Soft Repeater

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A software driven repeater

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Oct 2014

GB3TM repeater logic - a proposed replacement

Background:
The GB3TM repeater (and others) is getting quite long in the tooth and it can be foreseen that maintenance of the repeater hardware could become a problem if something dies. Of particular concern is the repeater logic as this is based upon the STAMP module which is no longer available or supported. It is also challenging to update the off-air slideshow as this requires manually hacking a hex file to change the embedded teletext codes (presumably adding new slides is impossible).

Alternatives:
1. Replace the repeater logic / controller with a modern, off the shelf, board based solution
2. Replace the repeater logic with a computer based solution
3. Replace it with a single board computer based solution - e.g. Raspberry Pi.

An off the shelf board solution is not cheap however it would doubtless perform well and may be considered a well proven solution.

A computer based solution will be expensive and will increase power consumption. It does however offer some potentially dramatic advantages in terms of the available facilities e.g. nice graphic blends and transitions, picture in picture etc. Maintenance will be an issue due to the nature of computer systems needing constant update - particularly if internet connected.

The solution proposed here is to use a Raspberry Pi single board computer to implement

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Jan 2015

TV Repeater Specification

The repeater will comprise:

- Several TV receivers (70cm DVB-S, 23cm FM Analogue, others?)
- A 2m FM audio receiver
- A logic unit
- A TV Transmitter (currently DVB-s 23cm) with PA

This document specifies the logic unit.

The logic unit will comprise:
A TV signal switcher
A Control unit (Raspberry Pi single board computer)
Format converters (CVBS / HDMI / others)
A watchdog circuit

Block Diagram:
 (to be added)

Interface specifications

Receivers
Each receiver will connect as follows:

Direction	Description	Notes	Connects to

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Using off-the-shelf hardware

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Under £5 !

Port HDMI Switch Switcher Selector Splitter

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£20

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£40

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Under £5

Soft Repeater

Under £1

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Raspberry Pi or other SBC

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Multi-tasking OS
(Raspbian or possibly RTOS)

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KISS approach
(Keep It Simple Stupid!)
Several light-weight
autonomous tasks

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Tasks:

Slide presentation

Video player

Control Logic

DTMF decoder

MSF Clock decoder

Power / UPS management

Activity logging

Web based management tools

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Slide show:
Simple shell script
Uses framebuffer device
Plays CW Ident
Optional tty-clock display

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Video player:
mplayer or omxplayer
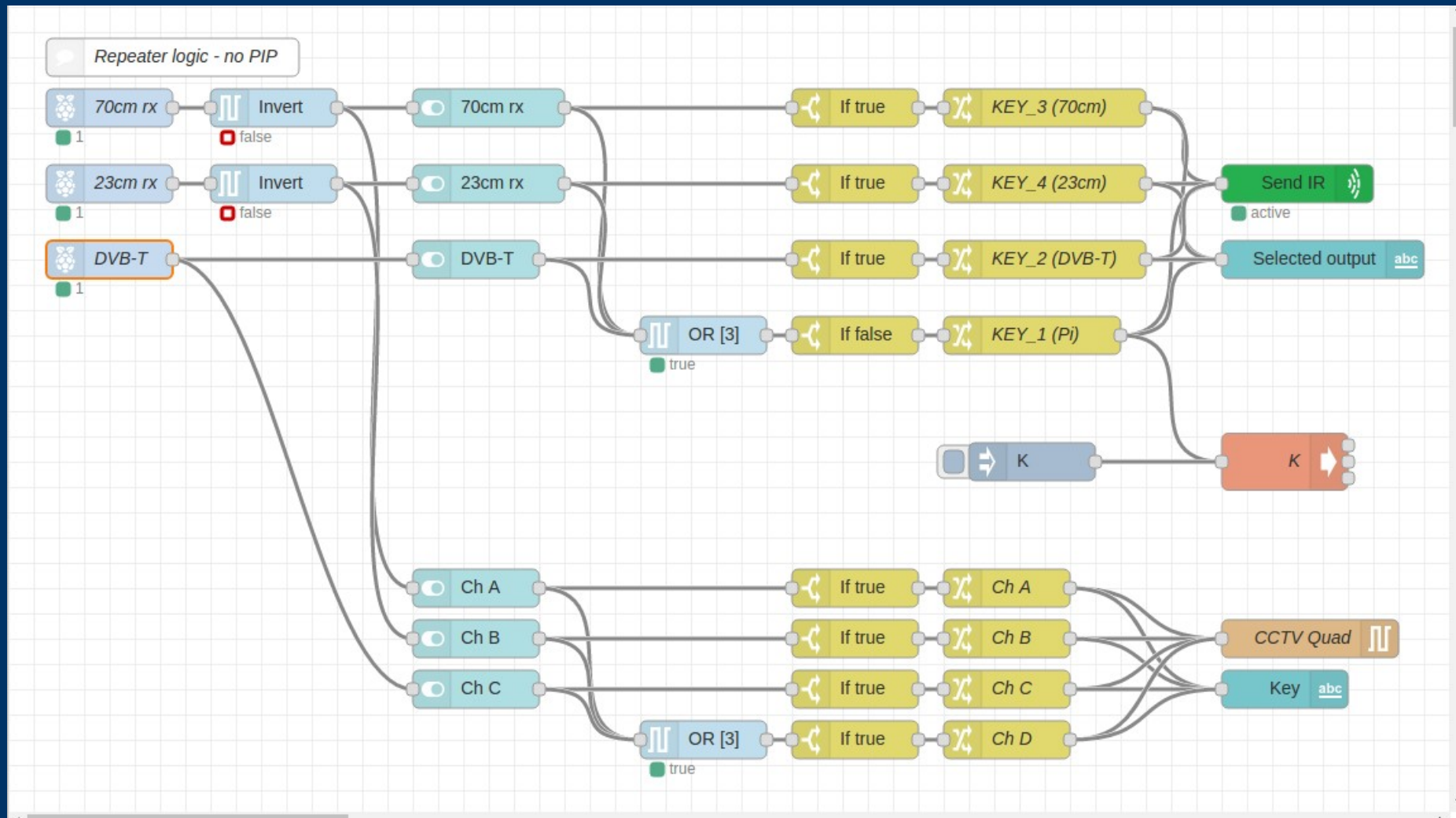Uses Pi GPU hardware
 decoding

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NodeRED Logic flow:
Simple to interface
Change easily to suit new hardware

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NodeRED controls:

Controls video switch(es)

Plays specific content e.g. 'K' slide and cw

Triggers timed events e.g. night service mode (shutdown Tx)

Any IOT / Serial / LIRC / Script / http / tcp / udp / gpio / pwm / file / Web dashboard

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DTMF Decoder:

Multimon-ng continuously monitors audio

Sends received characters to NodeRED flow

Actions then defined in logic e.g. select
  specific input, PIP, Test card etc.

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MSF Decoder:

Stand-alone task provides updates
  to local NTP daemon
Only required if no Internet link

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Power / UPS manager:
Stand-alone task shuts Pi down
  safely after power failure
Watchdog monitor reboots if
  locked-up

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Activity logging:

Stand-alone tasks log to syslogd

Logic writes a separate log to record repeater usage

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Web based management:
View logs
Monitor/start/stop tasks
Modify logic
Change or update slides & videos

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Future options:

Tweet or email when activated

Directly process video streams

PiCam to monitor site

DTMF control Rx 'Info' button

RTLSDR signal strength monitor

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Summary:

Low cost

Easy to upgrade/replace parts

Simple to change controls

Thank you

GB3TM

Activity night Tuesday
19:00 – 20:00

Chris MW0LLK