BERNARD DELSAUX

Independent Senior Consultant

IT Solutions and Security Architecture

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Since the first days of our professional activities, we have helped our customers building systems and products in critical environments and industries such as finance, banking, life sciences and IT services.

With our multidisciplinary education combined to an extensive experience of systems development and operations, we own the rare speciality to perfectly understand the vision of business actors while drawing architectures and designing high quality solutions along with expert engineers. Thanks to our management education and practice, as well as our sense of delivery, we also excel in leading teams and coordinating activities within or across complex projects.

Aside consultancy and management of our own businesses, our professional experience is made of a *conjunction* of two roles: architect *and* project/delivery manager. Indeed, while considering systems in their holistic perspective, we truly excel in "connecting and interfacing" people of different backgrounds and interests. We find ourselves very efficient in those situations where a strong technical understanding is required as well as those soft skills needed to coordinate distributed teams originating from different backgrounds and international cultures. Thanks to our open nature, permanent curiosity and our passion for travelling over the world.

Altogether, it represents around 30 years of professional experience that started with medical research work followed by system development, and 20 years of architecture and project leading, including critical large-scale e-banking infrastructure and security projects during the last 12 ones.

Professional Services

- **Systems integration architecture and security architecture,**

- **Consultancy / advisory in:**

  – Integration and cyber-protection of large systems and critical infrastructures;

  – Cyber-secured Internet portals and electronic communications;

  – Technical and Cyber-security solutions in large systems

Domains of expertise:

  – Banking & finance industry, financial markets and market infrastructures.

Document Contents

1. An overview of our services, domain fields and experience.
2. The detailed CV, listing all assignments and achievements.
3. A summary of our methods and techniques, including IT security.
4. Our personal profile and education records.

Overview

Since the early days of our independent contracting activity (1988), we combined both complementary roles of the analyst or architect envisioning the system or the product and the manager responsible to actually *deliver* them. Along with specific consultancy missions, most projects were executed in international environments; including with offshore teams in many occasions.

IT: Banking Industry and Market Infrastructures

2012-2017 Euroclear (BE, UK, FR)

- Security analyst, Security Architect – subject matter expert in several strategic projects.
- Technical Solutions Architect – subject matter expert in several strategic projects.

2011-2012 BNP Paribas, BNP Paribas Fortis (BE, FR)

- Enterprise architecture: BNPP Group level business cases and opportunity studies.
- Solutions architecture: Design of the Group Internet & Mobile platform for retail markets.

2006-2010 Euroclear (BE, UK, FR)

- Single Platform, Common Communications Interface; integration and security architecture.
- Integration to TARGET2 Securities (Eurosystem central settlement); security architecture.
- Distributed deployment process industrialisation; team leading.

2001-2006 ING Group

- B2B Secure File Transfer Service (BE): architecture and project leading.
- B2B Payment platform (Web portal, STP); security architecture (BE, NL, DE).
- E-Banking Web Platform, token-based access control (BE); project leading.
- Group Security Architecture Blueprint.
- Group internal network and intranet access control (BE, NL, ES).

1993-1999 Software Engineering and Methodology

- Object-oriented design and development; component-based architectures, SOA.
- SDLC: Rational unified process (RUP), UML; process modelling (IDEF0), architecture frameworks: Zachman, TOGAF, ISO RM-ODP.
- Process automation and industrialisation (followed by project we leaded)

1989-1993 Financial Systems (THEORY, own business; 1988-1993)

- Market instruments database and analysis: stocks, bonds, options; and
- Portfolio and fund management: pension funds and private banking
  (Institutional customers in BE/LU: pension funds, private bankers and stock brokers).

1988-1991 BBL (now ING BE)

- Data Centre Operations Support System (BE).
- Credit decisions support systems (mortgage, enterprise, export).

IT: Other Missions and Achievements

- 2001 Telindus LU: Enterprise architecture (LU, 2001): architect.
- 1996-2000 2001 Telindus LU: Bespoke ERP system and process implementation (LU): architect, project mng.
- 1995-1996 Intellectual Property Network: Interim IT management (BE, N-Y), offshore development feasibility study (Tunisia).
- 1994 Ziegler Logistics: Parcel Routing and Dispatching Support System (BE)

Health Industry and Life Sciences

1994-1999 RD MODELE (own business)

- Patented dental tool, internationally distributed (EU, USA, Asia).
- Veterinary shampoo, internationally distributed by *Boeringher Ingelheim DK* (DK, EU, NZ).

1985-1987 Medical and Veterinary Academic Research (Univ. Brussels; Univ. Liege)

Curriculum Vitae

This C.V. is organised per industry and domain where we offered our consulting and system delivery services. In each category, projects are listed in reverse order (most recent first). Except when outstanding, tools and techniques are not repeated in all detailed descriptions; rather they are summarised into our "personal profile" at the end.

Note: in case of part-time assignments (e.g. consultancy), periods may sometimes overlap.

Industry: Banking & Market Infrastructures

2012-2017 EUROCLEAR

As Security Analyst/ Architect: ECB Target2 Integration(communications security; SWIFT Market infra. Channel); DTCC communications security (and the same for multiple central banks or large custodians over the world); Screen-based applications (WEB, non-WEB, and SWIFT); secure WEB-Services (WS); multi-factor authentication (e.g. RSA OTP devices); federation protrocoles (SAML2P); Federated Identity and Access Management Stragegic Blueprint; Data-leakage Prevention (integration of Symantec DLP); Security of payment systems (SWIFT); Software Vulnerability and Patching Management.

As Technical Solutions Architect: Enterprise data management, Big Date Infrastructure (Hadoop ecosystem), IT Service Management selection and implementation (ServiceNow integration), iBPMS selection and implementation (PegaSystems), Cloud and XaaS studies and evaluations; Service-based IT Operations and Operations-as-a-Service; Asset management and configuration management (CMDB; BMC Atrium, ServiceNow).

2010-2012 BNP Paribas, BNP Paribas Fortis

Business cases and opportunity studies: requirement study and architecture proposals in various Group-level domains (credit processing, payment and cash management, WEB platforms).

Internet & Mobile Retail Platform: after business analysis and requirement specification made by a central "Maîtrise d'ouvrage" in Paris, the design and building of a global platform was assigned to a "Shared Service Centre" located in Brussels, delivering and integrating its products to all national entities (at the time of writing BE, FR, North Africa, before most entities in 2013-2014).

Role: Enterprise architect, IT solutions architect. Locations: BE, FR.

2006-2010 EUROCLEAR

The Single Platform/CCI: CCI (Common Communications Interface) is a Euroclear's strategic programme aiming to unify all back-ends and related client-facing channels into a single logical gateway over SWIFT, BT or other future IP providers (Screen/SOAP and STP/AS2 protocols, XML ISO15/20022). The CCI also replaces all internal network accesses to operational applications by a common internal and unified channel deployed in Citrix environments.

Among other constraints, non functional requirements included the possibility to operate in parallel about 15 test environments sometimes connected to the outside along with multiple client acceptance environments and evolving live systems. Such a complex infrastructure also required a lot of imaginative "industrialisation processes" when getting to deployment and validation matters.

The project force was spread between Brussels, London and Paris. We leaded the team hat delivered the security architecture and its associated services (DMZ, PKI, Access control, application firewall and filtering, non repudiation and archiving, administration, etc) for the CCI platform as well as the integrated "Single Platform" as a whole (i.e. ESES and SP Custody). We also defined and organised all security tests with internal and external expert teams, and organised proper assurance follow-up and tracking.

PKI integration and industrialisation: the new infrastructure is so dependant on PKI mechanisms (internally and externally) that it needed an actual *industrialisation* of all PKI integration processes in enabled systems or enabling candidates (administration, deployment, business continuity).

Target2 Securities is a *Eurosystem (*ECB*)* programme aiming to centralise all settlement activities in

the EC. We have been busy on integration scenarios and security architecture, in particular connectivity matters. Locations: BE, DE.

E-Voting: Along with other expert we produced a tender after an RFP issued by the French AFTI association, in order to propose a central electronic voting service for French and possibly European Equity Issuers and General Meeting organisers.

Roles: Integration and security architect, security consultant, team and delivery manager: IT Security Integration and consulting, from inception to live operations, including testing and assurance. Locations: BE, UK, FR.

2001-2006 ING GROUP

Secure Payment File Transfer Service: We delivered a new B2B infrastructure and operational processes to build a secure, PKI-based, FTP File Transfer channel for wholesale customers, integrated to the legacy middleware of the bank (for payments and reporting). IT Service providers: IBM and PWC.

Role: Project leader, system architect. Locations: BE, NL.

Web Portal Acquisition Study: In an expert team, we realised a feasibility study and impact analysis of an internet application expected to replace ING Bank NL legacy applications and to integrate with payment and reporting back-offices across other subsidiaries. We worked as team leader, systems and security Analyst, RFP; FS lead (requirement and solution study, service evaluation and integration). From the RFP process, a vendor was selected and the feasibility study considered all solutions and options for its customisation and integration (Coconet, Düsseldorf).

Roles: Security architect, feasibility study leader. Locations: NL, DE.

(Unified) Wholesale Payment Channels (WEB, STP): The programme built a pan European internet portal for institutions and wholesale markets. It pioneered group-wide project management and execution, associated to offshore development in India. In a first phase, we introduced the foundations of Web access management, based on Tivoli Access management technology, integrated to the IBM Websphere Portal Server. Later we extended the foundation to PKI-enabled services (smartcards, strong authentication, digital signature and non-repudiation). We also organised the security auditing and testing of the infrastructure ("PEN tests"). IT service providers: SecurIT, IBM, Cap Gemini, Logica, Tata Consulting Services (offshore development, India).

Roles: Security architect and security project leader. Locations: BE, NL.

WEB Portal OTP Token Access System: enhancement of the e-banking portal in place by the implementation of a token-based access-control system, application firewalls, penetration testing, etc. IT service provider: Vasco Security.

Roles: Requirement specification, project leading and overall coordination. Location: BE.

Group Security Architecture Blueprint : Along with the *ING Group Task Force*, developed a common reference known as the "*Security Architecture Blueprint*", and produced a general "Logical Access Control framework" after the ING Business Architecture requirements and common architecture frameworks (TOGAF, TAFIM).

Role: Security Architect.

Identity & Access Management Infrastructure: This project defined an IAM infrastructure targeting cross-entity LAN and intranets as well as other legacy platforms. We realised a pilot implementation integrated into the existing environments of ING Bank and ING Insurance BE in the early stages of their merge. IT service provider: SIA, Spain.

Roles: Project leader, system engineer (acquisition, systems integration and security administration). Locations: BE, ES.

2001 Business Case: Trading Application Service Platform

FreeBank: Along with a few business partners, we specified an internet-based application platform offering straight-through processing of front and back-office operations to small-&-medium banks. The project was introduced to risk capital funds but we had to resign when the "*internet dot.com*" market collapsed in 2001.

Roles: Architect; business case & capital research.

1989-1993 THEORY INVESTMENT SOLUTIONS

Market Analysis and Investment Management Systems: We developed an integrated product suite for professional investment managers in Belgium and Luxembourg (private and institutional banking). We also engaged into partnership with stock market data vendors permitting our clients to update their systems with affordable solutions. In many cases we also integrated our solutions to customers' back-office systems. The three products were:

PORTFOLIO: portfolio management, risk and performance analysis, cash, equity, option and bond analysis (duration, switch proposals, etc.); BONDS: decision support system for Eurobonds management (prices, analysis, switching strategies, etc...); BANK NOTES: decision support for the issuing and hedging of bank notes.

Roles: Company founder and manager, business and technical analyst, systems and software engineer (in 1994, we sold the company to FICS Group, Belgium).

We had customers in Belgium and Luxembourg:

- Banks: BBL (now ING BE), Van Breda, Banque Drèze, Belgolaise, Société Générale Brussels, IMI Lux, Minerve (ex. Generali), ASLK/CGER and Générale de Banque (both now BNPBFortis).

- Brokers and managers: Melice, FinancieHuis, Puilaetco BE/LU, DL Associates, Dellicourt, ICI Asset Management, Bestinvest,

- Corporate Pension Funds: Unilever, Agfa-Gevaert, Solvay, Citibank, Caisse de Prévoyance des Médecins, Câbleries d'Eupen.

1988-1991 BBL (now ING BE)

Computer Centre Operations Support System: We conceived and implemented EOT - the "Expert Operating Tool", a system which modelled the entire mainframe architecture at physical, logical and operational levels and served as the global repository for all application artefacts and their dependencies. It was completed with graphical interfaces, expert-system engines and incident simulation tools (still in use today at data centres). It also pioneered ORACLE Database development at the bank and is still I use today for supporting the data centre Unisys mainframe operations.

Roles: Team leader, business/technical analyst, software development. Location: BE.

Banking Decision Support Systems: We analysed and developed expert-systems and simulation programs used by the commercial advisors in all the bank's branches: Mortgage loans, investment loans for enterprises, import/export, as well as market segmentation & credit scoring tools.

Roles: Analysis, software development, team leading and special studies. Location: BE.

Industry: Business and I.T. Services

1997-2001 TELINDUS Luxembourg

Enterprise architecture: after the ERP launching below, we leaded the programme to building an "enterprise-level information system" aiming to integrate into the existing platform other systems to support professional client services (e.g. *Remedy, call-desk)*.

Role: architect, consultant. Location: LU.

Enterprise Operations Support System: We designed and developed the new ERP system to support end-to-end operations (sales, orders, service contracting, entire supply chain, stock management, dispatching and invoicing), integrated with other vertical packages (general ledgers, financial reporting…). The implementation went along with a process redesign of critical activities.

From a technical viewpoint, we also designed a complete object-oriented application framework as a foundation for all subsequent developments.

Roles: Project leader & systems architect: system development, integration, migration and business process re-design. Location: LU.

1993-1999 Consultancy: Software Engineering

Methodology of Software Engineering and Architecture: We developed courses on object-oriented concepts and methods (pioneering service in Belgium and Luxembourg), along with architecture frameworks.

References: more than 300 IT professionals in companies operating in BE/LU (e.g. AG1824/Fortis Insurance, BBL/ING, Prévoyance sociale, Trasys Space, Ministère des pensions, Banque Générale du Luxembourg, Telindus Luxembourg, etc.).

1995-1996 Groupe Gevers – Intellectual Property Network

Groupe Gevers IPN is the Belgian leader in intellectual property matters (advisory, registration and lifecycle management services). We managed IT operations & support, procurement, software development process, staff management (3 teams located in Brussels, Chicago, and Paris).

We also realised a feasibility study for offshore development in Tunisia.

Roles: IT Manager, Systems Engineer. Locations: BE, FR, (USA, remotely).

1994 Ziegler Logistics

Logistics Support Systems: Parcel distribution system (bespoke development and package selection and integration).

Role: Project leader. Location: BE.

Industry: Health and Life Sciences

1994-1999 RD MODELE / BOERINGHER INGELHEIM

R&D in Paramedical Products: We conceived and developed paramedical products in their early stages, and started ventures with strong business partners to i) industrialise the production processes under our direction, ii) initiate marketing and launching activities in their own commercial networks.

We created two product lines:

− A disposable dental tool covered by a European patent; pending in US and Japan. RD Modele owned the prototyping and pre-production infrastructure, made of complex plastic injection moulds, after feasibility studies realised in BE, NL, Hong-Kong and Taiwan. The product was industrialised and distributed by Groupe Couvreur in BE, NL, LU, and FR.

− A shampoo for the OTC Veterinary Market developed jointly with Creations Cosmétiques BE and BOERINGHER INGELHEIM DK. RD Modele owned the supply and production process up to QC, supplied by pharmaceutics certified labs. The product was distributed by Boeringher in BE, LU, FR, DE, NL, GR, NZ.

Roles: Company founder and manager: Research, development, industrialisation and pharmaceutical quality assurance, patent registration and follow-up. Despite their launching in multiple countries, those products could not reach the break-even point and we shut down all company activities in 1999, free of debt.

1986-1987 Liege University, Faculty of Veterinary Medicine

Research Assistant: teaching, clinics and research (echography, epidemiology); residency and emergency care unit (team leader).

Cattle Reproduction Pathology Database: In order to collect and analyse cattle reproduction data, we created a database system as well as computerised procedures for test results processing, along with automated statistical analysis and epidemical research.

1985-1986 Brussels University, Academic Hospital

Research assistant: **Protein Isolation Computerised System:** We acquired specialised techniques in biochemistry and methodology of high level scientific research (isolation of cationic proteins); we also created computerised procedures for test results processing and automated statistical analysis.

Summary of Methods and Techniques

Information Technology

Throughout our projects we developed or have been familiar a/o with the following technologies: Distributed architectures, RDBMS (Oracle, Sybase, DB2) or No-SQL DBMS, B2B and WEB Internet platforms (TCP/IP, DNS, HTTP, Html, XML, FTP, SOAP, AS2), SWIFT, ISO15022, ISO22022 (XML), Email gateways, Websphere (AS, PS), Axway File-Broker, Apache, IIS,…, Sterling Gateway, Connect:Direct, REST, JSON, Hadoop, ..., as well as several programming languages (Java, J2EE, C++, C#, Delphi, Powerbuilder, VBA, Python, ...).

Project and Operations Management Processes

– Project management (PMI, Prince2);
– IT Service Manageemnt and Systems operations (ITIL);
– SDLC, SEI software processes: development, acquisition, risk management, product lines, etc.

Architecture Frameworks and Methods

– Architecture: Zachman, TOGAF, RM-ODP, TAFIM.
– Object-oriented modelling (UML, Rational Unified Process, OMT, OOSE), design patterns, etc.
– Database modelling and design, process modelling (IDEF0)

Finance and Management

– Market research and analysis (equity, bonds, commodities), investment management.
– Macro-economy and investment risk management.
– Company management and operations.

Specific IT Security Experience

In all "Bank and Market Infrastructures" projects (2001 to 2010) we both specified the security architecture with expert teams that we leaded, and coordinated the development and integration activities by engineering teams. Our own expertise lies in risk analysis and solutions proposal, system-enablement of PKI techniques, communication security and logical access control.

Security Architectures (From Inception to Testing and Implementation)

– PKI and systems enablement of PKI (SSL, host-based, end-user).
– Authentication and access control systems (password, token, smartcard, HSM).
– Dematerialised instructions, electronic signature and non repudiation.
– Internet application security (HTTP, WEB, SOAP, AS2, S/MIME, FTP)
– Application and XML/WS firewalls (HTTP, HTML, XML, AS2)
– Enterprise identity and access management

Security Analysis and Consultancy

– Cryptographic key lifecycle management and its maturity model.
– Methodology: IT security integration projects.
– Security risk assessments along with their solutions specification.
– Security testing specification and control.

Summary of IT Security Methods and Techniques

– Methodology, risk assessment and architecture: ISO 27001 (ex BS7991), ISO 21188 (PKI), NIST, CERT (OCTAVE, SQUARE).
– Security frameworks, management of operational security processes (SABSA, COBIT & ITIL/Security); key and certificate lifecycle management; authorisation and access management.
– Technologies: Tivoli Access Manager, LDAP, Entrust GetAccess, BMC Control/SA, Mod-Security, Vordel Secure, Beeware Sentry, Axway File Broker/Secure FTP, Connect:Direct, Vasco Token, Gemalto Smartcard, Ncipher HSM, Websphere & Java security, RACF, SSL/TLS, SAML, SAML2P, OAUTH, etc.

Personal Profile and Education

"Getting things done" and "Connecting people Together"

- Result-oriented: Independent, autonomous, organised, hard-worker. Committed to delivery.
- Communicative: Excellent in inter-personal communications and unblocking difficult situations. Sense of humour and resistant to stress
- Open to the World: Curious, open and tolerant to others with a preference to multi-cultural environments. Living in Brussels, having travelled across all continents except the poles.
- Holistic view while keen in important details and pragmatic in decisions.
- Languages: French (mother), English (very good); basics of Dutch and Spanish.

Formal Education

- Doctor in Veterinary Medicine - University of Liege - High Honours (1978-83).
- Military service as a Medical Service Officer (1984-85; Military Hospital of Brussels).
- Research assistant in medical biochemistry and nephric diseases (1985)
- Research assistant in cattle reproduction pathology (1986-87).
- Artificial Intelligence - Free University of Brussels – H.H. (1986).
- Business Management – Saint-Louis School of Commerce (Brussels), H.H. (1987-88).
- Since, continuous learning and multiple professional seminars and conferences in EU and USA.

Leisure Time and Personal Interest

- Quantitative finance and portfolio risk management
- Travelling (more than 40 world regions in 30 years)
- Photography and Video
- Electronic music mixes