

# Dancing in the Cloud: Design for Dance Technology Collectives

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## ABSTRACT

Cloud systems provide infrastructure, platforms and software applications as service. Taking a design based approach that develops how these services can become central for developing dance technology collectives, a one day technical workshop on how to deploy a 3D Virtual World on the OpenStack Cloud system was created and presented. The workshop ran successfully on personal computers. However, performance of the deployed cloud services was inadequate. Thus connecting disparate members of a collective by adding their personal computers as nodes of the Cloud system was rejected. An alternative approach that deploys fit for purpose computers on fast network is being considered for the next design cycle.

## Categories and Subject Descriptors

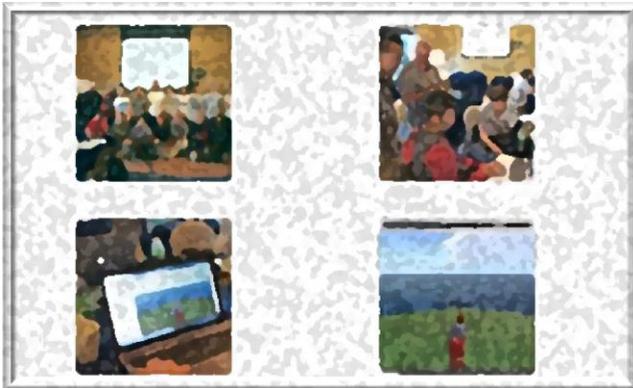
K.4.3 [Organizational Impacts] *Computer-supported collaborative work.*

## General Terms

Design, Experimentation.

## Keywords

Design research, Cloud, Collectives, OpenStack.



## 1. INTRODUCTION

Dance technology researchers and artists develop systems that capture data from human bodies, provide personal embodiment using digital means, border-crossing between digital and physical domains i.e. causing the performance space to be changed by dancers or digitally embodied participants, and emergent behaviour from the developed systems.

Cloud systems allow dynamic creation of services for business infrastructure, platforms and applications. For example, cloud systems dynamically deploy virtual servers, storage and network configurations on request [4]. This flexibility provided by cloud services on infrastructure, platform and application deployment seems to match requirements of dance technology system.

A design science research approach is being taken to understand if a cloud service is suitable system for facilitating dance technology artists' collectives. In this approach design and development of an artefact intended to solve an identified organizational problem is used as a focus [3].

## 2. BACKGROUND

A research system for a dance technology researcher and artist has been developed on a conventional private database system and a public 3D virtual world [1]. This has been a distance digital collaboration between an IT developer in New Zealand and a dance technology researcher and artist in Portugal over a three year period. The collaboration led to a short residency where the developer and the artist refined a system for collaborative dance performance. The system was then used in a performance that allowed dance in China and Japan to collaborate through video, a 3D Virtual World, and body data sensing transmission and re-interpretation [5].

The present system is beginning to be used by dance technology artists in different parts of the world. It meets requirements through close collaboration between the artist and the system developer. However, artist researchers want to express the relationship between dance or body data and effects in the system without having to go through a specialist computer programmer, and artists want to deploy their own 3D Virtual Worlds for their work.

Research is now heading towards developing a system that can be used by range of dance technology artists in a number of fronts. Body data sensing is being refined by the development of wireless network sensors that can be connected directly to the internet. For example: the "electricImp" [6] an Internet of Things micro-controller in an SD format with its associated cloud based development environment provided a possible pathway in the development of the system, however developing solutions with

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this system requires a developer. Kately [7] a cloud based 3D Virtual World system is being investigated to meet the 3D Virtual World requirement. Kately and the electricImp constrain the researcher artist to deployment of their system where the internet is always available.

An alternative approach is to deploy an open source cloud system that can be run on a local area network (LAN) or on the internet. OpenStack [8] is an open source cloud infrastructure system that can be deployed on a LAN or on the internet. Hence it was proposed that individual artist's personal computers could become nodes in a distributed infrastructural cloud implementing system requirements

### 3. METHOD

To develop our understanding of the constraints in the proposal a workshop on how to implement a 3D Virtual World in the Cloud (OpenStack) was treated as a way to develop an understanding of the issues when using OpenStack on individual's personal computers. The workshop was also developed to meet requirements of a technical workshop for the Hong Kong OpenStack Users' Group (HKOUSG). The organizers of the HKOUSG recommended either a render farm workshop or a virtual world deployment workshop as suitably interesting for digital professionals based in companies in the Cyberport incubation program or in their user group [2]. About twenty digital technology professionals from the HKOUSG participated in a 6 hour workshop where they deployed a 3D Virtual World on their personal computers. Participants were put into teams of about five participants with the aim to ask the teams to produce a Cloud on the team's computers.

The first three hours of the workshop was spent preparing an OpenSim [9] 3D Virtual World server for deployment on a cloud. The second three hours was spent deploying the OpenSim onto the cloud.

### 4. RESULTS

Participants deployed the OpenSim 3D Virtual World on OpenStack clouds on their personal computers. However, due to a slow start to the day none of the teams produced a multimode version of their cloud. In the running 3D Virtual Worlds the latency was extreme, none of the systems – even those computers with highest performance specifications ran the virtual world in a way that would allow a dance technology researcher or artist to work.

Development of a cloud based system on personal computers has been abandoned. At a time in the future when personal computers have high quality and high volume disk drives, and sufficient RAM (at least 64GB or RAM) and processing power, the deployment of a cloud on personal computers will be revisited.

### 5. NEXT

Planning is being undertaken to deploy a fit for purpose – yet low cost computer – on a faster digital at the offices of an existing digital collective. OpenSim on OpenStack is still being used as a test case. Deploying on a sufficiently low cost fit for purpose machine will test the proposal that this configuration can be used to create a distributed cloud that connects or interconnects people working in dance technology collectives.

## 6. SUMMARY AND CONCLUSION

Developing systems for use by researchers and artists in an on-going situation is treated as developmental research that is design focused, the artifact under development is the artists' collaboration and system that enables collectives. The incremental and exploratory nature of the dance technology research also allows for design centred research. Theoretic frames with in dance technology influence and lead the design.

## 7. ACKNOWLEDGMENTS

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