Project portfolio

Michele Mazzucchi

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Systems & Enterprise Architect

- 20 years in full-stack engineering of large HW/SW systems.

- Specialty: medical, mission critical and regulatory-intensive industries.

- Lead of initiatives in enterprise architecture with 150+ stakeholders.

- Creator of multiple popular applications & services. Open-source contributor.

- Experience in Start-up, NGOs, SMB and Enterprise.

- Experienced in roles: Lead engineer, Solution architect, System engineer, Project leader, Full-stack developer, Network engineer.

"brought order from chaos"

"profound expertise and above-average experience"

"the quantitative results were remarkable"
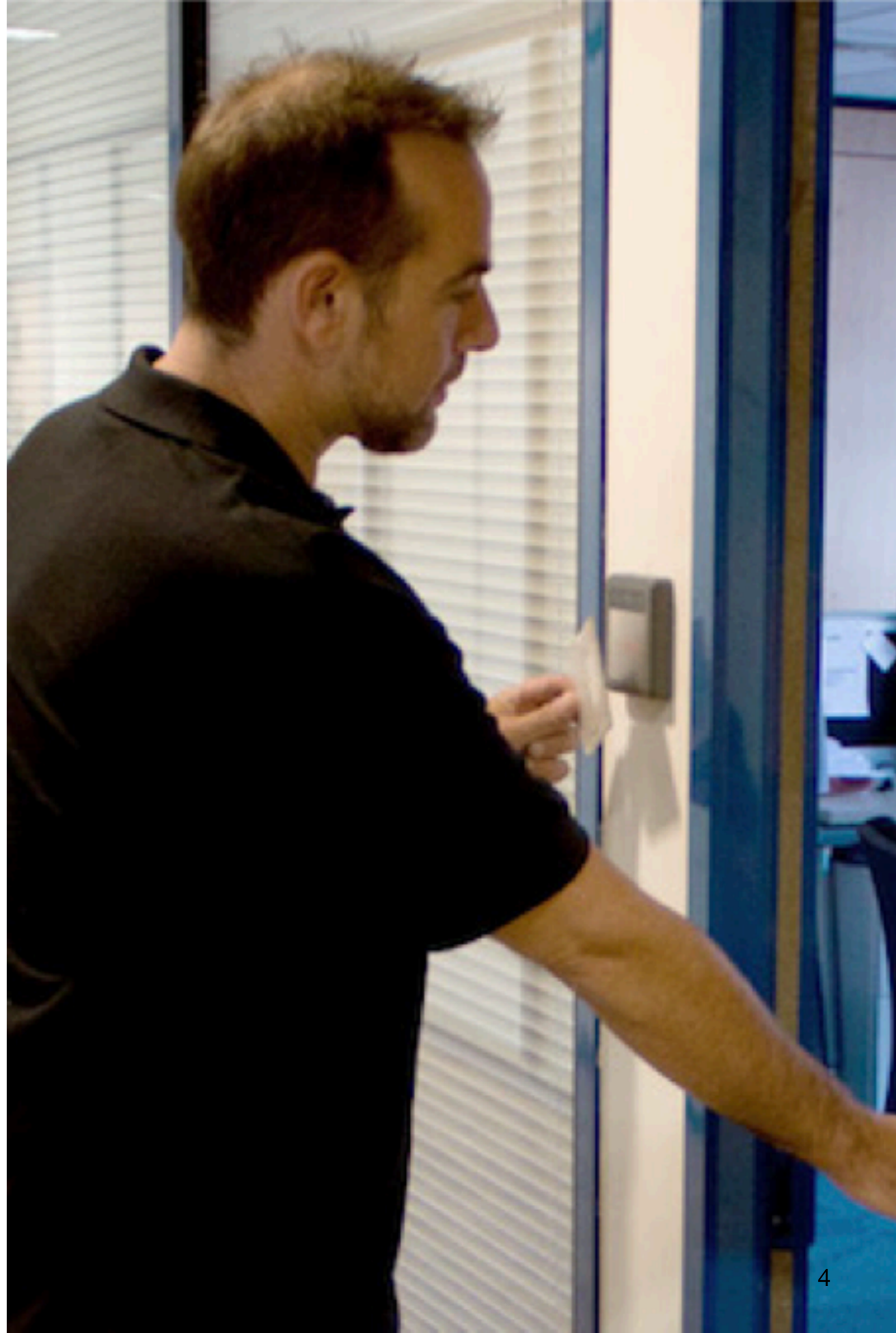
Languages

🇬🇧 *C2* 🇩🇪 *C1* 🇮🇹 *C2* 🇪🇸 *B1*

Sample projects

1. Door Security System

2. Mobile Time and Attendance Tracker

3. Telemedicine

4. High-reliability spam filter IaaS

5. Global DNS IaaS

6. SSHGuard

7. Glucose management solution

Door Security System

An Access Control System.

Door Security System — Project scope

Customer An Oil Company operating a number of Oil Camps and Oil Rigs in Angola, Africa.

Purpose Enforce enterprise security policies for physical access to secure rooms and dorms in an oil camp in Africa; to monitor properties such as temperature, smoke, and doors left open behind; and to issue alerts.

Duration 20 months (from concept to handover to Ops)

Value to Business
- Centralized access control of secure rooms & dorms
- Enabled investigation for episodes of missing or damaged equipment
- Enabled real-time detection and localization of:
  - smoke and fire in the building
  - doors left open at secure rooms
  - excess temperature in server rooms

Door Security System — Detail

Use case	Each secure room is equipped with a smart node, which controls the door's lockset and communicates with the company's ERP system to acquire access policies and report usage and room properties. Users access with their existing company badge, or through a PIN.
Deliverables	✓ HW design of smart nodes at doors: µC, RFID & PIN reader, actuator (door strike), sensors (smoke, temperature and Hall), wired bus network ✓ Overall system architecture comprising smart nodes' distributed system, communication infrastructure (network, protocols), control infrastructure (servers, APIs to and from ERP), quality attributes (safety, security, usability) ✓ Full software stack (µC firmware, bus protocols, bridge systems, ERP APIs) ✓ Validation and deployment protocols ✓ Project leadership (4 members)
Engineering features	• Fail-safe architecture to securely sustain infrastructure issues and tampering. • Ultra low-latency swipe-to-unlock with smart policy caching. • Extensive, fine-grained logging of events (badge & PIN, temperature, smoke, door status, smart node status, policy status)
Details	• Technologies: Arduino, SQLite, C++, Python, FreeBSD, protoBuf, SOAP • Methodology: adapted V-Model, Scrum

Mobile Time and Attendance System

A device to track work and presence of mobile employees.

mTAT — Project scope

Customer An Oil Company operating a number of Oil Camps and Oil Rigs in Angola, Africa.

Purpose Mobile Time and Attendance Tracker (mTAT) is a RFID-enabled mobile device used by workers to tag-in and tag-out their work day on oil platforms.

Duration 16 months (from concept to handover to Ops)

Value to Business
- Track work hours and automate parts of payroll
- Track which employees are on which platform
- Automatically detect excess overtime
- Detect and quantify unauthorized use of the camp's internal transportation service

mTAT — Detail

Use case	On *oil platforms*: One mTAT is given to each Team Leader, who is responsible to tag team members in & out of work. Once the Team Leader returns to the facilities on mainland, mTAT automatically uploads data onto the company's ERP, refreshes employee data, plus software and configuration. On *internal transport system*: One mTAT is installed on each bus; employees tag in when boarding. When the bus is parked in WiFi range, mTAT automatically uploads usage and downloads updates onto the ERP.
Deliverables	✓ HW design for rugged mobile device: smart device, RFID reader, storage ✓ Overall system architecture comprising device and interaction sequences with company's ERP for synchronization of activity, employee and configuration data ✓ Full software stack (mobile, drivers, interaction system with ERP) ✓ Project leadership (4 members)
Engineering features	• Rugged hardware and software to sustain rough handling, temperature, vibration, misusage, and unpredictable battery life. • Mission-critical data handling due to dependency for payroll and safety. • User Interaction Design based on testing with employees in Switzerland.
Details	• Technologies: Linux, BSD, OpenMoko, C++, Qt, SQLite, SOAP • Methodology: adapted V-Model

Telemedicine

Remotely monitor and configure medical devices.

Telemedicine — Project scope

Customer   Under Non-Disclosure Agreement

Purpose   A product and service to remotely monitor and configure medical devices, on-the-go and in the field. It runs over the Internet and supports simultaneous monitoring, configuration, and video-conferencing.

Duration   24 months (from concept to handover to marketing)

Value to Business

- Improve the convenience of healthcare for the patient
- Diagnose and troubleshoot location-dependent problems on-site
- Reduce time and infrastructural costs for the healthcare provider

[Further details are protected by NDA]

Telemedicine — Detail

Use case

The patient uses a mobile application to connect her medical device over Bluetooth®. The healthcare provider uses the vendor's medical software to video-conference with the customer, and simultaneously monitor, control and configure the medical device as needed.

Deliverables

✓ Interaction design: identification, authorization, 3-party hand-shaking, patient mobility across healthcare providers.
✓ System design: partitioning of cloud, desktop, mobile, embedded subsystems.
✓ Selection of key technologies: video, authentication, privacy, real-time data transfer.
✓ Leadership of domain experts from mobile, desktop, cloud, and embedded.

Engineering features

[Protected by NDA]

Details

· Methodology: V-Model, scrum of scrum.
· Compliance: IEC 62304, GDPR
· Technology: *[Further details are protected by NDA]*

High-Reliability spam filter IaaS

A spam filter service guaranteeing to never filter legitimate email.

High-reliability spam filter IaaS — Project scope

Customer

Own start-up project.

Purpose

An online service (for SMB) and a network device (for Enterprise) which filter spam with a guarantee of never filtering legitimate email. It relies on a proprietary filtering algorithm which challenges the sender's infrastructure by increasing their delivery cost as a function of their likelihood to be spammers. It delivers 95% filtering with no false positives.

Duration

6 months (from concept to MVP release) + 18 months (business development)

Value to Business

- Filter spam with no risk of filtering e-mail
- Ensure e-mail continuity in case of downtime
- Simplify data recovery upon incident response

High-reliability spam filter IaaS — Detail

Use case	Organizations direct their e-mail through the vendor's infrastructure, which filters spam and forwards legitimate e-mail on to the client. Filtered spam is available on a web interface. If the client's infrastructure fails, the service saves their email until it resumes. A network device product is available for organizations that require end-to-end control of their infrastructure.
Deliverables	✓ Overall system architecture comprising cluster, web application, and support systems ✓ Infrastructure comprising 15 servers across 10 countries ✓ Back-end software stack for spam filtering, failover, analytics, archival ✓ Multi-tenant web application ✓ Monitoring and alerting system
Engineering features	• High-availability cluster designed for 100% uptime over decades. • Custom-designed and optimized algorithm for 95% filtering and 0% false positives. • Low-power, PoE Mini-ITX device with low-latency OS and software for in-place filtering.
Details	• Methodology: Scrum • Technology: Cloud, Networking, Firewall, High-availability, C/C++, SQL, python, django, AIO, event-based

Global DNS IaaS

A service for continuity of Internet services.

Global DNS IaaS — Project scope

Customer

Own project, unbundled commercial project of "High-reliability spam filter IaaS".

Purpose

A freemium Infrastructure as a Service for ensuring an organization's most sensitive Internet asset (DNS) is available at all times. 24x7x365 uptime and synchronization 10-50x faster than industry average are the core value propositions, achieved with custom-designed software and cluster of 15 servers across 4 continents. The service serves thousands of organizations worldwide, protects tens of thousands of domain names, and answers billions of queries a month.

Duration

18 months (from concept to commercialization)

Value to Business

- Ensure continued Internet presence upon accidents
- Simplify infrastructure
- Improve security and service performance
- Monitor domain health and traffic patterns

Global DNS IaaS — Detail

Use case

Users sign up on the vendor's website, indicate which domain names (e.g. company.com) they want to protect, and receive instructions and tools for their setup. The system protects each domain on a geographically sparse cluster, provides analytics on their traffic, and notifies any issue arising.

Deliverables

✓ Overall system architecture comprising cluster (15 servers, 10 countries), web application, and support systems.
✓ Multi-tenant web application for cluster's command and control
✓ Monitoring and alerting system
✓ Project leadership (3 members)

Engineering features

• High-availability, secure design for 100% uptime over decades.
• Simplified cluster control through website and REST API.
• Resilient, low-latency distribution of DNS data, events, and traffic statistics.
• Full automation of billing and payments.

Details

• Methodology: Scrum
• Technology: Cloud (VPS, AWS), Networking, Firewall, High-availability, C/C++, SQL, python, django, jQuery, event-driven

SSHGuard

A popular Intrusion Prevention System.

SSHGuard — Project scope

Customer   The public domain.

Purpose   A modular Open-Source Intrusion Prevention System built for high-efficiency and ease of use. SSHGuard is free, open-source, and deployed on tens of thousands of servers worldwide, including Google.

Duration   24 months. Currently brought forward by the community.

Value to Business
- Protect servers from online attacks.

SSHGuard — Detail

Use case

SSHGuard monitors a system's activity by analysing its log files in real-time, detects an attack while it happens, and blocks the perpetrator using a variety of supported methods. Users can request support for protection of new services, or blocking through new systems (firewalls, monitoring systems etc) on the project's website. The modular architecture of the software makes such extensions efficient to introduce and to maintain.

Deliverables

- ✓ Software architecture
- ✓ Software implementation; test infrastructure
- ✓ Packaging for multiple operating systems
- ✓ Project leadership (3 members)

Engineering features

- Modular design to support a large set of Operating Systems, Services, and Firewalls.
- Secure detection of attacks through LALR parser; only software not vulnerable to log analysis vulnerabilities in 10 years.
- Easy-to-deploy package with largely automated detection and configuration, customizable attack detection thresholds.

Details

- Technology: UNIX, C/C++, Networking, event-driven, Django, SQL

Glucose management solution

Enterprise Architecture for innovation and harmonization.

Glucose management solution — Project scope

Customer   Roche Diagnostics international

Purpose   Combine multiple new products from independent business areas to build an integrated solution for professional glucose management in large hospitals.

Duration   3 years

Value to Business
- Offer solution that collectively raises efficiency of customers' workflows.
- Increase attractiveness of acquiring products in combination.
- Reduce service cost.
- Accelerate deployment after the sale.

Glucose management solution — Detail

Use case

An organization of 30k+ employees wants to launch a solution that integrates products from separate departments with independent P&L statements.
This requires to aggregate stakeholders, establish architecture capabilities, and introduce processes for all parties so buy-in is maintained until launch for each involved department.

Deliverables

✓ Stakeholder network at business and architecture level
✓ Architecture principles and operating model
✓ Information, data and technology architecture documents
✓ Periodic reporting

Work features

- Launch in time and on budget.
- Buy-in at all levels throughout.
- Pragmatic processes, clearly communicated.
- Some organizational adjustments as a result.
- Raised understanding for and visibility of architecture across organization.

Details

- TOGAF, Architecture Decision Records, DPIA, STRIDE, stakeholder matrix, architecture principles, architecture maturity levels.

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