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DSCHANG SCHOOL OF SCIENCES AND TECHNOLOGY

RESEARCH UNIT IN FUNDAMENTAL COMPUTING, ENGINEERING AND APPLICATIONS

WOCC23

MONITORING DES MOUVEMENTS DE DONNÉES

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Agenda

Context

Data transfer can be triggered in two ways: either the software requests data (via a function such as read), or the hardware asynchronously sends data to the system.

Usually, processors control the entire process of data transfer, from the beginning of the transfer to the storage of data at the destination

When the CPU is overused, latency, jitter and packet loss may increase which will result in the entire IT infrastructure deteriorating.

Input/Ouput transfer techniques

Identify the data movement circuits in a computer.

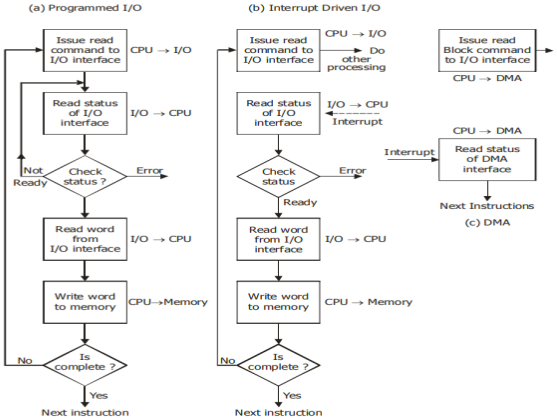


Figure: IO data transfer

[1]

DMA illustration

Identify the components involved in data movements

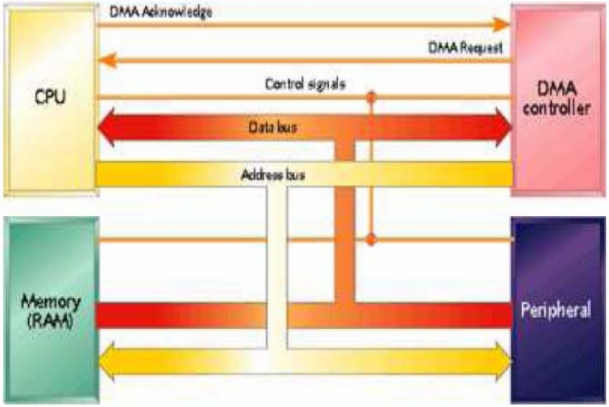


Figure: IO data transfer

[2]

Problem

Linux tools such as (iostat, sar, vmstat, vtune, ...) as existing tools do not provide us with information about the amount of data that has been transferred from CPU–>RAM, RAM–>CPU, RAM–>DISK.

No information is provided regarding data movement through Direct Memory Access (DMA).

Solutions

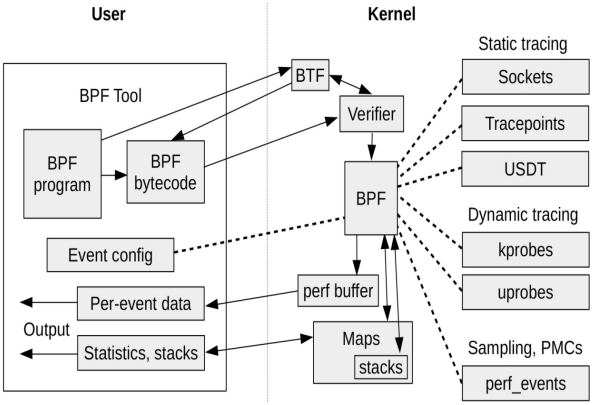
Setting up a protocol for tracing data movements.

Solutions

Data transfer can be traced from the Linux kernel.

Challenges

- Use BPF (Berkeley Packet Filter) to trace from the Linux kernel.



Solutions

- Construct a micro-benchmark for tracing using the DMA-MAPPING library.

Next steps

- Complete the construction of the benchmark with the help of the designers of the dma-mapping.h library. ;
- Start the DMA transaction tracing protocol. ;
- Designing a graphical tool to observe data movements.;

End

Thank you !!!

References I

CGS Technologies.
Implementation of a direct memory access controller.

Brendan Gregg.
BPF internals.
USENIX Association, June 2021.