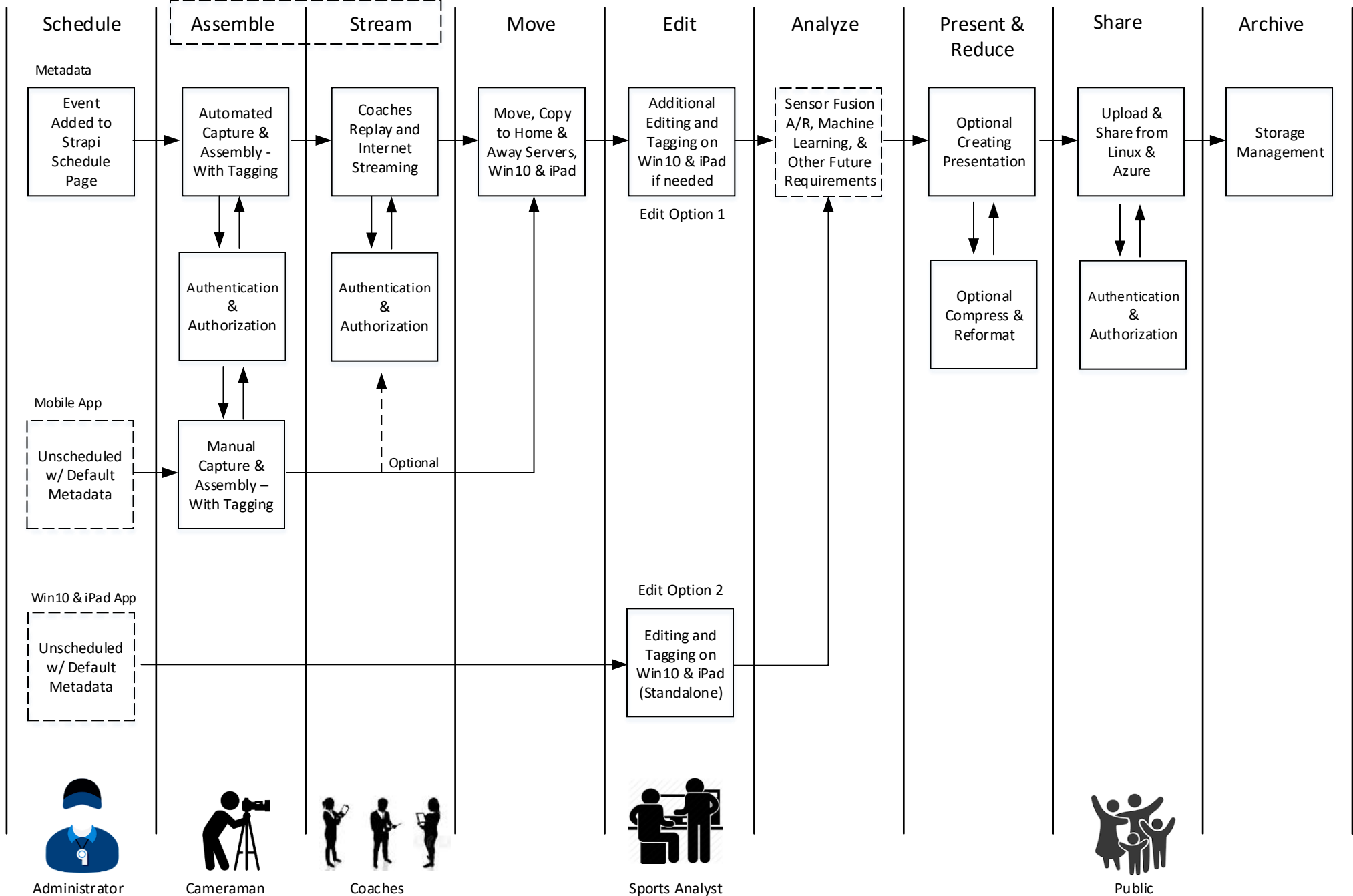


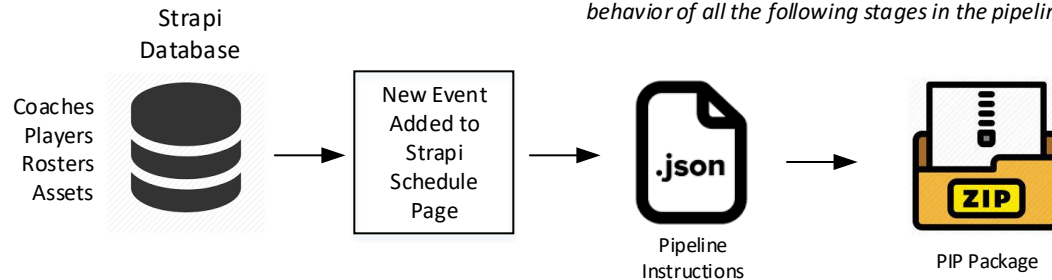
## SportsPip Pipeline Stages

*Live, Real-Time Events*



## Schedule Stage

*This will be like YAML in Azure DevOps, it controls the behavior of all the following stages in the pipeline.*



### Coach and Player Data

- Roster (Coaches and Players)
- Category (Sport, Level, Program, Year)
- Roles and Permissions



In this stage the coach enters basic information about all the planned events on the Strapi calendar for his or her team. This could mean games, matches, practices, or scrimmages. *Many events will require a PIP to be created, many events will not.* This is where and how plans are decided in advance.

It is possible for a coach to create a PIP even when not scheduled. In this case default metadata is assigned to the PIP. The examples on the right of this page are for unscheduled PIPs.

### Scheduled Event

- Event Date
- Event Start Time
- Event End Time (Expected)
- Event Location
- Opponent
- Date Created Timestamp
- Date Modified Timestamp
- Author

### PIP Settings

- New PIP (Y/N)
- Record IP Cameras (Y/N)
- Webcams (Y/N)
- Mobile Cameras (Y/N)
- BIT Rate Max (3)
- Tagging (Y/N)
- Public (Y/N)

### Authorizations

- Approvals

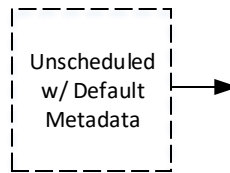
### Communications

- Notifications (Y/N)
- Invitations (Y/N)
- Confirmations (Y/N)

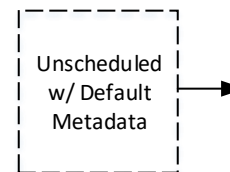
### PIP Retention

- Expiration Date (MM/DD/YYYY)
- Archive (Y/N)

### Mobile App



### Win10 & iPad App



What happens if the event was not scheduled on the Strapi service? We insert an event to the Strapi schedule using default settings based on the role and permissions of the coach that initiated the PIP build.

## Unscheduled

0, 1 or more IP Cameras – and  
iPhones, Android phones,  
Webcams, iPads for live tagging

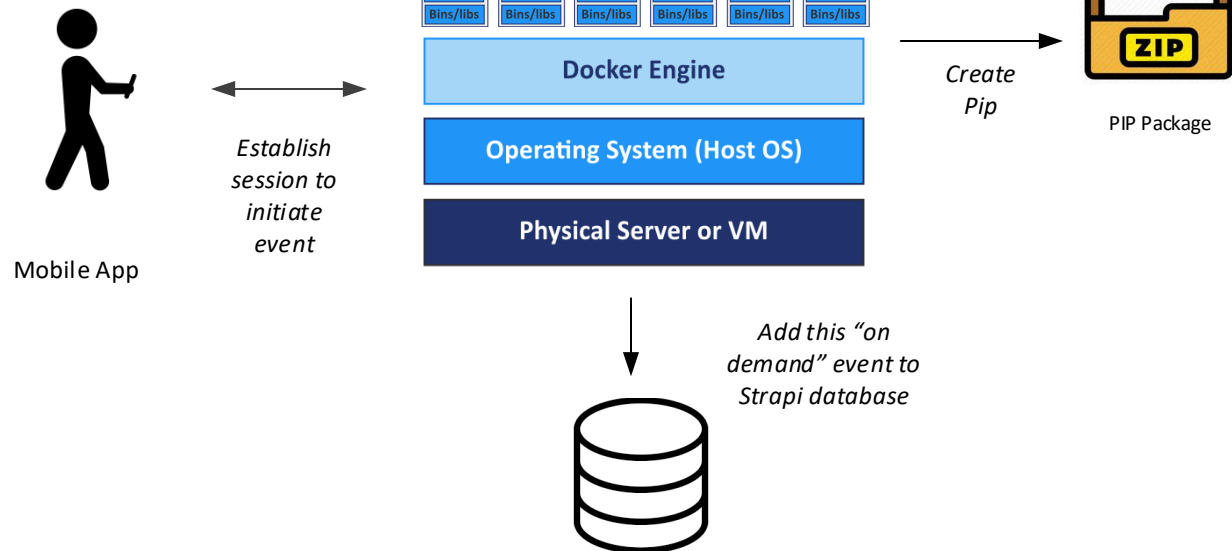
There may be times when an **authorized user** wants to create a “Pip” but the event has not been added to the Strapi database.

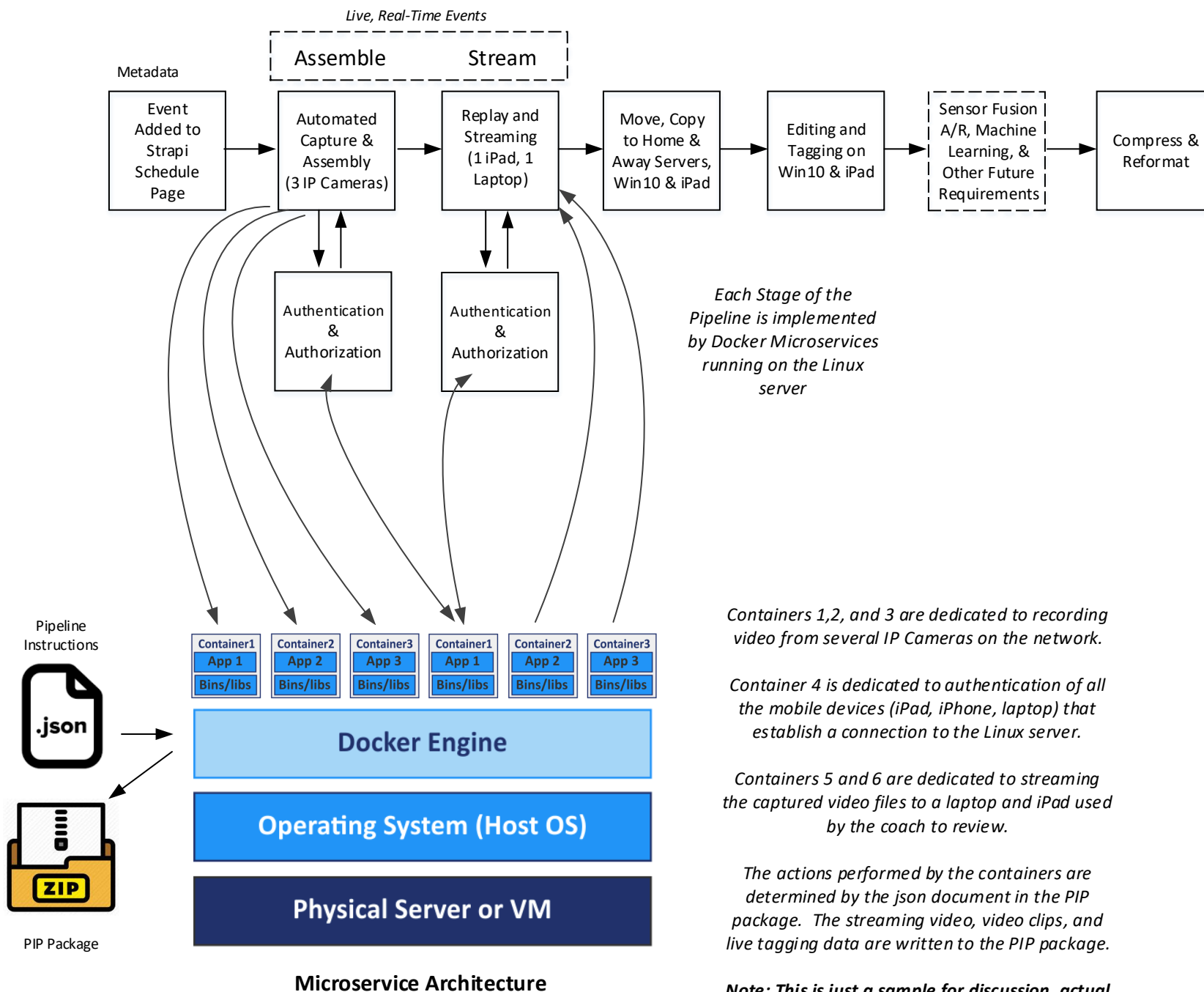
In this case, it will be something like the WP8 version of the capture app used to start the IP cameras recordings.

Use the mobile device to connect to the Linux Server and start a new recording session.

The “default” pipeline stages and metadata will be used and the event can be recorded.

Hopefully this will be the exception in most cases, but there are situations that happen on demand where the coach may decide he wants to get some video during a practice or lesson.





Containers 1,2, and 3 are dedicated to recording video from several IP Cameras on the network.

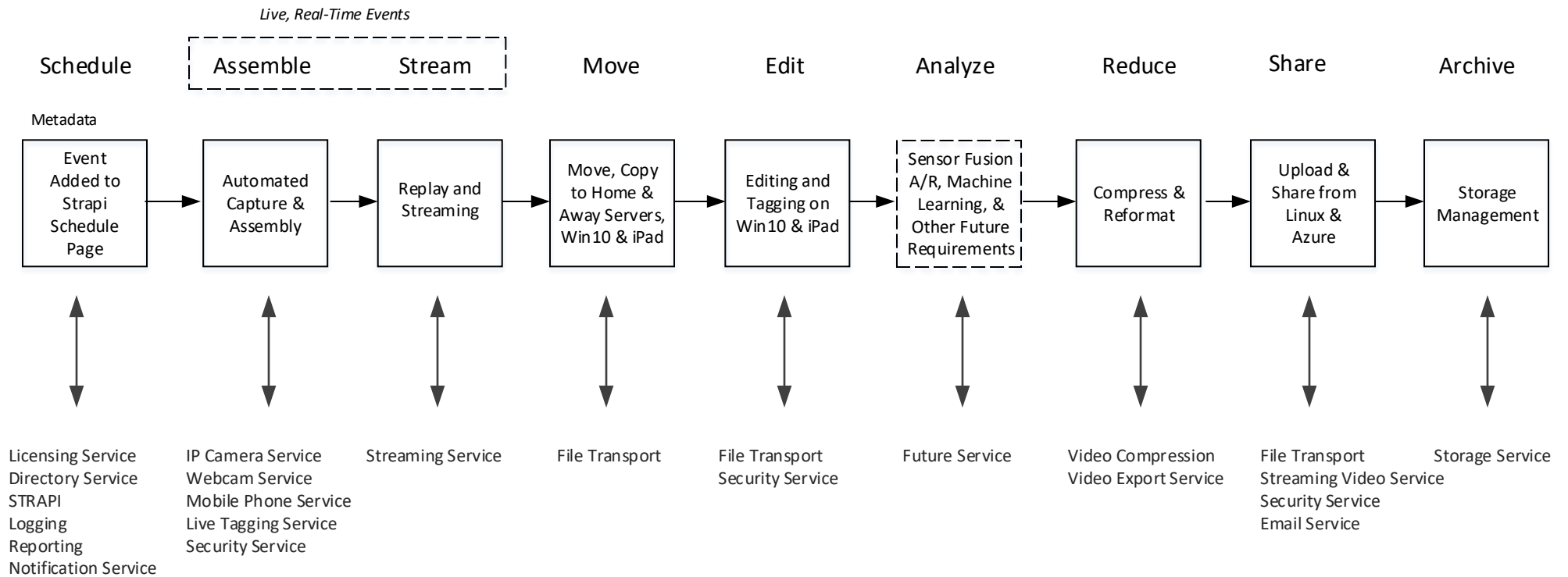
Container 4 is dedicated to authentication of all the mobile devices (iPad, iPhone, laptop) that establish a connection to the Linux server.

Containers 5 and 6 are dedicated to streaming the captured video files to a laptop and iPad used by the coach to review.

The actions performed by the containers are determined by the json document in the PIP package. The streaming video, video clips, and live tagging data are written to the PIP package.

**Note:** This is just a sample for discussion, actual implementation is yet to be determined.

## SportsPip Pipeline Stages



*This is the full pipeline. In many cases not every Pip will have to pass through every stage. For example, for now we bypass the Analyze Stage. Also, not every PIP will be Streamed, Reduced, Shared or Archived.*

*The metadata from the Strapi "Schedule", "Coaches" and "Roster" will be used to define the required stages.*

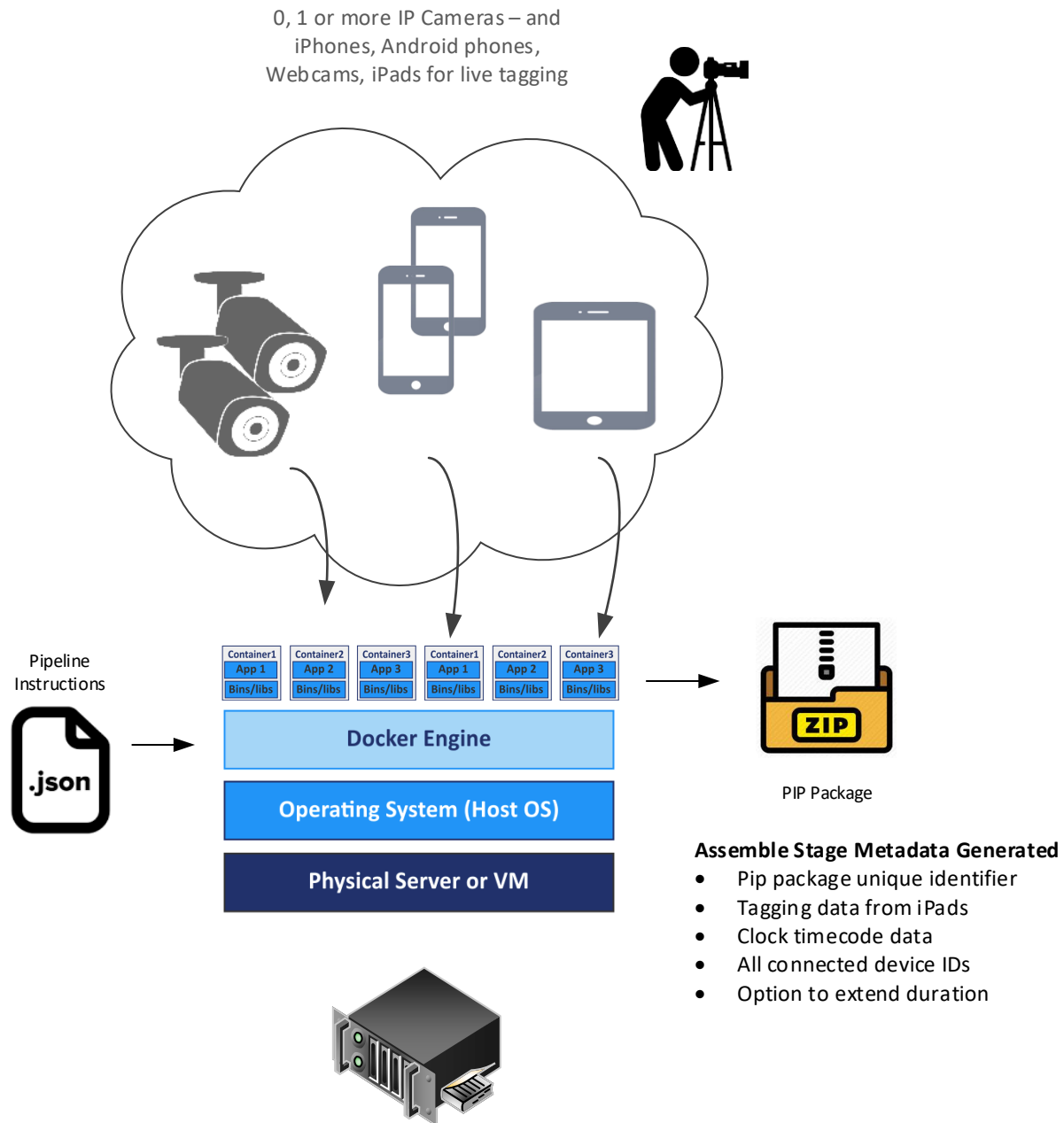
## Assemble Stage

*This is the biggest change from the original version of the SportsPip application. We added an important new scenario. Instead of just recording a single student practicing a skill from several camera angles, now we have added the requirement to record a long running event, such as a cricket match, or a football game which might run for several hours.*

*Also, we might have several coaches looking to review the footage while the match is still underway. It is a lot more demanding on the server and the urgency is much higher. No failures can occur while the competition is underway. Also, the network must be secured from unauthorized mobile devices.*

*Previously only one source type was captured at a time. The recordings were short, maybe a minute or two and all of the exact same length.*

*Now we could have 6 or more sources, some long running like the IP cameras, and others very intermittent, recording hundreds of short clips that have to be played back in sequence.*



*This is another big change from the previous version of the SportsPip app. The captured data can be either streamed or transferred to 1 or more iPad for immediate review by the coaches during the match. RTSP video will be streamed to the server, and the iPhone video will be short start-and-stop clips of video (10 – 20 seconds each)*

*The Live Tagging data is used to match the key events that occur, such as a big play, or to review the opponents tactics to make in-match adjustments.*

*Live Tagging is a new iPad or Win10 app using a radial menu to tag the events and the time of the event so that it will replay the exact 10 – 20 seconds of the recorded video showing what happens in that clip.*

*We might also need to stream the video to remote viewers over the Internet using a streaming service like YouTube or Facebook.*

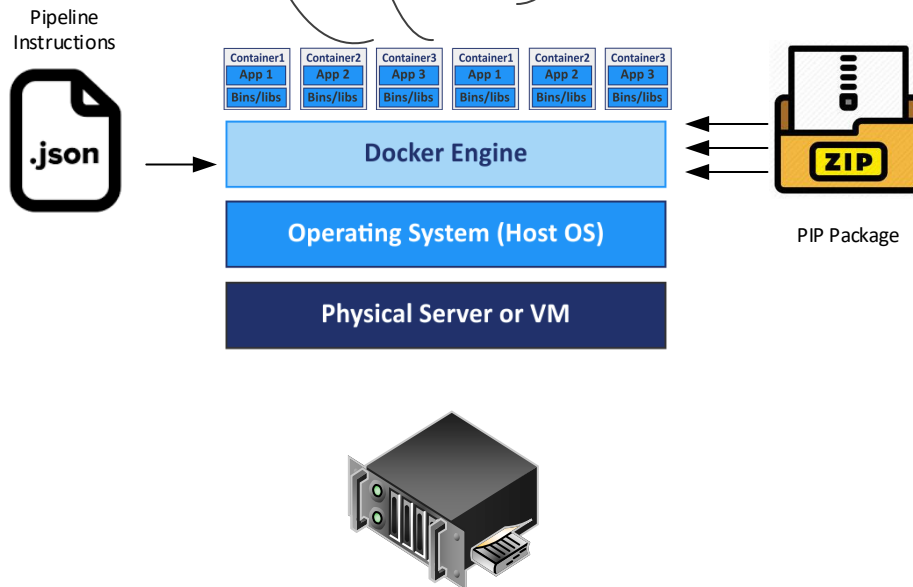
*Both assemble and stream stages happen from one physical server so the design needs to be quite efficient or the server needs to be fast.*

#### Stream Stage Metadata In

- Authorized users
- Priority users
- CPU utilization
- Network utilization
- Stream sources (1-N)
- Tagging sources (1-N)
- Program output stream
- Streaming service used

## Stream Stage

0, 1 or more IP Cameras – and iPhones, Android phones, Webcams, iPads for live tagging



## "Home" and "Away" Linux Servers

*Why do we have "Home" and "Away" Linux Servers and what is the difference between them.*

*The "Home" Linux Server will be a bigger computer, with multiple cores, more storage, and external power. It will probably be permanently installed in a secure location with Ethernet connectivity to Wi-Fi access points.*

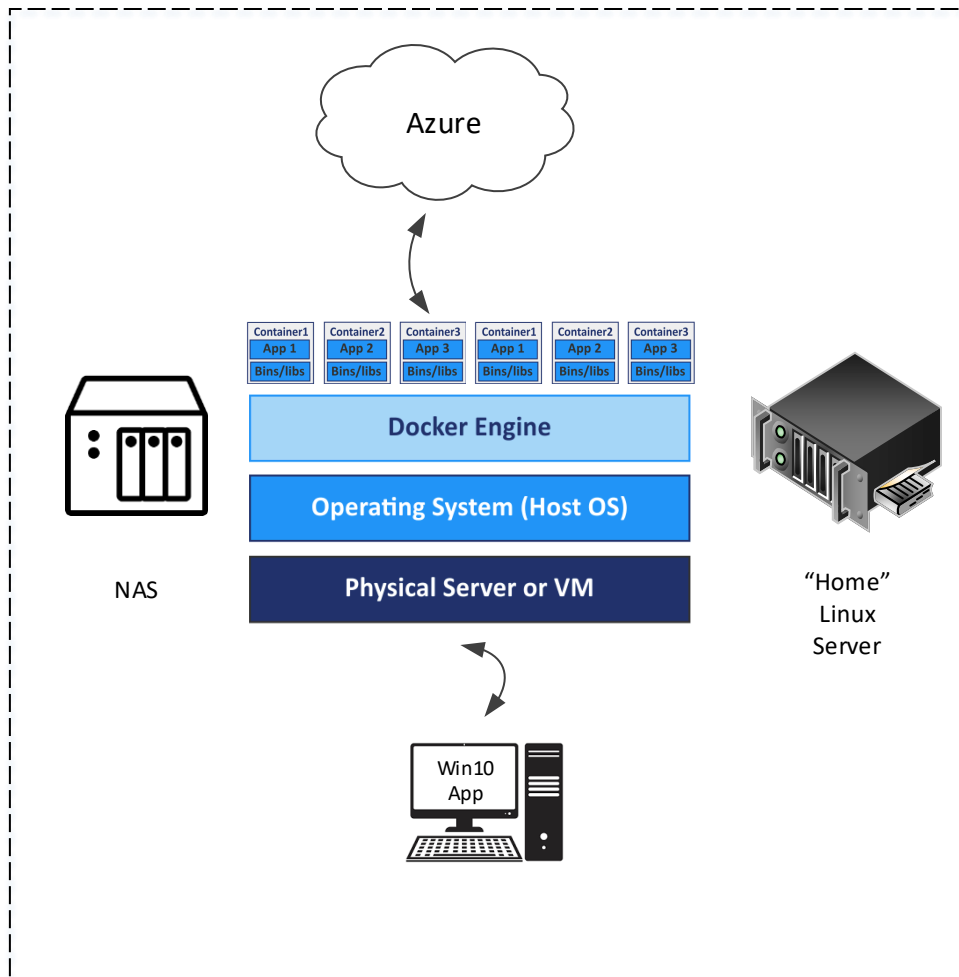
*The "Home" Server will support all the Microservices and will be able to support multiple stages at one time. The "Home" Server is part of the basic package and may be the only server needed by some smaller customers.*

*The "Away" Linux Server will be used for travel to other locations. It will probably be a laptop configuration and may have battery power only.*

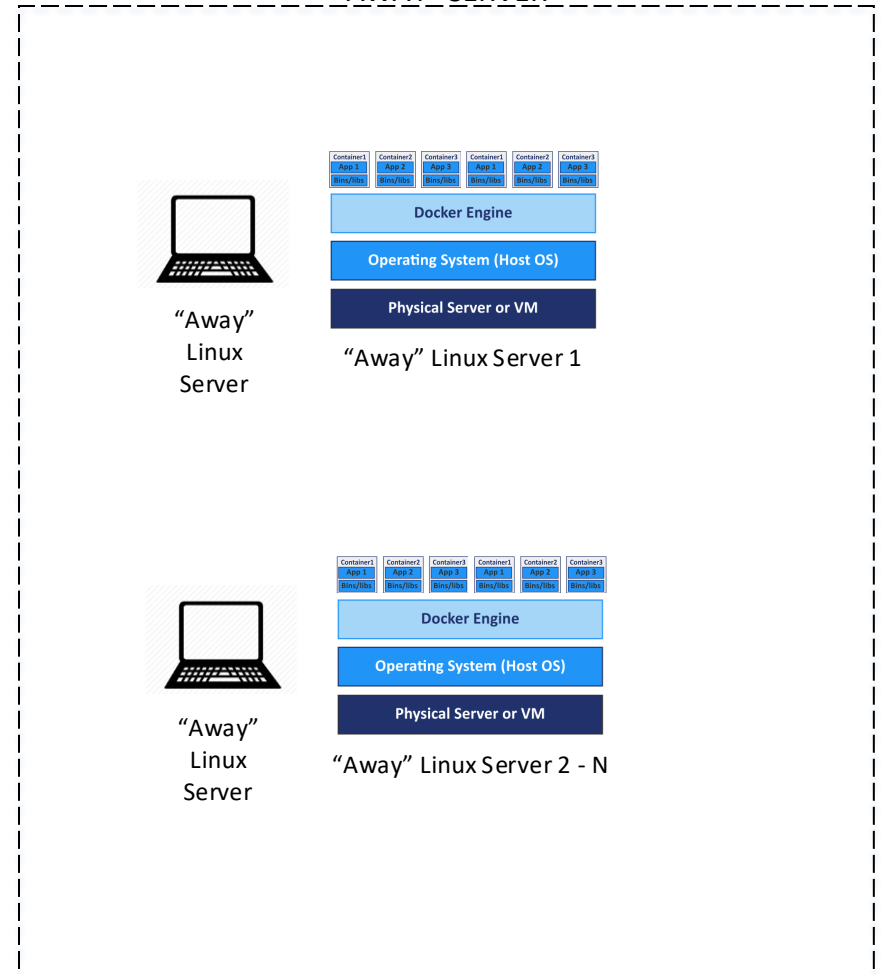
*It will only have the Microservices required to support the Assemble and Stream stages from the live events. It will support a smaller number of devices and streams.*

*The "Away" Server is a chargeable, upgrade option and will be needed by larger customers with multiple teams and travelling to many locations.*

### "HOME" SERVER



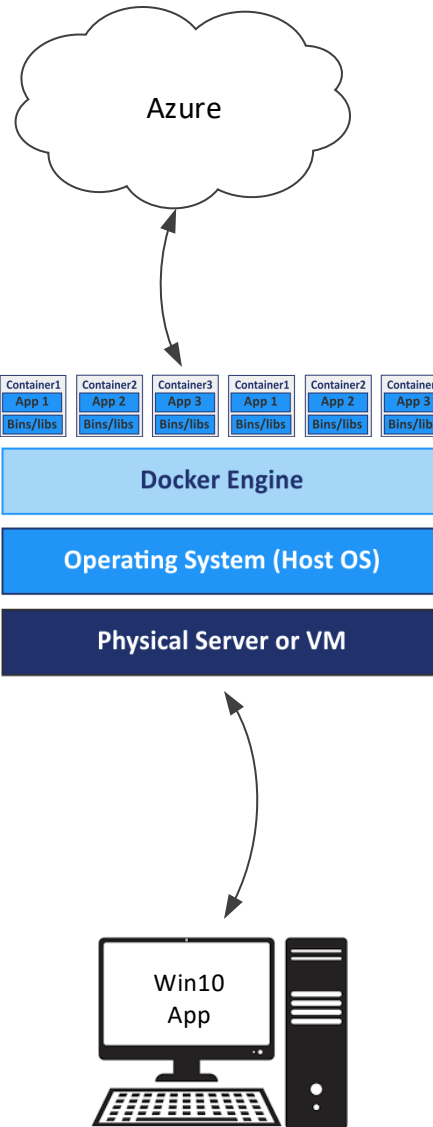
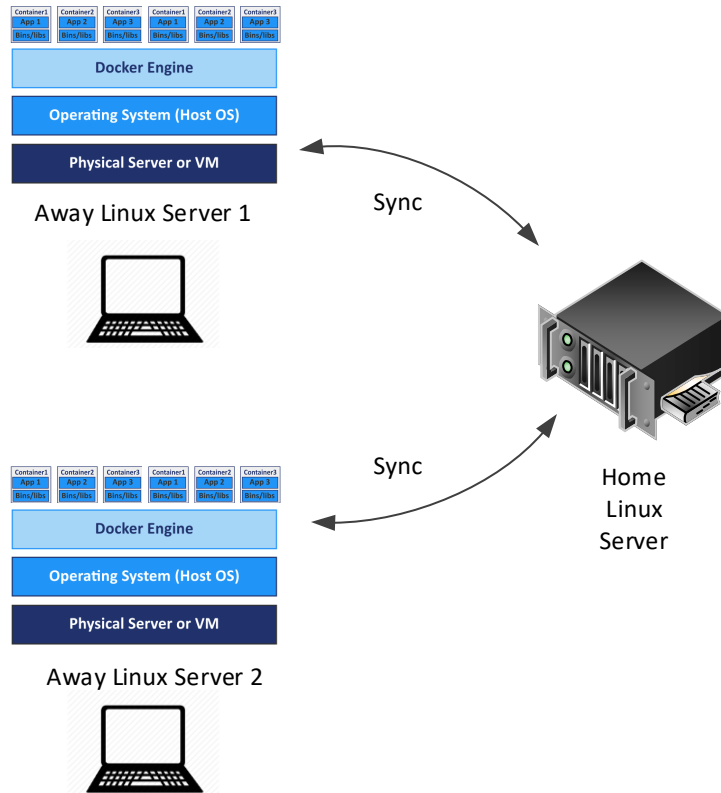
### "AWAY" SERVER





## Move Stage

*Portable version of the Linux Server to bring to remote locations. This is a new feature we can offer for a higher fee.*



### Move Stage Metadata

- Destination folder
- Network address
- Secrets
- Connection string
- Start time
- End time
- Checksum compare

*This design is a three-tier architecture. We use the Azure cloud for sharing PIPs with other coaches and with friends and family.*

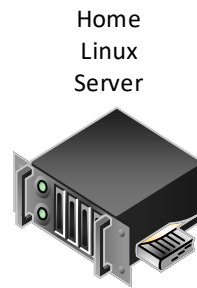
*The middle tier is one or more Linux servers. A "Home" Linux server is probably permanently installed in the school or academy. It has a full range of the SportsPip pipeline features.*

*An "Away" Linux server is a smaller portable configuration that can be used when the team travels to another location. The "Away" configuration only supports the live, real-time "Assemble" and "Stream" stages.*

*The bottom tier is probably a Win10 desktop with a full featured edit, playback and tagging application which is an updated and improved version of our current Win10 app. In the future we may also port some of the Win10 features to an iPad for editing.*

*We need an efficient way to move PIPs between all these devices and layers. It should be secure, and reliable delivery.*

## Edit Stage – Option 1



Filtering

User = Pete Catan

### STRAPI

Filter = Cricket; Results = 24

Cricket	Cricket	Cricket	Cricket
Description & Metadata	Description & Metadata	Description & Metadata	Description & Metadata
Cricket	Cricket	Cricket	Cricket
Description & Metadata	Description & Metadata	Description & Metadata	Description & Metadata
Cricket	Cricket	Cricket	Cricket
Description & Metadata	Description & Metadata	Description & Metadata	Description & Metadata
Cricket	Cricket	Cricket	Cricket
Description & Metadata	Description & Metadata	Description & Metadata	Description & Metadata
Cricket	Cricket	Cricket	Cricket
Description & Metadata	Description & Metadata	Description & Metadata	Description & Metadata
Cricket	Cricket	Cricket	Cricket
Description & Metadata	Description & Metadata	Description & Metadata	Description & Metadata

**CHANNELS**  
Baseball  
Basketball  
**Cricket**  
Cross Country  
Football  
Golf  
Hockey  
Martial Arts  
Rugby  
Soccer  
Swimming  
Tennis  
Track & Field  
Volleyball  
Wrestling

**LEVELS**  
Beginner  
Intermediate  
Advanced  
Expert

**COACH**  
Brooks  
Knight  
Lewitt  
Roselli  
Wooden

**DATE**  
2020  
2019  
2018  
2017  
2016  
2015

**LOCATION**  
Home  
Away



*The Edit – Option 1 Stage downloads the PIP from the Strapi website. The PIP was created in the “Assemble Stage” for a schedule event.*

*The Win10 app will allow the analyst or coach to review the footage and add a more detailed tagging database with advanced statistics like the NFL example we reviewed.*

*When completed, the analyst or coach can upload the edited PIP back to Strapi to share with the team members or others using the “Share Stage”*

### Edit Stage Metadata

- Name of editor
- Date of edit
- Name of tag file (1 or more)
- Include stock footage (Y/N)

## Edit Stage – Option 2

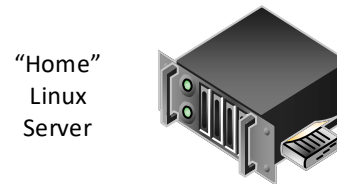
*The Edit – Option 2 Stage allows the coach to take some personal video of the student and then creates a training video on the Win10 app.*

*This example is like the “golf instruction” I showed you of my lessons with an instructor and personalized advice and examples.*

*When this package is completed, the PIP is saved locally and copied to the Linux server and automatically added to the Strapi PIP library page with the instructor and student metadata included.*

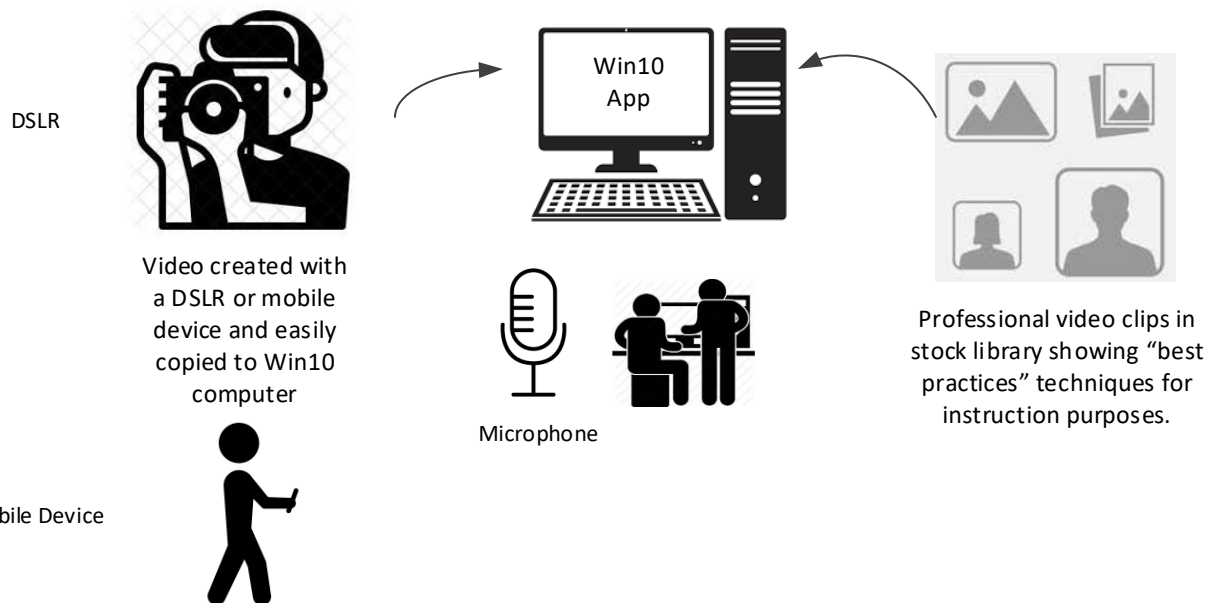
*The PIP can be sent to Azure for sharing and the student can download the PIP to their own computer.*

*I have some new ideas for the “Radial Menu” to improve the Win10 app for this type of instruction.*

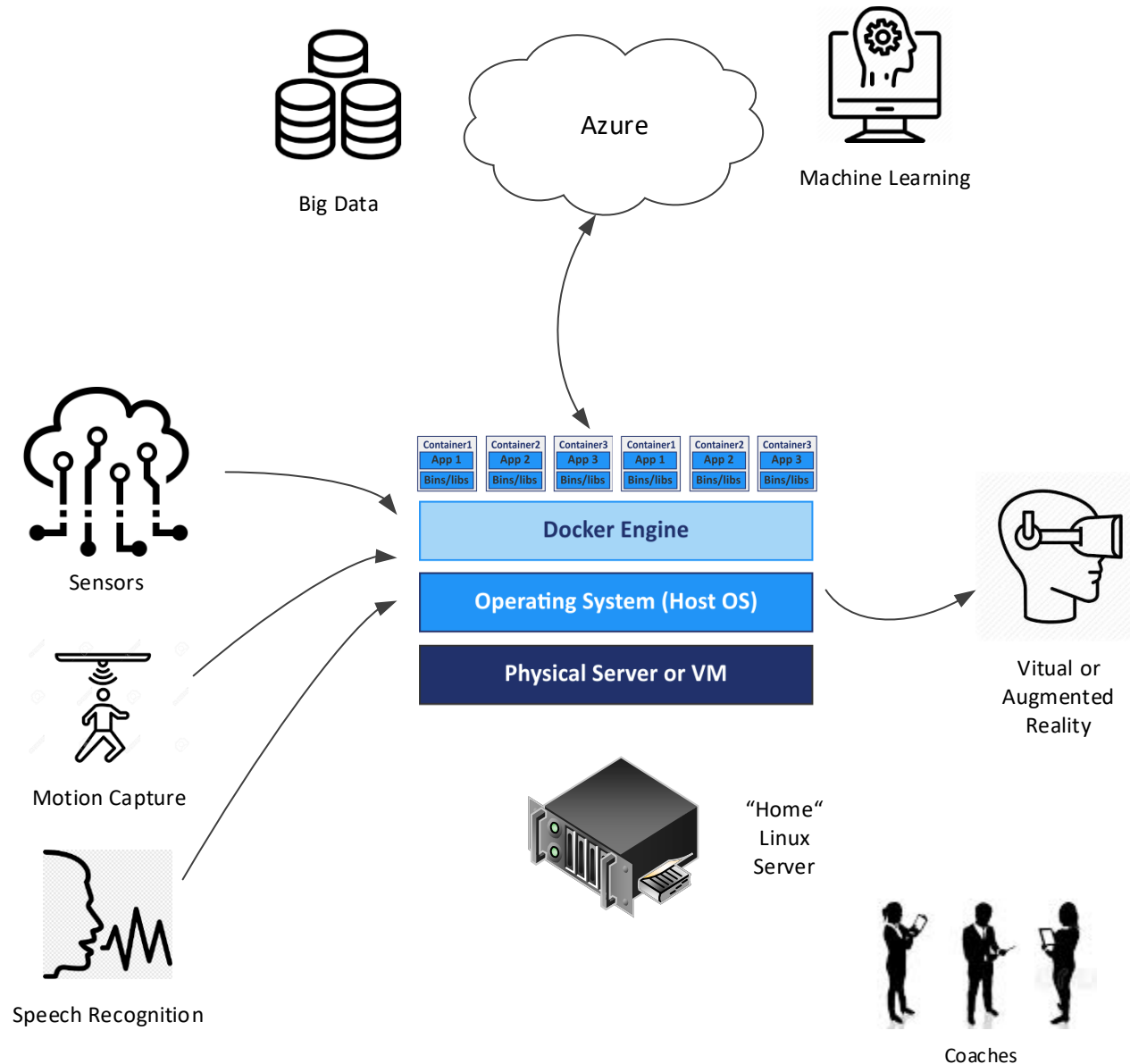


### Edit

- Name of editor
- Date of edit
- Name of tag file (1 or more)
- Include stock footage (Y/N)



## Analyze Stage



*There is a big investment being made today in advanced sports analytics using technology.*

*Right now we are not in a good position to implement some of these features in our offering. But, if we establish the SportsPip pipeline as a popular platform for sports video we will have many opportunities to partner with companies that are looking for a platform to support their innovations. Even MS Azure is investing in sports analytics.*

*We should anticipate these opportunities and add a placeholder for adding this stage at a later date. In the meantime, we could try something simple as a "spike" to learn about the requirements and look for industry standard API's from the big companies like MS to implement.*

## Presentation Stage

Home  
Linux  
Server



Filtering

Channels

- Baseball
- Basketball
- Cricket
- Cross Country
- Football
- Golf
- Hockey
- Martial Arts
- Rugby
- Soccer
- Swimming
- Tennis
- Track & Field
- Volleyball
- Wrestling

LEVELS

- Beginner
- Intermediate
- Advanced
- Expert

COACH

- Brooks
- Knight
- Lewitt
- Rosell
- Wooden

DATE

- 2020
- 2019
- 2018
- 2017
- 2016
- 2015

LOCATION

- Home
- Away

STRAPI

User = Pete Catan

search

Filter = Cricket; Results = 24

Cricket	Cricket	Cricket	Cricket
Description & Metadata	Description & Metadata	Description & Metadata	Description & Metadata
Cricket	Cricket	Cricket	Cricket
Description & Metadata	Description & Metadata	Description & Metadata	Description & Metadata
Cricket	Cricket	Cricket	Cricket
Description & Metadata	Description & Metadata	Description & Metadata	Description & Metadata
Cricket	Cricket	Cricket	Cricket
Description & Metadata	Description & Metadata	Description & Metadata	Description & Metadata
Cricket	Cricket	Cricket	Cricket
Description & Metadata	Description & Metadata	Description & Metadata	Description & Metadata
Cricket	Cricket	Cricket	Cricket
Description & Metadata	Description & Metadata	Description & Metadata	Description & Metadata

*If on the server, select the Pip to edit. If on local computer open the Pip*



### Requirement 1

The first requirement is to send the video footage and tagging data in Pip format to our Azure server

- Select one or more camera views
- Select the level of tagging data to include
- Select what resolution the video should be
- Identify who the Pip should be sent to
- Save to an outbound queue

An alternate requirement is to send the package to other coaches with video footage and tagging data in Hudl format

### Requirement 2

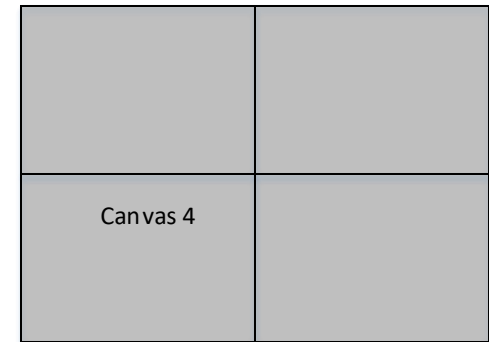
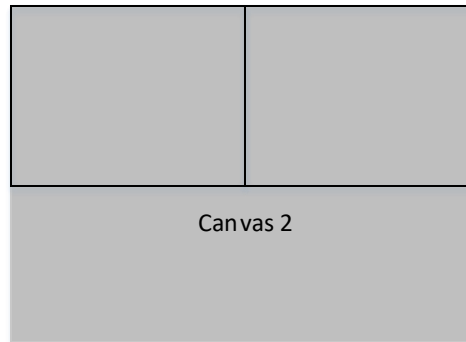
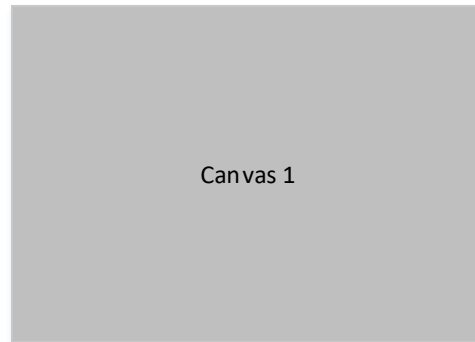
Here we are preparing an interactive instruction video for a student to review. This is more in a storyboard format. We can do this the easy way or the hard way.

The easy way is doing a screen recording exactly the same as the Scott lessons and save as an mp4 file.

The hard way is to create a timeline with all the content and gestures and export to a new package and send it.

## Presentation Stage – Option 1

Here we are preparing a traditional instruction video for a student to review. This is a just a screen recording of the presentation.



### New Presentation

- Audio recording on
- Start screen capture recording
- Edit the presentation using toolbar
- End screen capture recording
- Save
- Export as mp4
- Upload to Azure
- Send target user notification

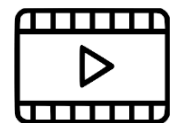
Start Screen Recording

Pause

Pause

Stop and Save

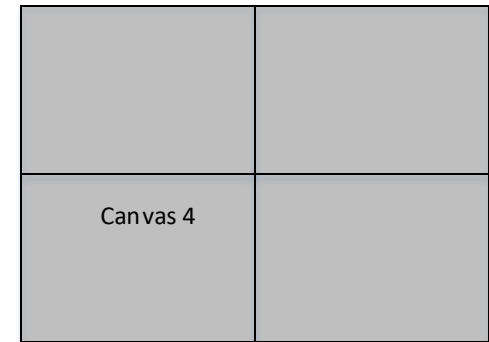
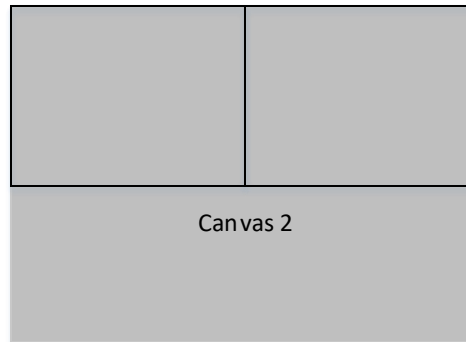
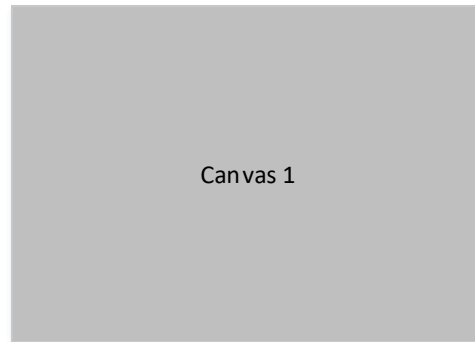
Object 1



One 10 Min  
Edited Video

## Presentation Stage – Option 1

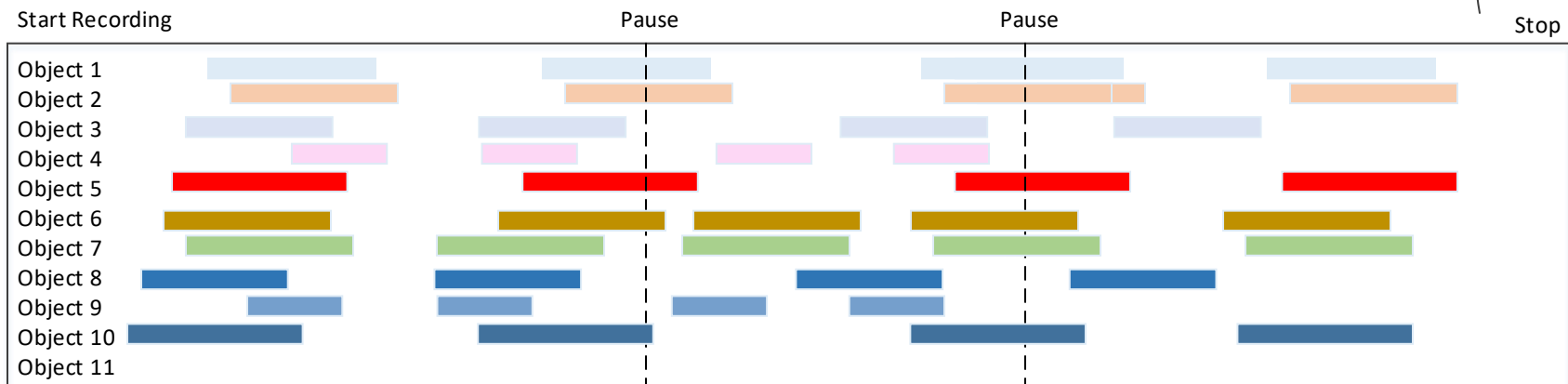
Here we are preparing an interactive instruction video for a student to review. This is more in a storyboard format. Not exactly the same as the Scott lessons.



New Presentation  
Start  
Audio Recording On  
Set Canvas = 2  
Insert Video1  
Set Video1 Position = 1:15:20  
Insert Video2  
Set Video2 Position = 2:28:15



PIP Package



## Reduce Stage Metadata

- Target resolution
- Target bit rate
- Target frame rate
- Export clips
- Timeline
- Proxy files
- Reduce server
- Reduce window (start; stop)

## Reduce Stage

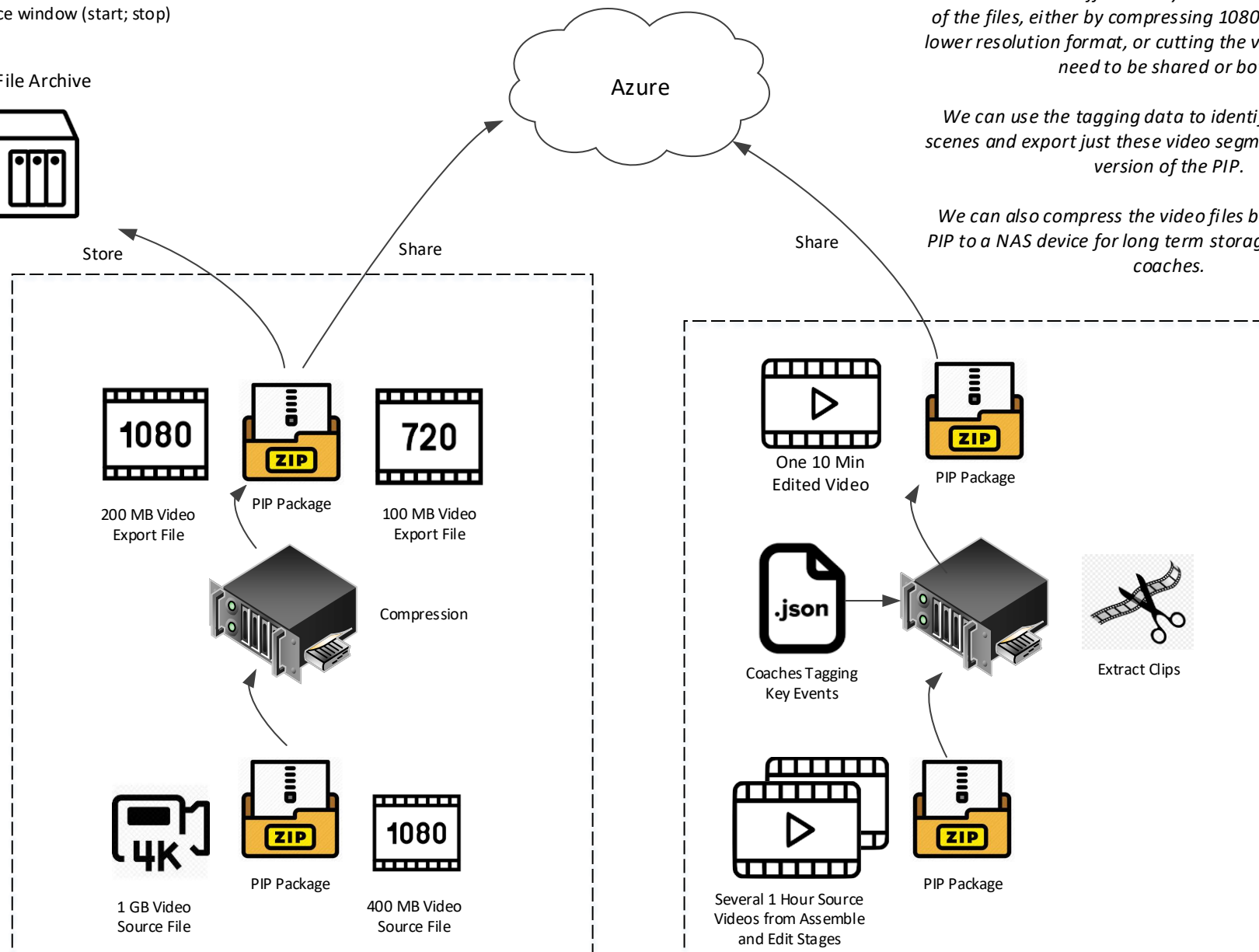
*One of the big advantages of having a local Linux Server is the ability to record large video files, with high quality sources like 4K cameras. Many of our competitors have cloud based storage only and limit the resolution to 720P.*

*Our problem is that we need to share some of the video on the Internet. For affordability we need to reduce the size of the files, either by compressing 1080P or 4K video to a lower resolution format, or cutting the video that does not need to be shared or both.*

*We can use the tagging data to identify the important scenes and export just these video segments to the shared version of the PIP.*

*We can also compress the video files before archive the PIP to a NAS device for long term storage if desired by the coaches.*

### NAS File Archive





### Share Stage Metadata

- Date shared
- Downloaded count
- Views
- Email notification sent

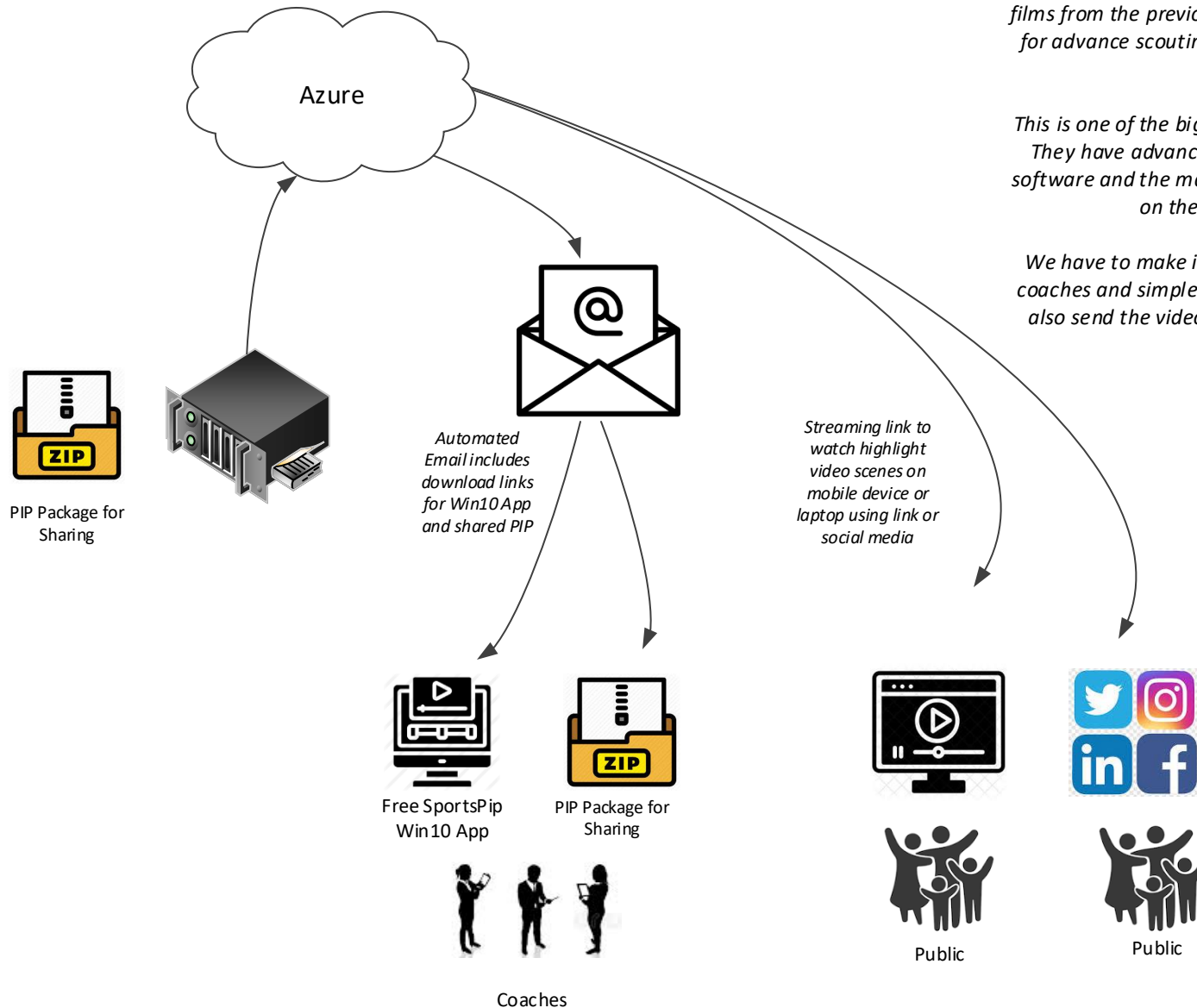
### Share Stage

*This is why we need to reduce the size of the PIP files in the previous stage. The sports industry is very interested in sharing the game highlights with the general public.*

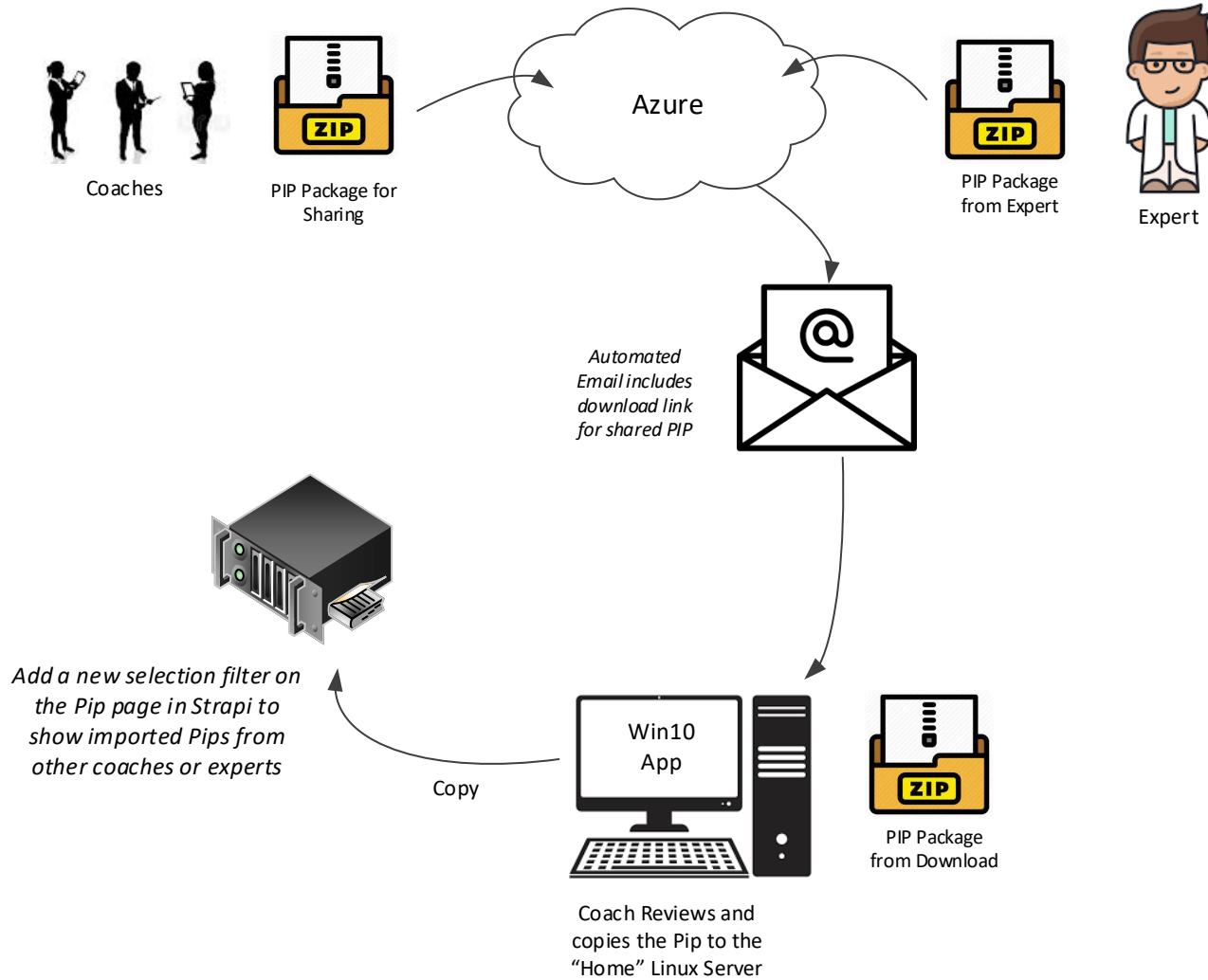
*There is also an agreement among coaches to share game films from the previous several games with other coaches for advance scouting. This is common among all sports and teams.*

*This is one of the biggest advantages of our competition. They have advanced sharing features build in to their software and the many sports leagues have standardized on these sharing agreements.*

*We have to make it easy and secure to share PIPs with coaches and simple to reach the general public. We can also send the video to services like YouTube or Vimeo.*



## Receiving a Shared Pip



*The coach can also receive Pips from other coaches or from experts. Probably the easiest way to do this is use the automated email to notify a coach that a Pip is available to download and manually initiate the transfer.*

*At some time in the future we can expand on this idea to create a "channel service" like we had with the original SportsPip concept using something like Azure Mobile Services or RSS.*

*I am concerned about security. We need to avoid someone hacking the Pip with embedded virus or worm and exposing the system to an attack. Not sure how to do that yet.*

## Archive

- Date created
- Expiration data
- Delete or archive
- Reduce (Y/N)
- Date archived

## Archive Stage

*The teams save the video from previous seasons because they play the same teams every year. The coaches will study the game footage from the previous year to create a game strategy for the upcoming games.*

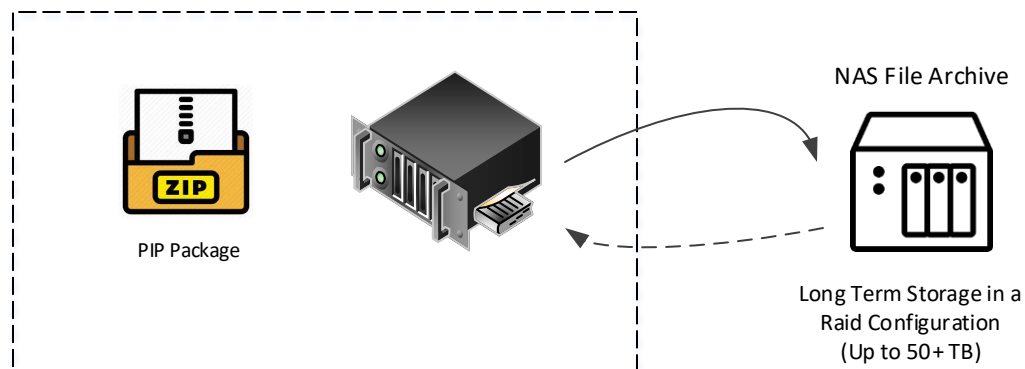
*Moving large files takes time and needs to be reliable.*

*Automated identification of a PIP that has past the expiration date set when the event is scheduled should initiate a task to move the PIP to the NAS device and confirm that the file transferred successfully using some type of checksum.*

*We also need the ability to restore the PIP from the NAS device to the "Home" Linux server when needed, either automatically or manually as needed.*

*These NAS devices are affordable. Some also support Docker containers so they are programmable.*

## 2020 Game Activity



2019  
2018  
2017  
2016  
2015  
2014  
2013  
2012  
2011  
2010

Prior Year Video

