Technical Specification – Client Subgroup

Components:

        Client Login

        Wireless Connectivity

        Media Playback

         Graphical User Interface

Environment:

The system client is designed around the ISEE IGEPv2 DM3C70 industrial processor board, [1] controlled by minimal Linux-based distribution, with a Linux Kernel, firmware. [2]  The board houses a TIDM 3730 processor with a Cortex A8 CPU clocked at 1GHz, 512Mb of DDR RAM as well as 512Mb of NAND flash memory storage.  The board provides USB (USB 2.0 Type A), Serial (UART), Audio (Stereo Minijack) as well as Wireless Connectivity (Specifically WiFi) peripherals. [1]

The peripherals, debugging facilities and the teams Linux familiarity, provided the main incentive for the use of this board for this project. It is capable of meeting all the requirements of the systems client, as well as being portable and having low power requirements, for demonstrating a prototype mobile audio distribution system.

Client Login:

Individual units each require a four digit login pin, which is provided by the Kiosk. The login request is made by entering the pin via a provided keypad peripheral; for which the device drivers are written in C. The drivers operate as firmware, as such are not entirely adaptable on the fly; the device will function correctly assuming that a pin is no longer than four digits. The keypad communicates with the IGEPv2 via Serial-USB, which is facilitated by the BMCM USB-PIO Digital I/O Interface. [3] Finally, four 7-Segment LCD displays are featured which provide the user, in real time, visual verification of the numbers being inputted.

Wireless Connectivity:

Client-server communication is handled by a Local Area Network operating over Wi-Fi (WLAN). The network is established by wireless antennae on all major hardware facilities and is controlled by a network router attached to the Kiosk. WLAN enables media streaming requests to be made via Real time Streaming Protocol, [4] As well as providing locational awareness functionality. By use of external wireless emitters, the known location of a client unit can be calculated; enabling the current exhibit the user is viewing to be extrapolated.

Media Playback:

Audio playback is enabled by appropriate server requests for audio data being made by the IGEP as required. Audio streaming and playback is conducted by the GStreamer  v1.2.3 pipeline, [5]  which was chosen for its robust adaptability, cross platform compatibility as well as it providing an appropriate and time-conservative implementation. The specific audio request being made is dictated by the level of user knowledge as well as the Museum Exhibit the client is making the request from. Control of Audio Playback, stop, pause, rewind etc. is also enabled by GStreamer.

Client Control – Graphical User Interface:

A Liquid Crystal Display (LCD), the SerLCD 2.5, [6] peripheral provides the user with a direct Graphical User Interface (GUI) with which they can control the client. The UI provides the following features:

         Audio Playback control

         Current Exhibit Number

         Language selection

         “Skill Level” selection

Drivers for the device are written in C++ on the Qt cross platform application framework, Integrated Design Environment. [7] The decision to create a real-time system in Qt (and by proxy C++), as opposed to C or another low-level language, was justified by the IDE being tailored towards GUI creation.  The display is a 16x2 LCD, is serial enabled (UART) and is capable of displaying characters and numbers; making it much more useful in providing users information than the 7-segment displays also featured on the client. The LCD possesses dimensions of 71.4x26.4mm, upon which 16 characters per line, across two lines, of characters can be displayed.

References:

[1] Integration Software & Electronics Engineering. (2013):

IGEPv2 Hardware Reference Manual,

Version 2.0

[2] Integration Software & Electronics Engineering. (2013):

# IGEP SDK Software User Manual,

# Version 2.0

[3] bmc messysteme gmbh (2012):

USB-PIO Digital I/O Interface (USB) Datasheet,

Revision 6.1

[4] Network Working Group (1998):

Real Time Streaming Protocol (RTSP).

[5] Taymans. W, Baker. S, Wingo. W, Bultje, .S .R, Kost. S(2014):

GStreamer Application Development Manual,

Version 1.2.4

[6] SparkFun Electronics (2006):

 SerLCD 2.5 Datasheet

Version 2.5

[7] Qt Project (2013):

http://qt-project.org/doc/qt-5/index.html