Dedicated H.264/MPEG4 intra 4x4 encoder for network video processing

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Over the past few years, the internet has changed significantly to offer more than WWW, email and simple file transfers, "classic" services let's say. The internet now combines all common communication services, ranging from email, radio broadcasts, phone calls to teleworking, gaming, video exchanging and even HD video broadcasting (IPTV) and tele-conferencing into a single, massive IP-network. The video aspect generates so much traffic, it has become one of the major motivations for research to keep pushing the boundaries further and further, and provide ever-increasing bit rates to the bandwidth-hungry users.

As the internet has evolved beyond anyone's expectations, not all arising requirements can be met by merely offering increased bit rates (physical layer) and changes on higher layers are required, such as e.g Quality of Service (QoS). Video transmission remains particularly challenging and demands very high compression to result in manageable bit-rates.

Combining high compression with a high quality of experience requires complex encoding/decoding algorithms (CODEC), usually H.264/MPEG4 in TV over internet (IPTV). Hence, IPTV users need a Set-Top Box (STB) to decode the incoming bit-stream and to signal the user's wishes to the provider. As technology matures, users expect more flexibility and so, over time more functionality (e.g. Picture-in-Picture) is implemented in the STB's. This increases cost and power dissipation, requires more updates and decreases reliability. A more economic and future-proof solution consists of performing video-operations in the network itself, allowing to share dedicated, high-end hardware over many users.

As video operations on H.264 compressed streams are nearly impossible, research to develop a dedicated scalable hardware architecture allowing to decode/encode many video-streams in parallel is a first step in this direction. Due to the asymmetric character of the CODEC, the encoding process is far more challenging than the decoder process and imposes a tremendous computational complexity. Research has led to the development of an intra frame encoder which can encode 32 HD video streams simultaneously in real-time.