Enterprise IT Architectures

Lecture Overview & Introduction
Introduction to the Course
Aim of the course

- The course is providing an introduction to the work of an IT Architect in projects as it is done in the industry. The goal is to enable YOU to work in such a role and to judge and develop solution scenarios.

- Architectural Methods are used to structure, describe, and specify architectures based on business goals as well as functional and non-functional requirements.

- Enterprise Architecture as well as Governance concepts provide a scope beyond projects on an enterprise level.

- The course introduces into current important Technology Concepts like SOA (Service Oriented Architecture) and BPM (Business Process Management).
Organization of the course

- Lectures with some exercises and a Term Paper working out the architecture of a project including a proposal (to a fictitious CEO and CIO), which will be
  - Worked out in a group
  - Presented of the group
  - Group presentations will be either on November 28 or on December 5, every team member has to present a significant part (therefore must be present at this day)

- The lecture is in BIN 2.A.10 on Fridays from September 19 to December 12 at 12:15 to 13:45 including a break of approximately 5 minutes

- December 19 is reserved for the written exam if necessary
Requirements for Obtaining the Credits

- Contribution to the project presentation and presenting a part of this work in the classroom lecture; attendance for the group’s presentation is mandatory and the group must pass (counts 1/3 to the final evaluation)

- The (updated) presentation must be sent to hans-peter@hoidn.ch until December 12, 23:59

- Passing the exam (counts 2/3 to the final evaluation)
  - Either written (December 19)
  - Or 20 to 30 minutes oral exam for everybody (in December or January)
  - Preference is an oral exam
Overview of the Course

- **Part 1** – Introduction, Role Play, What is IT Architecture, Key Aspects and Deliverables of Solution’s IT Architecture (19.9. & 26.9. – Hans-Peter Hoidn)
- **Part 2** – Introduction to the Term Paper (“Semesterarbeit”), Content of the Term Paper (03.10.2014 – Kai Schwidder)
- **Part 3** – Information Systems Architecture and SOA (Service Oriented Architecture), Technical Architecture, Business Architecture and BPM (Business Process Management) (10.10 & 17.10. – Hans-Peter Hoidn)
- **Part 4** – Key Aspects and Deliverables of Solution’s IT Architecture in more detail, Functional and Non-Functional Requirements (24.10 to 14.11. – Kai Schwidder)
- **Part 5** – EA (Enterprise Architecture) (21.11. – Hans-Peter Hoidn)
- Presentation of projects by Students (28.11 & 5.12.)
- **Part 6** – Architecture Management and Remaining Selected Topics – on student’s request (12.12 – Hans-Peter Hoidn)
- Exam (19.12. if written)
Lecturers

- Dr. Hans-Peter Hoidn  
  retired from IBM  
  Distinguished IT Architect (Opengroup)  
  hans-peter@hoidn.ch

- Kai Schwidder  
  on Sabbatical  
  Distinguished IT Architect  
  kai@schwidder.com

- Together about 70 years IT experience
Hans-Peter Hoidn

- Retired from IBM, Coach for Architecture and Education, Consultant for IT Architecture and IT Strategy
- Open Group certified Distinguished IT Architect
- Executive Architect in Global Business Integration “Tiger” Team until end of September 2012
- 11 years IBM and PwC
- Previously with UBS, Digital Equipment Corp, etc.
- Architect since about 25 years
- 40+ years in IT – started programming 1971
- Dr. sc. math ETH

three daughters (39, 36, 34 years old); five grandchildren (born January 2008, August 2009, June 2010, January 2012, April 2012)
Q & A – Next Steps

- Q & A – Questions & Answers

- Next Steps
  - Let us know when you intend to attend
  - Let us know the groups working together

- Contact:
  - hans-peter@hoidn.ch
  - +41 79 500 94 33
Questions
Role Play
YOUR New Job: IT Architect
The Course simulates some aspects of “real life”

- You are now THE architect for a new project – the course is a pre-run of an architect’s work

- Beginning with an Introduction on main aspects of IT Architecture and what IT Architects do all day

- You will receive an RFP (Request for Proposal) in order to deliver a proposal for a project

- Then you will get to work with a real project using the methodology in a mentored environment

- You will present your results and provide the “term paper” (the presentation) to your “customer”
Learning the Architecture Methodology

- What is Architecture
- Key aspects of Architect’s Work
- How to handle Requirements (Qualities and Constraints)
- What are the main “Work Products”
- Working through a “Case Study”
Applying the Architecture Methodology

- YOU will be the IT Architect for a new solution, which is the problem to be solved and presented – in the Term Paper (Semesterarbeit)

- YOU will address business goals and handle functional and non-functional requirements

- YOU will model the solution, investigate boundary conditions and risks

- YOU will work out the proposal (team work !) and present to the “customer” (CEO and CIO)
Technology Update

- **Service Oriented Architecture (SOA)**
  - Services are providing business functionality to the users
  - Connectivity through Middleware
  - SOAP and REST
  - Enterprise Service Bus (ESB)

- **Business Process Management (BPM)**
  - Modeling processes such that they can be automated

- And additional topics
Beyond Solution

- Enterprise Architecture overseeing multiple solutions
  - addressing the IT environment of the enterprise

- Architecture Management / Governance
  - Committees
  - Policies, Processes
In a Nutshell:
IT Architecture
Positioning – it is for Solving Business Problems

- **Addressing:**
  - Customer’s Pain Points, Why and What he / she wants to achieve
  - Current situation (as-is) and the areas of action
  - Constraints, Plans, Decisions already taken
  - Sketch future situation (to-be)

- **Using Architecture Methodology to**
  - DOING THE RIGHT THINGS RIGHT
  - Defining scope and overview
  - Capturing as-is and developing to-be architectures
  - Architecting possible solutions
  - Specifying roadmaps
IT Architecture – what is it ?

- Architecture: “Doing the right things right”

- IT Architecture dealing with the building blocks of a solution (and in addition of the Enterprise IT Environment)

- Using some “work products”, like Context Diagram, AOD (Architectural Overview Diagram), Service Model, ...

- Using Reference Architectures like SOA (Service Oriented Architecture) implying some Architectural Decisions and making the architecture more specific

- BPM (Business Process Management) adds new IT Capabilities in order to manage Business Requirements
IT Architecture – Definitions (I)

- Following TOGAF there are two aspects:
  - A formal description of a system, or a detailed plan of the system at component level to guide its implementation
  - The structure of components, their inter-relationships, and the principles and guide-lines governing their design and evolution over time

- Common elements of most attempts to define architecture, in the context of IT and other systems:
  - The organization of an IT-System or IT-Systems
  - Breakdown of a system into its parts
  - The relationship between the parts (static and dynamic)
  - Decisions about the design of a system that are hard to change
IT Architecture – Definitions (II)

- Rechtin, The Art of Systems Architecting
  - The structure (in terms of components, connections, and constraints) of a product, process, or element.
  - Architecture is what architects produce: The set of information that defines a system’s value, cost, and risk for the purposes of the systems sponsor.

- Must address
  - Function and quality, including aesthetics for the user (client / customer)
  - Feasibility and cost for the builder
IT Architecture – Definitions (III)

- Lankhorst, Enterprise Architecture at Work
  - Architecture is the art and science of designing complex structures, an indispensable instrument in controlling the complexity.
  - Is defined as a coherent whole of principles, methods, and models that are used in the design and realization of an enterprise’s organizational structure, business processes, information systems, and infrastructure.

- The term “IT Architecture” is defined slightly differently by various authors (in addition, after 5000 years of history “architecture” has not a crisp definition)
  - Thus we will use standards
    (to be introduced in Lecture 2 – next week)
Drivers of an IT-Architecture

- Non-Functional Requirements (Availability, Performance, etc.)
- Strategy & Business Goals
- Functional Requirements (Pain Points)
- Technology (Hardware, Software, etc.)
- Existing Applications
- Costs, Risks
Architectural Thinking at the solution architecture level leads to a complete systems architecture that serves multiple purposes.

- It **breaks down the complexity** of the IT System.
- It **analyzes the required functionality** to identify required technical components.
- It **provides a basis for the specification** of the physical computer systems.
- It **defines the structuring and strategy** for the connection of system elements.
- It **provides the rules** of composition and decomposition of system elements.
- It **assists in the analysis** of service level requirements to design a means of delivery.
- It **provides a decision trail**, which enables the system to evolve over time.

**It includes qualities (nonfunctional requirements).**
- Performance and Capacity
- Availability
- Manageability
- Security
- Usability
- Portability
- Reliability
- Maintainability
- Scalability
- Safety
- Extensibility

**It utilizes basic architectural principles.**
- Separation of concerns
- Information hiding
- Design by interface
- Separation of interface and implementation
- Partitioning and distributing responsibilities
IT Architecture – Description

- A collection of Work Products to document an architecture
- Addressed to one or more Stakeholders to answer their Concerns about the system
- Organized into one or more Views of the system
- Each View addresses one or more Concerns of the Stakeholders
- A View is a way of looking at an architecture
- A View is what you see when you look at the architecture from a particular Viewpoint
IT Architecture – Architectural Views

- Enable the architecture to be communicated to, and understood by, all the stakeholders

- Enable stakeholders to verify that the system will address their concerns

- Examples
  - Scope description: Planner’s view
  - Model of the business: Owner’s view
  - Information system model: Designer's view
  - Technology model: Builder's view
  - Detailed blueprints: Subcontractor’s view
IT Architecture – Sample Views

Source: Ira S. Sachs, Recommended Practice for Architectural Description, IEEE Standard P1471
**Analogy: Multiple views and models**

Source: Ira S. Sachs, Recommended Practice for Architectural Description, IEEE Standard P1471
The 4+1 view model of software architecture (Kruchten)

Source: Kruchten 1995
Aspects of IT architecture

**Functional**
- What is your system actually going to do?
- How are its applications and software organised?

**Operational**
- Where is your system going to operate? How are the computers interconnected and how many will you need?
- What happens to your system when it runs? What about over its lifetime?

**Build-time**
- How does your system get created?

**Run-time**
Enterprise IT Architectures

Architecture Overview

- Business Goals
- User Requirements
- System Requirements
- Today’s Applications

IT-Architecture

- As-Is Architecture
- To-Be-Architecture
- Roadmap
Enterprise IT Architectures

In a Nutshell: IT Architect Roles
Architects – Overview

- **IT Architects**
  - are technically competent system-level thinkers, guiding planned and economically efficient design processes to bring a system into existence
  - Focus on system- and subsystem-level issues to establish a solid foundation for detailed design, particularly for large-scale efforts

- There are different roles:

  ![Diagram showing the different roles of IT Architects](image_url)
Chief Architect Roles and Responsibilities

- Provide the technical leadership necessary to implement or achieve a business strategy through an IT solution
- Carry end-to-end technical solution responsibility
- Carry the whole scope of the problem to be solved, and the solution in his/her head
- Technical management of Requirements, Issues, Risks & Changes
- Definition of applicable Architectural Principles
- Manage reviews
  - Work products and deliverables
  - Co-ordinating external reviewers, Quality Assurance
- Internal: Advise the program manager and project executive on all aspects of the technical solution
- External: Develop relationships with client technical executives
Enterprise IT Architectures

Application Architect

Functional

Operational

IT-System

Component

Node

consists of

is distributed to

is placed on

Source: IBM
Application Architect

- Defines what the solution does
- Responsible for the Functional Aspects of the system
- Key responsibilities
  - Understands how the business requirements can be met using application software, and defines what application software packages and/or bespoke code is needed
  - Develops and maintains application architectures and strategies and to ensure the design integrity of the application subsystem and that it meets the agreed requirements
  - Defines high level data flows between applications
  - Leads any bespoke application development
  - Leads the configuration of the application software
The **Application Architect** is responsible for the Functional Aspects, which include these key concepts:

- **Component**
  - Modular unit of functionality which makes this functionality available through an interface

- **Subsystem**
  - Any grouping of components in IT system

- **Interaction and Collaboration**
  - Collaboration between components
  - Sequence of component operations
  - Exchanges between two components
  - Interface usage contract / protocol

- **Data**
Infrastructure (or Technical) Architect

- Defines the overall system shape
  - What the building blocks are from which the solution will be made
  - How the data and functionality will be placed

- Responsible for the Operational Aspects of the system

- Key responsibilities
  - Establishes non-functional and technical infrastructure requirements
  - Defines the infrastructure solution
    - Networking, hardware configurations, system software, middleware
  - Performance, Capacity, Scalability
  - Availability, Recoverability
  - Systems Management, Service Levels

Non-Functional Requirements
The **Infrastructure Architect** is responsible for the Operational Aspects, which include these key concepts:

- **Node**
  - platform on which software executes
- **Location**
  - type of geographical area or position
- **Zone**
  - an area for which a common set of non-functional requirements can be defined
- **Connection**
  - physical data path between nodes (LAN, WAN, dial-up etc)
- **Deployment Unit**
  - one or more components placed together on a node
- **Non-functional Requirements (NFRs)**
  - Service Level Requirement (SLR) like performance, availability, etc.
  - Constraints: business / geography, IT Standards, current Infrastructure, etc.
- **Walkthrough**
  - description of the flow of a scenario starting from a user all the way through the system and back to the user
Architect’s Responsibilities across the full life-cycle

Managing Requirements
- Requirements change management
- Requirements clarification, decomposition and allocation
- Requirements traceability

Outlining the Solution
- Design outline or technical roadmap
- Top level strategies, architectures and policies
- Definition of solution method

Developing the e2e Technical Plan
- Decomposition of solution into subsystems or projects
- Development of high level implementation strategy
- Dependencies and interfaces definition
- Building consistent business processes

Managing Execution
- Delegation of delivery phases
- Definition and oversight of technical governance processes
- Resolution of solution design issues
- Management of technical risks
- Management of changes and impact analysis
- Technical control of dependencies and interfaces

Assessing the Solution
- Proposal and project plan assurance
- Assure solution integrity within and between baselines
- Final sign-off of deliverables and changes

Be a Leader
“Architect” as a Profession

- Certification program from Open Group
  - Applying for a certification
  - Providing a package describing your architect work
  - Will be reviewed and possibly approved

- HPH’s Personal Experiences
  - Certified @ IBM as “Senior IT Architect” – once re-certified
  - Senior Certification @ IBM as “Executive Architect”
  - Re-Certification @ Open Group as “Distinguished IT Architect”
    (April 2013)
Example of an IT Architect’s Work
“Car Leasing” of a Bank: Situation and Customer’s Goals

- The “Car Leasing” process is very, very slow and the bank is loosing a lot of the business because clients are moving to the competition.

- Major Goal for the IT Architect is the definition of a Pilot Project for better support of “Car Leasing”.

- Characteristics: The work has to be done within one week, from the customer side Business People as well as IT people were involved.

- Major Results grouped in
  - Findings / Recommendations,
  - Pilot Project High level scope,
  - Next Steps Phase 1 and 2
  - Phase 1 Project Plan
### Example – an IT Architect at Work: Workshop Overview

<table>
<thead>
<tr>
<th>Day</th>
<th>Agenda</th>
<th>Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day 1</td>
<td>Introductions, Met LoB, which included Corporate, Retail &amp; Risk Mgmt</td>
<td>Consultant / Business from Customer</td>
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<tr>
<td>Day 2</td>
<td>Met IT folks and discussed our findings, agreed on Pilot Project.</td>
<td>Consultant / IT from Customer</td>
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<tr>
<td>Day 3</td>
<td>Technical Deep Dive including pilot arch overview</td>
<td>Consultant / IT from Customer</td>
</tr>
<tr>
<td>Day 4</td>
<td>Develop initial recommendations</td>
<td>Consultant only – need access to participants</td>
</tr>
<tr>
<td>Day 5</td>
<td>Presentation draft of Findings &amp; Recommendations</td>
<td>All Workshop Participants and Key Executive</td>
</tr>
</tbody>
</table>
Show Case: Car Leasing

Enterprise IT Architectures

Car Leasing

Seller (Customer)

Bank

Manager

Application

Leasing Application

Credits

Accounts

Customers
## Enterprise IT Architectures

### Example: Capturing Business Side

<table>
<thead>
<tr>
<th>Business Goal</th>
<th>Sub Goals</th>
<th>Key performance indicator</th>
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<tbody>
<tr>
<td>60% increase of the car lease business</td>
<td>Seamless interaction with the Loan System</td>
<td>Reduce process execution time from x hours to xx minutes</td>
</tr>
<tr>
<td></td>
<td>Seamless interaction with the Customer System</td>
<td>No delay in obtaining loan approval &amp; customer accreditation</td>
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<td></td>
<td>Sales rep. has instant secure access to the car lease application process</td>
<td>To be defined</td>
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<td></td>
<td>Proposal for a car lease can be issued to the customer instantaneously</td>
<td>Reduce time of notification to within x hours of Service Request Completion</td>
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<td></td>
<td>Simplify the application process by skipping the current account opening</td>
<td>Time to close a contract reduced with xx %</td>
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<td></td>
<td>Minimize the number of additional processes that need to be opened to issue a car lease loan</td>
<td>Instant proposal to a potential customer</td>
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<td>Proper access sales person within the car dealer shop.</td>
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<tr>
<td></td>
<td></td>
<td>To be defined</td>
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<tr>
<td></td>
<td></td>
<td>No requirements of opening a current account process</td>
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<td></td>
<td></td>
<td>To be defined</td>
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</tbody>
</table>

Example: Capturing Business Side
Example: Context Diagram – Car Leasing
Example: SOA Layered View – Car Leasing
Example: Technical View – Car Leasing
Example: Time Line – Car Leasing

- **Phase 1** Pilot project
  - Total duration 10 weeks
  - Estimated start July 2008
  - Estimated completion Mid September 2008

- **Phase 2** Pilot projects
  - Estimated total duration 1-4 months per process
  - Extension and optimization of Car Lease
  - New Credit Card process
  - Document Archiving and Retrieval
  - Consumer Loans
Example: Project Plan – Phase 1 Car Leasing
Questions