



Embedded Operating System

# 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

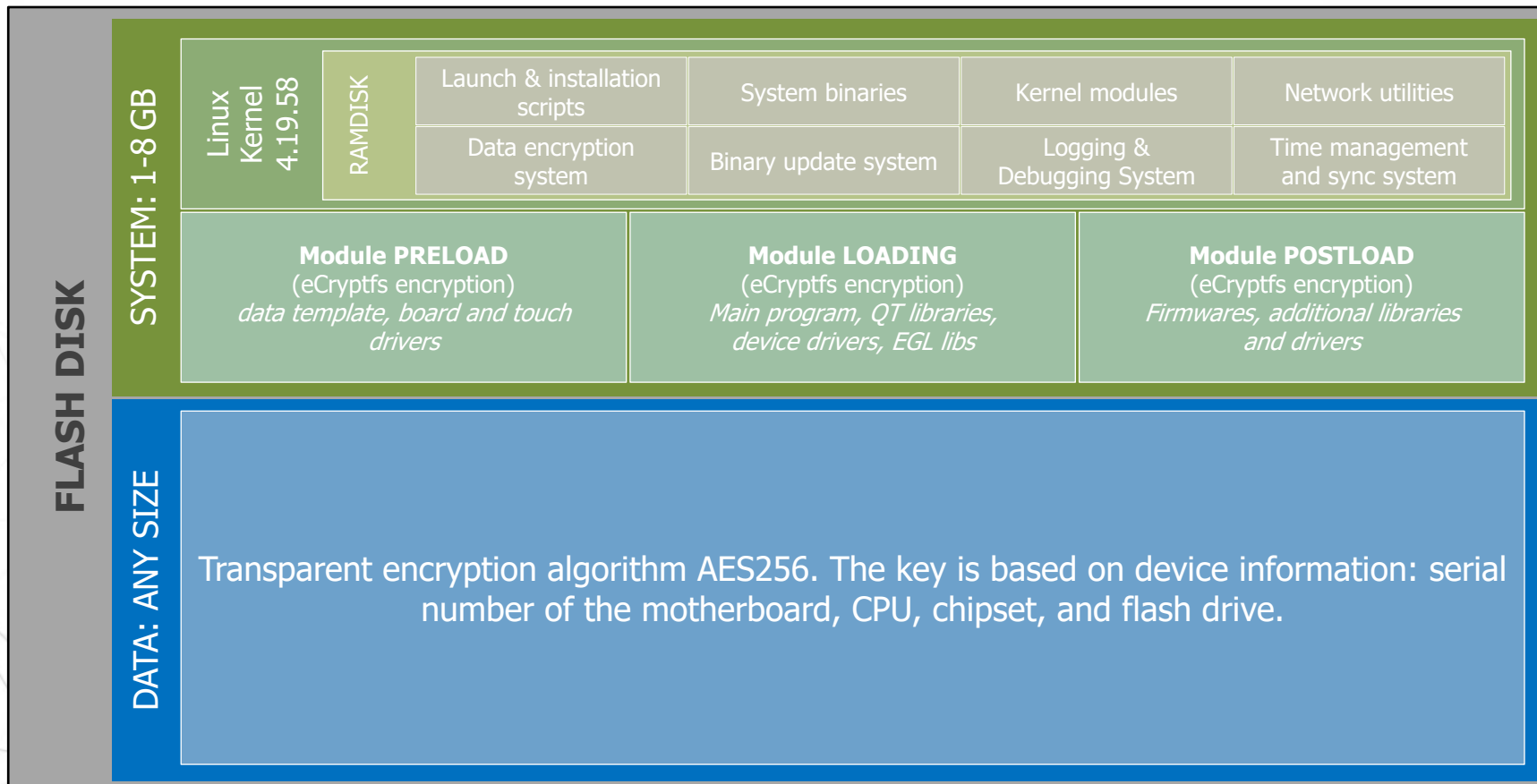


SimpleFB and EfiFB framebuffer



Multi-monitor

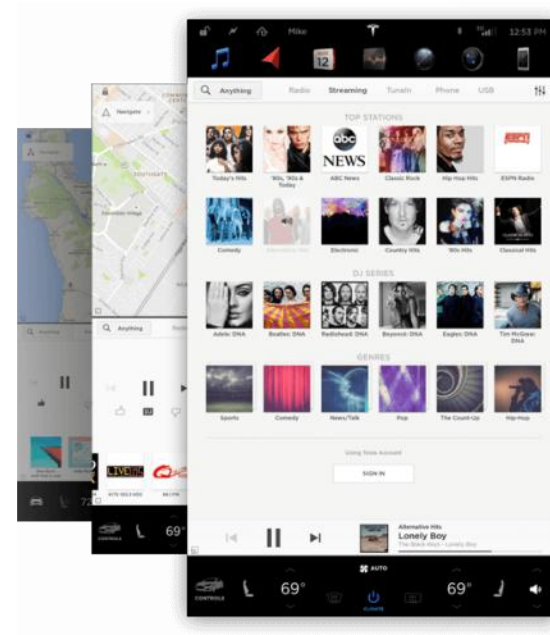
# FastSYS OS 5 operating system scheme



# What problems can be solved?

## Modification of Ubuntu 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 get 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/>



# Why Tesla needs our Operating System?

## 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



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**

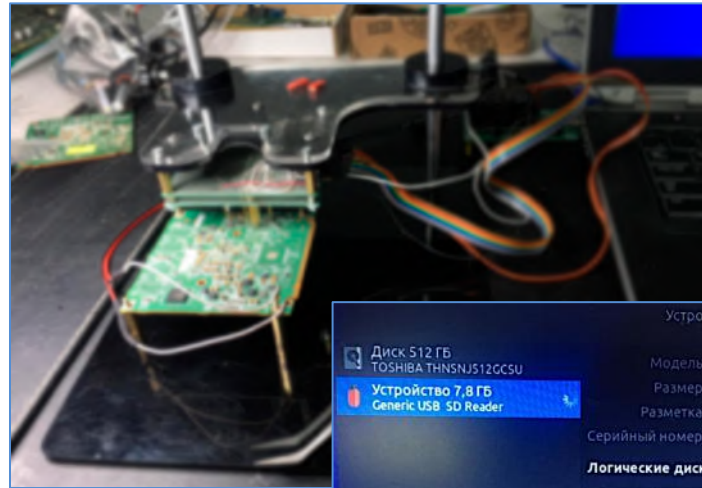
Because a Tesla is highly dependent on its electronics, once the flash memory in a Tesla's infotainment unit goes bad, it essentially bricks the entire car.

<https://www.tomshardware.com/news/flash-memory-wear-killing-older-teslas-due-to-excessive-data-logging-report>

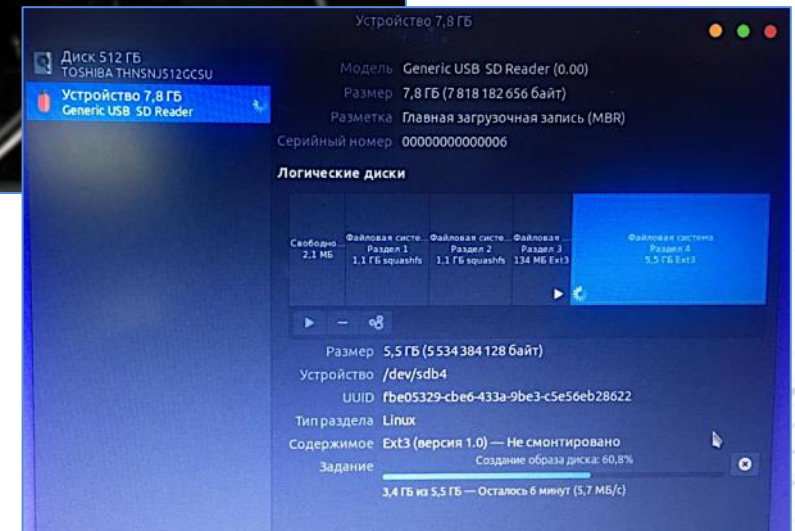


# Protection against cloning and hacking

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

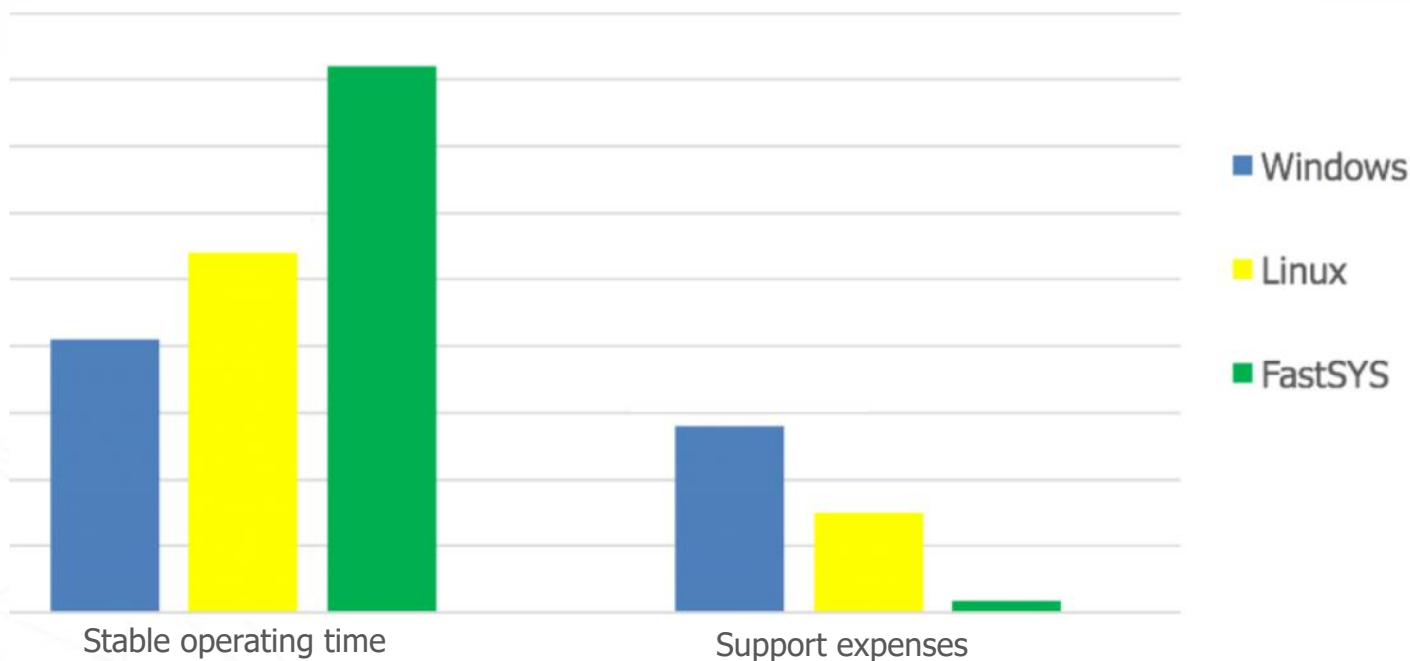
FastSYS OS contains 5 levels of crypto protection, it provides with reliable protection against unauthorized access, OS and software self-reinstalling, software extracting and searching for its «weaknesses», launching third-party applications

# 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

The background of the slide features a complex, abstract geometric pattern. It consists of numerous thin, light gray lines that intersect to form a network of triangles and other polygons. Small, dark gray dots are placed at many of the intersection points, creating a sense of a digital or molecular structure. The overall effect is a modern, technological aesthetic.

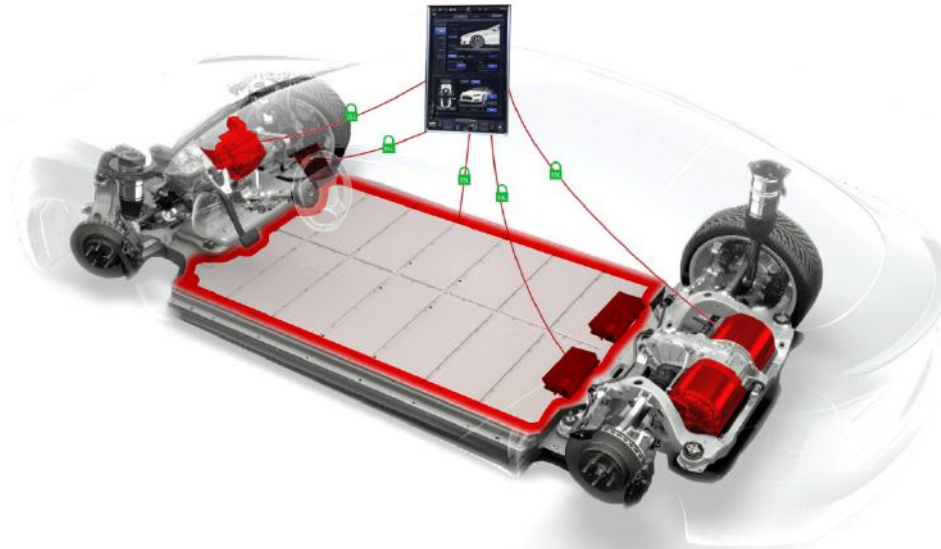
## **What innovations will become available for Tesla?**

# System of binary updates



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 3-5 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



Universal kiosks Beauty



Telemedicine system



Payment system



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.

# Contacts



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