

Digital Collaboration

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Collaboration

- Historical nature of musical collaboration
- Nature of electroacoustic music

- Collaboration within electroacoustic music
 - Performers and electronics
 - Performers and offline DSP
 - Performers and Real time DSP
 - Networked Performers

Real Time DSP

KIM's in the Sun

- 1977 Jim Horton and Rich Gold
 - 2 KIM's p2p
 - Polling based
- Blind Lemon Gallery 1978
 - The League of Automatic Music Composers
 - Jim Horton, Rich Gold & John Bischoff
 - 3 Micros Token Ringed
 - Interrupt based

The Hub

- 1985 -1999 developed from The LAMC
- Server based network
- Common clock
- Hardware neutral protocol
- Propriety Format
- Control data transmission

Realtime collaboration

- Requirements of system
 - Reliable, Stable
 - Built in redundancy
 - Platform neutral
 - Non proprietary

Example situation

- 20 geographically local musicians
- Collaborating on control and audio data

Solution

- Ethernet communication for control
 - Wired, Wireless
- Isolated network
- Open and platform neutral protocol for control data transmission
 - Midi, OSC
- Audio handled as separate audio network

LAN issues

- Bandwidth requirement
- Reliability
- Latency
- Jitter

TCP or UDP

- Transmission Control Protocol (TCP)
 - Handshake
 - Larger packet size
 - Congestion Control
 - Guaranteed packet arrival
- User Datagram Protocol (UDP)
 - No handshake
 - Reduced packet size
 - Packet loss possible

LAN to WAN

- Restrictions on WAN
- Security requirements
- Audio must be network hosted
- Significance of LAN issues increased

Audio issues

- Low latency requirement
- Synchronisation
- Audio high bandwidth requirement
 - Localise audio at performance
 - Localise audio at localities
 - High compression

Audio

- Streaming server structure between peers
- Shoutcast
- Icecast2
- Quicktime / Darwin streaming server
- Clients and servers locally hosted
- Free choice of transport so use UDP
- Audio requirements often beyond infrastructure

piksel04

- Norway 2004
- Streaming audio and video within LAN environment
- Open source advocates
- Drop in solution as fully GPL'd

Alternative Strategies

- Low quality non performance stream
 - Audio monitoring only over network
- Sample playback model
 - Control data triggers playback and other parameters
 - Similar to non real time collaboration

Non real time

- Collaborating off line on a single creative project
 - Traditionally done with postal system
 - Requires format agreement: midi, protocols, logic
- Distribution
 - p2p - hard to manage
 - Single repository - expensive
- Requires effective file management

File Management

- Versioning
 - Requires internal searching
- Distribution
- Readable file format
 - Universal file format open standard

The environment

- Real time
 - IM
 - Chatroom
 - Workspaces
 - Wiki's
- Off line
 - Email
 - website

Beyond

- Real time models provide interesting local machine abstractions
- Opportunities for multiple live venues
 - Venue in your room
- Collaboration through non musical frameworks
- Music created by the network