

ALLEN & HEATH dLIVE FOR IT MANAGERS

A GUIDE TO INTEGRATING A&H PROTOCOLS IN AN IT ENVIRONMENT

More and more, pro audio devices and sound systems are being integrated with corporate IT networks. TCP/IP control of AV equipment as well as audio and video transport over Ethernet are now common place in system integration, and IT managers are becoming more aware of the associated protocols and ports, but also security risks and traffic concerns.

Cooperation between IT departments and AV integrators from the early stages of a project is essential to avoid misunderstandings and plan how the network infrastructure can adapt to AV traffic.

This white paper lists the ports, protocols and bandwidth requirements used by the Allen & Heath dLive system. It gives IT managers an overview of the control and audio traffic on a network, so they can plan for sufficient hardware and network topologies in an efficient way, and ultimately ensure smooth operation of the system.

A dLive system will present different RJ45 and EtherCon sockets to the integrator, each with a specific function and protocol, so we will examine these one by one.

1. dLive Network ports

The network ports are all Gigabit Ethernet (1000BASE-T) capable and use the following protocols:

- 1.1 AHNNet
- 1.2 External Control
- 1.3 DHCP
- 1.4 NTP
- 1.5 HTTP

1.1 AHNNet

AHNNet is a proprietary application layer network protocol with mechanisms for device discovery and sending and receiving control data.

1.1.1 Device Discovery

AHNNet has a unit discovery mechanism, which sends a UDP broadcast on Port 51320 at a rate of 1 message / second, with a maximum payload of 32 Bytes.

Unicast UDP replies are sent from a remote unit in reply to the above broadcast, with a payload of up to 16 Bytes.

Device discovery is also used by the dLive Director software and dLive MixPad / OneMix iPad apps.

Device discovery is optional, and target device details can be entered manually by IP address if UDP broadcasts are blocked by a cross subnet device separation.

1.1.2 Control Data

ALLEN&HEATH®

AHNet uses a client / server model for passing control data. TCP port 51321 is used for server-side rendezvous endpoints. An ephemeral port is requested from the host system for outbound TCP client connections. For each TCP connection a UDP unicast connectionless datagram endpoint pair is also opened.

UDP Port Numbers start at UDP 51324 on each server and enumerate upwards for each new client accepted. The maximum number of connections is 40 resulting in UDP port range 51324-> 51364 on the server. On the client side, the UDP port number is ephemeral for each connectionless endpoint.

AHNet allows 2 subtypes of packets to be send / received "NET" and "UTIL", both of which have fixed header sizes with variable length data payloads.

NET packets have a static header overhead of 12 bytes per message, UTIL messages have a static header overhead of 4 bytes per message. Data payloads are variable between 0->40,000 bytes from the application layer.

A quiescent system will have no data flow on the TCP sockets.

The following UDP data payload rates (excluding static header and protocol overheads) apply for the following endpoint types and are per client / server pair.

Server	Client	UDP Data (App Layer) KB/s
MixRack	Director software	334
MixRack	Surface	334
MixRack	MixPad app	168
MixRack	IP Controller	0.78

Combined theoretical maximum transient network throughput across all connections

from a MixRack is approximately 380Mbit/s before becoming CPU bound.

1.2 External Control

TCP Rendezvous port 51325 is used for accepting external / non AHNet control messages often sent by DAWs or similar 3rd party applications. These are formatted as TCP encapsulated MIDI (hex) messages. Flow rates are dependent on client configuration, and limited by sliding window protocol from the server.

The specification of the TCP control protocol is available on the Allen & Heath website:

<https://www.allen-heath.com/dlive-home/dlive-documents/>

1.3 DHCP

Both MixRack and Surfaces can act as DHCP clients and be configured to receive IP Address allocation from a 3rd party DHCP servers as per RFC 2131.

1.4 NTP

Each MixRack acts as a local NTP server with onboard RTC. Each Surface will poll its MixRack Server using RFC 5905 Version 4 on a 5 minutes poll cycle via UDP Port 123.

1.5 HTTP

Each MixRack has an HTTP server listening on TCP Port 80 to facilitate Firmware Update.

ALLEN&HEATH®

2. dLive DX / ME ports

DX Link / ME are a 802.3 IEEE Layer 2 protocol for point to point audio transport using 100BASE-TX Fast Ethernet.

In terms of throughput each point to point link uses 99.7% of the available 100BASE-TX bandwidth.

3. dLive gigaACE ports

gigaACE is a Gigabit Ethernet point-to-point audio connection (1000BASE-T, IEEE 802.3ab), Layer 2 compliant.

gigaACE differs from DX / ME in that 250Mbits of the GbE pipe are reserved for encapsulated bridged network traffic, therefore Layer 3 / AHNet etc. can be tunnelled through gigaACE mitigating the need for separate network interconnectivity.

Bandwidth usage is 930Mbits/s in total including audio and encapsulated control data.

VLANs

In corporate environments and larger facilities, it is typical to segregate the network into Virtual Local Area Networks (VLANs). VLANs group ports together on a switch to isolate a system while still making use of the same Ethernet infrastructure.

This is particularly useful for AV systems: any problem on the AV VLAN does not affect other corporate services, and vice-versa; network administration is simplified, with clear responsibilities for each VLAN and without the need for advanced traffic management (QoS, Diffserv etc); security is improved by separation of data.

DX / ME traffic can be sent over a VLAN providing the VLAN is fully transparent to Layer 2 traffic. This means:

- Only one DX Link or ME point to point link is present on each VLAN.
- No other traffic is present on this VLAN.
- All layer 2.5 and higher protocols are disabled on this VLAN.
- Full 100Mbps bandwidth is available on this VLAN.

Ports should be forced to 100Mbps (Fast Ethernet) – Auto negotiation is known to be problematic.

Similarly, gigaACE traffic can be sent over a VLAN providing:

- Only one gigaACE point to point link is present on each VLAN.
- No other traffic is present on this VLAN.
- All layer 2.5 and higher protocols are disabled on this VLAN.
- Full Gigabit bandwidth is available on this VLAN.

Ports should be forced to Gigabit Ethernet – Auto negotiation is known to be problematic.

Note that sending gigaACE over a tagged VLAN requires dLive firmware V1.8 or higher.

Security

Converged networks can expose AV devices and generate security risks for the corporate domain. The following extract is taken from the Avixa 'Recommended Practices for Security in Networked AV Systems':

7.1.3 Establish Multiple User Roles

ALLEN&HEATH®

Some AV devices allow different modes of operation, providing greater capabilities/rights to administrators than to users. User roles should be set up so that the equipment is operated in a user mode that grants only the permissions required for the system's operation. By limiting the rights of general users, organizations can prevent them from changing system operations or other important elements.

A dLive system is fully compliant to these guidelines. Up to 10 User Profiles including an Administrator can be set to restrict operator access and protect selected

functions. The Admin user has access to all functions and can set permissions and allocate passwords if required for the other users. The password, if one is set, is required any time a User logs in, a User is changed, or the dLive Surface is locked / unlocked.

The user profiles and permissions are abided by the dLive Director software and dLive MixPad app too, facilitating a BYOD approach to AV control without additional risks.

For further information, application guides, and recommended products please visit <https://www.allen-heath.com/installation/>

Don't hesitate to contact our Install team at installedsolutions@allen-heath.com if you need assistance on which products to specify or if you have questions about an application.

ALLEN&HEATH®