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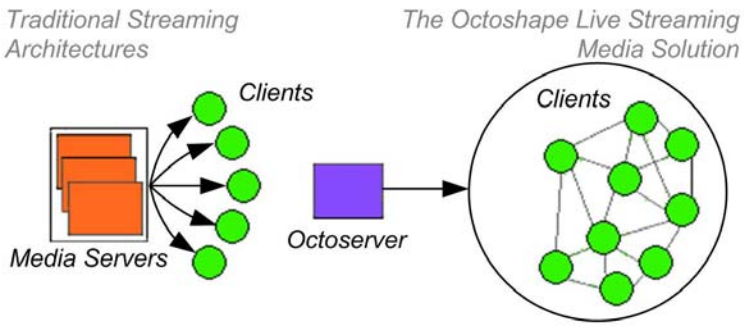
GRIDCASTING

Many radio broadcasters are making their content available on the Internet as a "live stream." The actual number of listeners who can be reached using this stream is limited since, by and large, the Internet is a "point-to-point" channel (unlike over-the-air broadcast which is a point-to-multipoint channel). Presently, the two dominant configurations for Internet streams are "unicasting" where each listener requires an individual connection to the broadcaster's stream server, and "multicasting" which makes better use of the broadcaster's server bandwidth but requires the presence of "multicast servers" distributed throughout the Internet.

A new concept in Internet streaming has been developed by a Danish company called Octoshape (Copenhagen, Denmark, www.octoshape.com). Called *Gridcasting*, Octoshape's streaming technology is modeled after the popular "peer-to-peer" (P2P) file sharing networks such as BitTorrent. Here's how it works:



- The audio (or video) stream is broken down into a large number of (lower rate) data streams such that none of the data streams are identical. For example, a 400 kbps video stream is broken down into twelve (different) 100 kbps data streams;
- These streams are sent out from the Octoserver (see figure) and propagate among the various clients that are "signed on" to watch (or listen to) the stream. Each client needs to be running the Octoshape plug-in, which is compatible with a variety of browsers (including Internet Explorer and Mozilla Firefox) and media players (including Windows Media Player, RealPlayer, and WinAmp). As these signals move among clients, information about who is signed on is sent as metadata along with the data streams;
- As long as a client is receiving any four (in this example) of the 12 different data streams, these four streams can be used to reconstruct the original live stream.

According to Octoshape, some of the advantages this Gridcasting technology has over unicasting and multicasting include the following:

- **Avoiding bottleneck problems** – if the connection to a sender gets congested, the user will exchange it with one from its standby list. Since all users continually monitor connections involving themselves, bottleneck and congestion problems on the Internet are avoided;
- **Stable connection** – each end user maintains a standby list of end users, and continually probes/asks the users from his standby list to be sure that they are ready to take over if one of the current senders stops sending or gets congested;
- **Security** – Octoshape has taken a number of steps to make their service secure: the plug-in runs in a secure "sandbox" and there are automatic updates, encryption etc. Furthermore, only communication verified by a central server is allowed. This last feature also makes it possible for the broadcaster to fully control who should and who should not receive the signal.

Currently, more than 20 high quality (128 – 192 kbps) radio streams are now available via Octoshape's live streaming technology (go to http://octoshape.com/play/play.asp).

In association with the European Broadcasting Union (EBU), Octoshape was recently the first P2P company to broadcast a 5.1 multichannel audio stream. In a test setup, the opening concert of Prix Europa (European broadcasting award ceremony) was streamed in the high quality 5.1 channel AAC format at 160 kbps. This test was recently highlighted in the October 2006 edition of the journal *EBU Technical Review*, in an article entitled "*Prix Europa – results of the 2006 media streaming trial*." As explained in the article, there were five steps involved in going from the recording of the live audio to the streaming of the Octoshape data streams:

- Generation of multichannel audio at the RBB radio building in Berlin and encoding it in APTX format;
- Conveying the multichannel APTX signal from Berlin to Geneva. This was done in two hops. The first hop was an E1 connection via ARD Hybnet from Berlin to ARD Stern in Frankfurt. The second hop was to use the Eurovision Fibre Optic Network (FiNE) from Frankfurt to the Eurovision premises in Geneva;
- Decoding of the multichannel APTX signal and converting it into three pairs of AES/EBU discrete digital signals in Geneva;
- Real-time encoding of the AES/EBU channels into HE AAC at 160 kbps and sending this to a Shoutcast stream server;
- Sending this signal to Octoshape in Copenhagen and distributing the signal across the Internet using their P2P Gridcasting system.

Users were then able to play these AAC streams by using a WinAmp media player on their PC.

For the full copy of the EBU Technical Review article on the Prix Europa concert stream, go to the EBU Web page at www.ebu.ch/en/technical/trev/trev_308-prix_europa.pdf. An article on Gridcasting, also published in the EBU Technical Review, is at www.octoshape.com/press/pdf/papers/0507ebu.pdf. Another article about Gridcasting, presented at the 2006 IBC conference, is available at www.octoshape.com/press/pdf/papers/IBC_paper.pdf.