

# Secure Computing

indispensable for dependable network infrastructure

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October 2, 2019



**CYBERUS**  
TECHNOLOGY

# Communication Infrastructure



# Communication Infrastructure

Application





# Communication Infrastructure

Application  
Software-Defined Network (SDN)



# Communication Infrastructure

Application  
Software-Defined Network (SDN)  
Virtualization



# Communication Infrastructure

Application  
Software-Defined Network (SDN)  
Virtualization  
Virtual Machine



# Communication Infrastructure

Application

Software-Defined Network (SDN)

Virtualization

Virtual Machine

Host OS/Hypervisor



The image features the Leaning Tower of Pisa on the left side, tilted to the right. The tower is overlaid with a vertical rainbow color gradient, starting with green at the top, transitioning through yellow and orange, and ending in white at the base. In the foreground, to the right of the tower's base, is a white marble statue of a group of figures on a pedestal. The background is a bright blue sky with scattered white clouds.

# Communication Infrastructure

Application

Software-Defined Network (SDN)

Virtualization

Virtual Machine

Host OS/Hypervisor

Firmware



# Communication Infrastructure

Application

Software-Defined Network (SDN)

Virtualization

Virtual Machine

Host OS/Hypervisor

Firmware

Microcode



# Communication Infrastructure

Application

Software-Defined Network (SDN)

Virtualization

Virtual Machine

Host OS/Hypervisor

Firmware

Microcode

Silicon



# Communication Infrastructure

Application

Software-Defined Network (SDN)

Virtualization

Virtual Machine

**Operation Soft Cell**

Firmware

Microcode

Silicon



# Communication Infrastructure

Application

Software-Defined Network (SDN)

Virtualization

Virtual Machine

**Operation Soft Cell**

**LoJax**

Microcode

Silicon



# Communication Infrastructure

Application

Software-Defined Network (SDN)

Virtualization

Virtual Machine

**Operation Soft Cell**

**LoJax**

**Checkm8**

Silicon



# Communication Infrastructure

Application

Software-Defined Network (SDN)

Virtualization

Virtual Machine

**Operation Soft Cell**

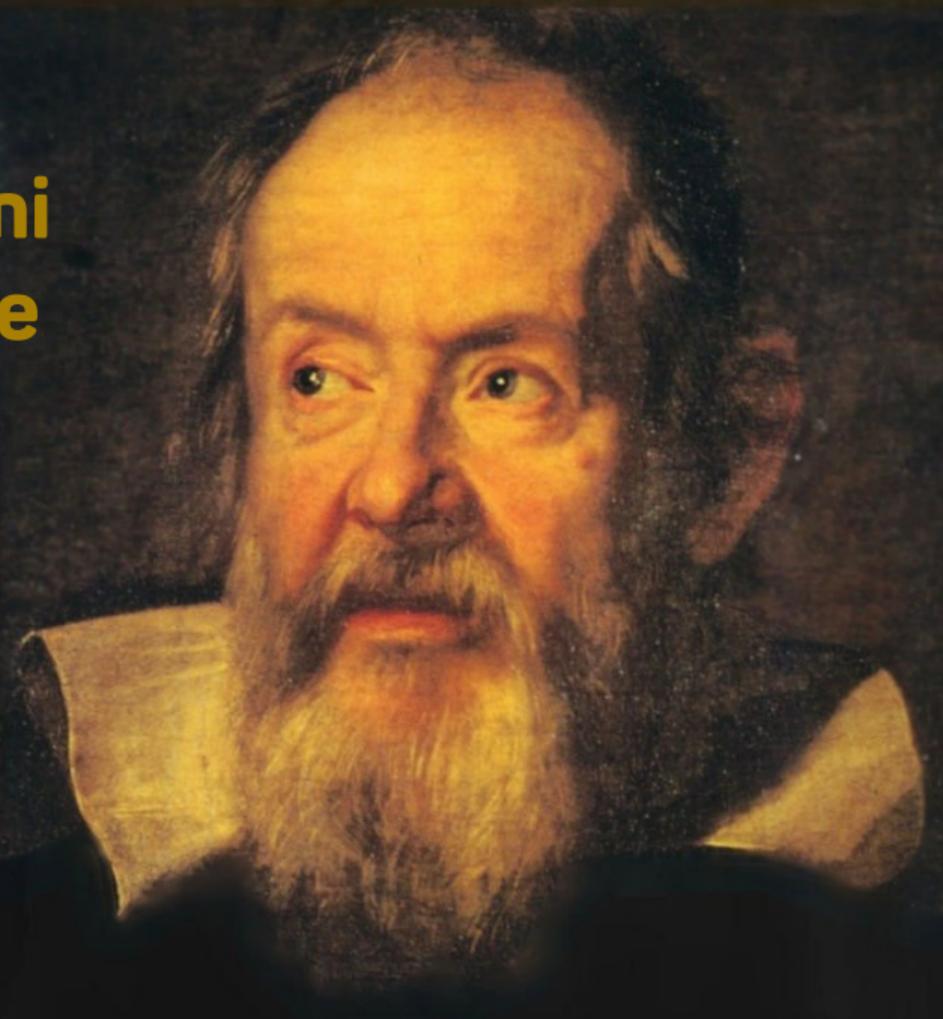
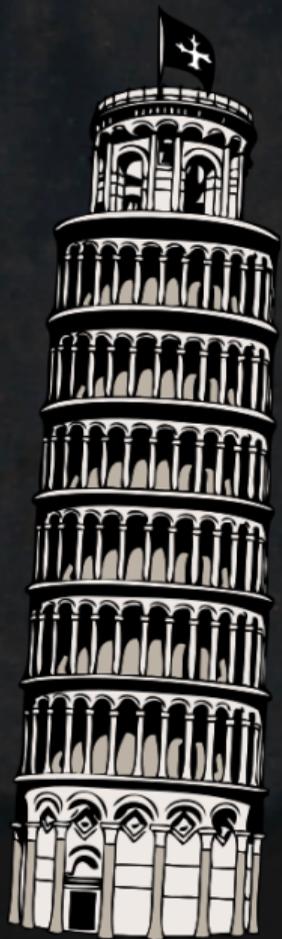
**LoJax**

**Checkm8**

**Meltdown, Spectre, etc.**

# Discorsi e dimostrazioni matematiche

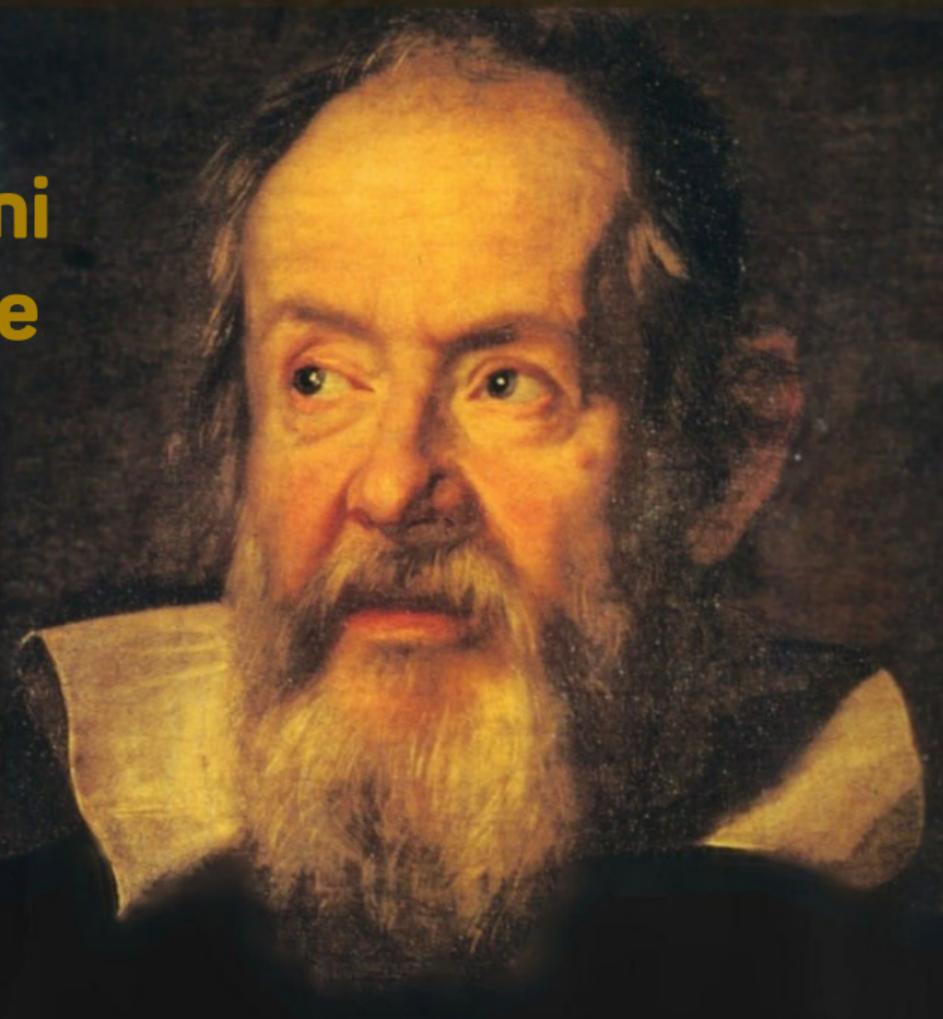
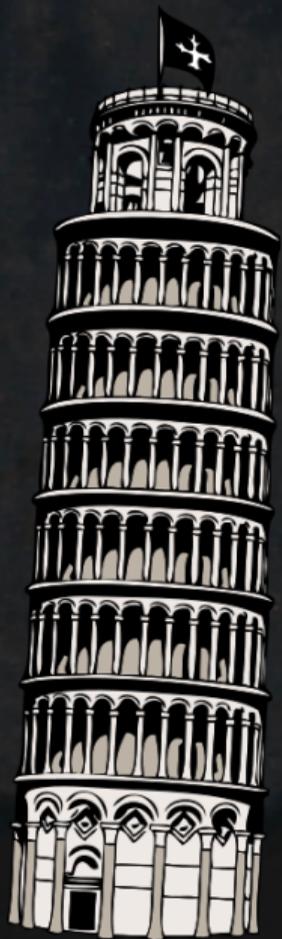
$$s(t) = \frac{1}{2}gt^2$$



# Discorsi e dimostrazioni matematiche

$$s(t) = \frac{1}{2}gt^2$$

$$\approx 50m, 10^m/s^2, 3s$$

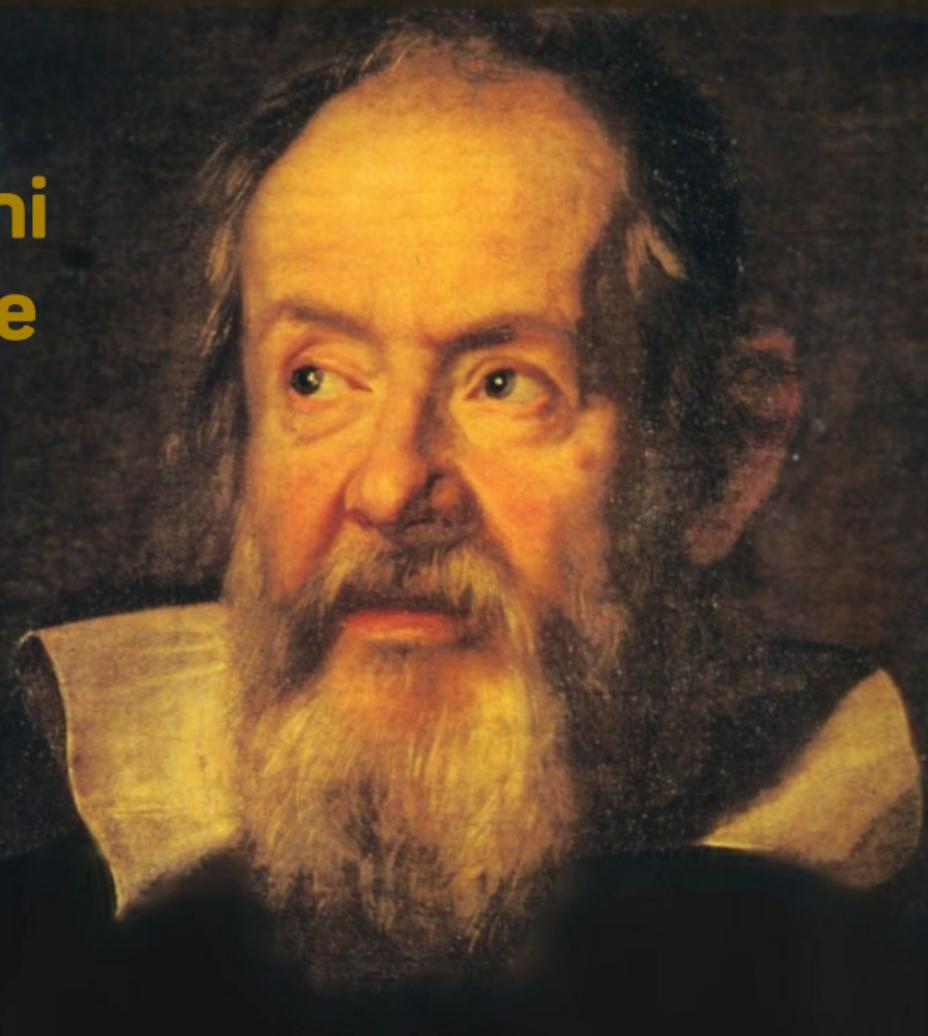
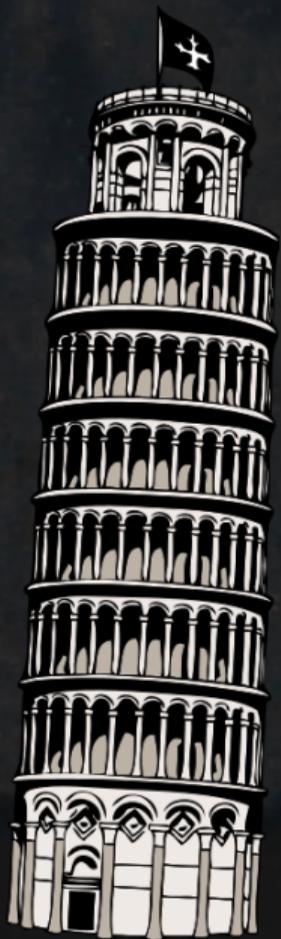


# Discorsi e dimostrazioni matematiche

$$s(t) = \frac{1}{2}gt^2$$

$$\approx 50m, 10^m/s^2, 3s$$

$$\approx 300 \text{ steps}, 300s$$



# Galileo GNSS

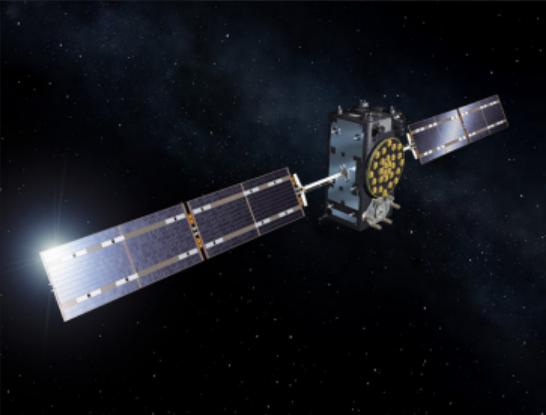


Photo: Copyright ESA-Pierre Carril, 2015



# Galileo GNSS

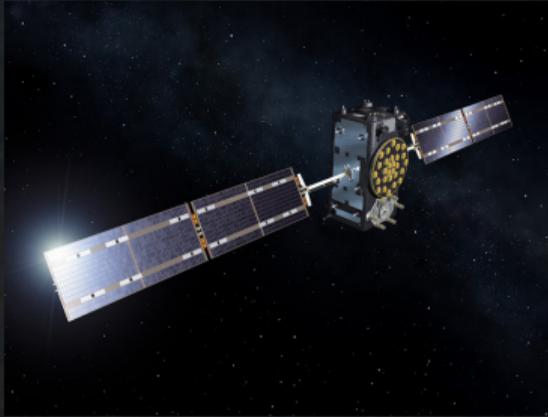


Photo: Copyright ESA–Pierre Carril, 2015

GPS outage  $\approx$  \$1 billion per day  
Europe:  $\approx$  6-7% of GDP



# Galileo GNSS

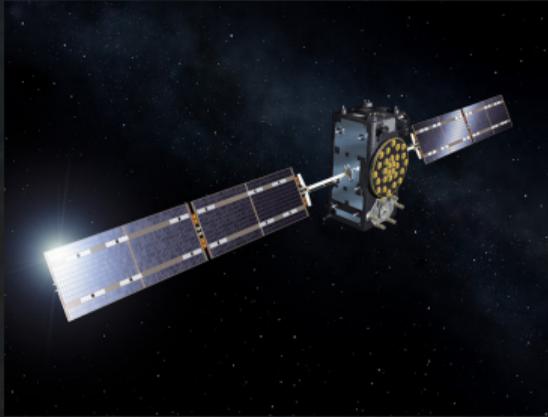
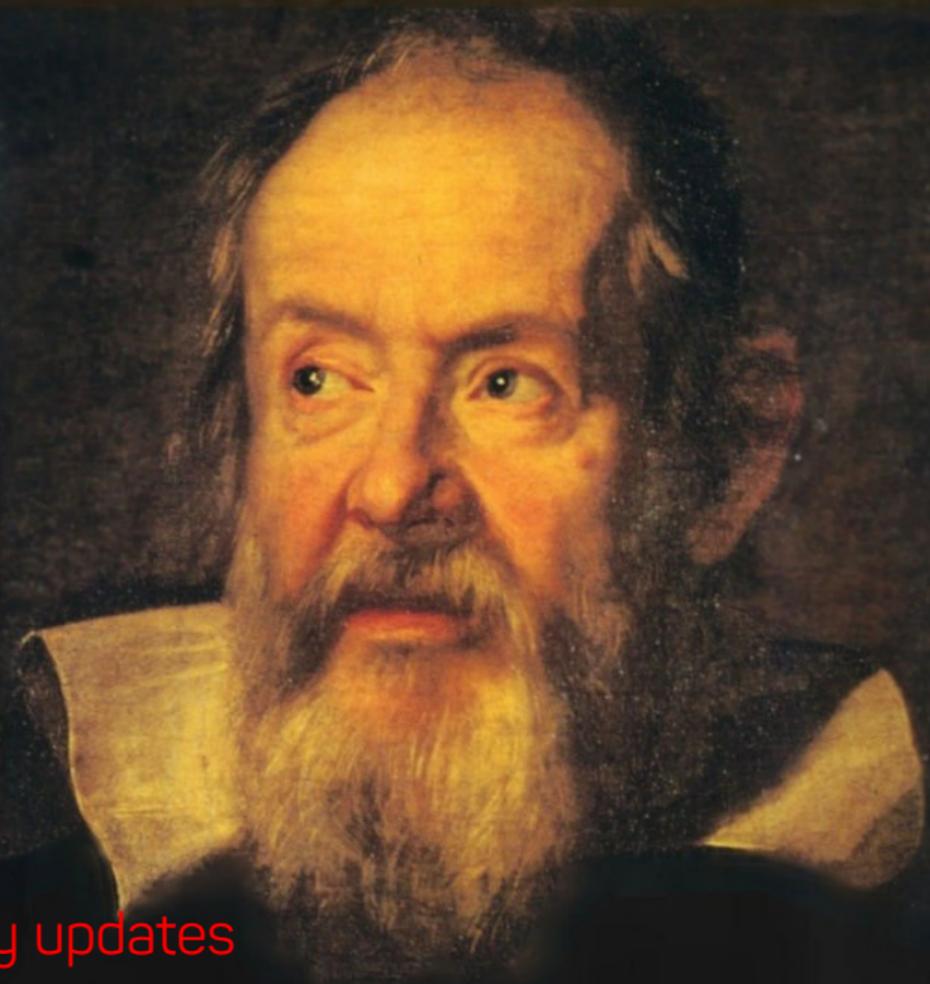


Photo: Copyright ESA-Pierre Carril, 2015

GPS outage  $\approx$  \$1 billion per day  
Europe:  $\approx$  6-7% of GDP

1 week outage caused by security updates



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# Communication Infrastructure

built on sand



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# Communication Infrastructure

built on sand -- but we can fix it



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