



Integrated Conferencing Platform™ (ICP)

Voice-Over-IP Overview

Rev. 1.04

Technology Document



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1. About the Arel ICP Platform

Arel ICP™ (Integrated Conferencing Platform) is an advanced platform that combines the critical aspects of verbal and visual communication – video and two-way audio - with rich content, collaboration, application sharing and live interaction. The communications platform reaches and connects large numbers of people in real-time through any combination of satellite, video conferencing and/or internet/intranet networks.

Arel's universal conferencing enterprise software solution is an integrated suite of applications for interactive voice, video and data web communication that changes the way people work by providing them with enhanced communication tools. These tools make meetings more effective and facilitate collaboration for key business processes such as **corporate and marketing communications**, **distance learning**, product development, customer relationship management, and supply chain management. Using Arel Spotlight applications, geographically dispersed users can work together in group meetings, attend webinars and panel discussions, participate in training courses, and have one-on-one meetings with customers or colleagues, from virtually anywhere using desktop systems, laptops, keypads or even handheld wireless devices via Internet, Intranet or PSTN connections.

2. System Components and Architecture

Arel Spotlight™ is a suite of client-server, real-time applications, architected for scalability, reliability and performance, while optimizing the use of bandwidth. The applications are based on Microsoft .NET technologies and uses components written in C++.

Arel Spotlight™ offers the following architectural features:

- Web-based, client-server, real-time application
- 3-tier distributed server architecture
- Highly scalable and reliable
- Proxy server and firewall friendly
- Multiple bandwidth support
- Designed for rich media and video-enabled delivery
- Multiple network configurations – satellite, video conferencing and terrestrial Internet/Intranet
- Hybrid solution of multiple end-user units such as interactive response units (keypads), PCs and PDAs used simultaneously

3. Audio and Video

Arel is highly focused on providing rich media and video-oriented communications, giving participants the best possible experience the network connection allows. Arel supports several different video distribution sub-systems. Solutions range from near-broadcast quality for satellite and broadband multicast networks, to mid-quality unicast or multicast video for intranets and fast internet users, and all the way to internet-type video, or audio only for dial-up users. All these video types may be provided to different users participating in the same session, based on available bandwidth and network type.

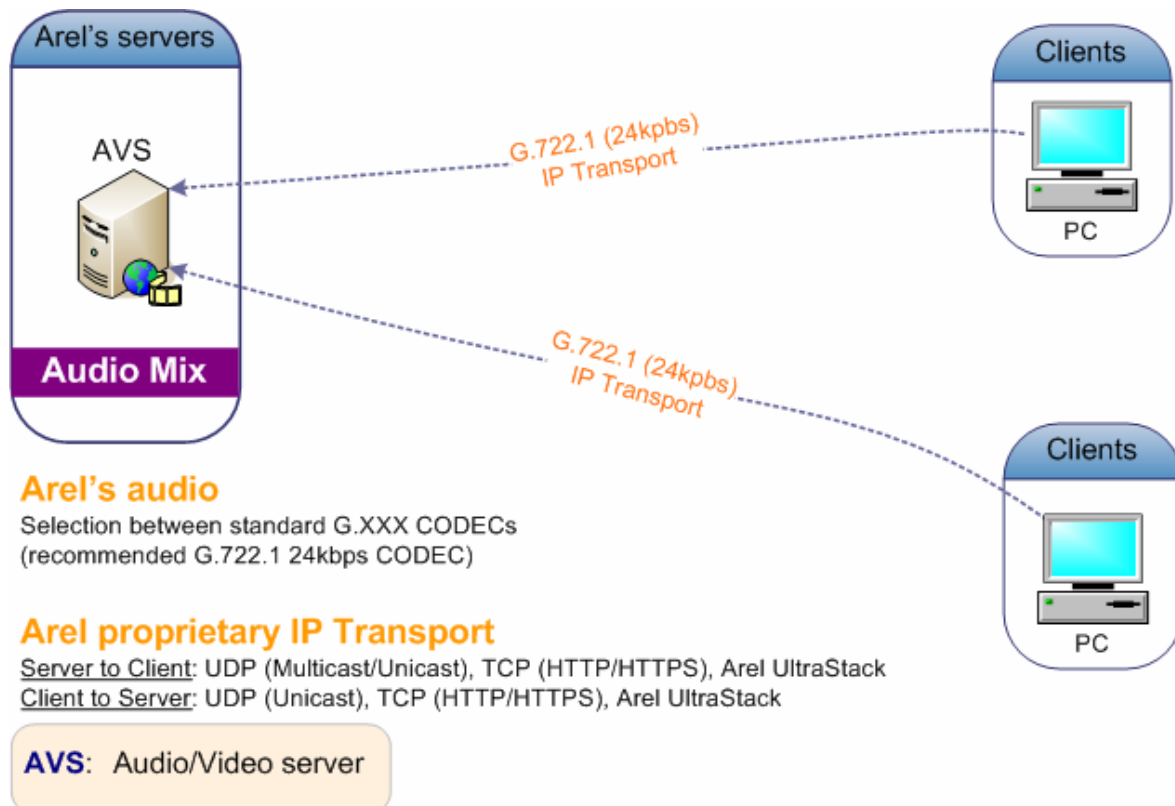
Arel's audio characteristics:

- Support for multiple audio CODECs (G.711, G.722.1, G.729, and others) for various audio qualities in different bandwidth ranges between 4kbps and 64kbps.
- Support for wideband audio (7khz) eliminates 'meeting fatigue' during live sessions and provides a "near FM" quality that is significantly better than standard 3.4Khz telephony audio, in addition the wideband audio is closer to natural conversation so makes understanding easier and also makes it easier to identify the current speaker.
- The presenter/moderator can switch between various supported audio CODECS during a live session (the audio CODEC controls the quality and the bandwidth of the audio portion of the session).
- Silence detection mechanism to use lower effective bandwidth by detecting silence periods and not transmitting audio during these periods.
- An echo cancellation technology reduces the echo that is generated when the audio from the speakers is being picked up by the microphone and re-transmitted. As a result users can attend sessions using all types of microphones and speakers without experiencing an acoustic echo.
- Users can choose to join sessions using a regular phone (PSTN) or VoIP during the same session.
- Network conditions may fluctuate during a live session, users can dynamically switch between VoIP (Voice-Over-IP) and PSTN.

4. Transport layer

Arel uses a proprietary transport method to transmit standard based audio (based on G.7XX CODECS such as G.722.1), and Arel's proprietary audio can work on either UDP (Multicast or Unicast), TCP (HTTP and optionally HTTPS), or Arel's proprietary UltraStack that enables UTP performance over TCP networks.

The system can be configured to send audio over any port. (Arel recommends the use of port 443).



5. Firewalls & Proxies

In the heart of the adaptive network technology is Arel's UltraStack™ technology. In theory, transmitting audio and video for conferencing over IP networks can be done either with TCP or UDP transport protocols.

TCP is a "reliable protocol" and is better for transmitting alphanumeric data since it corrects itself when data is lost. This protocol is used to guarantee sequenced, error-free transmission, but **causes delays and reduced throughput** that causes annoyance to the users, especially with audio and video.

By contrast UDP does not check for data loss. This makes it ideal for transmitting audio and video since it creates only minimal latency related to error correction. But in today's networking environment, due to growing security risks, IT departments tend to open only TCP port 80 (HTTP) and 443 (HTTPS) making it impossible to use UDP for communicating with clients outside of the corporate network. In addition, Proxy servers do not support UDP as well as some available and widely installed routers (usually older routers).

Optimizing network performance solves the above problem and offers UDP performance over TCP-enabled networks. Arel's UltraStack™ enables audio, video and data communication using TCP ports and communication providing UDP performance.

5.1. Automatic protocol selection

Several transport protocols are used for conferencing, TCP, UDP and Arel's UltraStack™. Each protocol uses packets to transmit the data. Each packet has a 'header' that identifies its content.

	UDP	TCP	Arel UltraStack™
TCP port 80 and 443 Friendly	X	✓	✓
Minimal latency	✓	X	✓

TCP was designed as a "reliable protocol" for transmitting alphanumeric data and it corrects itself when data is lost by retransmitting the undelivered packets. This protocol is used to guarantee sequenced, error-free transmission, but causes delays and reduced throughput that cause annoyance to users, especially with audio and video.

UDP (User Datagram Protocol) within the IP stack is, by contrast, an "unreliable protocol" in which data can be lost without error correction in preference to maintaining the flow.

The delay that is caused by the TCP acknowledgment mechanism and makes it "reliable" also makes it less favorable for real-time audio and video communication. Although the use of UDP is generally preferred to the use of TCP, in a situation where a large percentage of packets are lost, the video and audio become "choppy" and render the video unusable. In that case the user is better suited with a latency created by

the “reliable” TCP protocol than the “choppy” video which is the result of the UDP packet loss. Since UltraStack shares the same nature of UDP with regard to the packet behavior, UltraStack may encounter the same problems in nature and therefore is addressed with a similar methodology. ICP will drop the use of UDP or UltraStack and use another protocol instead in the following cases:

- When the network does not support UDP, Arel’s ICP will use UltraStack protocol instead.
- When UDP or UltraStack lose packets during video transmission, the end result is a “choppy” video or audio. This is determined by online diagnostic measuring of the percentage of packets lost against a parameter that defines the threshold. In the case of UDP it will be dropped and UltraStack will be used. In the case of UltraStack it will be dropped and TCP will be used.

5.2. Traversing firewalls

Corporate firewalls usually enable outbound communication using TCP port 80 (HTTP) and TCP port 443 (HTTPS) making it impossible to use standard video protocols such as H.323. Arel’s proprietary audio/video communication is based on HTTP like packets that can be configured to work with any port (usually port 80 or port 443) enabling it to work through the corporate firewall.

5.3. Traversing proxy servers

A Proxy Server acts as an intermediary server that makes network requests on behalf of internal users, so that organizations can ensure security, control and caching services. Organizations typically use a proxy server to reduce network traffic and user wait times since the proxy server caches frequently accessed documents automatically and requests web pages from the source only when that source has been updated. Proxy servers may generate difficulties for applications communicating with external clients or servers that reside on the internet.

Arel’s platform supports the ability to traverse proxy servers and will seamlessly work through most proxy servers in the market. In most cases Arel’s software client will automatically detect the proxy configuration. The supported proxy types are: HTTP Proxy, SOCKS version 4 and SOCKS version 5.