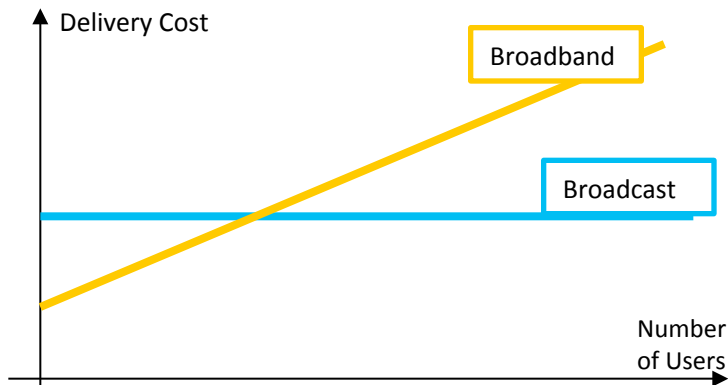
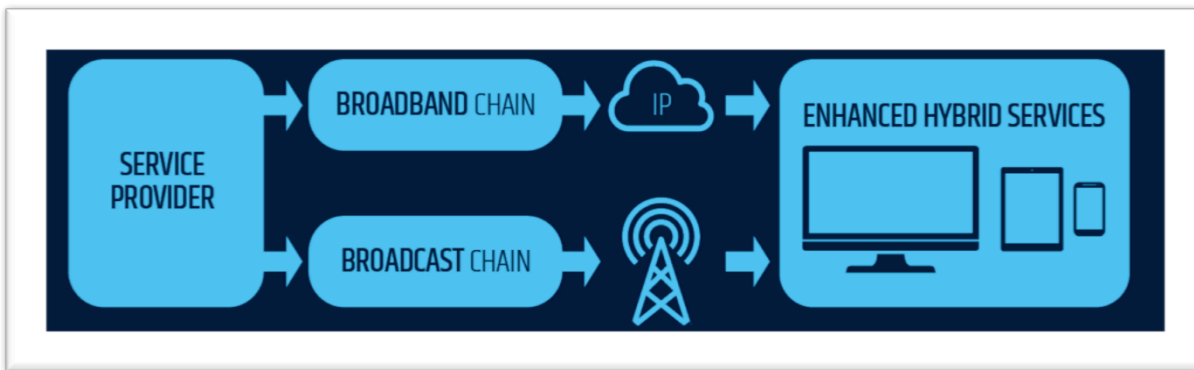


# *Scalable Encoding to enable Hybrid Broadcast - Broadband*

*Walid HAMRI, ATEME*  
*VP Solutions & Business Development*

# Broadcast/Broadband Convergence infrastructure

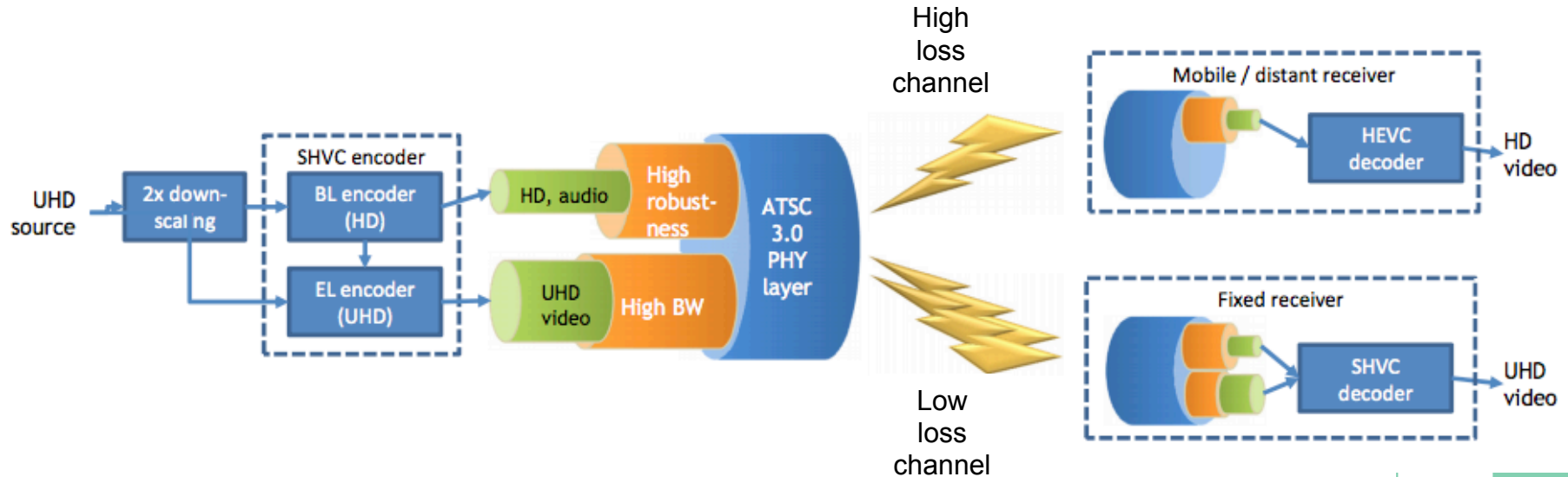


Broadband delivery: Extra Cost per User

Broadcast delivery: Fixed Cost

# Scalable Encoding – Layered Modulation Trades-off Quality / Reach

- Guaranteed “lower quality” (1080p) signal for robust reach / mobility
- Enhanced 4K when possible
- Leverages Scalable High-Efficiency Video Codec (SHVC)



# SHVC Enabled 30% Bandwidth Saving vs Simulcast

	Channel	HEVC Distribution (Simulcast)	SHVC Distribution (Scalable Encoding)
HD/UHD Distribution	1080p Channel	8Mbps	8Mbps (BL)
	UHD Channel	20Mbps	12Mbps (EL)
	<b>Total</b>	<b>28Mbps</b>	<b>20Mbps</b>
HD/SD Distribution	SD 480p Channel	2Mbps	2Mbps (BL)
	HD 1080p Channel	6Mbps	4Mbps (EL)
	<b>Total</b>	<b>8Mbps</b>	<b>6Mbps</b>

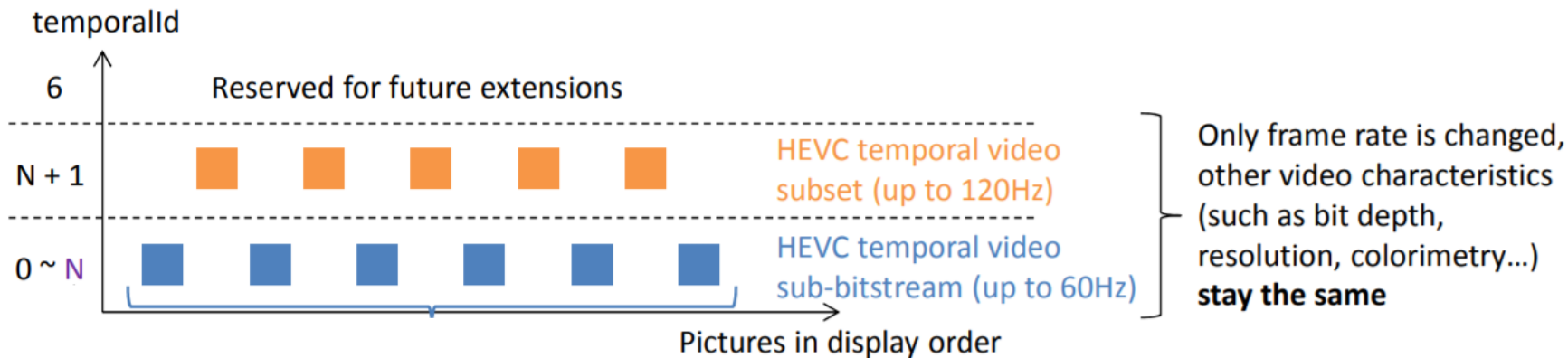
1. SHVC enables Up to **30% bandwidth saving** (vs. Simulcast)
2. SHVC EL requires 10% more bitrate vs. HEVC CBR  
⇒ HEVC 1080p60 8Mbps ~~ SHVC EL 1080p60 8.5Mbps
3. Complete Flexibility for the BL/EL bitrate choice  
⇒ The Video Quality Tradeoff between BL and EL is a business decision

# Status of Scalable Encoding (SHVC)

- Part of ATSC 3.0 Standard - [A/341:2019, “Video—HEVC](#)
  - SHVC spatial scalability (1.5x, 2x, 3x)
  - No color gamut scalability
  - HDR 10 and HLG10
  - Optional: Dolby Vision, Full Range, ICtCp color space SL-HDR1
- Will be supported by major CE Manufacturers as part of their ATSC 3.0 commitment
- Room to improve Improvements:
  - Color gamut scalability (BT.709 or BT.2020)
  - Temporal Scalability (same framerate between BL and EL)
  - Mix HDR/SDR (Same Dynamic Range between BL and EL)
  - Multiple layers of SHVC (Limited to 2 layers – BL/EL)

# HFR: Backward compatibility

- Support for framerates 100, 120fps
- Part of ATSC and DVB (TS 101 154) standard
- Dual PID and temporal scalability for backward compatibility with UHD 1 receivers
- ATEME Elastic Encoding to minimize Bitrate overhead



# Summary

- Scalable Encoding is just another tool enabling business cases
  - a) Monetize the EL layer (UHD, HDR)
  - b) Upscale the user experience for primetime events
  - c) Better monetize the targeted ad - all ads could be upscaled to the EL
  - d) Up 30% Saving on the CDN cost - only EL download is required
  - e) Optimized Broadcast delivery – BL for mobile, EL for fixed receiver
- Supported today as part of the ATSC 3.0 A/341 Spec