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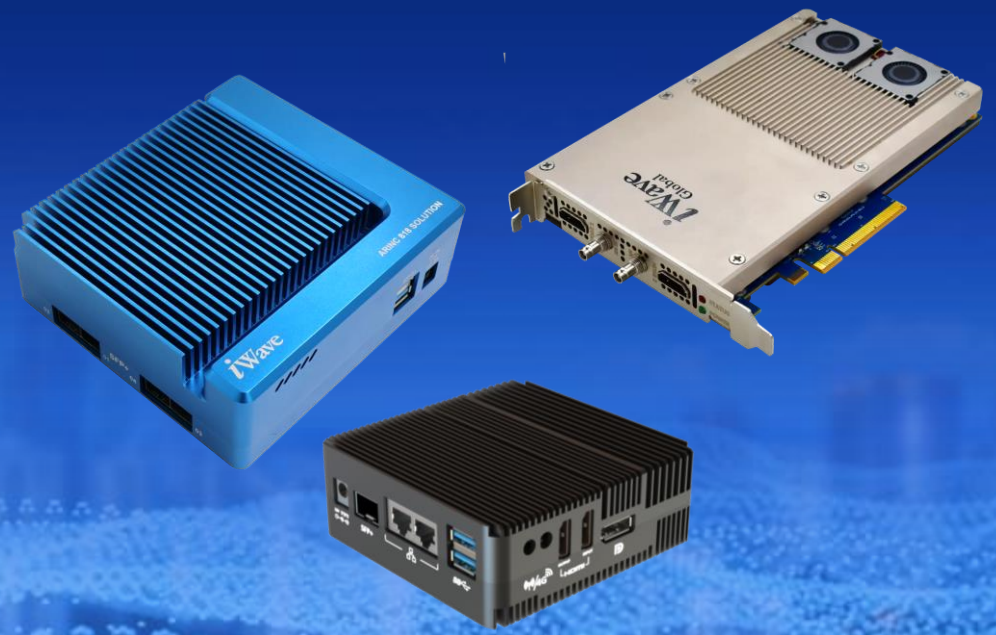
eBook

Video & Vision Solutions from iWave

Powering Real-Time Imaging, Streaming & Deterministic Video Systems



The Growing need for Advanced Vision System

Modern video and vision systems are evolving rapidly across industrial automation, healthcare, broadcast, surveillance, and immersive technology domains. The shift toward higher resolutions (4K/8K), increased frame rates, multi-channel video pipelines, and ultra-low-latency transport is driving the demand for high-bandwidth, deterministic video platforms.

From surgical visualization systems to real-time industrial inspection and live broadcast environments, video is no longer just display data — it is mission-critical information that must be captured, processed, transported, recorded, and analyzed without compromise.

Today's System must support -

- 8K / 4K high-resolution video capture
- Multi-channel 12G-SDI and HDMI 2.1 interfaces
- High-bandwidth PCIe-based video transport
- Ultra-low-latency streaming for real-time decision-making
- Secure, reliable video recording and analytics
- Seamless integration with processing and streaming frameworks

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Applications

Healthcare & Medical Imaging

Medical Imaging & Diagnostics
Camera-Based Surgery & Remote Consultation
AI-Assisted Detection (Polyp / Surgical Tool Identification)

Broadcast, Media & Sports Production

Real-Time Sports Broadcasting
On-Screen Graphics & Video Overlay
High-Resolution 4K/8K Live Production Workflows

Industrial Automation & Machine Vision

Machine Vision & Industrial Inspection
AI-Based Image Processing & Overlay
Real-Time Quality Monitoring & Defect Detection

Immersive & Intelligent Vision Systems

AR/VR & Mixed Reality Applications
Low-Latency Interactive Visual Systems
Security & Surveillance Systems

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Video & Vision Solutions from iWave

Frame Grabber

- HDMI 2.1 / 2.0 Frame Grabber
- 12G SDI 8K / 4K Frame Grabber
- ARINC 818 Frame Grabber

Ultra Low Latency Streamer

- HDMI 2.1/2.0 8K/4K, MIPI CSI 4k, Wi-Fi 6 / 7 / ethernet Streamer and recorder
- 12G SDI 4K Streamer and Recorder

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Frame Grabbers

HDMI 2.1 / 2.0 Frame Grabber

- Compliant with HDMI 2.1, supports max resolutions and refresh rates up to 2k @120FPS or 8K @60FPS.
- PCIe Gen 3 x8 lanes with a total maximum theoretical bandwidth of 64Gbps.
- Full-Height Half-Length PCIe form factor, suitable for integration into Host PC systems.
- Compatible with AMD Direct GMA and NVIDIA GPU Direct
- Supports V4L2 framework
- Compatible with Linux OS for flexible deployment.
- Supports video node detection for applications like VLC media, OBS studios and more.
- Compatible with native Linux (V4L2, ALSA) and Windows (AVStream) frameworks for seamless cross-platform deployment.

12G SDI 8K / 4K Frame Grabber

- 12G SDI Input/Output for capturing & transmitting 4K/8K streams.
- PCIe Gen 3 x8 lanes with a total maximum theoretical bandwidth of 64Gbps.
- Full-Height Half-Length PCIe form factor, suitable for integration into Host PC systems.
- Compatible with AMD Direct GMA and NVIDIA GPU Direct
- Supports V4L2 framework
- Compatible with Linux OS for flexible deployment.
- Supports video node detection for applications like VLC media, OBS studios and more.
- Compatible with native Linux (V4L2, ALSA) and Windows (AVStream) frameworks for seamless cross-platform deployment.

ARINC 818 Frame Grabber

- Handles multiple resolutions and refresh rates up to UHD @30FPS or 2K @60FPS.
- PCIe Gen 3 x8 lane with a total maximum theoretical bandwidth of 64Gbps.
- ARINC 818 to HDMI and HDMI to ARINC 818 Conversion supported.
- Full-Height Half-Length PCIe form factor, suitable for integration into Host PC systems.
- Compatible with Linux OS for flexible deployment.
- Supports video node detection for applications like VLC media, OBS studios and more.
- Compatible with native Linux (V4L2, ALSA) and Windows (AVStream) frameworks for seamless cross-platform deployment.

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ULL Streamer

Ultra Low Latency Streamer and Recorder

- Supports ultra-low latency streaming for live video and embedded vision.
- It is capable to capture high resolution video (7680 × 4320 pixels at 60frames)
- Handles real-time 4K UHD (3840x2160) at 60 fps video compression and decompression.
- Equipped with HDMI2.1/HDMI2.0 input/output interfaces.
- MIPI-CSI input interface.
- Enables video encoding, live streaming, recording to M.2 SSD/USB, and live display.
- Secures video streams using AES encryption and decryption.
- Ideal for high-performance, secure video broadcast applications.
- HEVC(H.265)/AVC(H.264) Encoder and Decoder
- HDMI2.1/HDMI2.0 Input/Loop out
- 2-channel stereo audio from HDMI2.1/HDMI2.0
- UDP, RTMP, RTP, SRTP protocol
- Simultaneous encoding and decoding with a max aggregated
- Recording and playback prerecorded video
- Capture, encode and transmitting side latency 11 ms
- Receive, decode and display latency 9ms
- Collective point to point latency below 100 ms
- video encryption and decryption

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Unique Features of Video & Vision Solutions

iWave extends video & vision-based solution capabilities with production-ready engineering features that reduce risk and accelerate deployment.

End-to-End Video Pipeline Ownership

- ✓ Complete video chain delivery from capture to processing, streaming, recording & display
- ✓ Not just compute boards or display modules; full system-level video architecture expertise
- ✓ Hardware, firmware, drivers, SDK & manufacturing under one roof

Deterministic Low-Latency Architectures

- ✓ FPGA-based real-time pre-processing pipelines
- ✓ Sub-frame latency architectures for mission-critical applications
- ✓ Zero-frame-loss, deterministic data paths
- ✓ Optimized for surgical, broadcast & avionics-grade reliability

High-Performance Heterogeneous Compute

- ✓ SoC + FPGA + GPU co-processing architectures
- ✓ AI/ML acceleration for vision and analytics workloads
- ✓ Multi-stream 4K video handling with hardware encoding/decoding
- ✓ Scalable from compact modules to full PCIe/ARINC platforms

Ultra Low Latency Streamer Differentiator

- ✓ HDMI 2.0/2.1 & MIPI camera support (4K/8K ready)
- ✓ 66 ms glass-to-glass latency
- ✓ Streaming over Wi-Fi 6E / 7
- ✓ Zero-latency video loop-out

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Software Features

V4L2 driver

NVIDIA GPU DIRECT

AVstream driver

NVIDIA HOLOSCAN

NVIDIA DEEPSTREAM

Custom Driver with SDK support

Windows ML

Third Party Applications

VLC

Open Broadcaster Software

Multimedia Libraries

gstreamer

FFmpeg

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Deliverables

Frame Grabbers:

Linux –

- V4L2 driver
- Software User manual
- SDK Dynamic Library
- SDK Documentation

Windows –

- AV Stream
- Software User manual
- SDK Dynamic Library
- SDK Documentation

ULL Streamer:

Linux -

- Software User Manual
- SDK Documentation
- Board Support Package (BSP)
- Web Application User Guide
- BSP User Guide
- Binaries: BOOT.bin, system.bit, image.ub, Root File System (rootfs)

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Case Study

Real-Time Streaming and Broadcast
Ultra-Low-Latency Video Streamer

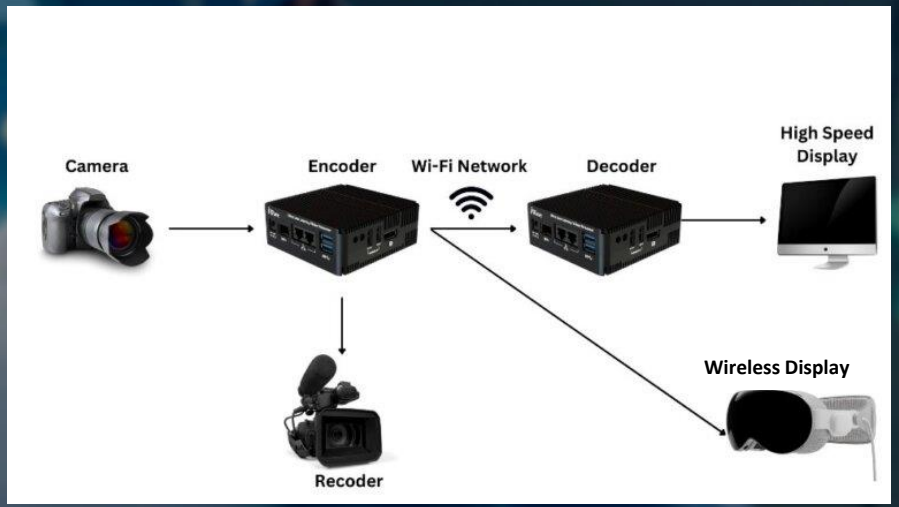
A global healthcare provider required secure, ultra-low latency 4K/8K video streaming for telemedicine and remote surgical consultation, ensuring real-time collaboration with uncompromised video clarity.

Challenges:

- Sub-second, near real-time video streaming
- High-resolution 4K/8K surgical visuals
- Secure AES-encrypted transmission
- Reliable performance over Wi-Fi 6E/7 and Ethernet
- Compact, deployment-ready platform

iWave Scope of Work:

- Delivered Ultra-Low-Latency (ULL) streaming platform with millisecond-level delay
- Enabled 4K/8K capture via 12G-SDI and HDMI 2.1
- Implemented H.264 / H.265 hardware encoding & decoding for optimized latency and quality
- Supported multi-interface display (SDI, HDMI, DP) and streaming protocols (RTMP, UDP/RTP)
- Ensured secure, high-speed connectivity with dual Gigabit Ethernet and Wi-Fi 6E/7 support



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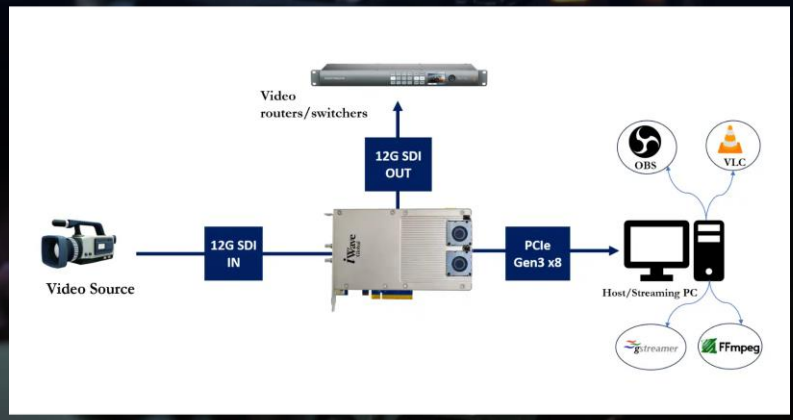
Case Study

High Resolution Video Transfer
12G SDI 8K / 4K Frame Grabber

A leading medical imaging OEM required real-time, lossless 4K/8K surgical video capture and transfer across operating rooms, ensuring ultra-low latency and uncompromised image fidelity for precision procedures.

Challenges:
- Uncompressed 4K/8K video capture with zero frame loss
- Ultra-low latency for real-time surgical visualization
- Long-distance SDI signal integrity
- Seamless integration into existing medical imaging platforms
- Compliance with medical safety standards

iWave Scope of Work:
- Integrated 12G-SDI Frame Grabber with PCIe Gen3 x8 interface
- Enabled real-time 8K/4K capture with high-bandwidth, low-latency transfer
- Delivered custom SDK, APIs, and GUI for simplified software integration
- Implemented CRC validation, frame diagnostics, and reliability mechanisms
- Provided end-to-end engineering, driver integration, IEC 60601/2 support, and on-site validation



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Case Study

Remote Surgeries / Telemedicine
Ultra Low Latency Video Streamer & Recorder

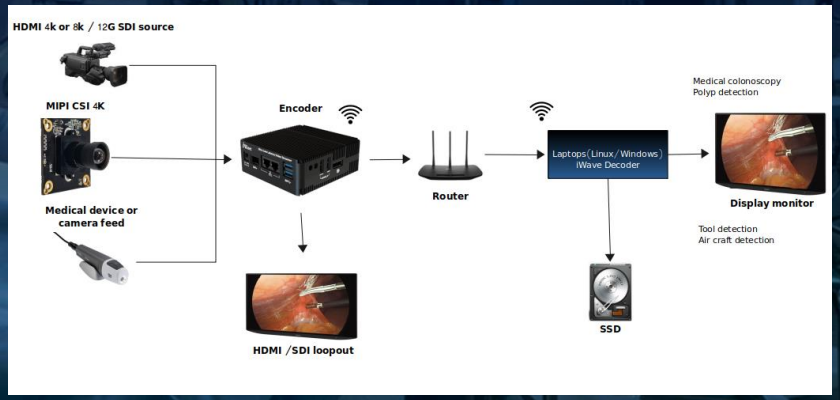
A leading multi-specialty medical device manufacturer required a real-time telemedicine solution to enable remote surgical assistance, seamless collaboration, and synchronized transmission of critical medical data across geographically dispersed locations.

Challenges:

- High audio/video latency disrupting surgeon collaboration
- Inconsistent video clarity impacting clinical decision-making
- Need for synchronized transmission of video, patient vitals, and medical imaging
- Secure, scalable streaming across hospital networks
- Reliable recording for post-procedure review and compliance

iWave Scope of Work:

- Reduced end-to-end latency to as low as 66 ms for real-time interaction
- Enabled 4K@60fps capture and streaming via 12G-SDI / HDMI 2.0
- Implemented simultaneous encode & decode with synchronized multi-stream transmission
- Delivered real-time recording to M.2 SSD / USB storage for archival and compliance
- Ensured AES-encrypted streaming over Wi-Fi 5 with AR/VR display support (e.g., Apple Vision Pro)
- Provided seamless web platform integration for remote consultation



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Resources

Technical Articles

- Article – Optimizing Thermal Performance in Compact Electronics Using Low Airflow Cooling
- Press Release - iWave Global Expands into Video and Vision Solutions with Launch of High-Performance Frame Grabber Portfolio
- Article - How iWave's Frame Grabber is Used in Medical Imaging Applications
- Article - Real-Time AI Colonoscopy: Polyp Segmentation with iWave SDI Frame Grabber
- Article - Ultra Low Latency Streamer in Surgery and Medical Imaging applications
- Article – Unveiling Ultra-Low Latency Video Streamer for Live Streaming
- Article – Next-Gen iWave ULL Streamer Wi-Fi 7 Ultra-Low Latency Wireless Video Streaming
- Article - ULL Streamer in Surgery and Medical Imaging applications

Case Studies

- Case Study – High-Resolution Video Transfer with 12G SDI 8K / 4K Frame Grabber
- Case Study – Real-Time Streaming and Broadcast using Ultra Low Latency Video Streaming
- Case Study - Remote Surgeries / Telemedicine with ULL Streamer and Recorder

Videos

- Demo Video - Accelerating Video Pipelines: iWave Frame Grabber with NVIDIA GPUDirect for Video Systems

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Thank You

We are here to
Accelerate Embedded Innovation

mktg@iwave-global.com

INDIA | USA | GERMANY | EUROPE | TAIWAN | KOREA | JAPAN | DUBAI