Smart Grid Standards Information

Version 1.7
Tuesday, May 11, 2010

Section I: Use and Application of the Standard

A. Identification and Affiliation

1.	Number of the standard	ANSI/CEA-852.1
2.	Title of the standard	Enhanced Protocol for Tunneling Component Network Protocols Over Internet Protocol Channels
3.	Name of owner organization	ANSI/CEA
4.	Latest versions, stages, dates	February 2010
5.	URL(s) for the standard	http://www.ce.org/Standards/browseByCommittee_6483.asp
6.	Working group / committee	CEA R7.1 Home Control Systems Subcommittee
7.	Original source of the content (if applicable)	Adept Systems; Echelon Corporation; LOYTEC electronic GmbH; ANSI/CEA-852 standard
8.	Brief description of scope	The CEA-852.1 standard specifies a communications method that allows networked data acquisition and control devices to communicate with each other over the internet. The purpose of such devices are widely varying and include functions such as appliance monitoring, meter reading, and HVAC and lighting control to name a few. CEA-852.1 does not replace existing device communications protocols, but instead allows those protocols to use the internet as a communications medium. CEA-852.1 currently supports the existing device protocols CEA-600 (CEBus) and CEA-709.1 (LonTalk®) and was designed to allow the support of others.

B. Level of Standardization

1.	Names of standards development organizations that recognize this standard and/or accredit the owner organization	American National Standards Institute (ANSI): CEA-852 & CEA-852.1; British Standards Institute (BS): CEA-852; Consumer Electronics Association (CEA): CEA-852 & CEA-852.1; Electronics Industries Alliance (EIA), formerly before CEA: CEA-852; European Committee for Standardization (CEN): CEA-852; International Electrotechnical Commission (IEC): CEA-852; International Forecourt Standards Forum (IFSF): CEA-852; International Organization for Standardization (ISO): CEA-852; Standardization Administration of China (SAC): CEA-852
2.	Has this standard been adopted in regulation or legislation, or is it under consideration for adoption?	☐ Yes ☐ No (Unknown)

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3.	Has it been endorsed or recommended by any level of government? If "Yes", please describe	☒ Yes ☐ No USACE and AFCESA projects where IP connectivity is allowable.
4.	Level of Standard (check all that apply)	☒International ☒National ☒Industry ☐de Facto ☐ Single Company
5.	Type of document	☒Standard ☐ Report ☐ Guide ☐ Technical Specification
6.	Level of Release	☒ Released ☐ In Development ☐ Proposed
C. Areas of Use		
1.	Currently used in which domains? (check all that apply)	☐ Markets ☐ Operations ☒ Service Providers ☐ Generation ☐ Transmission ☐ Distribution ☒ Customer
2.	Planned for use in which domains? (check all that apply)	☐ Markets ☐ Operations ☒Service Providers ☒ Generation ☐ Transmission ☒ Distribution ☒ Customer
3.	Please describe the Smart Grid systems and equipment to which this standard is applied	Is used in systems where controls information must traverse the Internet or an intranet without converting the underlying control-network protocol and/or data residing in control-network packets. Metering, in-facility communications, and other scenarios where IP protocols would be the ideal transport for control-network communications but where IP protocols are not ideal for control at the device level.

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D. Relationship to Other Standards or Specifications

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1.	Which standards or specifications are referenced by this standard?	CEA, “CEA Home Automation System (CEBus)”, CEA STANDARD CEA-600 CEBus SET, March 1996 CEA, “Control Network Protocol Specification”, ANSI/CEA STANDARD ANSI/CEA-709.1-B, January 2002 Bradner, S., “Key words for use in RFCs to Indicate Requirement Levels”, BCP 14, RFC 2119, Harvard University, March 1997 Postel, J., “Internet Protocol”, STD 5, RFC 791, USC Information Sciences Institute, September 1981 CEA, “Tunneling Component Network Protocols Over Internet Protocol Channels”, CEA Standard CEA-852-B, October 2009 Deering, S.E., “Host extensions for IP multi-casting”, STD 5, RFC 1112, Stanford University, August 1989 Postel, J., “User Datagram Protocol”, STD 6, RFC 768, USC Information Sciences Institute, August 1980 Postel, J., “Transmission Control Protocol”, STD 7, RFC 793, USC Information Sciences Institute, September 1981 Droms, R., “Dynamic Host Configuration Protocol”, RFC 2131, Bucknell University, March 1997 Croft, W.J., Gilmore, J., “Bootstrap Protocol”, RFC 951, September 1985 Mills, D., “Network Time Protocol (Version 3) specification, implementation and analysis”, RFC 1305, University of Delaware, March 1992 Mills, D., “Simple Network Time Protocol (SNTP) Version 4 for IPv4, IPv6 and OSI”, RFC 2030, University of Delaware, October 1996 Rivest, R. “The MD5 Message-Digest Algorithm”, RFC 1321, April 1992 R. Droms, Dynamic Host Configuration Protocol. RFC 2131, Standards Track, March 1997 Dynamic DNS, www.dyndns.org J. Rosenberg, et al., STUN - Simple Traversal of User Datagram Protocol (UDP) Through Network Address Translators (NATs). RFC 3489, Standards Track, March 2003

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2.	Which standards or specifications are related to this standard?	ANSI/CEA 709.1 through .4 ANSI/CEA-852 EN 14908-1 through -6 GB/Z 20177.1 through .4 GB/T 20299.4 ISO/IEC 14908-1 through -4
3.	Which standards or specifications cover similar areas (may overlap)?	
4.	What activities are building on this work?	Specifications by the Chinese Ministry of Construction, and USACE.

E. Dept of Energy Smart Grid Characteristics

Please describe how this standard may encourage each of the following:

1.	Enables informed participation by customers	☐ Yes ☒ No Specification concerns only the physical syntax layer
2.	Accommodates all generation and storage options	☐ Yes ☒ No Specification concerns only the physical syntax layer
3.	Enables new products, services and markets	☒ Yes ☐ No
4.	Provides the power quality for a range of needs	☐ Yes ☒ No Specification concerns only the physical syntax layer
5.	Optimizes asset utilization and operating efficiency	☐ Yes ☒ No Specification concerns only the physical syntax layer
6.	Operates resiliently to disturbances, attacks, and natural disasters	☒ Yes ☐ No Makes use of Internet and therefore can use alternate paths

F. Priority Areas Previously Mentioned by FERC and NIST

Please describe if and how this standard may be applied in each of the following areas. Note that there is space in section J to discuss any other significant areas where the standard may be applied.

1.	Cybersecurity and physical security	☒ Yes ☐ No Can be used to tunnel an otherwise-exposed control signal and associated data
2.	Communicating and coordinating across inter-system interfaces	☐ Yes ☒ No Specification uses normal Internet interfaces
3.	Wide area situational awareness	☐ Yes ☒ No Specification uses normal Internet interfaces
4.	Smart grid-enabled response for energy demand	☐ Yes ☒ No Specification uses normal Internet interfaces
5.	Electric storage	☐ Yes ☒ No Specification concerns only the transport of information
6.	Electric vehicle transportation	☐ Yes ☒ No Specification concerns only the transport of information
7.	Advanced metering infrastructure	☒ Yes ☒ No Specification allows for transport of metering information
8.	Distribution grid management	☐ Yes ☒ No Specification concerns only the transport of information

G. Openness

1.	Amount of fee (if any) for the documentation	$193.00 USD (normal purchase); $144.75 USD (CEA Member)
2.	Amount of fee (if any) for implementing the standard	None
3.	Amount of fee (if any) to participate in updating the standard	None
4.	Is the standard documentation available online?	☒ Yes ☐ No URL: http://www.ce.org/Standards/browseByCommittee_6483.asp for fee.
5.	Are there open-source or reference implementations?	☐ Yes ☐ No (Unknown)
6.	Are there open-source test tools?	☐ Yes ☐ No (Unknown)
7.	Would open-source implementations be permitted?	☒ Yes ☐ No
8.	Approximately how many implementers are there?	Unknown
9.	Approximately how many users are there?	Unknown
10.	Where is the standard used outside of the USA?	Europe, Asia, Mideast, Africa, Americas
11.	Is the standard free of references to patented technology?	☒ Yes ☐ No (IP standards excluded)
12.	If patented technology is used, does the holder provide a royalty-free license to users of the standard?	☐ Yes ☐ No ☒ Not Patented
13.	Can an implementer use the standard without signing a license agreement?	☒ Yes ☐ No
14.	Are draft documents available to the public at no cost?	☐ Yes ☐ No (Unknown)
15.	How does one join the working group or committee that controls the standard?	Through participation in either CEA or CEN working groups
16.	Is voting used to decide whether to modify the standard? If Yes, explain who is permitted to vote.	☒ Yes ☐ No Voting members of working groups must maintain eligibility by attending meetings/calls.
17.	Is an ANSI-accredited process used to develop the standard?	☒ Yes ☐ No
18.	What countries are represented in the working group or committee that controls the standard?	US and several EU countries

H. Support, Conformance, Certification and Testing

1.	Is there a users group or manufacturers group to support this standard?	☒ Yes ☐ No
2.	What is the name of the users group or manufacturers group (if any)?	LonMark® International: http://www.lonmark.org
3.	What type of test procedures are used to test this standard? (please check all that apply)	☒ Internal to the lab ☐ Published by standards organization ☒ Published by users group ☐ No procedures, informal testing
4.	Are there test vectors (pre-prepared data) used in testing? (please check all that apply)	☐ Internal to the lab ☐ Published by standards organization ☒ Published by users group ☐ No procedures, informal testing

5.	What types of testing programs exist? (check all that apply)	☒ Interoperability Testing ☒ Conformance Testing ☐ Security Testing ☐ No Testing
6.	What types of certificates are issued? (check all that apply)	☒ Interoperability Certificate ☒ Conformance Certificate ☐ Security Certificate (text document) ☐ No Certificates
7.	Are there rules controlling how and when to use the logo?	☒ Yes ☐ No ☒ Standard has no logo The standard has no logo but the user group has logos for devices that pass interoperability conformance testing and user-group membership.
8.	Is there a program to approve test labs?	☒ Yes ☐ No
9.	Approximately how many test labs are approved (if any)?	Testing is in vendor labs while connected to the Internet-based testing tool.
10.	Is there a defined process for users to make technical comments on the standard or propose changes to the standard and have these issues resolved?	☒ Yes ☐ No
11.	Is there a published conformance checklist or table?	☐ Yes ☒ No
12.	Are there defined conformance blocks or subsets?	☒ Yes ☐ No
13.	Approximately how many vendors provide test tools?	Approximately 5-to-10 vendors provide various test tools but only the user group's test tool qualifies a device to use the logo and only devices are tested; not routers.
14.	Are there tools for pre-certification prior to testing?	☒ Yes ☐ No
15.	Can vendors self-certify their implementations?	☐ Yes ☒ No The testing is accomplished by the vendors in a self-certification method but the user group's tools determine passing/failing by inspection of the test results.
16.	Is there application testing for specific uses?	☐ Yes ☒ No ☐ Not applicable
17.	Is there a "golden" or "reference" implementation to test against?	☐ Yes ☒ No
18.	Who typically funds the testing? (check all that apply)	☐ User ☐ Users Group ☒ Vendor ☐ Confidential
19.	Is there a method for users and implementers to ask questions about the standard and have them answered? (check all that apply)	☐ Yes, official interpretations ☒ Yes, informal opinions ☐ No
20.	Does the users' group (or some other group) fund specific tasks in the evolution of the standard?	☒ Yes ☐ No The user group has a small staff that participates in the SDOs and maintains the testing tools.
21.	Is the users' group working on integration, harmonization or unification with other similar standards?	☒ Yes ☐ No
22.	What other standards is this standard being integrated, harmonized, or unified with (if any)?	ANSI/CEA-852; ANSI/CEA-709.1; IP standards

23.	Are there application notes, implementation agreements, or guidelines available describing specific uses of the standard?	☒ Yes ☐ No ☐ Not applicable

J. Notes

Please present here any additional information about the standard that might be useful:

1.	ANSI/CEA-852.1 is an enhanced version of ANSI/EA-852. The standard is written to allow its use for different underlying controls-network protocols – to allow them to be tunneled over IP protocols (TCP or UDP) and ports of choice per installation.

Section II: Functional Description of the Standard

K. GridWise Architecture: Layers

Please identify which layers this standard specifies, as described in http://www.gridwiseac.org/pdfs/interopframework_v1_1.pdf, and the applicable section of the standard. Note the mapping to the Open Systems Interconnect (OSI) model is approximate.

1.	**Layer 8: Policy**	☐ Yes ☒ No Communications Protocol
2.	**Layer 7: Business Objectives**	☐ Yes ☒ No Communications Protocol
3.	**Layer 6: Business Procedures**	☐ Yes ☒ No Communications Protocol
4.	**Layer 5: Business Context**	☐ Yes ☒ No Communications Protocol
5.	**Layer 4: Semantic Understanding (object model)**	☐ Yes ☒ No Communications Protocol
6.	**Layer 3: Syntactic Interoperability (OSI layers 5-7)**	☐ Yes ☒ No Communications Protocol
7.	**Layer 2: Network Interoperability (OSI layers 3-4)**	☒ Yes ☐ No IP protocol; preserving underlying networking of controls protocol
8.	**Layer 1: Basic Connectivity (OSI layers 1-2)**	☐ Yes ☒ No Allows use over normal IP interfaces (wired and wireless)

L. GridWise Architecture: Cross-Cutting Issues

Please provide an explanation in the box beside the heading for any questions answered "Not applicable". If the question is not applicable because the function is provided in another layer or standard, please suggest any likely candidates. Note that "the standard" refers to the technology specified by the standard, not the documents themselves.

	Shared Meaning of Content	
1.	Do all implementations share a common information model?	☐ Yes ☒ No ☐ Not applicable
2.	Can data be arranged and accessed in groups or structures?	☒ Yes ☐ No ☐ Not applicable
3.	Can implementers extend the information model?	☒ Yes ☐ No ☐ Not applicable
4.	Can implementers use a subset of the information model?	☐ Yes ☐ No ☒ Not applicable
	Resource Identification	
5.	Can data be located using human-readable names?	☐ Yes ☐ No ☒ Not applicable
6.	Can names and addresses be centrally managed without human intervention?	☒ Yes ☐ No ☐ Not applicable
	Time Synchronization and Sequencing	
7.	Can the standard remotely synchronize time?	☒ Yes ☐ No ☐ Provided in another layer
8.	Can the standard indicate the quality of timestamps?	☒ Yes ☐ No ☐ Provided in another layer
	Security and Privacy	
9.	Where is security provided for this standard?	☒ Within this standard ☒ By other standards
10.	Does the standard provide authentication?	☒ Yes ☐ No

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11.	Does the standard permit role-based access control?	☒ Yes ☐ No via IP protocols
12.	Does the standard provide encryption?	☒ Yes ☐ No For authentication
13.	Does the standard detect intrusions or attacks?	☒ Yes ☐ No via Authentication
14.	Does the standard facilitate logging and auditing of security events?	☒ Yes ☐ No via IP protocols
15.	Can the security credentials be upgraded remotely?	☒ Yes ☐ No ☐ No Credentials
16.	Can the security credentials be managed centrally?	☒ Yes ☐ No ☐ No Credentials
17.	Please list any security algorithms and standards used	Authentication; use of IP-ready standards
18.	Please provide additional information on how the standard addresses any “Yes” answers above	Via IP protocols; the standard allows use of whatever overarching standards are needed
19.	Please provide additional information about why any of the questions listed above do not apply to this standard	
	Logging and Auditing	
20.	Does the standard facilitate logging and auditing of critical operations and events?	☒ Yes ☐ No
21.	Can the standard gather statistics on its operation?	☒ Yes ☐ No ☐ Not applicable
22.	Can the standard report alerts and warnings?	☒ Yes ☐ No ☐ Not applicable
	Transaction State Management	
23.	Can the standard remotely enable or disable devices or functions?	☐ Yes ☐ No ☒ Not applicable
	System Preservation	
24.	Can the standard automatically recover from failed devices or links?	☒ Yes ☐ No ☐ Not applicable ☐ Provided in another layer
25.	Can the standard automatically re-route messages?	☒ Yes ☐ No ☐ Not applicable ☐ Provided in another layer
26.	Can the standard remotely determine the health (as opposed to just connectivity) of devices or software?	☐ Yes ☐ No ☒ Not applicable
	Other Management Capabilities	
27.	Please describe any other system or network management capabilities the standard provides.	Time synchronization between devices/routers
	Quality of Service	
28.	Is data transfer bi-directional?	☒ Yes ☐ No
29.	Can data be prioritized?	☐ Yes ☐ No ☒ Not applicable
30.	What types of reliability are provided?	☐ Reliable ☐ Non-guaranteed ☐ Both ☐ Either ☒ Provided in another layer
31.	Can information be broadcast to many locations with a single transmission?	☒ Yes ☐ No ☐ Not applicable
32.	Please describe any other methods the standard uses to manage quality of service.	
	Discovery and Configuration	

Section II: Functional Description of the Standard		
33.	Can the software or firmware be upgraded remotely?	☒ Yes ☐ No ☐ Not applicable
34.	Can configuration or settings be upgraded remotely?	☒ Yes ☐ No ☐ Not applicable
35.	Can implementations announce when they have joined the system?	☒ Yes ☐ No ☐ Not applicable
36.	Can implementations electronically describe the data they provide?	☒ Yes ☐ No ☐ Not applicable
	System Evolution and Scalability	
37.	What factors could limit the number of places the standard could be applied?	Places where IP protocols are restricted could limit the use.
38.	What steps are required to increase the size of a system deploying this standard?	Inclusion of IPv6 would allow additional expansion of the standard's deployment but it can presently handle NAT.
39.	Is the information model separate from the transport method?	☒ Yes ☐ No
40.	Does the standard support alternate choices in the layers(s) below it?	☒ Yes ☐ No ☐ No layers below
41.	List the most common technology choices for layers implemented below this standard	IEEE 802-series standards; GPRS and other mobile-phone data carriers
42.	Does the standard support multiple technology choices in the layers above it?	☒ Yes ☐ No ☐ No layers above
43.	List the technologies or entities that would most commonly use this standard in the layer above	ANSI/CEA-709.1; CEA-600; others could also use the standard.
44.	Please describe any mechanism or plan to ensure the standard is as backward-compatible as possible with previous versions	While ANSI/CEA-852.1 is not fully backward-compatible with ANSI/CEA-852, the "Bootstrap Protocol" (RFC 951) allows for newer 852.1 devices and routers to negotiate down to use 852 methods.
45.	Please describe how the design of this standard permits it to be used together with older or legacy technologies	"Bootstrap Protocol" (RFC 951) as noted above.
46.	Please describe how the design of this standard permits it to co-exist on the same network or in the same geographic area with similar technologies, and give examples	Because it uses IP protocols, TCP or UDP, and can use any desired ports, it can be deployed in publically accessible networks.
47.	**Electromechanical**	

M. Architectural Principles

Please describe how this standard may apply any of these principles:

1.	Symmetry – facilitates bi-directional flow of energy and information	Yes.
2.	Transparency – supports a transparent and auditable chain of transactions	Limited only to IP configurations.
3.	Composition – facilitates the building of complex interfaces from simpler ones	Yes.

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4.	Loose coupling – can support bilateral and multilateral transactions without elaborate pre-arrangement	Limited only to IP configurations.
5.	Shallow integration – does not require detailed mutual information to interact with other components	Limited only to IP configurations.
6.	Please list any other architectural models, reference architectures or frameworks this standard was designed to be compliant with, e.g. W3C, IEC TC57, OSI and how it fits those models	Designed to be compliant to IP protocol and TCP and UDP for transport of tunneled information.