# Input Video Sources

## Input Data Sources

**Traditional Camcorder – No RTSP**

Local Copy

HDMI Out

HDMI to RTSP Converter

**New Camcorders – Wi-Fi, Ethernet and RTSP**

Local Copy

**1 or More IP Cameras – Wi-Fi, Ethernet and RTSP**

Security Check (Network access & user login)

iPads or Laptop for Entering Metadata

*One or More Linux Containers*

End Points

Video

Security Check (Network access & user login)

## Output Video Clips

Request

File Transfer (Video & Metadata)

2 – 3 iPads

*Streaming video*

Request

File Transfer (Video & Metadata)

2 – 3 Win10 Laptops

**1 or More Phone Camera – Wi-Fi and Streaming**

Local Copy

Video Device Profiles (IP address and security)

Volumes

*Streaming video alternate source*

*Another Linux Container*

Optional Video Streaming Server

IP Network

The length of the video clips varies from around 10 seconds to 20 minutes.

10 sec     Up to 20 min

The video files would be organized by event scheduled, the source device identification and the video properties such as time and type

Remote Viewers

## Traditional Camcorder – No RTSP

Local Copy

HDMI Out

HDMI to RTSP Converter

### H.264 LAN HDMI Video Encoder HTTP RTSP RTMP UDP to IPTV Live Stream

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New Camcorders – Wi-Fi, Ethernet and RTSP

Local Copy
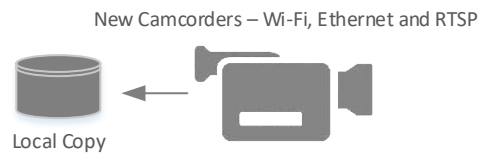
*The AG-CX10 includes advanced IP networking features, such as built-in Wi-Fi support for HD live streaming to YouTube, Facebook, and other social sites via RTMP/RTMPS/RTSP protocols. In addition, the AG-CX10 includes an Ethernet connection for streaming and an NDI|HX connectivity for use in live production, as well as ROP tablet-based control.*

New Panasonic AG-CX10

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1 or More IP Cameras – Wi-Fi, Ethernet and RTSP

*Assorted IP Cameras*

# Input Video Sources

## Traditional Camcorder – No RTSP

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## New Camcorders – Wi-Fi, Ethernet and RTSP

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## 1 or More IP Cameras – Wi-Fi, Ethernet and RTSP

## 1 or More Phone Camera – Wi-Fi and Streaming

Local Copy

Local Copy
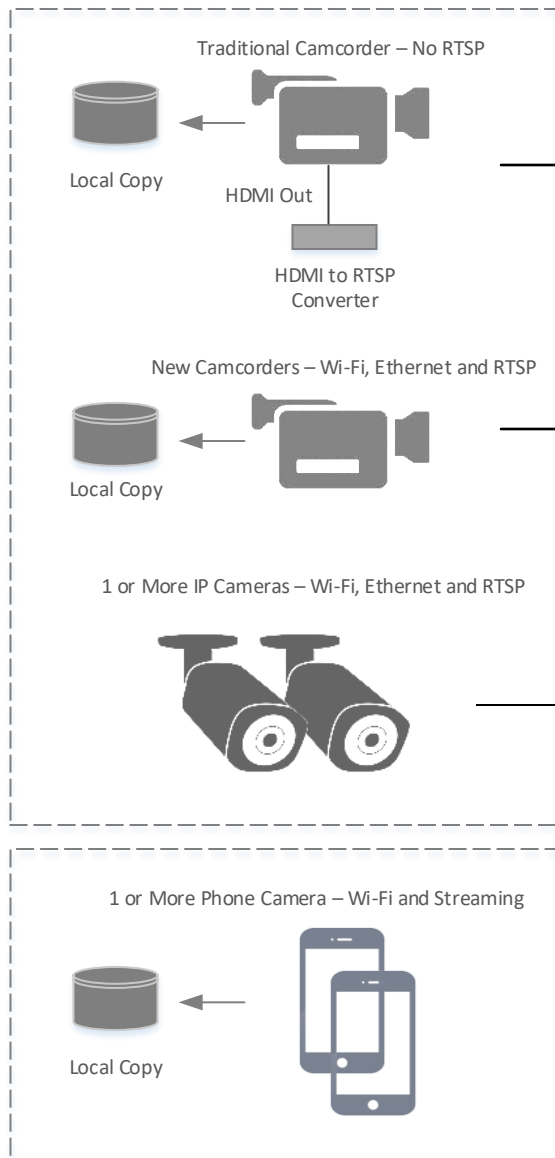
# Permanent Facilities With Cabling and Power

*This network could have a mix of indoor and outdoor cameras*

Ethernet Network

Router

Wi-Fi Access Point

Wi-Fi Access Point

iOS Recording Quality | Hudl Support

iOS Recording Quality | Hudl Support

# Consumers

2 – 3 iPads

Linux Server Running Docker
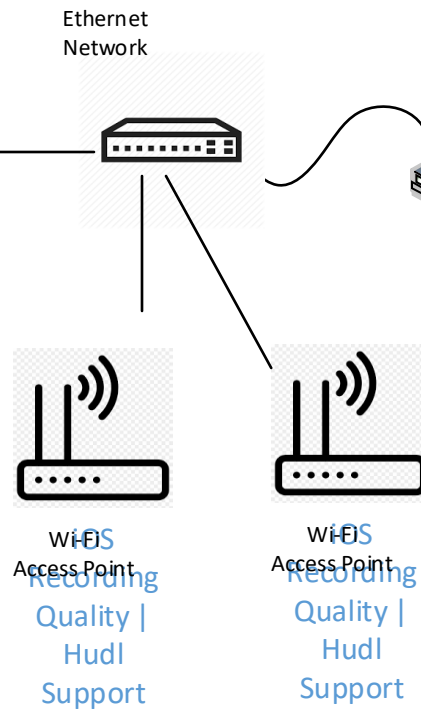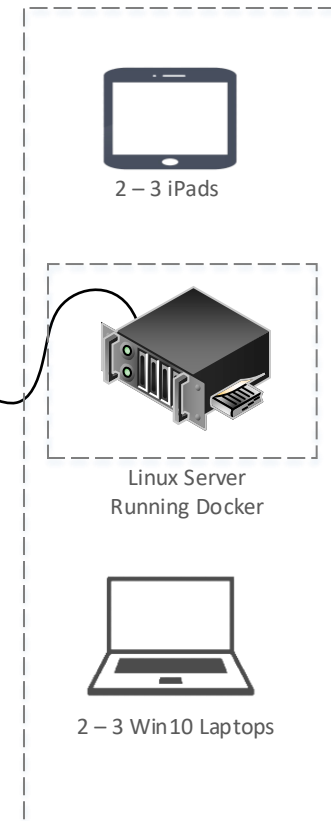
Secure Room With UPS and Backup Device

2 – 3 Win10 Laptops

# Temporary Facilities With Battery Powered Devices

## Input Video Sources

### Traditional Camcorder – No RTSP

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HDMI to RTSP Converter

### New Camcorders – Wi-Fi, Ethernet and RTSP

Local Copy

### 1 or More IP Cameras – Wi-Fi, Ethernet and RTSP

### 1 or More Phone Camera – Wi-Fi and Streaming

Local Copy

## Portable Network

Ubiquiti Mesh Wi-Fi

Battery

*This network should cover a full sideline of any outdoor sports field*

Battery

Ubiquiti Wi-Fi Access Point

Router

Ubiquiti Mesh Wi-Fi

Battery

## Consumers

2 – 3 iPads

Linux Laptop Running Docker

2 – 3 Win10 Laptops

# Input Video Sources

## Traditional Camcorder – No RTSP

Local Copy

HDMI Out

HDMI to RTSP Converter

## New Camcorders – Wi-Fi, Ethernet and RTSP

Local Copy

## 1 or More IP Cameras – Wi-Fi, Ethernet and RTSP

*One or More Linux Containers*

End Points

Video

Optional OBS Video Streaming Server Software

OBS

IP Network

*Streaming Video Sources*

## 1 or More Phone Camera – Wi-Fi and Streaming

Local Copy

Remote Viewers

The length of the video clips varies from around 10 seconds to 20 minutes.

| 10 sec | | Up to 20 min |

# Video Sources Security Requirements

## Input Video Sources

**Traditional Camcorder – No RTSP**

Local Copy

HDMI Out

HDMI to RTSP Converter

**New Camcorders – Wi-Fi, Ethernet and RTSP**

Local Copy

**1 or More IP Cameras – Wi-Fi, Ethernet and RTSP**

Wi-Fi Network

Router

*One or More Linux Containers*
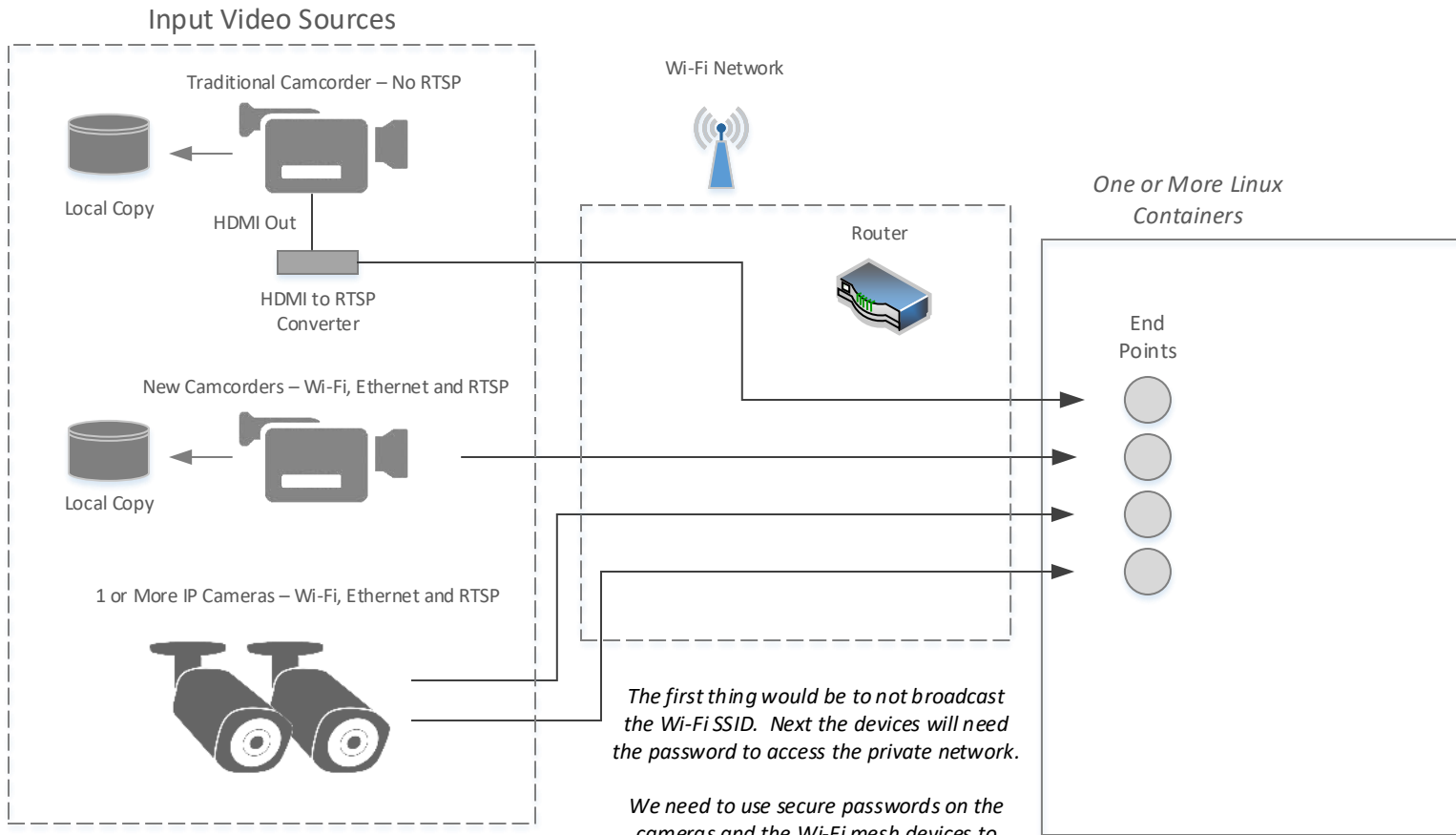
End Points

*The streaming device are not programmable like an iPhone so we need to have a security plan for these endpoints.*

*The first thing would be to not broadcast the Wi-Fi SSID. Next the devices will need the password to access the private network.*

*We need to use secure passwords on the cameras and the Wi-Fi mesh devices to protect the control panel of the IP camera from remote access hacks.*

*We should also set the router firewall to block open ports by default.*

*If possible we should use SSL to secure the network from someone scanning for passwords in the open.*

*The equipment needs to be physically secured to prevent someone from stealing it. Use locks and chains to protect the routers, network access points, and cameras and tablets from being lost in the confusion of a busy game environment.*

## Coaches Devices Security

iPads or Laptop for
Entering Metadata

### One or More Linux Containers

Wi-Fi Network

## Output Video Clips

Router

End
Points

Video

The Linux Server needs to
have all the patches
applied to protect from
common hacks targeting
Linux systems.  Ideally the
Linux servers are not
accessible from the
internal network at the
customer location.  If
needed use a VLAN to
isolate the network.

The same router
firewall will be
needed to protect
the devices used by
the coaches and any
connection for
streaming video

Request

File Transfer
(Video &
Metadata)

2 – 3 iPads

Request

File Transfer
(Video &
Metadata)

2 – 3 Win10 Laptops

Volumes

Internet Network Security

End
Points

Video

*Streaming video*

Volumes

*Streaming video
alternate source*

*Another Linux Container*

Optional
Video Streaming
Server
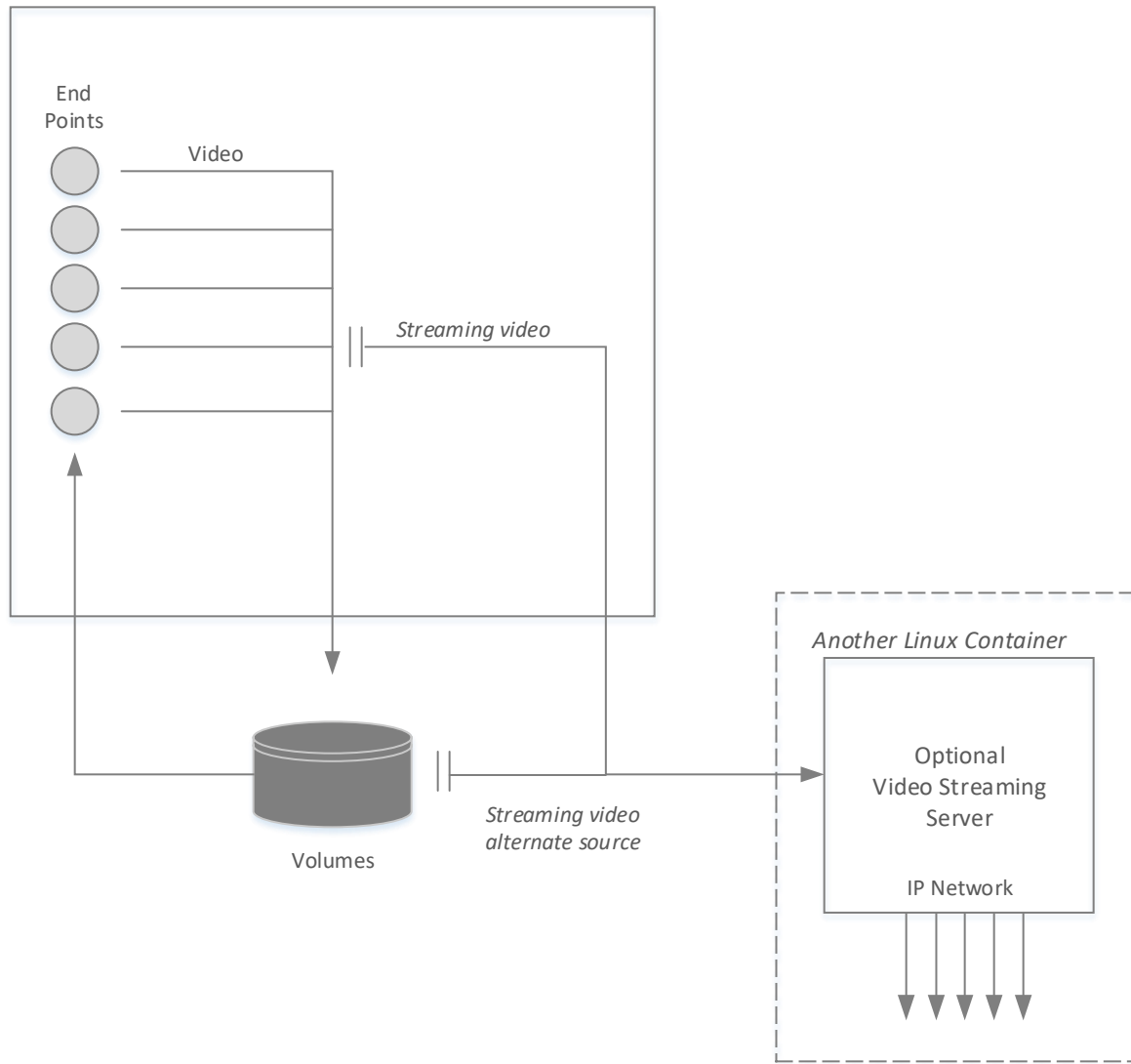
IP Network

*If the customer wants to live stream the
video to their fans on the Internet, they
need to protect the video streaming
server from direct attack from outside
locations, also, they should keep this
network separate from the internal
business network of the school.*

*This will take some additional research on
best practices for streaming video from
an on-premises server. Another option is
to stream the video directly to a business
that provides streaming services such as
Facebook, or Google.*

Remote Viewers
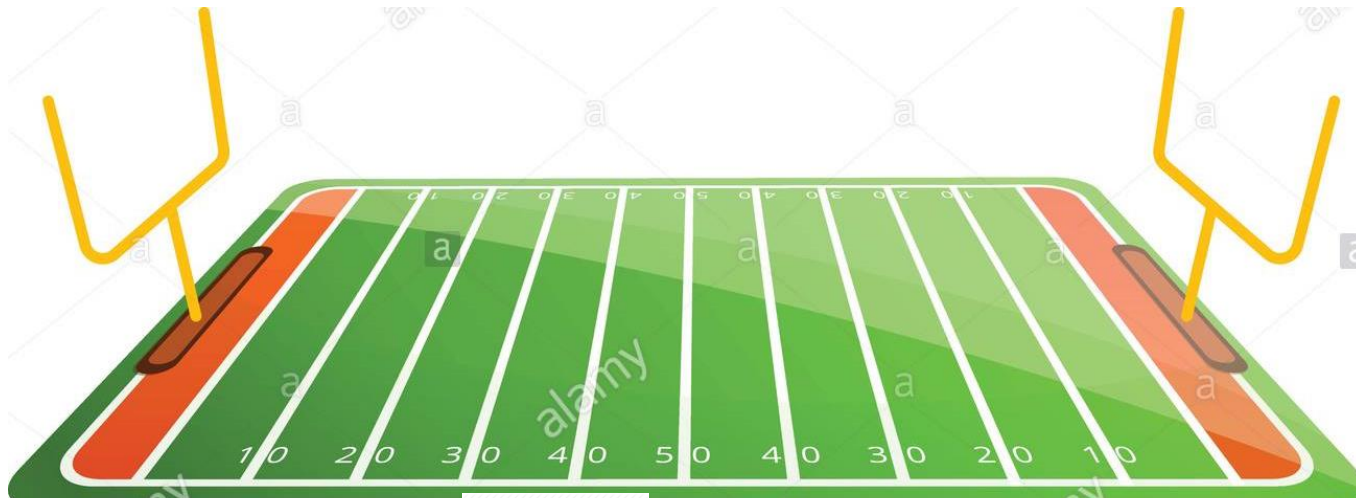
Wi-Fi
Access
Point
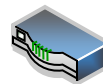
Wi-Fi
Access
Point

# Each Sport Will Have a Different UI, Properties and Output

| Properties | Properties | Properties | Properties | Properties | Properties | Properties |
|---|---|---|---|---|---|---|

| Football UI | Soccer UI | Vollyball UI | Basketball UI | Wrestling UI | Baseball UI | Lacrosse UI |
|---|---|---|---|---|---|---|

| Tagging Data JSON Format | Tagging Data JSON Format | Tagging Data JSON Format | Tagging Data JSON Format | Tagging Data JSON Format | Tagging Data JSON Format | Tagging Data JSON Format |
|---|---|---|---|---|---|---|
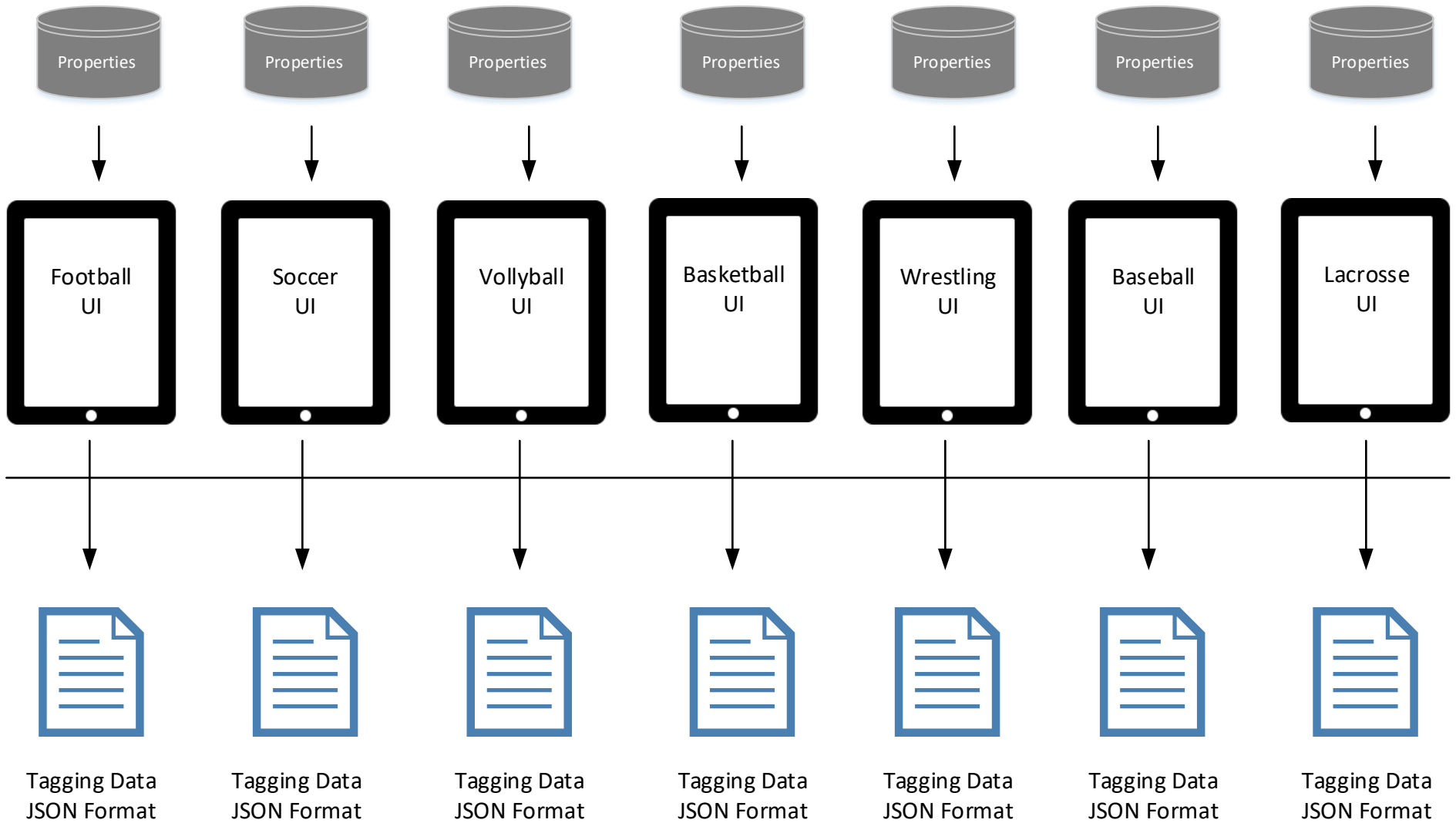
# There are Three Ways to Use Time in Sports

## Time Remaining in Game



00:02:06

Many sports have a time limit when the games end; for example professional basketball games are 48 minutes long, football is 60 minutes, soccer is 90 minutes. As the clock runs down to 00:00, the pressure becomes more urgent.

## Elapsed Time Since Start



+ 00:09:13

Some sports use time to measure performance. Running track events like a 100 meter sprint race can take only 9 seconds but running the 26 mile "Marathon" race from the start to the end can last as long as 3 hours.

## Accurate Time of Day
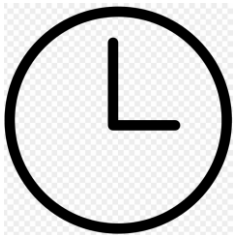


03:00:00

Other sports like baseball or golf or tennis do not use a timer. They can run as long as needed. The only time that matters is what time the event is supposed to start.

Question: How To Link Logging Data with Recorded Video?

Assistant Creating Play-by-Play
Tagging Document Using App

MP4

Tagging Data
JSON Format

## Cloud Services
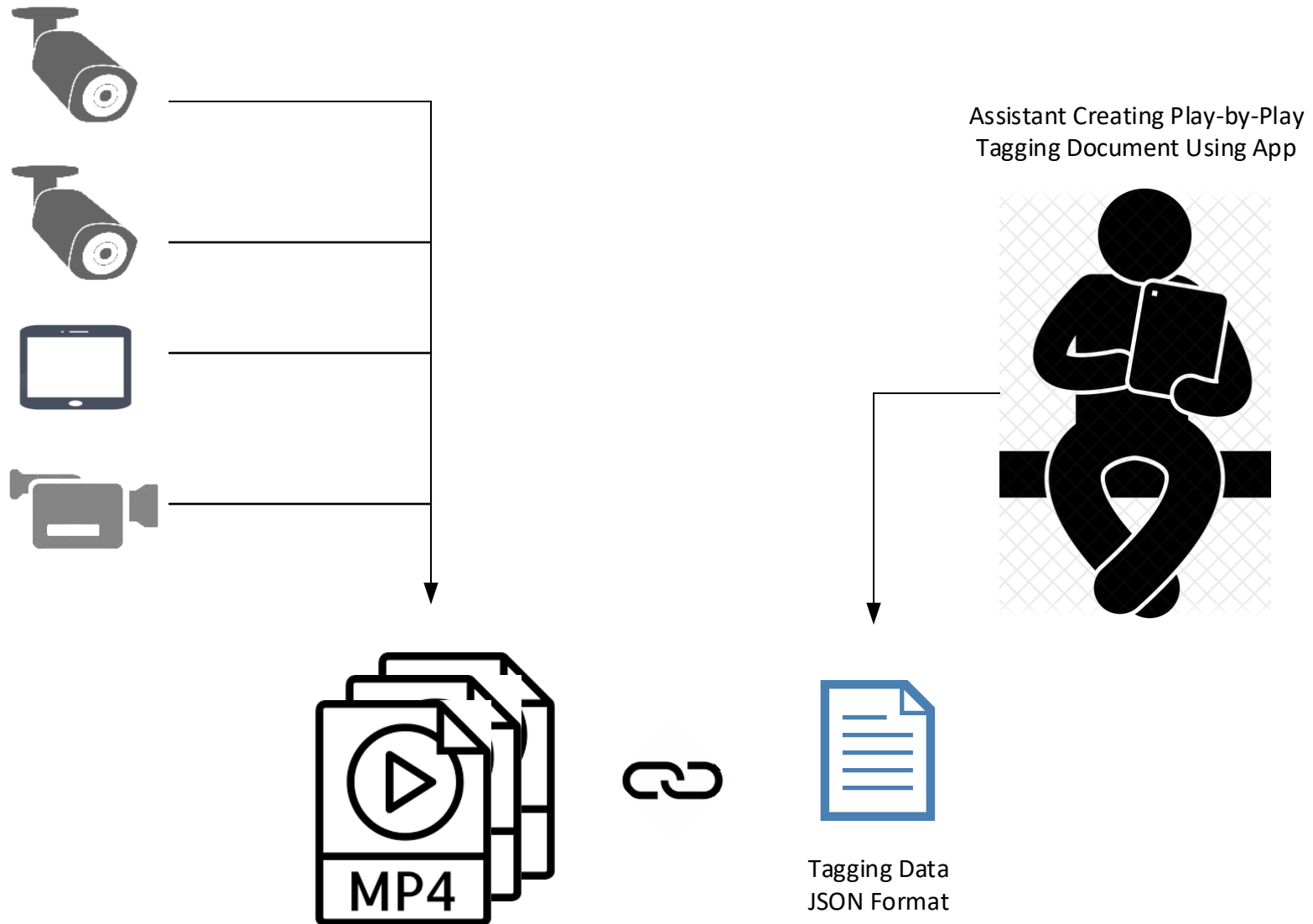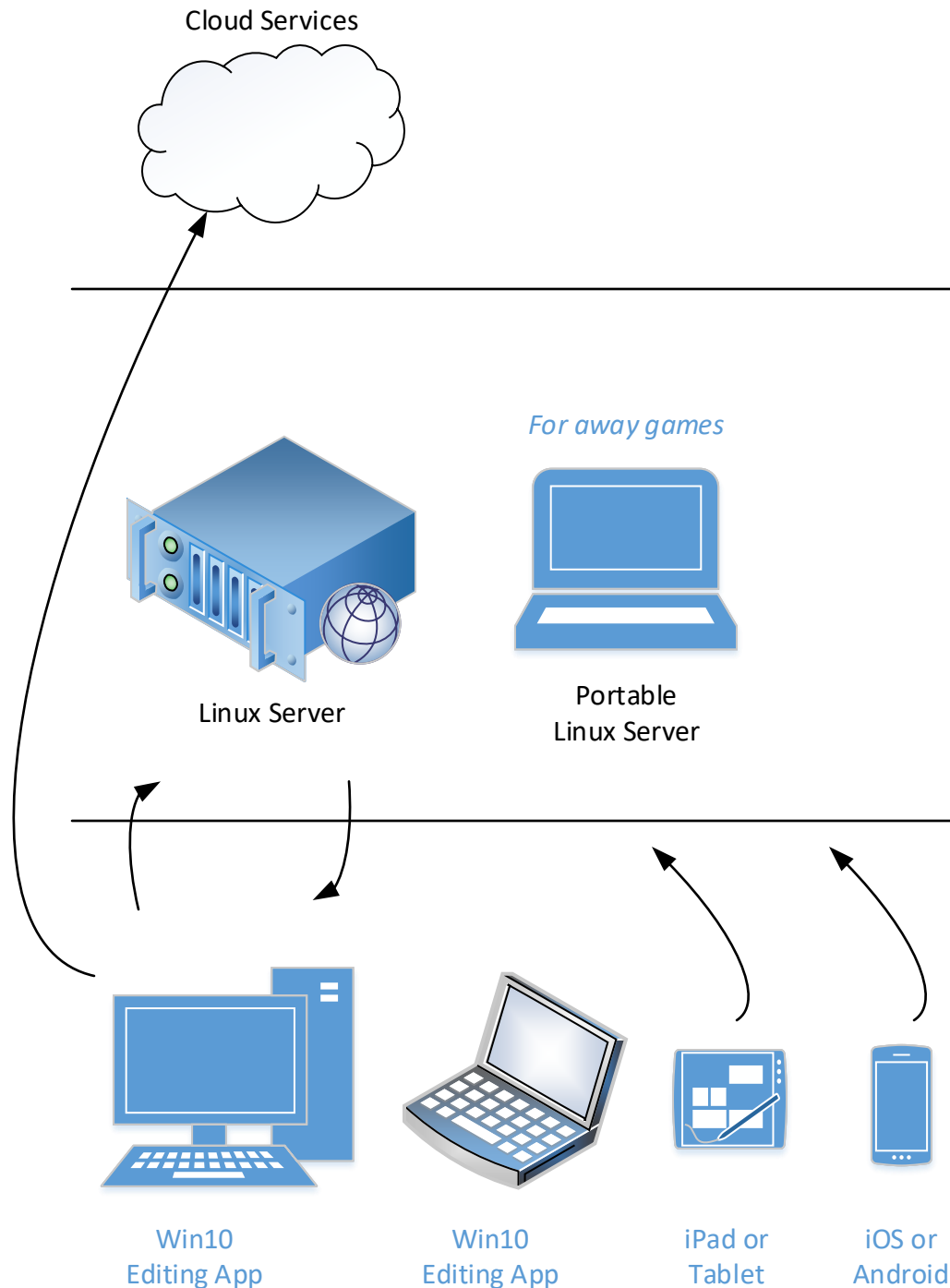
- Upload highlight video or storyboard from Win10 app
- Upload highlight video or storyboard from Linux server
- Send email notification to guest for viewing or download
- Delete highlight video or storyboard after expiration date
- Manage and report on cloud storage and network usage

## Linux Server

## Portable Linux Server

*For away games*

- Create roster of players on all the sports team
- Enter coaches profiles
- Write home page articles
- Enter schedule of events; games, practices, key dates
- Display grid view of Pip content
- Filter grid view using metadata properties
- Open Pip in HTML page using Strapi and plugins
- Stream the video to media player on these HTML pages
- Send notifications to registered users mobile devices
- Send schedule data to registered mobile devices
- Capture video streams from IP cameras
- Capture video clips from mobile devices

## Win10 Editing App

## Win10 Editing App

## iPad or Tablet

## iOS or Android

- Upload game video from tablets and mobile phones to server
- Download Pip from server to Win10 desktop or laptop
- Enter tagging data on iPad or tablet while watching live event
- Enter detailed tagging data from video clips on tablet or Win10
- Click on tagged data to view matching video clips
- Watch up to 4 camera angles in Win10 playback/editing app
- Add narration to video clips in pip
- Upload edited Pip to local server
- Export highlights or storyboard to cloud server for sharing

**Linux Server with Streaming Video Support**

**PIPS**
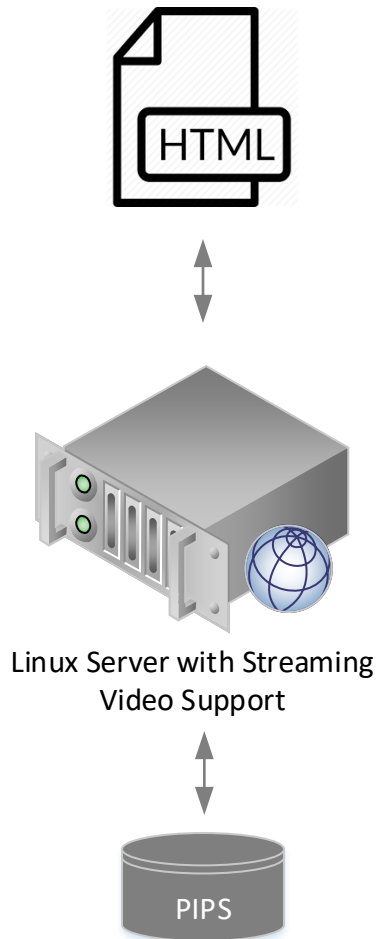
## Technology Decisions

- Research streaming video server applications that provide better user experience
  - Buffering, Quick Streaming
  - Consider open source and commercial options
  - Must run in Linux Docker container
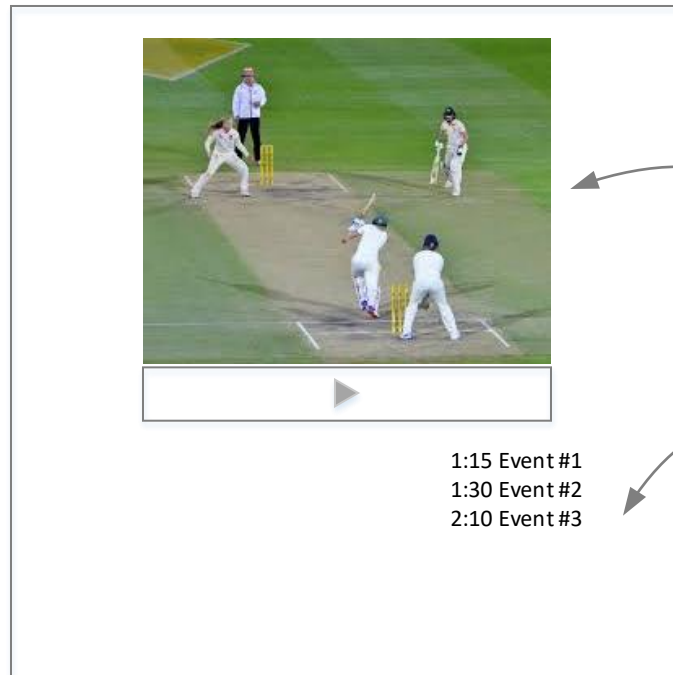  - Download demo versions and evaluate

## Development Requirements

- Open one of the PIPs from the Strapi grid in an HTML page generated by Strapi
- Display video in media player
- User can chooses 1 or 2 camera views displayed
- Controller to support, start, stop, .25X, .5X, 1X, 2X, 4X playback
- Need to be able to support camera angles
- Need to handle video camera angle made up of short clips (what are the implications?)
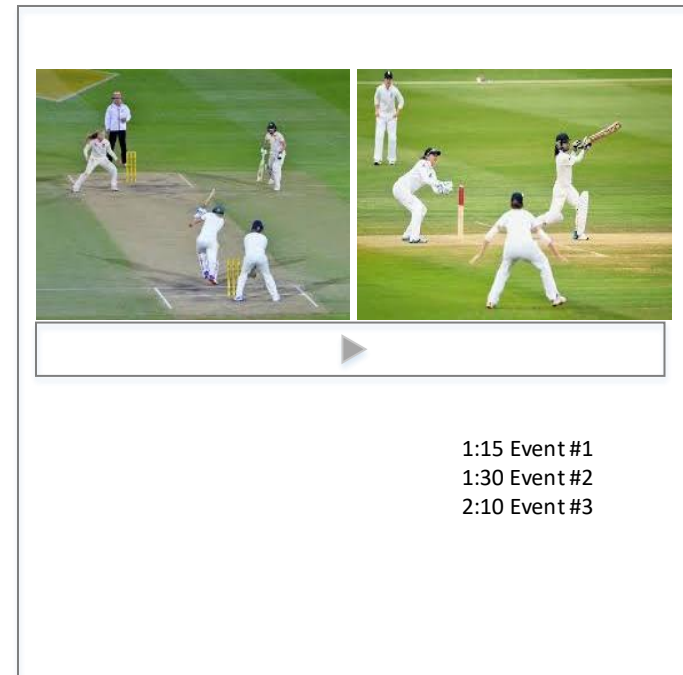
## Test Conditions

- Test with various video formats and codecs (.mov, .mp4, h.264, h.265)
- Test with and without using streaming video server technology
- Multiple camera angles in PIP (1 – 4), but only need to display up to 2 views
- Various video durations (15 seconds to 30 minutes long)
- Test with short clips from one camera angle
- Recording with audio and without audio
- Test with up to 10 concurrent users HTML browsers opening the same or different PIPs.

HTML Page with One Open View

HTML Page with Two Open Views

PIPS

1:15 Event #1
1:30 Event #2
2:10 Event #3

1:15 Event #1
1:30 Event #2
2:10 Event #3

Json document
1:15 Event #1
1:30 Event #2
2:10 Event #3

*One problem we need to address is different start and end times from multiple independent camera scources*

*Many 15 second clips recorded only during action*

iPad
Source

IP
Camera
Source

*One long video recorded when game starts and stopped between periods or innings or turns*