**12IEEE 802.24**

**Smart Grid TAG**

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| Re: | [] |
| Abstract | [DRAFT DOCUMENT: Not yet approved by IEEE 802.24 or IEEE 802. This document provides a list of 802 and related standards that provide solutions for smart grid/smart utility networks (SUNs).] |
| Purpose | [] |
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# Executive Summary

This document provides list of standards and the related to Smart Grid. Initially the IEEE 802.24 group will focus on PHY and MAC standards related to the Smart Grid, to recommend to the IEEE-SA, so the standards can be formally documented and publicized by the IEEE. This document will be of help in the following areas:

* IEEE-SA activities relating to Smart Grid Standards and Technologies
* IEEE 802 activities in the Smart Grid area
* SGIP activities in establishing Smart Grid Catalog of Standards (CoS)

The list of Smart Grid Standards, currently in the form of recommended PHY/MAC Groups (PMGs), is intended to be submitted to the IEEE 802 Executive Committee to forward to IEEE-SA. This document will be updated on an as needed basis to reflect the on-going work in IEEE 802. Future work will include identifying standards applicable to higher layers for each Smart Grid application area that can be combined with the PMGs.

Each group is numbered for reference as 802.24-<working group#>-<group #> where the working group number is replaced with the appropriate IEEE 802 “dot number” and the group # is a incremented for each group that is added for that IEEE 802 working group. For example, the third group defined for 802.3 would be referenced as 802.24-WG3-3.

# IEEE 802.24 Scope

IEEE 802.24 Smart Grid Technical Advisory Group (SG TAG) charter is:

* Acts as a liaison and point of contact with regulatory agencies, industry organizations, other SDOs, government agencies, IEEE societies, etc., for questions regarding the use of 802 standards in Smart Grid applications.
* Facilitate coordination and collaboration among 802 groups.
* Provides speakers as needed and available to present on 802 standards in Smart Grid applications.
* Develops white papers, guidelines, presentations and other documents that do not require a PAR that describe the application of 802 standards to Smart Grid applications.
* Acts as a resource for understanding 802 standards for certification efforts by industry bodies.

# Background

Standards play a key role in the development, deployment and operation of smart grid worldwide. They are a proven tool to safeguarding interoperability, enabling the different components of a grid to exchange information.

Various Standards Development Organizations (SDOs) have developed/developing standards related to Smart Grid. Within IEEE802, several working groups including 802.1, 802.3, 802.11, 802.15, 802.16, and 802.22, are active in smart grid standards area. There are also various smart grid related activities going on in other SDOs with whom IEEE 802 has a collaborative relationship, such as Telecommunication Industry Association (TIA), European Telecommunications Standards Institute (ETSI) and others.

Various PHY and MAC related Smart Grid standards have been developed at several Standards Development Organizations (SDOs). These standards can lead to various Smart Grid standards protocol stacks that include PHY and MAC. As an example, such as IEEE 802.15.4g and IEEE 802.15.4e are developed to address PHY and MAC layers, respectively, for Smart Grid applications. Other IEEE 802 groups have also developed PHY and MAC standards that are applicable to the smart grid, and they are included in the groups.

# Listing of Groups

The groups in this clause are listed in numerical order of the working group.

## Applicable to all PMGs

These standards are applicable to all PMGs for Smart Grid applications.

**802.24-WG1-1 (security related)**

* **802.1X-2010 Port-based Network Access Control**
For the purpose of providing compatible authentication, authorization and cryptographic key agreement mechanisms to support secure communication between devices connected by IEEE 802 Local Area Networks (LANs), this standard
a) Specifies a general method for provision of port-based network access control.
b) Specifies protocols that establish secure associations for IEEE Std 802.1AE MAC Security
c) Facilitates the use of industry standard authentication and authorization protocols.
* **802.1AE-2006 Media Access Control (MAC) Security**
The scope of this standard is to specify provision of connectionless user data confidentiality, frame data integrity, and data origin authenticity by media access independent protocols and entities that operate transparently to MAC Clients. NOTE—The MAC Clients are as specified in IEEE Std 802, IEEE Std 802.2™, IEEE Std 802.1D™, IEEE Std 802.1Q™,and IEEE Std 802.1X™.2To this end it
a) Specifies the requirements to be satisfied by equipment claiming conformance to this standard.
b) Specifies the requirements for MAC Security in terms of provision of the MAC Service and the preservation of the semantics and parameters of service requests and indications.
c) Describes the threats, both intentional and accidental, to correct provision of the service.
d) Specifies security services that prevent, or restrict, the effect of attacks that exploit these threats.
e) Examines the potential impact of both the threats and the use of MAC Security on the Quality of Service (QoS), specifying constraints on the design and operation of MAC Security entities and protocols.
f) Models support of the secure MAC Service in terms of the operation of media access control method independent MAC Security Entities (SecYs) within the MAC Sublayer.
g) Specifies the format of the MACsec Protocol Data Unit (MPDUs) used to provide secure service.
h) Identifies the functions to be performed by each SecY, and provides an architectural model of its internal operation in terms of Processes and Entities that provide those functions.
i) Specifies the interface/exchanges between a SecY and its associated and collocated MAC Security Key Agreement Entity (KaY, IEEE P802.1af [B2]) that provides and updates cryptographic keys.
j) Specifies performance requirements and recommends default values and applicable ranges for the operational parameters of a SecY.
k) Specifies how SecYs are incorporated within the architectural structure within end stations and bridges.
l) Establishes the requirements for management of MAC Security, identifying the managed objects and defining the management operations for SecYs.
m) Specifies the Management Information Base (MIB) module for managing the operation of MAC Security in TCP/IP networks.
n) Specifies requirements, criteria and choices of Cipher Suites for use with this standard. This standard does not
o) Specify how the relationships between MACsec protocol peers are discovered and authenticated, as supported by key management or key distribution protocols, but makes use of IEEE P802.1af Key Agreement for MAC security to achieve these functions.
* **802.1AR-2009 Secure Device Identity**
This standard specifies unique per-device identifiers (DevID) and the management and cryptographic binding of a device to its identifiers, the relationship between an initially installed identity and subsequent locally significant identities, and interfaces and methods for use of DevIDs with existing and new provisioning and authentication protocols.

**802.24-WG1-2 (bridging and link aggregation related)**

* **802.1Q-2011 Media Access Control (MAC) Bridges and Virtual Bridge Local Area Networks**
This standard specifies Media Access Control (MAC) Bridges that interconnect individual Local Area Networks (LANs), each supporting the IEEE 802 MAC service using a different or identical media access control method, to provide Bridged Local Area Networks and Virtual LANs (VLANs).
* **802.1AX-2009 Link Aggregation**
Link Aggregation allows one or more links to be aggregated together to form a Link Aggregation Group, such that a MAC Client can treat the Link Aggregation Group as if it were a single link. To this end, it specifies the establishment of data terminal equipment (DTE) to DTE logical links, consisting of N parallel instances of full duplex point-to-point links operating at the same data rate. This standard defines the MAC independent Link Aggregation capability, and general information relevant to specific MAC types that support Link Aggregation.

## IEEE 802.3 groups

**802.24-WG3-1**

* IEEE Std 802.3-2012 Ethernet

## IEEE 802.11 groups

**802.24-WG11-1**

## IEEE 802.15 groups

**802.24-WG15-1**

* **IEEE 802.15.4g (PHY)**IEEE 802.15.4g defines a PHY amendment to IEEE 802.15.4 wireless standard to address outdoor Smart Utility Network (SUN). IEEE 802.15 working group formed the 802.15.4g task group for the purpose of standardizing the SUN physical layer protocol for Smart Grid. IEEE 802.15.4g standards effort was to establish industry-wide compatibility at the physical layer for SUN and remove the limitations imposed by the then-current IEEE 802.15.4-2006 standard.
* **IEEE 802.15.4e (MAC)**IEEE 802.15.4e defines a MAC amendment to enhance and add functionality to the 802.15.4-2006 MAC to better support the industrial markets. The recently approved IEEE802.15.4e-2012 MAC amendment has many features that apply to SUN networks. Specifically, the MAC enhancements specified in IEEE 802.15.4e are TDMA, channel hopping, GTS (to increase its flexibility such as supporting peer to peer, the length of the slot, and number of slots), CSMA, security and low latency.

**802.24-WG15-2**

* **IEEE 802.15.4g (PHY)**IEEE 802.15.4g defines a PHY amendment to IEEE 802.15.4 wireless standard to address outdoor Smart Utility Network (SUN). IEEE 802.15 working group formed the 802.15.4g task group for the purpose of standardizing the SUN physical layer protocol for Smart Grid. IEEE 802.15.4g standards effort was to establish industry-wide compatibility at the physical layer for SUN and remove the limitations imposed by the then-current IEEE 802.15.4-2006 standard.
* **ANSI\_TIA-PN4957\_200 (MAC)**TIA standard [ANSI/TIA-PN-4957.200] defines a MAC standard for Smart Utility Networks. The TIA MAC specification allows the deployment of small to very large scale networks of devices supporting applications in a wide range of markets from generic M2M communications to large scale utility networks. Particular attention is paid to the use of shared spectrum with very efficient distribution of devices across available channels to minimize the impact of interference to and from other spectrum users as well as collisions from other devices.

## IEEE 802.16 groups

**802.24-WG16-1**

* IEEE Std 802.16

## IEEE 802.20 groups

**802.24-WG20-1**

* IEEE Std 802.20

## IEEE 802.21 groups

**802.24-WG21-1**

* IEEE Std 802.21

## IEEE 802.22

**802.24-WG22-1**

* IEEE Std 802.22