]
7. The 802.11az range measurement protocol shall under all conditions perform no worse than the legacy REVmc Fine Timing Measurement protocol (i.e. the resulting range measurement accuracy is as good as the legacy REVmc Fine Timing Measurement protocol). [Ref-3]
   * 1. **60Ghz Bands**
8. Decrease units of Min Delta FTM for 60 GHz while maintaining backwards compatibility. [Ref-4]
9. Allow for smaller Burst Duration for 60 GHz while maintaining backwards compatibility. [Ref-4]
10. Add additional rotational angle (ROLL) to measurement reports. [Ref-4]
11. Define TOD for T1 & T3 and TOA for T2 & T4 to reduce effect of drift on ranging computation. [Ref-4]
12. The 802.11az amendment shall support at least one mode of operation that enables range measurement in the 60GHz band with an accuracy of 1cm, @90%.[Ref-6]
13. The 802.11az amendment shall support at least one mode of operation that enables AOA/DOA measurement in the 60GHz band with an accuracy of 5deg, @90%.[Ref-6]
14. The 802.11az amendment shall support at least one mode of operation that enables range/AOA measurement in the 60GHz band with a latency of 10ms. [Ref-6]
15. The 802.11az amendment shall support at least one mode of operation that provides location using a single link range and angle measurement. [Ref-6]
16. The 802.11az amendment shall support at least one mode of operation at 60GHz that enables range measurement at a minimum distance of at most 5 cm. [Ref-6]
17. The 802.11az amendment shall support at least one mode of operation at 60GHz that enables concurrent location measurement of 12 users and 7APs over the same 60GHz channel. [Ref-6]
    * 1. **Scalability**

The scalable mode of the 802.11az range measurement protocol shall support at least one mode which allows for scalable positioning, meeting the following scalability mode requirements.

1. Support at least 200 unassociated and associated STAs, per AP performing locationing operation concurrently. [Ref-7]
2. Achieve improved accuracy of 1st fixed time of a STA with greater number of APs involved. [Ref-7]
3. Utilize less than 10% of the channel capacity of an AP. [Ref-7]
4. Operate with a maximum refresh rate of .5Hz. [Ref-7]
5. Maintain stability with up to 5% STAs joining and leaving the coverage of the AP. [Ref-7]
   * 1. **Legacy**
6. Legacy operation with REVmc FTM devices
   1. **Compliance to PAR and CSD**
7. The 802.11az amendment shall comply with the PAR [Ref-1] and the CSD [Ref-2].
8. **References**
9. **11-15-0030-09-0ngp-ngp-par-draft**
10. **11-15-0262-04-0ngp-csd-working-draft**
11. **11-16-0134-03-00az-accuracy-and-coverage-functional-requirements**
12. **11-16-0148-01-00az-60-ghz-focus-area**
13. **11-16-0137-00-00az-ngp-use-case-document**
14. **11-16-0309-00-00az-60ghz-functional-requirements**
15. **11-16-0448-01-00az-functional-requirement-for-scalability-operation**