Utah Scientific

TECHNICAL GUIDE · HYBRID SDI / IP ROUTING

Planning Your SDI-to-IP Migration Path

A practical guide for broadcast engineers and facility managers

The transition from SDI to IP is not a single event; it's a journey shaped by budget cycles, operational risk tolerance, signal formats already in use, and the timeline of your next infrastructure refresh. This guide helps you think clearly about your options at each stage, evaluate hybrid routing solutions, and protect existing investment while opening a credible path to SMPTE ST 2110.

UTAH SCIENTIFIC, INC.

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Engineering broadcast routing solutions since 1977

Backed by the broadcast industry's only no-fee 10-year hardware warranty on routers

SECTION 1

Understanding the IP Transition Landscape

The Transition Is Inevitable, But Not Urgent for Everyone

The broadcast industry's shift to IP-based signal transport is well underway. SMPTE ST 2110, the standard defining how uncompressed professional media travels over IP networks, has moved from early-adopter territory to mainstream infrastructure at major networks, OB companies, and production facilities worldwide.

That shift does not mean every facility needs to move now. Broadcast infrastructure runs on long capital cycles. Routers are purchased to last a decade or more, and a well-maintained 3G-SDI system installed five years ago still has years of productive life ahead of it.

The real question is not whether to transition; it's a matter of when, at what pace, and how to structure the migration to manage risk and cost without abandoning infrastructure that still earns its keep. Facilities that navigate this most successfully treat it as a phased evolution, not a hard cutover.

The Three Transition Models

Broadcast facilities typically approach the SDI-to-IP transition through one of three models, each with a different risk profile, cost structure, and operational implication.

Model 1: Full IP Replacement

Highest upfront cost and transition risk

The facility removes existing SDI infrastructure and replaces it with an all-IP core built around ST 2110. Cleanest architecture, maximum long-term flexibility, but a failure in the IP fabric (network switch crash, control system outage, PTP timing disruption) takes the entire signal path offline without a separate backup, unless you purchase, setup, and power two of everything. Best suited to new facility builds, major greenfield projects, or organizations with the budget and engineering depth to run parallel infrastructure during cutover.

Model 2: Parallel Infrastructure

Reduced cutover risk; doubled infrastructure cost during transition

The facility builds an IP infrastructure alongside the existing SDI system, running both in parallel until IP is proven stable, then decommissioning SDI. Minimizes cutover risk but requires significant investment in SDI and gateway devices during the transition window and creates the operational complexity of managing two separate signal domains simultaneously. Best suited to large facilities with substantial IT and broadcast engineering resources and a multi-year transition timeline.

Model 3: Hybrid SDI/IP Integration (Recommended)

Protects existing investment; built-in SDI fallback

The facility integrates IP capability into its existing SDI infrastructure incrementally, running SDI and ST 2110 signal paths simultaneously within the same chassis and under a single control system. This approach protects existing investment, minimizes operational disruption, and provides a built-in SDI fallback if the IP side encounters problems. Suitable for most broadcast facilities: studios, OB trucks, regional broadcasters, sports venues, and government media operations that need a credible path to IP without the cost and risk of full replacement. A hybrid SDI/IP architecture is not a compromise; it is the architecturally sound choice for facilities that need to stay on air while they evolve.

SECTION 2

The Case for Hybrid SDI/IP Routing

What "Hybrid" Actually Means

A true hybrid SDI/IP router carries both SDI and SMPTE ST 2110 IP signal paths simultaneously within a single chassis. Signals enter and exit in either format. A single control system (either a hardware panel or NMOS software) manages both domains without requiring operators to work in two separate environments.

> *What hybrid does not mean: an SDI router with an external gateway device bolted onto it. That architecture introduces a separate point of failure, adds rack space and power draw, and creates a signal path that breaks if the gateway goes offline.*

Considerations with External Gateways

Many facilities attempt to add IP capability by installing standalone SDI-to-IP gateway devices between their router and IP network. It works, but it introduces structural vulnerabilities that compound over time:

- The external gateway is a single point of failure. A power loss, crash, or loss of network connectivity takes the entire IP signal path offline.
- Each gateway requires its own rack space, power, cooling, and management, adding operational overhead that scales poorly.
- The gateway and router are managed separately, creating two control environments operators must navigate under pressure.
- Timing synchronization between the SDI and IP domains must be handled externally, adding configuration complexity and another failure mode.

When an External Gateway Is the Right Call

Sometimes an external gateway is the only practical solution for your setup. When that's the case, On-Ramp is the recommended choice. Unlike a generic standalone converter, On-Ramp also functions as a 32x32 SDI router, so you retain an uninterrupted backup signal path even in a standalone deployment.

- Functions as both a 1RU ST 2110 gateway and a 32x32 SDI router simultaneously
- Five hot-swappable card slots; 16 SFP cages for flexible I/O configuration
- Supports 12G UHD, 3G HD, and 1.5G SDI to ST 2110 encapsulation and de-encapsulation
- Backed by Utah Scientific's no-fee 10-year hardware warranty

Why the Embedded Gateway Architecture Changes the Equation

Utah Scientific's hybrid routing approach embeds the gateway function directly inside the router chassis via PassThrough cards. These cards occupy standard I/O card slots in the UTAH-400 Series 2 frame and handle SDI-to-ST 2110 encapsulation and de-encapsulation with no external hardware required.

- SDI Fallback: If the IP control system or network fabric encounters a disruption, critical feeds remain live through the dedicated SDI path inside the same chassis.
- Single Control Plane: SDI crosspoints and IP flows managed via the same hardware panel or NMOS controller. No separate gateway management interface.
- Rack Efficiency: Gateway functionality lives inside the router frame, with no additional rack units, no separate power supplies.
- PTP Timing: PTP compliant. Supports simultaneous management of ST 2110 timing alongside legacy analog Black Burst references.
- Scalability: Frame sizes from 72×72 to 1056×1056. PassThrough cards added incrementally as IP requirements grow.

Gateway Router: SDI routing and ST 2110 gateway in a single chassis

SECTION 3

A Phased Migration Framework

The SDI-to-IP transition does not happen all at once. The following framework describes how most facilities move through the transition in stages, and where Utah Scientific hybrid routing products fit at each stage.

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Phase 1: SDI Foundation with IP Readiness

Your facility runs SDI today. You're monitoring the IP transition, evaluating vendor strategies, and planning your next major router refresh, but not yet running ST 2110 workloads in production.

The right move at this stage is to ensure your next router purchase is IP-ready, built on a hybrid architecture that can accept PassThrough cards when you're ready, without requiring a chassis replacement.

Utah Scientific product for this phase: UTAH-400 Series 2: runs SDI today, accepts PassThrough cards for IP capability when ready. Scalable from 72×72 to 1056×1056. Backed by the industry's only no-fee 10-year warranty.

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Phase 2: Selective IP Integration

Your facility is beginning to send or receive ST 2110 signals (remote production, cloud contribution, or connecting to an IP-native device in the chain) without disrupting the SDI infrastructure that keeps you on air.

The right move is to add IP gateway capability at the edges of your existing router, either via PassThrough cards inside a Series 2 chassis or via an On-Ramp connected to your existing router.

Utah Scientific product for this phase: PassThrough Cards (slot into UTAH-400 Series 2, add ST 2110 encapsulation at specific I/O slots); On-Ramp (1RU hybrid gateway, five hot-swappable card slots, 16 SFP cages, supports 12G UHD, 3G HD, and 1.5G SDI to ST 2110).

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Phase 3: Hybrid SDI/IP Core

Your facility runs a hybrid core with ST 2110 and SDI simultaneously under a single control plane. You need to guarantee that a failure in the IP fabric does not take you off air.

This is where the UTAH-400 Series 2 Gateway Router earns its place. Specifically engineered for this workflow: hybrid SDI/IP in one chassis, with a live SDI fallback that engages automatically if the IP side encounters any disruption.

Utah Scientific product for this phase: UTAH-400 Series 2 Gateway Router: SDI routing and ST 2110 gateway simultaneously in one chassis. Configurable as core router in an ST 2110/SDI hybrid solution, or as a gateway and edge device in an ST 2110 core. Scalable from 72×72 to 1056×1056.

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Phase 4: ST 2110 Core with SDI Edge

Your facility has moved to a full ST 2110 core. SDI remains at the edges (legacy devices, satellite receive, older production equipment) and you need reliable SDI/IP bridging at those edge points.

The UTAH-400 Series 2 Gateway Router continues to serve this architecture as an edge device, bridging SDI endpoints into the ST 2110 core and providing the SDI safety net that all-IP architectures lack on their own.

Utah Scientific product for this phase: UTAH-400 Series 2 Gateway Router: edge deployment, bridging SDI endpoints into ST 2110 core.

SECTION 4

Evaluating Hybrid Routing Solutions

Not all hybrid routers are created equal. The following framework covers the key technical and operational criteria to evaluate when assessing hybrid SDI/IP routing solutions for your facility.

Signal Format Support

Confirm the router handles all signal formats present in your facility: SD, HD, 3G-SDI, 12G-SDI, DVB-ASI, as well as SMPTE ST 2110. Auto-select across formats without manual reconfiguration is the baseline requirement for a true hybrid system.

Gateway Architecture

Determine whether IP gateway functionality can be embedded inside the router chassis or if it will require external hardware.

SDI Fallback

Evaluate whether the system provides a continuous SDI path that remains live independently of the IP fabric. This is the most critical resilience feature for mission-critical facilities. If the IP control system crashes or the network fabric loses connectivity, does the SDI path keep signals flowing without operator intervention?

Control System Integration

Confirm that SDI and IP signal paths are managed through a single control interface: hardware panel, NMOS software, or both. Systems that require separate management interfaces create operational complexity and training overhead.

PTP and Timing

Verify PTP compliance (IEEE 1588) and confirm the system can manage ST 2110 timing alongside legacy analog references such as Black Burst. Timing domain management is one of the most consistently underestimated complexities in hybrid deployments.

Scalability

Evaluate the router's scalability range and whether I/O cards are common across frame sizes. A system requiring different cards for different frame sizes creates inventory complexity when scaling. Hot-swappable I/O cards reduce operational risk during configuration changes.

The Comparison at a Glance

	TRADITIONAL APPROACH	UTAH SCIENTIFIC APPROACH
Gateway	External device required; separate rack unit	Embedded in router chassis via PassThrough cards
Failure Mode	Gateway is a single point of failure	SDI fallback path always live, independent of IP fabric
Control	Separate management interfaces for SDI and IP	Single control plane: UCP panel or NMOS
Rack Space	Additional RUs and power for standalone gateway	Gateway inside chassis; no extra rack units or PSU
Warranty	Separate warranty per device; annual fees typical	Single no-fee 10-year warranty covers the full system

Questions to Ask Any Vendor

- If my IP control system crashes tonight, what happens to my 2110 signal paths? Is there an SDI backup?
- Is the gateway function embedded in the chassis, or does it require a separate device?
- Can the same hardware panel control both SDI crosspoints and IP flows?
- What is the warranty coverage, and what are the ongoing support costs?
- Can I add IP capability incrementally, or does it require a full chassis replacement?
- How does the system handle PTP timing alongside existing Black Burst references?
- What happens to my investment if ST 2110 evolves and a new standard emerges?

SECTION 5

Utah Scientific Hybrid Routing Products

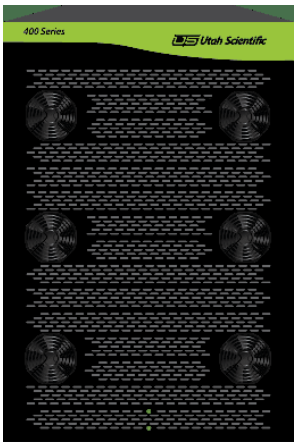
Utah Scientific has been engineering video routing systems since 1977. The company's hybrid routing product line is purpose-built for the SDI-to-IP transition, designed to protect existing infrastructure investment while providing a credible, low-risk path to SMPTE ST 2110.

UTAH-400 Series 2 Gateway Router

Integrates SDI routing and ST 2110 gateway simultaneously in one chassis. The embedded gateway is not a bolt-on; it's part of the routing fabric. If the IP control system or network fabric encounters any disruption, the dedicated SDI path remains live without operator intervention. Configurable as a core router in an ST 2110/SDI hybrid solution, or as a gateway and edge device in an ST 2110 core.

- Scalable 72×72 to 1056×1056
- Compatible with other vendors' SDI-to-ST 2110 gateways
- Covered by the industry's only no-fee 10-year hardware warranty
- Embed/Deembed of SDI signals

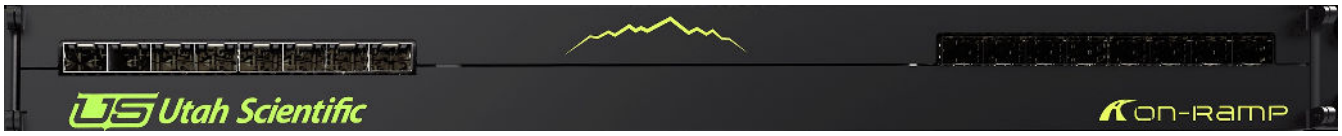
UTAH-400 Series 2



Designed to provide a single platform for all signal formats including those used in IP networks. Advanced modules deliver SDI management and 2110 decoding of SMPTE ST 2022-6/8, clean-quiet switching, audio shuffling, de-embedding and embedding, AES, MADI, and support for fiber and analog formats, all in a single frame.

- Frame sizes: 72×72, 144×144, 288×288, 528×528, 1056×1056
- Common I/O cards across all frame sizes, simplifying inventory and scaling
- Hot-swappable modular I/O cards reduce rack space and power consumption
- Compatible with SC-4, SC-40, and SC-400 control systems plus NMOS

On-Ramp



A 1RU rack-mountable hybrid gateway that adds SMPTE ST 2110 capability to any Utah Scientific router, including the UDS, Series 2, and UHD router lines. Five hot-swappable card slots and 16 SFP cages. Supports encapsulation and de-encapsulation of 12G UHD, 3G HD, and 1.5G SDI signals into ST 2110 IP streams, or signal processing, or both simultaneously. Forward-compatible with future router generations.

- Single, double, or mixed encap/de-encap configurations
- Optional HD/UHD SDI processing: up/down/cross-convert, frame sync, clean and quiet
- 1RU form factor with minimal rack footprint
- Backed by Utah Scientific's no-fee 10-year hardware warranty

PassThrough Cards

Slot directly into standard I/O card positions in an existing UTAH-400 Series 2 chassis. PassThrough input cards provide SDI inputs to the router and simultaneously create SMPTE ST 2110 IP copies of those signals. PassThrough output cards pass SDI outputs and provide simultaneous ST 2110 IP streams. No chassis replacement required; add IP capability where and when you need it.

- Supports 12 3G/HD/SD-SDI inputs per card
- All 12 signals simultaneously copied and encapsulated as uncompressed IP
- Supported IP format: SMPTE ST 2110
- Quad 25G QSFP+ ports for IP output
- SDI routing fabric continues to operate as normal; continuous fallback path maintained

Product Summary

PRODUCT	BEST FOR	KEY HYBRID FEATURE
UTAH-400 Series 2	Enterprise hybrid routing at any scale	Single platform for all signal formats including IP. Scalable 72×72 to 1056×1056. IP-ready chassis accepts PassThrough cards.
UTAH-400 Series 2 Gateway Router	Hybrid SDI/IP core with live SDI fallback	SDI routing and ST 2110 gateway in one chassis. Built-in SDI fallback. Configurable as core router or edge device. All signals available as SDI & 2110.
On-Ramp	Adding ST 2110 to any existing router	1RU hybrid gateway. Five hot-swappable card slots, 16 SFP cages. Supports 12G UHD, 3G HD, and 1.5G SDI to ST 2110.
PassThrough Cards	Incremental IP in existing Series 2	Slots into UTAH-400 Series 2 chassis. SDI-to-ST 2110 encapsulation/de-encapsulation without external hardware.

THE 10-YEAR WARRANTY ADVANTAGE

Utah Scientific's no-fee 10-year hardware warranty on routers is the only warranty of its kind in the broadcast industry: no annual fees, no fine print, no support contract required to access technical assistance. A system that stays under warranty through an entire infrastructure cycle eliminates the cost and disruption of premature replacement driven by end-of-support timelines.

SECTION 6

Planning Your Migration: A Practical Checklist

Use the following checklist to structure your facility's SDI-to-IP migration planning. Designed for broadcast engineers and facility managers as a starting point for internal discussions and vendor conversations.

Infrastructure Audit

- ✓ Document all signal formats currently in use (SD, HD, 3G, 12G, ASI, analog) and determine feasibility of 2110 deployment
- ✓ Identify all router chassis in operation and their remaining useful life
- ✓ Identify any IP-capable devices already present in the signal chain
- ✓ Document control system infrastructure: hardware panels, software panels, automation
- ✓ Identify timing infrastructure: Black Burst generators, house sync, any existing PTP

Transition Readiness Assessment

- ✓ Identify workflows that are candidates for early IP migration (contribution, remote production)
- ✓ Identify workflows that must remain SDI for the foreseeable future (legacy device connectivity)
- ✓ Assess IT network infrastructure: switch capacity, VLAN configuration, multicast routing
- ✓ Assess team expertise: IP networking skills, training needs
- ✓ Identify budget cycles aligned with infrastructure refresh decisions

Risk Planning

- ✓ Define acceptable downtime for your facility: live production has zero tolerance; post-production has more flexibility
- ✓ Identify signal paths that are mission-critical and require continuous SDI fallback
- ✓ Evaluate vendor support response times and warranty coverage for any new infrastructure
- ✓ Plan for a parallel testing period before cutting any production workflow over to IP

Vendor Evaluation

- ✓ Request a demonstration of the hybrid routing system under simulated IP failure conditions
- ✓ Confirm embedded vs. external gateway architecture
- ✓ Verify warranty terms: duration, fee structure, support access
- ✓ Confirm scalability path from current requirements to future growth
- ✓ Evaluate control system compatibility with existing hardware panels and automation

> *"The UTAH-400 was a great choice for the upgrade. Not only does the router come with Utah Scientific's no-fee, 10-year warranty (unheard of in the broadcast industry), based on a unique hybrid signal architecture that offers a single platform for all types of signals, including those used in IP networks."*
>
> **— Chuck Heffner, Digital Video Group**

TALK TO A UTAH SCIENTIFIC HYBRID ROUTING EXPERT

Utah Scientific engineers work directly with broadcast facilities to evaluate hybrid routing requirements and design migration paths that match operational reality, not theoretical best-case scenarios.

Visit utahscientific.com to explore the full hybrid routing product line, request a hybrid routing consultation with a Utah Scientific application engineer, or download product datasheets and technical specs for the Gateway Router, On-Ramp, and PassThrough Cards.