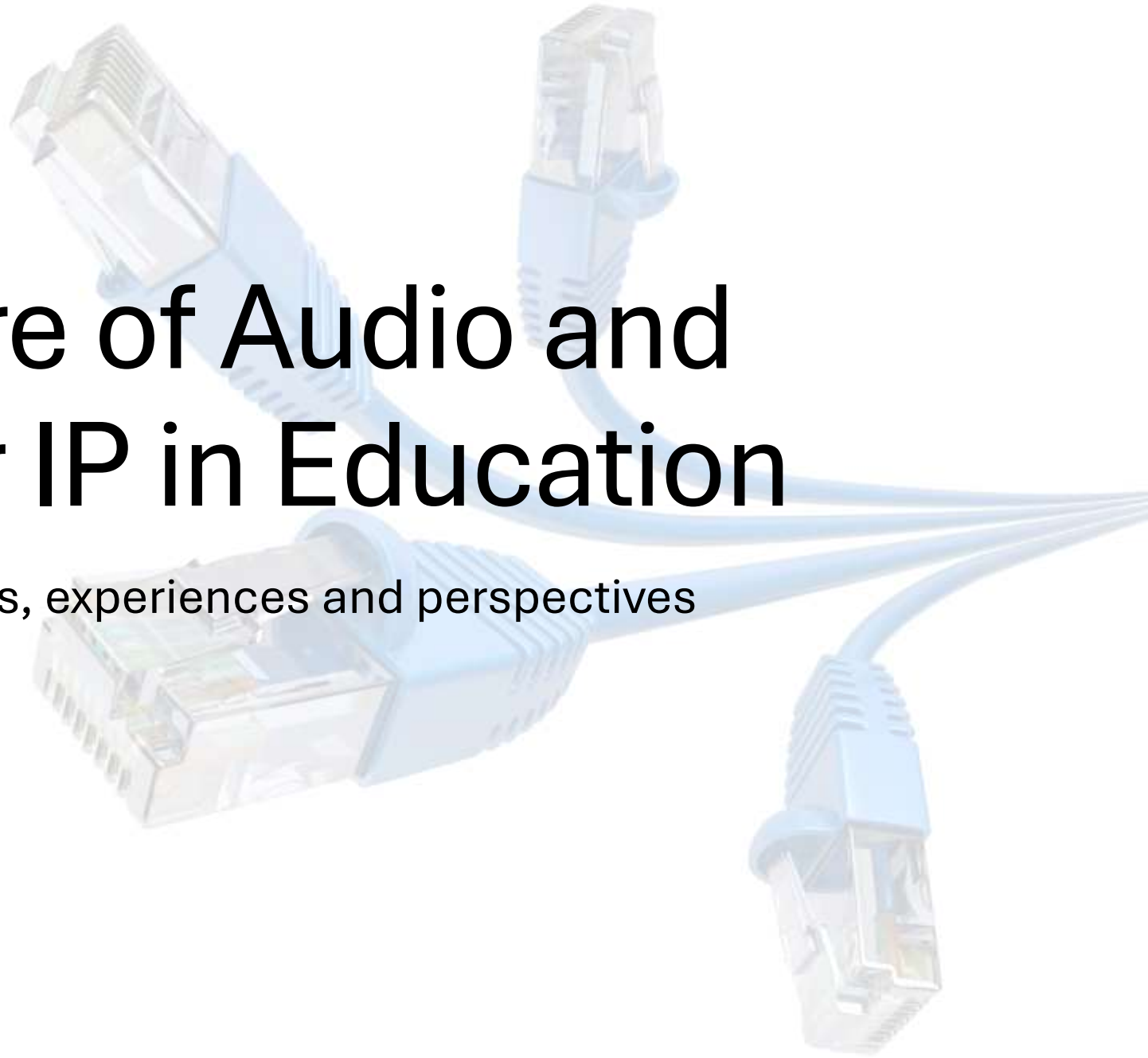
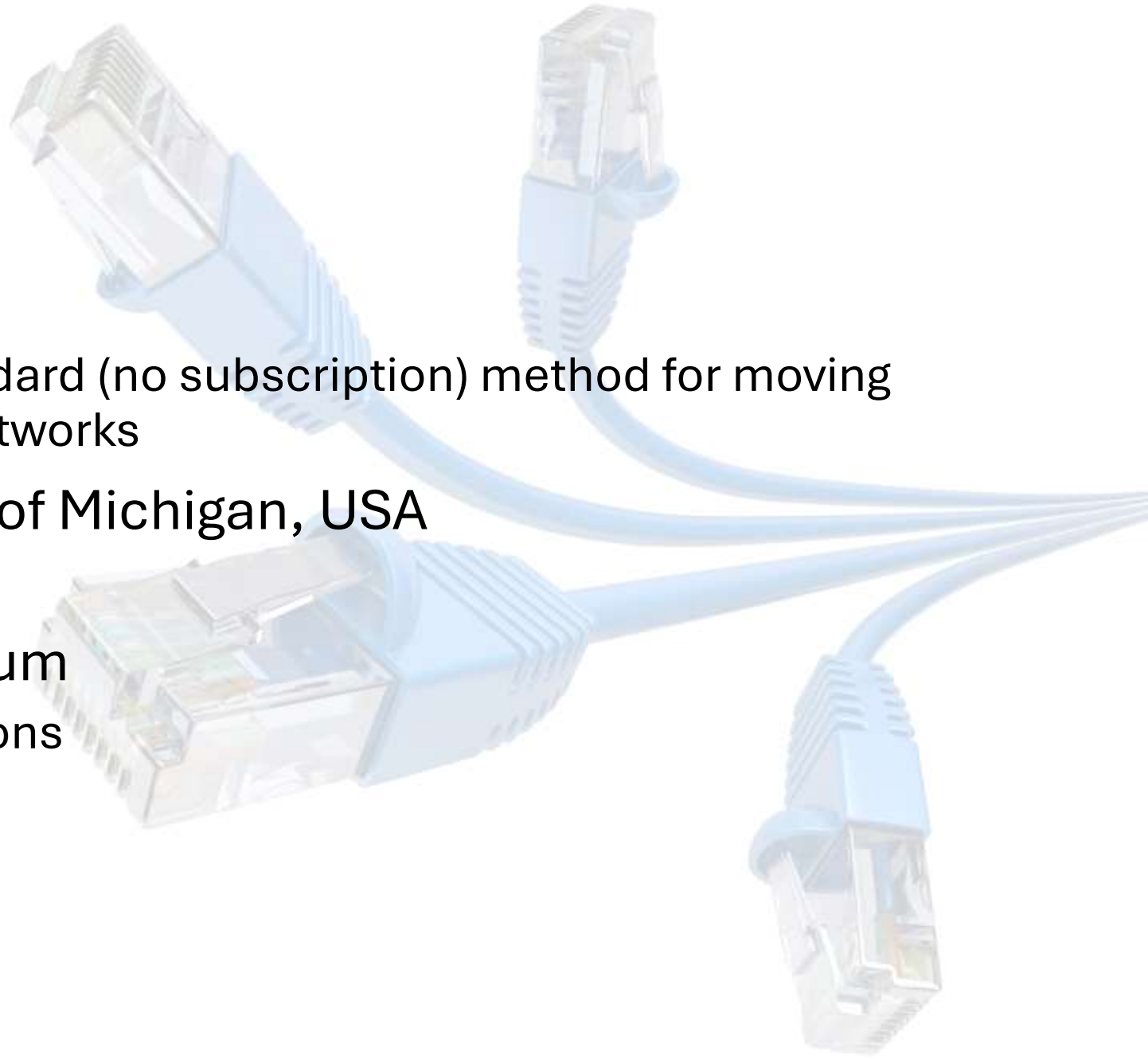


The Future of Audio and Video over IP in Education

The role of standards, experiences and perspectives



- **Rob Moodey**, Matrox Video

  about IPMX, a new, open standard (no subscription) method for moving video content over modern networks

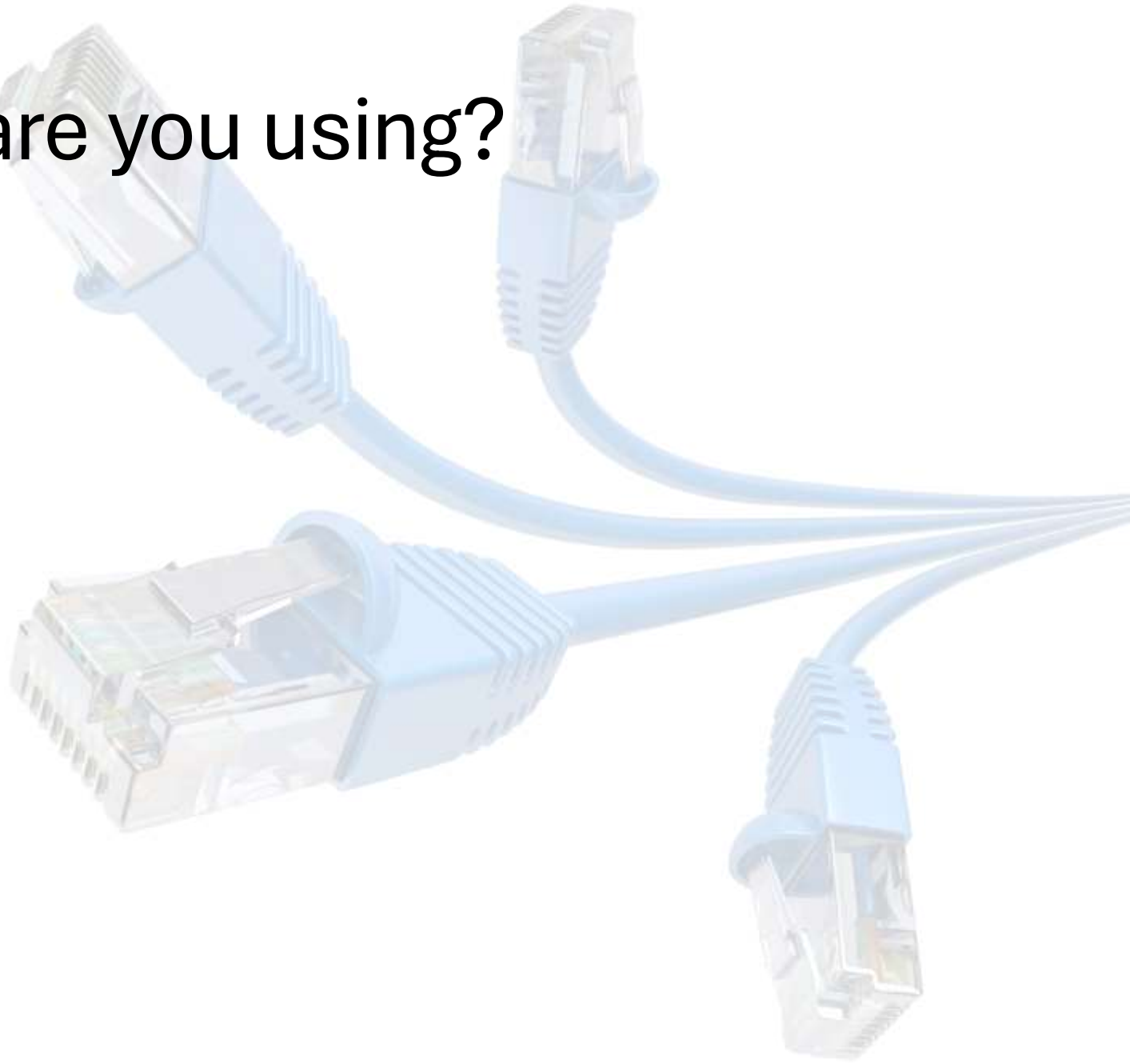
- **Jeremy Nelson**, University of Michigan, USA

  on SMPTE 2110

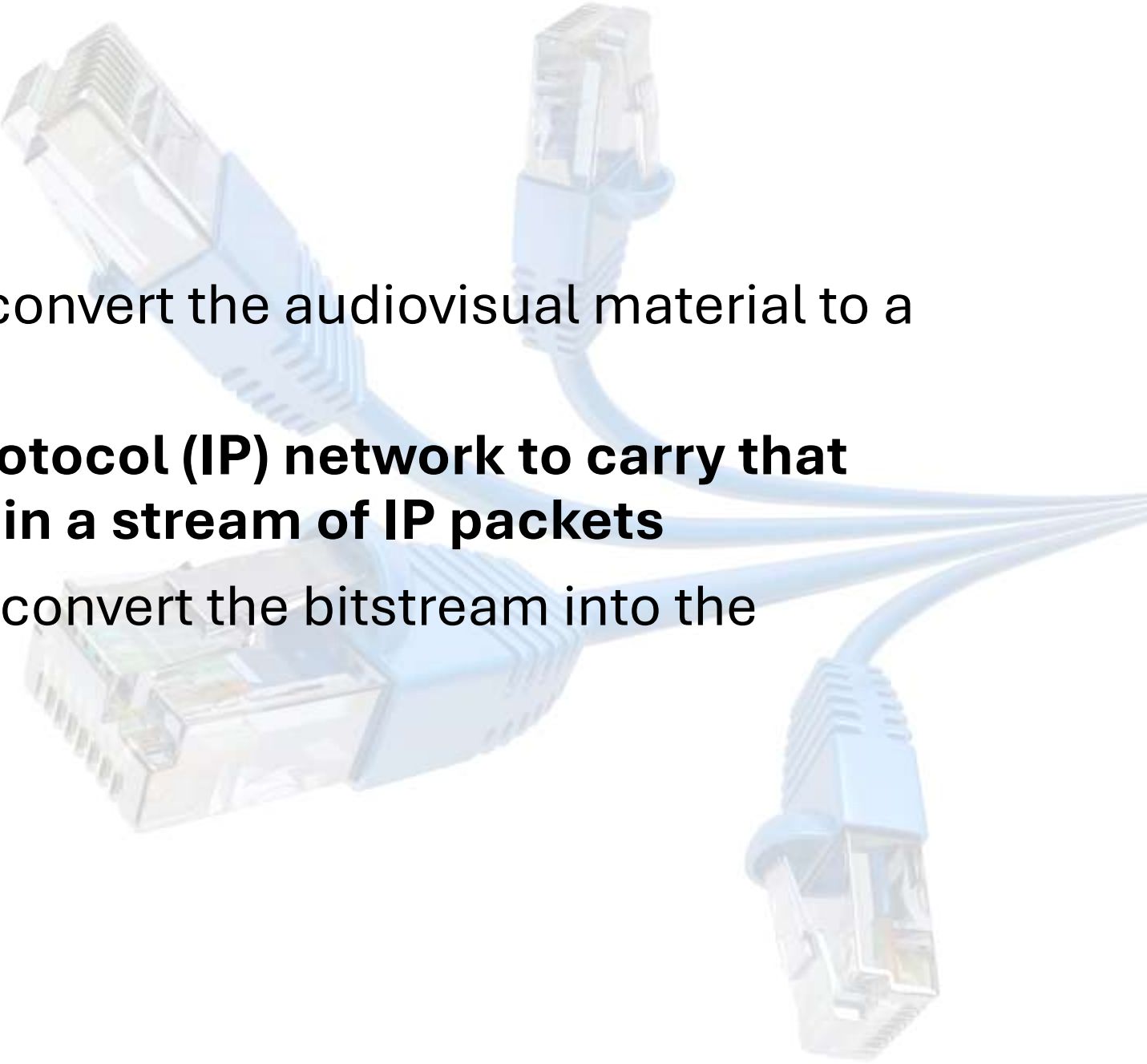
- **Mathy Vanbuel**, ATiT, Belgium

  AV over IP, exploring (the) options

What Video over IP are you using?



What do we mean?



1. The use of an encoder to convert the audiovisual material to a bitstream
2. **The use of an Internet Protocol (IP) network to carry that bitstream encapsulated in a stream of IP packets**
3. The use of a decoder to reconvert the bitstream into the audiovisual material

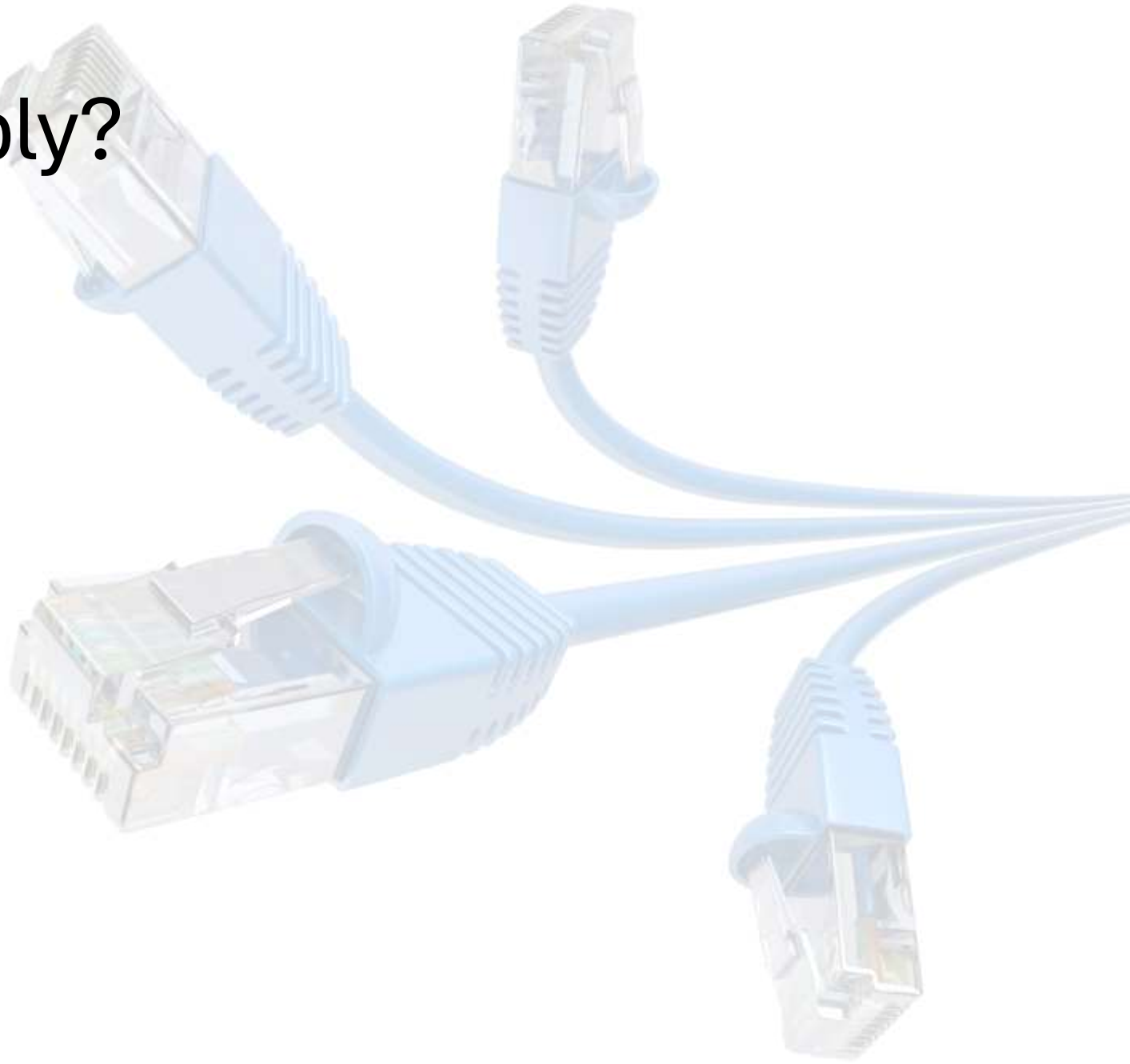
Why do we need AV over IP?

1. From analog to digital
2. IP infrastructure exists (no need for dedicated video infrastructure)
3. Scalable and cost effective
4. Flexible (quasi unlimited routing, multiple devices)
5. Efficient use of bandwidth (adaptive bitrates where applicable)
6. Ease of management (remote, automation, analytics…)
7. Secure
8. Standards

Where does this apply?

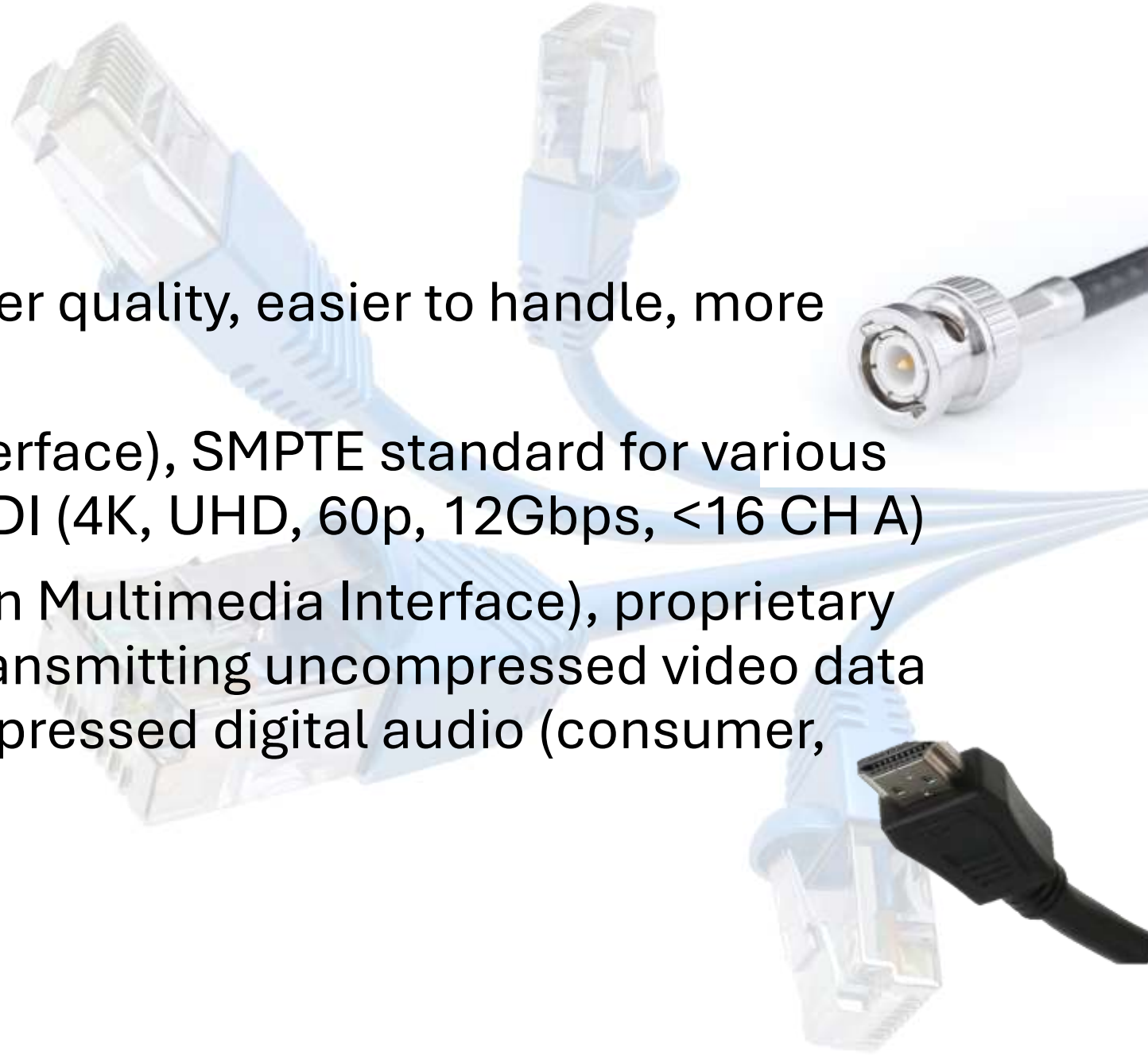
- Production
  - Studio
  - Contribution
  - Transmission, distribution
- (Storage)
- (Display)
- *(Conferencing)*

Not one size fits

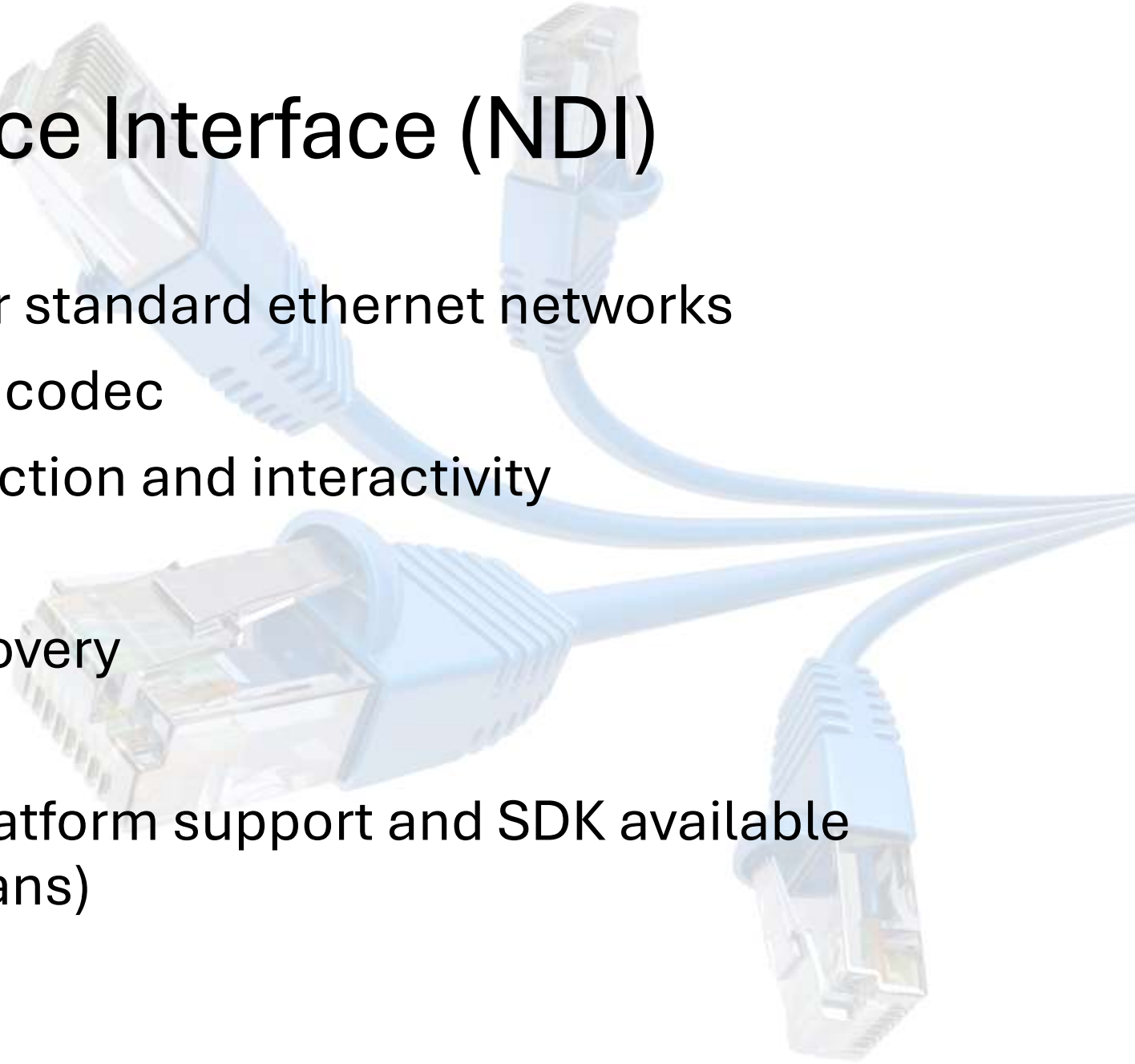


Production

- From analog to digital: higher quality, easier to handle, more efficient to transmit
- 1980: SDI (Serial Digital Interface), SMPTE standard for various developments up to 12G-SDI (4K, UHD, 60p, 12Gbps, <16 CH A)
- 2002: HDMI (High-Definition Multimedia Interface), proprietary audio/video interface for transmitting uncompressed video data and compressed or uncompressed digital audio (consumer, prosumer)
- AV over IP

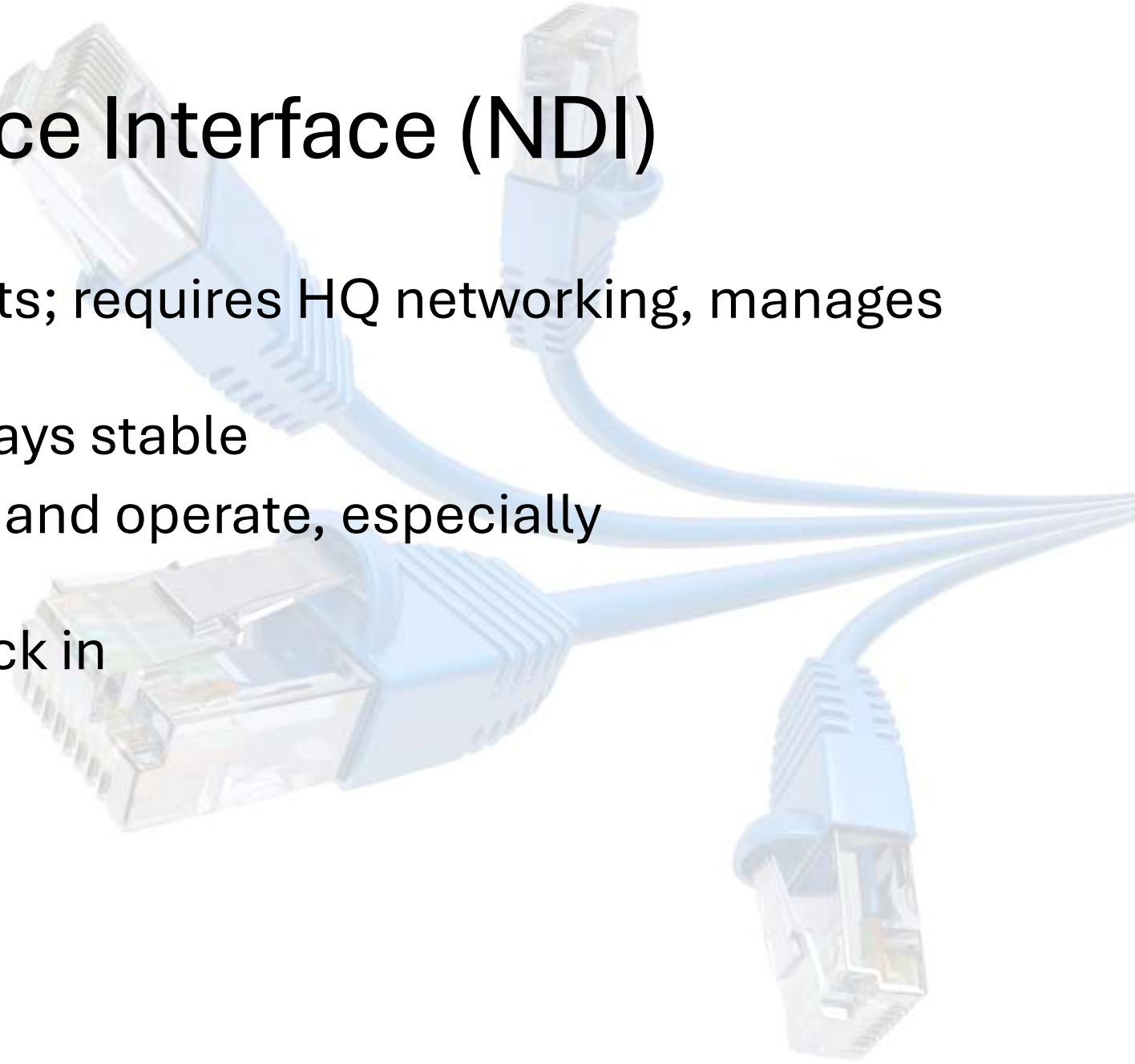


2015: Network Device Interface (NDI)



- Video and audio signals over standard ethernet networks
- High-efficiency, low-latency codec
- Minimal delay, for live production and interactivity
- Allows remote production
- Plug and play and auto discovery
- Synchronisation
- Industry standard? Cross platform support and SDK available
  NDI 5 : reliable UDP (over wans)

2015: Network Device Interface (NDI)

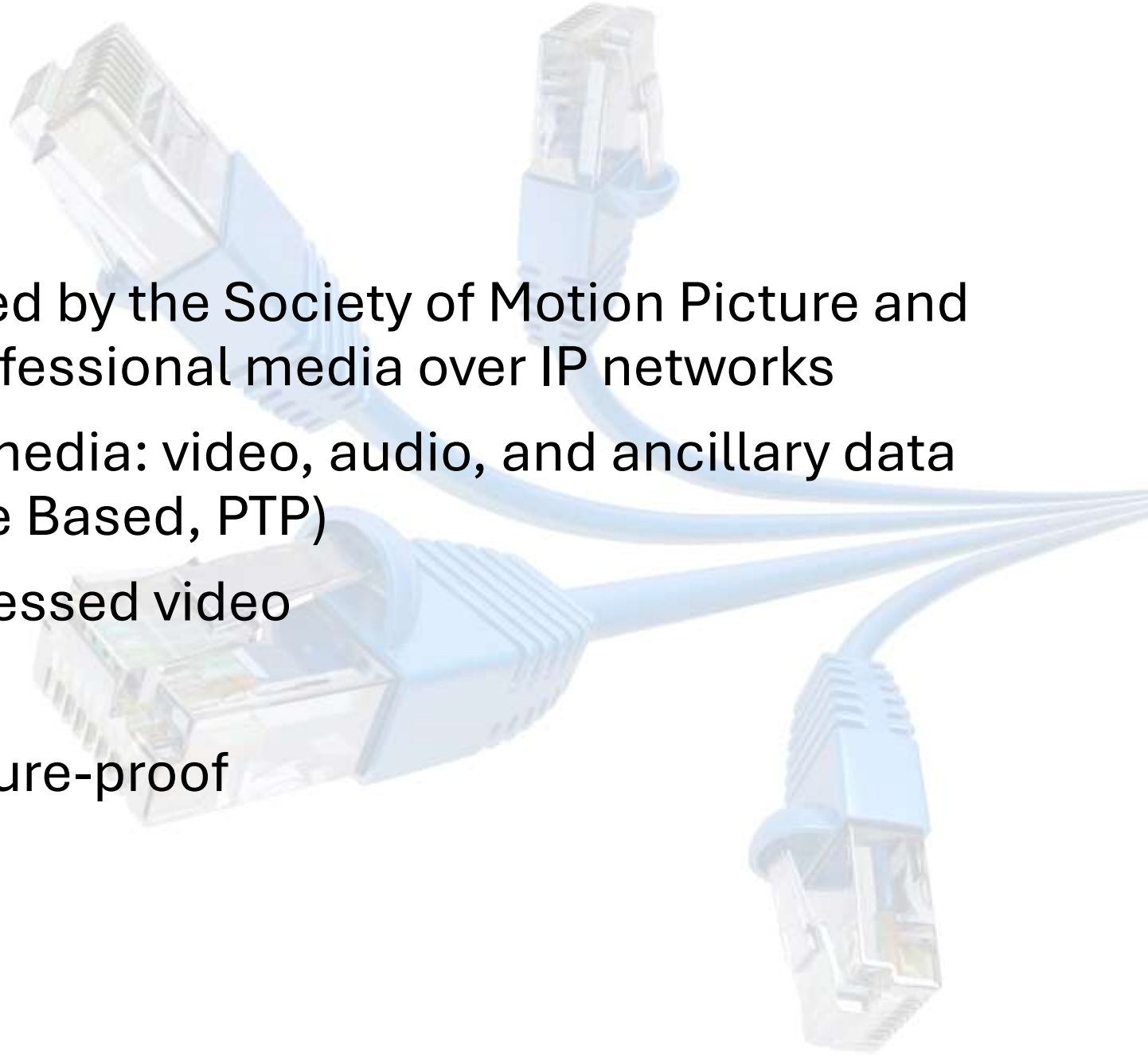


- High bandwidth requirements; requires HQ networking, manages switches…
- Latency is not 0 and not always stable
- Requires expertise to set up and operate, especially troubleshooting
- Compatibility and vendor lock in
  Licenses required
  Need for converters
- Conversion cost
- Processing power

2017: SMPTE 2110

- 2017: SMPTE 2110 describes how to send digital media over an IP network (Video Services Forum)

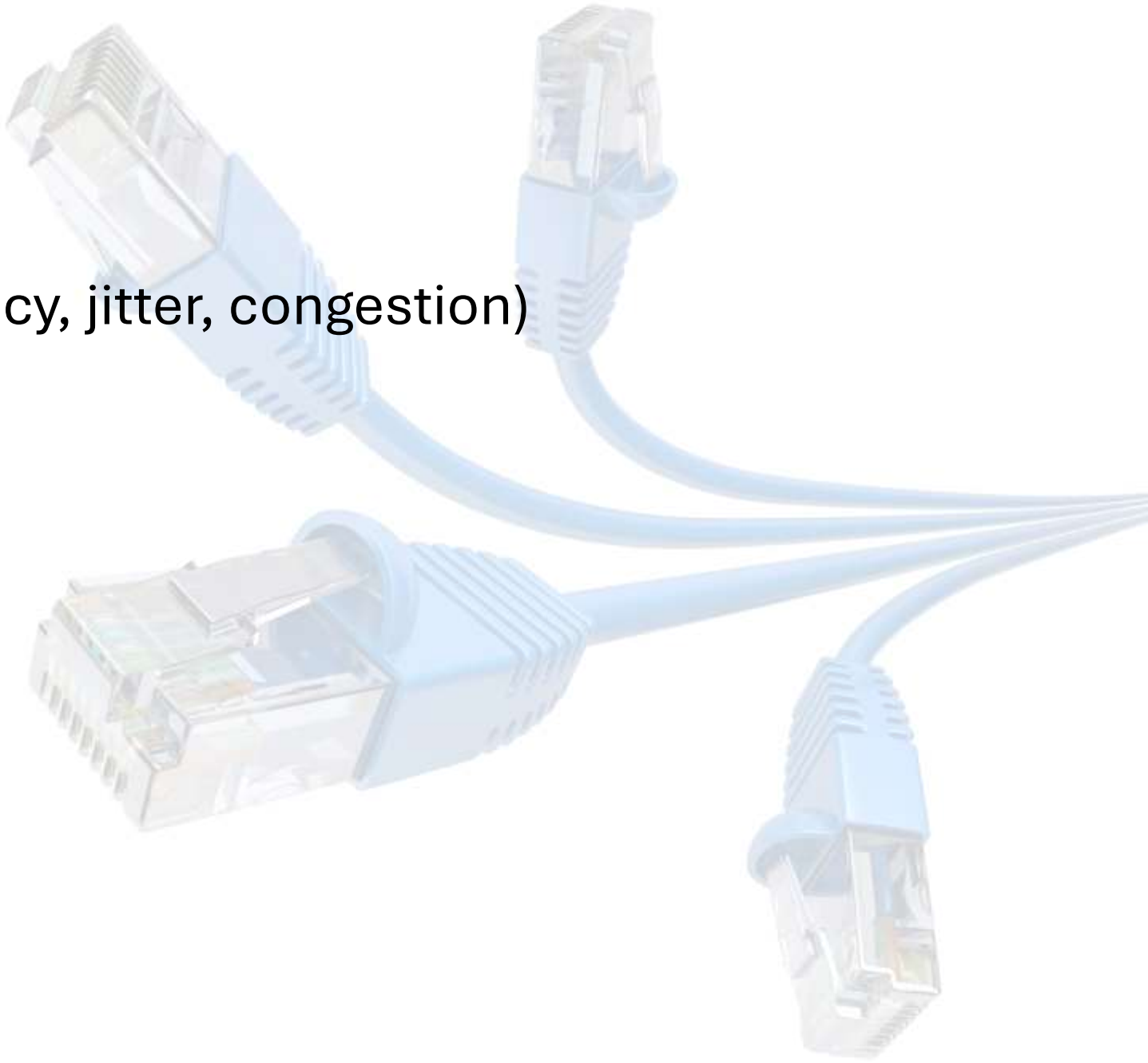
2017: SMPTE 2110



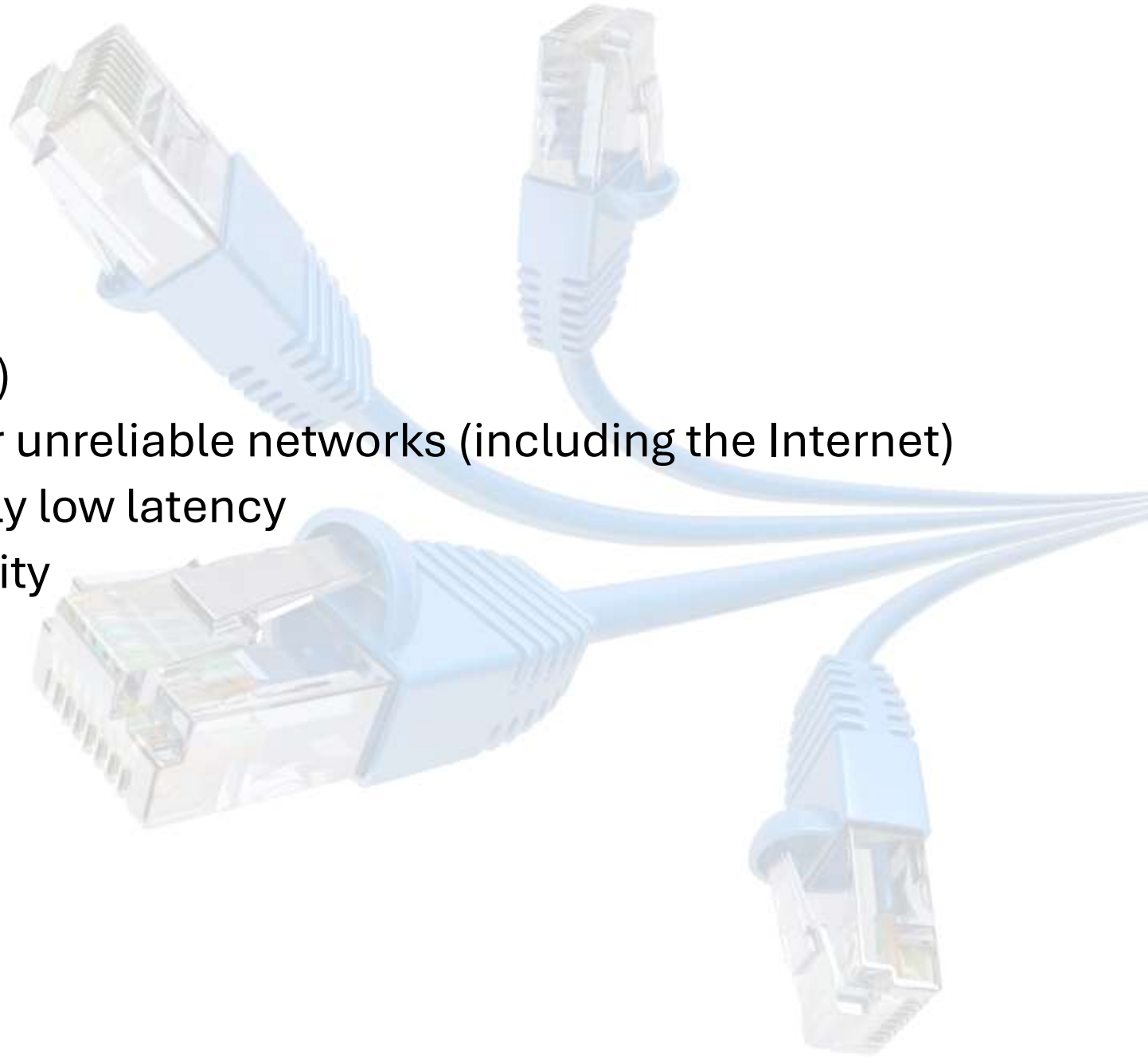
- suite of standards developed by the Society of Motion Picture and Television Engineers for professional media over IP networks
- transmission of individual media: video, audio, and ancillary data (separate streams, Essence Based, PTP)
- Uncompressed and compressed video
- Flexible and scalable
- Interoperable standard, future-proof

2017: SMPTE 2110

- Requires HQ network (latency, jitter, congestion)
- Complex technology
- Conversion cost

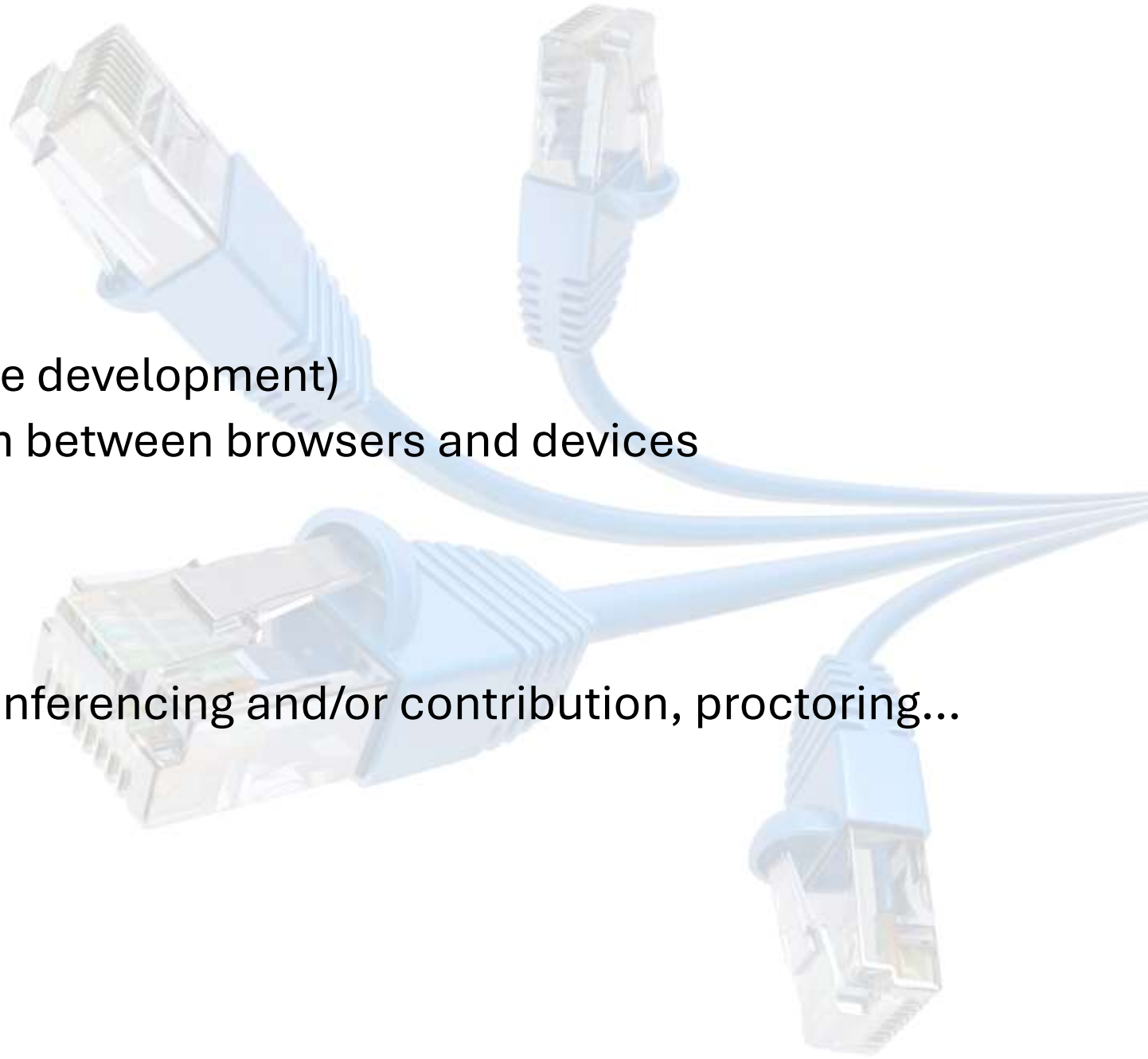


Other standards?



- srt
  - Industry standard (Haivision)
  - Reliable video transport over unreliable networks (including the Internet)
  - Adaptive bitrate and relatively low latency
  - Balances quality and reliability
  - complexity

Other standards?



- WebRTC
  - W3C and IETF owned (Google development)
  - Real time AV communication between browsers and devices
  - Peer to peer (low latency)
  - Open for developers (APIs)
  - Interactive
  - Not for production but for conferencing and/or contribution, proctoring…

Other standards?

- IPMX