# The Rise of IP in Remote Production Networks

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IP SHOWCASE THEATRE AT IBC2019 : 13–17 SEPT 2019

**20,000-Kilometer Remote Production Breakthrough**

**ITN coverage of IAAF World Relays 2019 in Yokohama Japan**

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## Un-compressed

### TIny COdec (TICO)

Light Compression
Process of initial Quantization of YUV (Video +Audio) Then TIC Compression
Very Low Latency/Lossless Quality
TICO Alliance/SMPTE as RDD35
Up to 4:1
Built for IP-High Bit Rate / HD/UHD/4k/3G-SDI

Uncompressed
Zero Compression Latency
Original Uncompromised Quality

### VC-2 Compression

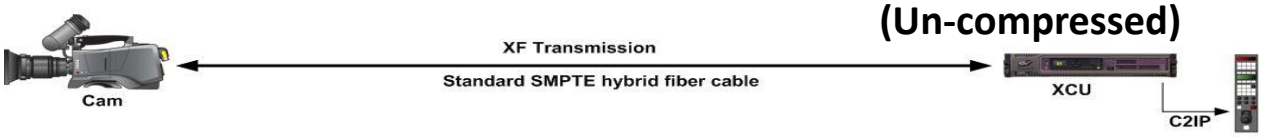
Intra-Frame
Wavelet Transform Encoding
Low Latency
(BBC-R&D) SMPTE ST 2042-1
2:1 or 4:1 compression
Built for IP Networks High Bit Rate
HD/UHD/4k/3G-SDI

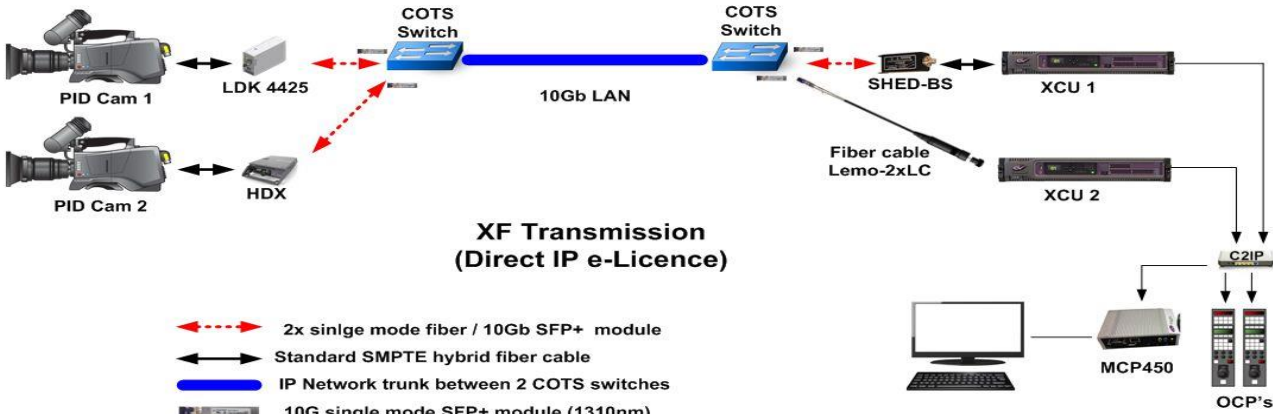



## 20,000-Kilometer Remote Production Breakthrough (Un-compressed)

# 20,000-Kilometer Remote Production Breakthrough (Un-compressed)

## XF Transmission
Communication Protocol between Camera and XCU

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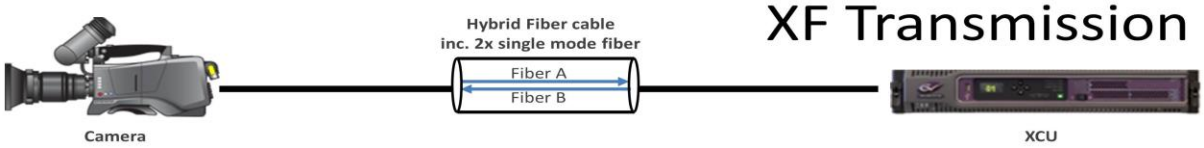


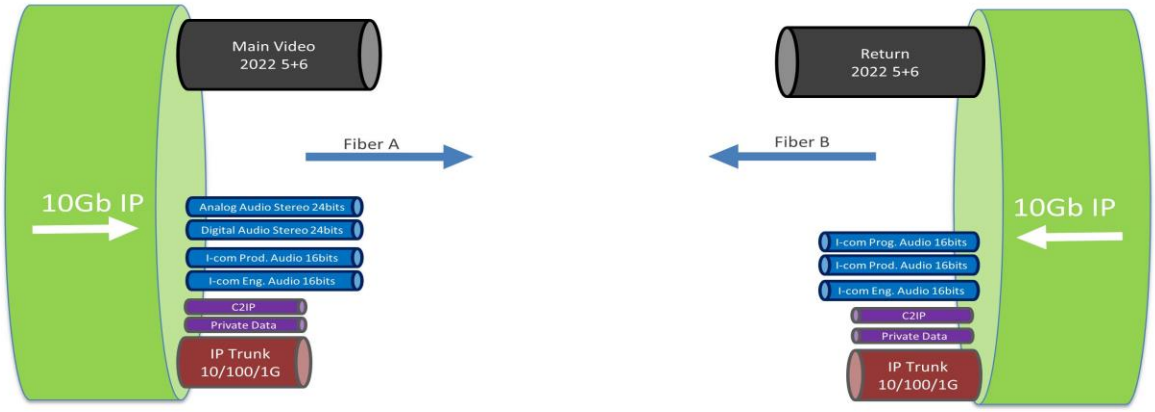


| | | |
|---|---|---|
| Main ; 1 Channel SMPTE 2022-5+6 | 1080i50/59 = 1,8Gb | 1080p50/59 = 3,4Gb |
| Return ; 1 Channel SMPTE 2022-5+6 | 1080i50/59 = 1,8Gb | 1080i50/59 = 1,8Gb |

C2IP + Private Data + I-com + Analog Audio + Digital Audio = ~ 8Mb
IP Trunk = 0Mb (when not connected)

## 6,848 -Kilometre LIVE Remote Production (Compressed)

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## ITN coverage of IAAF World Relays 2019 in Yokohama Japan (Light-compression)

Low Delay IP Optical Transport Networks allowed a successful delivery of Remote Production for IAAF.

Full two days live coverage between Yokohama Japan and NEP Andrews Hub in Sydney Australia.

- 30 high definition (HD) signals,
- 17 where main cameras, of which two Sony HDC4800 cameras in ultra-high frame rate,
- Graphics all done in Yokohama all were linked via diverse and hitless dual 10 gigabit-per-second IP network
- Distributed Production Network (DPN) to Sydney, 7,800km away,
- VC2 ultra-low-latency compression technology.

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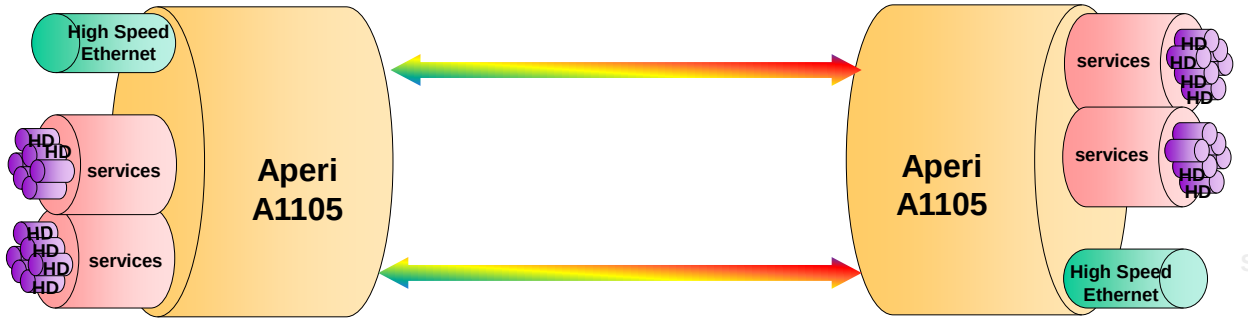




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# Transmission Delay

| Route | Latency ms | Notes/Cable |
|---|---|---|
| **Tokyo – London (Westbound via Indian Ocean)** | 258.1 ms | EAC+SMW5+BH2 |
| **Tokyo -- London (Eastbound via USA)** | 223.056 ms | Measured Latency PoP to PoP RNAL+AAE1 Cable |
| **Tokyo – London (Westbound via Indian Ocean) 2** | 237.406 ms | Measured Latency PoP to PoP EAC+SMW5 Cable |
| **Tokyo – London (Eastbound via USA)** | 247.988 ms | Measured Latency PoP to PoP C2C+AJC+ Apollo South Cable |
| **Tokyo – London (Eastbound via USA)** | 268.0533 ms | Measured Latency PoP to PoP C2C+Unity+ Yellow Cable |
| **Tokyo – Sydney** | 118.398.00 ms | AJC |
| **Tokyo – Sydney** | 166.16693 ms | JUS-HAWAII-TEC |
| **LA – Sydney** | 139.711 ms | TEC-AAG |
| **Sydney-London** | 280 ms | Asian/Pacific+Atlantic |

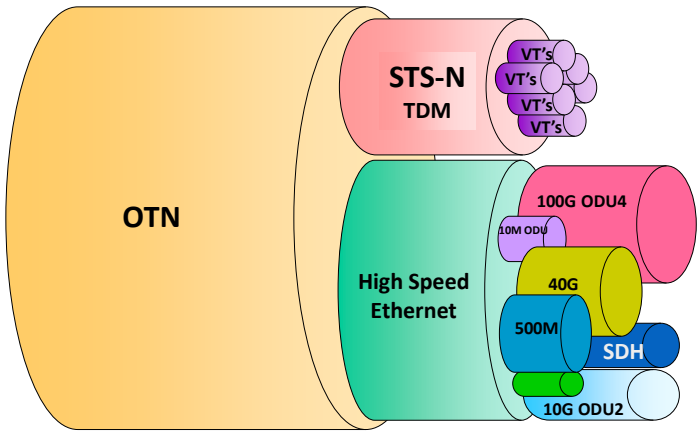


# Jitter

## Jitter (IP Packer Delay Variation)

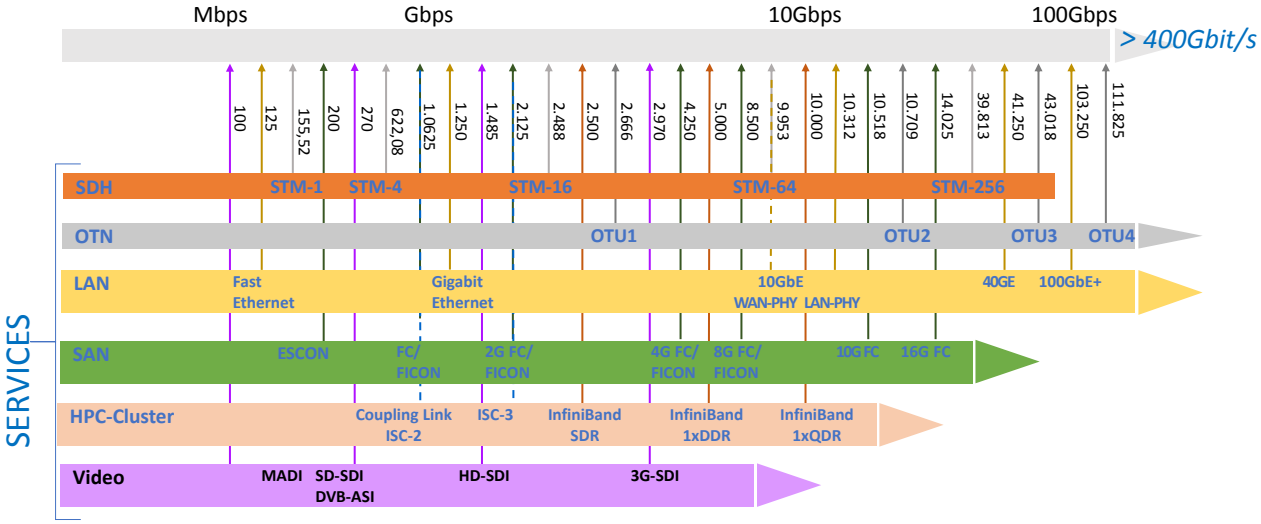
- IP Packet delay variation (IPDV) as defined in ITU-T recommendation Y.1540 is a 2-point metric that measures the difference in IP Transfer Delay (IPTD) of a pair of specified packets in a stream (otherwise known as “Jitter”).
- Measurements for IPDV are performed in accordance with Y.1540 section 6.2.4 – End-to-end 2-point IP packet delay variation. The performance parameters are defined for a set of packets (population of interest), the population of interest to be used must represent a single video flow having the same source, destination and session identification. The minimum IP Transfer Delay (IPTD) is used as the reference delay for all IPDV calculations, as per the ITU’s recommendations.
- Telstra commits to a maximum end-to-end IP packet delay variation of 7 milliseconds in respect of each event. Telstra will measure the IPDV on supported video flows, and does not include Media Data. Measurements will be performed at the points of ingress and egress to Telstra’s network.

# Open Transport Network (OTN)






# Simpler Multiservice Approach



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# Converged Remote Production

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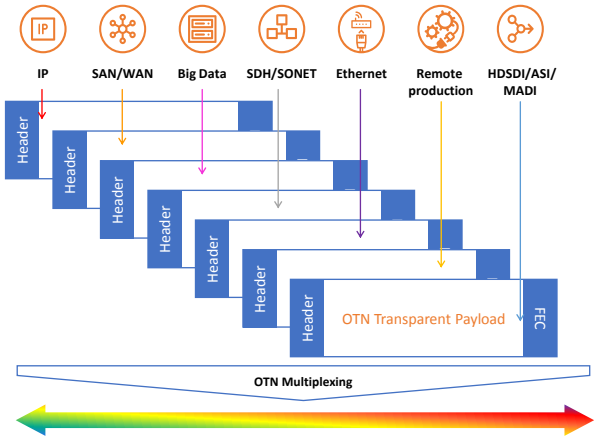
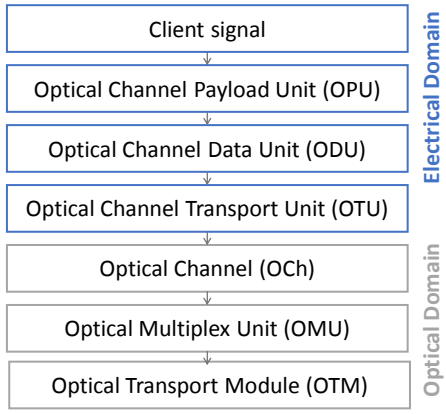
## Remote production a converged transport over OTN

Scalability and simplicity addressing the need for reliable remote production networks




IP → SDH/ SONET → Data → HDSDI → ASI → Remote



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# Reference Case Studies

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### PyeongChang 2018

**The Task:** Creating a far Stretched World Wide OTN Network to support Rights Holding broadcasters on behalf of the Host.

**The Magic:** Rights holding broadcasters send their content across Telstra's global fibre network to our Dual and Diverse Meet Me Points of Presence across the extending PyeongChang to Americas, Europe and North America. Telstra supplied high quality OTN low delay network.

**The Result:** Any Service any Interface and Any Protocol to many Countries. One Cost Effective Next Generation Global Open Transport Network accommodating all Host and RHB requirements.

### Women's Tennis Assoc. for Perform Group

**The Task:** A stated goal was to move as much as possible away from satellite delivery to fibre network delivery, and to limit dependency on SNG services to more IP terrestrial fibre services.

**The Magic:** Telstra delivered a scenario where they had one partner providing a consistent, reliable end to end content delivery network for all media from all courts from all WTA events around the world.

**The Result:** Telstra simplified the technology and partnerships required to deliver content for WTA.

### Remote production for Fox Sports Australia

**The Task:** Growing demand for live, high-quality content drives-up operational costs and excessive capital expenditure for broadcasters.

**The Magic:** Venues broken down by usage into bandwidth allocation high demand sites 50Gbps for near uncompressed workflows, regional 10Gig for smaller less used sites, providing both PoP and Path physical diversity. Telstra delivered a end-to-end IP network.

**The Result:** More efficiencies, optimisation of technologies, economies of scale. Innovative technology strategy, less resource wastage, accelerated speed to finished product.

# OTN Simplicity

**Open and simple**
Easy to deploy, plug and play, fully transparent

**Multi**
- Supports wide industry standard transport network interfaces including SMPTE, DVB interfaces
- Metro and efficient long haul transport networks
- Granular BW 100 Mbps to 100 Gbps
- Supports legacy services

**Network**
- Fully meshed
- High availability, fast protection mechanism
- Resilient fully meshed self healing network

**Media transport**
- Secured optical encrypted communication for all protocols in particular HDSDI with built in encryption algorithm e.g. GCM-AES-256
- Built in efficient forward error correction suitable for contribution media



# Thank you

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