JISC Project Plan

Project Information			
Project Acronym	ViCoVRE		
Project Title	Video Conversion for Virtual Research Environments		
Start Date	01/04/2009	**End Date**	30/11/2009
Lead Institution	University of Manchester		
Project Director			
Project Manager & contact details	Martin Turner – Martin.Turner@manchester.ac.uk Andrew Rowley – Andrew.Rowley@manchester.ac.uk		
Partner Institutions			
Project Web URL	http://www.rcs.manchester.ac.uk/research/ViCoVRE		
Programme Name (and number)	Virtual Research Environments Programme B1		
Programme Manager	Frederique Van Till		

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Overview of Project

1. Background

Virtual Research Environments (VREs) need to take account of significant differences between research practices across different disciplines. However, it has become clear that there is a need for the conversion of Access Grid recordings to more interoperable formats to support a broad range of different researchers' needs. The VRE phase 2 project Collaborative Research Events on the Web (CREW) developed a system for recording and replaying research seminars, presentations and workshops. This built upon the VRE phase 1 project Memetic, which was primarily designed to record research meetings. In addition to the users of Memetic and CREW, the VRE phase 1 projects CSAGE and the VRE for the History of Political Discourse also made use of Memetic, and since then, the concepts developed in Memetic have been reused by the joint AHRC, EPSRC and JISC funded e-Dance project to document and help create dance performances. All these projects requested that the videos created be exportable to other common media formats for various use, from writing the recordings to DVD, to being able to play them back from a web page.

A flexible tool that allows recordings to be converted from and to common formats has therefore been shown to be a requirement in a generic research toolkit designed to support the development of the autonomous, collaborative researcher. This project will address this need by building on the lessons learned from CREW and Memetic. It is proposed to develop a video conversion tool that will be flexible enough to support recordings of different types of events, allowing them to be converted from and to common formats for different scenarios depending on the needs of the researchers. These needs will be evaluated using a user-driven approach and the tool will then be developed using participatory design and rapid application development, whereby the users are consulted before any code is written, and then the produced software is evaluated after each part of the tool is developed. This will ensure that the resulting tool is developed in an agile manner and meets their specific needs.

The use of standards in the access of this tool will ensure that it can be easily integrated into different systems, and that the recordings can be replayed and edited with a variety of third party software including video editing tools (such as Adobe Premier), standard media players (such as Microsoft Windows Media Player and RealPlayer), DVD players, and also to support replay directly from the web, rather than requiring the use of the Access Grid software client. The tool will also be deployed as a service using the service-oriented architecture (SOA) approach to allow the system to be used from within the e-Framework.

1.1. Key Project Building Block: Memetic

Memetic was funded as part of the first phase of the VRE programme. The purpose of the project was to develop an Access Grid recording and replay system that allows live annotations to be made alongside the recordings. These annotations are used to navigate around the recording, avoiding the need to watch everything. The project was designed to record meetings, but it was found that users wanted to record diverse events, from seminars and workshops to dance performances.

Access Grid communicates using the Real Time Protocol (RTP), and Memetic records this by storing these RTP packets directly, along with an index. This allows the recordings to be played back into another Access Grid meeting with very few changes. There are many benefits of this choice in storage including: the ability for the recordings to be started from any time point; allowing annotations to be made against any time point in the recording; and allowing the recordings to be edited without the original being changed.

One of the inconveniences of the format is that it cannot be played or edited with standard video or audio tools, making it more difficult to present the recordings on websites. During the first phase of the VRE programme, Memetic was successfully used by the VRE for the History of Political Discourse and CSAGE projects, as well as the Locating Grid Technologies workshops at the University of Bristol. These users requested that their recordings be exported to common file formats to allow them to be used for different purposes.

1.2. Key Project Building Block: CREW and E-Dance

CREW was funded as part of the second phase of the VRE programme with the aim of joining Memetic with another VRE phase 1 project Iugo. The project was designed around the recording of seminars, allowing these events to be searched within the context of other information. CREW also added the ability to record events when network access is not available.

To allow recordings to be replayed within a web browser, the CREW project developed a Flash-based player. This required a converter to transform the files into Flash Video (FLV) streams. This allows a wider audience to access the recordings, but is still designed specifically for replaying presentations.

E-Dance is a JISC, EPSRC and AHRC joint funded project which is investigating the use of e-Science tools in practice-led dance research. This project has also developed a customised recording and playback system based on the Memetic software. In this instance, the playback is performed through a stand-alone program that allows the recording to be combined with a live performance. One issue with this program is that, because it was designed to play only Memetic recordings, it cannot play streams in standard video formats, and so older material recorded without Memetic cannot easily be used in the performance.

2. Aims and Objectives

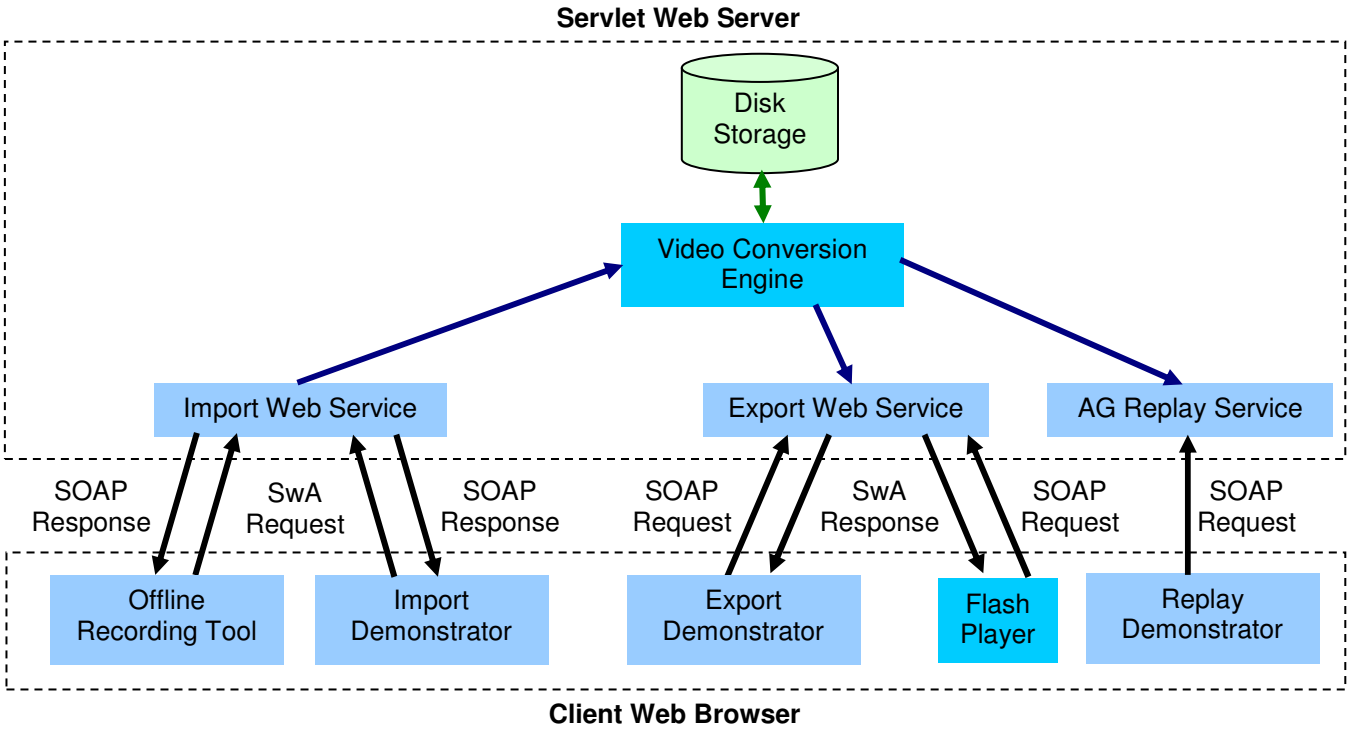
There is clear benefit to be gained from providing a general video conversion tool. Autonomous researchers want to be able to record for various reasons. The proposed web service will allow these researchers to upload recordings in various formats, such as avi or mpg. These will then be converted into the Memetic file format, so that they can be combined with other recordings when using Memetic-based replay tools. This will also support the upload of recordings in the Memetic format for storage and use by the export interface. The web service will use the Simple Object Access Protocol (SOAP) for control and SOAP-with-attachments for the uploading of videos to ensure compatibility within the e-Framework.

A web service will also be created for exporting videos. This will allow users to download the streams of the recording in a variety of formats. The interface will allow the user to choose what combination of audio streams are included with each video stream, and will also allow basic editing such as the resizing of videos.

3. Overall Approach

The services will be hosted on a **Servlet Web Server**. The recordings will be stored on non-volatile disk. At the heart of the server will be a **Video Conversion** Engine. This will take videos in one format and convert them into another format, guided by instructions. The recordings will be written to disk by the **Video Conversion Engine** which will ensure that the recordings are written using RTP and will also ensure that the video and audio files are encoded such that minimal disk space is used while maintaining high quality. The **Import Web Service** will provide the media to be converted. This will be received using **SwA**, and the results of the conversion will be sent using **SOAP**. The **Export Web Service** and the **AG Replay Service** will both receive the video from the **Video Conversion Engine**, which will read the RTP recordings from disk and ensure that they are in the right format for use by these services. The **Export Web Service** will receive the converted media and forward it on to the client using **SwA**. The client will be able to control the conversion using **SOAP**. The **AG Replay Service** will receive the converted media and then replay it to the Access Grid. The format of the streams will be fixed to be compatible with Access Grid, although **SOAP** will also allow some control over this.

The **Client Web Browser** will access the services through a variety of web pages and tools. The **Offline Recording Tool** will be downloadable via the browser. This will allow users to make recordings which it will then upload to the **Import Web Service** using **SwA**. The **Import Demonstrator** will allow the users to upload their own videos using a variety of formats. This will require a java applet on the web page which will encode the files using **SwA**. The **Export Demonstrator** will allow users to convert existing recordings into other formats. This will also require a java applet to request the conversion using **SOAP** and then receive the files and decode the **SwA** response. The **Flash Player** will use similar requests to receive the files in FLV format, so that they can be played directly in the player. The **Replay Demonstrator** page will allow the user to select which recordings to play into which Access Grid virtual venue.



4. Project Outputs

4.1. Software Outputs

- A web service for importing and converting videos from a variety of popular media formats.
- A demonstrator import web application allowing use of the import web service.
- A demonstrator offline recording tool for recording from local cameras and from Access Grid.
- A web service for exporting and converting videos into a variety of popular media formats.
- A demonstrator export web application allowing use of the export web service.
- A demonstrator flash player for playing back recordings directly within web pages.
- A web service for replaying recordings via Access Grid.
- A demonstrator web application allowing use of the replay web service.

4.2. Non-Software Outputs

- Monthly meetings with the JISC programme management team and an interim report after six months from the project start.
- A project web site on which the demonstrator web applications will be hosted, as well as links to the other software produced and reports.
- Interaction with the Virtual Research Community Website, including the support forum, the FAQs, and the public blog for the project. Issues with the demonstrator will be summarised in a final report to the VRC website at the end of the project.
- A final project report that analyses the project in detail from development through to user engagement and evaluation.
- A Google Code website for the project that will enable interaction with other open-source developers. This site will remain available in perpetuity in line with the Google Code guidelines.
- A service description and documentation submitted to the e-Framework innovation knowledge base.
- An evaluation report detailing the issues encountered, lessons learned and indicated, and the future work to be carried out in the area of video conversion.

5. Project Outcomes

Software developed in this project will make Access Grid recordings more useful and more usable. This will make users more likely to record their seminars and meetings, and also make it more likely that these recordings will be used again in the future.

6. Stakeholder Analysis

Currently, Access Grid users have little access to video conversion tools. Other than the aforementioned Memetic and CREW services, which are designed for specific purposes, the services available for recording Access Grid include an integrated recorder in the commercial IoCom software, and AG-VCR. The former provides only a basic interface for replaying meetings, in which no navigation of the recordings in possible, and requires that users purchase the IoCom software. The latter allows recording and replay, but this still only allows interaction with Access Grid. No AG recording tools exist that allow conversion to and from other formats.

Stakeholder	Role	Involvement
University of Manchester Research Computing Services	Developer	High
Virtual Research Group	Customer	Medium
ACM SIGGRAPH Manchester Professional Chapter	Customer	Medium
e-Dance Project Partners	Customer	Medium
OMII-UK	Dissemination	Low
JISC	Funder, Dissemination	High

7. Risk Analysis

The table below is drawn from the basic analysis carried out at the proposal stage.

Risk	Probability (1-5)	Severity (1-5)	Score (PxS)	Action to Prevent/Manage Risk
Staffing	2	4	8	Expertise is shared between other members of staff at the University; these staff members could take over responsibilities as necessary.
Organisational	1	1	1	No external collaboration is involved.
Technical	3	3	9	The technologies involved are challenging. However, the developer involved is an expert and well known to appropriate user groups if external assistance is required.
Suppliers	1	1	1	No external suppliers involved.
Legal	3	3	9	Legal issues are a key topic in software that stores copyrighted data. These issues have been explicitly addressed in CREW via related organisations, and this project will ensure these recommendations are undertaken within the developed tools.

8. Standards

RTP

RTP is a packet format for multimedia data streams and is used by many standard protocols, such as the video and audio tools used in the Access Grid as well as H.323 and SIP for IP telephony applications.

Multimedia Formats

Video and audio in recordings can be stored in a variety of formats. In order for video and audio to be displayed within a web page, a web browser plug-in must be used. To avoid the user having to install a plug-in when using the application, a multimedia file format can be chosen that is likely to be compatible with either a variety of plug-ins (such as avi, mpeg, or wmv), one of which is commonly installed in most systems, or a particular plug-in that is commonly installed on most systems (such as Adobe Flash). It would also be useful if this format could be played within a stand-alone multimedia player on various platforms so that the recorded media can be written to a CD or DVD for playback where an internet connection is not available.

The pros and cons of various media formats will be evaluated to determine the most suitable for users' needs.

AJAX

Asynchronous JavaScript and XML (AJAX) allows parts of a web page to be updated without the need to reload the entire page. This is well-suited to portlet applications where one may want to update the user interface of one portlet without affecting the others. Although the JSR-168 standard does not disallow the use of AJAX, it does not give any information on how it might be used. Many workarounds have been devised to aid the use of AJAX from within portlets; considering the advantages AJAX provides for portlets.

SOAP

Simple Object Access Protocol (SOAP) is a protocol for exchanging structured information and is commonly used in web service implementations. SOAP allows for the calling of methods and functions within web services and allows these services to receive and return complex objects. SOAP encodes data in XML, enabling communication between different operating systems and programming languages. SOAP with Attachments (SwA) extends SOAP to allow the transfer of files to and from web services.

9. Technical Development

Ensuring Quality Code

This project will follow best practice in future development of code by ensuring that all code follows the relevant programming guidelines:

- Java Code Conventions http://java.sun.com/docs/codeconv/

The quality of the code will be checked using automatic code checking tools, such as Checkstyle (http://checkstyle.sourceforge.net).

The developer will adopt suitable Integrated Development Environment (IDE) Tools, such as Eclipse (http://www.eclipse.org/) to support quality, shared software development. This use of IDEs should enable code to be more easily produced during the project and make it more readable, easier to maintain and more reusable.

Application Development

Application development will involve close consultation with users to meet the needs of the co-realisation methodology and ensure a thorough understanding of the user environment by developers. Lines of communication between users and developers will be as open and fluid as possible with the aim of producing software tools that are highly usable and relevant to user needs. Traditional stages of requirements capture, design, development, deployment and evaluation will be encompassed within a non-linear and iterative approach.

10. Intellectual Property Rights

All tools and software developed in this project will be available on an open source basis, licensed for free non-commercial use and development and will be available to the UK HE and FE community in perpetuity. Detailed License conditions will be defined in consultation with experts at OSS Watch.

11. Project Management

The project will be managed and administered by the Project Manager (PM), Martin Turner, whose role it is to provide strategic direction for the project; to monitor progress of project activities; to initiate remedial action because of slippage or in the event of risks occurring; to provide a single point of contact for the project; to ensure the full engagement of all stakeholders (users, developers and the wider JISC community) through effective implementation of the dissemination strategy and internal procedures (i.e. co-attended sessions, meetings, collaboration tools, etc.); and to lead the production of JISC progress and final reports.

Project Team

Team Member	Roles	Contact Details
Martin Turner	Project Manager	Martin.Turner@manchester.ac.uk
Andrew Rowley	Developer	Andrew.Rowley@manchester.ac.uk

11.1. Project Leads

Martin Turner (Project Manager) is currently the Visualization Team Leader within Research Computing Services. Related to e-Science and Grid infrastructure he has worked as project manager for the various JISC funded projects, PI for the EPSRC OMII-UK funded Access Grid Portalisation project and is manager of the NW spoke for the JISC funded vizNET (National Visualization Support Network) programme. He has worked on the management and development of web-based Visualization portals for the Grid GEMEDA economics census data (NCeSS funded), as well as a Linguistic avatar based Virtual Manchester Campus (Distance Learning Fund).Teaching has covered all academic levels from undergraduate to postgraduate; and currently also an Honorary Lecturer in Computer Science.

11.2. Development

Andrew Rowley is a Senior Software Developer within RCS at the University of Manchester. He has worked recently on the CREW project and the precursor VRE Phase One project Memetic, as well as the AHRC e-Dance project. He has skills in software development using Java and C/C++ and in web development using JSP, HTML, JavaScript and Flash. He has experience of evaluation of software from his PhD, and through the previously mentioned experience of the VRE programme, in which he was heavily involved with user analysis and evaluation activities.

12. Programme Support

No specific support requirement is anticipated.

13. Budget

See Appendix A. Budget

Detailed Project Planning

14. Work Packages

See Appendix C for detailed breakdown.

15. Evaluation Plan

Timing	Factor to Evaluate	Questions to Address	Method(s)	Measure of Success
End of project	Software robustness	How robust is the software?	User evaluation	Users report satisfaction with software robustness

Deployment	Usage levels	Are the tools being used as normal work practice?	User evaluation	Users are using the technologies outside of that required for the project
Deployment	Usability	What uses are made of the software? Is the software highly usable?	User evaluation	Analysis of usage by new users shows little help required to get started and that users are able to discover features new to them; users submit few bug reports related to usability
Deployment	Mode of usage	How is the software used?	User evaluation and analysis of types of recordings made	Most major features of the software fully employed by users
Throughout project lifetime	Knowledge contribution	How has the software helped to increase understanding of VREs and improve access to research resources from this stage of the research lifecycle?	Papers submitted to journals and conferences	Papers accepted for publication/presentation

16. Dissemination Plan

Some of our planned dissemination is detailed below. Further dissemination activities will be added throughout the project in collaboration with our user partners and as opportunities are presented.

Timing	**Dissemination Activity**	**Audience**	**Purpose**	**Key Message**
Throughout project lifetime	Blogs on the Virtual Research Community	Other VRE Developers	Share experiences and knowledge	Project progress and problems solved
Jul 2009	Introduction at JISC VRE3 Kickoff Meeting	Other VRE Developers	Introduce ViCoVRE	ViCoVRE has arrived
Oct 2009	Presentation at Access Grid Retreat	Access Grid Community	Increase awareness of project	ViCoVRE can be used to convert Access Grid Recordings into other formats
Dec 2009	Presentation at eScience All Hands Meeting	e-Research community	Demonstrate project outputs	Demonstrate ViCoVRE

17. Exit and Sustainability Plans

This section presents some early thoughts concerning our Sustainability Plan.

Project Outputs	Action for Take-up & Embedding	Action for Exit
Import, Export and AG Replay Web Services	Host service within RCS and encourage user groups to use service by addressing their needs	Submit service description and documentation to e-Framework
Source code	Accessible via Google Code website	Ensure code is well documented
Support materials	Accessible via software installations	Ensure integration with main software
Reports	Accessible from project and JISC websites	Publish reports on both project and JISC websites

Project Outputs	Why Sustainable	Scenarios for Taking Forward	Issues to Address
Import, Export and AG Replay Web Services	Useable beyond the project end	Make services binary installation available	
Project Source Code	Can be used in other projects	Make source code available	

Appendix A. Budget

The budget below requests resources for project management, and for evaluation and integration of the tools to be tested. Resource for travel is requested for attendance at JISC and other events and for engagement with the JISC community throughout the project. Dissemination resource is requested for production of dissemination material, such as posters. The evaluation and user testing resource is requested to aid in the engagement of the user groups by providing resource for workshops and meetings.

Directly Incurred Staff	**Apr09 – Mar10**	**TOTAL £**
Project Manager, Grade 8, 10% FTE	£3,454.11	£3,454.11
Developer and Evaluator, Grade 6, 100% FTE	£21,240.52	£21,240.52
Total Directly Incurred Staff (A)	**£24,694.63**	**£24,694.63**
Non-Staff	**Apr09 – Mar10**	**TOTAL £**
Travel and expenses	£1000.00	£1000.00
Dissemination	£850.00	£850.00
Evaluation	£5000.00	£5000.00
Total Directly Incurred Non-Staff (B)	**£6850.00**	**£6850.00**
Directly Incurred Total (C) (A+B=C)	**£31,554.63**	**£31,554.63**
Directly Allocated	**Apr09– Mar10**	**TOTAL £**
Estates	£9,979.20	£9,979.20
Directly Allocated Total (D)	**£9,979.20**	**£9,979.20**
Indirect Costs (E)	**£26,903.80**	**£26,903.80**
Total Project Cost (C+D+E)	**£68,427.63**	**£68,427.63**
Amount Requested from JISC	**£49,986.13**	**£49,986.13**
Institutional Contributions	**£18,441.50**	**£18,441.50**
Percentage Contributions over the life of the project	**Partners 26.95%**	**Total 100%**
No. FTEs used to calculate indirect and estates charges, and staff included	**No FTEs** 110%	**Which Staff:** Project Manager, Developer and Evaluator

Appendix B. Project Activities

Work Package	Apr09		May09		Jun09		Jul09		Aug09		Sep09		Oct09		Nov09	
WP1: Project Planning																
WP2: User Needs Analysis																
WP3: Dissemination																
WP4: Import Web Service																
WP5: Offline Recording Tool																
WP6: Import Demonstrator																
WP7: Export Web Service																
WP8: Export Demonstrator																
WP9: Reports & Documentation																
WP10: Evaluation and Testing																