WHITE PAPER

Agility in 3 Dimensions: Versatility – Scalability - Flexibility

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"The only constant is change", *Heraclitus of Ephesus (535 BC - 475 BC)*

Introduction

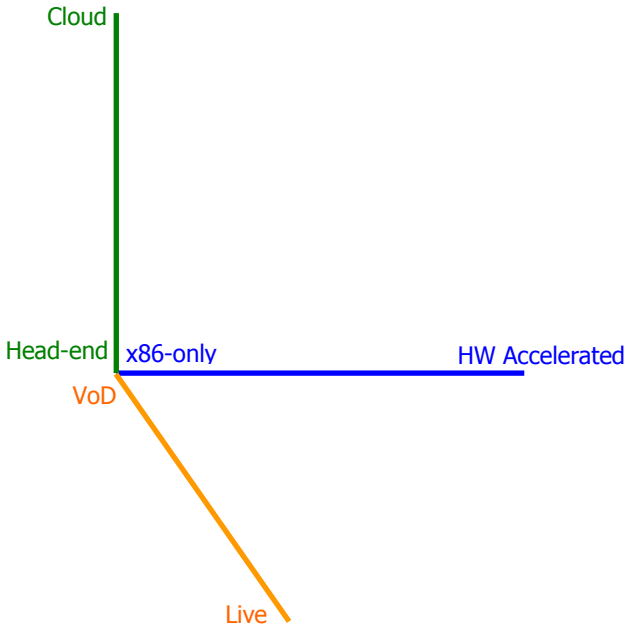
One of the paramount factors of the success of an organization is its ability to adapt to new market conditions, whether those are driver by technological advancements or are dictated by customer and/or competitive forces.

In the video delivery landscape, this is even more critical as both technology and customer needs evolve rapidly and constantly:

- Customer expectations: instant gratification, content mobility, quality of experience, etc
- Market directives: video delivery standards, stricter SLAs, unpredictable growth patterns, unified/end-to-end monitoring, etc
- Competitive forces: deployment life-cycle, OPEX and CAPEX footprints, project turnaround time, quality of service, etc

Operators that demonstrate agility within this ever-changing landscape, can quickly obtain (and retain) a leading role in their respective segments in terms of both market share and financial bottom line.

This white-paper focuses in the encoding/transcoding aspect of video delivery and attempts to position agility in a 3-dimensional space, along the axis of:



- **Versatility**: Live/Linear and VoD workflows
- **Scalability**: x86 and hardware-based acceleration
- **Flexibility**: Head-end and Cloud deployment

These axes represent fundamental questions that operators constantly have to evaluate and position their offerings on.

Versatility:
Live and VoD workflows

Given the constantly-evolving nature of the business, operators have to dynamically adjust their product offering (and packaging) across multiple form factors and outlets. A typical product mix of Live and VoD services require continuous adjustment across diverse audience segments, geographies and seasons. As VoD and Live/Linear offerings generally operate under separate processing workflows, adjusting the product mix according to consumer demand has significant impact and overhead for the operator's bottom line.

More specifically, operators have to invest in resources for diverse workflows (Linear and VoD) and are asked to forecast the demand/load for each one, so that they don't over/under budget. Further, operators need to allow for overflows/peaks in consumer demand, but at the same time, they have to maximize utilization of their investment. In a head-end based deployment this translates to investment on hardware/CAPEX that eventually becomes obsolete, while in a Cloud based deployment often translates to lock-in contracts based on volume commitments.

Media Excel provides a very cost-effective mechanism to address those uncertainties, as the HERO platform can be used interchangeably either as a Live or a VoD transcoder. The switch-over can be done dynamically according to the operator's daily needs and does not require any additional licensing, software or hardware adjustments. Further, Media Excel's Management System (HMS) enables these distinct workflows to co-exist and co-operate under the same centrally managed environment, allowing sharing of configuration presets and monitoring infrastructure.

This unique advantage liberates operators from costly budgetary adjustment and obsolete inventory, and further empowers them to experiment with and launch new services with minimal risk and overhead.

Scalability:
x86 and hardware-based acceleration

As x86-based processing power evolves, more and more of low-to-mid end requirements (in terms of channel density and/or multi-screen coverage) can be accommodated by generic IT-based equipment. This helps reduce procurement, setup and maintenance cost and also encourages video delivery adoption across multiple market segments. With the IT-based equipment, scalability is addressed by either growing the server population or by continuous technology refresh.

On the other hand, to address the high-end processing requirements (higher channel density, video quality, resolution etc) several specialized (co-)processors can be deployed, ranging from GPU to DSP to ASIC. Those can dramatically enhance transcoding throughput but tend to either become obsolete quickly (e.g. GPUs) or require a significant initial investment (e.g. ASIC-based blades on multi-RU ATCA chassis). In this case, scalability is addressed by adding more (or replacing) the processors within the existing chassis (where permitted) or purchasing more appliances.

Media Excel's HERO enables the operator to start small (e.g. with the HERO 50x0x models, which utilize x86 and Sandy Bridge architectures on an IT/carrier-grade chassis) but grow intrinsically with the in-the-field addition of specialized acceleration modules as needs and requirements grow.

This unique advantage eliminates costly and time-consuming rip-replace-QA cycles and also

enables rapid growth with minimal impact in the power, cooling and rack space infrastructure.

Flexibility: Head-end and Cloud deployment

Broadcasters with heavy installed base of video processing/transmission infrastructure, high bitrate (or uncompressed) live content and strict SLA expectations generally favor a specialized encoding appliance versus a cloud-based virtual one. This is also true for content aggregators who deal with high volume of content (Live or VoD) or content that is too valuable to be entrusted to 3rd-party processing farms.

Smaller broadcasters or content owners, who can't afford to invest in in-house infrastructure (CAPEX), tend to favor a service-based model (essentially outsourcing their transcoding needs) or a cloud-based solution (OPEX). These options also make good sense for major broadcasting events (e.g. Olympic Games, World Cup etc) as operators can fulfill temporary peak requirements without committing huge capital expenditures that later sit unused.

Regardless of the scope and the scale of their business, all operators are struggling to remain flexible to market demands and customer expectations within strict OPEX/CAPEX constrains.

HERO addresses this in a unified way by offering two distinct form factors:

- HERO 5000 is a carrier-grade appliance for high-density/availability deployments
- HERO VS is a virtual appliance for cloud-services and scales dynamically with the demand

Both form factors are centrally and seamlessly managed by HMS and provide a unified fully flexible solution that combines the robustness and throughput of the carrier-grade appliance with the elasticity of a cloud-based platform.

Essentially, operators can utilize an in-house HERO 5000 based farm for projects with predictable growth pattern and use a HERO VS based farm for demand spikes, capacity overflows and short-term projects.

Further, a unique feature of HERO VS is that it can reliably ingest live input feeds within the cloud. This feature is widely utilized by service providers and operators worldwide to ensure a high quality master input for all their downstream multi-screen workflows.

The head-end and cloud-based form factors provide further reassurances to the operator that a HERO based installation is a future proof, long-term solution regardless of market demand fluctuations.

Agility

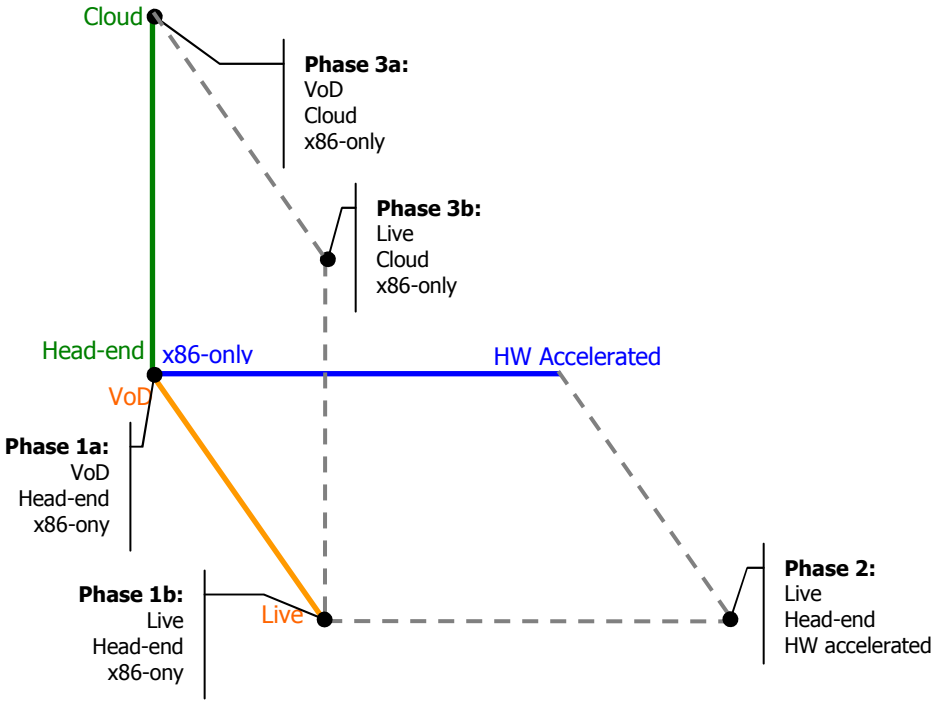
By utilizing the framework presented here, operators can demonstrate superior agility by navigating across the 3 dimensions (Versatility, Scalability and Flexibility) in a multitude of ways and based on their evolving needs.

In the example below, an operator can

- At Phase 1a, start with some VoD transcoding in-house, in order to prepare the VoD library for multi-screen delivery.
- At Phase 1b, add support for Live transcoding as the service launches, initially only a few Live channels are needed.
- At Phase 2, as the Live services grow across more channels and more devices, scalability

becomes more important and HW acceleration is utilized to increase density intrinsically.

- At Phase 3a, the additional VoD transcoding demand is offloaded to a Cloud service to help account for fluctuations in VoD asset acquisition.
- At Phase 3b, some live events are added to the Cloud to address short-term needs with unpredictable frequency and/or popularity.



Conclusion HERO empowers operators to seamlessly navigate across different optimal points/phases of their operations without triggering continuous rip-replace-QA cycles.

Further, HMS allows for all those distinct points to coexist and interact in a transparent manner, across different geographies and form factors but within a single, unified ecosystem. This helps centralize the operational aspect of the business and balance QoS and OPEX.

About Media Excel, Inc.
Media Excel defines the adaptive bitrate, multi-device transcoding standard for multiscreen video delivery. The company's hybrid approach of using software and hardware transcoding solutions powers more than 18 million live mobile/tablet TV viewers daily in the US alone. Across the head-end, cloud, or edge video distribution, the company's solutions are used in a variety of markets including broadcast, government, telecom, MSO and CDNs. Founded in early 2000, the company continuously innovates services and offerings for large-scale mobile carrier customers such as AT&T, Sprint, T-Mobile, Korea Telecom, SK Telecom and Verizon, to high-profile event-driven organizations such as Telstra Australia, NFL, NBA and the Olympic Games. Media Excel is headquartered in Austin, Texas with offices in Seoul and Silicon Valley.

HERO product information: http://www.mediaexcel.com/products/overview
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