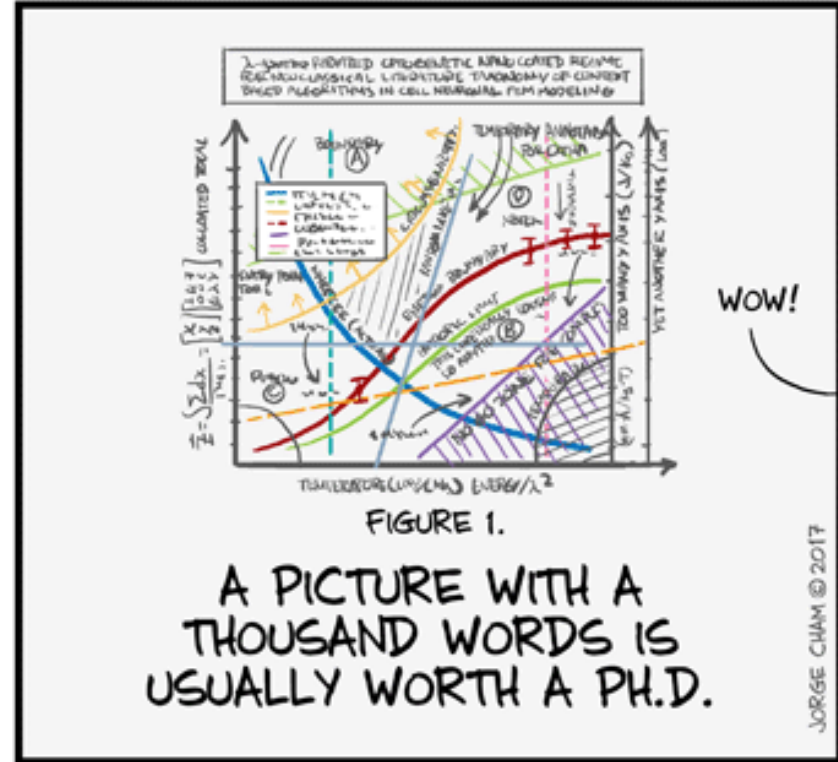
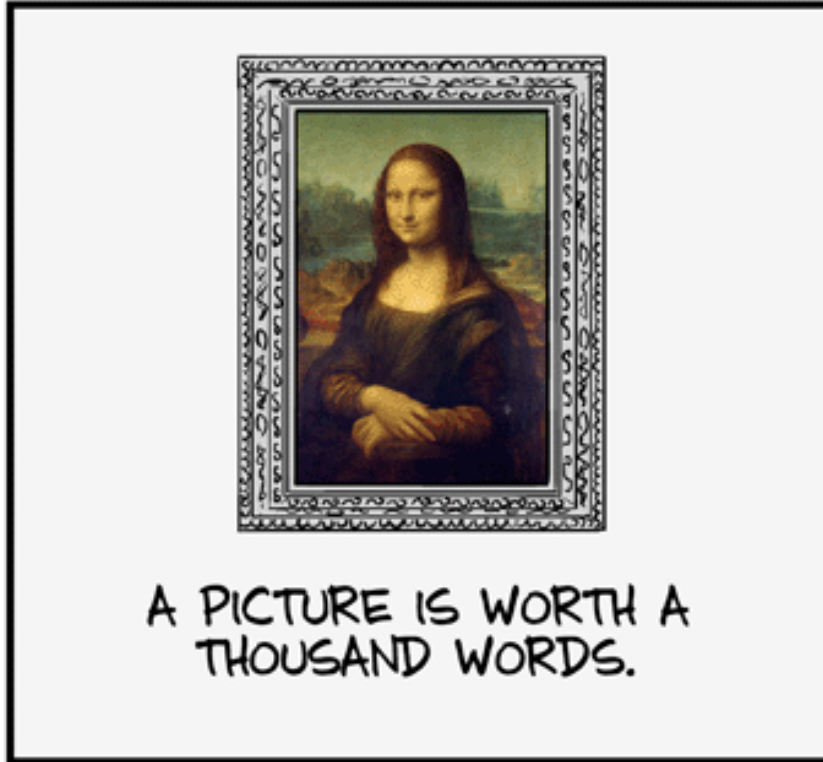


**IFIP WG 10.4 – PORTUGAL 2023 – BEHROOZ SANGCHOLIE**

# **Analysis of the Interplay between dependability and security attributes**

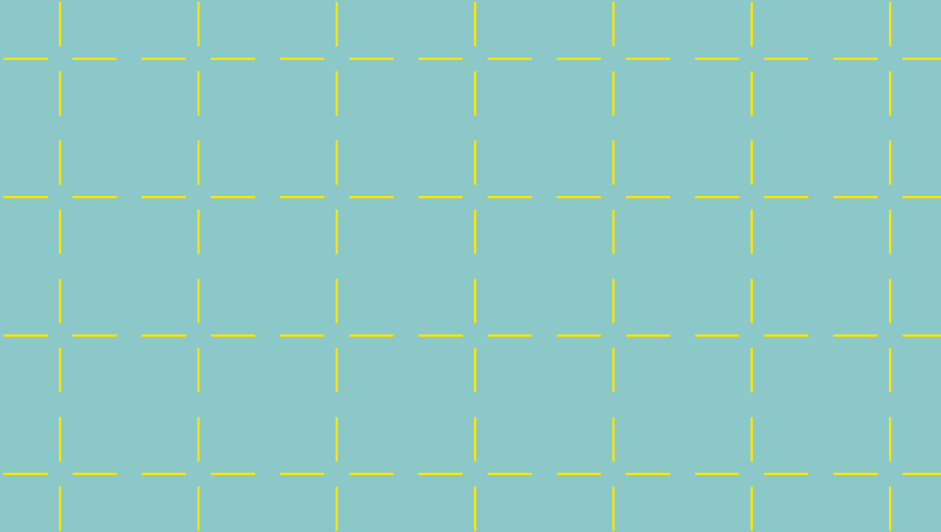
**Research report**

# TRUISMS



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# Analysis of the Interplay between *dependability and security attributes*

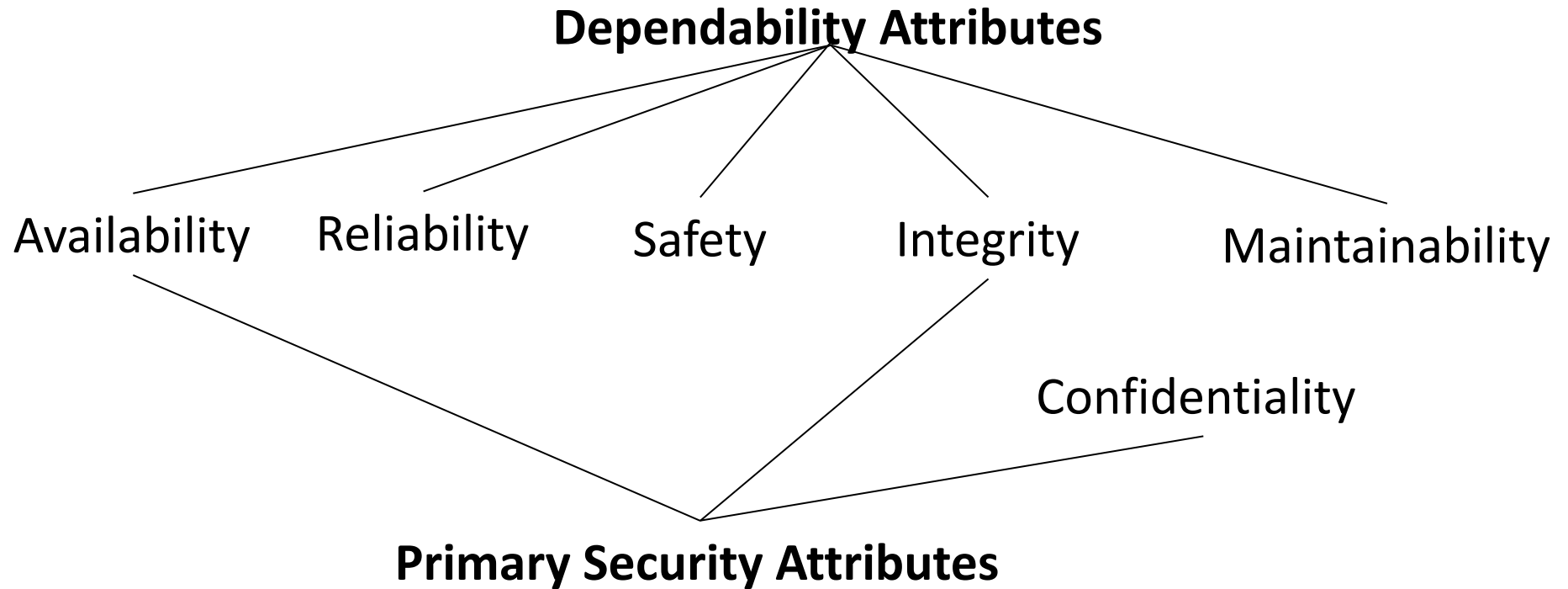
# Basic Concepts and Taxonomy of Dependable and Secure Computing

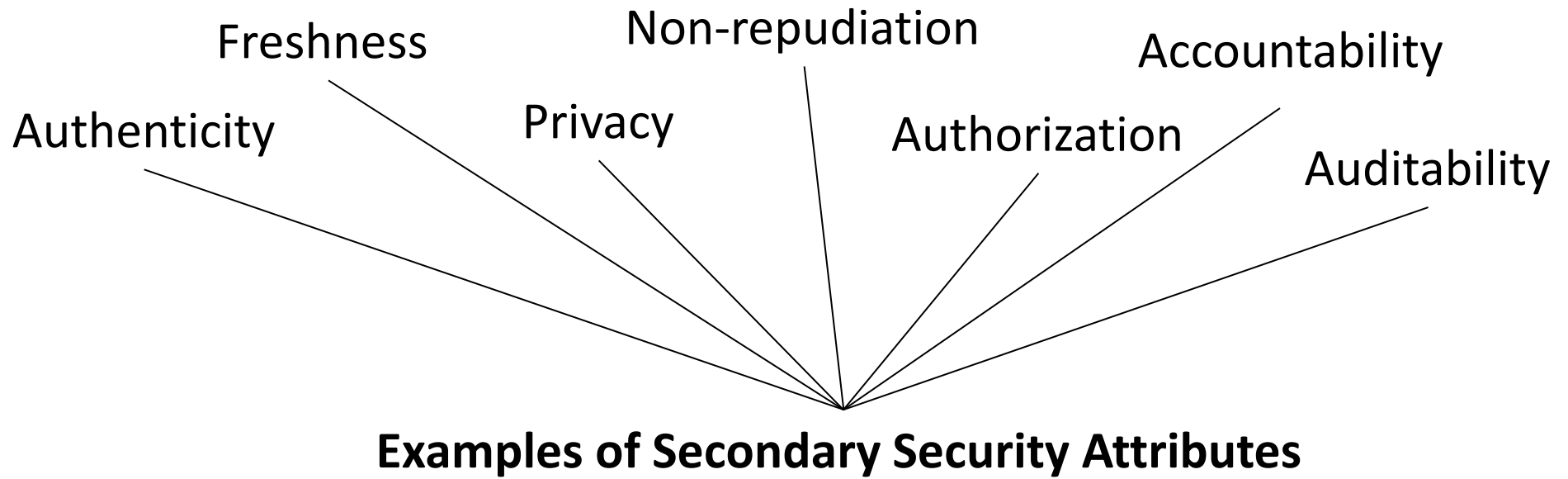
Algirdas Avižienis, *Fellow, IEEE*, Jean-Claude Laprie,  
Brian Randell, and Carl Landwehr, *Senior Member, IEEE*

**Abstract**—This paper gives the main definitions relating to dependability, a generic concept including as special case such attributes as reliability, availability, safety, integrity, maintainability, etc. Security brings in concerns for confidentiality, in addition to availability and integrity. Basic definitions are given first. They are then commented upon, and supplemented by additional definitions, which address the threats to dependability and security (faults, errors, failures), their attributes, and the means for their achievement (fault prevention, fault tolerance, fault removal, fault forecasting). The aim is to explicate a set of general concepts, of relevance across a wide range of situations and, therefore, helping communication and cooperation among a number of scientific and technical communities, including ones that are concentrating on particular types of system, of system failures, or of causes of system failures.

**Index Terms**—Dependability, security, trust, faults, errors, failures, vulnerabilities, attacks, fault tolerance, fault removal, fault forecasting.









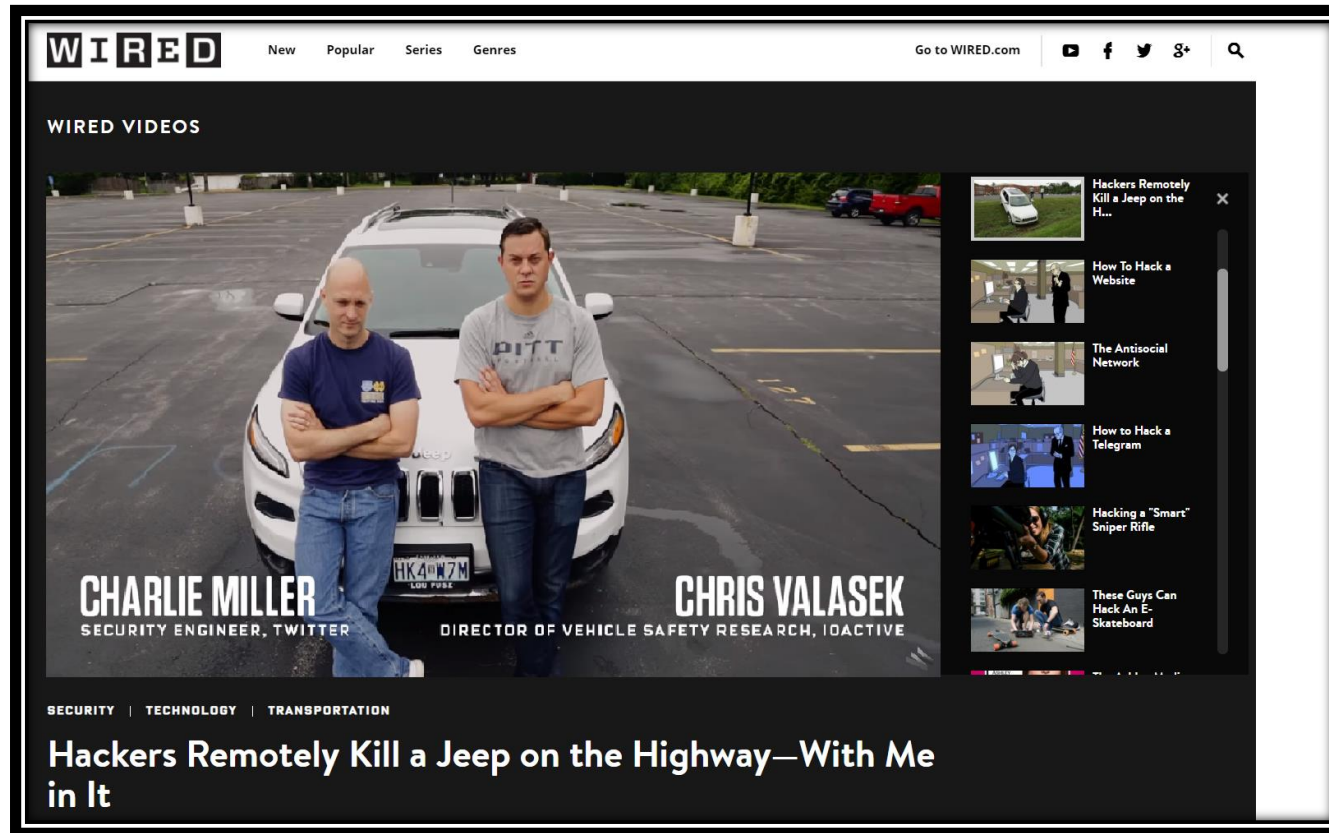
# Analysis of the *Interplay* *between* dependability and security attributes

# The way in which the means to obtain dependability and security affect each other

**Interplay between dependability and security**



# Wired (2015)



# The Guardian (2016)

## Team of hackers take remote control of Tesla Model S from 12 miles away

Chinese researchers were able to interfere with the car's brakes, door locks and other electronic features, demonstrating an attack that could cause havoc



▲ Now that cars such as Tesla's are increasingly high-tech and connected to the internet, cybersecurity has become as big an issue as traditional safety features. Photograph: Jim Dyson/Getty Images

# BBC (2016)

## Mitsubishi Outlander hybrid car alarm 'hacked'

6 June 2016

f WhatsApp Twitter Email Share



Car alarm hacked via wi-fi

# Associated Press (2020)

## German hospital hacked, patient taken to another city dies

September 17, 2020



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BERLIN (AP) — German authorities said Thursday that an apparently misdirected ransomware attack caused the failure of IT systems at a major hospital in Duesseldorf, and a woman who needed urgent admission died after she had to be taken to another city for treatment.

The woman's death appeared to be the first resulting from a ransomware attack, even if indirectly so.

The Duesseldorf University Clinic's systems have been disrupted for a week. The hospital said investigators have found that the source of the problem was a hacker attack on a weak spot in "widely used commercial add-on software," which it didn't identify.

As a consequence, systems gradually crashed and the hospital wasn't able to access data; emergency patients were taken elsewhere and operations postponed.



# Wired (2021)

## A Hacker Tried to Poison a Florida City's Water Supply, Officials Say

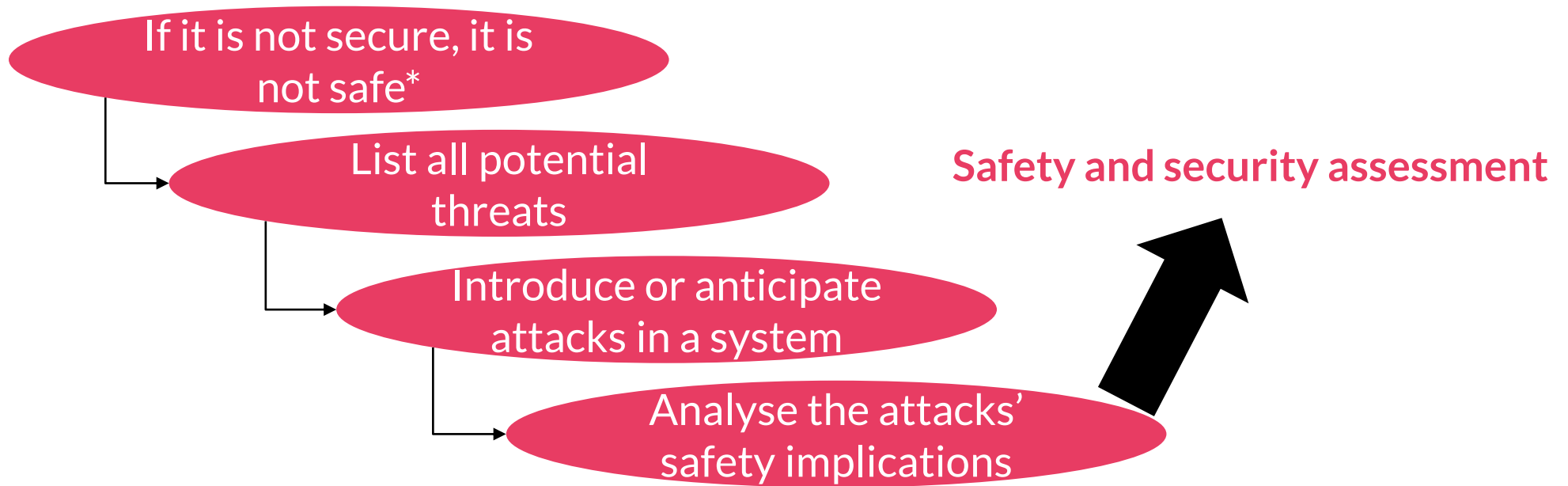
The attacker upped sodium hydroxide levels in the Oldsmar, Florida, water supply to extremely dangerous levels.





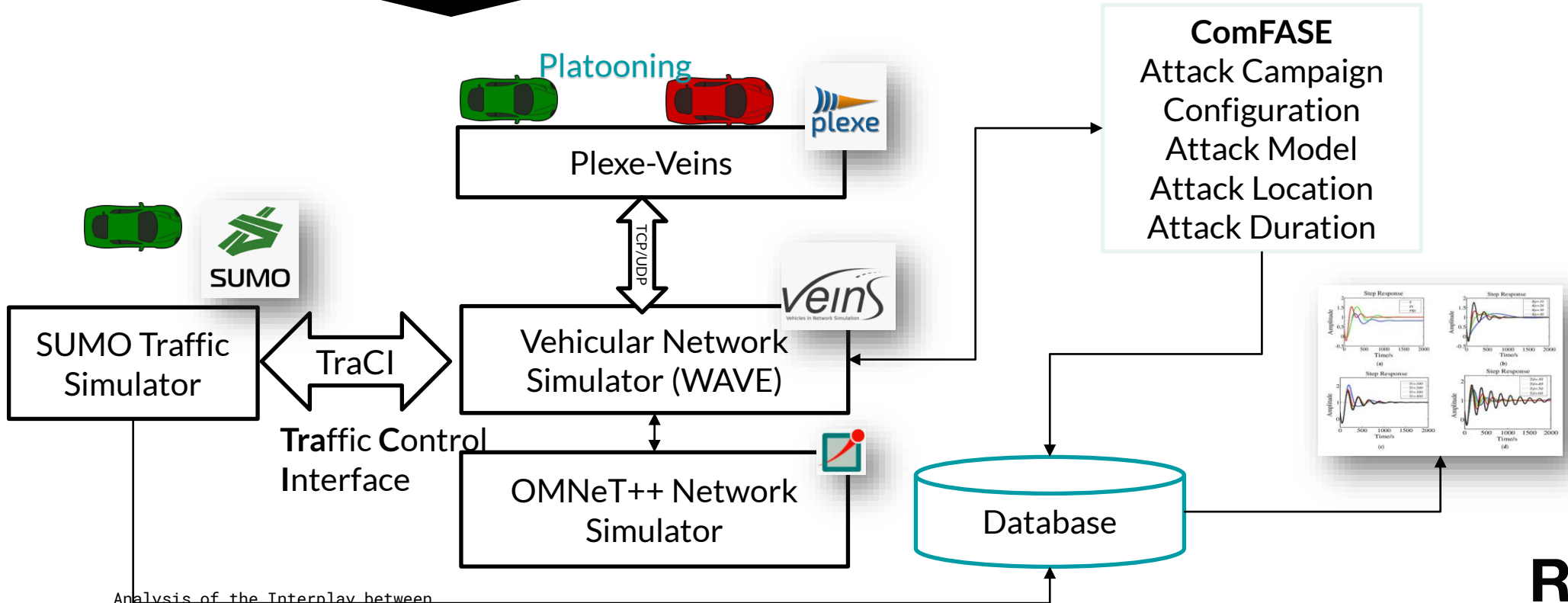
# *Analysis* of the Interplay between dependability and security attributes





\* Bloomfield, R., Netkachova, K., Stroud, R. (2013). Security-Informed Safety: If It's Not Secure, It's Not Safe. In: Gorbenko, A., Romanovsky, A., Kharchenko, V. (eds) Software Engineering for Resilient Systems. SERENE 2013. Lecture Notes in Computer Science, vol 8166. Springer, Berlin.

# Example-1: fault and attack injection



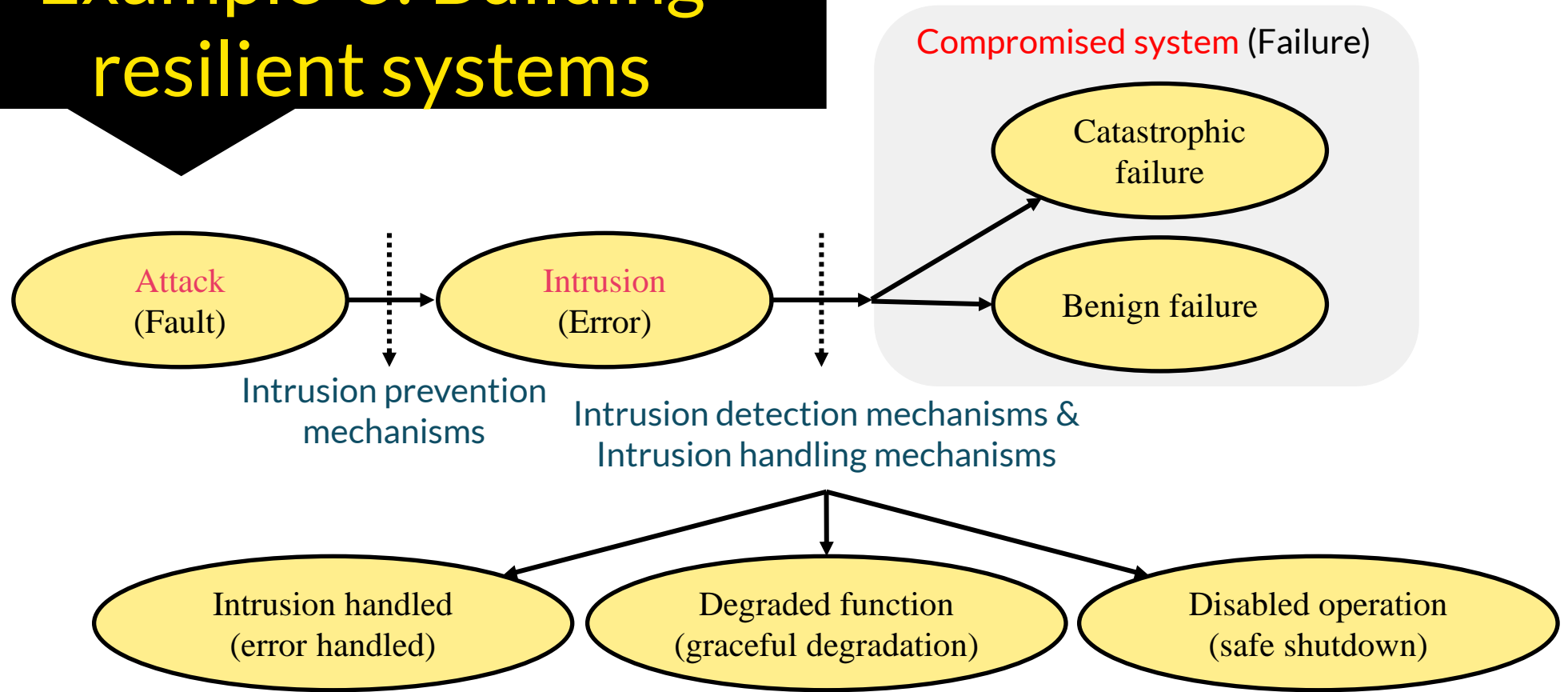


# Example-2: Analysis of security mechanisms

Mechanism	Prevention	Detection	Handling
access control	✓		
authentication control	✓		
device authentication	✓		
firewalls	✓		
virtual network	✓		
encryption	✓		
virtual private network	✓		
log auditing		✓	
intrusion detection/prevention systems		✓	✓
virus/malicious code detection systems		✓	✓
vulnerability scanning	✓		
Host Configuration Management (HCM) and Automated Software Management (ACM) tools			✓
operating systems	✓	✓	✓
web technologies	✓		
physical security controls	✓		
signatures	✓	✓	
partitioning and separation	✓		

\* Discussed in: IEC 62443, SESAMO, OWASP, NIST SP 800-53

# Example-3: Building resilient systems



# VALU3S Demo session

## Verification and Validation of Automated Systems' Safety and Security



Tuesday, June 27

Wednesday, June 28

Thursday, June 29

Friday, June 30

9:00 - 9:30	JCL Award			Hall Árabe
9:30 - 10:30	Keynote 2: Evgenia Smirni			
10:30 - 11:00	Coffe Break			Pátio das Nações
	Hall Árabe	Room Assembleias Gerais	Room Dourada	
11:00 - 12:30	RT-6: Memory 2	RT-7: Network Security & Privacy	BSELSE	VALU3S DEMOS
12:30 - 14:00	Lunch			
	Hall Árabe	Room Assembleias Gerais	Room Dourada	Room Retratos
14:00 - 15:30	RT-8: Machine Learning	RT-9: Obfuscation	D23-3: Networks and Intrusion Detection Systems	IT-3: Testing
15:30 - 16:00	Coffe Break			
16:00 - 17:30	RT-10: Cyberphysical Systems	RT-11: Virtualization	D23-4: Hardware Resilience and Human Factors	IT-4: Security and Error Resiliency
18:00 - 22:00	<b>Excursion + Banquet</b> 18h00 – Boarding at <a href="#">Estiva dock (Porto)</a> 19h00 – Deboarding at <a href="#">Rota do Douro dock, Vila Nova de Gaia</a> 19h30 – Banquet at <a href="#">Casa Ferreirinha</a>			

# VERDI workshop

## Workshop on Verification & Validation of Dependable Cyber-Physical Systems



Tuesday, June 27

Wednesday, June 28

Thursday, June 29

Friday, June 30

Local Time (UTC+1)	Workshops					Tutorials			
	DCDS	SSIV	DSML	AxC	VERDI	T1	T2	T3	T4
	Retratos	Tribunal	Árabe	Dourada	Assembleias	Presidente		Galeria	Reuniões
8:30 - 9:00	Registration								
9:00 - 10:30	DCDS-1	SSIV-1	DSML-1	AxC-1	VERDI-1	Tut1-s1			
10:30 - 11:00	Coffee Break								
11:00 - 12:30	DCDS-2	SSIV-2	DSML-2	AxC-2	VERDI-2	Tut1-s2		Tut3-s1	
12:30 - 14:00	Lunch								
14:00 - 16:00	DCDS-3	SSIV-3	DSML-3	AxC-3	VERDI-3	Tut2-s1		Tut3-s2	Tut4-s1
16:00 - 16:30	Coffee break								
16:30 - 18:30	DCDS-4	SSIV-4	DSML-4	AxC-4	VERDI-4	Tut2-s2			Tut4-s2
19:30 - 21:30	Welcome reception								