

**UNITED KINGDOM EDUCATION & RESEARCH
NETWORKING ASSOCIATION**



Call for Participation

**Content Delivery Infrastructure
Content Streaming Trial**

November 2002

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1 Introduction

This Call for Participation invites JANET connected Higher Education Institutions, Further Education Colleges and other Education and Research organisations the opportunity to participate in a Content Delivery Infrastructure (CDI) and Content Streaming Trial. The eligibility criteria for participation in the trial are highlighted in section 4.4 'Eligibility'. The trial, established as a result of this Call for Participation, will commence in January 2003 for a period of six months, and may optionally be extended beyond this timescale depending upon initial trial results.

2 Background

The real-time, networked delivery of moving image and sound content via Internet Protocols (commonly referred to as 'streaming') is becoming much more commonplace in the networked world, and there have been enough significant developments in this emerging technology to enable beneficial services to be developed for the networked delivery of moving picture and sound content as a scalable service to the JANET community. During the latter part of 2000 UKERNA started planning a streaming content demonstrator project. This planning work identified the Kasenna MediaBase technology as the most likely technology to be able to support the multiplicity of formats and bit rates currently available. As a result UKERNA purchased and deployed a Kasenna MediaBase server to gain experience of the technology and its potential impact on JANET.

In 2001 UKERNA commissioned a requirements study for a Content Delivery Infrastructure on JANET which was undertaken by ESYS plc. This concluded in October 2001 and confirmed the Kasenna MediaBase software running on SGI hardware technology as one of the leading options that could support a basic content delivery infrastructure for JANET at that time. Specifically, the report recommended that 'A pilot project to serve video content with the Kasenna MediaBase product should be carried out.' The recommendation went on to make a number of other specific points, full details of which can be found in Annex A. Based upon this recommendation UKERNA and the JISC are launching a project which builds on work it started in the latter part of 2000 using the Kasenna MediaBase server and other latest generation software to demonstrate the benefits of an architected solution for the storage, publishing and distribution of moving pictures and sound content to the whole of JANET.

This 'Call For Participation' seeks participants for this project.

3 Objectives

The trial objectives are:

- To assess whether it is feasible and practical to provide a JANET CDI service and to investigate the service delivery and support implications;
- To monitor usage and performance of the different streaming media formats/codecs and provide guidance and best practice for sites wishing to engage in streaming media activities;
- To trial Kasenna MediaBase's functionality and performance in order to assess its suitability for wider trials and possible national service and to identify alternative solutions for further trials;
- To establish whether the caching of Moving Picture and Sound content is required at the 'edges' of JANET in the context of a JANET CDI Service;
- To trial a variety of hardware in order to establish the best return on investment in terms of price/performance;
- To ensure interoperability with emerging best practice for the creation of other Information Environment projects and initiatives (MLEs, VLEs and Portals etc).

4 Overview of Trial

4.1 Content Delivery Networks

The diversity of material being stored and distributed over the Internet has reached the stage where the original framework that arose out of the need for guaranteeing peer-to-peer communication in the event of a catastrophe has become seriously challenged. The web allowed us to self-publish magazine style material, and the images and other resources that could be incorporated into a web page gave network engineers something to be concerned about. In fact many people speculated that the Internet would grind to a halt, due to the proliferation of image intensive websites. Instead, there emerged best practice for web publishing and techniques to speed the delivery of these websites to the end user (such as co-locating Web Servers in the network backbones and caching closer to the end user).

More recently, the real-time delivery of moving image and sound content over the Internet (streaming) has become much more commonplace, as solutions to the inherent problems of efficient delivery over the congested Internet arise. This was spurred on by the emergence of Content Delivery Networks (CDNs) that take content off the congested Internet and deliver it to the end user from a closer location (edge) than the source. In this way, the network related factors that can cause a stream to be delivered in an unsatisfactory manner could be reduced. These factors include network congestion (due to over-contention of bandwidth and routers), delay (lag), delay variation (jitter) and finally packet loss. All these factors can result in buffering in the media player at best, and at worst can result in a dropped connection to the streaming server. A CDN will normally bypass the unpredictable Internet by providing an overlay network, either terrestrial (via fibre) or over satellite.

During the Internet boom of the late 1990's, several commercial CDNs were created, and they appeared to have an expanding and lucrative market in the form of DotCom companies. However, it wasn't long after the boom ended that many of the companies who survived the

downturn realised that they were not getting a return on their investment and several of the CDNs have now been bought or closed down. The issue of return on investment for streaming content is inherent in the nature of streaming from a unicast server - the more popular a media file - the less available and more expensive it is to deliver.

The enterprise Content Delivery Network (eCDN) is a fairly recent phenomena that describes a medium to large company with it's own network infrastructure, that takes steps to improve content delivery by adding caching, load balancing, redirecting and other technologies to improve the delivery of content within the enterprise. This can also include the use of multicast and other networking protocols, and the purchase of additional content routing/switching technology.

JANET is a network that could be described as falling between the Internet and enterprise model. UKERNA is able to exercise a certain amount of control in the IP layer, as well as the application layer and has the option to architect a CDI that can ensure the efficient delivery of both internally ingested content and external content from the public Internet. UKERNA and the JISC have initiated a trial to test the effectiveness and functionality of various solutions for the management and networked delivery of MAAS/BUFVC (Managing Agent and Advisory Service/British Universities Film and Video Council) moving image and sound collections for the education and research community.

UKERNA has also begun to examine and assess the options for a more pervasive solution for content delivery, which will take content from the public Internet and make it available closer to the JANET end user. A key building block of the CDI concept is the JANET Co-location Service that has recently been launched. This service allows education and research based content and/or service providers to co-locate their servers at one of the JANET Core Points of Presence (C-PoP), allowing direct access to the JANET core (currently 10Gbit/s). This offers the best connectivity to all sites on JANET, as well as offering facilities and procedures that are specifically designed for the secure hosting of server hardware.

4.2 Infrastructure Supporting the Trial

The core infrastructure deployed for the JANET CDI trial will consist of SGI Origin300 hardware hosted in the Co-Location facility of a JANET C-PoP, providing Gigabit Ethernet connectivity to the JANET core. The edge servers/appliances will be Origin300, Sun LX50 or Cobalt Raq/Qube or x86 Linux based rack mount servers, depending on the predicted requirements for simultaneous streams to be served and the LAN and JANET connectivity available. All equipment will be running cache appliance and streaming server software with licences for the distribution of a range of encoding formats, these could include RealMedia, Windows Media, Quicktime, MPEG-1, MPEG-2, MPEG-4 and possibly others. Cisco devices will be deployed next to each edge cache device for the purpose of network monitoring and measurement.

4.3 Terms and Conditions of Participating in the Trial

Use of the JANET CDI trial infrastructure is subject to the JANET Acceptable Use Policy. Full policy details are available at <http://www.ja.net/documents/use.html>. The organisations participating in this trial must not use or knowingly allow or permit the use of the CDI:

- in a way that does not comply with the terms of any legislation or any licence applicable to UKERNA or organisations participating in the trial or that it is in any way unlawful or fraudulent, or, to the knowledge of organisations participating in the trial has any unlawful or fraudulent purpose of effect; or

- to ingest, knowingly receive, upload, download, use or re-use material which is abusive, indecent, defamatory, obscene or menacing, or in breach of copyright, confidence, privacy or any other rights; or
- in a way that does not comply with equipment connected (directly or indirectly) to be used with the service that must be connected in accordance with any published instructions and safety and security procedures applicable to the use of that equipment.

4.4 Eligibility

Organisations wishing to participate in the trial must:

- Have a requirement to utilise moving image and sound content as a learning resource;
- Have a primary connection to JANET;
- Obtain support for the project from the Computer Centre Director (or equivalent) confirming that the organisation will allow access to the cache appliance and monitoring device deployed on the organisations network from a small range of IP addresses, external to the organisation, for the purposes of administration and monitoring of traffic directly related to this trial (proof of support will be in the form of a signature from the Computer Centre Director on the trial application form);
- Provide End User PC's of a high enough specification to participate (see Annex B for minimum specification);
- Provide Network Topology Diagrams detailing the location of the trial equipment and the trial participants PC's and highlighting the route, network traffic from the trial equipment will take, to the organisations JANET connection point;
- Provide a clean and reliable power supply and suitable space for the deployment of cache server (ranging from 1 to 6U) and monitoring equipment (ranging from 3 to 6U). Size of equipment will vary to support the plans for the number of concurrently connected PCs;
- Take all reasonable steps to ensure security, both physically and logically, of the equipment provided by UKERNA.

Organisations wishing to participate in the trial may wish to consider the following points, to support the application:

- A range of sites with various bandwidth provisions are sought, from sites with a 2Mbit/s connection to JANET, up to sites with MAN connections of high bandwidth;
- As broad a spectrum of users as possible is sought to participate in the trial (across different disciplines and with varied requirements);
- The possibility of integrating research projects underway, or interest in basing projects on the trial content delivery infrastructure would be ideal (MLE, VLE, Portal etc);

- A willingness to participate in the ‘publishing’ of content produced by the institution and to develop procedures and best practice – sites active in media production may find this an advantage;
- A teaching programme or course in which MAAS (Managing Agent and Advisory Service – <http://www.bufvc.ac.uk/maas/>) content can easily be integrated as a learning resource (see Annex C for a list of MAAS content) would be beneficial.

4.5 Trial Structure and Funding

The trial will consist of five organisations, selected against the criteria set out above. The five sites will use the CDI as part a structure programme of work and report back to the project management group on their experiences. Subjective data on performance will be collected by each trail site and collated with the objective data collected from the network monitoring in order to analyse the performance of the CDI. One organisation, ideally part of the trial, will undertake specific monitoring and measurement work in collaboration with UKERNA. Given the skills and experience necessary to undertake the monitoring and measurement, UKERNA will accept applications to undertake the monitoring and measurement work independently of the main trail sites.

The project management group will liaise with the project working group set up to establish and guide the project and report back to the JISC. Monthly reports will be produced by the project management group and will be provided to UKERNA and the JISC.

UKERNA will fund the cost of the edge devices and licensing costs associated with them for those organisations that are accepted, as well as funding the effort to participate in the trial (£5k per site payable on completion of final report – edge devices may stay with the site on completion of trial). In addition UKERNA will fund one site to take on the responsibility for monitoring, measurement and administration of equipment as part of the trail. This will include an element of technical support to the main trial sites and the collection and collation of the necessary network statistics, in collaboration with UKERNA, for the production of a final report (£30k payable on completion of the final report).

4.6 Responsibilities of Trial Participants

It is the responsibility of the organisation participating in the trial to liaise with the project team on:

- What content will be required, and when it will be required (in some cases content will need to be ‘pre-loaded’ onto the cache);
- Arrangements for uploading locally produced content into the CDI;
- Participation in the trial as agreed between the organisation as set out in their application form and agreed with UKERNA;
- The timely submission of completed subjective feedback forms by e-mail;
- Timely submission of the final report;
- Joining and regular participation in the project forum (on the project website) and attending project meetings and updates.

The organisation contracted to carry out the monitoring, measurement and administration work will (in addition to the responsibilities as a trial participant) be expected to configure and administer all cache appliances and to work with UKERNA on the configuration, development, monitoring and testing of the CDI infrastructure. The organisation will also be expected to have experience of measurement and monitoring practices in a real-time network environment, UNIX system administration skills and be familiar with configuration of Cisco products for monitoring and measurement activities. Other responsibilities include providing

technical support to trial participants; gathering and collating objective data from all sites; correlating subjective data from all sites with objective data gained from measurement and monitoring; and in conjunction with UKERNA producing a final report on findings.

5 Timescales

The timescales for this trial are as follows:

Issue Call for Proposals by:	14 November 2002
Responses received by:	5 Dec 2002
Successful Trial sites notified by:	13 Dec 2002
Trial Equip shipped to sites:	10 Jan 2003
Installation & Commission equip complete	31 Jan 2003
Trials start:	1 Feb 2003
Trial end date:	28 May 2003
Report completed:	30 June 2003

6 Deliverables

Participants in the trial must complete a number of feedback forms during the course of the trial. The feedback form will ask for opinions on the subjective qualitative assessment of the delivery of Moving Image and Sound content to the end-user and the effective usage of the CDI itself by end users. The feedback forms must be completed by the trial site and returned to the site responsible for collating them. Recommendations will be sought for the direction of future work from all participants.

7 Management of the Trial

The overall management of the CDI trial will be carried out by UKERNA.

8 Submission and Evaluation of Applications

Eligibility for the trial does not automatically guarantee inclusion. UKERNA must receive full details of the teaching and /or research effort underway or planned that will support the aims and objectives of the CDI Trial, as well as the criteria detailed in section 4.4 – Eligibility Guidelines.

Selection of organisations for inclusion in the trial will be made by the project team, which includes representatives of UKERNA and members of the academic community. Organisations must agree to be bound by the terms of the trial. Selection will be made on the basis of the best match of application to the criteria as set out in section 4.4.

In order to apply to take part in this trial please complete the application form in Annex D. Sites wishing to be considered for the Monitoring, Measurement and Administration role should fill in the relevant section on the application form. Completed application forms must be sent to the following address, by post, to be received before **12:00 noon Thursday 5th December**. The application form must include a signature of support from the computing centre director or equivalent.

FAO Mr. Paul Sergeant
 Application for the Content Streaming Trial
 UKERNA
 Atlas Centre
 Chilton
 Didcot
 Oxfordshire
 OX11

OQS

Contact for Enquiries

All enquiries relating to this call for proposals should be addressed in the first instance to Mr Paul Sergeant. If Mr Paul Sergeant is unavailable, the secondary contact is Mr Henry Hughes:

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Annex A: Recommendation Eight from ESYS report

A pilot project to serve video content with the Kasenna MediaBase product should be carried out. A trial of this product is already in preparation within UKERNA with a Kasenna server at the Reading C-PoP. We recommend that trial should be continued, broadened and conducted along the following lines:

- The latest version of the Kasenna server product should be deployed on current generation hardware at the C-PoP;
- The BUFVC and the Data Centres should act as content providers to a recognised participating user community who are motivated to look at the content;
- The content served should encompass a mixture of high resolution and low resolution video files, in both proprietary and non proprietary format
- All participating user institutes should be equipped with the appropriate Kasenna edge appliances;
- It would be interesting to configure a conventional streaming server such as QT, Windows Media, or Real Networks at a C-PoP as a control, and to compare the performance seen by a conventional client at the edge with that experienced by a client receiving the media via the Kasenna infrastructure.
- The user community should consist of at least one FE institute, physically close to the C-PoP, with low bandwidth connection, an FE institute with low bandwidth connection remote from the C-PoP, a remote user institute (e.g. a hall of residence) connected via an ISP, and an HE institute with good connectivity as a control;
- An investigation should be carried out regarding the ease of integration of authentication services via the Kasenna APIs;
- The effort required to deploy, maintain and operate the system should be recorded
- User feedback should be actively collated and analysed, including users perception of performance
- Some form of network monitoring should be carried out to quantify any performance issues.

Annex B: Minimum Client PC Specification

This is the minimum specification of machines required for the trial to play the lowest bit rate streams and to install the necessary streaming media player client software.

Platform:	PC: Windows 98/Me/2000/XP; Mac: OS 8.1
Processor:	Pentium-166; PowerPC 603e/180
RAM:	32MB
Disk space:	20MB
Display requirements:	256-color
Sound requirements:	16-bit sound card
CD-ROM required:	No

Annex C: Content to be made available via MAAS

Educational Television Films

The ETV collection is unique in that it is the largest collection of productions from the former Soviet Union, Communist China, the European Eastern block, Chile and Cuba, which survives in Western Europe. It is the legacy of the work of Stanley Forman, one of the leading figures in the Communist Party of Great Britain. The first selection of fifty hours is made up entirely of documentary material and, as well as a selection of the material mentioned above, also includes footage on Tsarist Russia, Nazi Germany, the Spanish Civil War, Vietnam, Tibet and the history of the Left in Britain.

The material will be useful to lecturers and students both HE and FE and will be particularly useful in the disciplines of Military, Political and Social History, the History of Science, War Studies, Media Studies, Music and the Performing Arts, and the study of propaganda.

Films of Scotland

The collection charts the changing face of Scotland from the 1930s to 1982. All the films were made under the auspices of the Films of Scotland Committee, which had a brief to sponsor films to promote Scotland's social, cultural and industrial attributes, both nationally and internationally. MAAS has been able to make available 133 of the 157 titles thanks to the collaboration of the Scottish Screen Film Archive. These include all 7 films made for the Empire Exhibition in 1938, as well as a selection of the films made between 1955 and 1982. It is one of the most coherent local and national film collections in the UK and topics covered range across industry, agriculture, fishing, the work of Scottish artists and writers, architecture, tourism, urban redevelopment and Scottish music, and dancing. Those wishing to carry out further research should note that the Scottish Screen Film Archive holds an archive of supporting documentation, including correspondence, draft and final scripts, music cue sheets, still photographs, marketing materials, programme booklets and awards certificates, distribution details and the administrative records of the Committee which commissioned the productions.

The material is relevant to both HE and FE courses and will be useful in Media Studies, Social, Economic and Industrial History, Architectural History, Cultural Studies, Sociology, Environmental Studies, and Ethnographic, Literary, and Music Studies.

Healthcare Productions.

This collection contains material in the field of health education and is aimed at students, nurses, medical practitioners and the general public. The collection has been highly acclaimed and much of the material has been awarded Certificates of Educational Merit by the British Medical Association (BMA). Programmes vary from case studies into conditions and diseases, such as 'Time to Think About It: Hepatitis A, B and C', to training videos on patient-staff interaction and public education programmes on local authority health services. Healthcare Productions have also produced a number of television programmes including a series on the impact of AIDS in Africa produced for Channel Four.

The material from Healthcare Productions will primarily be of interest to the FE sector in the fields of Health Care, Biology, Child Care, Care in the Community and Nutrition. Programmes from the Pathways to Care series will be of particular interest to NVQ students. The material should also be beneficial to students of Biomedical Science, Pharmacology and Medicine in the HE sector.

St George's Hospital Medical School Academic Services

The collection of nineteen films from St George's Hospital Medical School Academic Services reflects the teaching needs of one of the leading Medical schools in the UK. This selection covers subjects in the Clinical-Medical and Bio-Medical field, as well as aspects of Current Medical Practice. The titles cover examination techniques, case studies on specific illnesses and operations, guides on diagnosis, and training on doctor-patient interaction.

The material will be of interest to university medical faculties and is aimed at Medical, Bio-medical undergraduate and post-graduate students.

A number of Medical and Surgical titles will be restricted to Medical departments only. This is due to issues of content sensitivity and/or patient confidentiality.

Sheffield Learning Media Unit

Sheffield University Learning Media Unit is one of the largest university production units in the UK. The collection covers a wide range of subjects and programmes, and will be useful right across the academic subject range including Medicine, Bio-Medical Science, Chemistry, Life Sciences, Biology, Sociology, Environmental and Earth Sciences, Archaeology, Music, Law, Geology, Civil Engineering, English Language and the Performing Arts. A cross-section of around fifty hours has been provided and it is aimed at Undergraduate and Postgraduate students and lecturers in the HE sector.

A number of Medical and Surgical titles will be restricted to Medical departments only. This is due to issues of content sensitivity and/or patient confidentiality.

Imperial War Museum

The IWM film and video collection is recognised as one of the most important moving image resources for the study of all aspects of the major conflicts in which Britain was involved in the 20th Century. This selection from their holdings consists mainly of British official film, but there are also titles from the USSR and the USA. The material spans the First and Second World Wars, post-war reconstruction, Cold War and Civil Defence films, and, most recently, videotape from the United Nations Television Campaign in the former Yugoslavia from 1994 to 1996.

The films are suitable for use in a wide variety of disciplines, including Military, Political, Social history, Defence and War Studies, American Studies, Colonial and Post-Colonial Studies, Women's Studies, Media Studies, Cultural Studies, International Relations, Town and Country Development, Art, Literacy and the uses of propaganda.

Logic Lane

A series of six films made by Professor Michael Chanan (University of Western England) while at Oxford in the 1960s. The first title (Logic Lane) traces the development of philosophy at Oxford University from the 1930s to the early 1970s. The rest of the series uses debates and conversations between pairs of philosophers as its basic format and features many eminent scholars including Sir Alfred Ayers, Bernard Williams, Iris Murdoch, Sir Isaiah Berlin, David Pears, Stuart Hampshire and Gilbert Ryle. The films provide a cross section of their views on many issues, including, ethics, freedom and determinism, philosophy and science, linguistic theory and the philosophy of mind.

The material will obviously be useful to lecturers and students of Philosophy in HE, but will also be of interest to those with an interest in Psychology, Aesthetics and Cultural Theory, as well as Language and Literature.

Anglia Television

The two series 'Who Were the British' (1965) and 'The Lost Centuries' (1968) have been recommended to the MAAS by both the Archaeology Data Service (ADS) and the Council for British Archaeology/BUFVC Audio-Visual Working Party. The Working Party acts as the MAAS Steering Group for archaeology and is made up of senior UK academics and a range of senior archaeology film producers.

The two series are seen as reflecting the change in methodologies and approaches in archaeological discourse and they are also important for the study of the portrayal of archaeology on television. Like many programmes from the period they have been unseen for many years.

'Who Were the British?' covers in particular the history and the impact of the Romans in Britain. 'The Lost Centuries' covers post-Roman Europe from the rise of Christianity and the influence of the later Islamic empires through to the beginning of the Renaissance. The series also explores Anglo Saxon Britain and the expansion of the Vikings from Scandinavia to Britain.

Anglia Television played a leading role in the development of archaeology programmes producing series with the input of eminent professors and experts of the time, in these two cases Dr Brian Hope Taylor.

The Trials of Alger Hiss

The Trials of Alger Hiss is an account of the espionage and perjury case that resulted in the conviction and imprisonment of Alger Hiss. The director John Lowenthal is a lawyer and he approaches the case as a testing of the American criminal justice system under pressure. Contemporary newsreel footage and newly filmed interviews are used to set the case in its historical context. Public hearings of the House of Un-American Activities Committee of the US Congress feature Hiss and Whittaker Chambers confronting each other and exchanging accusations. Events are presented as they were seen at the time and as they are perceived thirty years later by a range of the participants. The film offers no final conclusions about Hiss's guilt or innocence, but it does help to illuminate a political era.

The film is acknowledged as a milestone in American documentary film-making and excels in its use of film as an instrument of record.

An annotated script and a range of contemporary publicity materials and reviews will also be digitised.