

SUMOVER Project: **The UCL media tools past, present, and future**

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Overview

- Origins of packet multimedia
- Genesis of tools
- Current status
- Licensing
- SUMOVER project
- Future

Origins of packet based multimedia

- 1974
 - Realtime Packet Voice demonstrated between USC/ISI and MIT/LL, using CVSD and Network Voice Protocol (NVP[RFC471]) on IPv5 (ST[RFC 1819])
- 1976
 - First packetised speech over SATNET between Lincoln Labs and both NTA (Norway) and UCL (UK).
- 1991
 - LBL's audio tool vat released for DARTnet use.
- 1992
 - First IETF MBone audiocast (San Diego, CA)
- 1996
 - RTP standardized (RFC 1889/1890)
- 1996
 - H.323v1 published
- 1999
 - SIP standardized (RFC 2543)

Genesis of tools

- VIC:
 - Lawrence Berkeley National Lab
 - Initial Funding: ARPA, DoE
 - First LBL release 2.0a (Oct 93)
 - Earlier collaborator releases to UCL
- RAT :
 - University College London
 - Initial funding: MICE EU Project
 - First release: RAT-1 95 -
- Common
 - University College London
 - Initial funding: MECCANO EU Project
 - First release: common-1.0.0 (Nov 98)

Other tools

- Session directories
 - SD from LBL
 - SDR from UCL – using SDP (RFC2327)
- Shared Whiteboards
 - WB from LBL using SRM reliable multicast
 - WBD from Loughborough and then UCL
 - DBL (Digital Lecture Board) from U of Mannheim
- Shared Text
 - NTE (Networked Text) tool from UCL
- Integrated systems
 - Mstar/Marratech Java system from Lulea University
 - ISABEL from Universidad Politecnica Madrid
 - Relate from UCL

VIC (VideoConference tool)

- Motivation
 - Move beyond existing tools: e.g. ivs(INRIA), nv(Xerox)
 - Increased range of codecs, networking options, GUI, packet loss tolerance
- Origins
 - Lawrence Berkeley National Lab
 - Funding: DoE, ARPA
 - Later University of California, Berkeley
 - NSF, DEC, SUN, SGI
 - MASH Project
 - Credits
 - S.McCanne, V.Jacobson, E.Amir, and many more

VIC development

- Source code: C & Tcl/Tk in C/C++ with tcl/tk GUI
- Berkeley
 - Early years at LBL ('93)
 - Small group – Mostly Steve McCanne
 - Initial features – codecs; nv, H.261, CellB, etc, Network; IP, ATM
 - Berkeley (MASH Project '97-03)
 - Integrated with into large project using otcl/C++ bindings
 - Included: vat, wb (whiteboard)
 - Many graduate student developers (with little time)
 - Lower quality code, a bit ad-hoc
- UCL (MERC I project '97)
 - MICE (Multimedia International Conferencing for Europe) EU Project(s): '92-95
 - EU:{MERC I (95-97), MECCANO(98-00), COIAS(98-00)} HICID(97-00)
 - Started from vic-2.8 (pre-MASH)
 - Because of issues with monolithic nature of MASH
 - Integrated UCL Common Library functions
 - Crypto, MBUS

VIC Current Architecture

- Single process
 - Tcl/C++ components connected using tcl scripting
 - Uses UCL common for MBUS and DES
 - Integrated some MASH code into UCL vic
 - E.g. Packet-buf, layered codec support (PVH)
- Subsystems
 - RTP : Session handling
 - NET : Network support (IPv6/4, ATM, etc)
 - VIDEO : Grabber hardware drivers (new: WDM)
 - RENDER : Video rendering/conversion
 - CODEC : H.261, H.263, PVH, BVC, JPEG, CellB, NV

RAT (Robust Audio Tool)

- Motivation
 - Move beyond existing tools: VAT(LBL), nevot (AT&T), vt(ISI)
 - New features; Redundant Audio, Loss concealment schemes, sample-rate conversion, IPv6, Stereo, 3D audio, etc
- Origins
 - University College London
 - MICE (**M**ultimedia **I**nternational **C**onferencing for **E**urope) EU Project(s): '92-95
 - EU:{MERC1 (95-97), MECCANO(98-00), COIAS(98-00)} HICID(97-00)
 - RAT EPSRC Project: '96-99
 - Relate (**R**emote **L**anguage **T**eaching) BT Project : '94-97
 - Credits
 - C.Perkins, O.Hodson, I.Kouvelas, V.Hardman, A.Sasse, M.Handley, S.Varakliotis, and many more

RAT development

- Source code: C & Tcl/Tk
- Early years('95)
 - Initially known as Better Audio Tool (BAT)
 - Began in small dev group
 - File based development
- RAT3 ('98)
 - Expanded dev team from multiple projects
 - CVS employed from RAT3 onwards
 - First stable release
 - Closed license
- RAT4 ('99->...)
 - Total re-write
 - Multi-process model with many new features
 - BSD license
 - Birth of UCL Common Library
 - Heavily used by RAT4

RAT4 Current Architecture

- Two main processes
 - Controller process parses arguments and spawns 2 processes
 - Communication using MBUS over local multicast
 - Built on UCL common library
- Media Engine
 - Auddev: Drivers to various audio hardware
 - Linux (new: ALSA1.0 & OSS), Win32, OSX, Solaris, BSD
 - Packet reception/transmission and RTP de/packetisation
 - Mixing, Redundancy support, Layering, Loss concealment schemes, IPv6, Stereo, 3D audio, sample-rate conversion
 - Codecs: G.711, G.726, GSM, DVI, LPC, L16..
- User interface
 - Tcl/tk GUI to control media engine
 - Others possible (Java one has been done)

UCL Common library

- Motivation
 - Abstract out core multimedia functionality (from RAT)
 - So it could be used by many tools (and now is)
 - Create a new reference implementation of RTP, MBUS
- Origins
 - University College London
 - EU MECCANO(98-00), COIAS(98-00)} HICID(97-00)
 - University College London
 - First release: common-1.0.0 (Nov 98)
 - Latest: common-1.2.16 (Apr 06)
 - Credits
 - C.Perkins, O.Hodson, I.Kouvelas, M.Handley, S.Varakliotis, and many more

UCL Common Library development

- Source code: C (in CVS from start)
- Early years('98)
 - Dev team from a few projects
 - BSD license
 - Abstracted out from RAT3.2.7
 - Provided for the multi-process version of RAT4
 - Using MBUS, RTP, Crypto from Common lib
- Latter years (02->...)
 - Minimal funding
 - Best effort development

UCL Common Library architecture

- NETUDP - A UDP interface for IPv4 and IPv6.
- MBUS - Message bus for local coordination (RFC 3259)
 - Used in RAT extensively, in VIC less so. Other apps (Freevo)
- Crypto/Authentication
 - DES, AES – Data & Advanced Encryption Standards
 - HMAC - Cryptographic message authentication.
 - MD5 - Message Digest-5 algorithm.
- RTP - Real-Time Transport Protocol (RFC 3550)
- SAP - Session announcement protocol (RFC 2974)
- SDP - Session Description Protocol (RFC 2327)
- Debug - Functions for outputting diagnostics.
- Memory - Memory allocation and debugging functions.
- Utility functions – Base64, random numbers, binary trees

Licensing

- The tools are generally under [old] Berkeley Standard Distribution (BSD) style license.
 - BSD recently modified to remove advertising clause
 - Plan to move to new BSD license
- Contributed code uses other licenses
 - The licenses in use are mainly a BSD style licence from *University College London* for RAT and the Common multimedia library, whilst VIC is mainly covered by a BSD licence from *Regents of the University of California*. Other source files are under a new-BSD licence from external institutions including *Stichting Mathematisch Centrum, Amsterdam, Sun Microsystems Inc, Xerox Corporation, Apple Computer Inc, University of British Columbia, and WIDE Project*. Others files are under the old-BSD license from *Argonne National Laboratory/University of Chicago*. Some files are freely licensed by the *Internet Software Consortium*.
 - In addition to the license holders above there copyright holders including; *Bell Communications Research, RSA Data Security, Inc. Nortel Networks, University of Sydney, Technische Universitaet Berlin, British Telecommunications Plc, Brook Milligan, Intel Corporation, HEWLETT-PACKARD COMPANY, Luigi Rizzo, University of Sydney Vislab, Software Research Associates, Inc, Telenor Research and Development*.

What to do...?

- Media tools widely used
 - Notably in AccessGrid, VRVS etc
- Lack of core funding for a number of years
 - Tools had become stagnated and fragmented
- New SUMOVER Project is providing fresh impetus

SUMOVER Project overview

- JISC funded project for 2 years (Started: Aug 05)
 - Joint Information Systems Committee (JISC)
 - Directly funded by UK further and higher education funding councils for development of the infrastructure and activities
 - Resources: ~1.5 people for 2 years
- Background
 - Resulted from UKERNA e-Science videoconf reports
 - Wide use of Advanced Collaborative Environments
 - Diverging code base
 - Lack of support for VIC and RAT
 - UCL has long history of working on the tools

Aims and objectives

- Setup and maintenance of code management tools
- Provision for support and bug fixing of tools
- Creation of common code base
- Organisation of workshop(s) to foster collaboration and assist in direction
- Creation of a small number of focussed development projects
- Publish papers on research work done on tools

Workpackages

- WP1 : Project management
- WP2 : Code management systems
 - Source code versioning, Bug/feature tracking, checking/testing tools, project management
- WP3 : Common code base
 - Bring together source code under one ‘roof’
- WP4 : Tools support
 - Actually provide some support for tools
- WP5 : Workshops
 - Bring together interested parties and community
- WP6 : Tools development projects
 - Develop some new interesting stuff

WP2 : Software management systems

- Surveyed a number of systems
 - Source code versioning systems
 - CVS, RCS, Git, Bitkeeper, Arch, **Subversion**
 - Bug tracking systems
 - Bugzilla, Mantis, **Trac**
 - Static analysis tools
 - Testing suites
 - Documentation systems
 - Draft deliverable (#8)
- Now running beta system
 - Trac and Subversion
 - Imported all existing code and history
 - Local and external users (ANL) created

MBone Tools - Trac - Mozilla Firefox

File Edit View Go Bookmarks Tools Help  <https://frostie.cs.ucl.ac.uk/> 

MBone Tools Repository
 DEPARTMENT OF COMPUTER SCIENCE
 Networked Multimedia



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Welcome to UCL MBone tools

This is the *Content Management System* (CMS) for the MBone tools based on [Trac](#). The UCL media tools have been widely used since their origins in the early nineties; providing vehicles for pioneering work in multimedia research, and as a powerful media agents, for example, within Advanced Collaborative Environments, most notably in [AccessGrid](#) and [VRVS](#). The main tools provide for audio, with the [RAT tool](#), video, using [VIC](#), and text, using [NTE](#). Both [RAT](#) and [NTE](#) originated within [UCL Computer Science](#), whilst [VIC](#) was largely [created in Berkeley](#), though UCL has since maintained an updated version.

The new [SUMOVER](#) [JISC](#) project will update the core tools ([RAT](#) and [VIC](#)), as well as the common library they depend on, incorporating many improvements and bug fixes that have been made by different other groups, which could not be integrated into the main code base through lack of effort. It will re-engineer their development basis, such that development of the tools will become more straightforward and widely accessible. The project has begun to foster links between interested parties such as [Argonne National Laboratories](#), [VRVS](#) and [inSORS](#). To the extent that this is practicable, it will provide a single code base that can be used by all interested in the tools. It is already clear that the policies of some of the parties developing products will limit the extent to which this can be done. The main goal is to provide a good basis for their continued evolution.

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<http://www.cs.ucl.ac.uk/> frostie.cs.ucl.ac.uk   1.312s

WP3 : Common code base

- Surveyed existing patches
 - ANL, VRVS, External (NCHC, Glasgow, ANU)
 - Draft Deliverable (#9)
- Licensing issues
 - Staying with BSD style license
- Collaboration partners
 - ANL, NCHC, Glasgow, ANU

WP4 : Tools support

- Utilising new software management systems
- Integrating in existing patches
 - E.g. H.264 (NCHC),
- Coordinate with external developers
 - Dev mailing list
- Work with users
- Work with AGSC
- Stimulate contributions from community
 - Code, Bugs, Features, Docs

WP5 : Workshops

- Organised and ran first workshop at UCL
 - Participants: 16 + 3 (AG remote)
 - Brought together ANL, VRVS, inSORS and others
 - Discussed limits
 - Contributors: VRVS & inSORS are not open source.
 - Licensing: Stay BSD style
 - Laid ground for further collaboration
 - Discussed and ordered feature/modification list
 - Putting on project website wiki
 - Security issues discussed
 - Some suggested modification but no big changes
 - Platforms
 - Support new Linux and WinXP versions, plus some OSX
 - Hardware
 - Project will contribute to hardware compatibility but won't expend energy

WP6 : Tools development projects

- A lot of discussion at workshop
 - Large list of desired features/changes
- Selecting a few new features as “dev projects”
 - DCCP, RAT-multithreaded
- Putting up list of features/changes on Web
 - Encourage external suggestions/re-org

Workshop feature list

- Set up decent CMS (e.g. Trac) - feature requests/voting,
 - o Bug tracking & dev visible/contributable by others \u2013 designation of representative at sites.
 - o Visibility: AGportal, AG-TECH, Freshmeat, srcforge
 - o Put up this list \u2013 Working items
 - o Wiki style hardware support listing
 - o Clear labelling of unstable features \u2013 not to be compiled into distributed versions
- * GUI simplification
- * Clean compilation
- * RAT
 - o Multithreaded mode
 - o Mbus stability \u2013 fix reliable mode
 - o MBUS without multicast \u2013 using some form of inter-process communication
 - o Padlock icon to indicate security mode
 - o Better error reporting \u2013 automatic bug reporting
 - o Push-to-talk
- * VIC
 - o List receivers in main window
 - o Padlock security icon
 - o Integration of new codecs: H.264 (from NCHC)
- * Add a start-up GUI to RAT/VIC where user can supply address, keys, codec
- * VIC
 - o Full screen video/arbitrary video resizing (external contribution)
 - o Smart tiling \u2013 work from NCHC - All video in one
 - o Who's speaking functionality (external contribution)
 - o Thumbnail sorting
 - o Desktop sharing (compatible with inSORS?)
 - + inSORS: H.264 \u2013 Data mode?\u2013
 - + VRVS: H.263 baseline
 - o Video subtitling/watermarking (like the news!)
- * Firewall/NAT traversal (UMTP?)
 - o Port number in use
- * P2P (e.g. Orta, Aspen) support \u2013 source specific behaviours (external contribution)
- * SRTP support
 - o Signalling issues, rekeying
- * H.263 improved (UKERNA) \u2013 dependent upon GW initiative
- * Low bandwidth support (i.e. don't receive video if don't want)

Evaluation

- Internal evaluation
 - Progress reports
 - Final project report
- JISC evaluation
 - JISC meetings
 - Project officer discussions
- Evaluation and steering advisory group (ESAG)
 - Workshop attendees and others (ANL)

Plan for next 6 months

- Stabilise Software Management systems
 - Full testing, More info, LDAP user management etc
- Register more external developers
 - Glasgow, NCHC ...
- Do two releases of software
 - First at end of Feb
- Events
 - Present at OSS2006
 - Attend/present at AG retreat (May 2006, Ann Arbor)
 - JISC 2006
- Meeting (over network) with evaluation group