STANDARDS AND INFORMATION DOCUMENTS

AES70-1-2018
(Rev. AES70-1-2015)

AES standard for audio applications of networks - Open Control Architecture - Part 1: Framework

AUDIO ENGINEERING SOCIETY, INC.
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AES standard for audio applications of networks - Open Control Architecture - Part 1: Framework

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Abstract

AES70 defines a scalable control-protocol architecture for professional media networks. AES70 addresses device control and monitoring only; it does not define standards for streaming media transport. However, the Open Control Architecture (AES70) is intended to cooperate with various media transport architectures.

AES70 is divided into a number of separate parts. This Part 1 describes the models and mechanisms of the AES70 Open Control Architecture. These models and mechanisms together form the AES70 Framework. This document should be read together with Part 2, Class Structure and Part 3, TCP/IP communications protocol.

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Foreword

This foreword is not part of this document, AES70, *AES standard for audio applications of networks - Open Control Architecture - Part 1: Framework*.

This document is a member of the three-document set that defines AES70, the Open Control Architecture (OCA). AES70-11 defines the architectural framework for AES70. Other parts define the control repertoire and the specific protocols used.

The development project for this standard was originally proposed by the Open Control Architecture Alliance (OCA Alliance) and initiated in October 2012 as project X210 to be developed in task group SC-02-12-L. The OCA Alliance also contributed to the task-group working draft and, as a result, there are various references to "OCA" in the protocol, in order to maintain compatibility with implementations already in the field.

The members of the writing group that developed this document in draft are: J. Berryman, H. Hamamatsu, T. Head, S. Jones, M. Lave, N. O'Neill, M. Renz, M. Smaak, G. van Beuningen, S. van Tienen, E. Wetzell.

J. Berryman led the task group.

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2015-11-12

Foreword to the 2018 edition

The members of the writing group that drafted this version of the document are: F. Bergholtz, J. Berryman, A. Gödeke, J. Grant, A. Kuzub, M. Lave, G. Linis, S. Price, M. Renz, A. Rosen, S. Scott, G. Shay, P. Stevens, P. Treleaven, S. van Tienen, and E. Wetzell. As well, the writing group was materially assisted by contributions from T. de Brouwer, B. Escalante, S. Jones, M. Smaak, and M. Versteeg.

J. Berryman led the writing group.

Morten Lave
Chair, working group SC-02-12
2018-12-20

Note on normative language

In AES standards documents, sentences containing the word "shall" are requirements for compliance with the document. Sentences containing the verb "should" are strong suggestions (recommendations). Sentences giving permission use the verb "may". Sentences expressing a possibility use the verb "can".

AES standard for Audio applications of networks - Open control architecture - Part 1: Framework

0. Introduction

0.1. General

This document describes the models and mechanisms of the AES70 Open Control Architecture (AES70) for the control and monitoring of media networks. These models and mechanisms together form the AES70 Framework.

AES70 is for system control and monitoring only, and may be integrated with any streaming program transport protocol scheme, as long as the underlying communication network is capable of carrying AES70 control and monitoring traffic.

AES70 does not provide a complete device implementation model. AES70 models the control and monitoring functions of a device, not its entire signal path. If a particular device element has no remotely controllable features, then that element need not be represented in the device's AES70 protocol interface.

0.2. Architectural goals and constraints

AES70 is based upon the following features and requirements:

Functionality

AES70 supports the following functions:

1. Discover the AES70 devices that are connected to the network.
2. Define and undefine media stream paths between devices.
3. Control operating and configuration parameters of an AES70 device.
4. Monitor operating and configuration parameters of an AES70 device.
5. For devices with reconfigurable signal processing and/or control capabilities, define and manage configuration parameters.
6. Upgrade software and firmware of controlled devices. Include features for fail-safe upgrades.

Security

AES70 supports the following security measures for control and monitoring data:

1. Entity authentication
2. Prevention of eavesdropping
3. Integrity protection
4. Freshness - *"Freshness" in this context means certainty that replayed messages in a replay attack on a protocol will be detected as such.*

Scalability

AES70 supports networks with up to at least 10,000 application devices. AES70 imposes minimal restriction on the physical distribution of application devices.

Availability

AES70 supports high availability by offering:

1. Device supervision of AES70 devices.
2. Supervision of network connections to AES70 devices.
3. Efficient network re-initialization following errors and configuration changes.

Robustness

AES70 supports robustness by offering:

1. A mechanism for operation confirmation.
2. A mechanism for handling loss of control data.
3. A mechanism for handling device failure of AES70 devices.
4. Recommendations on network robustness mechanisms that network implementers may use.

Safety compliance

AES70 allows implementations of media networks that conform to life-safety emergency standards.

Compatibility

As AES70 evolves, it will maximize compatibility among its different versions. A controller based on one version of AES70 operates with a device based on another version of AES70 in the following manner:

1. For a device based on an older version of AES70, the controller which is based on a newer version will function as if it were based on the same version of AES70 as the device.

2. For a device based on a newer version of AES70, the controller which is based on an older version will be able to control and monitor all the functions of the device defined in the controller's version of AES70, and will not interfere with functions defined only in the device's version of AES70.

Analyzability

AES70 defines diagnostic functions that allow access to the following information:

1. Version information of all components, hardware and software, of each device
2. Network parameters of a device - for example, MAC address, IP address
3. Device status (including status of devices' network interfaces)
4. Media stream parameters (for each active receive and/or transmit media stream of a device)

0.3. Document conventions

In what follows, the phrase "AES70 supports '*x*' ", where '*x*' is some function or feature should be interpreted to mean that AES70 defines one or more mechanisms by which a device will be able to implement feature '*x*' in an AES70-compliant manner.

Numerical values are decimal unless otherwise stated.

A **`Courier`** typeface is used to identify **`programmatic names`** to distinguish them from regular text.

Where a term is first introduced in body text, the term will be set in an *italic* typeface.

When normative references are cited in the text they are [enclosed in brackets].

1. Scope

AES70 defines a scalable control-protocol architecture for the control and monitoring of professional media networks. AES70 addresses device control and monitoring only; it does not define standards for transporting streaming media or for describing media content.

This Part 1 describes the models and mechanisms of the AES70 Open Control Architecture. These models and mechanisms together form the AES70 Framework. This document should be read in conjunction with AES70-2: Class Structure, and AES70-3: OCP.1 Protocol for IP Networks.

2. Normative References

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

AES17. *AES standard method for digital audio engineering - Measurement of digital audio equipment*, Audio Engineering Society, New York, NY., US.

AES70-2. *AES standard for audio applications of Networks - Open Control Architecture - Part 2: Class structure*, Audio Engineering Society, New York, NY., US.

AES70-3. *AES standard for audio applications of Networks - Open Control Architecture - Part 3: Protocol for TCP/IP Networks*, Audio Engineering Society, New York, NY., US.

IEEE-1588. *1588-2008 - IEEE Standard for a Precision Clock Synchronization Protocol for Networked Measurement and Control Systems*, Institute of Electrical and Electronic Engineers (IEEE), Piscataway, New Jersey, US.

ISO-9787. *ISO 9787:2013 - Robots and robotic devices -- Coordinate systems and motion nomenclatures.* International Standards Organization (ISO), Geneva, Switzerland.

ISO/IEC-10646-1. *Information technology - Universal Multiple-Octet Coded Character Set (UCS) - Part 1: Architecture and basic multilingual plane*. International Standards Organization (ISO), Geneva, Switzerland.

ITU-1(8). *ITU-R BS.2076.1, Audio Definition Model*; chapter 8, *Coordinate System*. International Telecommunications Union, Geneva, Switzerland, 2017 June.