

# LinuxBIOS

freedom for your motherboard

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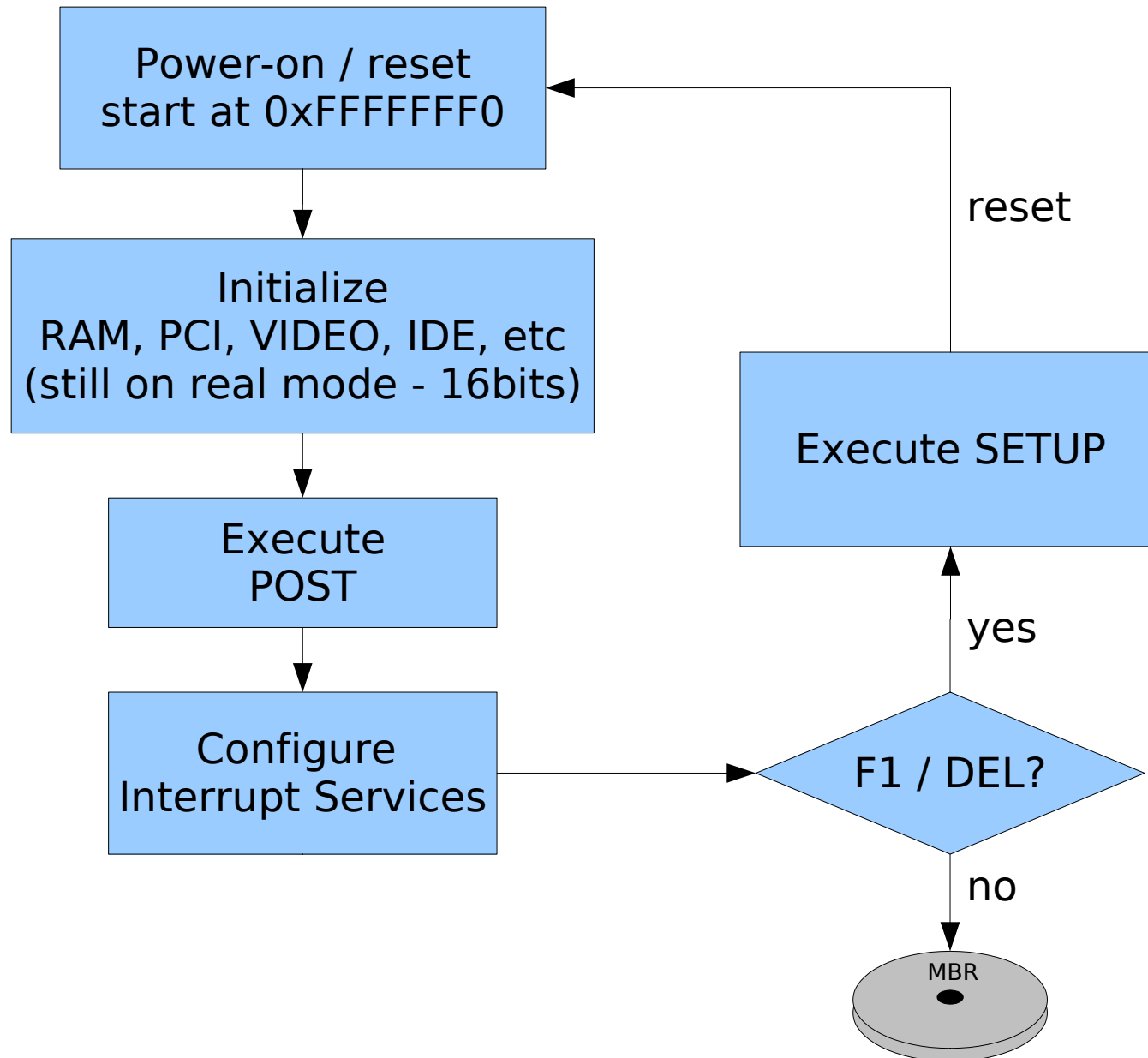
Alan Carvalho de Assis

# What is BIOS?

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- BIOS stands for: Basic Input/Output System;
- Firmware - stored inside a chip (ROM, EPROM, Flash);
- Initializes the hardware

# How commercial BIOS works?



# Commercial BIOS' problems

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- Slow – commonly runs on real mode;
- Redundant – Modern Operating Systems initialize hardware by itself; They also don't use BIOS Interrupt services;
- Complexity – commercial BIOS normally are written in assembly;
- Suboptimal – some commercial BIOS configure devices in a suboptimal way;
- BUGs – you can't fix it yourself!



# What is LinuxBIOS?

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- A FOSS project to replace closed BIOS firmware;
- Started by Ron Minnich at Los Alamos National Laboratory 1999;
- It was developed to solve cluster's BIOS configuration problem;
- It supports x86, Alpha and PowerPC;
- The first mainboard supported was Intel L440GX+.



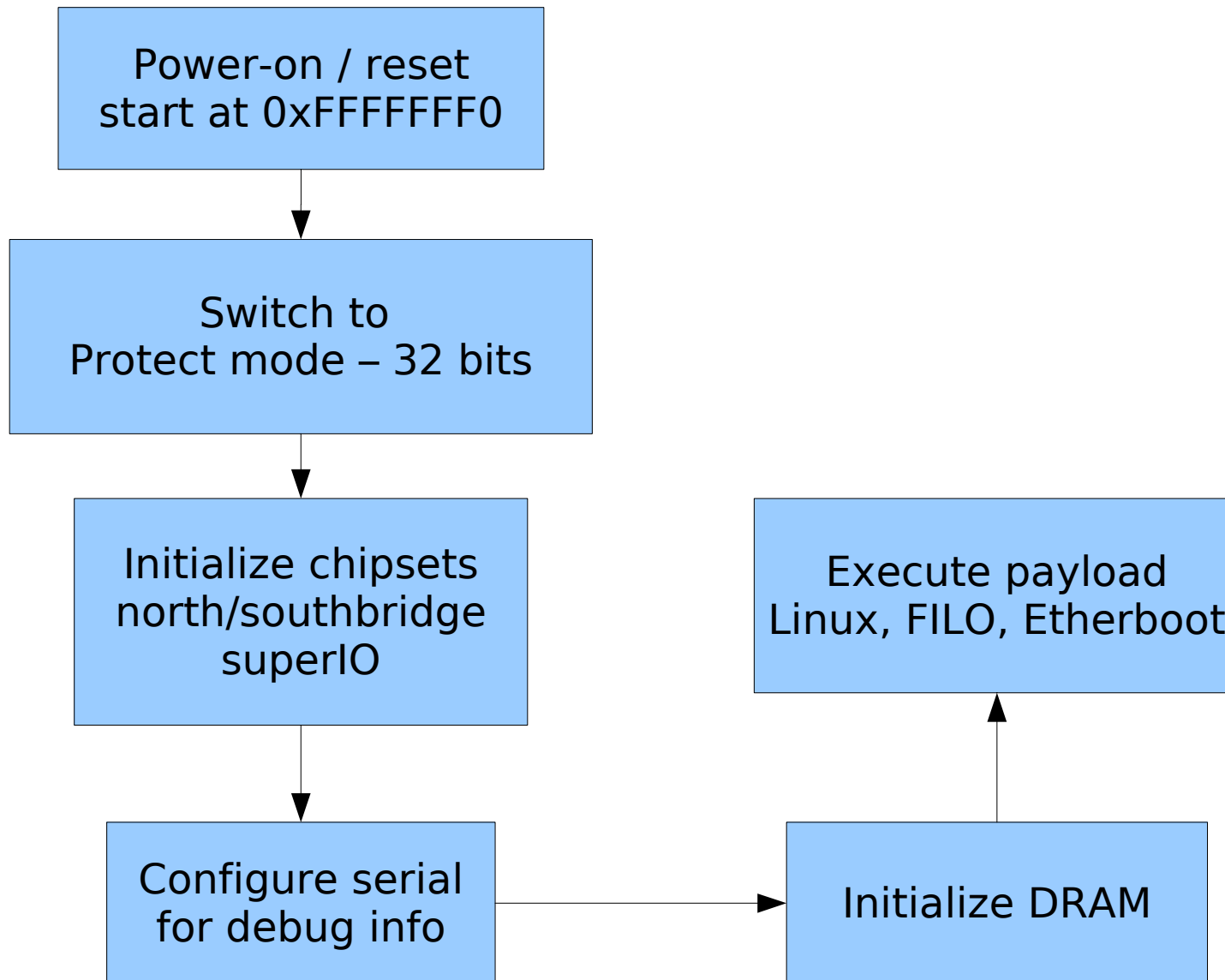
# Why use LinuxBIOS?

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- It starts your system faster;
- It is free;
- It is reliable;
- It is customizable;
- Any BUG will be fixed fast;
- No DRM by default;
- It is FUN;



# How LinuxBIOS works?





# How is it done without RAM?

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- There are two approaches:
  - ROMCC
  - Cache As Ram (CAR)





# ROMCC

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- C compiler which compile to “stackless assembly” way;
- It uses some especial processor registers to store variables (mmx, sse);
- It is deprecated, use CAR;



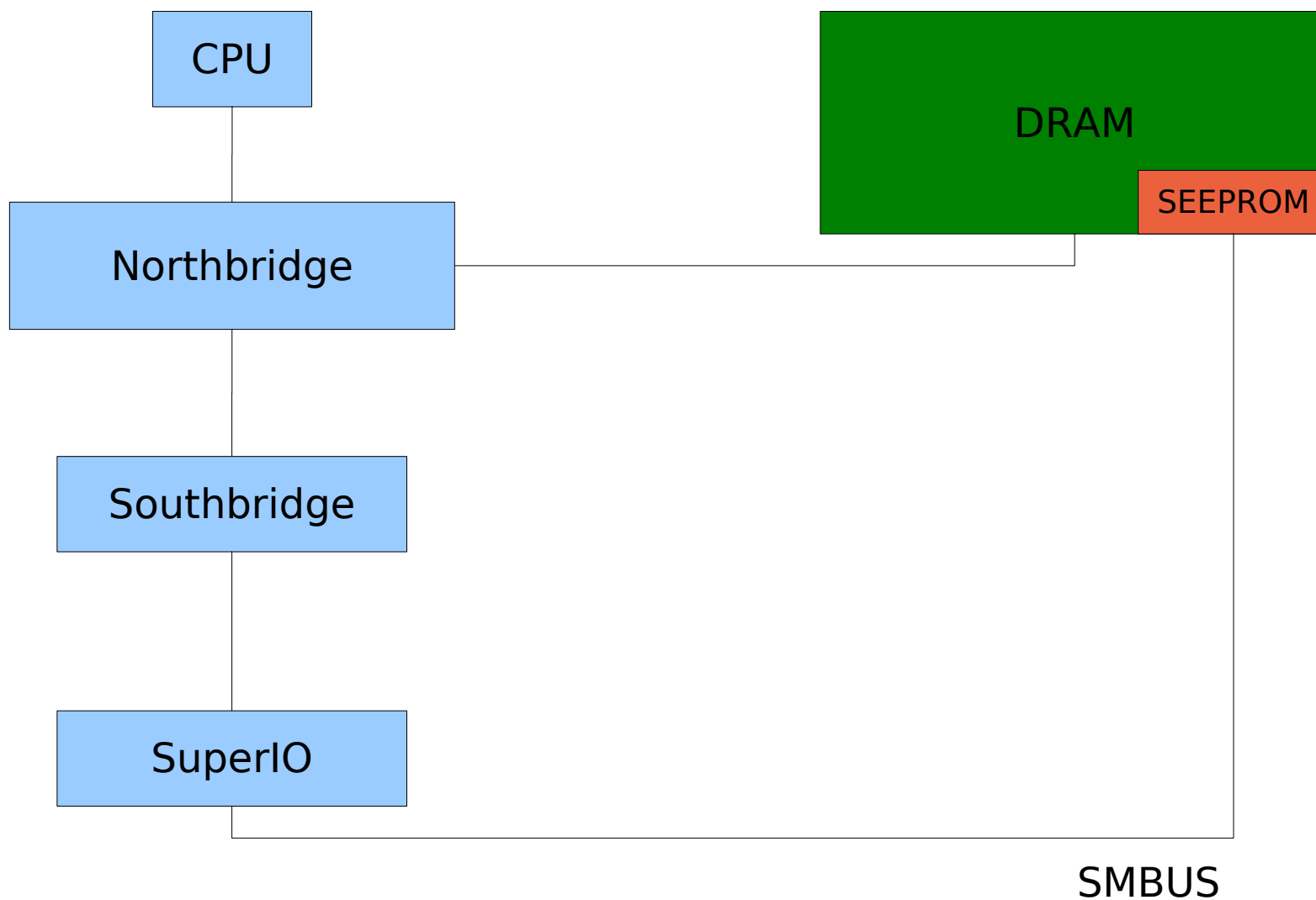
# CAR - Cache As Ram

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- It use processor cache (L1) as RAM;
- Cache is SRAM memory;
- The cache need be in *NO-FILL* mode;
- All mainboard will use it on LinuxBIOSv3;



# How to initialize DRAM?





# Interesting LinuxBIOS Features

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- serial console at early;
- serial console over USB 2.0;
- fallback system;
- vm86 emulator;
- small footprint (~64KB);



# Getting started

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- You can use QEMU:
  - Download LinuxBIOS, linux kernel, busybox, mkelfImage,;
  - Make the rootfs (compile busybox);
  - Compile a minimal linux kernel;
  - Convert the kernel image and rootfs to ELF;
  - Compile LB for QEMU using this ELF as payload;
  - Start QEMU using this LB image

# Installing LinuxBIOS in Mainboard

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- Download LinuxBIOS;
- Get FILO or linux kernel + busybox;
- Compile FILO or linux kernel and busybox;
- If linux kernel and busybox, convert to ELF using the mkelfImage;
- Compile LinuxBIOS with the ELF payload;
- Reprogram the BIOS Flash.



# How to program the FLASH?

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- There are some approaches:
  - using an external programmer;
  - using the flashrom program;
  - using a NIC as programmer  
(**EXPERIMENTAL**)  
(<http://ctflasher.sourceforge.net>)



# How to add support to your motherboard?

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- Enumerate the resources (lspci is your friend);
- You will need the chip datasheet;
- Use this article as reference:

<http://www.linuxbios.org/Documentation>





# What motherboard to buy?

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- The following desktop motherboards are supported by LinuxBIOS:

[Gigabyte GA-M57SLI-S4;](#)

[MSI K9N Neo-F;](#)

[MSI Platinum;](#)



# LinuxBIOS x DRM

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- Do you know Dr. Fritz (fritz-chip)?
- Xbox360 is best DRM hardware example;
- In few years we will see more examples;
- Users needs say “NO” to DRM sw/hw:
  - Don't buy computer w/ EFI BIOS (i.e. MacIntel);
  - Don't buy DRM hardware;
  - Use free and open source software;
  - Use LinuxBIOS in your computer;
  - Ask hardware vendor to support LinuxBIOS;



# LinuxBIOS future

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- There are some news and willing:
  - Easy compilation (ncurses based);
  - Support for more desktop motherboards;
  - Motherboard manufactured with LinuxBIOS;
  - Quality Assurance – LinuxBIOS automatic test for all supported mainboards;

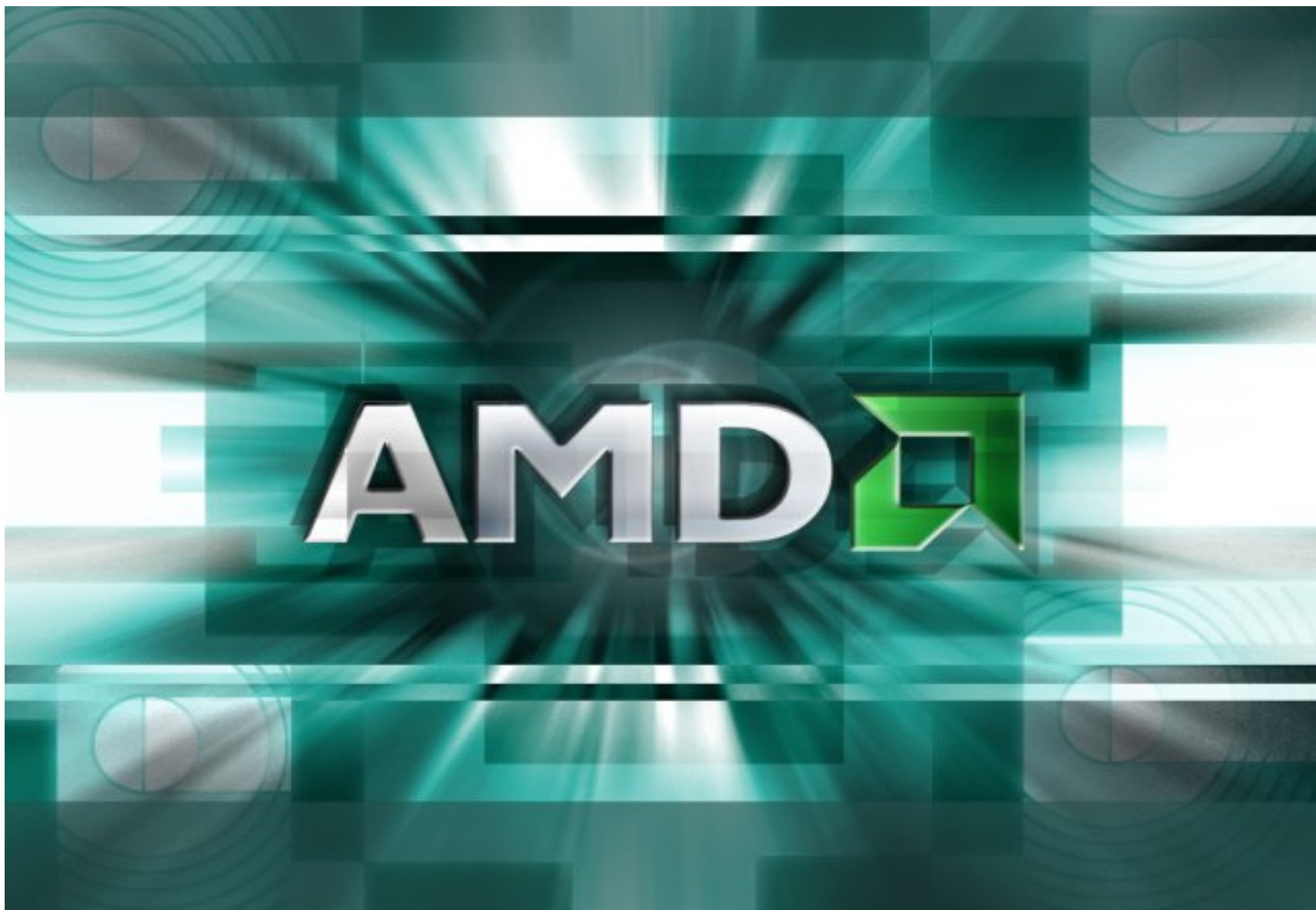
# Thanks

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- Special Thanks (alphabetically):
  - Frederico Schaf;
  - Marcelo Barros;
  - Ron Minnich;
  - Stefan Reinauer;
  - Uwe Hermann;
  - all LinuxBIOS' developers;

# Thanks

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Questions?

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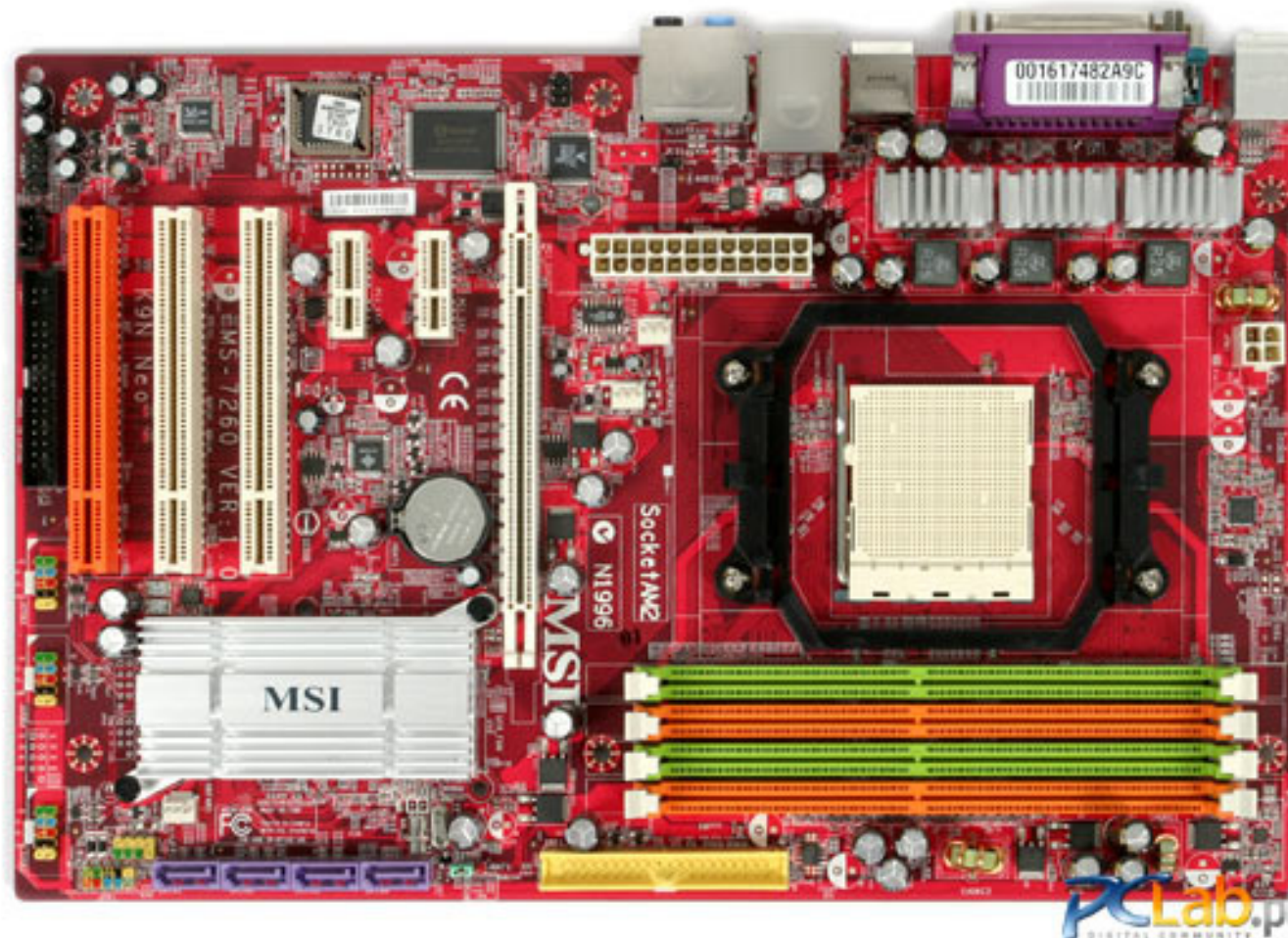
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# Gigabyte M57SLI-S4



# MSI K9N Neo-F





# MSI Platinum

