White Paper

Importance of SDNs, Orchestration and NMOS in Broadcast Networks

In this white paper, dB Broadcast discusses the importance of orchestration in broadcast networks. The paper is based on dB Broadcast's unique experience in designing and implementing IP solutions for broadcasting, and its work on state of the art projects for clients including Bloomberg Television and BBC Wales.

Recently there has been much talk in our industry (and especially at trade shows) about the term 'orchestration'. But what does orchestration mean, and what are the implications for the deployment of IP Video production networks?

Put simply: orchestration is the automation of the workflows and processes within a network.

To provide easier interoperability and configurability within IP networks, there has been a trend towards the use of Software Defined Networks (SDNs), which allow networks to be programmatically configured and managed. This programmatic capability is required to minimise provisioning times for reconfigured services.

Network orchestration - otherwise known as SDN orchestration - is the ability to use an SDN controller automatically to control the behaviour of the network. This is achieved by coordinating the hardware and software network elements required to support specified applications and services. This could include for example, capacity and bandwidth management, as well as congestion avoidance.

Service orchestration separates the network services from the network components, automatically configuring the network to provision specified services. Service orchestration reduces the time taken to design and deploy new services, and enables real-time service provisioning.

In IP Video networks, both service and network orchestration are important considerations. It should be remembered that one of the key advantages of an IP network, when compared with an SDI network, is that connections between devices are established logically rather than physically. In a previous White Paper, we considered how the flexibility and scalability of leaf-spine networks make them likely to become the norm in IP video applications. It is this flexibility that will allow network resources to be centralised, and to be logically reconfigured for different production applications.

SDN Controlled IP Video Network
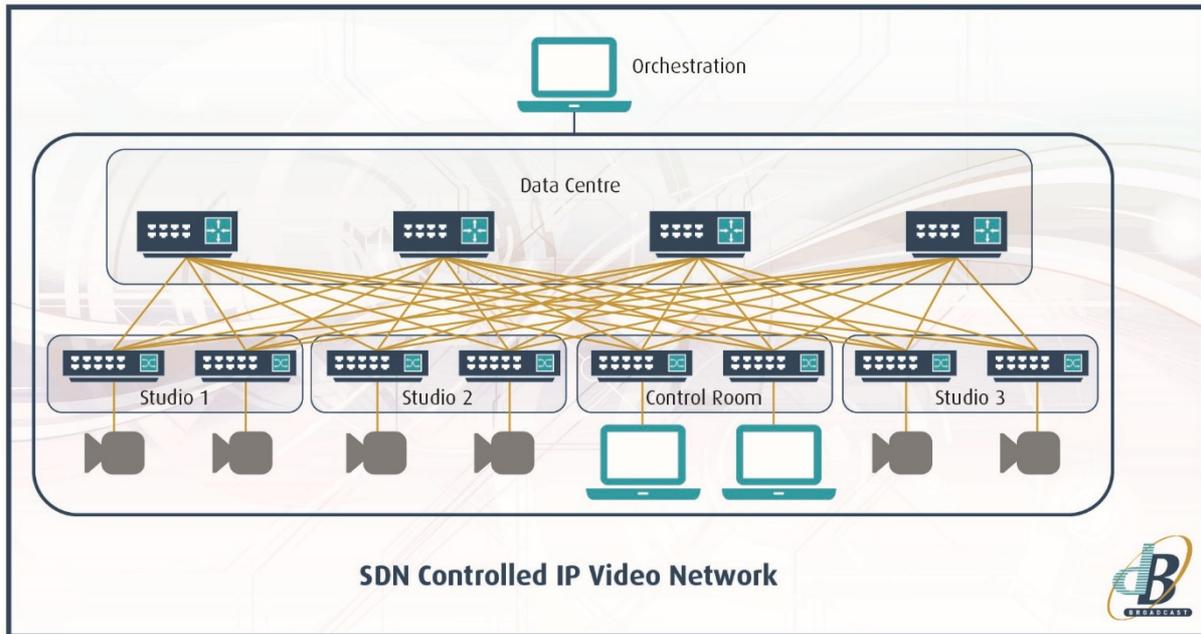
This obviously implies that different media resources will need to be connected to each other under software control in very different configurations, depending on the individual production requirements (number of cameras, microphones, other audio channels, effects etc.). It is also obvious that if these resources can be connected in such a multiplicity of ways, then software control of the network elements is equally important to ensure that sufficient network capacity is available.

To provide standardisation for the interoperable automated configuration and management of networked media flows, the Advanced Media Workflow Association (AMWA) is developing a suite of open specifications known as the Networked Media Open Specifications (NMOS). These provide an open set of APIs to support interoperability for networked media applications. Where possible, AMWA's specifications are designed to use internet friendly protocols.

NMOS consists of three Interface Specifications: IS-04, IS-05 and the future IS-06.

AMWA has already published the IS-04 specification, which offers a mechanism to automatically discover and register broadcast resources within an IP network. IS-04 uses HTTP for the registration, query and node APIs. The node API is used for 'peer-to-peer' discovery where no registry is available. All APIs are announced using DNS Service Discovery (DNS-SD).

AMWA IS-04 Discovery and Registration
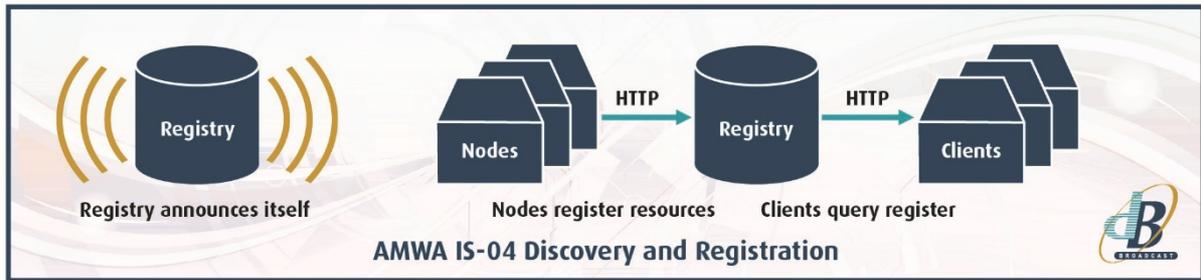
IS-04 provides the first step towards service orchestration, greatly simplifying system configuration, and is already being integrated into vendors' products.

Once broadcast devices have been discovered and registered, there needs to be a mechanism for connection management of these resources. The published IS-05 specification complements IS-04 to provide a system to manage connections between senders and receivers. These can be scheduled or ad hoc, and the specification does not mandate the use of an SDN controller, so it is possible to use both IS-04 and IS-05 with a traditional-style router control panel.

Both IS-04 and IS-05 were an important component of the IP Showcase at NAB 2018. Both specifications are designed to work with SMPTE ST 2110, but are in fact generic and can be used with other transport protocols, do not require RTP and support both multicast and unicast flows.

The final specification, IS-06 is a work in progress and is intended to provide specifications for network control. It can be considered as being a "north-bound" API for SDN controllers. The intention is to provide an API that describes the network topology, and enables reservation of bandwidth for capacity management.

In the past, SDN Control and service orchestration could only be implemented using proprietary means. The NMOS open specifications are intended to replace these proprietary equipment interfaces with non-proprietary means, making configuration, management and interoperability of multi-vendor networks much simpler.

dB Broadcast is an Associate Member of AMWA, enabling monitoring and participation in interoperability workshops to support the development of NMOS. dB has accumulated unique knowledge in designing and implementing IP solutions for broadcasting, and has systems experience with technology from several different switch manufacturers, including solutions from Arista, Cisco and Evertz.