What Is ‘Time’ Anyway?

Date <> Time-of-day <> Frequency <> Phase

SMPT-309M  SMPTE-12M  B&B/Tri-Level Sync

‘Offline’     ‘Real-time’

Different use cases care about timing accuracy to differing granularity.
IP-Based Production: Does ‘Real-time Processing’ even exist?

Audio and video takes different paths through the system with different processing latencies.

Video and audio samples can be accurately aligned for monitoring and output.

Processing devices may preserve or overwrite timestamps depending on use.

devices register as senders and lock to PTP clock.

All flows (audio/video streams) are timestamped against PTP.

Real-Time processing >> Minimising & Managing Latency

Arguably, since the advent of digital video and certainly with the move to IP there is no such thing as ‘real-time’ processing. The challenge is to minimise latency to a level where its impact can be ignored. But at some point it cannot be ignored and must be managed – otherwise the impact can be disastrous to the ability to make quality programming.
Outside Events

IP studio architectures are already being deployed in outside broadcast facilities (OB Trucks)

Onsite live production, whether IP or not, is typically too costly for many events

Outside Events

People onsite are a significant cost and can also be very inefficient for low-profile/short events

Remote production keeps operational staff at a central location reducing costs
Production With Remote Sources

Sources captured/relocated over high-bandwidth links allowing use of fixed studio facilities at production centre

Compression reduces link bandwidth but introduces latency

More Sources = More Bandwidth
Remote Controlled Production

Link bandwidth can be reduce by keeping all the ‘heavy lifting’ on site with simple remote control and monitoring of on-site systems.

Simple remote control doesn’t compensate for latencies, impacting the quality of coverage.

What the operator intends:

<table>
<thead>
<tr>
<th>00:07</th>
<th>00:08</th>
<th>00:09</th>
<th>00:10</th>
<th>00:11</th>
<th>00:12</th>
<th>00:13</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source 1</td>
<td>Source 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

What actually gets switched (what the viewers sees):

<table>
<thead>
<tr>
<th>00:11</th>
<th>00:12</th>
<th>00:13</th>
<th>00:14</th>
<th>00:15</th>
<th>00:16</th>
<th>00:17</th>
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</tr>
</tbody>
</table>
Time-Compensated Remote Controlled Production

By delaying the mixer processing the compensate for the latencies accurate switching is possible.

What the operator intends:

What gets switched (what the viewers sees):

Local simulations of mixing are done using proxy sources to give use the feel of ‘real-time’ operation.

Suitcase TV

Time-Compensated Remote Controlled Production

Iphrame Flyaway is based on Architecture 3 and allows production to be done over IP links as low as 20Mb/s

LOCATION B/C
• Anywhere
  (typically at Production centre)

LOCATION A
• Event Site

LOCATION B
• Production Centre

Iphrame Flyaway is based on Architecture 3 and allows production to be done over IP links as low as 20Mb/s.
What about sources not generated at the event location?

A second stage (downstream) mixer can be used to include local sources – all controlled as part of the same proxy source mix.
Distributed (Multi-Stage) Time-Compensated Production

Iphrame Flyaway++ can be used in the Architecture 4 model allowing sources from multiple locations to be mixed in a frame accurate way whilst minimising link bandwidth required.

Remote Production Trial at Euro 2016

The trial with BBC Sport showed architecture 4 was achievable (combining sources from Paris and Salford in 1 production)
Remote Production Trial at Euro 2016

Control workstations in Paris and Salford allowed operators to mix between all sources with ‘real-time’ PGM+PVW outputs generated from proxies.
Where Next?
Architecture 5 – Hybrid Production with Proxy Sources

The time-compensated concepts of Architecture 3&4 can be applied to traditional hardware mixers in a variety of ways – this 5th architecture we’ve been developing with Sony is a hybrid of software and hardware processing allowing operation in an existing HD gallery (using HDSDI proxies) with high-quality A-B feeds being sent back for final mix processing on a slave M/E bank.

How did he do?
Watch Ed whizz through remote production architectures in 10 mins on our website (hopefully it’ll be very similar!)

suitcasetv.com/live-event-mixing