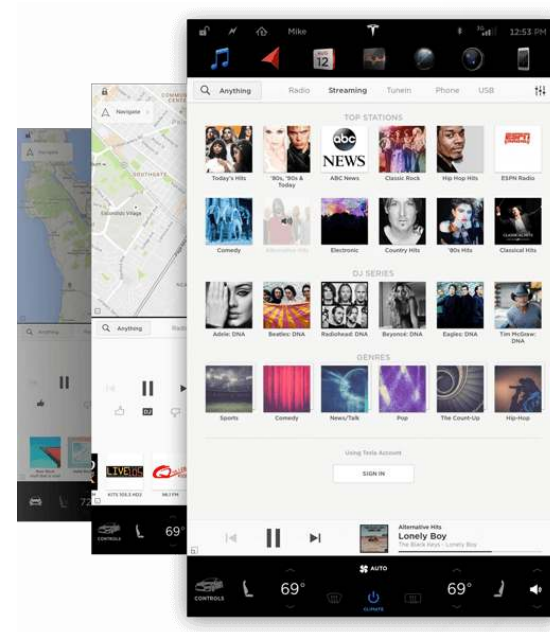# FastSYS

Embedded Operating System

What are the problems with classic Linux?

- Slow system boot
- System freezing
- High hacking and security risk
- Updating requires a lot of time
- High cost of development

Occurred incidents

HACKING A TESLA MODEL S: SYSTEM WEAKNESSES
A Model S can be hacked and anyone would be able to gain access to the system, modify the firmware and steal the car.
https://blog.lookout.com/hacking-a-tesla

THE OWNER OF TESLA MODEL S HACKED HIS CAR
Tesla Model S owner demonstrates how to got root access to the touchscreen, henceforth known as the CID, and hack the Tesla car.
https://promon.co/security-news/hacking-tesla-app-stolen-car/

TESLA MODEL S CRASHES INTO FIRE TRUCK WITH AUTOPILOT REPORTEDLY ENGAGED
The electric vehicle crashed into the truck with the Autopilot engaged as a result of hacking firmware and reinstallation of OS Linux with switched off necessity of periodic steering wheel touching, as confirmed by the Tesla driver.
https://www.carscoops.com/2018/01/tesla-model-s-crashes-fire-truck-autopilot-reportedly-engaged/

We offer Tesla to use FastSYS OS

Why Tesla needs our Operating System?

For owners of Tesla cars:

Improving car safety

Update system improvement

Improving software speed and stability

Improved support

For Tesla company:

Hacking and software modifications protection

Increased development speed and usability

Saving and reducing financial risks

Improving the quality of the final product

What is FastSYS OS 5?

FastSYS OS is the same Linux, only fast, compact, safe and ready to create your projects in the shortest possible time. The external system consists of only 4 files and a bootloader. All existing Tesla applications will start immediately on the FastSYS

```
root@linux:/flash# ls -ls
total 27168
    4 drwxr-xr-x 3 root root     4096 Jun 25 20:08 EFI
    4 drwxr-xr-x 3 root root     4096 Jun 25 20:08 boot
27156 -rwxr-xr-x 1 root root 27804544 Oct 21 15:10 fastsys
    4 drwxr-xr-x 2 root root     4096 Jun 25 20:08 load
root@linux:/flash# ls -ls ./load/
total 400352
195588 -rwxr-xr-x 1 root root 200282112 Jul 12 20:28 loading
130144 -rwxr-xr-x 1 root root 133267456 Jul 12 20:28 postload
 74620 -rwxr-xr-x 1 root root  76410880 Jul 12 20:28 preload
root@linux:/flash#
```

OS FastSYS – is a modern high-tech system that supports the work of various software tools:

Linux Kernel 4.19.58

QT version 5.13

GPU Drivers

OpenGL version es2 and es3

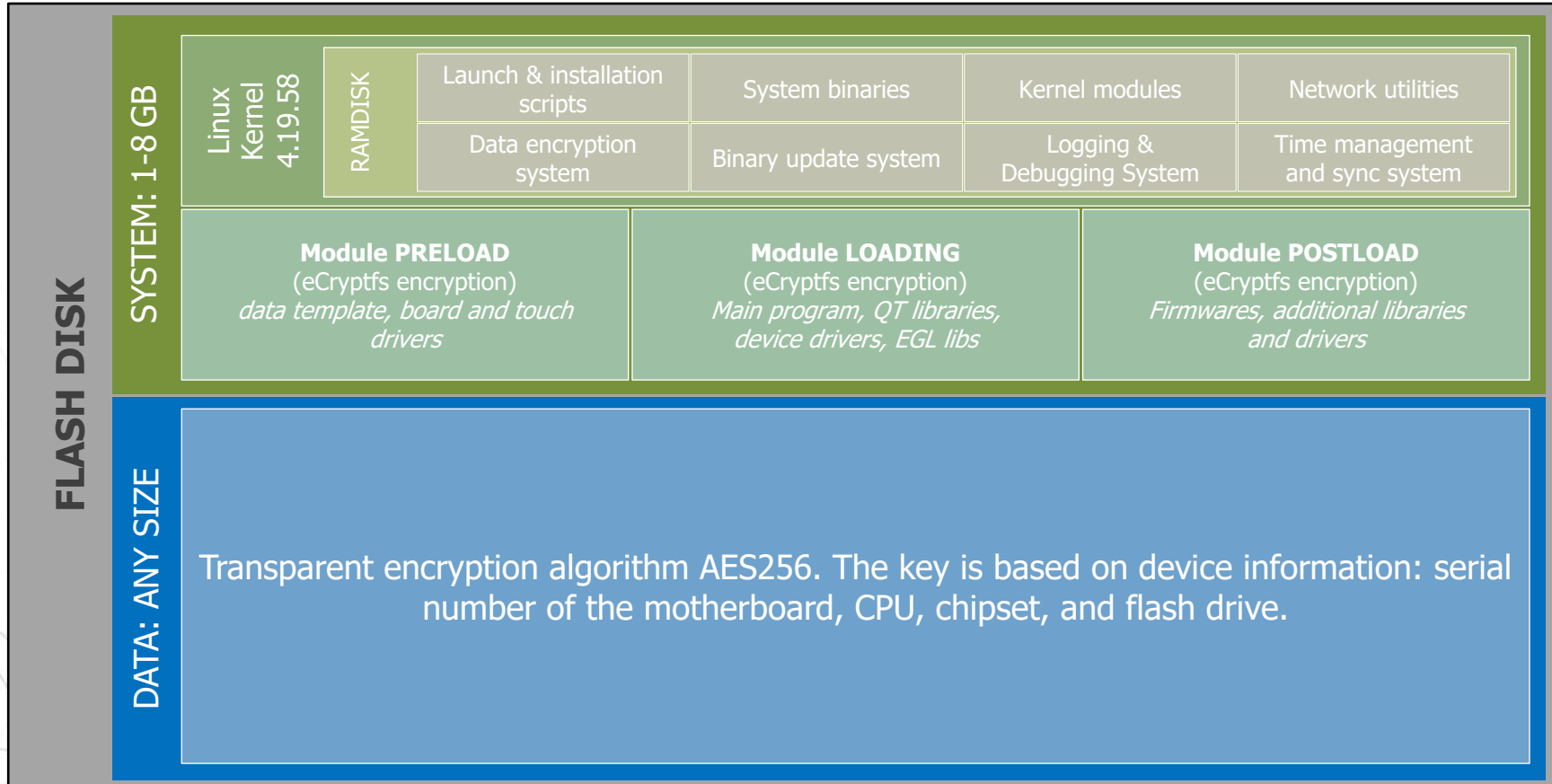Chromium Browser

Libc version 2.27

Geolocation API

SimpleFB and EfiFB framebuffer

Multi-monitor

FastSYS OS 5 operating system scheme

FLASH DISK

SYSTEM: 1-8 GB

Linux Kernel 4.19.58

RAMDISK

Launch & installation scripts	System binaries	Kernel modules	Network utilities
Data encryption system	Binary update system	Logging & Debugging System	Time management and sync system

Module PRELOAD
(eCryptfs encryption)
data template, board and touch drivers

Module LOADING
(eCryptfs encryption)
Main program, QT libraries, device drivers, EGL libs

Module POSTLOAD
(eCryptfs encryption)
Firmwares, additional libraries and drivers

DATA: ANY SIZE

Transparent encryption algorithm AES256. The key is based on device information: serial number of the motherboard, CPU, chipset, and flash drive.

On-board system speed increasing

- Compact system kernel ~ 27 Mb
- System load is divided into 3 stages
- 256MB of RAM is needed
- Data is cached in memory
- Low consumption of system resources

Due to described advantages, the speed and responsiveness of software will significantly increase, the loading time of on-board system will be ~ 15 seconds

Drive protection and storage optimization

Logrotate

FastSYS OS contains a rotation system of system logs and the accumulation control of user data. This system solves the problem of drive failure due to the large number of data rewriting cycles

Information about storage data problems in electric vehicles:

FLASH MEMORY WEAR KILLING OLDER TESLA'S DUE TO EXCESSIVE DATA LOGGING: REPORT
Because a Tesla is highly dependent on its electronics, once the flash memory in a Tesla's infotainment unit goes bad, it essentially bricks the entire car.
https://www.tomshardware.com/news/flash-memory-wear-killing-older-teslas-due-to-excessive-data-logging-report

Protection against cloning and hacking

There are devices in the world that can be connected to the circuits of the motherboard used in electric vehicles. Such devices supply power to the boards chips from external sources, transfer them to USB mode, after which it becomes possible to dump and clone the boards
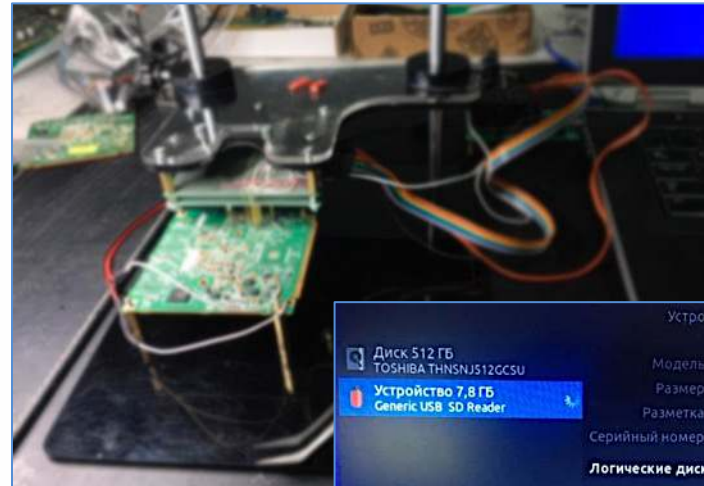
FastSYS OS uses protection, which allows you to bind the system to the serial number of the devices. This approach allows you to use the system without the risk of hacking and cloning
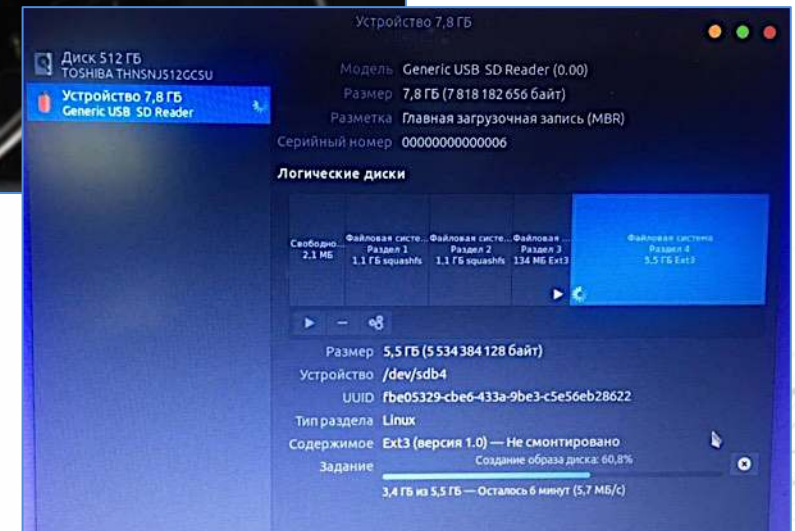
Increasing vehicle protection and safety

Software's image encryption

Data encryption

Cryptographic device binding

Compilation a system kernel

Data transfer encryption

FastSYS OS contains 5 levels of crypto protection, it provides with reliable protection against unauthorized access, OS and software self-reinstalling, software extracting and searching for its «weaknesses», launching third-party applications

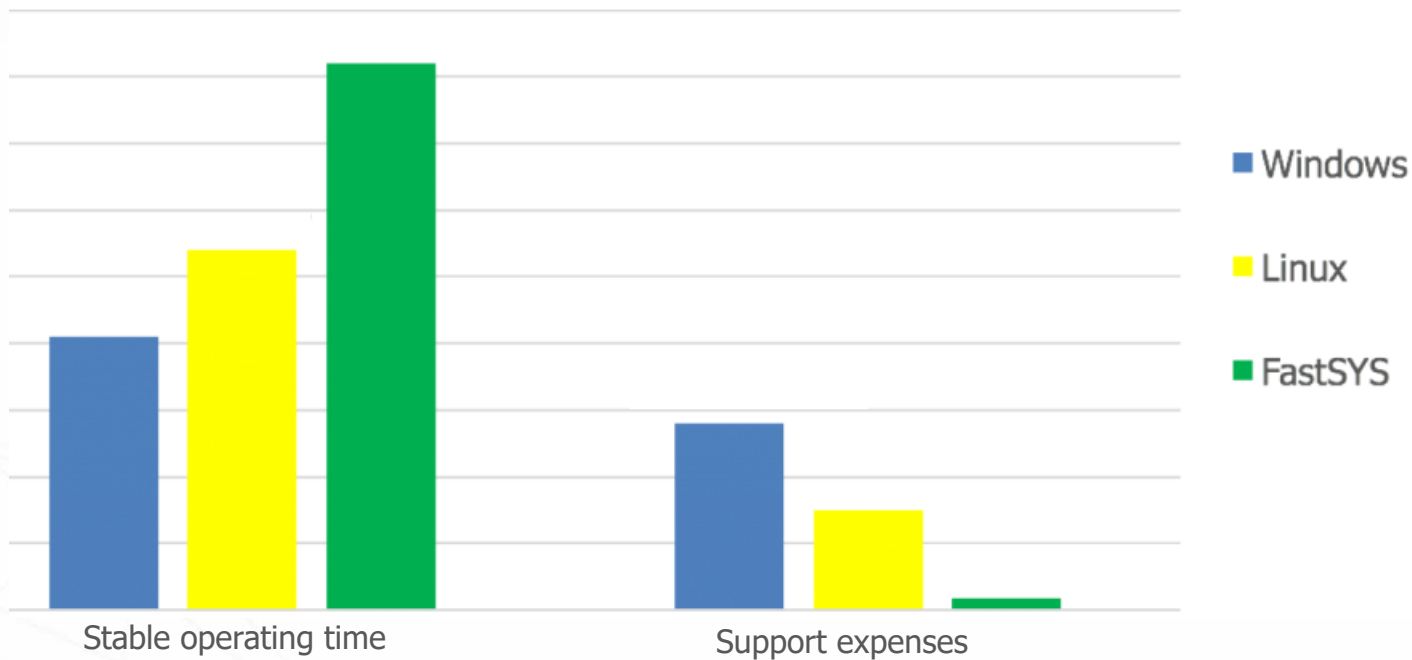# Increasing on-board system stability

FastSYS OS is operating

525 600 000 hours

with **NO crash**

Reducing support cost and software development

- The use of FastSYS OS is reducing the cost of software development and support

- The system allows to decrease the number of needed developers

- The possibility to create your own solutions due to support of a cross-platform QT development environment

What innovations will become available for Tesla?

System of binary updates

| OLD SOFTWARE | **+** | BIN PATCH |

=

| NEW SOFTWARE |

The binary update system allows to download updates in the size of the bit-difference of modified files. The size of the binary update is just only 10-15 Mb, that gives an opportunity to fix software errors quickly, reduce network traffic and the time of system update

Two-way cryptography of software and car components

Operating System Data is securely encrypted that gives an opportunity to make a bidirectional cryptographic link between the car OS and its nodes

It is not possible to uninstall the software unauthorized or to replace the vehicle's parts since they will contain digital signatures and public encryption keys. Closed software keys and vehicle nodes are in the special Tesla licensing service. Stealing a Tesla car will not make any sense

Biometric identification system

- Seat and steering position

- Climate-control and software widgets

- Restrictions for the driver

- Pairing with the phone

FastSYS OS contains a biometric identification subsystem. It allows you to customize various personal settings and set restrictions on the vehicle use with the help of fingerprint or driver's face identification function

Complete remote system management

Control

Management

Monitoring

Reports

Any changes in settings and functions are updated within a few minutes with no need of physical equipment configuration due to the function of remote control

Fast and convenient software and releases development

- Software versioning package

- Binary patch maintenance system

- Drive firmware package

- Virtual machine for developer

- Debug and analysis mode

Comparison of solutions

Item	Ubuntu (Arm)	FastSYS
Boot speed, sec	65	15
Min RAM, mb	512	256
OS size, mb	1500	27
Binary updates	-	+
Full encrypting	-	+
Built-in OS	-	+
Optimization for flash	-	+
Open source	+	+
Linux kernel	+	+
Update time, sec	600	35

* The mean values of the parameters of the compared systems are used.

Inform Systems Group

Inform Systems Group is a modern, dynamic company engaged in technologies and creating innovations. Priority activities are UNIX systems developments, automated and financial systems, built-in and biometric solutions. Our technologies make everyday life easier and more comfortable, they are used in more than 10,000 self-service kiosks all over the world since 2006. Reputation is the most important value for us!

Our projects:

Built-in OS

Telemedicine system

Payment system

Universal kiosks Beauty

Universal vending software

Biometric Payment System

Why you should choose our group?

SAFELY

- Open source
- Independence from a developer
- Professional approach

QUICKLY

- Reasonable development deadlines
- Support 24x7
- Newest technologies

PROFITABLY

- Good prices
- Pay after work
- Individual approach

Where FastSYS OS is already used?

Embedded FastSYS OS is used in more than 10 000 pieces of equipment in Russia and worldwide.

SKYSEND

SOCIAL SERVICES

SENAGAT BANK

ROSTELECOM

CORALTRAVEL

BEELINE

Team of main specialists

OLGA BELYAEVA
Head of External Communication Department

Organizes the development of activities of the company group, partner relations in Russia and abroad. Introduces and promotes technological projects of the company.
Personal qualities: She has the ability to convince, seek compromises and make decisions in unusual situations.
Skills: negotiation, active / direct sales, drafting of commercial proposals, preparation of presentations, project management, analytical mindset, decision-making skills, conflict resolution, knowledge of MS Office, 1C: Accounting, Adobe Photoshop, MS PowerPoint
Hobbies: snowboard, rollers

NATALIA LIFANOVA
Head of Legal Control Department

Provides full legal support of all spheres, projects and stages of activity of the Group enterprises.
Personal qualities: possesses determination, organization, purposefulness, increased capacity for work, by nature is a perfectionist.
Skills: knowledge of the current Russian Federation civil legislation, labor, financial, administrative law, MS Office.
Projects: "Payment service" Online - Purse Finger "(legal and organizational part); program module "Company Statistics System".
Hobbies: street-riding and traveling.

ALEXEY IGNATEV
Chairman of the Board of Directors,
founder of Inform Systems Group

Founder and CEO of the company.
He successfully leads the Group for more than 12 years.
Personal qualities: has a focus on results, the ability to manage people, seek compromises and make decisions.
Skills: UNIX/Linux/Mac, BASH, SSL, x509, XML, CryptoPro, IP, WIFI, Network, Cisco, VLAN, VOIP, Web, MySQL/PgSQL/Oracle, VMWare, Virtualbox, IPSEC, Cluster, Cloud, Groupware, MS Office , biometrics, radio engineering, programming, finance, international legal and financial practice, banks, payment systems, engineering, accounting, auditing, law, design, marketing, management, documentation development, management of complex projects.
Hobbies: snowboarding, running, fitness, skydiving, yoga, horse riding and traveling.

PAVEL PLUKCHI
Lead Programmer of System Development Department

At the enterprises of the Group, he is engaged in the development and implementation of the Group software products, technical support for the implementation of the group's development directions, the priority areas of which are developments in the field of UNIX systems.
Personal qualities: perseverance, self-learning ability, stress resistance, concentration in work, analytical mindset, high working capacity, not template thinking
Skills: Qt, Unix API, C/C++, PHP, CSS, HTML, MySQL, SQLite, json, xml, OpenSSL, CryptoPro etc.
Hobbies: football.

ANNA STEPINA
Head of Accounting Department
Founder of Inform Systems Group

A high-skilled specialist in taxation and accounting, organizes financial planning and economic activities of the Group's enterprises. She successfully manages the financial department by organizing accounting according to Russian standards.
Personal qualities: has an analytical mind, high efficiency, scrupulousness.
Skills: conducting internal audit of the company, making calculations, opening bank accounts, knowledge of legislation on accounting, labor legislation, taxation, MS Office, 1C: Accounting, PC Bank-client.
Hobbies: movies and traveling.

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