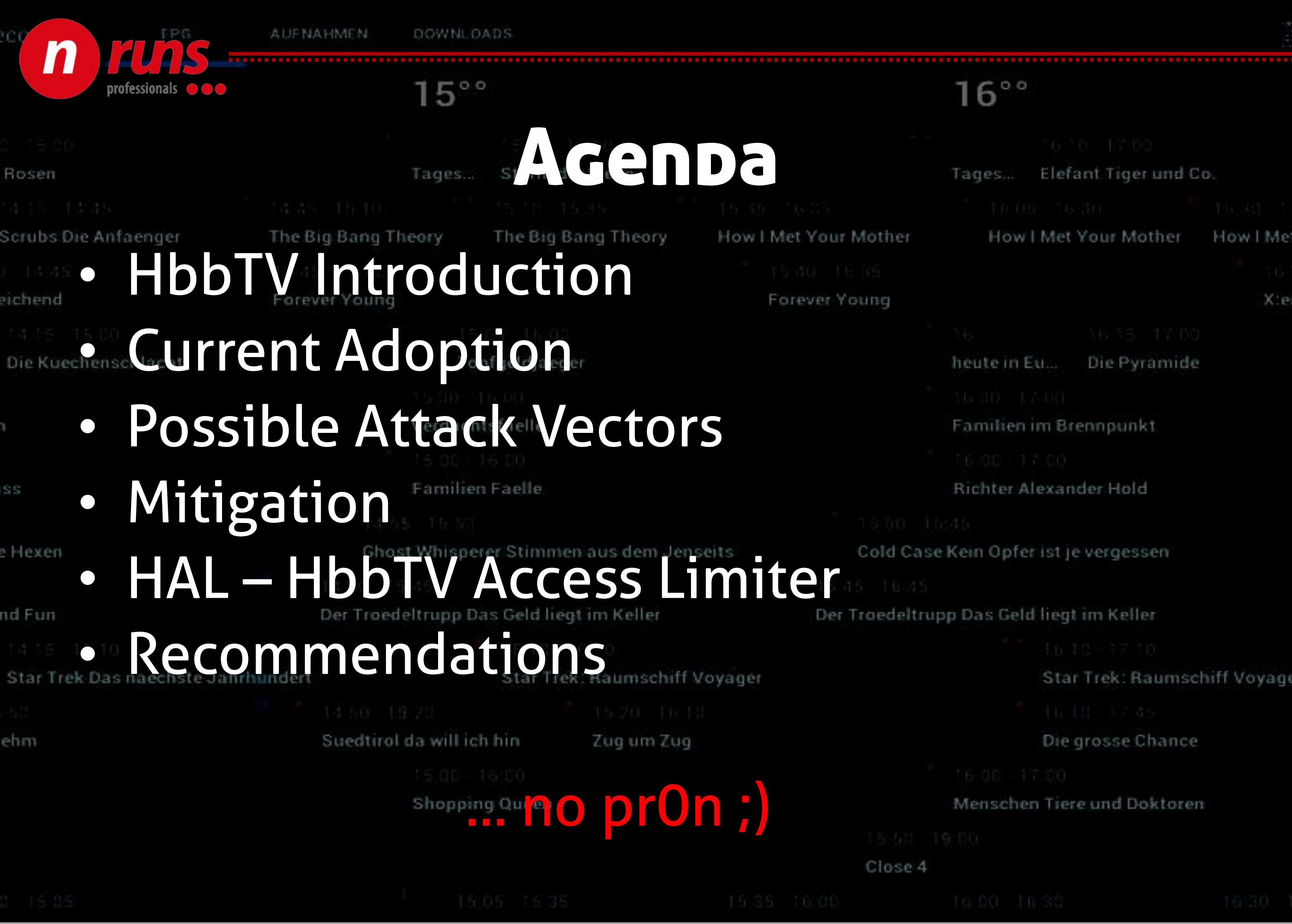
Security Issues with Hybrid Broadcast Broadband TV (HbbTV)

Watching TV suddenly is fun again!



Agenda

- HbbTV Introduction
- Current Adoption
- Possible Attack Vectors
- Mitigation
- HAL – HbbTV Access Limiter
- Recommendations

… no pr0n ;)

Who am I

- Martin Herfurt
- Security Consultant working with n.runs
- Co-founder of trifinite.org
- Bluetooth security expert
- Based in Salzburg/Austria
- @mherfurt +MartinHerfurt

SmartTV Security Overview

- December 2012: ReVuln - USB/Local attacks on SAMSUNG Smart TV
- March 2013: CanSecWest – Smart TV Security (great talk, but excluding HbbTV stuff) (SeungJin Lee, Seungjoo Kim)
- May 2013: (TU Darmstadt) HbbTV Privacy issues (Marco Ghiglieri, Florian Oswald, Erik Tews)
- June 2013: Security Issues with HbbTV
- August 2013: Attacking Smart TVs via apps (Aaron Grattafiori, Josh Yavor)
- November 2013: LG TVs transmit personal info

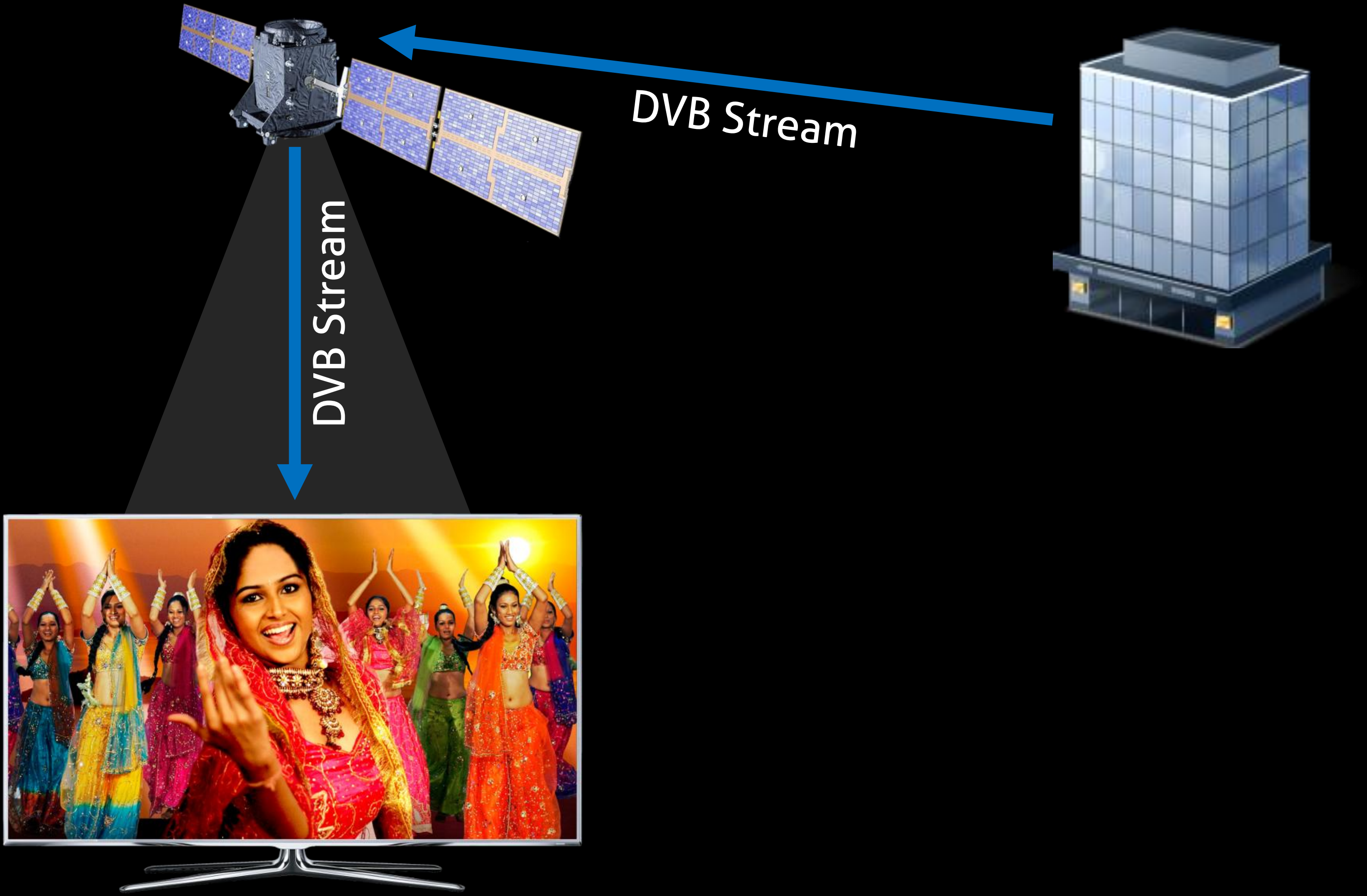
HbbTV Background

- Pan-European effort
- HbbTV = H4TV(fr) + HTML Profil(de)
- ETSI TS 102796 (published in June 2010)
- Adopts existing specifications
  - HTML-CE (Web for Consumer Electronics)
  - OIPF (Open IPTV Forum)
- Goal is to combine broadcast content with online content

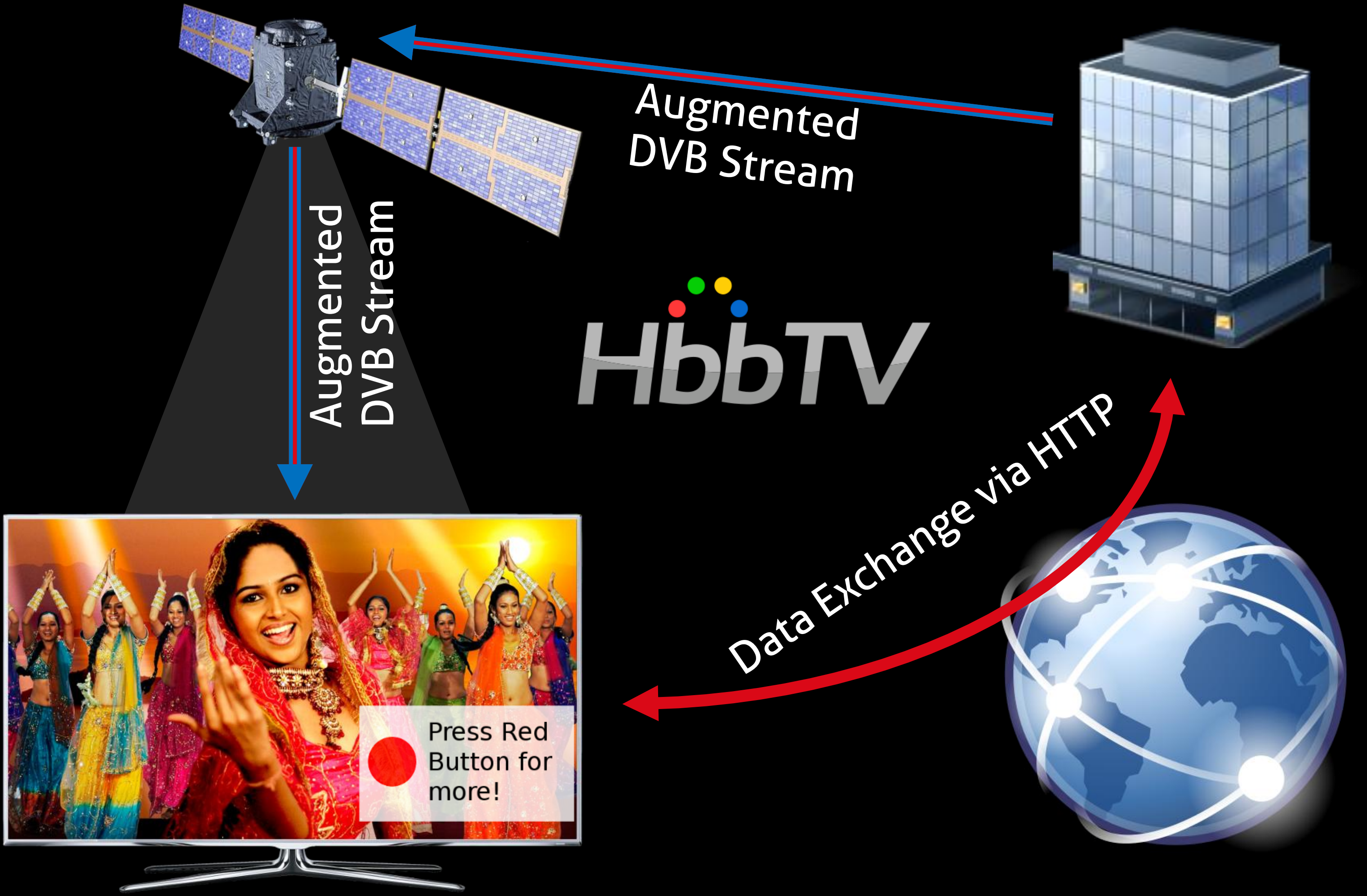
HbbTV – Intended Use-Cases

- enhanced teletext
- catch-up services
- video-on-demand
- interactive advertising
- Personalization
- Voting
- Games
- social networking

Plain Old DVB

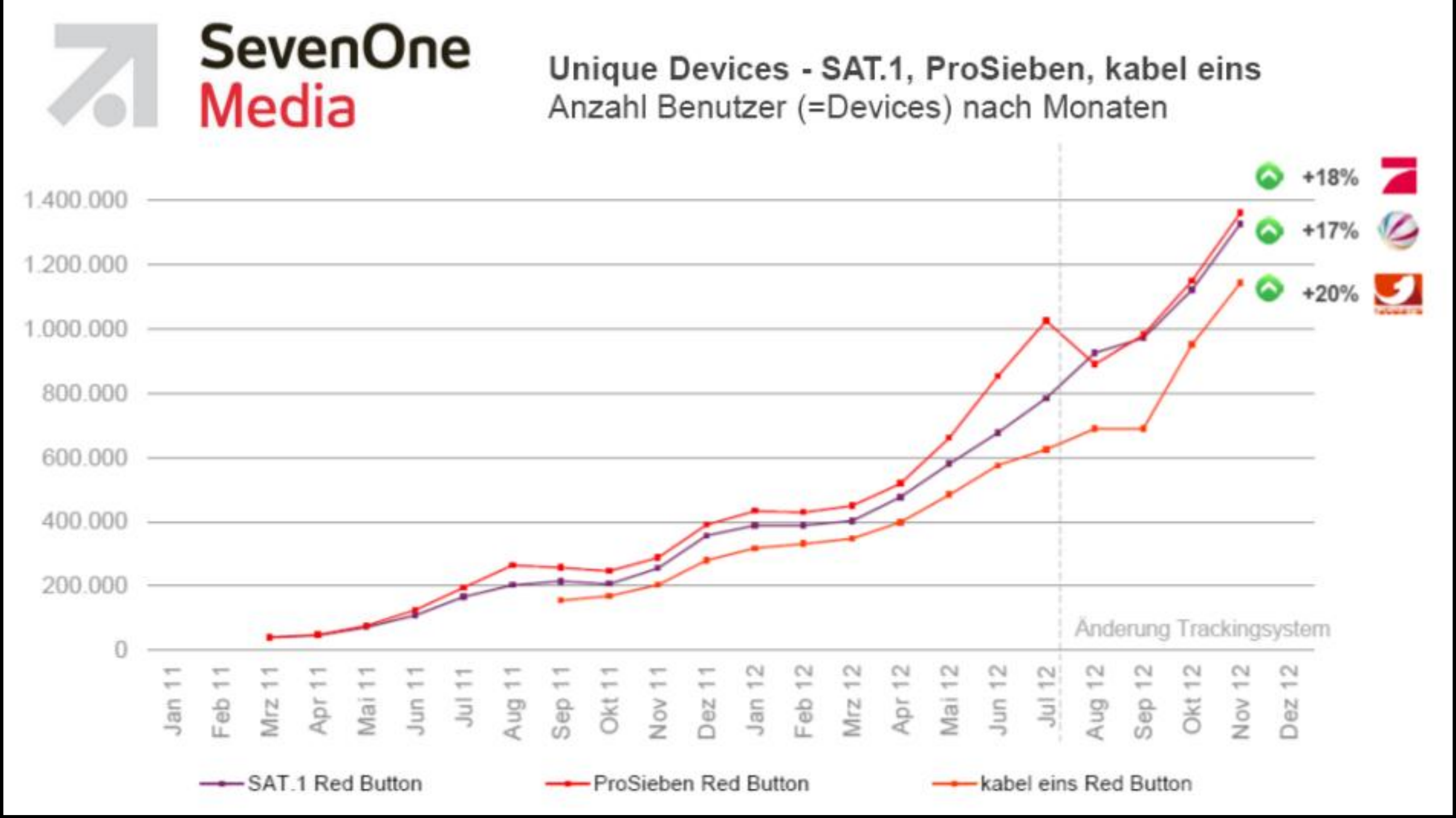


Hybrid Broadcast Broadband TV



The Red Button

SevenOne Media



SevenOne Media

Unique Devices - SAT.1, ProSieben, kabel eins

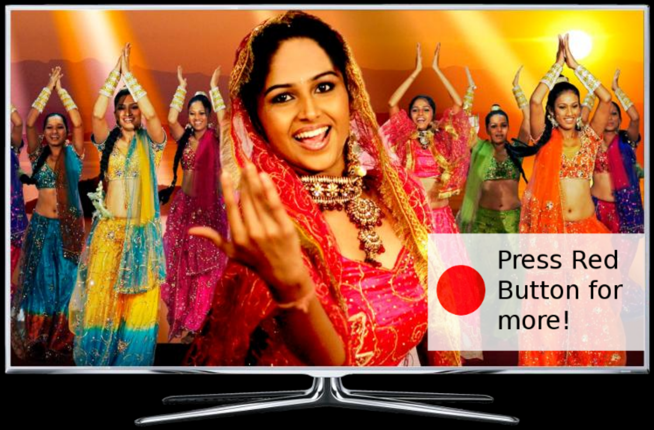
Anzahl Benutzer (=Devices) nach Monaten

What you think you see

What you are really seeing

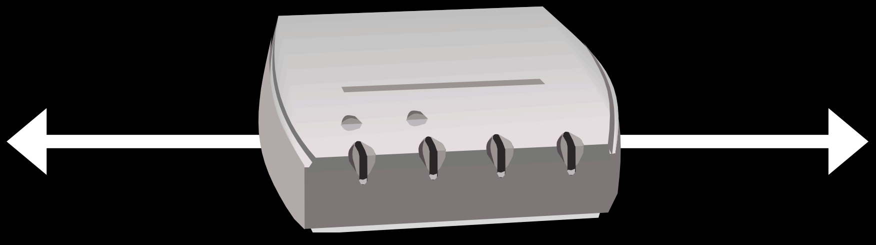
How is the Red Button displayed?

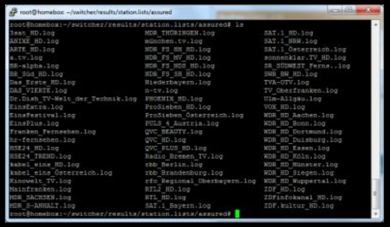
- TV has a DAE (Browser)
- Content from URL within DVB-Stream
- Overlay on actual TV image
- Mostly transparent web page



Data Collection

- Extraction of channel list
- Transparent proxy setup
- Script for switching channels via IP
- Script for saving proxy-log per station



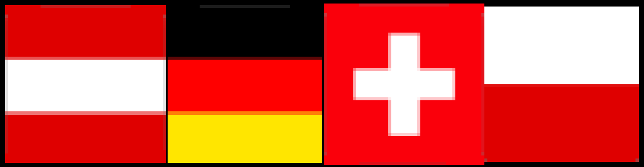


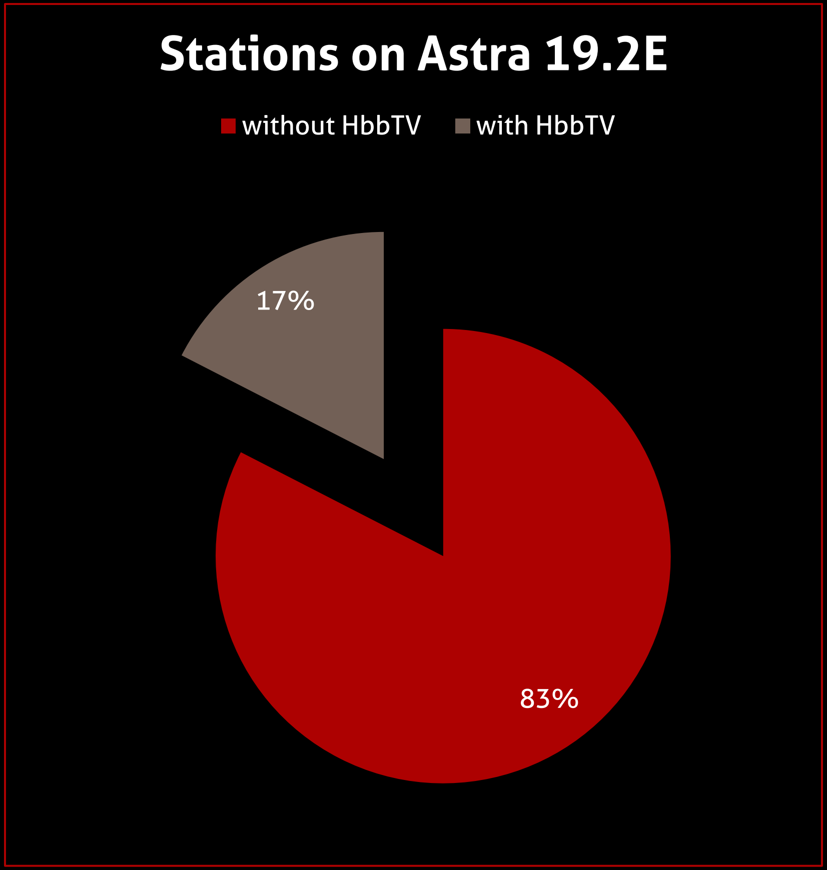
root@homebox ~/switcher/results/station.lists/assured

```
root@homebox:~/switcher/results/station.lists/assured# ls
3sat_HD.log                          MDR_THÜRINGEN.log                SAT.1_HD.log
ANIXE_HD.log                         münchen.tv.log                   SAT.1_NRW.log
ARTE_HD.log                          NDR_FS_HH_HD.log                 SAT.1_Österreich.log
a.tv.log                             NDR_FS_MV_HD.log                 sonnenklar.TV_HD.log
BR-alpha.log                         NDR_FS_NDS_HD.log                SR_SÜDWEST_Ferns..log
BR_Süd_HD.log                        NDR_FS_SH_HD.log                 SWR_BW_HD.log
Das_Erste_HD.log                     Niederbayern.log                 TVA-OTV.log
DAS_VIERTE.log                       n-tv.log                         TV_Oberfranken.log
Dr.Dish_TV-Welt_der_Technik.log      PHOENIX_HD.log                   Ulm-Allgäu.log
EinsExtra.log                        ProSieben_HD.log                 VOX_HD.log
EinsFestival.log                     ProSieben_Österreich.log         WDR_HD_Aachen.log
EinsPlus.log                         PULS_4_Austria.log               WDR_HD_Bonn.log
Franken_Fernsehen.log                QVC_BEAUTY.log                   WDR_HD_Dortmund.log
hr-fernsehen.log                     QVC_HD.log                       WDR_HD_Duisburg.log
HSE24_HD.log                         QVC_PLUS_HD.log                  WDR_HD_Essen.log
HSE24_TREND.log                      Radio_Bremen_TV.log              WDR_HD_Köln.log
kabel_eins_HD.log                    rbb_Berlin.log                   WDR_HD_Münster.log
kabel_eins_Österreich.log            rbb_Brandenburg.log              WDR_HD_Siegen.log
Kinowelt_TV.log                      rfo_Regional_Oberbayern.log      WDR_HD_Wuppertal.log
Mainfranken.log                      RTL2_HD.log                      ZDF_HD.log
MDR_SACHSEN.log                      RTL_HD.log                       ZDFinfokanal_HD.log
MDR_S-ANHALT.log                     SAT.1_Bayern.log                 ZDF.kultur_HD.log
root@homebox:~/switcher/results/station.lists/assured#
```

Astra 19.2E Statistics

- 680 TV/HD channels
- 119 with HbbTV
- Only 40 hosts
- No SSL in use
- Maybe 15 entertainment providers





Data acquired on 23.12.2013 (no CI+ modules except HD+)

Use of Ad-Servers

- OpenX – now called Revive (2 stations)
  - Anixe
    - Used as frame for current program
    - Geo-IP to locate the viewers
    - First banners date back to October 2011 (directory listings enabled ;))
  - RTL2
    - Used for ads within HbbTV portal page

Use of 3rd Party Tracking

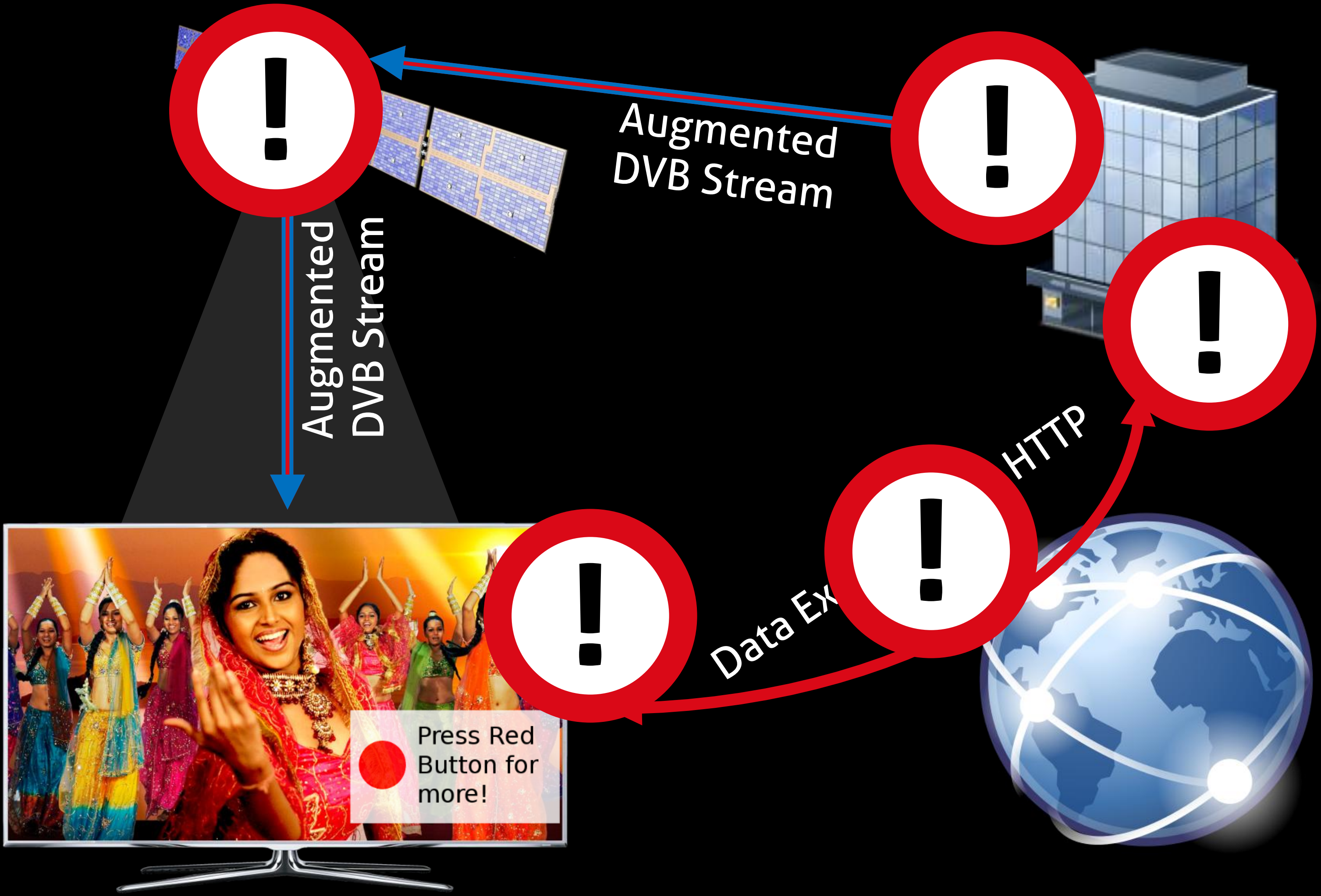
- Google Analytics (22 channels)
  - ARTE, DAS VIERTE , Kabel1, Pro7, Sat.1, SIXX, sonnenklar.TV, n-tv, VOX, RTL
- Other tracking services (4 channels)
  - RTL2 (etracker.com)
  - TVP Polonia (gemius.pl)
- Cookie with unique IDs (7 channels)
  - TecTime TV, Kinowelt TV, ORF1, ORF2, RTL2

Legal Aspects

- Telemediengesetz (TMG)
  - §15 collection of usage data – current use of tracking could be considered illegal
  - Missing opt-out
  - http://www.gesetze-im-internet.de/tmg/

Not Only Big Brother is watching

Possible Attack Vectors

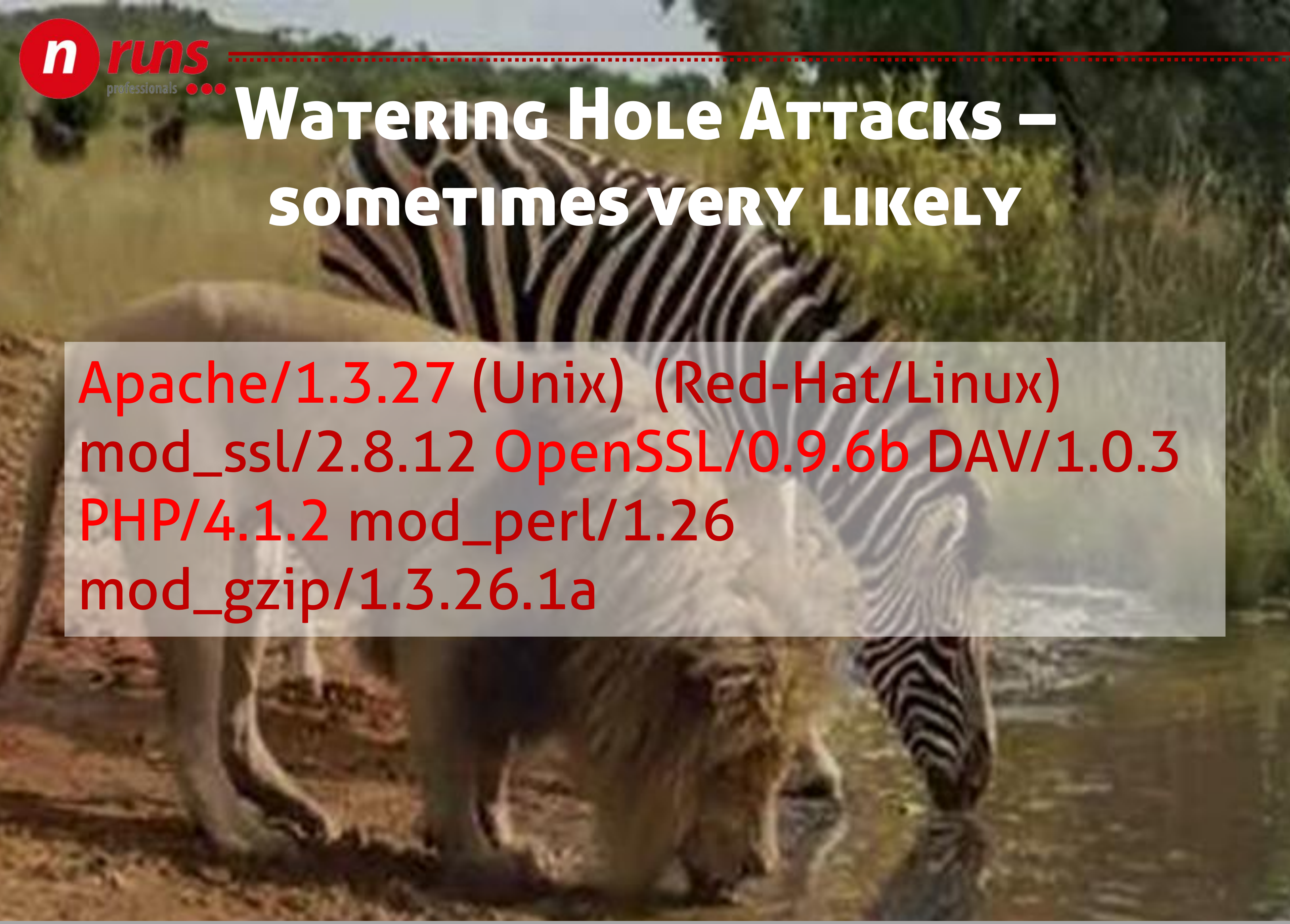


Attacking Playout System

Attacking Satellites

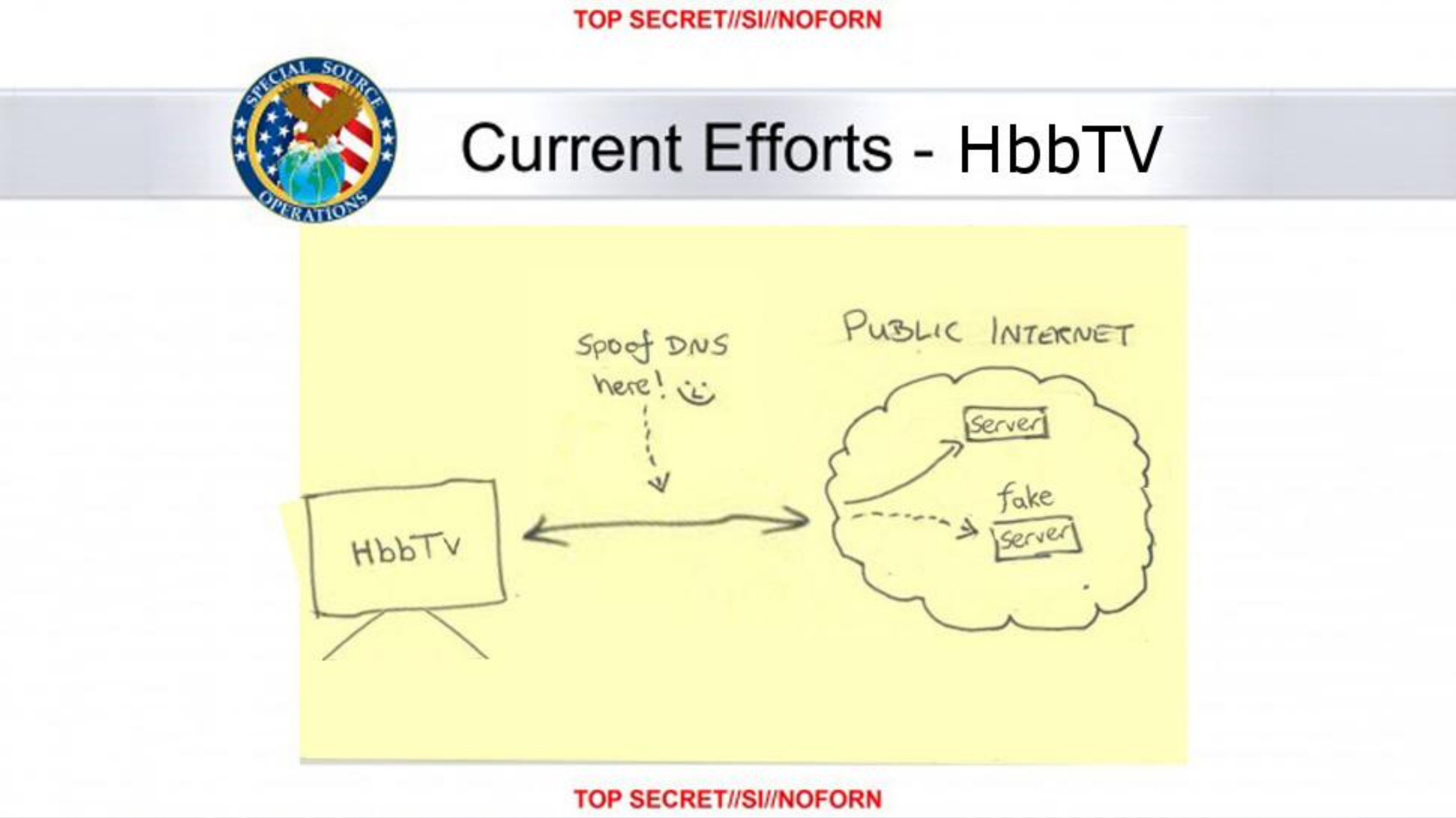
...ask Travis Goodspeed about this.

Watering Hole Attacks – sometimes very likely



Apache/1.3.27 (Unix) (Red-Hat/Linux)
mod_ssl/2.8.12 OpenSSL/0.9.6b DAV/1.0.3
PHP/4.1.2 mod_perl/1.26
mod_gzip/1.3.26.1a

Attacks on DNS



TOP SECRET//SI//NOFORN

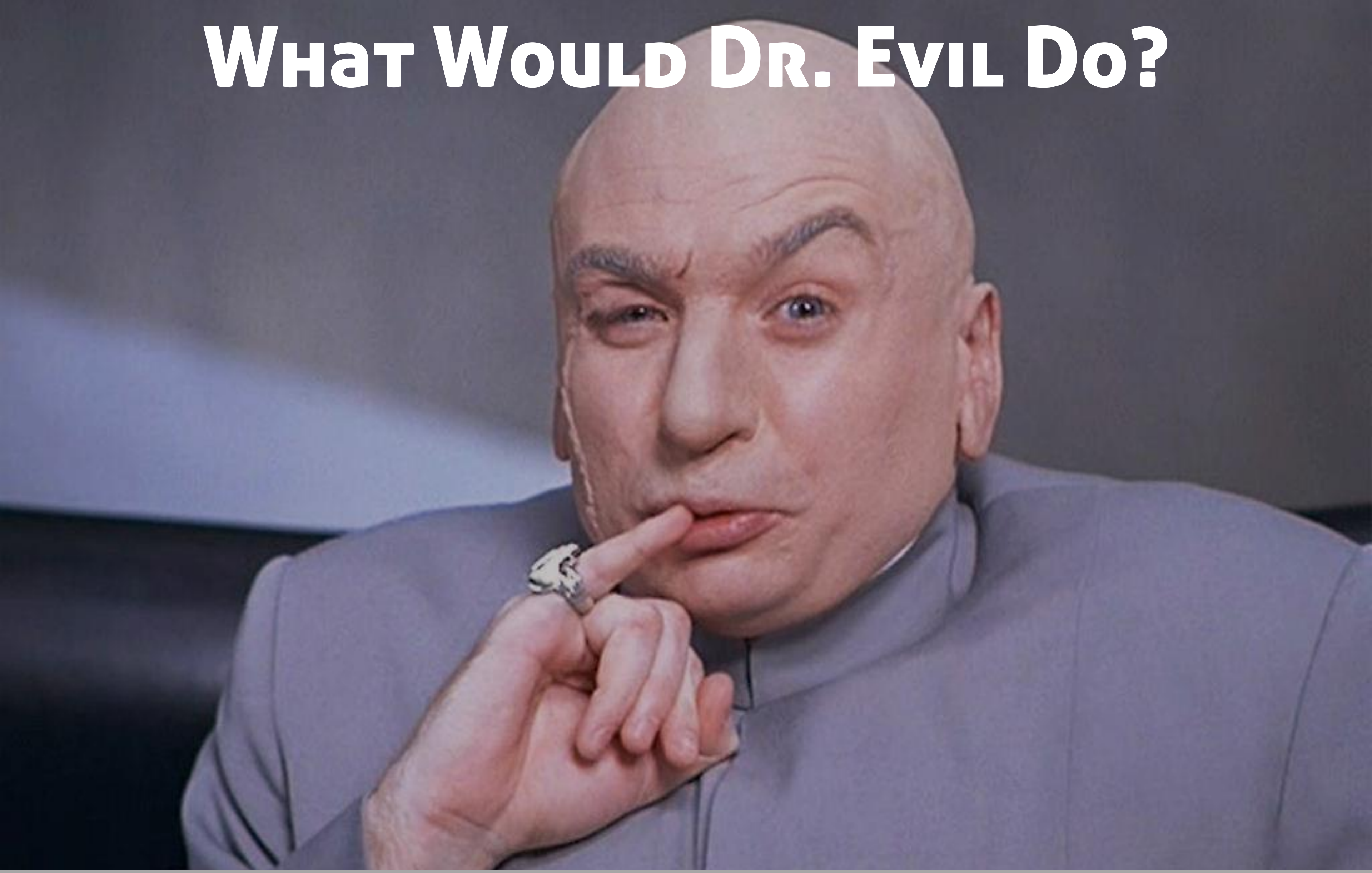
Current Efforts - HbbTV

SPECIAL SOURCE OPERATIONS
Spoof DNS here! :)
PUBLIC INTERNET
HbbTv
Server
fake
Server

TOP SECRET//SI//NOFORN

Content Injection

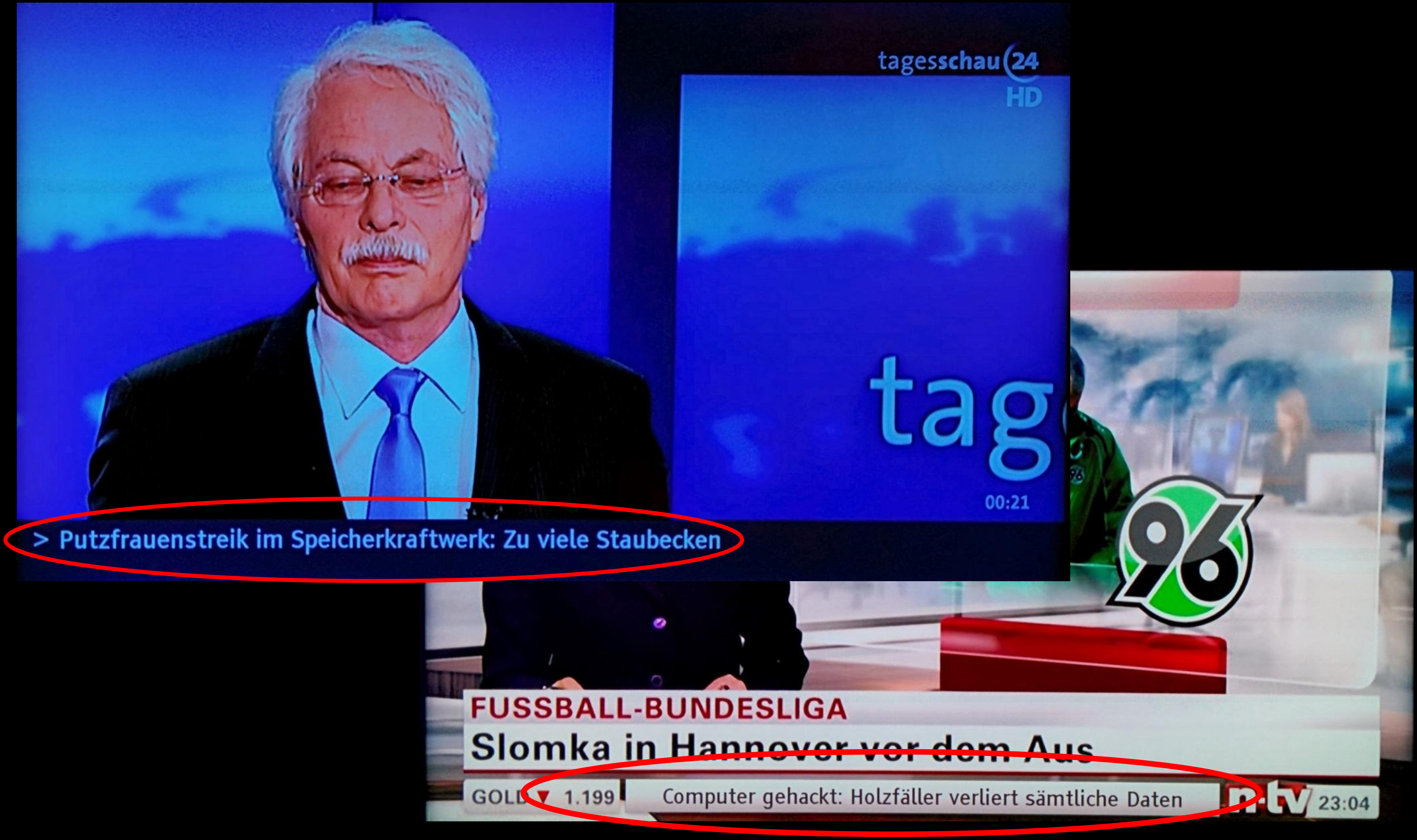
What Would Dr. Evil Do?



Rogue Video Display

SpooofTicker®

- Brand-new trifinite.project
- Overlays news tickers from
  - Tagesschau24
  - n-tv
- Thanks for the permission/support to
  - www.der-postillon.com
  - Stefan Sichermann

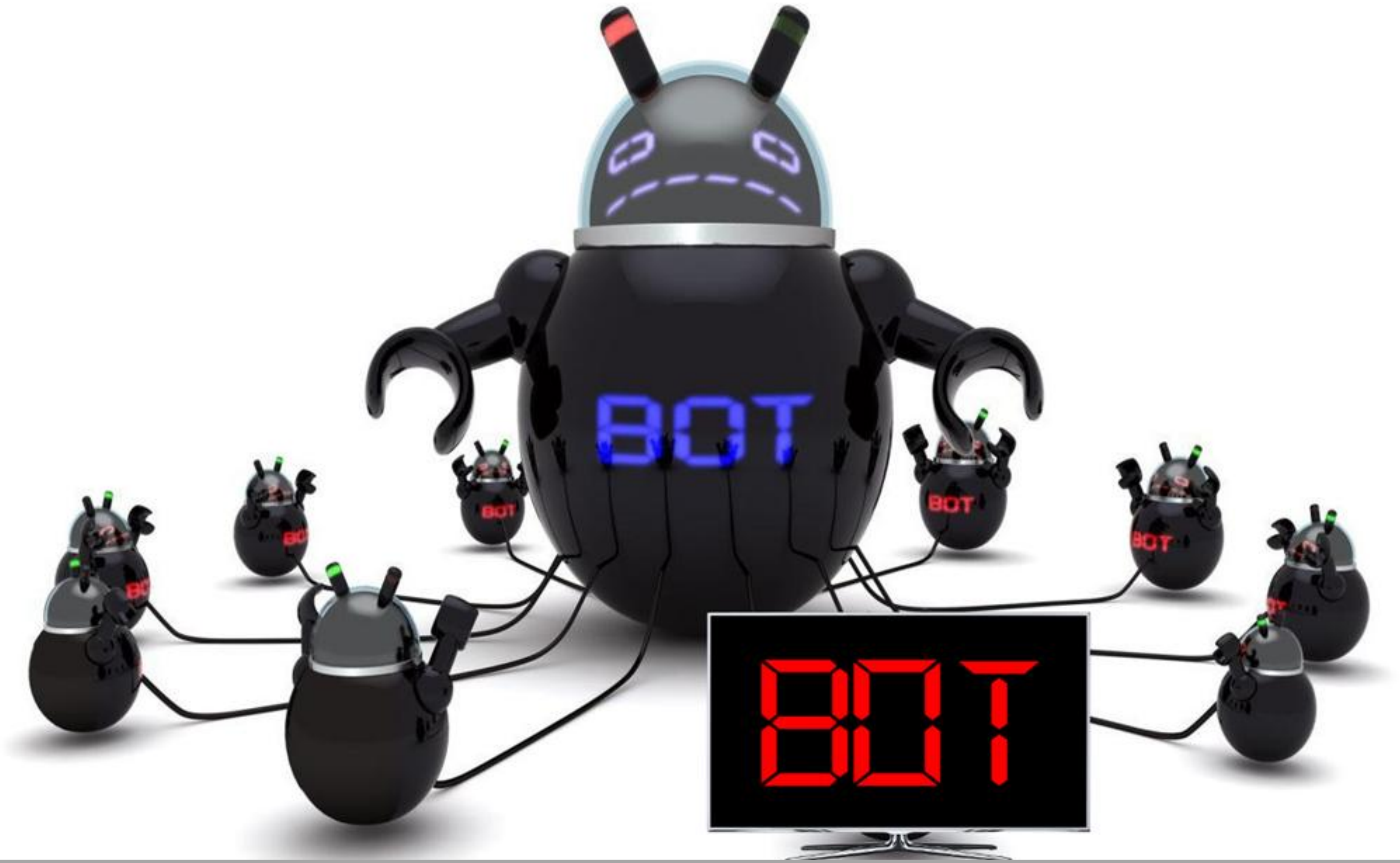


> Putzfrauenstreik im Speicherkraftwerk: Zu viele Staubecken

FUSSBALL-BUNDESLIGA

Slomka in Hannover vor dem Aus

Computer gehackt: Holzfäller verliert sämtliche Daten


BOT
BOT
BOT
BOT
BOT

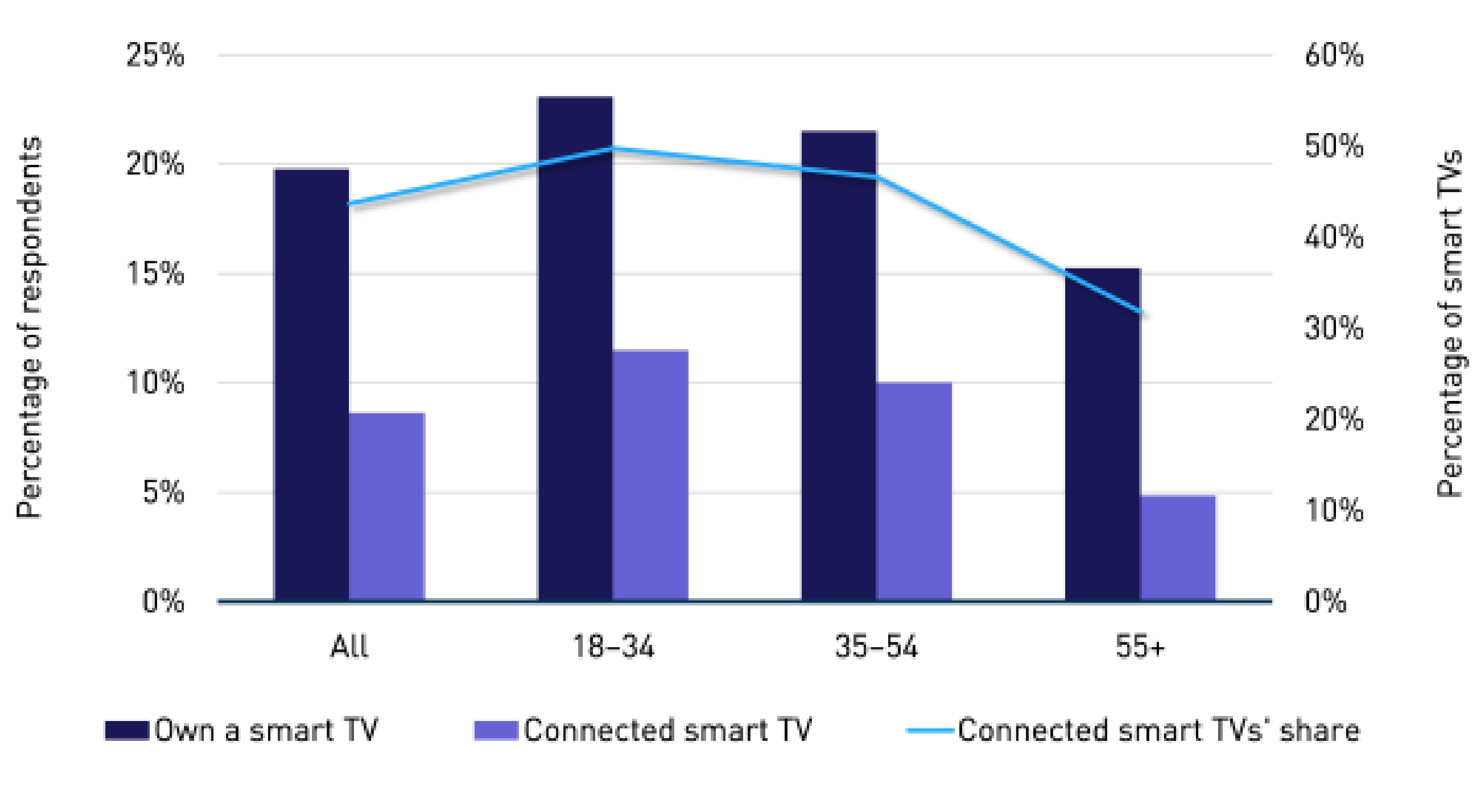
Botnet Activities

- JavaScript
  - Network scans … maybe router-XSRF
  - BitCoin mining
  - Hash cracking
  - DDos attacks
  - You name it!
- Generation of new TV formats ;)

Resistance is Futile

Countermeasures

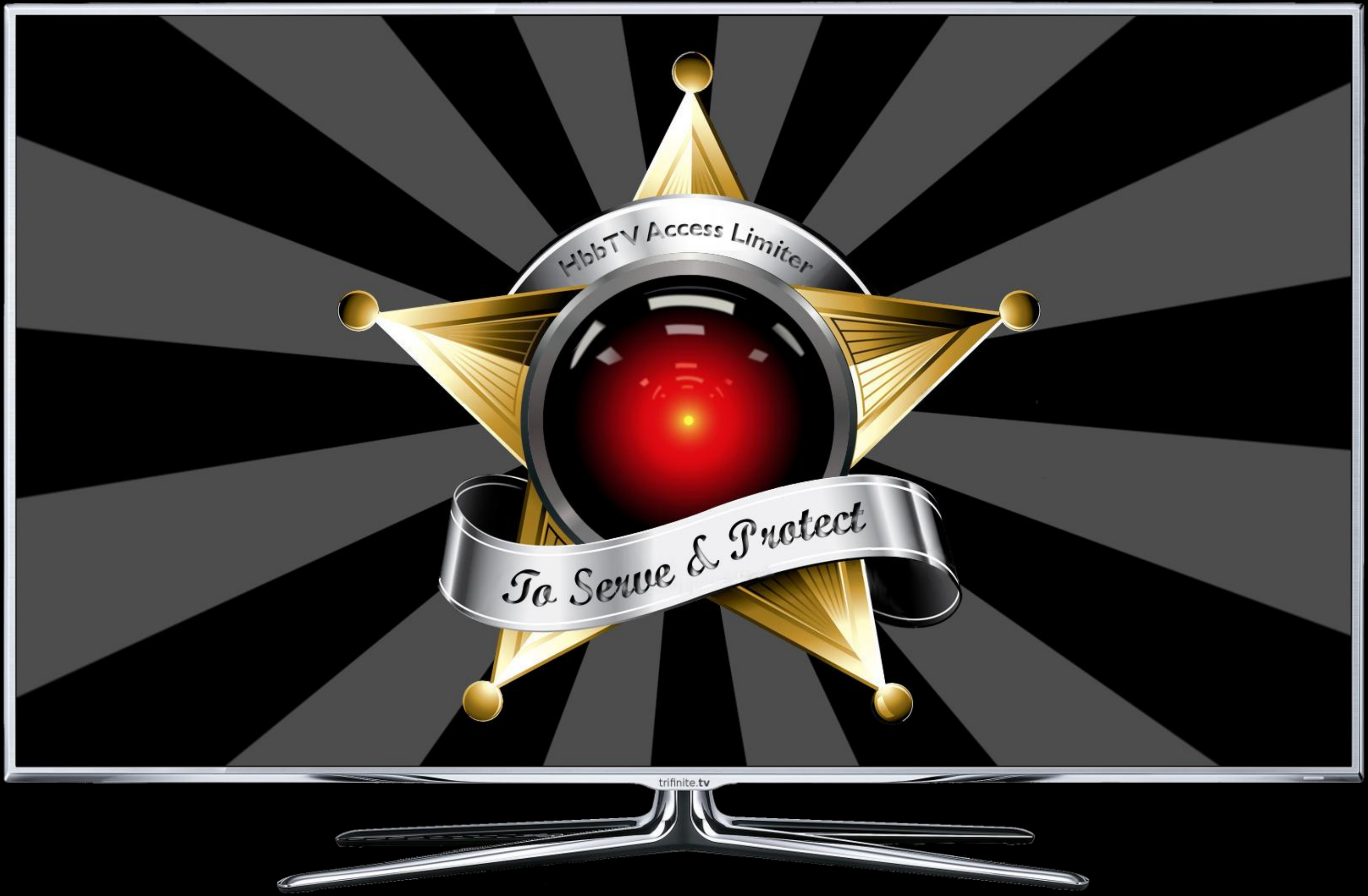
Disconnect SmartTV



Use a Proxy/Firewall

Filter/Block DNS

HAL – To Serve & Protect



How HAL works

- Virtual Server in Germany
  - ServerBiz
- DNS Server
  - tinyDNS
- Webserver with catch-all
  - nginx
  - Document tree with symbolic link structure
    - Some TVs perform HEAD request before GET

HAL Stages

HAL Stages

- Stage 1 – Collecting Data
  - HbbTV application Data
  - Smart TV Data
- Stage 2 – Data Analysis
  - Definition of criteria for HbbTV apps
- Stage 3 – HbbTV app auditing
- Stage 4 – White-List Generation

… in iterating repetitions …

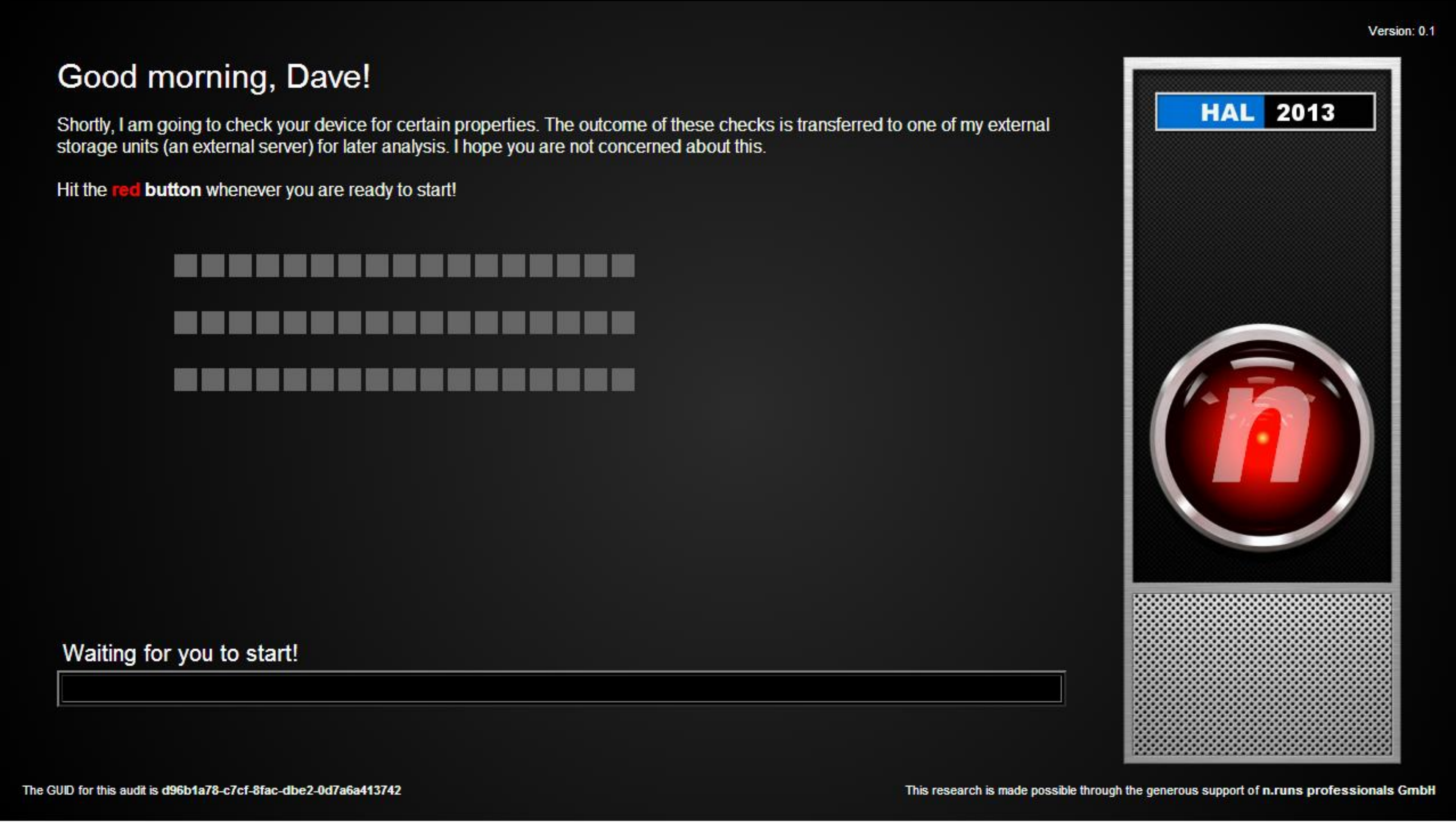
HAL Units

Data Collection Unit

3sat|1.1079.28007|Samsung|http://hbbtv.zdf.de/zdfstart/index.php

- Station name
- DVB Triplet
- TV Manufacturer
- Red Button URL

SmartTV Auditing Unit



Version: 0.1

Good morning, Dave!

Shortly, I am going to check your device for certain properties. The outcome of these checks is transferred to one of my external storage units (an external server) for later analysis. I hope you are not concerned about this.

Hit the red **button** whenever you are ready to start!

Waiting for you to start!

The GUID for this audit is **d96b1a78-c7cf-8fac-dbe2-0d7a6a413742**

This research is made possible through the generous support of **n.runs professionals GmbH**

SmartTV Auditing Unit

- Checks for
  - Available HTML5 objects
    - WebSockets, WebWorkers, AppCache, SessionStorage, LocalStorage, WebSQL
  - Objects from Open IP TV Standard (OIPF)
    - ApplicationManager, VideoBroadcast , DownloadManager, DownloadTrigger, ParentalControlManager, CodManager, DRMManager, GatewayInfo, InternetMessagingService, RecordingScheduler, SearchManager, MulticastDeliveryTerminatingFunction, StatusView, Configuration
  - Personalized Data

HbbTV App Auditing Unit

- Use of HTTrack Website Copier
  - http://www.httrack.com/
- Static code analysis
  - Very basic
  - Mainly manual
  - A lot of room for improvement ☺

HAL Goal

- DNS Server for SmartTVs
  - Only clean sercive endpoints get resolved
- Security relevant info about SmartTVs
  - without having to buy all of them
- Overview of HbbTV services (worldwide)
  - Along with a classification info

How to use HAL

- Just use the following IP as the DNS server for your TV

109.230.231.222

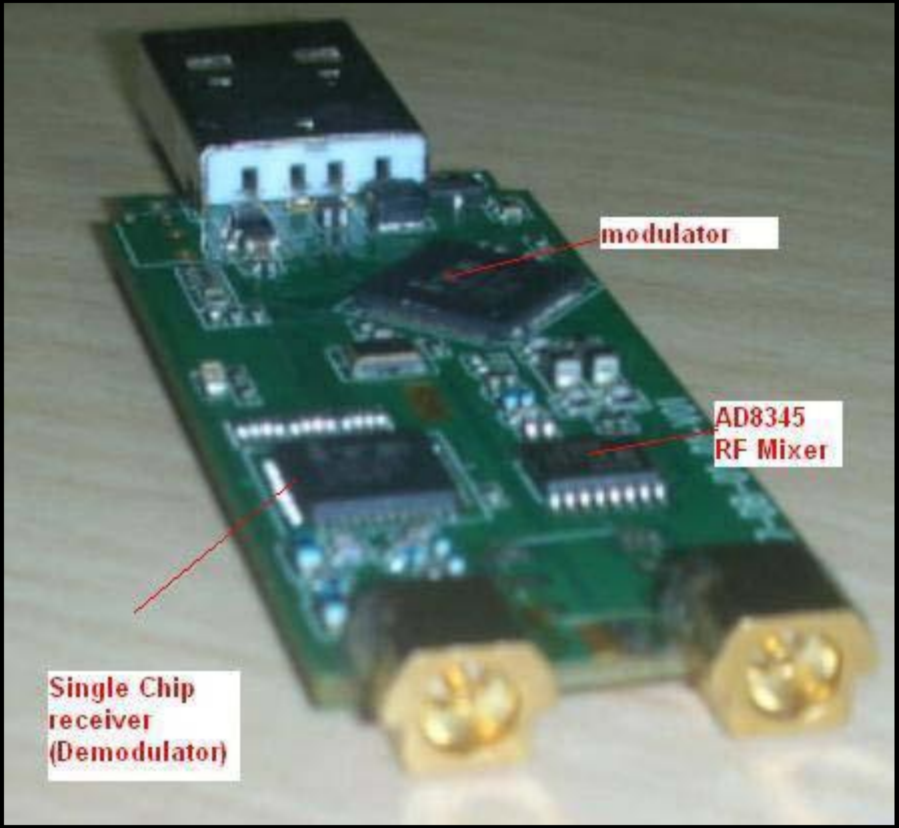
- Also Spoooftícker® will be visible then
- Also check

trifinite.org/hbbtv/

Upcoming FS1 Co-Operation

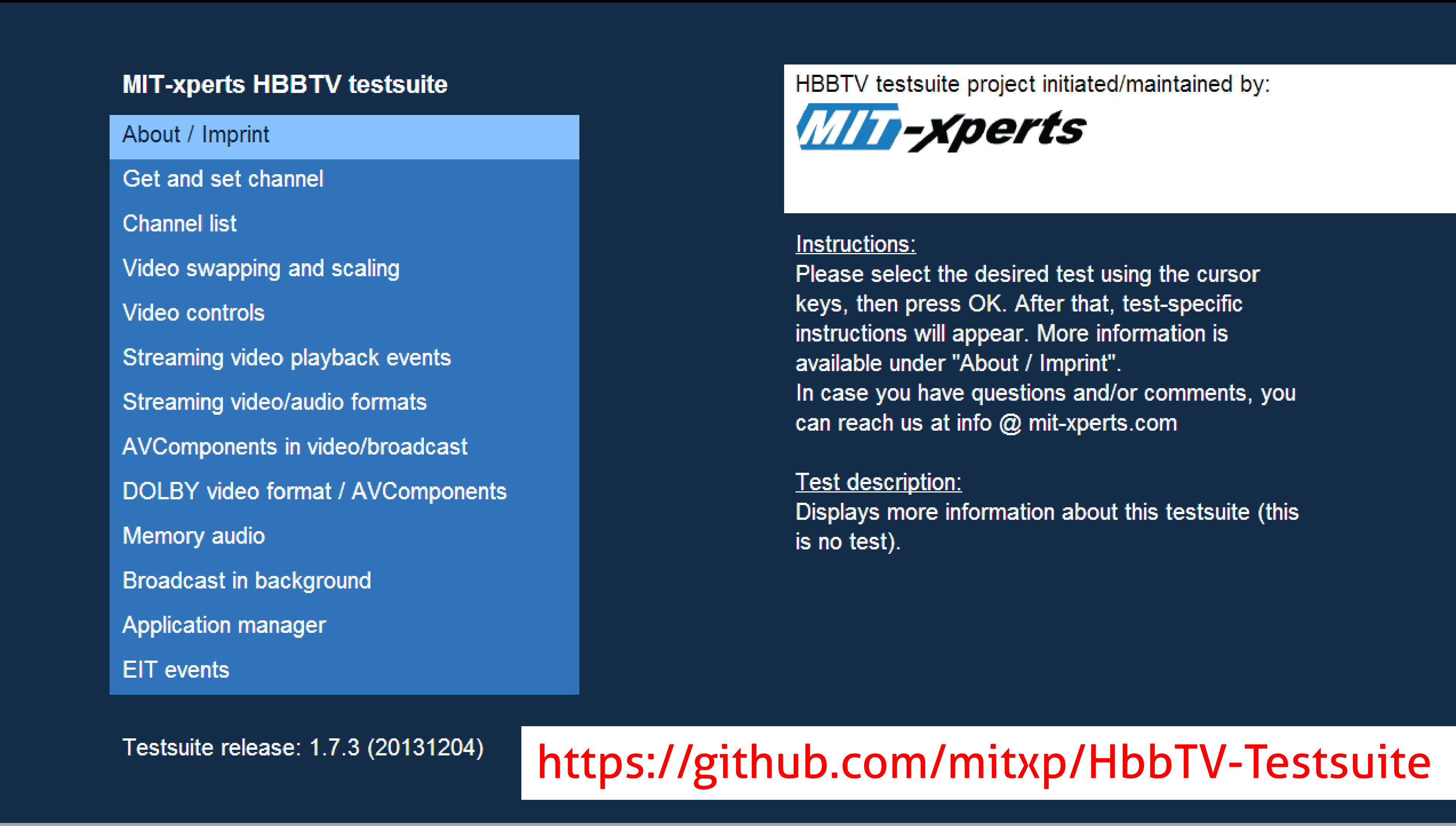
http://fs1.tv/

OpenCaster



http://www.avalpa.com/

MitXP HbbTV-Testsuite



MIT-xperts HBBTV testsuite

- About / Imprint
- Get and set channel
- Channel list
- Video swapping and scaling
- Video controls
- Streaming video playback events
- Streaming video/audio formats
- AVComponents in video/broadcast
- DOLBY video format / AVComponents
- Memory audio
- Broadcast in background
- Application manager
- EIT events

HBBTV testsuite project initiated/maintained by:

MIT-xperts

Instructions:
Please select the desired test using the cursor keys, then press OK. After that, test-specific instructions will appear. More information is available under "About / Imprint".
In case you have questions and/or comments, you can reach us at info @ mit-xperts.com

Test description:
Displays more information about this testsuite (this is no test).

Testsuite release: 1.7.3 (20131204)

https://github.com/mitxp/HbbTV-Testsuite

TV Application Layer

BBC

http://fmtvp.github.io/tal/index.html

Credits to...

- Collin Mulliner
- Emerson Tan
- Eva
- Graf Zahl
- Lukas Grunwald
- Matthias Zeitler
- Michael Schäfer
- Roger Klose
- **trifinite.**group
- BerlinSides Conference
- n.runs professionals GmbH
- Der Postillon – Stefan Sichermann
- IF WE DON'T, REMEMBER ME. iwdrm.tumblr.com

Thank You!

More: mherfurt.wordpress.com

GooglePlus Community: HbbTVSecurity

blog.nruns.com trifinite.org/hbbtv/