

Hacking Espresso

Making an espresso machine from scratch



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Why do this?

Why make an espresso
machine?

Why have a tablet?

Making Good Espresso is very difficult

- Lack of feedback
and
- Lack of control

Lack of feedback

- Traditional machines tell you temperature and pressure
- And both are lies

Pressure

“Pump pressure”, not coffee pressure, so always ~9 bar

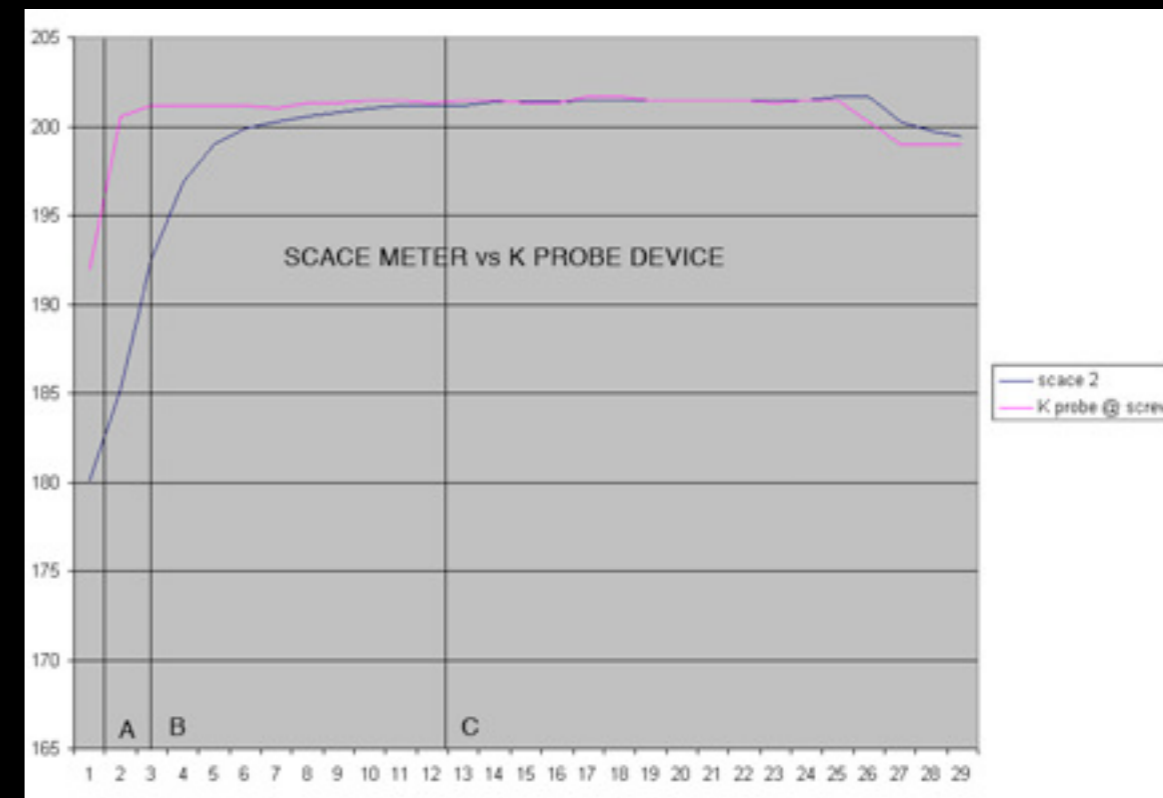
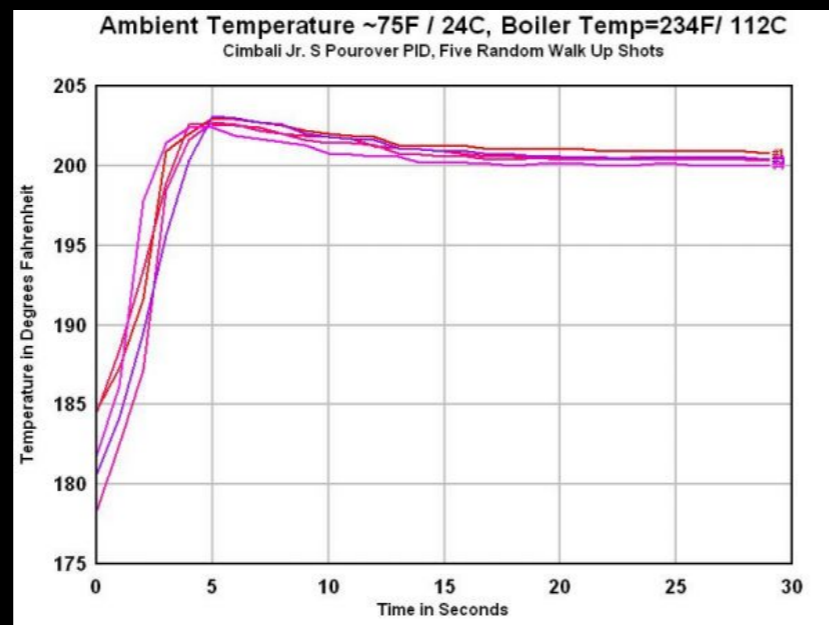


Temperature

Boiler temperature is stated

Interaction effects are ignored

Latency is high



Before “semi-automatic”



There were “Lever” machines



with manual control over *flow and pressure* and reporting the *real pressure* on the coffee puck

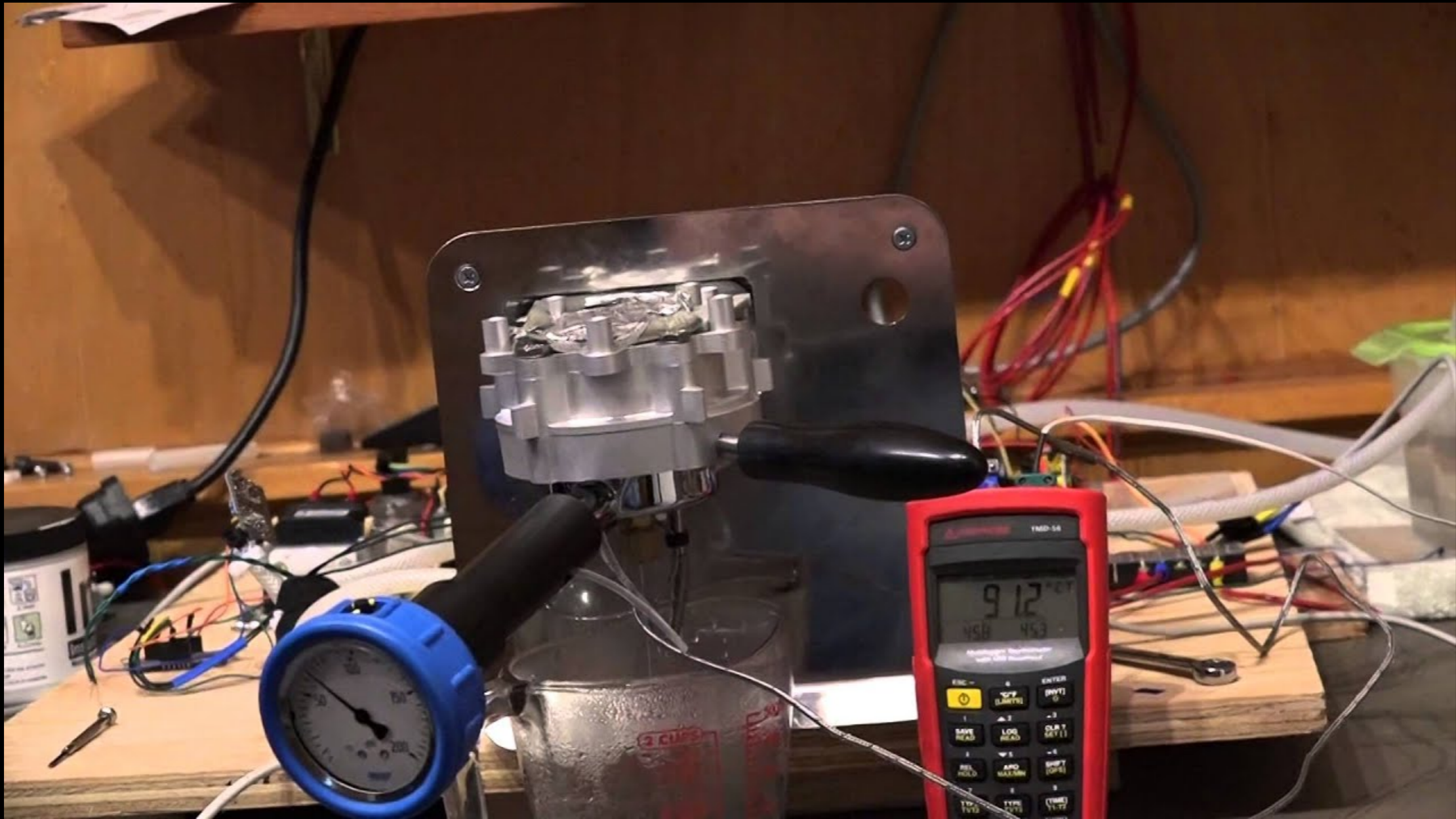
Lever machines aren't dead



they can make
extraordinarily
good coffee

but they do
require skill to
use

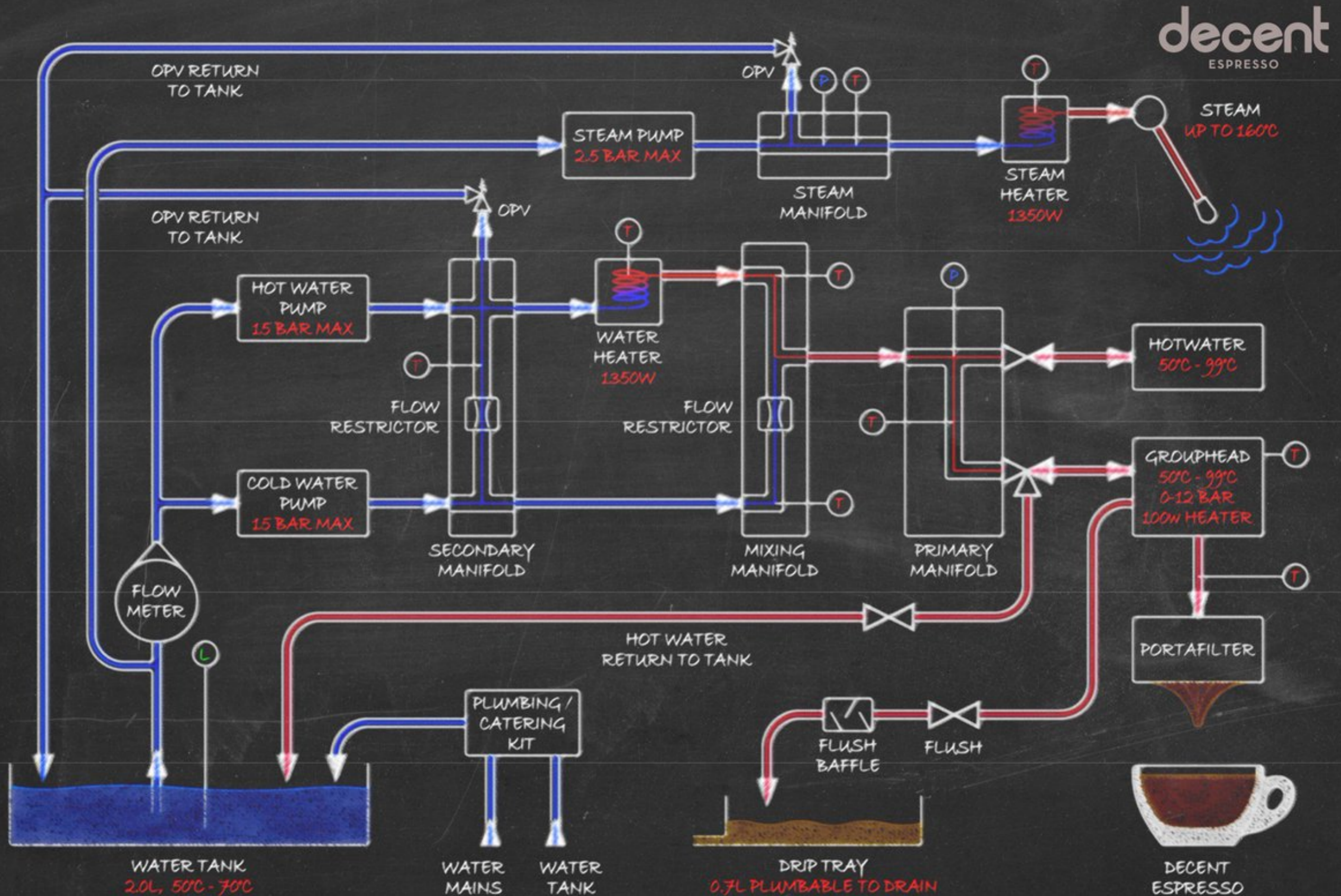
So we made this



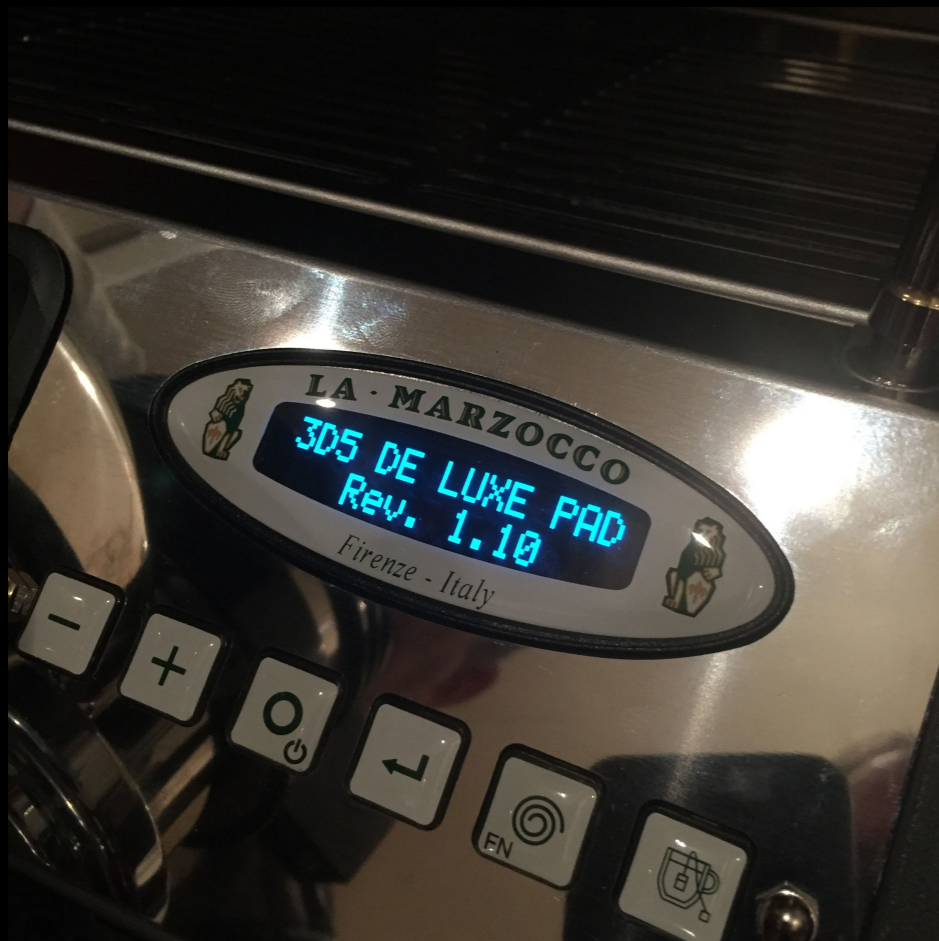
And discovered...

that dynamic control over
water temperature,
pressure and
flow would be very nice.

Which led to this



Embedded or IoT?

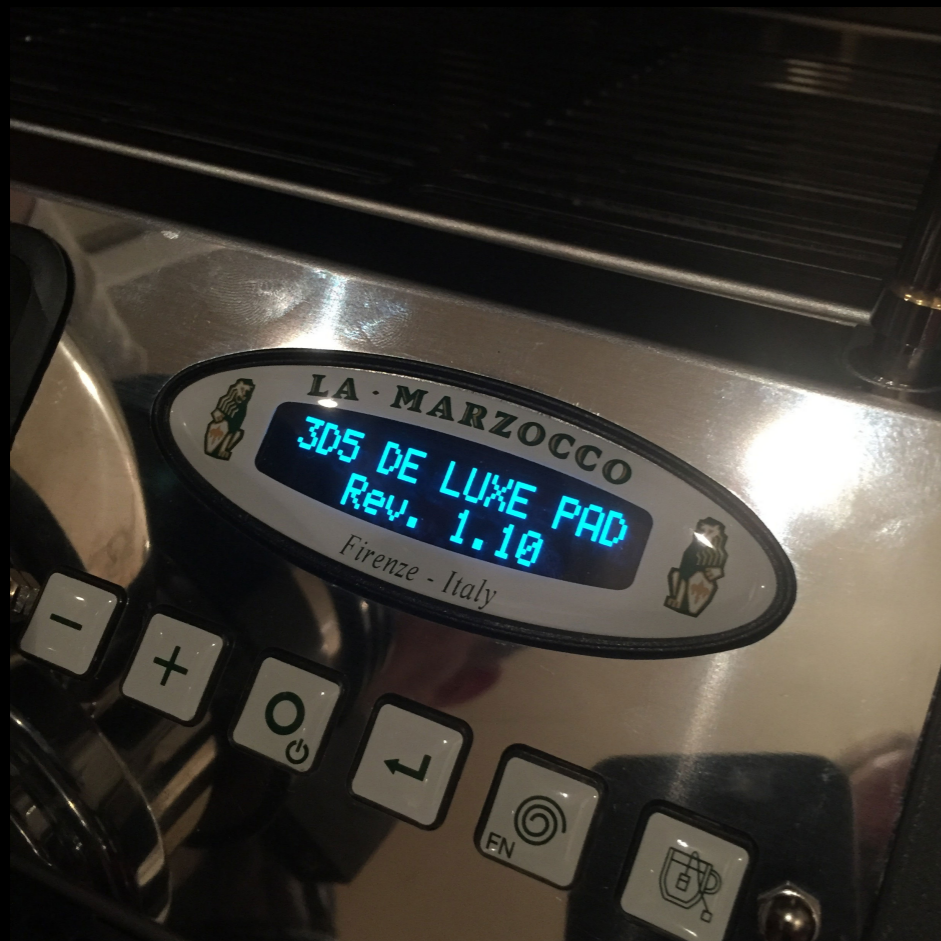


Limited functionality



limited reliability

Embedded



Depreciates
with time

IoT



An Investment: in time
may become more
valuable or zero-value

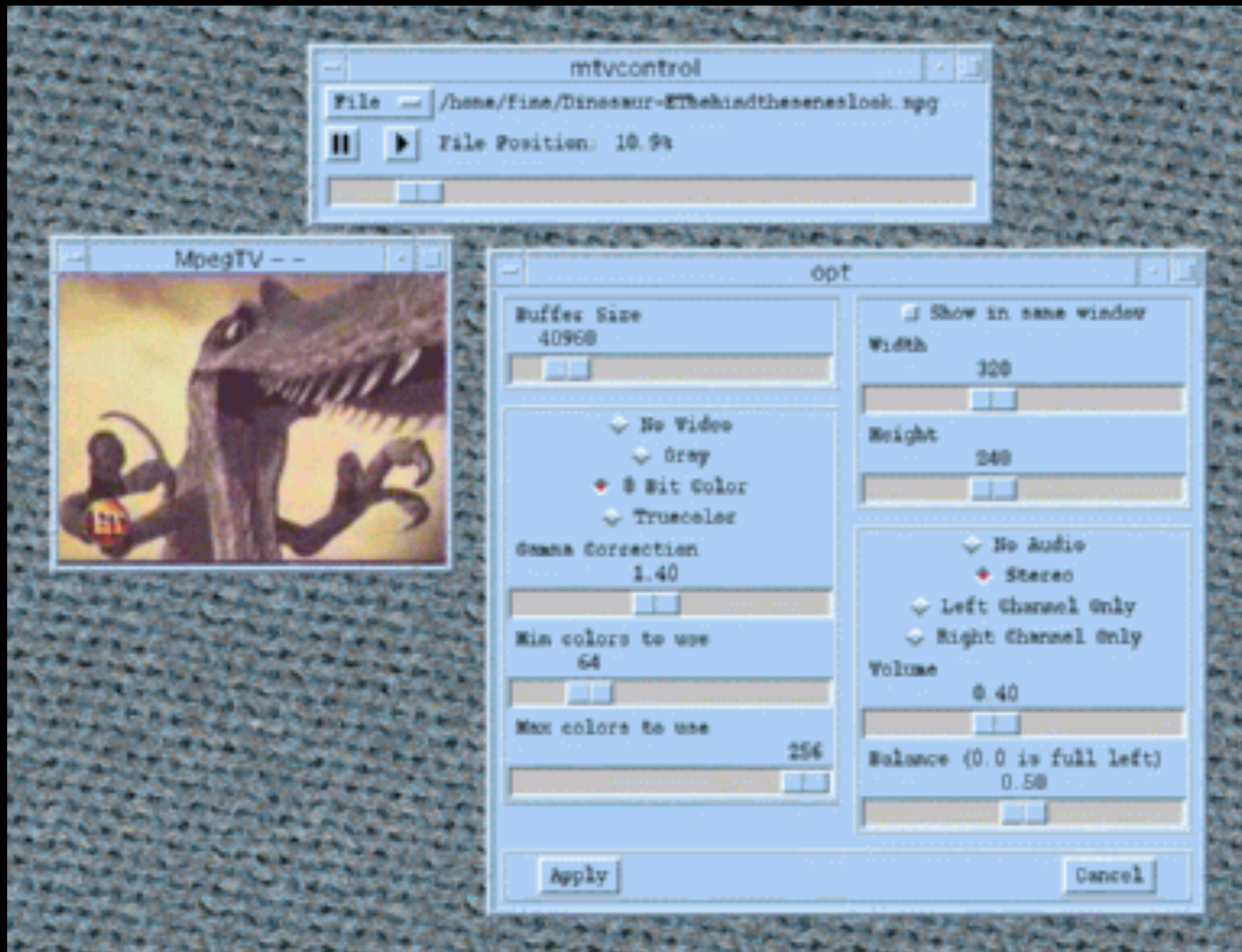
and include a pre-configured tablet for best of both worlds



Non-integrated tablet for upgradeability



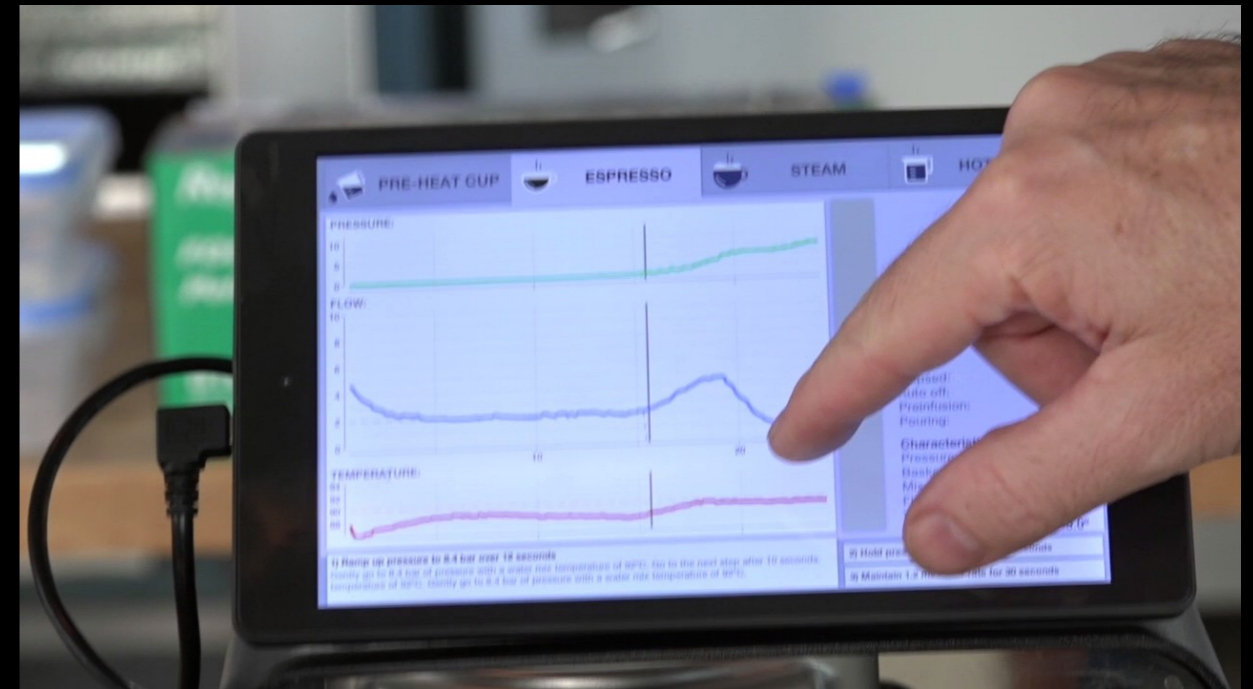
Tk oriented toward windowing UI



There's never been an espresso
UI, so I try many ideas



There were no models to follow, and people could not express what they wanted



Years ago, I'd made a simple rule language for my anti-spam.

It used a (simple for me to parse) subset of Perl.

The simple rule language was the most popular feature.



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With MailShield, your mail server can reject spam, prevent unauthorized mail relaying and halt email bombs!

Everything MailShield does is documented, configureable, changeable. Don't trust your mail to those other mail filters which decide for you what you should accept. MailShield doesn't lay down the law, *you* do.

MailShield gives you control over every step of the mail receiving process. More than 50 different mail protection techniques are built into MailShield. Each one can be selectively turned on or off, and you get unparalleled flexibility to add more with an easy scripting language to meet your particular needs, making MailShield the power leader in mail server protection.

MailShield is a software plug-in for your current mail server, adding powerful filtering, rejection and programmability features to your existing setup.

MailShield works with all mail servers when in a two-machine configuration. MailShield also works and has been tested on the same machine with these servers: Sendmail, Exchange, Notes/Domino, Netscape Mail Server, Post Office, NTMail, Qmail, WinGate, Exim, SLMail, IMail, Microsoft IMS, AltaVista Mail, MDAemon and MailSite.

MailShield is now available for Windows NT, Windows 95/98, Linux, Sun Solaris/Sparc, and Sun Solaris/Intel.

Kept as simple as possible

```
skin.tcl x
package require de1 1.0

#####
# DECENT ESPRESSO DEFAULT SKIN
#####

# use the standard graphic filenames and standard settings pages
source "[homedir]/skins/default/standard_includes.tcl"

#####
# text and buttons to display when the DE1 is idle

add_de1_text "splash" 510 1240 -text [translate "START"] -font Helv_10_bold -fill "#2d3046" -anchor "center"

# these 3 text labels are for the three main DE1 functions, and they X,Y coordinates need to be adjusted for your skin graphics
add_de1_text "off" 510 1240 -text [translate "WATER"] -font Helv_10_bold -fill "#2d3046" -anchor "center"
add_de1_text "off" 1280 1240 -text [translate "ESPRESSO"] -font Helv_10_bold -fill "#2d3046" -anchor "center"
add_de1_text "off" 2048 1240 -text [translate "STEAM"] -font Helv_10_bold -fill "#2d3046" -anchor "center"

add_de1_text "water" 510 1240 -text [translate "WATER"] -font Helv_10_bold -fill "#2d3046" -anchor "center"
add_de1_text "steam" 2048 1240 -text [translate "STEAM"] -font Helv_10_bold -fill "#2d3046" -anchor "center"
add_de1_text "espresso" 1280 1240 -text [translate "ESPRESSO"] -font Helv_10_bold -fill "#2d3046" -anchor "center"

# these 3 buttons are rectangular areas, where tapping the rectangle causes a major DE1 action (steam/espresso/water)
add_de1_button "off" "say [translate {water}] $::settings(sound_button_in);start_water" 210 612 808 1416
add_de1_button "off" "say [translate {steam}] $::settings(sound_button_in);start_steam" 1748 616 2346 1414
add_de1_button "off" "say [translate {espresso}] $::settings(sound_button_in);start_espresso" 948 584 1606 1444

# these 2 buttons are rectangular areas for putting the machine to sleep or starting settings. Traditionally, tapping one of the corners of the screen puts it to sleep.
add_de1_button "off" "say [translate {sleep}] $::settings(sound_button_in);start_sleep" 0 0 400 400
add_de1_button "off" { say [translate {settings}] $::settings(sound_button_in); show_settings } 2000 0 2560 500
add_de1_variable "off" 1280 1320 -justify right -anchor "center" -text "" -font Helv_9_bold -fill "#7f879a" -width 520 -textvariable {[group_head_heating_text]}

# during espresso we show the current state of things (heating, waiting, flushing, etc)
add_de1_variable "espresso" 1280 1320 -text "" -font Helv_9_bold -fill "#7f879a" -anchor "center" -textvariable {[translate [de1_substate_text]]}

# show whether the espresso machine is ready to make an espresso, or heating, or the tablet is disconnected
add_de1_variable "off" 20 1520 -justify left -anchor "nw" -text "" -font Helv_10 -fill "#666666" -width 1520 -textvariable {[de1_connected_state 5]}

#####
# text and buttons to display when the DE1 is doing steam, hot water or espresso

# the standard behavior when the DE1 is doing something is for tapping anywhere on the screen to stop that. This "source" command does that.
source "[homedir]/skins/default/standard_stop_buttons.tcl"
```

Users make their own skins

PROJECTS BY DAMIAN BRAKEL
things that help

HOME DSV2 DE1 PROFILES 3D PRINT PROJECTS

Decent Espresso Machine Skin

December 13, 2018 *Off* By DAMIAN

The DSV2 project is a skin for DE1 espresso machines, the goal behind this project is to allow people to customise the look of there app, offer further functionality and convenience

Love a Decent Coffee

Water Level 537 ml Pressure profile Jayson Philbeck's Slayer Style Profile ready

Goal Temp. 90.0°C Metal Temp. 0.0°C Shot Time 0s 0s

Auto-Off Temperature 15s 161.5°C

Temperature Volume 80.0°C 14 mL

Auto-Off 3s available soon

Weight Disconnected 0.0g

START ESPRESSO

Tap graphs for full screen

Tap to profile settings

Skin settings

Tap to connect + Tap to Tare

Turn skale display off/on

Category: Uncategorized

Shout Damian A Coffee

Donate with **PayPal**

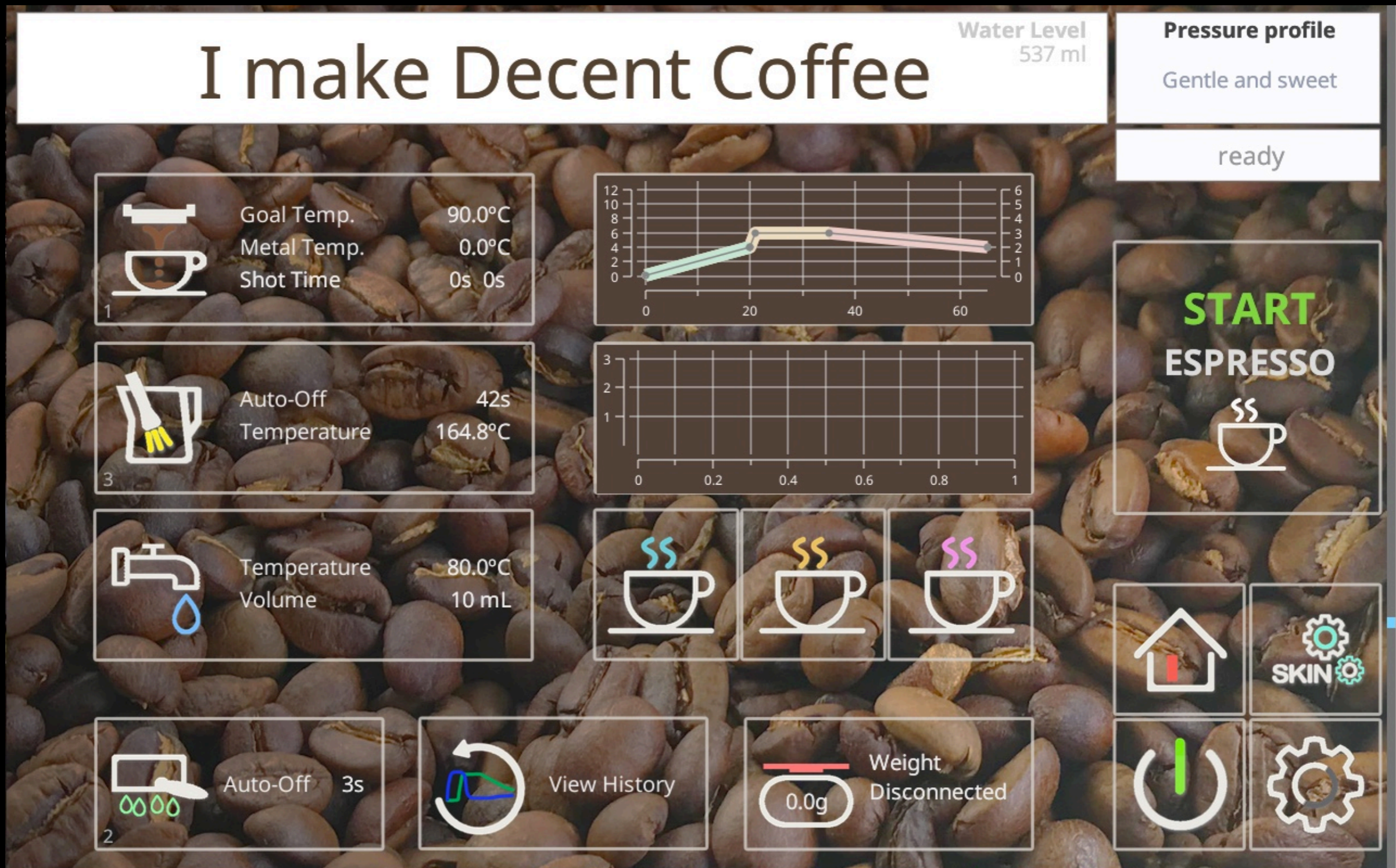
M4 BEANS TO COFFEE PAGE ON FACEBOOK

DOWNLOADS

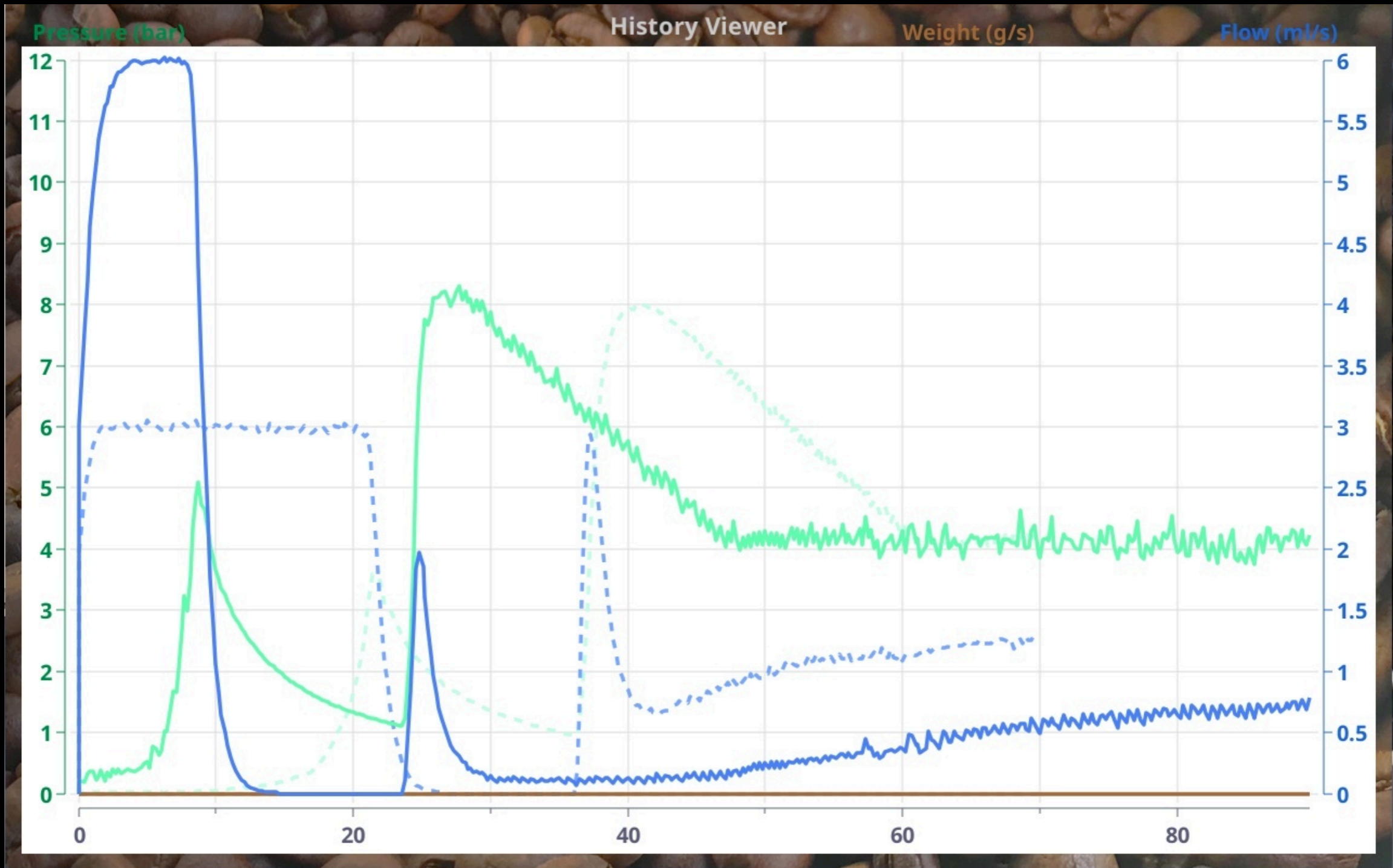
Downloads

- DSV2**
Version 4.20 added calibration to hot water page
Date added: June 11, 2019 3:18 pm File size: 5 MB Downloads: 82
- DSV2_4_12**
Version 4.12 adds limits to the font sizing and changed workings of extraction ratio function
Date added: June 7, 2019 9:46 pm File size: 5 MB Downloads: 84
- DSV2_4_10**
version 4.10 fixed stop at weight clicker fixed skin preview images change history combined graph icon
Date added: May 29, 2019 3:42 pm File size: 5 MB Downloads: 189
- DSV2_4_01**
version 4.01 preset font starting variable to

With different UI approaches (this one is single-screen)



Trying to get different insights

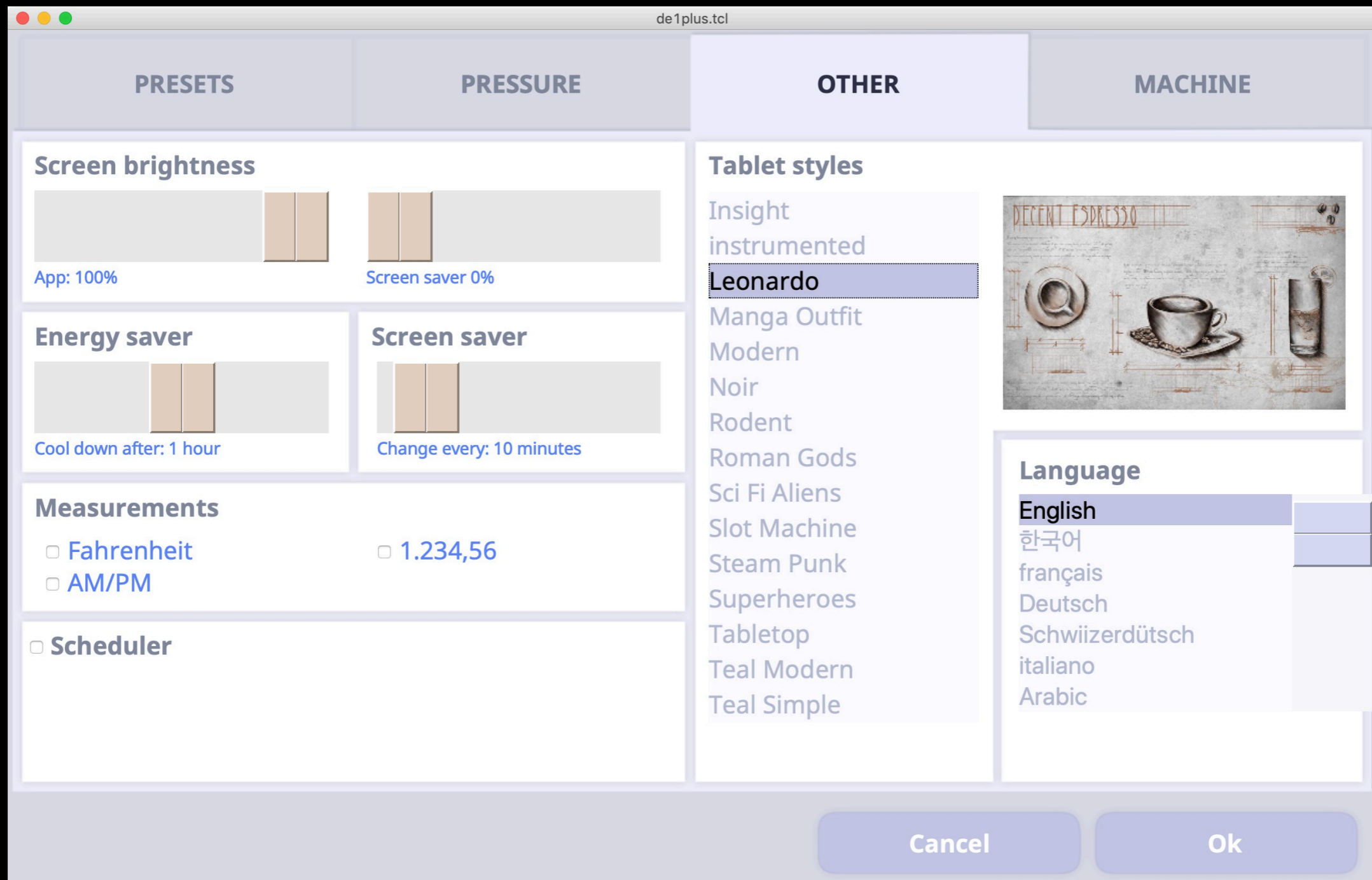


Solving different problems

(here: comparing historical espressos)



Leading to many UI choices





And many translations

de1plus.tcl

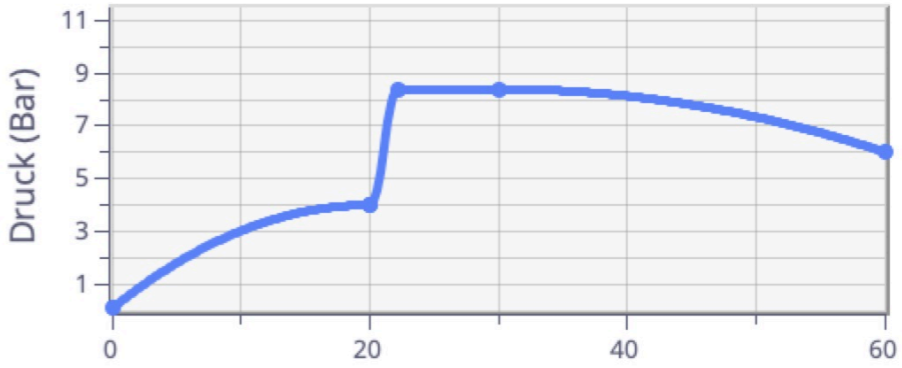
VORIISCHTELLIGÄ **DRUCK** **ANDERI** **MASCHINÄ**

Ä Vorischtellig ladä


- Ds beshti Druckprofil** 
- Blooming Espresso
- Klassischä italiänischä Espresso
- Standard
- Klassischä E61 bi 9 Bar
- Klassischä E61 mit süüferligem Durckaast
- E61 mit rasantem Hochschnällä vum Druc
- E61 mit schnäller Vorinfusion bis 9 Bar
- Dunkli Röschtig im Stil vu Espresso Forge
- Helli Röschtig im Stil vu Espresso Forge
- Durchflussprofil für Milchkaffigetränk
- Durchflussprofil für regulärä Espresso
- Mild und süässlich
- Liächtä Durchfluss bi 2,5 ml/Sek
- Durchflussprofil mit süüferliger Vorinfusio



Vorschau




Druck (Bar)

88°C 

Beschriibig

Mir empfähd das Druckprofil, wells unter verschiedenschtä Bedin
gigä am ehestä guätä Espresso macht. Ds Verringerä vum Druck hi
ft, der Sürighalt ds reduziärä.

Ä Namä gii und spiicherä 

Ds beshti Druckprofil

Abbrächä **Ok**

Using Google Sheets to coordinate translations

de1 gui translation

File Edit View Insert Format Data Tools Add-ons Help Last edit was made on May 27 by Decent Espresso Korea디센트 에스프레소 코리아

100% \$ % .0 .00 123 Arial 10 B I U A

en	ar	fr	de	de-ch	es	da	sv
(Cooling):	(تبريد)	(Refroidissement)	(Abkühlung)	(Abchüällig)	(Refrigeración)	(Afkøling)	(Kyler)
(heating)	(تدفئة)	(chauffe)	(Erhitzen)	(Erhitzä)	(calentamiento)	(opvarmer)	(uppvärmning)
1 hour	١ ساعة	1 heure	1 Stunde	1 Stund	1 hora	1 time	1 timme
1: preinfuse	١: قبل الصب	1: Préinfusion	1: Preinfusion	1: Vorinfusion	1: Preinfusión	1: Preinfuser	1: Preinfusera
1: Temperature	١: حرارة	1: Température	1: Temperatur	1: Temperatur	1: Temperatura	1: Temperatur	1: Temperatur
1.234,56	١.٢٣٤,٥٦	1.234,56	1.234,56	1'234,56	1.234,56	1.234,56	1.234,56
1) Choose auto-off time	(١) اختر الغلق التلقائي	1) Paramètres d'extinction a	1) Zeit bis zur Selbstabschaltung auswä	1) Ziit bis zur Sälbstabschaltig uswäh	1) Indicar tiempo para autoapagado	1) Vælg auto-off tid	1) Välj auto-off tid
1) How much water?	(١) ما هي كمية المياه؟	1) Quantité d'eau?	1) Wieviel Wasser?	1) Wevill Wasser?	1) ¿Cuánta agua?	1) Hvor meget vand?	1) Hur mycket vatten?
1) Settings	(١) إعدادات	1) Paramètres	1) Einstellungen	1) listelligä	1) Ajustes	1) Indstillinger	1) Inställningar
2: hold	٢: أمسك	2: maintenir	2: Beibehalten	2: Biibhältä	2: mantener	2: oprethold	2: upprätthåll
2: Pump	٢: ضغ	2: Pompe	2: Pumpe	2: Pumpi	2: Bomba	2: Pump	2: Pump
2: rise and hold	٢: ارفع وأمسك	2: Augmenter et maintenir	2: Anheben und beibehalten	2: Stiegerä und biibhältä	2: Aumentar y mantener	2: Stig og hold	3: Stig och håll
2) Hot water is pouring	(٢) ماء ساخن يتدفق	2) Distribution d'eau chaude	2) Brühvorgang läuft	2) Heisswasser flüsst usä	2) Vertiendo agua caliente	2) Varmt vand løber	2) Varmvatten rinner
2) Hot water is pouring out	(٢) ماء ساخن يتدفق خارجا	2) Distribution d'eau chaude	2) Brühvorgang läuft	2) Heisswasser wird usgiih	2) Vertiendo agua caliente	2) Varmt vand løber ud	2) Varmvatten rinner
2) Hot water will pour	(٢) سيتدفق ماء ساخن	2) Distribution d'eau chaude	2) Brühvorgang wird vorbereitet	2) Heisswasserusgab wird vorbereitet	2) Se verterá agua caliente	2) Varmt vand vil løbe	2) Varmvatten kommer
2) Hot water will pour out	(٢) سيتدفق ماء ساخن خارجا	2) Distribution d'eau chaude	2) Brühvorgang wird vorbereitet	2) Heisswasser wird usgiih	2) Se verterá agua caliente	2) Varmt vand vil løbe ud	2) Varmvatten kommer
2) Steam your milk	(٢) بخر الحليب	2) Monter votre lait	2) Milch aufschäumen	2) Milch ufschümä	2) Vaporice la leche	2) Skum din mælk	2) Skumma mjölk
2) Steaming your milk	(٢) تبخير الحليب	2) Montage du lait	2) Aufschäumen der Milch	2) Ufschümig vu dr Milch	2) Vaporizando la leche	2) Skummer din mælk	2) Skummar mjölk
2) The group head will pour	(٢) رأس الآلة سيسكب الماء الساخن خارجا	2) Nettoyage du groupe sou	2) Reinigung im Gange	2) Reinigung im Gang	2) El grupo verterá agua caliente	2) Gruppehovedet vil give van	2) Varmt vatten ur grup
3: decline	٣: إرفض	3: Déclin	3: Reduktion	3: Reduktion	3: Descenso	3: Reducer	3: Reducera
3: Duration	٣: مدة	3: Durée	3: Dauer	3: Dur	3: Duración	3: Varighed	3: Varaktighet
3) Done	(٣) تم	3) Terminé	3) Fertig	3) Fertig	3) Terminado	3) Færdig	3) Färdig
3) Make amazing latte art	(٣) اصنع قهوة لائيه مذهلة	3) Faites de sublimes latte a	3) Tolle Latte Art machen	3) Kuuli Latte Art machä	3) Haga un latte art increíble	3) Lav fantastisk latte art	3) Skapar fantastisk lat
3) Your cup is now warm	(٣) كوبك الآن دافئ	3) Votre tasse est chaude	3) Ihre Tasse ist jetzt warm	3) Ihr Tassä isch jetzt warm	3) Su taza ya está caliente	3) Din kop er varm nu	3) Din kopp är varm nu
3) Your group head is now c	(٣) إن رأس الآلة نظيف الان	3) Nettoyage du groupe terr	3) Ihre Brühgruppe ist jetzt sauber	3) Ihrä Brühhchopf isch jetzt suuber	3) El grupo está limpio	3) Gruppehovedet er nu rense	3) Grupphuvudet är rer
4: Move on if...	٤: تحرك إذا	4: Continuer si...	4: Weiter springen, wenn...	4: Wiiter springe, wänn...	4: Continuar si...	4: Fortsæt hvis...	4: Fortsätt om...
4: stop at weight:	٤: توقف عند الوزن:	4: Arrêter au poids suivant	4: Zielgewicht	4: Zielgwicht	4: Parar en el peso	4: Stop ved vægt	4: avsluta vid vikt
Stop at weight	توقف عند الوزن	Poids souhaité	Zielgewicht	Zielgwicht	Parar en el peso	Stop ved vægt	avsluta vid vikt
Acacia	أكاسيا	Acacia	Akazie	Akaziä	Acacia	Akacie	Akacia
Acai berry	توت الاساي	Açaï (Pinot)	Acai-Beere	Akai-Beer	Baya de acai	Acaibær	Acaibär
Acerola	كرز هندي	Acérola	Acerola	Acerola	Acerola	Acerola	Acerola
Advanced	متقدم	Avancé	Erweitert	Erwiiteret	Avanzado	Avanceret	Avancerat
ADVANCED	متقدم	AVANCÉ	ERWEITERT	ERWIITERET	AVANZADO	AVANCERET	AVANCERAT
Advanced profile	مظهر متقدم	Profil avancé	Erweitertes Profil	Erwiiterets Profil	Perfil avanzado	Avanceret profil	Avancerad profil
Almond	لوز	Amande	Mandel	Mandlä	Almendra	Mandel	Mandel
Aloe	الصبار	Aloes	Aloe	Aloe	Aloe	Aloevera	Aloevera

Ready-to-run cross-platform thanks to “undroidwish”

Espresso Making Software

You can try out our espresso making software on your computer.

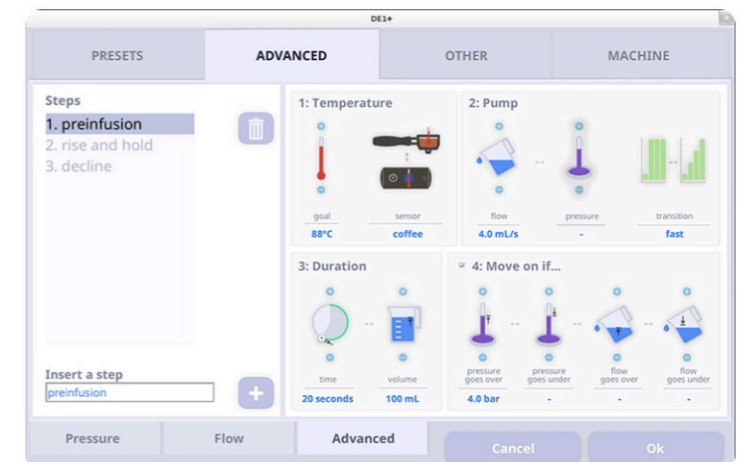
This will help you experience what it would be like to own our espresso machine. These programs also make it easier for people to develop their own extensions, skins and translations.



For Windows



For MacOS



For Linux




For Android

Binary and source downloads

<https://decentespesso.com/downloads>


Downloads



For Windows

Instructions:

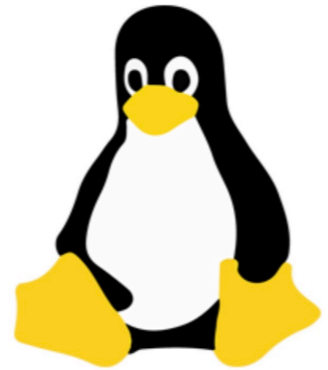
1. Unzip to its own directory
2. Double-click on DE1PLUS.bat



For MacOS

Instructions:


1. Move the DE1+ icon to your Desktop
2. Double-click on the DE1+ icon



For Linux

Instructions:


1. Unzip to its own directory
2. Run the de1plus.sh script for your Linux version
3. For Linux/32bit, Linux/64bit, and Linux/64bit/Wayland



For Android

Instructions:

1. [Download the DE1+ software](#) to your computer
2. Unzip to its own directory
3. Use [Android File Transfer](#) to copy the



Open Source

Instructions:

1. Run ./de1plus.tcl
2. You will need a working copy of Tcl/Tk, Androwish, Undroidwish, or ActiveTcl.

but ...

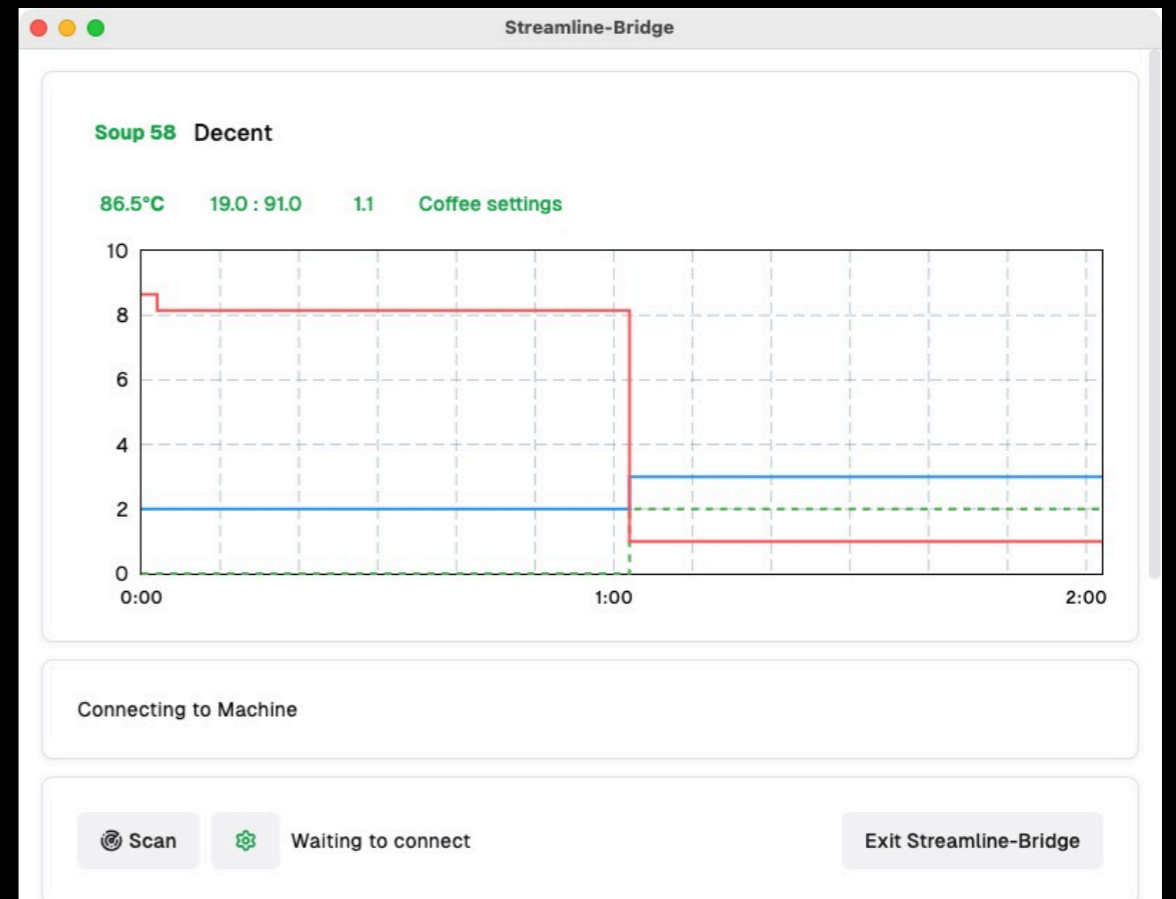
Security and sandboxing is causing real problems on all platforms (except Linux).

and Bluetooth support is Android only, for now

New: bridge app

***A Websockets
API (in Flutter)
enabling:***

- * Multi-OS
- * Javascript coding
- * Cloud-based App server
- * Vibe Coding



Big next steps

Cloud based espresso data storage

Data mining

100% javascript new app

Vibe coding, containerized

Extension mechanism

“Extension store” with ranking

All sitting on Github

Big next steps

App store

- * All apps free or not
- * Easy sharing of espresso profiles
- * Distributed responsibility for skins
- * Possibility of bad actors

Big next steps

SNMP support

- * So cafes can manage espresso machines as if they were servers
- * Monitoring tools can notice decrease in QoS
- * AI can notice likely failures before they happen

Big next steps

iOS support

- * To avoid the religion wars about platforms
- * While still being OSS and hackable

New: Javascript app

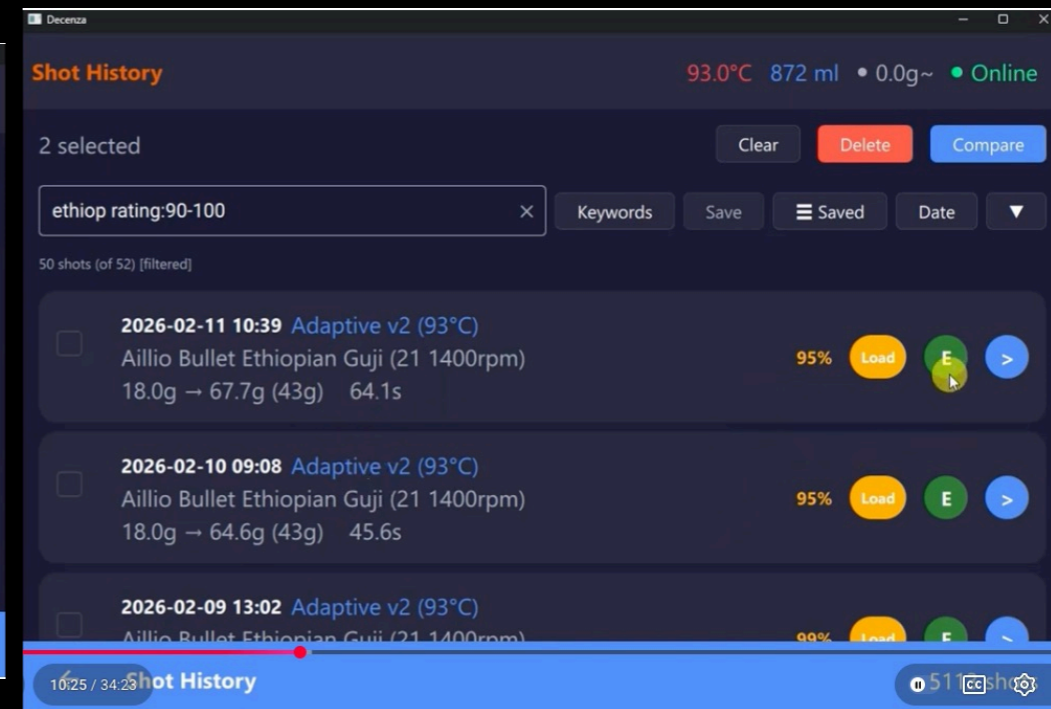
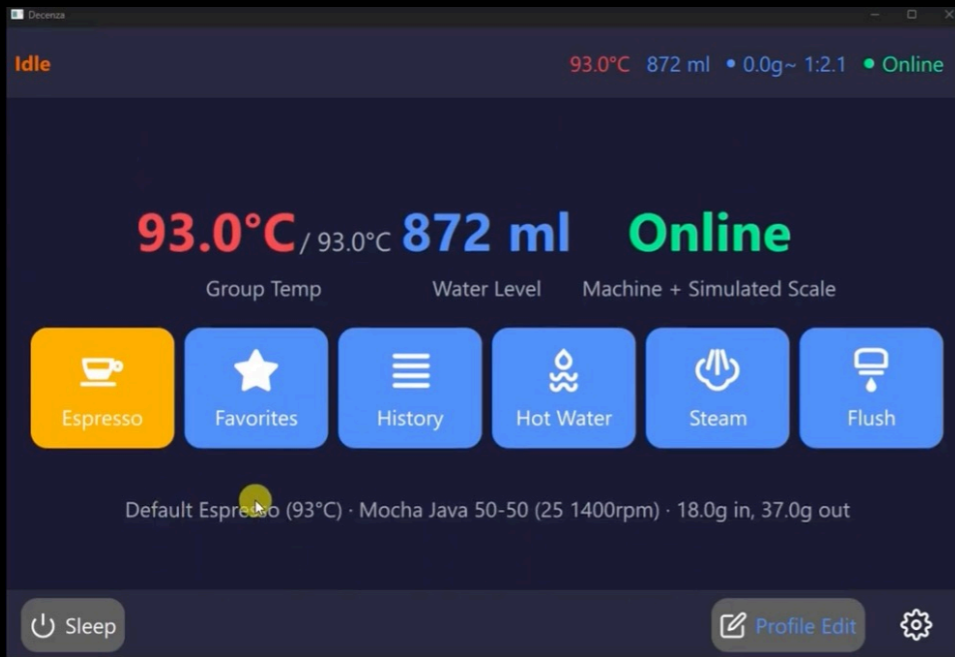


USB

**Reliability,
and
better
multi-OS
than BLE**

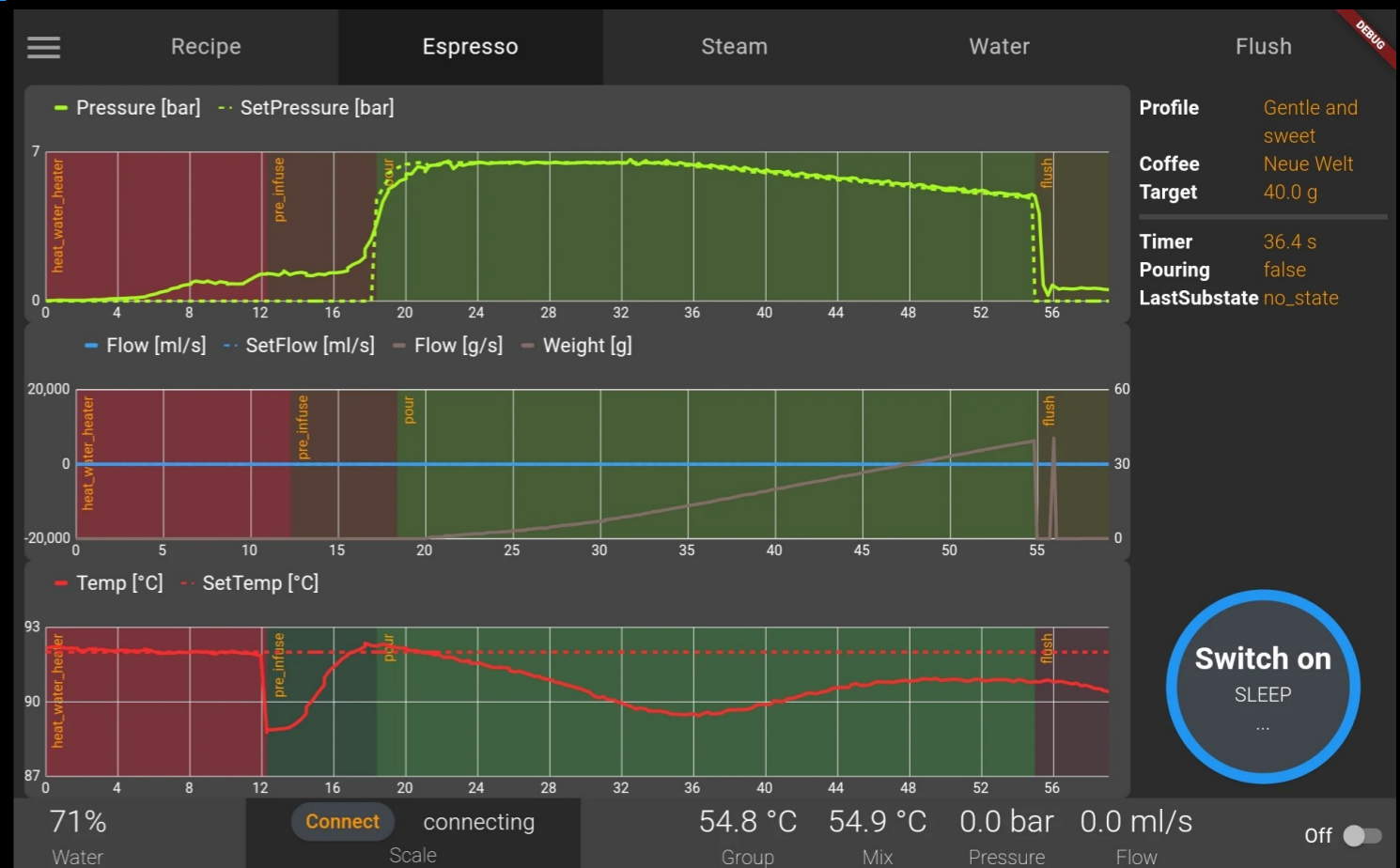


Vibe Coding : App Proliferation



“Decenza”

Hand Coding : App Proliferation

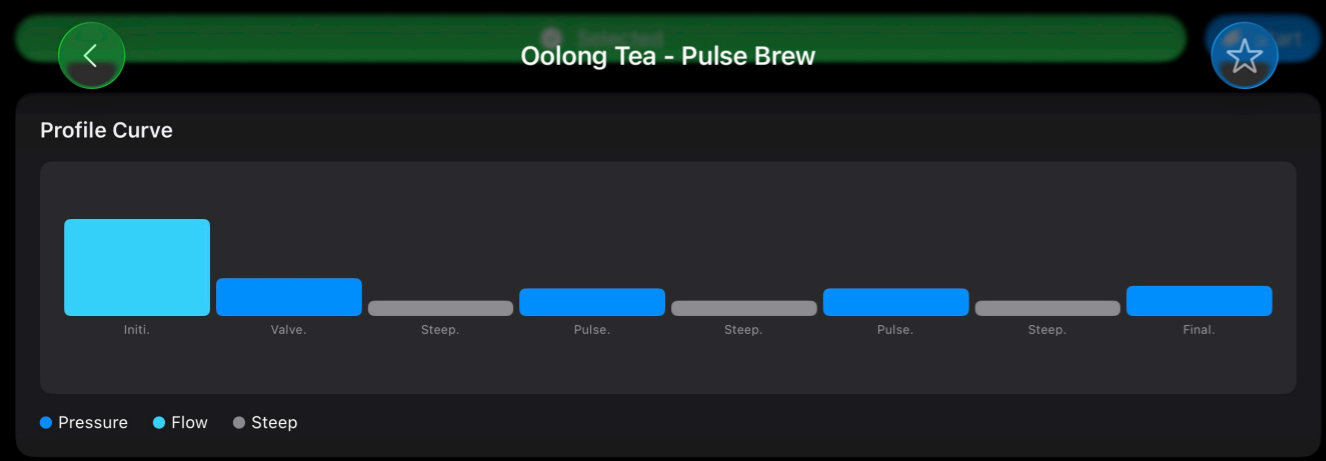


“Despresso”

Vibe Coding : App Proliferation



- Home
- Profiles
- Control
- History
- Settings



- Home
- Profiles
- Control
- History
- Settings

Control

Machine Controls

- Sleep
- Wake
- Clean
- Descalc
- Skip Step
- Refill

Temperatures

- Head: 93°
- Mix: 93°
- Steam: 159°

Settings

Target Temperature: 93°C

Steam Temperature: 140°C

Water Level: OK

Machine: nRF5x

- Home
- Profiles
- Control
- History
- Settings

Profiles

Search profiles

- All
- Espresso
- Tea
- Favorites

- E61 Classic (2 steps - 36g target)
- E61 High Temperature (2 steps - 40g target)
- Lever Machine - Blooming (3 steps - 36g target)
- Turbo Shot (2 steps - 40g target)
- Advanced Pressure Profile (4 steps - 38g target)
- Ristretto (2 steps - 28g target)

- Home
- Profiles
- Control
- History
- Settings

“Good Espresso”

The far future?

DE2?

- * open source firmware
- * UI on device, via built in http server
- * Totally hackable via GitHub hosted mod-list
- * group head runs its own round-display ESP32
- * each internal part being self-managing and “smart”

Binary and source downloads

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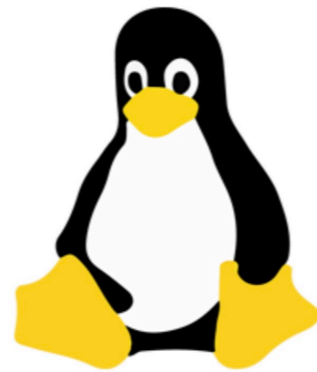
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2. You will need a working copy of Tcl/Tk, Androwish, Undroidwish, or ActiveTcl.

Thank you!

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