END OF PHASE 1 REPORT

Project Acronym:	**PREFORMA**
Grant Agreement number:	**619568**
Project Title:	**PREservation FORMAts for culture information/e-archives**

MediaArea.net SARL
Conch - CONformance CHecking for audiovisual files

Revision: March 14, 2015

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Dissemination Level		
P	**Public**	**X**

1 INTRODUCTION

The purpose of the end of phase report is to ensure that contractors have performed the procured R&D services as specified in the framework agreement. Please describe the work undertaken during phase1, including what work was completed and why this was important. Please complete this form as fully as possible.

This report must be submitted within 14 days of the completion/ termination of the phase. You are advised that satisfactory completion of this report forms part of the contract.

Reports should be submitted by email to the following email addresses:

- Peter Pharow: phw@idmt.fraunhofer.de
- Claudio Prandoni: prandoni@promoter.it

The objectives of reporting:

- To create an understanding of the work undertaken and its success in meeting the projects agreed objectives.
- Also, to provide the company with a comprehensive report to share with stakeholders and those that may help further commercialisation.

The report should be completed by the contractor, with input from any sub-contractors or project partners as appropriate. Please answer, wherever possible, on behalf of the business units, divisions, companies or other legal entities involved in the work. If this is not possible, please specify the organisation to which your answers refer.

Please answer the questions in the spaces provided. Try to answer fully, but keep your answers succinct and no longer than necessary to clearly explain them. When describing technical solutions, please regard your audience as being someone familiar with the technology, but not an expert. The report may be done in narrative alone. However, diagrams or pictures may be added where these aid clarity within the restriction on the page limit of a total of 20 sides of A4.

Because the true impact of an R&D project often takes several years to emerge, we may approach you for up to six years after project completion to follow up on the questions in this report. Your co-operation with any such follow up work is greatly valued.

2 END OF PHASE 1 REPORT

1. Details
Type of Organisation: SARL (private limited company)
Registered Name of Organisation: MediaArea.net
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Project Name: Conch (formerly Preforma MediaInfo)
Report Type: End of Phase 1 Report
Total Contract Price [euro]: €64.028
Start Date: November 4, 2014
End Date: March 14, 2015
Sub-contractors: Dave Rice, Tessa Fallon, Ashley Blewer, Erik Piil

2. At the outset of this piece of work, what were your aims and objectives?

MediaArea has evolved to specialize in developing technology for archival applications with a focus on media identification, data analysis, and audiovisual conformance. The PREFORMA Challenge Brief struck directly at our professional concerns and interests with its focus on technologically empowering memory institutions to assess, manage, and control relevant file formats. Our area of focus of Matroska and FFV1 compliments the team's advocacy for and support of these formats within audiovisual archival workflows.

Within the first phase of PREFORMA project we had several specific aims and objectives:

- Identify and involve partners, collaborators and stakeholders within the development of our design work for later PREFORMA phases
- Evaluate and assess the status of Matroska, FFV1, and LPCM within archival contexts
- Gather feedback of our research and development from diverse communities, including repository system architects, memory institutions, codec developers, and integrators and vendors that support archival work
- Design a plan for facilitating the standardization of FFV1 and Matroska within the project
- Foster a more immersive relationship between memory institutions and open source technology development
- Identify more effective means to utilize the digital preservation features of the specifications of FFV1 and Matroska
- Develop an open technical plan that is modular, collaborative, and encouraging of participation
- Anticipate and prepare for key areas for collaboration amongst PREFORMA suppliers

3. Please provide a summary off the outputs of this piece of work and relate these to the original objectives. How do the outputs address the challenge of this PCP?

MediaArea reached out to former and current clients, memory institutions, archival vendors, and other stakeholders to gather feedback about our project approach. These outreach efforts included disseminating surveys among archival listservs, conducting discovery interviews, and conference. These efforts generated a significant amount of community feedback and aided us in identifying specific organizations and collaborators to involve in our design plans. Our participation in Code4Lib led to a series of dialogues with Artefactual Systems and others about the application of intended PREFORMA project outputs to the OAIS framework and systems that support it. Participating in FOSDEM led to debates about archival applications of FFV1 and Matroska and standardization strategies for each format. We also met part of the team that standardized Opus audio through IETF as well as the developers of the FFV1 codec. By the end of the first phase, MediaArea had gained a much larger network of specialists involved in codec standardization, conformance checking, OAIS microservice development, and archival technology.

Regarding conformance checking, MediaArea extended support for FFV1 and Matroska within MediaInfo (our flagship product). Initially our goal was to support FFV1 bitstream parsing and analysis via the specification documents alone; however, we soon found that the specification alone was insufficient for this purpose and we had to supplement this resource with codec implementations from FFmpeg and libav. Through these prototyping experiences and community feedback we found that the status of the standardization of Matroska and FFV1 had a significant impact on the perception and adoption rate amongst memory institutions. As the objectives of the PREFORMA Challenge focus on enabling more comprehensive levels of verification and control of these formats we began to develop plans specifically to facilitate standardization of the formats through an open standards organization. In addition to a standardization plan we have also produced an updated version of MediaInfo that increases Matroska and FFV1 analysis and complies with PREFORMA's licensing requirements.

Throughout the Design Report, MediaArea notes several places within its technical plans where we find it in the best interest of the project for PREFORMA's suppliers to collaborate closely, such as expressing sets of policy checks, vocabulary management, and documenting conformance checks themselves. We delved deeply into defining conformance checks for the Matroska format and, to a lesser extent, the FFV1 format. While we anticipate that further work on identifying, defining, and implementing conformance checks is at the heart of the second phase of work, we wish to make progress on this effort early, partly to inform our overall conformance checker design plans and also to work out some information structures to identify, describe, and relate conformance checks. During the more collaborative natural of later PREFORMA project phases we hope to coordinate with the work of other PREFORMA suppliers to define a mutual information structure in an effort to increase standardization and modularity of the total work.

4. Describe any changes to the original plan in the tender. What was the reason for these changes? Please include any circumstances that aided or impeded the progress of the project and the actions taken to overcome them.

MediaArea's consideration of the standardization status of Matroska and FFV1 changed during the project. Matroska and FFV1 are based upon draft specification but are not supported by an open standards organization. During initial prototyping efforts, we found the draft specification of each format to have insufficiencies for the development of a comprehensive and authoritative conformance checker. With this experience and the gathered feedback, we found that the standardization status of these formats could be problematic within the long-term development and implementation of PREFORMA's objectives. Thus MediaArea changed our approach to include standardization plans that could run concurrently within other PREFORMA development work. We involved the lead authors and implementers of the formats within our plans and sought advice from other audiovisual open format efforts such Opus audio (standardized through the IETF).

Initially MediaArea considered including analysis of the decoded streams of FFV1 and LPCM into the overall plans. For instance if the decoded streams were analyzed then a user could test for audio silence, audio clipping, or video errors (such as head clogs or illegal chroma values). Through research, feedback, and our own project prioritization, MediaArea determined not to include tests that occur on the results of decoded streams within the project, but instead focus on bitstream analysis and conformance checker through tests that do not require decoding. The tests upon decoded audio and video are more specifically handled in our other projects such as QCTools and these tests are not format specific, whereas for PREFORMA the interpretation of the status and structure of particular formats is essential.

In preparation of Phase 1 MediaArea identified a project team well experienced in digital archiving, bitstream analysis, application design, project management, and outreach. For later phases, we envisioned that we could accomplish the work with the same team but include partners and collaborators to provide specific expertise and testing. As we began to clarify how comprehensiveness of the plan and to allocate resources to it, we identified a need for another partner specifically on implementation issues within an OAIS framework. During the Code4Lib conference we presented on the state of our research and started a dialogue with Artefactual Systems that provided new levels of inspiration for particular aspects of the project. As the developers of a key open-source, OAIS-based repository systems we determined by including them within the project plans we could facilitate the implementation of our development work within a separate, independent repository system (Artefactual's Archivematica) and gain access to their expertise in OAIS microservice design and their Format Policy Registry.

A complication in the technical planning occurred within interpretation issues with the licensing requirements of the project as defined by the Framework Agreement and Tender Specifications. MediaArea participated with the other Suppliers to draft a letter to the PREFORMA Consortium to seek direct clarification. While our team awaited a response we planned out two differing development scenarios based on the potential outcome. Once the response was provided MediaArea found the clarification clear and well suited to the spirit of the project.

5. Please provide a short factual summary of the most significant outcomes of your work.

One of the most significant outcomes of the Conch project thus far is the team's initial design architecture of the conformance checker that will implement meaningful file format validation for Matroska, FFV1 and LPCM. Additionally, in our discussion with IETF and FFmpeg/libav maintainers, a plan emerged to strengthen the disclosure, transparency, and credibility of these file formats through a concomitant standardization and standards adoption. We find that strategizing to concurrently develop conformance tools while facilitating refinement and formalization of the underlying specifications benefits the credibility and stability of both the project and its underlying formats.

We've found community involvement, even at this early phase, to be a significant outcome. Throughout our research we engaged with a variety of stakeholder communities and brought about a much greater degree of involvement than we had anticipated. By continuing the project in an transparent and participatory manner while continuing our outreach and training efforts we hope to continue to foster this involvement and to better connect memory institutions with the technological communities that they rely upon.

6. Describe the innovative aspects of the work, including any new findings or techniques.

Both the questionnaire and discovery interviews provided the project team useful, up-to-date information to incorporate into our overall Conch design architecture. The interviewees came from a wide spectrum of technical backgrounds and heritage positions and were able to provide key feedback on aspects of contemporary conformance checking that could be approved upon with the project.

Participants of our web-based questionnaire also elucidated on contemporary methods and practices. The team was excited to learn that the majority of participants checked audiovisual files for conformance using our MediaInfo software, adding its output metadata into existing schemas such as PREMIS or PBCore. This reinforces the idea that the Conch project is as much about refining the current conformance checking workflow of existing software tools, as it is about raising awareness and building a knowledge base. To take another example, while a majority of questionnaire participants' institutions maintained a digital repository for collection materials, only half of these institutions implemented procedures based on the OAIS reference model. For OAIS adopters, a majority of information packages were created in-house, with outside vendors providing mostly Preservation Description Information in the form of Fixity Information, like checksums.

Open codecs and wrappers were implemented the most by institutions in the creation of preservation master assets. FFV1 and LPCM were currently implemented in several institutions providing a large set of participants and testers for future development. We found Matroska to have significant interest though found very few archival uses of it (significantly in the City of Vancouver Archives as well as Archivematica's default normalizing strategy for video). Within the EU, we found Matroska notably used in film digitization projects within the UK National Archives. Although actual implementation of Matroska was found to be low, there was significant interest in realizing its digital preservation features, such as internal fixity features, support of attachments, and extensible support for complex metadata structures. Although the Matroska specification incorporates features of significant interest to digital preservation, the implementation of these features within implementation and policy checkers and metadata fixers has yet to be achieved. As a result we've found that PREFORMA's focus on Matroska to support innovative applications of a format well prepared for preservation use.

7. Describe where the R&D and other operational activities have been performed.

For phase 1, research and development as well as operational activities have been performed in Curienne, France at 40%, Montpellier, France at 15%, New York, USA at 45%.

For our plans of phase 2 we anticipate more widespread geographical participation based on the roles of our project partners and collaborators. The expected breakdown of geographically located research and development as well as operational activities is: Curienne (France) at 35%, Montpelier (France) at 20%, New York (USA) 30%, British-Columbia (Canada) at 6%, and other work within UK, France, Austria, the Czech Republic, and Germany at 9%.

8. Please provide complete and clear information about the allocation of monies paid by the Authority with consideration to the R&D service contract minimum requirement (that more than 50% of the contract value is attributable directly and exclusively to legitimate R&D services).
MediaArea is a very lightweight R&D company with a focus on virtual workspaces. As a result, we can participate in projects of various sizes with very minimal overhead. Additionally the context of our agreements with project sub-contractors is almost exclusively focused on research and development in direct support of the project. We estimate that at least 90% of the Phase 1 budget has been directed to research and development efforts specifically, while the remainder covered administrative costs, travel, materials, and project expenses.

9. Describe any potential long-term collaborations/ partnerships entered into. Please list the organisation/s and the role they played in the project.

Through Phase one MediaArea made efforts to garner support and feedback from individuals representing a variety of heritage institutions. Resulting from this outreach, we have including some specific names of collaborators within our plan. In most cases, these collaborators do not have specific deliverables but agree to participate within the project to provide peer review and expertise, feedback and testing, and help guide the overall development strategy.

The team of collaborators includes:

- Moritz Bunkus (Matroska main developer): validation of Matroska tests, Matroska specific technical support, review of standardization efforts
- Michael Niedermayer (FFmpeg maintainer and FFV1 primary author): validation of FFV1 tests, FFV1 specific technical support, review of standardization efforts
- Luca Barbato (Libav maintainer): validation of FFV1 tests, FFV1 specific technical support, review of standardization efforts
- Ian Hendersohn (User of MKV/FFV1/LPCM in a national archive): Provide testing and feedback of project tools
- Richard Barnes (standardization strategist): Advisor on implementation and standardization efforts

Additionally Artefactual Systems, a consulting and development company, that develops a open source, OAIS-focused repository solution called Archivematica which is in use within several memory institutions throughout the European Union. Artefactual Systems is referenced in our project plans as a development partner. One of our objectives is to ensure that our work is well prepared for integration within other larger projects. To demonstrate this objective in a manner beneficial to memory institutions we are partnering with Artefactual System to facilitate an initiative to integrate selections of the PREFORMA developments into Archivematica. The aspect of the project will ensure that PREFORMA conformance checkers are available to Archivematica's existing user community. Additionally by including these integration efforts within the context of the project we will receive a significant and collaborative use case to test during the prototype phases.

In addition to the collaborators listed above we also interviewed two vendors about conformance checking, George Blood of George Blood Audio and Christophe Kummer of NOA. Getting feedback from NOA was significant as NOA has facilitated several large-scale digitization projects based on FFV1 and has sponsored development of the existing FFV1 specification. From memory institutions we also interviewed Hermann Lewetz and Peter Bubestinger from Österreichische Mediathek as long-time archival users of FFV1.

During later phases of the project we anticipate increases to our networking and outreach to vendors, archivists, and developers relevant to the objectives of the project.

10. Please describe how your organisation has gained from this project. What new business opportunities have been created? Do you expect your organisation to grow as a result of this project?

MediaArea's original business model focused on the offering of an open source product (such as MediaInfo) and facilitating requests for consultation, implementation, or feature support directly from product users. More recently MediaArea's growth has fostered a more active approach to advocating for or applying for larger, focused development projects in response to archival challenges. These initiatives led to projects such as QCTools, extensions of MediaInfo, and workshops on audiovisual data in locations such as the Tate Museum in London and VIAA in Ghent. To prepare for PREFORMA and other upcoming projects, MediaArea has undergone significant steps in business development including developing a business plan, codes of conduct and policies, hiring new employees and developing relationship with new subcontractors.

MediaArea has undertaken prior projects focused on analysis of FFV1 and Matroska and such results are incorporated into MediaInfo. However with the additional research within the context of the PREFORMA project, we find that the rate of FFV1 adoption within archives is accelerating. More vendors are supporting the format within large-scale preservation projects. In our opinion FFV1 is really at a tipping point of archival credibility and adoption; but the principle drawback is the status of its standardization and lack of conformance tools. We are excited that the objective of PREFORMA coincides so well with this stage of application of FFV1, as the intended tools of PREFORMA are crucially needed to support the use of this format in archival application.

During Phase 1 of the PREFORMA project, MediaArea was able to focus on research and development into the Matroska, FFV1, and LPCM file formats, in particular their potential usage for long-term digital preservation standard formats and the existing conformance needs and risks. Through efforts of publicity and outreach done for the PREFORMA project, MediaArea was able to form closer relations with potential future business partners, collaborators, and sponsoring memory institutions.

If MediaArea is awarded for the next phase, MediaArea will recruit an additional full-time person focused on the development of the PREFORMA project as well as to support (through bug corrections, issue management, and new feature requests) the software resulting from the PREFORMA project. MediaArea intends to seek other business opportunities involving Matroska and FFV1 concurrent to the PREFORMA project as we find these formats to resolve multiple challenges within archival digitization, access, and digital conservation. MediaArea plans to continue to support the product after the end of the PREFORMA project, so additional personnel are anticipated to be long term positions.

Furthermore, MediaArea has long-anticipated revisiting its earlier conformance checking work in DV Analyzer and BWF MetaEdit. Given the stable, detailed framework provided by the PREFORMA project, we hope to promote opportunities to include DV and Broadcast Wave Format conformance checkers to incorporate into the project results and work from there to other formats relevant to our client's needs.

11. Describe the potential for exploiting the work. Please identify any new intellectual property which has been filed or for which filing is anticipated.

After the PREFORMA project is completed, MediaArea anticipates offering access to an integrated solution in two ways: as a ready-to-use environment with a subscription business model (SaaS), and as a ready-to-download version of the integrated solution. This is based on MediaArea's future business model, which consists of a combination of subscriptions and paid punctual support, such as accommodation of bug corrections and new feature requests. With this long-term business model approach in mind, MediaArea will be able to continue offering a PREFORMA-specific version, free of non-PREFORMA related layers, as a subset of our own integrated solution. MediaArea foresees that many memory institutions or organizations may be interested in custom integrations, institution-specific features, or support in the creation of preservation workflows that utilize the software, and will develop business offerings to facilitate this need.

Intellectual property will be mainly focused on the method for having a fast, complete and generic conformance checker capable to be reused for other formats. It should also be noted that MediaArea is committed to creating intellectual property under open licenses through transparent modes of development. Our business model is not based upon selling intellectual property but rather upon supporting it through advocacy, sponsorship and partnership.

12. Describe the suitability of the project results for: (a) developing a prototype, and (b) development of test series – in order to facilitate assessments of progress into next phase.

During the design phase, MediaArea created several proofs of concept in order to be sure that the conformance checker is feasible. These proofs of concepts will be reused for the development of the prototype during the second phase and integrated into the current development of MediaInfo. Within our Design Report, we included specific functional requirements, design criteria, and objectives to guide the development of a prototype. Such details in addition to the transparent and participatory nature of our plans are designed to support self-evaluation and assessment through the project. In many cases such as the conformance check registry we tested design procedures to significant extents to verifying their ability to scale into the more comprehensive prototype phase.

To better envision the design of a Matroska conformance checker, we expanded our support for Matroska parsing within MediaInfo and evaluated several Matroska demultiplexers. Through this and additionally combing thoroughly through the Matroska specifications we developed an early draft of a conformance check registry for Matroska. The work to identify and define each implementation check prepares us for later phases to synthetically create a series of test files that relate to each check. We plan for each check to be defined to reference at least one sample (either collected from real-world use of Matroska or created by us artificially). Through the research and development of Phase 1, MediaArea is well prepared to create artificial test files that challenge specific elements of their underlying specification and are designed to trigger an assortment of defined conformance checks. In addition to test files, we intend to develop a test series by creating specific workflows and use cases that implement such tests. In this manner, exercises such as migration, acquisition, or transcoding will be outlined in such a manner that users can recreate and adapt specific OAIS-based test procedures to perform in conjunction with use of PREFORMA's toolset.

MediaArea often specializes in research and development involving problematic files. Our clients from broadcast and archival systems frequently provide files with particular issues and request we develop means to identify them. Within the PREFORMA project we see the file format specifications as more central than the test files and will work to disassemble the requirements and logic of the specification to compose and define each implementation check. From this data we will identify or create a sample set that correlates to each aspect of the check. Each sample will be associated with a particular anticipated outcome of the implementation checker. Using the sample library with the conformance checker should results in particular documented results. Any deviation from the intended results will be noted as a consistency issue with the development of the implementation checker and addressed through updates to documentation, samples, or code.

13. Open Source approach

MediaArea has and continues to be dedicated to open source. MediaArea has relicensed its flagship product, MediaInfo, to be licensed under PREFORMA's requested open source standard of GPLv3+ and MPLv2+. Efforts have been made to only use software that also falls under this license, with some open source software being leveraged that follow under similar licenses. Should the additional supporting software chosen as foundational software for the creation of this project become unavailable due to open source licensing complications, an alternative open source solution will either be chosen to work in its place, or an in-house solution will be developed, depending on if an alternative solution exists or if budget constraints allow for the creation of in-house software components.

MediaInfo is a well-established asset to the long-term digital preservation of moving image assets in archives, libraries, and museums, and Conch will be an extension of that usage by providing memory institutions with more comprehensive open source tools. Because of MediaInfo's popularity as a technical and tag data retrieval service, it is already entrenched in open source communities and already exists within a structure of open source support.

MediaArea hosts Conch and other code on its Github account. Github acts as a social network for connecting MediaArea projects with open source contributors and collaborators. The open source community can view or compile versions of the code, file issues and address problems, and offer bug patches or features all using Github as the primary network of communication.

Members of MediaArea fostered interest in the PREFORMA project by speaking at open source-focused conferences FOSDEM and Code4lib. FOSDEM is a free and non-commercial event organised by the community for the community. Code4lib is a volunteer-driven collective of hackers, designers, architects, curators, catalogers, artists and instigators from around the world, who largely work for and with libraries, archives and museums on technology.

14. Standardisation efforts

MediaArea presents a plan to strengthen the disclosure, transparency, and credibility of Matroska and FFV1 through standardization and adoption by relevant standards bodies. MediaArea researched the standardization process for three major standards-granting bodies: Internet Engineering Task Force (IETF), SMPTE (Society of Motion Picture and Television Engineers), and ISO (International Organization for Standardization). IETF was chosen as the optimal standards organization to pursue for the endeavor of making Matroska and FFV1 preservation standards. The standardization procedures require a high degree of planning, network, and strategy. MediaArea has outlined a plan for the standardization of the Matroska and FFV1 formats, including research, correspondence with field expert and lead project developers, and the creation of a timeline that lays out a roadmap for standardization submission protocols and the completion of the effort by the end of the PREFORMA funding term. MediaArea has identified field experts to serve as project advisors throughout the standardisation process.

We feel confident in our standardisation plans in regards to cost, resources, timing, and benefits to the overall project. Please see our appendix on this effort for more information: https://github.com/MediaArea/PreFormaMediaInfo/raw/master/ProjectReports/MediaAreaConch_Appendix_ConformanceCheckRegistry.pdf.

15. Provision of data.

MediaArea anticipates developing a rich corpus of sample valid and corrupt files to support PREFORMA consortium testing and development. This includes generating samples from all current open source tools that support writing FFV1 or Matroska. Because of the simplicity of LPCM, we do not intend to create samples specific to a variety of writers. MediaArea will instead focus on the creation of LPCM files in WAV and Matroska containers. Such files will incorporate various coherency issues where aspects of the LPCM stream will conflict the supporting metadata of the container.

As MediaArea develops a registry of conformance checks (covering implementation checks, policy checks, and container/stream coherency checks), we will seek to identify or synthetically create sample corrupted data to relate to each error. This will allow not only the PREFORMA consortium to test each like module, but will also provide a consistent corrupt corpus for outside institutions to use in further module development.

In addition to generating samples, the MediaArea team will incorporate collections of test samples already offered from Matroska and FFV1's development teams, as well as those existing in libav and FFmpeg's sample library (see http://samples.ffmpeg.org).

16. Please insert additional information that may be pertinent. This may be in the form of text, pictures, diagrams, data, graphs that support the work.

Figure 1: Demonstrates the system architectural design of the conformance checker, relating the various user interface types to the system core and associated conformance checker modules.

Figure 2: Checker Architecture -- Describes the architectural layers and whether they are or may be supported by the MediaArea's development or through potential third-party future integration.

Figure 3: Community Overview -- Shows MediaArea in collaboration with PREFORMA's suppliers, the open source community, and a support structure of project collaborators.

Figure 4: Demonstrates incorporation of MediaArea's plans for Conch within an OAIS framework.

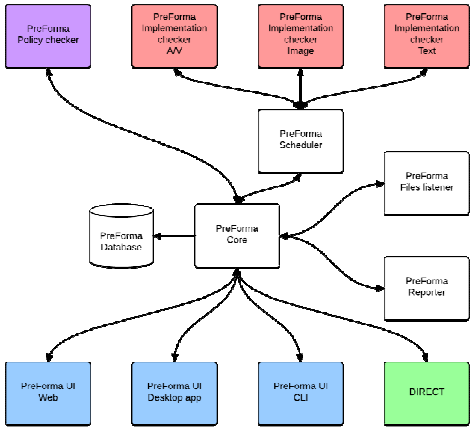

Figure 1

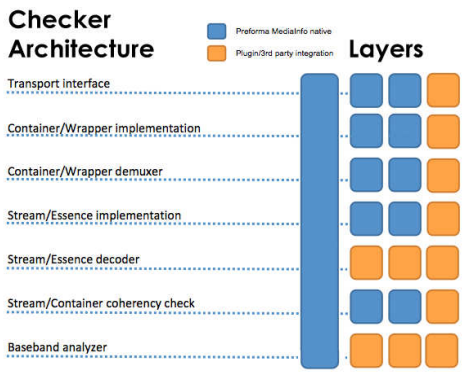

Figure 2

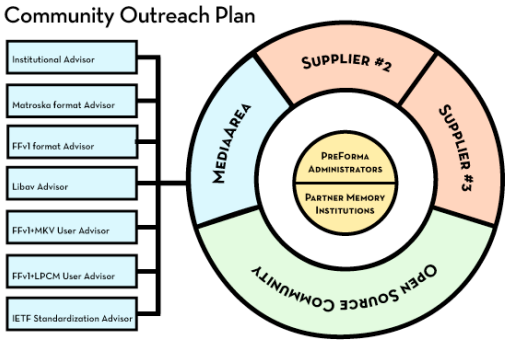

Figure 3

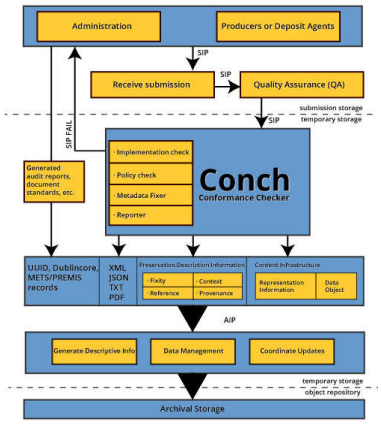

Figure 4

17. Describe what ethical aspects you have identified and how this may influence your solution.

Throughout our discovery work, including interviews and surveys, we've found that often memory institutions have been slow to integrate technology into archival workflows though are increasingly aware of the urgency to do so. The focus of PREFORMA's Challenge is technically complex and delves into all corners of codec standards and underlying specifications. We are well aware of the potential technological gap between the intent of the project and traditional memory institutions that are currently making initial steps to move to digital preservation workflows. As a result we find that ethics factor significantly in the approach to application design and documentation. The resulting toolkit of the PREFORMA project should not focus on appeasing the most technically advanced archives but consider a broad range of technical proficiencies available at stakeholder memory institutions. We hope to consider a layered design so that users may approach and use our developed work through an intuitive and guided design without burdensome technological prerequisites places upon the user. However in efforts to make the application transparent, comprehensive and authoritative, the application will lead users to related documentation, specifications, community dialogue and sample files. We find the balanced objectives of serving a wide variety of user skillsets to be an ethical design issue and aim to design work responsive to both ends of the spectrum through active implementation cases, user feedback, trial runs, and outreach.

3 FINANCIAL REPORT

	Unit price	Quantity	Quoted price (€)	Total Price (€)
Labour Price				
1. Jérôme Martinez	€ 128 000	50% FTE at 4 months	€ 21 000	€ 21 000
2. Dave Rice (Sub Contract)	€ 128 000	35% FTE at 4 months	€ 15 000	€ 15 000
3. Guillaume Roques	€ 90 000	40% FTE at 4 months	€ 12 000	€ 12 000
4. Tessa Fallon (Sub Contract)	€ 75 000	10% FTE at 4 months	€ 2 500	€ 2 500
5. Ashley Blewer (Sub Contract)	€ 75 000	40% FTE at 4 months	€ 10 000	€ 10 000
6. Erik Piil (Sub Contract)	€ 75 000	10% FTE at 4 months	€ 2 500	€ 2 500
Materials				
Capital Equipment				
Sub Contract		See 2., 4., 5., 6.		
Travel and accommodation			€ 4 000	€ 4 000
Rebate			€ -2 972	€ -2 972
TOTAL PRICE (excluding VAT)				
TOTAL PRICE (including VAT)*		No VAT	€ 64 028	€ 64 028