Monitoring and alerting | Longterm monitoring of Duet 2 and automatic Hotend PowerOff/Movement Stop

To monitor some important values from Duet Trikarus project is going to monitor different values like MCU temperature or general printer status. This is done by triggering **M408 S4** GCode. In Repetier Server a callback function is registered to monitor this command and append the output to the callback log / websocket stream. A bash script takes this information and parses it. The parsed data will be pushed into InfluxDB. The data is graphically evaluated by Grafana instance.

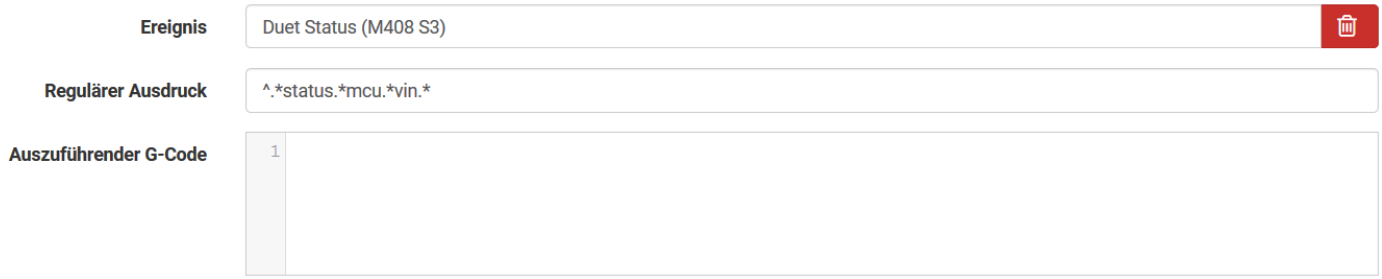
We are using this script to monitor if the printer idles but hotend is still active, too. In case Duet is running a GCode sequence, it's status is "busy". While heating up it's "idle". Because the old Duet firmware has no built-in watcher to check if the printer is heating while not printing. Our script is not 100% safe because we need to trust into a working network connection (we already defined an extra value "-2" for Duet polling). But it still helps to perform emergency shutdowns in case we forgot to turn off the printer correctly.

Another job is to monitor if Repetier Server is still sending job data even the printer controller got not enough voltage to run the motors (e.g. power loss or emergency stop button pushed). In this case the print job silently continues which creates unusuably situation and it would mean if the power comes back the printer would just move to some unknown weird position. We omit this by triggering the @pause command which gets interpreted by Repetier Server to stop the gcode data feed. By the way "Warning: VIN under-voltage event" message get's written into log line by Duet.

> We could also use Smart Stepper ABCD position data to check if the printer really moves while it is printing.

> **Warning.** Under some circumstances "Warning: Communication timeout - resetting communication buffer." will appear. Then you might need to reset Duet by web interface (in case Repetier Server interface reset does not properly work and no USB response)

Create Repetier Server callback



The bash script

```
vim /opt/duet_status.sh
```

```
#!/bin/bash
# this script will read the current IP Adress by using a pre-defined custom event in Repetier
Server. Please see documentation for more details on how to do that

source "/opt/repetier-conf.sh" #source config for Repetier Server instance

PID_FILE="/opt/duet_status.pid"

case "$1" in
    start)
    #get the scripts own PID number
    echo $$>"$PID_FILE"
    IDLE_TIMEOUT=900 #We turn off the extruder after 15 minutes (15 * 60 = 900 seconds)
    LAST_IDLE_TIME="" #we store the last timestamp where printer was in an idling state
        while true; do
                        echo "_____________________________________"
                        echo LAST_IDLE_TIME=$LAST_IDLE_TIME
            #LAST_IDLE_TIME="" #we store the last timestamp where printer was in an idling
state
            STATUS="-999" #reset status because we are in a while loop

           #authenticate
            curl --silent "duetdevice/rr_connect?password=somePw" > /dev/null

            if [ $? == 7 ]; then
                STATUS="-2" #network connection could not be established
            fi
```

```
            #get status response from Duet (note that if previous authentication is some
seconds too old it will fail because you need to re-authenticate) - regular output is
"{"err":0,"sessionTimeout":8000,"boardType":"duetethernet102"}"
            LOG_LINE=$(curl --silent "duetdevice/rr_status?type=2")
            #echo $LOG_LINE

            #status mapping (InfluxDB cannot store characters):
            # -1=O=Offline
            #  0=I=idle
            #  1=P=printing from SD card
            #  2=S=stopped (i.e. needs a reset)
            #  3=C=running config file (i.e starting up)
            #  4=A=paused
            #  5=D=pausing
            #  6=R=resuming from a pause
            #  7=B=busy (e.g. running a macro)
            #  8=F=performing firmware update
            #  9=T=changing tool
            # 10=M=simulating
            # 11=H=halt

            # Warning: the following lines will fail if the configuration of firmware changes
(number of hotends for example)
            if [[ ! $STATUS == "-2" ]]; then
                STATUS=$(jq -r '.|{status}|.status' <<< ${LOG_LINE})
            fi

            MCU_TEMP=$(jq -r '.|{temps}|.[]|{extra}|.[]|.[]|.temp' <<< ${LOG_LINE})
            HOTEND_ACTIVE=$(jq -r '.|{temps}|.[]|{tools}|.[]|{active}|.[]|.[]|.[]' <<<
${LOG_LINE})
            HOTEND_TEMP=$(jq -r '.|{temps}|.[]|{current}|.[]|.[0]' <<< ${LOG_LINE})
            SPEEDFACTOR=$(jq -r '.|{params}|.[]|{speedFactor}|.speedFactor' <<< ${LOG_LINE})
            EXTRFACTOR=$(jq -r '.|{params}|.[]|{extrFactors}|.[]|.[0]' <<< ${LOG_LINE})
            BABYSTEP=$(jq -r '.|{params}|.[]|{babystep}|.[]' <<< ${LOG_LINE})
            VIN=$(jq -r '.|.vin|{cur}|.[]' <<< ${LOG_LINE})
            Z_COORD=$(jq -r '.|{coords}|.[]|{xyz}|.[]|.[2]' <<< ${LOG_LINE})

            #now replace Status with integer values for InfluxDB
            STATUS=$(echo ${STATUS/O/-1})
            STATUS=$(echo ${STATUS/I/0})
```

```
            STATUS=$(echo ${STATUS/P/1})
            STATUS=$(echo ${STATUS/S/2})
            STATUS=$(echo ${STATUS/C/3})
            STATUS=$(echo ${STATUS/A/4})
            STATUS=$(echo ${STATUS/D/5})
            STATUS=$(echo ${STATUS/R/6})
            STATUS=$(echo ${STATUS/B/7})
            STATUS=$(echo ${STATUS/F/8})
            STATUS=$(echo ${STATUS/T/9})
            STATUS=$(echo ${STATUS/M/10})
            STATUS=$(echo ${STATUS/H/11})

            # note that space white characters destroy the --data-binary. So watch them
exactly!
            # if errors occure values might need to be converted from int to float! (missing
yet)
            if [[ $STATUS == "-2" ]]; then
                echo "Duet is not connected by LAN"
                #MCU_TEMP=99999
                #HOTEND_ACTIVE=99999
                #HOTEND_TEMP=99999
                #SPEEDFACTOR=99999
                #EXTRFACTOR=99999
                #BABYSTEP=99999
                #VIN=99999
                #Z_COORD=99999

                # note that space white characters destroy the --data-binary. So watch them
exactly!
                curl --silent -k -XPOST "http://localhost:8086/write?db=trikarus" --data-
binary "duet_ethernet,host=hangdevice.fablabchemnitz.de status=${STATUS}" --user dbUser:dbPass
> /dev/null
            else

                #################
                # Movement Watchdog (pause print iff Duet status is "OFFLINE" and VIN is below
minimum
                #################
                if [[ $STATUS == -1 ]] && [[ $VIN < 23 ]]; then
                    echo "Current VIN is below the supply voltage required to be able to
```

```
print. Pausing print (if a print job is running at the moment)"
                    send_gcode '@pause' #ToDo: add some check if already paused to avoid
@pause spamming
                fi

                ##################
                # Hotend Watchdog
                ##################
                echo "Hotend Watchdog is active"

                if [[ $HOTEND_ACTIVE == "0" ]]; then
                    echo "ok" > /dev/null #everything fine. Hotend is off (target temperature
is exactly zero).
                    echo "Hotend is off. everything fine"
                    LAST_IDLE_TIME="" #okidoki. We reset the timestamp again to clear the last
information
                else
                                        echo "Hotend is active (target temperature is
$HOTEND_ACTIVE degrees). Checking if i should turn off"
                    #Hotend is on. Checking whats up.
                    if [[ $STATUS == "0" ]] || [[ $STATUS == "2" ]] || [[ $STATUS == "8" ]];
then #Duet is still/again idling, stopped or is doing firmware upgrade.
                                                echo "Duet is still/again idling"
                        if [[ -z "$LAST_IDLE_TIME" ]]; then #only if LAST_IDLE_TIME is empty
we overwrite with a new time information
                             LAST_IDLE_TIME=$(date '+%s') #We store that timestamp
                                                        echo LASTIDLE_TIME=$LAST_IDLE_TIME
                        fi
                    else
                        if [[ $STATUS == "7" ]]; then
                                                echo "Printer is printing at the moment!"
                                                fi
                        LAST_IDLE_TIME="" #okidoki. We reset the timestamp again to clear the
last information
                    fi
                fi
                if [[ ! -z "$LAST_IDLE_TIME" ]]; then #if LAST_IDLE_TIME is not empty
                    CURRENT_TIME=$(date '+%s')
                    TIME_DIFF=$(($CURRENT_TIME - $LAST_IDLE_TIME))
                                        echo TIME_DIFF=$TIME_DIFF
```

```
                    if [[ "$TIME_DIFF" -gt "$IDLE_TIMEOUT" ]]; then #We turn off the extruder
after reaching timeout
                        send_gcode "M104 S0" #turn off the extruder remotely
                        send_gcode "M106 S0" #turn off the part cooling fan remotely
                                            echo "Heater was turned off by script (idle)"
                                            echo "" | mail -s "Heater was turned off by script
(idle)" somemail@somedomain.de
                    fi
                fi

                #################
                # Write InfluxDB
                #################
                #echo "Writing regular Duet values to InfluxDB"
                echo STATUS=$STATUS
                echo MCU_TEMP=$MCU_TEMP
                echo HOTEND_ACTIVE=$HOTEND_ACTIVE
                echo HOTEND_TEMP=$HOTEND_TEMP
                echo SPEEDFACTOR=$SPEEDFACTOR
                echo EXTRFACTOR=$EXTRFACTOR
                echo BABYSTEP=$BABYSTEP
                echo VIN=$VIN
                echo Z_COORD=$Z_COORD

                curl --silent -k -XPOST "http://localhost:8086/write?db=trikarus" --data-
binary "duet_ethernet,host=device.fablabchemnitz.de
status=${STATUS},mcu_temp=${MCU_TEMP},hotend_temp=${HOTEND_TEMP},speedfactor=${SPEEDFACTOR},ex
trfactor=${EXTRFACTOR},babystep=${BABYSTEP},vin=${VIN},z_coord=${Z_COORD}" --user
dbUser:dbPass> /dev/null
            fi
            sleep 1 #wait to generate not too much data
        done #end of while loop
;;

    stop)
    pkill -P `cat "$PID_FILE"`
    rm "$PID_FILE"
;;

    restart)
```

```
    $0 stop
    $0 start
;;

    status)
    if [ -e "$PID_FILE" ]; then
            echo Service is still running, pid=`cat "$PID_FILE"`
    else
            echo Service is NOT running
    exit 1
    fi
;;

    *)
    echo "Usage: $0 {start|stop|status|restart}"
esac

exit 0
```

```
chmod +x /opt/duet_status.sh
```

Install as service

```
vim /opt/duet_status.service
```

```
[Unit]
After=network.target
Description=Duet Ethernet Controller Status Service

[Service]
Type=simple
ExecStart=/opt/duet_status.sh start
ExecStop=/opt/duet_status.sh stop
KillMode=process
Restart=on-failure
RestartSec=10
RemainAfterExit=no
User=root
Group=root
```

```
[Install]
WantedBy= multi-user.target
```

```
systemctl enable /opt/duet_status.service
service duet_status restart && journalctl -f -u duet_status.service
```

Dropping old values

```
influx

use trikarus
drop series from duet_ethernet
show series
show measurements
```

Create Grafana dashboard

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