EEG's iCap
Modernize workflow with IP-based closed captioning.

BY PHILIP MCLAUGHLIN

In 2007, EEG introduced iCap, an IP-based, closed-captioning software system that runs on the company's HD480 hardware encoder. The system solves numerous shortcomings associated with previous modem-based real-time captioning models. These problems include poor audio quality resulting in lower captioning accuracy, inflexibility in large system configurations, difficulty in monitoring and troubleshooting, and significant security vulnerabilities. In addition to addressing these limitations of previous-generation systems, it also offers a host of new features for broadcasters and the captioning agencies they work with.

Intuitive GUI

iCap uses an intuitive GUI to address the common administrative requirements of captioners, such as connection to multiple encoder nets and handoffs between live captioners. For broadcasters, this results in uninterrupted data and less lost time spent on troubleshooting.

The system delivers securely encrypted, high-quality streaming audio over an IP link, which translates to improved captioning services for viewers. It also eliminates the need for external audio couplers, which deliver much lower quality audio and consume an additional telephone line. Also no longer necessary are captioners viewing satellite downlinks, which can result in high caption latency due to compression delays. If broadcasters have multiple encoders, they won't need a separate phone line for each one. They simply connect each phone encoder to a local Ethernet that shares an outside Internet connection.

The block diagram shown in Figure 1 illustrates the signal flow of the iCap system. The caption encoders from the broadcast plant and the captioners, from their work site, both connect to a centrally located server that provides identity authentication and a secure encryption key for data transfer. The authenticated IP connection carries program audio and live caption monitoring to the captioner. Then it carries caption data back to the encoder. Customized routing for multi-encoder jobs, backup encoders and other configurations can be setup through a password-protected interactive Web page on the server.

Superior audio

Improved audio performance is a key feature of the new system. The combination of software and HD480 hardware transports audio sampled at a rate of 16kHz, compressed with a highly efficient codec specifically designed for voice applications. The resulting sound quality is a significant improvement over telephone-quality audio, which is band-limited to about 3.3kHz.

The audio data is transported over a dynamically optimized IP stream, which results in point-to-point latencies as low as 150ms compared with the 500ms typical of many streaming applications, and the three to four seconds of latency that is common on a digitally compressed satellite downlink.

iCap dynamically reaches the lowest possible latency for a given network connection by maintaining strict real-time transport, meaning it does not fall behind over time by attempting to retransmit lost packets. Instead, the system uses a special audio algorithm to conceal lost packets, while the exact latency is independently optimized at each client based on packet loss history. Each user's software automatically detects the minimum amount of buffering necessary to preserve acceptable audio quality on the current network connection. The latency adjusts accordingly, though it will not attempt to exceed the limit for easy-to-read,
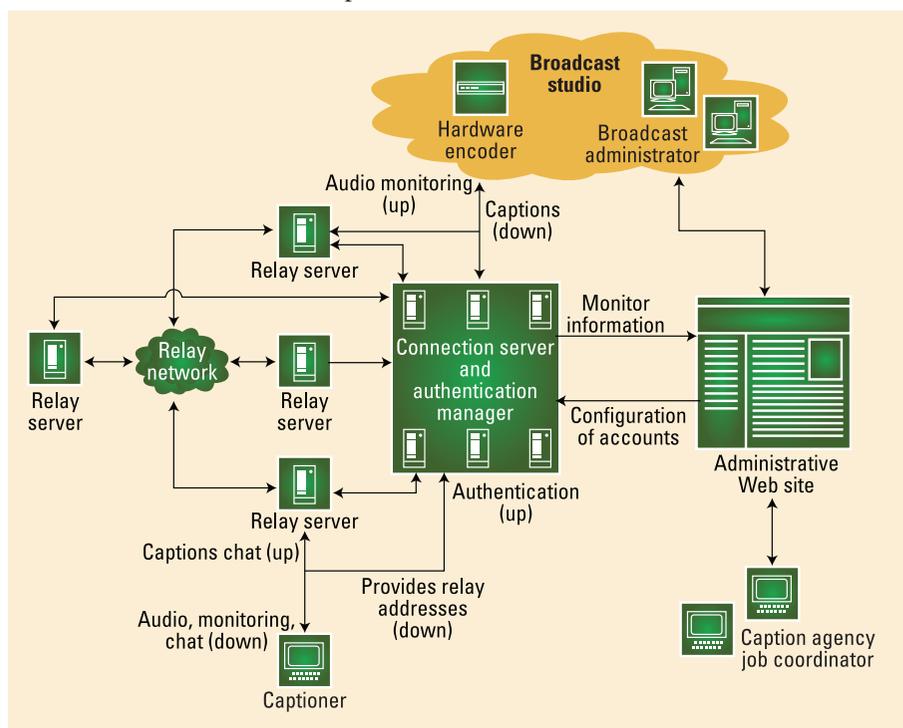

Figure 1. Shown here is the signal flow of iCap.

real-time captioning, which is approximately one-half of a second.

Increased security

In the dial-up model, anyone can dial into a closed-caption encoder simply by knowing the phone number and a few commands. This leaves it vulnerable to on-air hacking, a public security breach that has happened in the past. iCap eliminates this vulnerability, using advanced cryptographic algorithms that require authentications and password-protected user log-ins, all of which are protected on the server via 256-bit SSL encryption. Streaming program audio is also encrypted, with a separate key, removing the risk of unauthorized eavesdropping and/or recording.

The system is designed to minimize the risks broadcasters face in connecting their on-air equipment to the outside Internet. It doesn't require broadcasters (or captioners) to leave their computers or networks open to unknown/nontrusted remote connections. Broadcasters only need to allow the hardware encoder to dial out of the building to the fixed iCap server address and then accept data back from the same server, on the same port it dialed out of. No unsolicited data, or data from other sources, is accepted. This type of setup is safe against almost all types of unauthorized use and is easily configurable on most commercial firewall products.

Conclusion

Designed with digital/HD plants in mind, iCap improves communications, security and administrative issues at practically every level. These features help improve the viewer experience and make life markedly easier for broadcasters without an increase in costs. **BE**

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