IP SHOWCASE THEATRE

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Live Closed Captioning and Subtitling in SMPTE 2110

2110-40 VANC standards, How-To, and Progress Report

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Speaker Introduction

EEG has been the leading U.S. brand in closed captioning insertion products and remote transcription technologies for over 30 years. Today, the company provides a global customer base with captioning and subtitling solutions focused on live video workflows.

Bill McLaughlin is VP of Product Development at EEG and has been with the company in various technical roles since 2007. Bill is the architect of iCap™, a secure networking system for live caption transmission that manages over 1 million hours of programming annually and was honored with a Technology Emmy® award in 2015.

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Goals of this Talk

1. How does the 2110-40 ancillary data standard work?
2. Understand how live captioning in 2110-40 is (and isn't) different from SDI
3. What improvements does 2110-40 present for ancillary data chains?
4. What do I need to understand to implement live captioning as part of a facility wide IP transition?
5. What is the status of industry adoption on 2110-40?

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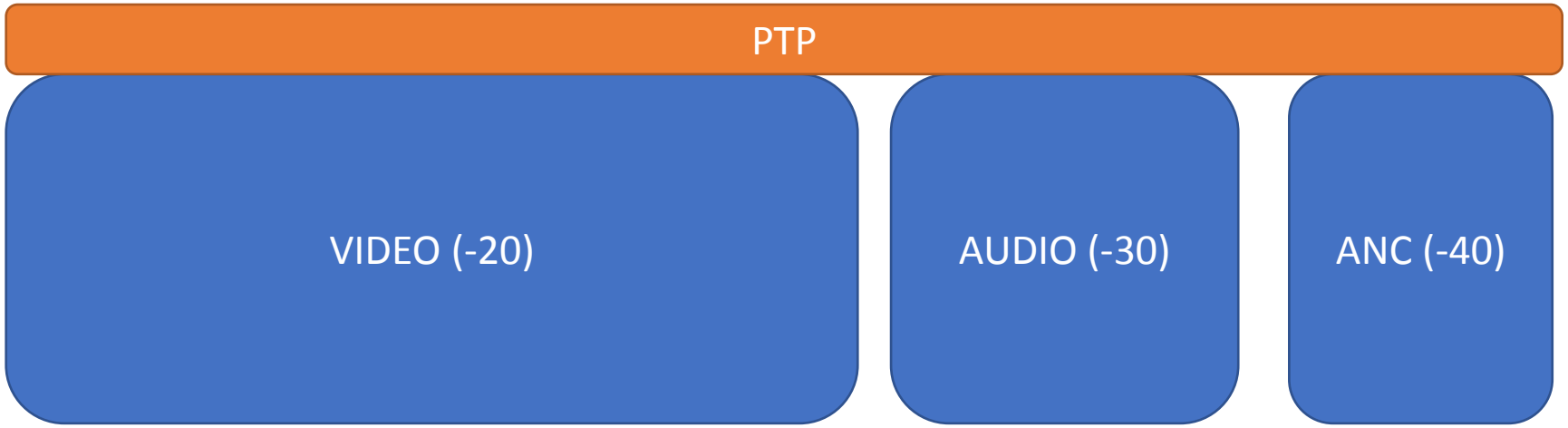
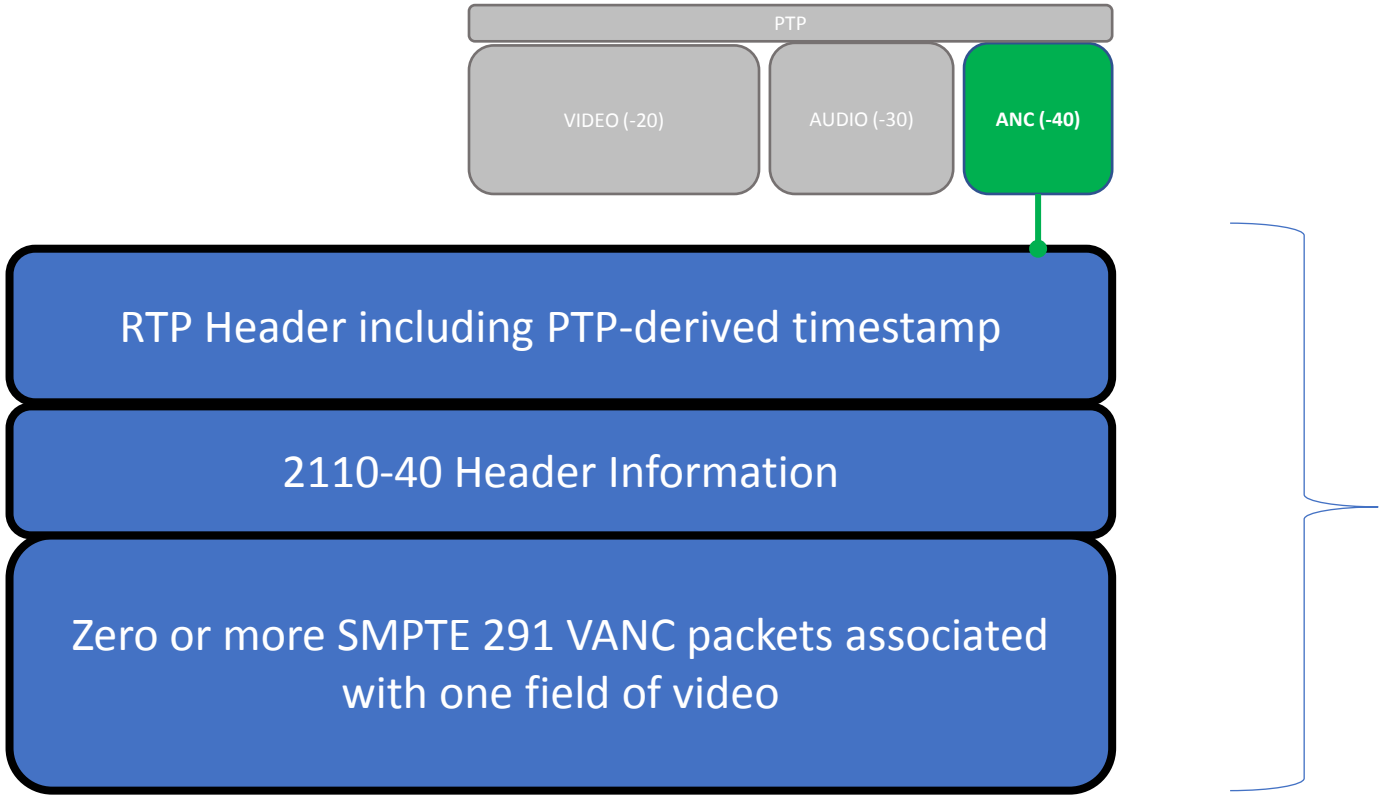
2110 Media Flows

- ✓ Video, audio, and data are **three separate RTP multicasts**
- ✓ Streams are synchronized with PTP timestamps in each packet



Ancillary Data in 2110-40



Ancillary Data in 2110-40

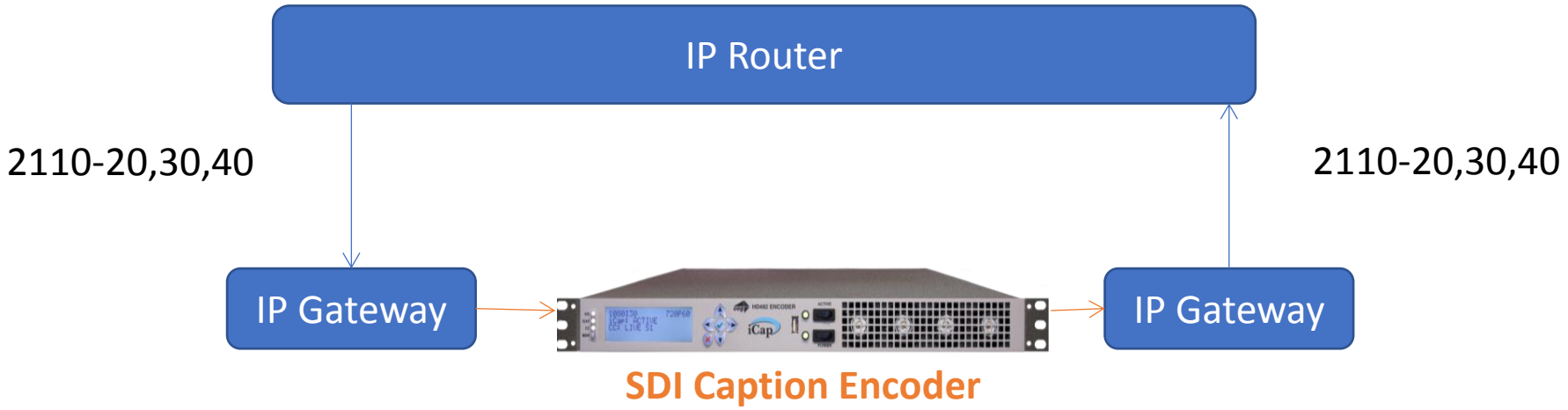
Live subtitling still carried in same "Inner" formats as in SDI VANC

- **USA/NTSC:** SMPTE 334 VANC packet, CEA-708 payload
- **EU/UK/PAL:** OP-47 VANC packet, Teletext payload
- **Japan/Brazil/ARIB:** ARIB B37 VANC packet, or SMPTE 334

Conversion between SDI and IP is simple and does not require generic gateways to have deep subtitle format knowledge.

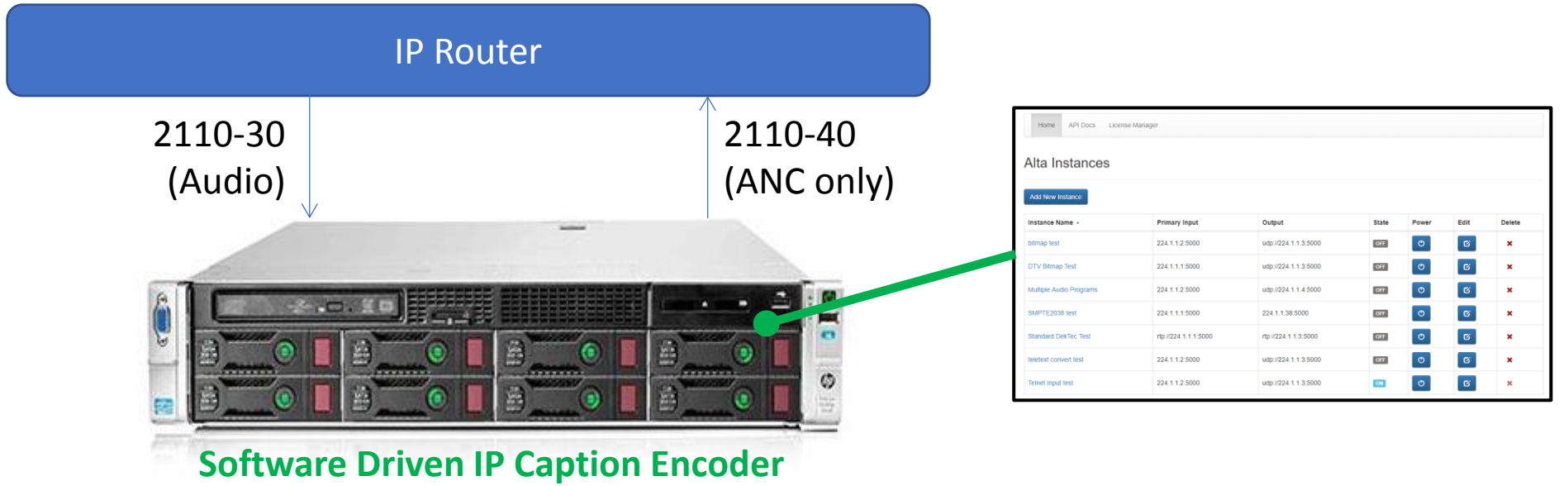
Transitional IP ANC Workflow

Existing SDI VANC caption encoding equipment CAN be used with IP Gateways



Native 2110 Caption Generation

Offers simplification and dramatic reduction in bandwidth



Advantages of Native 2110 Caption Generation vs. SDI Insertion

	SDI CC Insertion	2110 CC Insertion
Virtualization Friendly?	No	**Yes**
External Hardware	2 IP Gateways	**None**
Bandwidth Per Port	Up to 10 Gb/s, more for UHD	**Less than 1 Mb/s, all standards**
Density	1-2 unique video channels per 1 RU	**100 or more video channels per 1 RU**

How do Live Captions Enter the 2110 media system?

- A stenographer or ASR system receives audio reference
- Text data is returned to the caption encoder in real-time
- Return data is synchronized back to 2110-40 frames with PTP

Combining Recorded and Live Captions

239.40.1.1

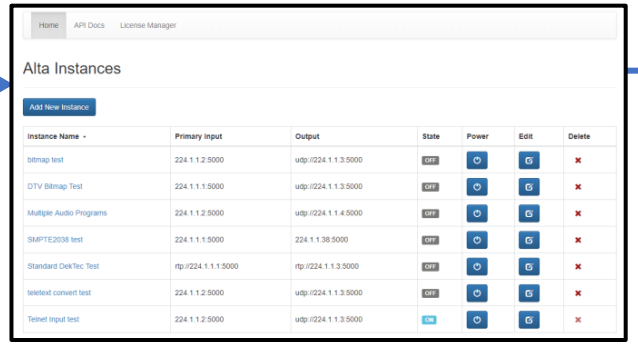
Valid subtitles during pre-recorded shows, blank during live

Prerecorded Program (Captioned)

Live Bulletin (Blank / No Captions)

Prerecorded Program (Captioned)

Air Schedule and Playout



IP Caption Encoder

Passes through upstream captions and generates captions for blank segments

239.40.2.1

Desired Output: Continuous Valid Subtitles mixing Live & non-live

Simple Receiver

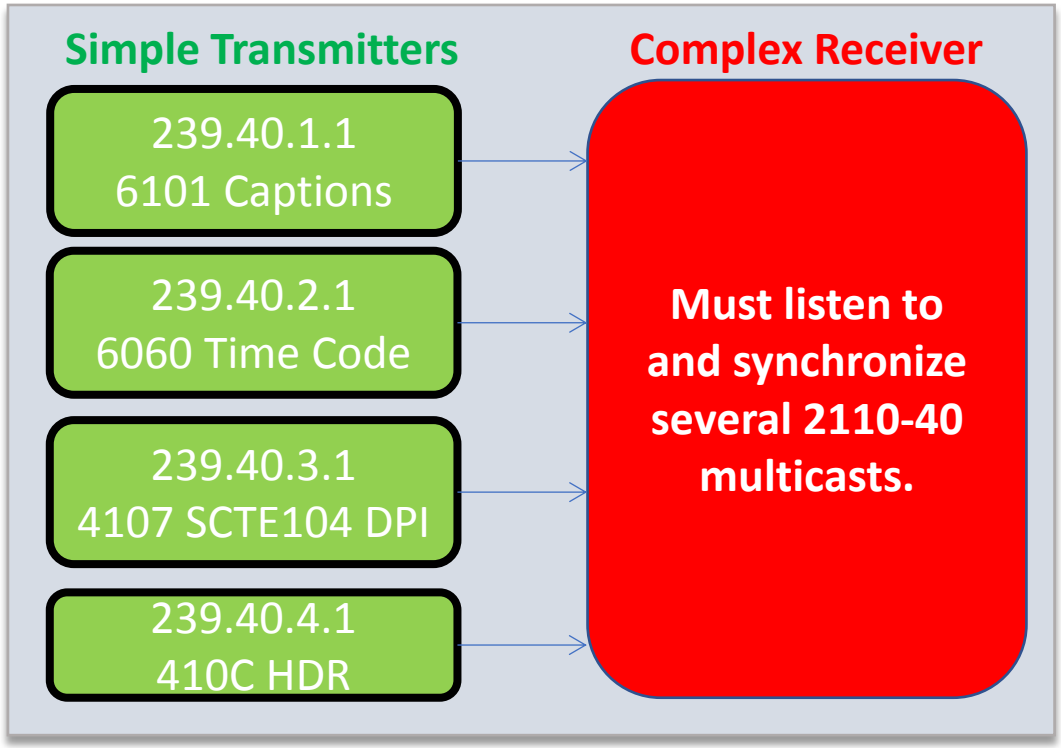
Caption/ANC Routing is simpler with 2110

A Single 2110-40 multicast can be associated with multiple videos using NMOS Connection Management

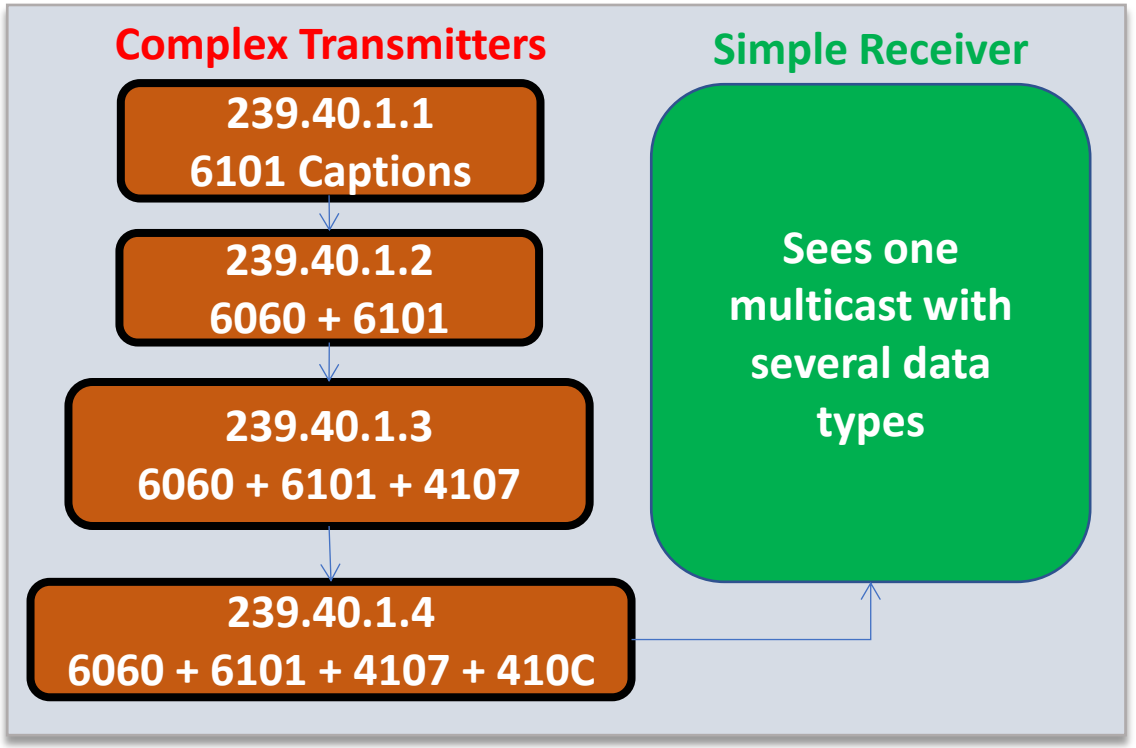
Video: 239.20.101.1
Audio: 239.30.101.1
Ancillary: 239.40.101.1

Video: 239.20.201.1
Audio: 239.30.201.1
Ancillary: 239.40.101.1

2110-40 Sender/Receiver Architectures

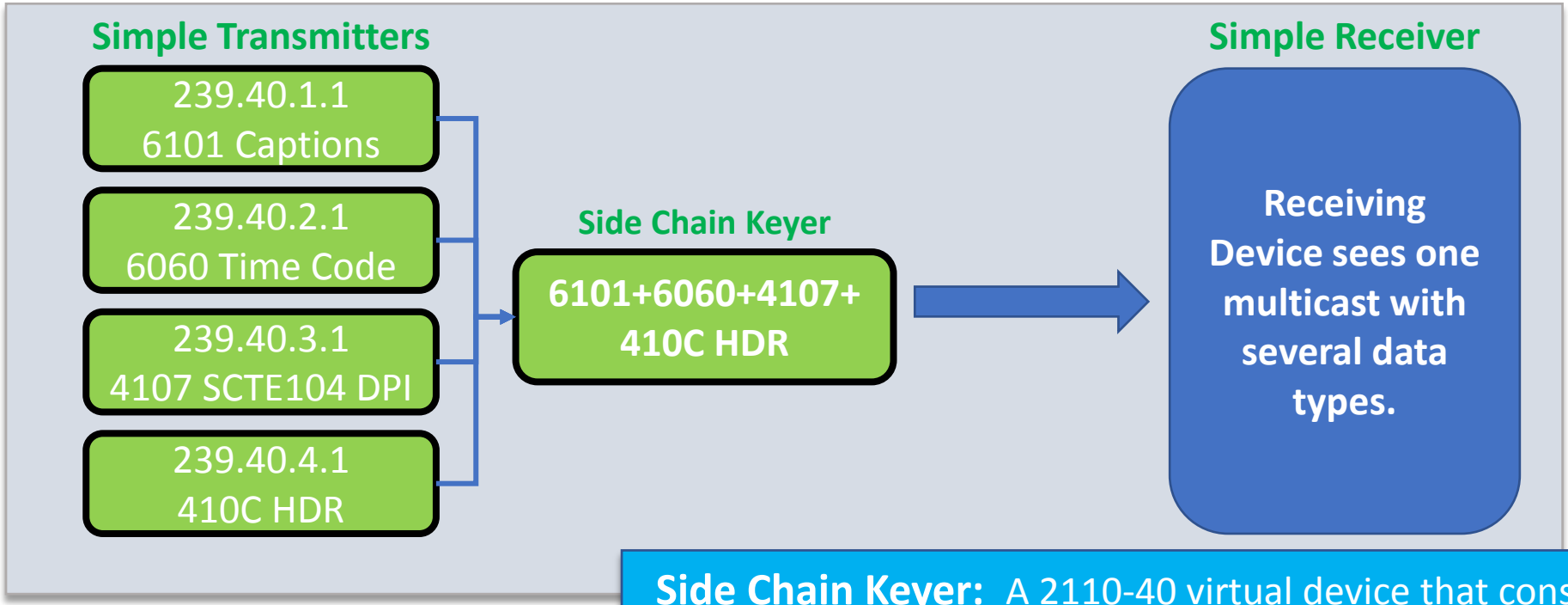


Parallel Approach



Serial Approach

2110-40 Sender/Receiver Architectures



Side Chain Keyer: A 2110-40 virtual device that consolidates parallel sources as necessary to simplify receiver task

2110-40 Adoption Overview

- Standard finalized March 2018
- Good: Most implementing vendors show good Tx/Rx compatibility
  - Most commonly observed problem: field flag & marker use across progressive versus interlaced standards
- Good: Most available SDI/IP gateways support 2110-40 (buyer beware: still ask!)
- Good: Prominent IP multi viewers support North America captioning from 2110-40, though European OP-47 support less common
- Mixed: Test and measurement equipment improving, but native -40 support lags SDI VANC analysis

Continued Adoption of 2110-40 Provides

- ✓ **Continuity in all major global captioning and subtitling production standards**
- ✓ **Higher density, and lower switch bandwidth utilization** for live subtitling and any other standalone expert ANC processing systems
- ✓ **Continued momentum towards virtualization and IT security** when dealing with remote live subtitling
- ✓ **New routing options for live subtitles and other ancillary data**

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Thank You!

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