

Curriculum Vitae of *Davide Berardi*

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1 Personal Information

- Birthplace: Redacted Redacted (Redacted) (Redacted).
- Birthdate: Redacted.
- Residence: Redacted, 40054 Budrio (BO) (IT).
- Nationality: Italian.

2 Contact Details

Domicile Redacted, 40054 Budrio (BO) (IT).

Work Contact DISI – Dipartimento di Informatica Scienza e Ingegneria — Alma Mater Studiorum — Università degli Studi di Bologna.

URL berardi.dav@gmail.com <http://cs.unibo.it/~davide.berardi6/>

3 Qualifications

Jun.2022 Ph.D. – Computer Science and Engineering Alma Mater Studiorum — University of Bologna.

Dec.2016 Master Degree – Computer Science Alma Mater Studiorum — University of Bologna.

Thesis title: Design and development of improved versions of VirtualSquare projects based on the new services offered by the Linux kernel. (Progettazione e realizzazione di versioni evolute dei progetti di VirtualSquare basate sui nuovi servizi forniti dal kernel Linux).

Grade 110/110 cum Laude.

Nov.2013 Bachelor Degree – Computer Science Alma Mater Studiorum — University of Bologna.

Thesis title: Porting of the partial virtual machine UmView on the Android operating system (ARM) (Porting della macchina virtuale parziale UmView su sistema operativo Android ARM).

Grade 102/110.

Sep.2009 High School Diploma Technical institute ITIS “G.Bruno” — Viale I Maggio, 40054, Budrio, (BO), Italy.

Grade 84/100.

3.1 Optional Courses

During the discourse of my education and studies I’ve followed various optional courses, distributed between internal courses and Summer / Winter Schools.

2024 Lead Advisor of ISO 27001
Offered by: Online – we-learn.

2020 Security and Cyber Range
Offered by: Winter School – Università degli Studi di Trento.

2020 The network softwarization revolution: NFV, SDN, Intent interfaces and 5G
Offered by: DISI – Department of Computer Science and Engineering – Alma Mater Studiorum — Università degli Studi di Bologna.

2020 Cybersecurity foundations and research challenges
Offered by: DISI – Department of Computer Science and Engineering – Alma Mater Studiorum — Università degli Studi di Bologna.

- 2020** Models And Languages For Service-Oriented And Cloud Computing
Offered by: DISI – Department of Computer Science and Engineering – Alma Mater Studiorum — Università degli Studi di Bologna.
- 2019** Machine Learning and Security
Offered by: Summer School – Università degli Studi di Padova.
- 2019** Probabilistic Data Structures and their applications in security and privacy
Offered by: DISI – Department of Computer Science and Engineering – Alma Mater Studiorum — Università degli Studi di Bologna.
- 2015** Architectures and Protocols for Space Networks
Offered by: DISI – Department of Computer Science and Engineering – Alma Mater Studiorum — Università degli Studi di Bologna.
- 2015** Number-Theory’s Algorithm and Cryptography
Offered by: Department of Mathematics – Alma Mater Studiorum — Università degli Studi di Bologna.
- 2013** Virtual System Project
Offered by: DISI – Department of Computer Science and Engineering – Alma Mater Studiorum — Università degli Studi di Bologna.
- 2012** Laboratory of System Administration
Offered by: DISI – Department of Computer Science and Engineering – Alma Mater Studiorum — Università degli Studi di Bologna.

4 Study and Work Experience

The research activity of Davide Berardi started in 2016 with the OpenNext regional project in T3LAB consortium¹. Davide worked simultaneously in the private scenario and on the research projects, developing innovative solutions based on GNU/Linux operating system. After two years of work in T3LAB, he moved to Alma Mater Studiorum – Università degli studi di Bologna, to continue his studies as a Ph.D. student. He chose to focus on Network Security, under the supervision of Franco Callegati and Marco Prandini of his Alma Mater department, Department of computer science and engineering (D.I.S.I). Davide followed his three years of Ph.D. with a sponsorship and a collaboration from Obsidium S.R.L., an Italian company which main business is Penetration test, red teaming, malware analysis, and secure infrastructure development.

Today Researcher (RTT, tenure track) Universitas Mercatorum

SSD: ING-INF/05 I am a Tenure Track Researcher at Universitas Mercatorum. Focusing on cybersecurity and analysis of industrial protocols. I focus on the research of secure machine learning, secure operating system and secure networks for industrial automation (i.e. I5.0).

Today Computer Engineering Consultant Consultant

Consultant of Computer Security, system administration and firmware design I work as security consultant for various customers. I focus on Operational Technology security problems, network security flaws, and secure firmware design. My work is mainly centered on ensuring the security of embedded devices.

Feb.2024 Co-Founder and Stakeholder MON5 S.R.L.

Co-Founder and Stakeholder of MON5 Startup Inside the startup I follow the entire (technical) lifecycle of the products. The main goal of the startup is the creation of a Industrial-Systems monitoring platform for security purposes. That is, we focus on the monitoring of OT systems such as PLCs and CNC machines.

¹A Technology Transfer consortium backed by the University of Bologna and Confindustria, the General confederation of Italian industries.

Mar.2023 Research Fellow Alma Mater Studiorum – University of Bologna

Computer Science and Engineering In my research path I focused on the analysis of security of time-constrained systems such as safety related systems. This includes the analysis of protocols related to time synchronization such as TSN and PTP. Also I've analyzed more in details the Industrial protocols and cooperation methods.

Jun.2022 Ph.D. Student Alma Mater Studiorum – University of Bologna

Computer Science and Engineering My research topic is focused on the security of emerging network infrastructures, such as SDN and NFV. I have explored the field of industrial network security like TSN standard and PTP protocol. Other research interest are: Network Security, System Security, penetration test, virtualization technologies (network and system), and embedded systems engineering.

In the course of this study I have followed a list of ancillary projects:

- **2020** Local Chair of Microservices 2020 conference.
- **2018-2021** Member of ULISSE CTF team. During Jeopardy CTFs I tend to focus on PWN and Misc challenges. During Attack Defense CTFs I play as a sysadmin / defense role. *Technologies:* ghidra, IDA, pwntools, GNU/Linux, Firewalls
- **2018-2021** Member of ADMStaff system administration Team. I administer a little set of machines, not strictly related to security. *Technologies:* GNU/Linux, OpenBSD, Terraform, Ansible, vagrant, Cloud platforms (AWS, Hetzner)
- **2019-2021** Management and deploy of a student A.I. competition machine. The machine runs the code of 30+ students, constraining it in a security sandbox. *Technologies:* Nested VM, libvirt, GPU pass-through, IOMMU.
- **2018-2021** Management and deployment of a high availability cluster with cloud computing, serverless and CTF scenarios to test attacks. *Technologies:* DRBD, KVM, PXE, NFS, Proxmox.
- **2019-2021** : Collaboration with CISPA Hemholtz center for information Security, under the local supervision of the professor Nils Ole Tippenhauer on the theme of Industrial Protocols (Fieldbus) Security.

Nov.2020 Security Engineer Obsidium S.R.L. – Via Antonio Canova 3, Bologna, Italy

Development of infrastructure for penetration test control and malware reverse engineering. I've developed various infrastructure (hardware and software) to control the employee during penetration tests in high risk systems. I've also done a Malware Reverse task with a malware which was used in the wild. Mainly, my task focus on the internal and external network penetration test, wireless penetration test and industrial machine testing.

Jun.2021 Examiner Alma Mater Studiorum – Università di Bologna Bologna, Italy National engineer exam (Computer Engineer) I have examined candidates to the profession of Computer Engineer. The candidates (mainly master graduates in Computer Engineering and Computer Science), were describing one complex computer engineering experience for c.a. 20 minutes. Then the candidate were supposed to ask some questions on Computer Security, Algorithms, Software Engineering, Operating Systems, Computer Networks, Databases or Web Technologies.

Mar.2021 Reverse Engineering Expert T3LAB Bologna, Italy Reverse engineer I have done a reverse engineer test of an internal application, the license generator for the software was missing and my task was to run the software in a virtual machine. I've adapted the Windows based software to a wine virtual machine and made it redistributable.

Aug.2020 Basic vulnerability Assessor Self-employed Remote Vulnerability assessor I have done a vulnerability assessment for a company which manages the electricity contracts of many agencies of north of Italy. While the assessment has not retrieved sensitive data, we managed to discover the correct handling of the database and the correct use of server-side frameworks.

May.2019 Firmware Engineer (CCNL Metallmeccanico) Consorzio T3LAB Via Sario Bassanelli 9-11, 40129, Bologna (BO), Italy Firmware Engineer

- **Linux** kernel development, drivers and network protocols; Application developer for multi-many core systems; Real time systems (**FreeRTOS**, **SYS/BIOS**); AMP applications;
- Development and maintenance of a network of systems to support developer's work (External access through **VPN**, **GitLab**, Continuous integration with **Jenkins**, Backup and disk management, internal services maintenance, account security).
- Security developer (cryptography for logins and embedded system protocols; development of anti-tampering solutions for desktop and embedded applications).

Nov.2015 System Administrator Laboratori Marconi Via Porrettana 123, 40037,Pontecchio Marconi (BO), Italy Internship (Master degree in Computer Science) 150 hours internship as system and network administrator in the network and security team.

Main tasks: **bash**, **perl5** and **python** (2.7 and 3) scripting; administration of system and networks; penetration testing and security assessment of existing systems and network infrastructures.

5 Research Activity

Davide Berardi has took part in various national projects, mainly focused on the local industrial development (e.g. Industry 4.0). Starting from industrial virtualization and segmentation technologies on multi-many core systems, he moved to secure networking and network virtualization in University. These topics includes the emerging network technologies such as network virtualization (SDN, NFV, 5G MEC), network adaptive configuration (P4), and security of high-performance network protocols for industry (TSN / PTP, OPC-UA).

5.1 Bibliometric Indicators

On Google Scholar Database², in date 31 May 2024, were classified citations to papers with Davide Berardi as Author or Co-Author. The resultant H-Index is therefore .

5.2 Synthesis of research themes

The research activity of Davide evolved during the period of his studies, starting from operating system segmentation to gain real-time performances on general purpose systems.

Research on the Security of Emerging Network Technologies, focusing on the ones that can be performed in industrial scenarios. This is the main research topic, ranging from cloud-related infrastructures such as Software Defined Networking, Microservices and Network Function Virtualization. The research is focused on the security of these systems, divided between the security value which can be added from the introduction of these and the security implications of systems based on these technologies. A part of this research is dedicated to the analysis of the emerging 5G infrastructure, which will extensively use them as the basis of its network.

Research on the Security of Industrial Network Protocols, which is focused on the analysis of field-bus alternatives such as Ethernet enhancements like Time Sensitive Networking (TSN). These technologies are naturally based on pre-existent and well known protocols such as Precision Time Protocol (PTP). Under these assumptions, backed by academic and industrial research, the research efforts are focused on finding novel uses and exploitations of these technologies.

Research on application and system security, which analyze the aspects of general-purpose systems, with a specific focus on embedded ones. The works done in this area, especially on the analysis of the widespread use of networks and operating systems, such as Unix-like systems and their TCP/IP stacks. One of my work in this area is the analysis of password-reuse, which can lead to complete disruption of pre-described security measures.

²<https://scholar.google.com>

6 Third mission activities

Davide Berardi has taken and takes part in activities related to industrial research themes. These activities are mainly related to the education and update of Industrial realities in the Emilia-Romagna region. After taking part in a working team of the high technology laboratory network of the region Emilia-Romagna, he focused on a Ph.D. strongly centered on industrial realities, collaborating with industries, research laboratory and training centers for workers. During the Ph.D. studies, he took part in works with his backing company, Obsidium S.R.L., making analysis on how the penetration test in which the company took part can be enhanced. Also, Davide took actively part in the creation of the Company network and system infrastructure, playing a core role in the development of its private-cloud.

6.1 Teaching Experience

Davide developed and taught various courses with various level of details. These courses attendants were various, from courses to Bachelor students of computer science, to courses developed for engineer which works on the field.

Sep.2023 – Today University Mercatorum

Target Students: Bachelor students of Computer Engineering

Length: 1 Academic Year

Professor of Computer Security

The Cyber Security course focus on the analysis of students theses, analysis of exam questions, recorded lectures and interfacing with students that requests to graduate. During this course I've followed various courses mainly focusing on Operational Technology security and Italian Public Administration security.

Apr.2023 – Apr.2023 University Mercatorum

Target Students: Ph.D. students.

Length: 3 hours

Webinar in the Ph.D. course of Big Data and Artificial Intelligence

Technologies for Industry 5.0 for Ph.D. students. The main topics explored were:

- Digital Twin virtualization
- Containerization
- Network Slicing

Sep.2022 – Today University Mercatorum

Target Students: Bachelor students of Computer Engineering and Webinars for Ph.D. students.

Length: 2 Academic Years

Tutor of Software Engineering

Software Engineering course is presented to the students with recorded lectures. I've followed the part of the course which focus on CI/CD and DevOps. The main topics explored were:

- git
- docker
- ansible
- terraform

Sep.2023 – Feb.2024 Alma Mater Studiorum – Università degli studi di Bologna

Target Students: Bachelor Students of Computer Science

Length: 1 Academic Year

Professor of Cybersecurity

The Cybersecurity course is a complete refactoring of the previous edition. It presents lectures on modern thematics such as: Reverse Engineering with Ghidra and Assembly analysis; Network Anonymization; Memory Corruption attacks and modern countermeasures such as PAC; Cryptography. The course also contains a laboratory exercise for each theme.

Sep.2022 – Sep.2023 Alma Mater Studiorum – Università degli studi di Bologna

Target Students: Studenti iscritti alla triennale di Informatica

Length: 1 Academic Year

Academic Tutor Accademico of Operating System

Operating systems is an exam that contains a project. The project I followed covers the creation of a Kernel with modern capabilities such as Namespaces and real time management of clocks. The grade of such exercise is assigned by analyzing the performance of the system and how well it was written.

Feb.2023 – Mar.2023 Sicurform Italia Group S.R.L.

Target Students: High school students, Undergraduate students and Graduate students

Length: 24h

Teacher of Python Programming

The course, financed by Regione Emilia Romagna, is an introduction to the technology used to analyze data with Python programming language. It starts with the basis of programming such as UML and Flow Charts, then it continues with the Python language and ends with an introduction to statistics and analysis of data with Machine Learning Libraries such as Tensorflow.

Nov.2022 – Dec.2022 Datalogic S.P.A. (Fondazione Alma Mater)

Target Students: Embedded Systems Engineers (Ranging from Master Graduated students in Computer / Electronic Engineering to Graduated students)

Length: 32h

Teacher of advanced Linux Embedded systems

The course was a deep overview (32 hours) of the main features of the Linux kernel useful for real time systems and various userspace counterparts. I have made the entire course as the only teacher. The arguments I have taught were:

- Linux kernel scheduler's policies and co-kernels for real time systems (FIFO, RR, DEADLINE, Xenomai, RTAI);
- Linux kernel and userspace Debug and profiling strategies (perf, bpf-tools, gdb, kernel tracepoints, etc.).
- Linux build and customization through yocto.
- Linux modules and GPIO/interrupt management.
- Linux Thread and kernel synchronization (mutex, semaphores, RCU).

Oct.2022 – Dec.2022 Alma Mater Studiorum – Università degli studi di Bologna

Target Students: Master degree students of Advanced Automotive Engineering

Length: 25h

Adjunct Professor of Real Time Operating Systems

The course (in English language) describes the main technologies which are employed to create Real Time Operating Systems such as FreeRTOS. It highlights also the difference with General Purpose Operating Systems such as Linux.

Aug.2021 – Aug.2022 Alma Mater Studiorum – Università degli studi di Bologna

Target Students: Bachelor students of Computer Science

Length: 36h

Academic Tutor of Cybersecurity course

The cybersecurity course is composed of five laboratory exercises which spans over 36 hours. The exercises have been executed by the students after five lectures in which the problem was exposed and how the students should resolve it. I covered the creation of a set of virtual machines to do the exercises; helping the students during this period; the valuation of the final reports (60% of the final grade); exams supervision. The exercises covered these themes:

- Cryptography (gpg, openssl and certificates)
- One time password

- Firewall (iptables)

Oct.2021 – Oct.2021 Experis Academy (Manpower Group)

Target Students: Master Graduated students in Computer / Electronic Engineering

Length: 36h

Teacher of Automotive development and Security

The course was a deep overview (36 hours) of the main mechanism of software development for automotive engineering. The arguments I have taught were:

- MISRA C software development and why automotive engineering needs it.
- Operating Systems process scheduling and real examples with Linux and FreeRTOS.
- Network protocols such as CAN-BUS, Ethernet, IP, TCP, UDP, etc.
- Cyber Security with practical examples.

This work was a spinoff of my Ph.D. studies.

Mar.2021 – Jul.2021 Volunteer for University of Bologna and Consorzio CINI

Target Students: Graduate, Undergraduate and High School students

Length: $5 \cdot (3+3)h = 24h$

Tutor and Teacher for CyberChallenge security contest

The course is a deep overview of the main topics of Cyber Security and CTF competitions. I've followed and selected a team of 20 participants and prepared 6 of them for the national finals, where we got the fifteenth place against 33 other Universities. My lectures were composed of four modules (3 hour of theory and 3 hours of practical Laboratory per module) on Application Security (PWN, two modules), Reverse engineering, network security and Hardware Security, revisiting CINI reference material.

Aug.2020 – Aug.2021 Alma Mater Studiorum – Università degli studi di Bologna

Target Students: Bachelor students of Computer Science

Length: 36h

Teaching assistant of Computer Security course

The computer security course includes five laboratory exercises. These exercises were executed by students after five lectures which I prepared and presented in class. Mine tasks included the creation of the virtual machine for the laboratory; the help to students during the exercises; the analysis of the final report (60% of the final grade); supervision of exams. The exercise themes were the following:

- Cryptography (gpg, openssl and certificates)
- One time passwords
- Firewalls (iptables)

Oct.2020 – May.2021 Datalogic S.P.A. (Fondazione Alma Mater)

Target Students: Embedded Systems Engineers (Ranging from Master Graduated students in Computer / Electronic Engineering to Graduated students)

Length: 24 / 32h

Teacher of advanced Linux Embedded systems

The course was a deep overview (32 hours) of the main features of the Linux kernel useful for real time systems and various userspace counterparts. I have made 24 hours of the 32 total of the course. The arguments I have taught were:

- Linux kernel scheduler's policies and co-kernels for real time systems (FIFO, RR, DEADLINE, Xenomai, RTAI);
- Linux kernel and userspace Debug and profiling strategies (perf, bpf-tools, gdb, kernel tracepoints, etc.).
- Linux build and customization trough yocto.
- Linux modules and GPIO/interrupt management.

- Linux Thread and kernel synchronization (mutex, semaphores, RCU).

This work was a spinoff of my Ph.D. studies.

Mar.2020 – Jul.2020 Volunteer for University of Bologna and Consorzio CINI

Target Students: Graduate, Undergraduate and High School students

Length: $4 \cdot (2+4)h = 24h$

Tutor and Teacher for CyberChallenge security contest

The course is a deep overview of the main topics of Cyber Security and CTF competitions. I've followed and selected a team of 20 participants and prepared 6 of them for the national finals, where we got the fifth place against 28 other Universities. My lectures were composed of four modules (2 hour of theory and 4 hours of practical Laboratory per module) on Application Security (PWN, two modules), Reverse engineering and Hardware Security, revisiting CINI reference material. These lessons are publicly available on Youtube. In Italian language: <https://www.youtube.com/watch?v=4u7-c07LVVU>.

Feb.2019 – Jun.2020 University of Bologna

Target Students: Undergraduate students in Computer Engineering

Length: 90 hours * 2 (Academic year 2018/2019 and 2019/2020)

Volunteer

Subject Expert of the course *Laboratorio di amministrazione di sistemi T* (Laboratory of system administration, responsible professor Marco Prandini) at University of Bologna, faculty of computer engineering My task focused on support 50+ undergraduate students which was following the laboratory, focused on the administration of GNU/Linux systems and VirtualBox virtual machines.

Mar.2019 – Jul.2019 Volunteer for Alma Mater Studiorum and Consorzio CINI

Target Students: Graduate, Undergraduate and High School students

Length: $4 \cdot 4 + 2h = 18h$

Tutor and Teacher for CyberChallenge security contest

The course is a deep overview of the main topics of Cyber Security and CTF competitions. I've followed and selected a team of 20 participants and prepared 4 of them for the national finals, where we got the second place against 19 other Universities. My lectures were composed of four practical modules (4 hours of practical Laboratory) on Application Security (PWN), and Reverse engineering and a single module on Application Security for dynamic libraries (2 hours, theoretical).

Mar.2019 – Mar.2019 Fondazione Aldini Valeriani (FAV)

Target Students: Undergraduate technical students

Length: 8h

Teacher of Cyber Security

8h course of theoretical and practical Cyber Security essentials for technical students. The course agenda was:

- Cryptography
- ISO 27001
- Network Security
- Firewall, IDS and IPS
- Antivirus
- Application and system security
- Man In The Middle attack (practical)
- Firewall configuration (practical)
- IDS rule writing (practical)

The course was directed to students of technical post-high school course. This experience was a spin-off of the T3Lab one.

Sep.2018 – Dec.2018 University of Bologna

Target Students: Graduate students in Computer Engineering

Length: 80 hours

Volunteer

Subject Expert of the course *Sicurezza dell'informazione M* (Information security, responsible professor Rebecca Montanari) at University of Bologna, faculty of computer engineering. I followed the penetration test part of the course preparing the laboratory and penetration test exercises for 100+ master students.

May.2018 – May.2018 BTicino S.P.A.

Target Students: Embedded Systems Engineers (Ranging from Master Graduated students in Computer / Electronic Engineering to Graduated students)

Length: 16h

Teacher of basic GNU/Linux usages and internals

The course was an overview of the main features of the Linux kernel and the basic usage of the GNU userspace (`gcc`, `bash`, ...), the arguments of the course were:

- Linux kernel schedulers for real time systems;
- Linux kernel forking mechanisms focusing on real time systems;
- `bash` and POSIX `sh` syntax to create scripts;
- Networking: IP routing, IPv6 features;
- Security: Password management, `ssh`;
- Disk-less setup: how to create a disk-less setup for the developers;
- Javascript: package managers and basic concepts.

This experience was a spinoff of the T3Lab one.

May.2018 – May.2018 GD S.P.A.

Target Students: Embedded Systems Engineers (Ranging from Master Graduated students in Computer / Electronic Engineering to Graduated students)

Length: 16h

Teacher of embedded web-server usage and security

The course was an introduction to web-servers focusing on resource-constrained machines like embedded systems. Arguments:

- Recall of network programming in UNIX: sockets, `SEQ_STREAM`, `SEQ_DGRAM`, ...;
- HTTP-Protocol basics: methods, `POST` vs `GET` for security contexts;
- JavaScript: Basic syntax and usage;
- `duktape`: Implement a basic web application using a server side js on an embedded device;
- Security: `CSRF`, `XSS`, buffer overflow on network applications.

This experience was a spinoff of the T3Lab one.

Mar.2014 – Sep.2015 Centro Guinizzelli

Target Students:

Length: 18 months

Teacher for high school and undergraduate students, of computer science, digital electronics and mathematics.

Main subjects: Computer Architecture, PIC Micro-controllers, C/C++, Algorithms, Operating systems, Computer Security.

7 Software and Patents

During his working and study experiences, Davide has developed software and vulnerabilities which got recognition in the public domain. These research activities do not have related patents but are published with free and / or open-source licenses.

Vulnerabilities (CVEs) During my research I've developed novel attacks which can reduce or bypass the security of various software, mainly hypervisors and network sniffers. While the majority of these vulnerabilities were not enough to be eligible to receive a world-recognized number and classification. The ones listed thereafter are the ones which are recognized globally by the NIST and the CVE agency.

CVE-2020-2703 Oracle VirtualBox Crash and possible privesc with extpack. Released 14 Jan 2020 CVSSv3.0 Base Score: 6.5 CVSS:3.0/AV:L/AC:L/PR:L/UI:N/S:C/C:N/I:N/A:H
URL: <https://www.oracle.com/security-alerts/cpujan2020.html>

CVE-2020-26694 Reserved Unauthenticated Denial of Service of IP Camera. Currently under Embargo. Reserved
Reserved
URL: [Unpublished](#)

8 Teaching Activities

Davide Berardi teaches at University of Bologna and University Mercatorum in Italian and English. The courses are focused on the research activities of Davide. Ranging from Cybersecurity, System Security, Network Security, DevOps, and Operating System design. While academic-level teaching is explicitly not allowed for Ph.D. students, during that period of time he has followed various thesis themes based on the academic course Laboratorio di Amministrazione di Sistemi (Laboratory of System administration). This course, lectured by Professor Marco Prandini³, focuses on the management of non-trivial infrastructures using GNU/Linux and maintaining a multi-user based system. The course has (as for 2021) a conspicuous part of Application and Network Security in it, which enabled the realization of thesis which followed the course and the main research theme of Davide.

8.1 Theses themes

During my Professor and Ph.D. career I have followed more than 71 Theses, distributed between the courses of Computer Science, Computer Engineering, Master Computer Science and Master Computer Engineering. The themes of the theses includes cloud security, network security, system security, system administration, embedded systems, and algorithms.

8.1.1 Co-Supervisor of Master Degree Thesis

2021 Assistant Supervisor of Master Thesis of Jacopo Tamagnini in Computer Engineering, entitled “Progetto e realizzazione di un laboratorio per attività di Penetration Testing, Red Teaming e Blue teaming in ambiente Active Directory”.

2021 Assistant Supervisor of Master Thesis of Amir Al Sadi in Computer Engineering, entitled “Algoritmi di calcolo del delay link per la rilevazione di attacchi in un ambiente SDN integrato ONOS-P4”.

2021 Assistant Supervisor of Master Thesis of Emiliano Ciavatta in Computer Science and Engineering, entitled “Analisi e ricostruzione di flussi TCP con il software Caronte”.

2021 Assistant Supervisor of Master Thesis of Federico Galanti in Computer Engineering, entitled “Analisi dei vettori di attacco alle architetture a Microservizi e definizione delle strategie di contrasto per i Blue Team”.

2020 Assistant Supervisor of Master Thesis of Simone Berni in Computer Science, entitled “Dragonfly: next generation sandbox”. Done in collaboration with: Certego S.R.L.

³<https://www.unibo.it/sitoweb/marco.prandini/en>

8.1.2 Co-Supervisor of Bachelor Degree Thesis

- 2024 Supervisor of Bachelor Thesis of Vittorio Frinquello in Computer Engineering, entitled “Il Phishing e Le Metodologie Di Contrasto Dei Reati Informatici”.
- 2024 Supervisor of Bachelor Thesis of Pasquale Francesco Armenio in Computer Engineering, entitled “Cybercrime E Le Investigazioni Digitali Nelle Forze Di Polizia”.
- 2024 Supervisor of Bachelor Thesis of Marco Pepe in Computer Engineering, entitled “Tecnologia E Sicurezza: L’Autenticità Delle Informazioni”.
- 2024 Supervisor of Bachelor Thesis of Carlo Ermeti in Computer Engineering, entitled “Dal Perimetro Alla Segmentazione: Progettazione Di Reti Sicure Per L’Era Digitale”.
- 2024 Supervisor of Bachelor Thesis of Fiorenzo Criscuolo in Computer Engineering, entitled “Flipper Zero Analisi E Difesa Da Hacking Devices.”.
- 2024 Supervisor of Bachelor Thesis of Gabriele Scifo in Computer Engineering, entitled “Kimera: La Chiave Per Un Nuovo Orizzonte. Progettazione E Sviluppo Di Un Malware Avanzato”.
- 2024 Supervisor of Bachelor Thesis of Gabriele Zullo in Computer Engineering, entitled “Procedure E Tecniche Di Revisione Per Produrre Software Di Qualità: Lo Standard Ieee 1028 - 2008”.
- 2024 Supervisor of Bachelor Thesis of Daniele Rigon in Computer Engineering, entitled “Attacco Contro Un Plc Simatic S7-300”.
- 2024 Supervisor of Bachelor Thesis of Sara Brachetti in Computer Engineering, entitled “Analisi Delle Principali Vulnerabilità Dei Sistemi Operativi: Un Confronto Tra Windows, MacOS E Linux”.
- 2024 Supervisor of Bachelor Thesis of Cristian Pinto in Computer Engineering, entitled “La Sicurezza Informatica Al Tempo Delle Smart Home E Le Possibili Implicazioni (In Termini Di Sicurezza) Del Diffondersi Dell’IoT”.
- 2024 Supervisor of Bachelor Thesis of Giuseppe Rivero in Computer Engineering, entitled “La Sicurezza Informatica Nella Pubblica Amministrazione”.
- 2024 Supervisor of Bachelor Thesis of Simone Giacomarro in Computer Engineering, entitled “Reti Tsn: Sicurezza, Attacchi E Innovazioni Per La Difesa”.
- 2024 Supervisor of Bachelor Thesis of Vincenzo Vitiello in Computer Engineering, entitled “Rischi Digitali In Et  Adolescente:Un’Indagine Sugli Attacchi Informatici Con Particolare Attenzione Ai Furti D’Identit ”.
- 2024 Supervisor of Bachelor Thesis of Riccardo Pellegrini in Computer Engineering, entitled “Le Linee Guida Di Sicurezza Ict Per Le Pubbliche Amministrazioni - La Protezione Dei Dati E Le Possibili Strategie Implementative”.
- 2024 Supervisor of Bachelor Thesis of Davide Ragusi in Computer Engineering, entitled “Analisi, Crescita E Sviluppo Dei Malware”.
- 2024 Supervisor of Bachelor Thesis of Luca Masiello in Computer Engineering, entitled “Gli Attacchi Microarchitetturali E Le Contromisure Di Sel4”.
- 2024 Supervisor of Bachelor Thesis of Saverio Petrangelo in Computer Engineering, entitled “Analisi Della Visibilit  Ai Fini Di Sicurezza Nelle Piattaforme Di Cloud Computing”.
- 2024 Supervisor of Bachelor Thesis of Milena Pittaro in Computer Engineering, entitled “Cybercrime, Big Data E Privacy: Studio Dei Fenomeni In Ambito Sanitario.”.
- 2024 Supervisor of Bachelor Thesis of Giovanni Improta in Computer Engineering, entitled “Denial Of Service: Analisi E Varianti Degli Attacchi Di Interruzione Del Servizio”.

- 2024** Supervisor of Bachelor Thesis of Valerio Ventura in Computer Engineering, entitled “Sicurezza Informatica Nelle Piattaforme Videoludiche”Il Progresso Tecnologico Apre Le Porte Agli Attacchi Informatici””.
- 2024** Supervisor of Bachelor Thesis of Michele Catalano in Computer Engineering, entitled “Le Criticità Strutturali Nella Sicurezza Dei Moderni Processori E L’Attacco Pacman.”.
- 2024** Supervisor of Bachelor Thesis of Giancarlo Tassone in Computer Engineering, entitled “Sicurezza Dei Sistemi Operativi”.
- 2024** Supervisor of Bachelor Thesis of Vito Sbano in Computer Engineering, entitled “Vincenzo Cyber Security: Advanced Persistent Threat (APT) Come Agisce, Come Difendersi”.
- 2024** Supervisor of Bachelor Thesis of Carmine Mastroianni in Computer Engineering, entitled “Analisi E Miglioramento Della Sicurezza Nei Framework Quarkus E Angular: Applicazione Dei Principi Di Sicurezza Informatica.”.
- 2024** Supervisor of Bachelor Thesis of Luigi Serio in Computer Engineering, entitled “Evoluzione E Sicurezza Delle Reti IT/OT/IIoT E 6G”.
- 2024** Supervisor of Bachelor Thesis of Mariapina Restaino in Computer Engineering, entitled “Generazione Di Attacchi Avversari Per I Test E Il Potenziamiento Dei Sistemi Di Rilevamento Delle Intrusioni Utilizzando L’Adversarial Machine Learning”.
- 2024** Supervisor of Bachelor Thesis of Mario Ferrara in Computer Engineering, entitled “La Cyber Security: Una Nuova Sfida Per Le Aziende”.
- 2024** Supervisor of Bachelor Thesis of Salvatore Lucchese in Computer Engineering, entitled “Enrico Sicurezza E Privacy Nell’Era Dell’Iot E Del Cloud Computing: Gestione Sicura Dei Dati”.
- 2024** Supervisor of Bachelor Thesis of Federico Cardilicchia in Computer Engineering, entitled “Data Breach: Strategie Di Difesa E L’Importanza Dell’Adozione Di Soluzioni Data Loss Prevention In Ambito Aziendale.”.
- 2023** Supervisor of Bachelor Thesis of Raffaele Pergamo in Computer Engineering, entitled “Cybersecurity per la Blockchain”.
- 2023** Supervisor of Bachelor Thesis of Davide Gianni in Computer Engineering, entitled “Cybersecurity Automotive: Analisi dello Standard ISO/SAE 21434”.
- 2023** Supervisor of Bachelor Thesis of Gabriele Crestanello in Computer Science, entitled “Analisi sulla sicurezza di container e immagini in ambiente Docker”.
- 2023** Supervisor of Bachelor Thesis of Federica Grisendi in Computer Science, entitled “Integrazione di HashiCorp Vault nella gestione delle credenziali amministrative di diversi domini Active Directory”.
- 2021** Assistant Supervisor of Bachelor Thesis of Antonio Iannotta in Computer Engineering, entitled “Progettazione e realizzazione di TSN Digital Twin tramite sistemi di virtualizzazione”.
- 2021** Assistant Supervisor of Bachelor Thesis of Karina Chichifoi in Computer Engineering, entitled “Progetto di Sistemi Basati su Deep Neural Network per la rilevazione di similarità tra Password”.
- 2021** Assistant Supervisor of Bachelor Thesis of Jacopo Terreri in Computer Engineering, entitled “Integrazione di un sistema di Denial of Service Detection basato su P4 in architetture SDN”.
- 2021** Assistant Supervisor of Bachelor Thesis of Luca Zambrini in Computer Engineering, entitled “Binary Analysis, una panoramica sullo stato dell’arte”.
- 2021** Assistant Supervisor of Bachelor Thesis of Daniele Bernaudo in Computer Engineering, entitled “Analisi di metodologie per il reverse engineering efficiente di protocolli di rete proprietari”.

- 2020** Assistant Supervisor of Bachelor Thesis of Pierpaolo Agamennone in Computer Engineering, entitled “Porting su architettura ARM di rootkit basati su tabella delle system call”.
- 2020** Assistant Supervisor of Bachelor Thesis of Giulio Tripi in Computer Engineering, entitled “L’ausilio al soccorso attraverso lo sviluppo di software specifici per il Corpo Nazionale dei Vigili del Fuoco”.
- 2020** Assistant Supervisor of Bachelor Thesis of Gianluca Soavi in Computer Engineering, entitled “Analisi dell’efficacia delle tecniche basate su Differential Privacy per la valutazione della password similarity”.
- 2020** Assistant Supervisor of Bachelor Thesis of Loris Onori in Computer Engineering, entitled “RanFlood: Mitigazione di attacchi ransomware attraverso tecniche di file flooding”.
- 2020** Assistant Supervisor of Bachelor Thesis of Alberto Marziali in Computer Engineering, entitled “Analisi di problematiche di sicurezza dello standard TSN 802.1Qav tramite simulazione a eventi discreti”.
- 2020** Assistant Supervisor of Bachelor Thesis of Francesco Lucianò in Computer Engineering, entitled “Serverless Computing Security: Tecniche di Lateral Movement”.
- 2020** Assistant Supervisor of Bachelor Thesis of Simone Daraio in Computer Engineering, entitled “Tecniche di Lateral Movement in architetture a microservizi”.
- 2020** Assistant Supervisor of Bachelor Thesis of Andrea Cavallari in Computer Engineering, entitled “Offensive and Defensive security in Automotive Embedded Systems”.
- 2020** Assistant Supervisor of Bachelor Thesis of Livia Butera in Computer Engineering, entitled “Meccanismi di anonimizzazione e loro applicabilità”.
- 2020** Assistant Supervisor of Bachelor Thesis of Andrea Pellegrino Acierno in Computer Engineering, entitled “Meccanismi e Protocolli di Autorizzazione e Autenticazione in Architetture Serverless”.
- 2020** Assistant Supervisor of Bachelor Thesis of Lorenzo Venturini in Computer Engineering, entitled “Studio di meccanismi di autenticazione per applicazioni a microservizi”.
- 2020** Assistant Supervisor of Bachelor Thesis of Alberto Taddia in Computer Engineering, entitled “Integrazione tra IoT e Blockchain: problemi e opportunità per il futuro”.
- 2020** Assistant Supervisor of Bachelor Thesis of Martino Tommasini in Computer Engineering, entitled “Realizzazione di un dispositivo per il test della sicurezza di reti Zigbee basato su framework Killerbee e chip CC2531”.
- 2020** Assistant Supervisor of Bachelor Thesis of Fabio Merizzi in Computer Engineering, entitled “Sviluppo di Soluzioni per la Sicurezza di Reti SDN basate su Data Plane Programmabili in P4”.
- 2020** Assistant Supervisor of Bachelor Thesis of Mario D’Alessandro in Computer Engineering, entitled “Progetto e Realizzazione di un Dataset per l’Analisi di Malware IoT”.
- 2020** Assistant Supervisor of Bachelor Thesis of Luigi Francesco Ricatti in Computer Engineering, entitled “Generazione automatica di HoneyNet con l’uso di tecnologie SDN”.
- 2020** Assistant Supervisor of Bachelor Thesis of Giovanni Fazi in Computer Science, entitled “Serverless Computing: Penetration Testing e Metodi per la sicurezza”.
- 2020** Assistant Supervisor of Bachelor Thesis of Beatrice Lorenzini in Computer Engineering, entitled “Analisi di Sistemi per il Provisioning e il Monitoring di Infrastrutture NFV”.
- 2020** Assistant Supervisor of Bachelor Thesis of Marco Costante in Computer Engineering, entitled “Analisi e Confronto delle Caratteristiche di Sicurezza nei Diversi Modelli di Orchestrazione di Microservizi”.
- 2020** Assistant Supervisor of Bachelor Thesis of Mario Caniglia in Computer Engineering, entitled “Sistemi di monitoraggio tramite serie temporali per architetture NFV”.

- 2020** Assistant Supervisor of Bachelor Thesis of Giorgio Falcone in Computer Engineering, entitled “Analisi e progettazione di Unidirectional Gateway”.
- 2019** Assistant Supervisor of Bachelor Thesis of Tommaso Sacchetti in Computer Engineering, entitled “Analisi di Piattaforme Open Source per la Comunicazione East-West nelle Infrastrutture SDN per il Cloud”.
- 2019** Assistant Supervisor of Bachelor Thesis of Adelina Khafizova Ramil in Computer Engineering, entitled “Progetto di un sistema sicuro per la notifica delle compromissioni di credenziali”.
- 2019** Assistant Supervisor of Bachelor Thesis of Angelo Farina in Computer Engineering, entitled “Integrazione di Virtual Infrastructure Manager in architetture SDN gestite con Open Source Mano”.
- 2019** Assistant Supervisor of Bachelor Thesis of Andrea Mengascini in Computer Engineering, entitled “Progetto di Metodologie di Analisi della Sicurezza per Dispositivi su Bus CAN in ambito Automotive”.
- 2019** Assistant Supervisor of Bachelor Thesis of Roberto Scolaro in Computer Engineering, entitled “Un Sistema di Gestione delle Macchine Virtuali per un Laboratorio di Penetration Testing”.
- 2018** Assistant Supervisor of Bachelor Thesis of Valentina Mignardi in Computer Engineering, entitled “Realizzazione di un ambiente di test per la sicurezza delle reti ZigBee”.
- 2018** Assistant Supervisor of Bachelor Thesis of Andrea Giovine in Computer Engineering, entitled “Modelli di sicurezza e Tecniche di penetration testing per architetture serverless”.

9 Institutional Activities

Davide has took part in activities in University of Bologna. These ranged from the participation to a team which explore security aspects of products and implementations (Unibo Laboratory of Information and System SEcurity) and organization of international conferences.

- 2018 – 2021** Member of the research team on the themes of network and application security. Active participation in the management of a group of students that organizes events and CTF competitions.

10 Organization of Conferences

10.1 International Conferences

- 2020** Local Chair of Microservices 2020, International Conference. Bologna (Italy), 2020. URL: <https://www.conf-micro.services/2020>

11 List of Publications

Journals

- [A1] Amir Al Sadi, Davide Berardi, Franco Callegati, Andrea Melis, and Marco Prandini. P4dm: Measure the link delay with p4. *Sensors*, 22(12):4411, 2022.
- [A2] D. Berardi, F. Callegati, A. Melis, and M. Prandini. Password similarity using probabilistic data structures. *Journal of Cybersecurity and Privacy*, 1(1):78–92, 2021.
- [A3] Davide Berardi, Franco Callegati, Andrea Giovine, Andrea Melis, Marco Prandini, and Lorenzo Rinieri. When operation technology meets information technology: Challenges and opportunities. *Future Internet*, 15(3):95, 2023.

- [A4] Davide Berardi, Saverio Giallorenzo, Jacopo Mauro, Andrea Melis, Fabrizio Montesi, and Marco Prandini. Microservice security: a systematic literature review. *PeerJ Computer Science*, 7:e779, 2022.
- [A5] Davide Berardi, Saverio Giallorenzo, Andrea Melis, Simone Melloni, Loris Onori, and Marco Prandini. Data flooding against ransomware: Concepts and implementations. *Computers & Security*, 131:103295, 2023.
- [A6] Davide Berardi, Saverio Giallorenzo, Andrea Melis, Simone Melloni, and Marco Prandini. Ranflood: A mitigation tool based on the principles of data flooding against ransomware. *SoftwareX*, 25:101605, 2024.
- [A7] Davide Berardi, Nils O Tippenhauer, Andrea Melis, Marco Prandini, and Franco Callegati. Time sensitive networking security: issues of precision time protocol and its implementation. *Cybersecurity*, 6(1):1–13, 2023.
- [A8] A. Melis, S. Layeghy, D. Berardi, M. Portmann, M. Prandini, and F. Callegati. P-scor: Integration of constraint programming orchestration and programmable data plane. *IEEE Transactions on Network and Service Management*, pages 1–13, 2020.
- [A9] Andrea Melis, Amir Al Sadi, Davide Berardi, Franco Callegati, and Marco Prandini. A systematic literature review of offensive and defensive security solutions with software defined network. *IEEE Access*, 2023.

International Conferences

- [C1] Amir Al Sadi, Davide Berardi, Franco Callegati, Andrea Melis, Marco Prandini, and Luca Tolomei. A structured approach to insider threat monitoring for offensive security teams. In *2023 IEEE 20th Consumer Communications & Networking Conference (CCNC)*, pages 628–631. IEEE, 2023.
- [C2] Amir Al Sadi, Marco Savi, Davide Berardi, Andrea Melis, Marco Prandini, and Franco Callegati. Real-time pipeline reconfiguration of p4 programmable switches to efficiently detect and mitigate ddos attacks. In *2023 26th Conference on Innovation in Clouds, Internet and Networks and Workshops (ICIN)*, pages 21–23. IEEE, 2023.
- [C3] Amir Alsadi, Davide Berardi, Franco Callegati, Andrea Melis, and Marco Prandini. A security monitoring architecture based on data plane programmability. In *2021 Joint European Conference on Networks and Communications 6G Summit (EuCNC/6G Summit)*, pages 389–394, 2021.
- [C4] D. Berardi, F. Callegati, A. Melis, and M. Prandini. Security network policy enforcement through a sdn framework. In *2018 28th International Telecommunication Networks and Applications Conference (ITNAC)*, pages 1–4, Nov 2018.
- [C5] D. Berardi, F. Callegati, A. Melis, and M. Prandini. Sustainable infrastructure monitoring for security-oriented purposes. In *Proceedings of the 6th EAI International Conference on Smart Objects and Technologies for Social Good*, GoodTechs '20, page 48–53, New York, NY, USA, 2020. Association for Computing Machinery.
- [C6] D. Berardi, F. Callegati, A. Melis, and M. Prandini. Technetium: Atomic predicates and model driven development to verify security network policies. In *2020 IEEE 17th Annual Consumer Communications Networking Conference (CCNC)*, pages 1–6, Jan 2020.
- [C7] Giacomo Gori, Andrea Melis, Davide Berardi, Marco Prandini, Amir Al Sadi, and Franco Callegati. Towards the creation of interdisciplinary consumer-oriented security metrics. In *2023 IEEE 20th Consumer Communications & Networking Conference (CCNC)*, pages 957–958. IEEE, 2023.
- [C8] Chiara Grasselli, Andrea Melis, Lorenzo Rinieri, Davide Berardi, Giacomo Gori, and Amir Al Sadi. An industrial network digital twin for enhanced security of cyber-physical systems. In *2022 International Symposium on Networks, Computers and Communications (ISNCC)*, pages 1–7. IEEE, 2022.

- [C9] A. Melis, D. Berardi, C. Contoli, F. Callegati, F. Esposito, and M. Prandini. A policy checker approach for secure industrial sdn. In *2018 2nd Cyber Security in Networking Conference (CSNet)*, pages 1–7, Oct 2018.

Miscellaneous Publications

- [V1] D. Berardi, F. Callegati, A. Melis, and M. Prandini. Password similarity using probabilistic data structures. arXiv, 2020.
- [V2] A. Melis D. Berardi, F. Callegati and M. Prandini. Technetium, atomic predicates and model driven development to verify security network policies. ITASEC, 2020.
- [V3] D/V²team D. Berardi. Deprecating set-uid:capability do. PagedOut, 2019.
- [V4] J. Mauro A. Melis D. Berardi, S. Giallorenzo and F. Montesi. A survey on microservices security: Preliminary findings. Microservices, 2020.

12 Participation as speaker

12.1 International Conferences

- 2023** Cybertech. Rome (Italy), 2023. Presentation of MON5 Solution and Integration.
- 2020** ETSI MEC WG. Online, 2020. Presentation of Unibo MEC API Tester.
- 2020** GoodTechs. Online, 2020. Security Network Policy Enforcement through a SDN Framework.
- 2020** ITASEC. Ancona (Italy), 2020. Ph.D. Forum + TechNETium, Atomic Predicates and Model Driven Development to Verify Security Network Policies..
- 2018** LinuxLab. Florence (Italy), 2018. Linux Hardening and Security Measures against Memory Corruptions.
- 2018** CSNet. Paris (France), 2018. A Policy Checker Approach for Secure Industrial SDN.

13 GDPR specification

Le informazioni contenute nel curriculum sono rilasciate ai sensi degli articoli 46/47 del D.P.R. 445/2000. Autorizzo il trattamento dei miei dati personali ai sensi del Regolamento Europeo (G.D.P.R. 2016/679).