Control Plane Comparison

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Governance

Category	Ember+	AES70	Catena	NMOS IS-x Suite	Comments
References	[2], [3]	[1]	[4] [5]	[6]	
Standard?	No	Yes, AES	Yes, SMPTE ST-2138-x, in progress	No	
Industry Sponsors	Lawo	AES	IABM, Control Plane WG, SMPTE	AMWA	
Open Source	Yes	Several, but many not active ocac – C99	Yes	Yes Implementations available by Sony, Nvidia	AES70 has more repos – Paul Treleaven has better info
Public SDK	Yes	Yes – need reference	Yes	No	
Languages	C++	C	C++, Java	JSON-schema	
License	Boost Software License V1.1	ocac - MIT	BSD 3-Clause	Apache 2	

Technical

Category	Ember+	AES70	Catena	NMOS IS-x Suite	Comments
Schemas for Protocol Objects	Yes, Abstract Syntax Notation	Unknown	Yes, protobuf IDL and JSON-schema	Yes, JSON-schema	
Serialization / object encoding	Yes, EmBER (embedded basic encoding rules), binary format	Yes, binary (OC1?). JSON and XML planned	Yes, binary and JSON	JSON	
Defines Network Message Formatting	Yes, S101 packetization protocol	Unknown	No, deferred to connection manager. Support for gRPC and REST	Unknown	
Preferred Transport	S101	Yes	HTTPS/2 (gRPC) HTTPS/1.1 (REST)	HTTPS	
Device Partitioning	No	Unknown	Yes	Ask the experts	e.g. present a 4M/E switcher as 2 2M/E switchers
Reference sub-devices	Unknown	Yes	Yes, device models can import definitions via URL	Yes: IS-12	e.g. there's a reference 4-band eq definition that can be imported by devices wishing to have 4-band eq controls
Plug & Play	Yes	Yes	Yes	IS-12 is self-describing	i.e. clients can be "dumb" but provide reasonable GUIs

					without prior knowledge of devices they meet online
Discovery	EmBER Service Discovery_v0.2.docx	Unknown	In design – also looking at DNS-SD	Based on DNS-SD via IS-04	
Performance & Scaling		Yes – more details available from Jeff	Subscriptions to minimize traffic		
Web Client Direct Access	No (S101)	No (no JSON or XML)	gRPC: no REST: yes	Yes. IS-12 (websocket), IS-07	
Deterministic	Unknown	Yes (provisionally)	Unknown	IS-07 is time-stamped	If an operator presses a button the associated action happens within a defined and repeatable time.
Port Agility					Ability for devices to listen on configurable IP ports
Ease of integration					How long to go from zero to working device

Dependencies

Category	Ember+	AES70	Catena	NMOS IS-x Suite	Comments
Hard Cost Items					e.g. patent licenses
RAND					Reasonable and non-discriminatory

Security

Category	Ember+	AES70	Catena	NMOS IS-x Suite	Comments
Secure Comms (TLS)	No	Yes, relies on transport to provide this	Yes, relies on HTTP/1.1 or HTTP/2 to provide this	Yes, BCP-003	Confidentiality Integrity
Zero Trust	No	No	Yes, defines access scopes for monitor, operate, configure, and administer workflows. OAuth2 based	Yes, via IS-10 profile for OAuth2	Non-repudiation Fine-grained Access Control Support for Roles
Transport Redundancy	Unknown	Yes (is this -7? Ask Jeff)	No, delegated to cloud architectures such as load balancers, service mesh, proxies	Unknown	Availability
NAT Traversal					Device can reach out to establish bi-directional comms. One implementation could be an MQTT broker at a public endpoint
Registration Access Control				Yes – via IS-10 access to IS-04	

				end-points. But is it used?	
IAM Integration Support for Service accounts					Identity and Access Management
Fail open/closed					

Internationalization

Category	Ember+	AES70	Catena	NMOS IS-x Suite	Comments
Multi-language Support	No	No	Yes	Unknown	

Market Adoption & Maturity

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Publication Date	2012	2015	2025 (planned)	V1.0 2024	
Users	30 companies listed on open source site	Unknown	As an evolution of openGear protocol, there are 150 openGear Partners who could readily transition to Catena	Unknown	

Benchmarks

Category	Ember+	AES70	Catena	NMOS IS-x Suite	Comments
Embedded Host w/o Crypto Acceleration					We need to agree on a useful metric – messages / second, CPU, Memory, Network resource usage
Embedded Host with Crypto Acceleration					
Server Class Host					
Ground - Cloud					

Bibliography

[1] J. Berryman, *AES70, Open Control Architecture, Quick View,* 2024.

[2] Lawo, "Ember+ Specification," [Online]. Available: https://github.com/Lawo/ember-plus/blob/master/documentation/Ember%2B%20Documentation.pdf. [Accessed 1 July 2024].

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[4] SMPTE, "34CS-WD- ST-2138-10 Catena Model.docx," 6 November 2024. [Online]. Available: https://smpte.sharepoint.com/:w:/s/RIS-OSA-Catena/ERQy6HRqZeBJm6U2AwTX4YIBZ-OBx-3vwO3pTNO-ZPd8jQ?e=h6mP3p. [Accessed 13 November 2024].

[5] SMPTE, "34CS-WD- ST-2138-11 Catena gRPC Connection Type.docx," 11 November 2024. [Online]. Available: https://smpte.sharepoint.com/:w:/s/RIS-OSA-Catena/EQJNiPovgcpCjN2v1jwNYw8BvkKoRXzJV4zkJlroE45nuQ?e=qdAogJ. [Accessed 13 November 2024].

[6] AMWA, "AMWA IS-12 NMOS Control Protocol," [Online]. Available: https://specs.amwa.tv/is-12/. [Accessed 13 November 2024].