This deliverable provides a detailed overview of the CONFetti experiment problem statement and requirements for both the experiment venue and EXPERIMEDIA facility operators. This document has been prepared considering particularly information enclosed in deliverables D2.1.1 (First EXPERIMEDIA Methodology), D2.2.1 (EXPERIMEDIA Baseline Components) and D4.2.1 (CAR Experiment Design and Plan).
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<tr>
<td>Authors</td>
<td>Sergiusz Zieliński, Piotr Pawałowski, Tomasz Kuczyński (PSNC)</td>
</tr>
<tr>
<td>Reviewers</td>
<td>Stephen C. Phillips (ITInnov)</td>
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1. Executive summary

This deliverable reports on the problem statement, design and requirements of the CONFetti experiment which aims to investigate the possible applications of FMI (Future Media Internet) technologies in the improvement of the training process of professional athletes. The technologies planned to be utilised include HD videoconferencing, stereoscopy, motion tracking and augmented reality.

Section 2 of this document, which is an introduction, explains the motivation for preparing the experiment. Section 3 contains the experiment problem statement with its objectives, constraints and relevant background information. In section 4, a more specific description of the experiment’s design is presented. Section 5 states the requirements towards the venue and facility operators. Section 6 describes the identified risks and ways of their mitigation. A plan for implementation of the tasks is shown in section 7. Section 8 contains observations on ethics and privacy matters. The document ends with a short concluding section.
2. Introduction

The process of training athletes, especially those competing at the highest international level, involves the transfer of very specific and often difficult to formalise knowledge from the mentor to the protégé. Even though scientific insight and findings have an ever increasing influence on sport preparations, the trainer is still the authority making decisions, giving direct advice to the athlete and often combining his intuition with psychological skills and computer data in order to make the right call. The person of the coach, their experience, example and supervision play a very important and sometimes underestimated role in the athlete's success. In the end it is the athlete who gets to perform in the spotlight using their natural and acquired skills, but the quality of guidance and adequacy of the chosen training program often mean the difference between hearing the national anthem and going home with unfulfilled hopes.

That is why the CONFetti experiment aims to investigate the possible applications of FMI (Future Media Internet) technologies in the improvement of the training process. As the relationship between the coach and the athletes is irreplaceable, the goal is not to substitute it, but to augment the availability, convenience and effectiveness of the process basing on this relationship. The technologies that will be utilised include HD videoconferencing, stereoscopy, motion tracking and augmented reality. The experiment will be held at the CAR (Centre d'Alt Rendiment) venue, a facility with a long history of training successful athletes. This will allow the experimenters to evaluate their system in a realistic target environment.
3. Experiment problem statement

The CONFetti experiment will employ a system allowing the coach to hold a training session without the need for his presence in the venue. He will connect remotely with his protégés located in the training hall using a high definition (HD) videoconferencing tool. Additionally, he will be able to review and present archival footage of athletes recorded with stereoscopic (3D) HD cameras and stored in the experiment's video repository. This footage will also contain a 3D model of a human body reflecting the athlete's movements collected via motion tracking. The stream with the superimposed model will be treated as one of the sides of the videoconference for both the athletes and the coach to view.

Although the system can be used for many different sports (Figure 1), the athletes chosen to take part in the experiment are gymnasts. It was established that it would be best to use a static (in terms of space) event like the high bar, balance beam or pommel horse, because it will be easier to capture all the athlete's movements in those disciplines. What is more, gymnastics is also used by another EXPERIMEDIA experiment: 3D Acrobatic Sport.

![Figure 1. Functions and objectives of the CONFetti experiment](image)

3.1. Objectives

The objectives of the CONFetti experiment can be divided into a few groups, based on the stakeholders they apply to.
3.1.1. CAR venue
The experiment's goals from the venue's point of view are to enhance the training process and to evaluate the possibilities offered by the various FMI technologies used. The training process gets improved in the following ways:

- The availability of coaches for sessions is incremented as they can be held even when the coach is not present at the venue.
- The convenience for the coaches is raised thanks to the possibility of holding sessions from remote locations.
- The coach has access to additional motion tracking and sensor data concerning the athletes' performance, on which he can base his decisions.
- The transfer of knowledge and instructions is more efficient with the use of archival footage and 3D model teaching aids.
- The use of new technologies like augmented reality or stereoscopy may appeal to young athletes and make the sessions more interesting and, in turn, more beneficial.

3.1.2. EXPERIMEDIA facilities
The CONFetti experiment is supposed to evaluate the adequacy of the EXPERIMEDIA general architecture and the design and implementation of the utilised components:

- The ECC (Experiment Content Component) used for collecting monitoring data
- The AVCC (Audio Visual Content Component) used for acquisition, management and exposition of footage of the athletes' performances

Feedback and requirements from the experimenters will be a source of ideas for extensions and improvements for the facility operators.

3.1.3. The experimenters (learning objectives)
The experimenters wish to carry out the experiment in order to investigate the following issues:

- The feasibility of installing and utilising a setup for stereoscopic HD videoconferencing and augmented reality in a real-life training facility
- User acceptance level (concerning both coaches and athletes) of the FMI functionalities provided by the system deployed in a sport training setting
- Performance of a platform combining HD videoconferencing with stereoscopic video and remotely rendered 3D models generated basing on motion tracking

3.2. Background
CAR is a high performance sports centre focused on comprehensive upbringing of athletes. What this means is that while the goal of training them to compete and win on the highest international level is very significant, the academic and humane development of students is even more important. CAR was established in 1987 and can boast a history of successes in both those areas. In order to keep reaching the competitive aims on the highest athletic level it's crucial to always try to find applications for state of the art scientific findings and technologies.
testimonial of following this rule by the venue's leaders are the rooms filled with electric treadmills, climatic chambers and other medical apparatus as well as motion sensors, force sensors and even a machine to measure the resistance of the wind for a biker depending on his position on the bike. The technological advance, miniaturisation of devices and ubiquitous connectivity made it possible to move the installations from laboratories to the training rooms themselves, where research and measurements can be done in an almost completely non-intrusive way from the athletes' point of view. An illustration of this trend is CAR's new building finished in 2012 containing state of the art training facilities (combat sports rooms, gymnastics hall, swimming pools for waterball, synchronised swimming and dive jumping) and a server infrastructure. Examples of cutting edge technological installations that can be found in the building's practice rooms or are planned to be put there are:

- a system to visualise the movement of the bar for weightlifters
- a system to mark the points where the ball hits the table tennis table
- a "charriot" that rides along a side of the pool and records the swimmer using 3 cameras
- a high-quality Bose sound system encompassing the whole new building, operated from on-wall controllers and giving the possibility to play audio per-room, per part of a room or even underwater from a central repository or from external sources
- a system for releasing air under high pressure from the bottom of the pool when a diver jumps to lessen the force of impact on the surface

The fact that CAR is a high performance sports training centre has several consequences for the CONFetti experiment:

- The experiment's results will be reliable, as they will originate from professional coaches and competitive-level athletes using the system in real training sessions.
- The staff and students are used to working with state of the art technology.
- Some of the existing infrastructure can be used in the experiment, for example the server resources for deploying experiment components, sound system for the videoconference audio or the cameras that are planned to be installed in some of the rooms.

3.3. Constraints

There are some constraints that apply to the planned experiment:

- The training groups at CAR are not very large. The group chosen for the experiment might not be enough to constitute a representative sample. An ideal solution to this problem would certainly be if the system gets adopted at CAR after the experiment's completion and more groups use it.
- Part of the QoE experimental data will be collected using questionnaires. They will have to be designed carefully in order to usefully model the continuous spectrum of subjective experiences into objective discrete values useful for the experimenters. This might prove to be nontrivial, especially concerning the small number of experiment subjects.
- As mentioned in Section 1 (Introduction), the coaches' experience is often difficult to formalise. As a result, the training methodology may be quite individual and once a coach
establishes it, he might be hesitant to change it or extend it with new elements. That is why the large number of new functionalities introduced by the experiment or even the order in which they are presented may have an impact on their acceptance level.
4. **Experiment design**

4.1. **Participants**
This section describes the actors that can be distinguished in the experiment and their roles.

4.1.1. **Athletes**
The athletes take part in the experiment in two ways. Firstly, they perform the gymnastics routines which get recorded for the archives. Secondly, they take part in the training session with the remote coach in which these archival materials can be used as training aids. After the session they will provide their QoE data by filling questionnaires.

4.1.2. **Coaches**
The coach uses the platform to hold a remote training session with his protégés. During the videoconference he is able to review and present archival materials and rendered 3D models. After the session he will also provide his QoE data by filling questionnaires.

4.1.3. **Experimenters**
The experimenters prepare and test the experiment’s setup and supervise its execution. After the experiment they collect and analyse the resulting QoS and QoE data.

4.2. **Preliminary usage scenario**
Miguel is a gymnastics coach working in CAR. He trains a group of professional horizontal bar athletes, including Arnau, Javier and Ramon. They have a training session planned for today, because they are preparing for a national competition. They are supposed to work on and improve their technique in the dismount phase of the routine. Unfortunately, Miguel's car broke down and he is not able to arrive at the CAR venue in time. In this situation they decide to hold a remote training video session with augmented reality. Miguel connects to the CONFetti system from his home over the Internet, while the gymnasts connect from their terminal in the CAR centre. Miguel tells them what he wants them to do this day, showing them videos of other gymnasts performing that routine recorded with the centre's video infrastructure in the past. Ramon performs the dismount according to Miguel's directions. Miguel observes the performance live and, additionally, it gets recorded. Ramon joins Arnau and Javier by the video terminal. Miguel displays Ramon's dismount in the videoconference. A 3D rendered model of a human body is superimposed on the video in real-time and it follows Ramon's movements thanks to motion tracking analysis. Miguel pauses the video and shows the athletes that in the top instant of the dismount Ramon's shoulder was in the wrong position. He demonstrates the shoulder's position on the 3D model. The next one to perform is Arnau. He performs the routine and it also gets recorded. When he joins the rest by the terminal, Miguel pulls up a 3D (stereoscopic) recording of his dismount. It turns out Arnau did not make the same mistake as Ramon, but thanks to the stereoscopic view it can be seen that the relative position of his legs was not perfect. Miguel points out the fault in detail on the model, which is also stereoscopic. Now it's Javier's turn to do the routine. He does it and awaits Miguel's commentary with the others. Miguel brings up his recording and it turns out he made the same mistake as Arnau. Miguel adds the measurements from the electromyography and isocontrol sensors to the video
A slow motion display of the recording shows which of Javier's muscles were responsible for the false movement. In the next series of performances all three gymnasts avoid the mistake thanks to Miguel's advice. After two months of training using the system they proceed to win top places in the competition.

4.3. System architecture

A schema of the system employed by the CONFetti experiment can be seen in Figure 2.

4.3.1. Functional building blocks

A description of the different components marked on the schema follows.

4.3.1.1. HD videoconferencing

This component's main task is to enable a stereoscopic HD videoconferencing connection between the athletes in the training room and the remote coach. Additionally, it allows the coach to review and present the archival 2D or stereoscopic footage of previous athletes' performances. Remotely rendered 3D models are superimposed on this footage. There are two instances of the videoconferencing client, one running on a machine at the coach's site, the other in the training room at CAR. The addition of the archival stream and the superimposition of 3D models is done on the latter machine.
The videoconferencing solution adopted for the CONFetti experiment will be based on HDVIPER\(^1\), an open and scalable HD videoconferencing platform developed in the course of the CELTIC initiative with a substantial participation of PSNC. The aim of the HDVIPER project was to provide a converged platform for High Definition videoconferencing (point-to-point and multi-point transmissions), to be integrated in a PC environment (pre-commercial prototype) and to be tested in residential VC, healthcare, business VC and distance education scenarios. Thanks to its extendable architecture the platform's functionality can easily be broadened with additional services apart from HD video and audio connectivity. The architecture is based on SIP (Session Initiation Protocol), which is very widespread in Internet multimedia applications. Its popularity makes possible the platform's compatibility with a wide array of solutions including software phones, smart phones and videoconferencing terminals. HDVIPER's architecture is compatible with various client applications, but for the purposes of the experiment one solution has to be selected and appropriately extended. At this stage we prefer Minisip\(^2\), an open source SIP User Agent developed by the Royal Institute of Technology (KTH) in Stockholm and a community of developers including PSNC employees.

4.3.1.2. Remote visualisation

This component is used to render the images that will get superimposed on the archival video material. The input data for the rendering process are models and sensor events acquired by motion tracking done by the STT experiment. Visualisation will give the coach and athletes a possibility of viewing the movements and body layout from any arbitrary point of view with the ease of natural interfaces like multi touch devices. Provided with optimal and boundary values of measured metrics, it will be possible to visualise all the mistakes made by the athlete in a clear manner, giving a useful insight into the real causes of spotted problems. In addition, the component will enclose a user interface for the coach and athletes taking part in the experiment. It will be possible to choose, control and tag video material played from the AVCC.

The software used for this component is the Vitrall\(^3\) visualisation system designed and implemented at PSNC. It will be used to render 3D content and create virtual sport scenes in real-time to meet augmented reality requirements. Vitrall is a distributed, web based visualisation system that is capable of remote rendering of complex 3D content coming from various sources, e.g. scientific data or multiple 3D model formats. It is designed to efficiently utilise multi-GPU and CPU-GPU hybrid server installations. Thanks to highly efficient remote server rendering even a less capable client is able to efficiently display and manipulate large 3D datasets in real-time. The system can also be used in collaborative environments, where many users can simultaneously interact, modifying the 3D content in real-time. Vitrall’s high-performance remote visualisation capabilities have been successfully demonstrated at various international conferences. In the main CONFetti scenario Vitrall will be used to render interactive 3D human body models that will be automatically combined with video content and presented during the videoconference as help to illustrate the body position of athletes. Thanks to the modular architecture of the Vitrall platform, it will be possible to control the model with a web browser running either on PC/laptop or mobile devices such an iPad or smartphone. Depending on

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whether a 2D or 3D source is used during the videoconference, different input devices might be more appropriate, e.g. a tablet or smart phone LCD screen might be hard to read when using 3D polarized glasses.

Vitrall, as an extensible platform, is not only capable of creating sophisticated 3D content in real-time, but it can also be used to create 2D visualisations. With the ability of receiving data from external sensors it could, for example, plot output data from motion sensors as a real-time chart. The data could also be used to enhance the 3D human model with additional information. The visualization would be later interposed on the video stream, giving the trainer an even better picture of the athlete’s performance. We initially assumed that in the CONFetti experiment Vitrall will be installed remotely on specialized and dedicated PSNC multi-GPU computing resources as a remote rendering service. Both the venue and PSNC have connections to GÉANT pan-European research and education network and therefore the experiment could make use of high-performance, state-of-the-art computing and visualisation infrastructure. Nevertheless, it will also be possible to run all the components within existing CAR service and communication infrastructure, provided that the minimal computing requirements described in section 4.3.2 (Technical assets) are met, e.g. the availability of GPUs.

4.3.1.3. **3D transcoder**
The Audio Video Content Component is not capable of receiving stereoscopic video material at this time. The role of the 3D transcoder component is to receive the signal from the 3D camera and put it in a format acceptable for AVCC without losing its stereoscopic properties, so it can be properly retrieved by the VC client. This involves format change, colour correction, geometrical alignment and output image formatting in real time. The transcoder utilises hardware grabbers for various video inputs and outputs, it uses software processing of the 3D stream and is able to provide standard 3D format such as side-by-side, frame packed video and network packed streams such as the Mini sip feed, but it is also open for any custom solution. It can also share data about the transcoding process and network statistics. That makes the 3D transcoder a very flexible system that can be dynamically reconfigured.

4.3.1.4. **Audio Video Content Component**
The AVCC is used for storing the archival footage of athletes' performances, both in 2D and stereoscopic. Afterwards, the material is served to the VC client to be used as one of its input streams. The material from different cameras should be synchronised to enable the coach to switch views dynamically. He should also be able to pause, rewind and fast forward the video.

4.3.1.5. **Experiment Content Component**
The ECC’s role is to gather monitoring QoS data from the other components that register as sources of such data. The monitored entities are the videoconferencing, remote visualisation, 3D transcoder and AVCC components.

4.3.1.6. **STT sensors and sensor data processing component**
Preliminary discussions with representatives of STT, who are the creators of another EXPERIMEDIA experiment in CAR, have shown that there are overlapping areas in the scopes of both experiments. The 3D Acrobatic Sport experiment will also employ motion capture and
generating 3D models based on the acquired data. This brought to mind the idea of cooperation. Two ways of doing that were identified:

1) The 3D models generated by STT’s system (possibly superimposed on video feed) could be used as a separate source in the videoconference.
2) The motion capture data and the 3D mesh created by STT's system could be used by CONFetti's remote visualisation system (Vitrall) to generate 3D models, which could later be superimposed onto CONFetti video (also in 3D).

The first solution is easier to implement, but the second gives more possibilities, because the models generated by Vitrall would benefit from all the functionality of CONFetti, for example they could be manipulated with the use of mobile devices. Also, sending motion capture and mesh data is less bandwidth-consuming than sending frames of ready models, not to mention video containing them. That is why the second solution will be attempted in the experiment.

Sensor data along with the 3D mesh will be exposed by STT via a VRPN server integrated into STT's motion capture software and consumed by VRPN client on the Vitrall side.

4.3.2. Technical assets
The experiment setup will involve a series of hardware pieces and infrastructure elements, namely:

- HD cameras installed in the training room. CAR is in the phase of negotiations with the supplier of them, it will probably be the Sony FCB-H11 model with HD-SDI extension card and GiGe Ethernet.
- Stereoscopic cameras for HD 3D recordings of athletes. There are various solutions providing this functionality, ranging from dual-lens units to separate FullHD cameras mounted on a 3D rig. If it proves necessary, PSNC is able to provide this equipment.
- HD 3D displays for both sides of the videoconference - the coach and the athletes. Those can be active or passive 3D TV displays.
- 2 computers for the VC client (Minisip) powerful enough to encode and decode HD video equipped with AV capture cards with appropriate inputs. Intel Core i7 3.2 GHz have been tested to work for this setup. If it proves necessary, PSNC is able to provide this equipment or parts of it, e.g. the capture cards.
- A computer for the 3D transcoder powerful enough to encode and decode HD video equipped with two Blackmagic AV grabbing cards with appropriate inputs. Intel Core i7 3.4 GHz have been tested to work for this setup. If it proves necessary, PSNC is able to provide this equipment or parts of it, e.g. the capture cards.
- At least one PC or a server machine equipped with at least two GPUs of the same model, for the remote visualisation component installation. NVidia GTX 460 and ATI HD 5870 are known to work well with the Vitrall system. A CPU comparable or better than Intel Core i7 3.0 GHz is also needed. It can be located in CAR or at a remote location, e.g. computing resources already installed in PSNC's premises could be utilized.

4 http://www.cs.unc.edu/Research/vrpn/
• Network connectivity with an appropriate bandwidth between the AVCC server, 3D transcoder, Minisip and Vitrall installations. CAR's new building has a state of the art network infrastructure and is connected to the GÉANT network, so setting up adequate connections between both the internally and externally deployed components should be possible.
• A tablet device for the coach to choose and control video material from AVCC. This piece of equipment can be provided by PSNC.
• Motion tracking sensors used by STT's 3D Acrobatic Sport experiment.
• Temperature, electromyography, isocontrol sensors if it will be decided to integrate data from them in the recorded material.

4.4. Parameters
In order to differentiate the QoS and QoE data between experiment runs and explore the relation between the two, the experiment can be parametrised in the following ways:

• The properties of the videoconferencing stream such as resolution, bandwidth or framerate can be changed between sessions.
• The system's different functionalities such as stereoscopic video or 3D models can be turned off in some of the sessions.

4.5. Data collection
Data on both QoS and QoE will be gathered in the course of the experiment.

4.5.1. Quality of Service
QoS data will be collected by the ECC from components registered with it, namely:

• Minisip videoconferencing clients - data concerning the resolution, bandwidth, framerate, packets sent and lost in the outgoing and incoming VC streams.
• Vitrall visualisation system - data regarding rendering and encoding frequency and time span on per view basis; sizes of encoded frames; frame access requests, service time; network throughput; communication with clients; basic metrics from client side (fps); each metric with per event resolution and in an averaged form (where possible) over short time period.
• 3D transcoder - data concerning the resolutions, frame rates and bandwidths of input and output streams, packets sent, video transcoding mode, video corrections applied, input/output format, system usage parameters.
• AVCC - server CPU load, memory usage, disk usage, media distribution performance and throughput.

4.5.2. Quality of Experience
QoE data will be collected through questionnaires filled after each session by both the coaches and the athletes. They will be prepared carefully in order to enable the experimenters to research the relation between QoS and QoE.
4.6. **Experiment procedure**
Each of the two experiment runs will be carried out in a process that can be divided into three phases, the descriptions of which follow.

4.6.1. **Preparation**
The specific date for the experiment run will be fixed to ensure the availability of the venue, its personnel involved in the experiment and the participants. The hardware and software infrastructure will be installed and tested to make sure all systems work properly.

4.6.2. **Execution**
This phase will include the actual training sessions augmented with FMI functionality provided by the experiment. The coach will connect with the athletes who are on site using the videoconferencing system. He will use stereoscopic archival footage with 3D models as training aids. QoS data will be collected from system components and the participants will fill QoE questionnaires after the session.

4.6.3. **Results analysis**
The collected QoS and QoE data will be analysed alongside any additional observations made during the experiment run. This will be the basis for improvements and modifications in the next run (if there is one left) and material for the report.

4.7. **Content lifecycle**

4.7.1. **Content authoring**
The main type of content created in the course of the experiment consists of footage of athletes performing their routines. It will be captured in CAR's gymnastics training hall using 2D and 3D cameras (through the 3D transcoder) and afterwards sent to the AVCC storage component.

Another type of content will be the 3D models rendered by Vitrall on the basis of motion tracking data coming from the 3D Acrobatic Sport experiment's system. The models will be superimposed onto the footage and the resulting stream will be used in the videoconference.

The QoS and QoE data generated during the experiment runs should also be treated as content. QoS data will be collected by the ECC, while QoE evaluation will be based on questionnaires filled by the participants after experiment runs.

4.7.2. **Content management**
The footage of athletes' performances will be stored in the AVCC AV repository. From there it will be served to the Minisip VC client when the coach chooses a specific video to be included in the videoconference.

The motion tracking data originating from the 3D Acrobatic Sport experiment's system will be stored on the Vitrall server and fed to the Vitrall system when the corresponding video material is chosen to be played in the videoconference. Vitrall will then render the appropriate models and send them to Minisip.
3D models and sensor events will be served by STT in form of VRPN sessions and then stored as VRPN session dumps by the VRPN client built into the Vitrall visualisation server for further use when the corresponding video material is chosen to be played in the videoconference. Vitrall will then render the appropriate models and send them to Minisip.

4.7.3. Content delivery

4.7.3.1. Transmission
The recorded video material will be sent from the AVCC to the Minisip videoconferencing client when a coach selects a specific archival performance to be included as a training aid in the current session. It is then seen as one of the streams in the videoconference with corresponding 3D models included.

4.7.3.2. Visualisation
The archival footage with 3D models is displayed during the videoconference to both the coach and the athletes. If the material is stereoscopic, they will need to use a 3D display and dedicated glasses (if it is an active display). The coach is able to switch views from different cameras as well as pause, rewind and fast forward the video from the currently chosen camera.
5. Requirements

The following requirements should be met for the experiment to be carried out in its full scope:

- There should be periods of the venue’s availability within the scheduled timeframes for installation of the experiment’s setup, tests and experiment runs themselves.
- The venue should be able to provide the technical assets mentioned in section 4.3.2 (cameras, displays, computing resources). Some of it can be provided by the experimenters, as noted in the Technical assets (4.3.2) section.
- The venue should provide network connectivity with appropriate parameters between the AVCC server, 3D transcoder, Minisip and Vitrall installations.
- The venue should ensure that there are coaches and athletes willing to take part in the experiment and that they understand its procedure and goals, according to section 8 (ethics and privacy).
- The AVCC component providers should deploy the component in the venue’s infrastructure.
- The AVCC component should provide the functionality needed by the experiment (receiving FullHD video streams, storing them, serving them on demand or live, camera synchronisation, switching between camera sources, pausing, fast forwarding, rewinding the material, tagging the material, allowing to fetch list of materials, as well as tags and camera sources related to a given material).
- The AVCC component should be able to process FullHD stereoscopic video in realtime as well as provide enough repository space to store archival materials in this format.
6. Risks

6.1.1. Venue logistics or participants availability problem
As CAR is a real sports training centre with its own goals and schedules, it is possible that there may be periods when the training hall, the coaches or the athletes are not available to take part in the experiment. This risk is mitigated by the long duration of planned experiment execution tasks. As a result, it will be possible to shift the experiment runs accordingly within these boundaries.

6.1.2. Technical issues on venue infrastructure and equipment
As stated in D4.2.1 (CAR Experiment Design and Plan), the facility is located in a new building with thousands of network connection points, a couple of thousands of electricity outlets and hundreds of SCADA sensor devices, which include SIEMENS sensors and domotics infrastructure for managing the building temperatures, lights and alarms systems. Therefore the probability of failure, especially in the beginning of the implementation and use of the building, has to be taken into account.

Data-centre infrastructure requires a long period of testing to warrant stability. Potentially, short downtimes may be required during the period of use and may affect schedules and services. Until today none were experienced.

Sporting equipment also has an initial period of adaptation and sometimes factory mistakes appear within the first months of its use, some triggering a process of appropriate diagnostics and replacement if it’s required.

6.1.3. Feasibility risk
If during the course of the experiment it turns out that the chosen functionality and scope are not possible to be realised in the planned schedule with the dedicated resources, for example because of failure to meet the requirements by other parties or unforeseen technological incompatibilities, a scope reduction might be applied, e.g. additional assumptions might be introduced to limit the complexity. Nevertheless, a full experiment based upon the chosen subset of functions will be run.
7. Plan for implementation

This sections lists the actions needed to be completed in order to carry out the experiment and a preliminary timeline for their completion.

7.1. Adaptation of system's components

The system's software and hardware components have to be adapted to the experiment. That includes:

- Extending the Minisip videoconferencing client with the ability to treat a remote stream as source for its conference streams.
- Integrating the Vitrall platform with motion tracking data provided by the 3D Acrobatic Sport experiment's system.
- Adding an interface in the Vitrall mobile client to enable the coach to choose archival materials that should be used in the VC session as well as to switch cameras, pause, rewind and fast forward the video.
- Adapting the 3D transcoder element to enable it to convert stereoscopic HD video from the cameras into a format accepted by AVCC and Minisip.
- The QoS measurements that will be researched in the experiment need to be defined and the Minisip, Vitrall and 3D transcoder components need to be adapted in order to collect them.

7.2. Integrating the system with EXPERIMEDIA baseline components

Two EXPERIMEDIA baseline components, ECC and AVCC, are planned to be utilised in the experiment. This requires some integration effort:

- The Minisip, Vitrall and 3D transcoder components must implement the AMQP client interface to send monitoring data to the ECC.
- The 3D transcoder component must be adapted to enable it to connect to AVCC and provide it with the transcoded stereoscopic stream.
- Minisip must be extended with the possibility to receive streams from AVCC. This will require a comparison of the lists of compatible a/v formats for both systems and the choice of one of them.

7.3. Experiment runs

Two runs of the experiment are planned. The preliminary run will allow the experimenters to identify any potential problems in the experiment setup and to fine-tune the parameters. The final run will be carried out to gather the QoS and QoE measurements in an optimal setup, although this data will also be recorded during the test run. In order to do that, QoE questionnaires have to get prepared beforehand.
7.4. **Experiment results assessment and reporting**

The assessment of results will start after the preliminary run of the experiment and will continue after the final run. The gathered QoS and QoE data along with any additional experiences and findings will serve as basis for the final experiment report.

Figure 3 contains an approximate timeline for the above tasks.

![Approximate experiment timeline](image-url)
8. Ethics and privacy

D5.1.2 and D5.1.3 have delivered a detailed discussion of ethical guidelines considering the EXPERIMEDIA project and its specification. The Privacy Impact Assessment (PIA) detailed in D2.1.1 is also an important source of principles. As all EXPERIMEDIA experiments need to be conducted in accordance with the EXPERIMEDIA ethical oversight procedures and the CONFetti experiment in particular will involve the recording and processing of video of professional athletes, those principles will be integrated into the design of the experiment as follows:

Informed consent

All users of the CONFetti experiment will be informed about the experiment purpose and all aspects around the usage of the CONFetti platform and how it contributes to the experiment to make sure that the users are willing to participate in the experiment.

Deception

The experimenter will never intentionally deceive, mislead or withhold information from participants over the purpose and general nature of the experiment.

Data collection

The experimenter will only store user data necessary for the experiment. The users will be informed about what data is being stored and how it is being used in the experiment. User data will be anonymised in aspects where personalisation is not needed. There will be no commercial usage of the user data.

Withdrawal from investigation

Participants will be informed about their rights to withdraw from the experiment and to require the destruction of generated data collected with their contribution.

Observational research

CAR is a private venue, so this clause is not applicable.

Data Protection Regulation

The CONFetti experiment will use the components provided by the EXPERIMEDIA project to store user data, thus ensuring accordance with EU directives.

Consortium partner responsibility

EXPERIMEDIA partners are invited to monitor and follow the CONFetti experiment. In case of any concern, it will be considered and treated accordingly.
9. Conclusion

This deliverable is an initial report on the design of the CONFetti experiment, which aims to research the possible applications of FMI (Future Media Internet) technologies in the improvement of the training process of professional athletes. The document contains a set of requirements which need to be met in order for the experiment to succeed as well as an initial plan for implementation which will be updated as work proceeds.