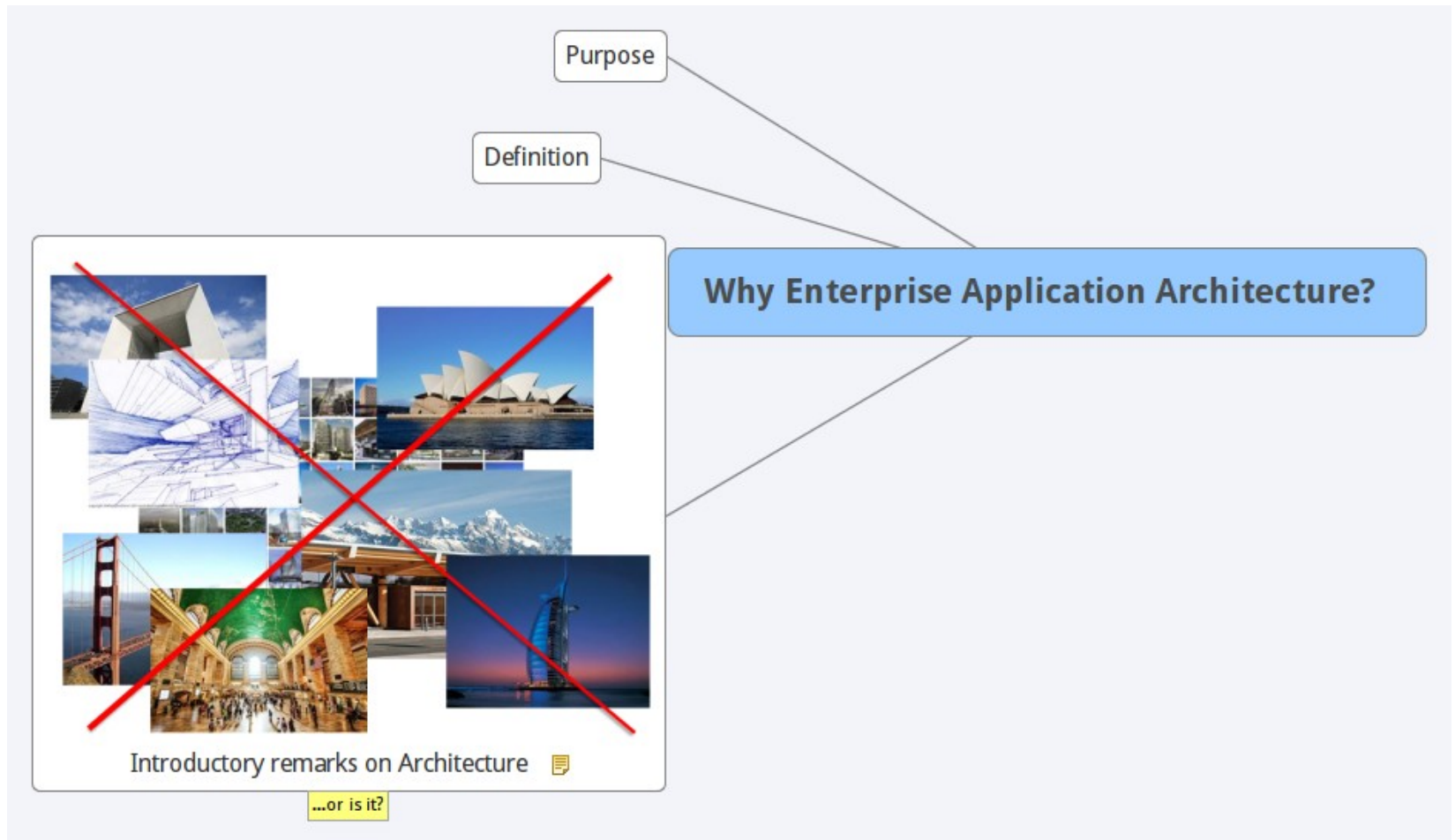

WIT 2016 ITA Module

Lecture Group #1 - Part 3 Enterprise Application Architecture



Why Enterprise Application Architecture?



Introductory remarks on Architecture

"Architecture" is one of those words that has long migrated into our common language.

Its manifestations are visible all around us and are an integral part of our daily lives, in both Physical and Digital ways.

We think we understand each other when we talk about Architecture.

And indeed, precise enough definitions of Architecture are captured in dictionaries and encyclopedias.

But most refer to the "classic" definition of the term from the building construction industry.

As a result Architecture typically refers to monuments or structures, visual aesthetics or features smartly designed.

Few of us think of Architecture as the complex & modern field of Design & Engineering it is today.



Module Guiding Statements

Architecture is an ENGINEERING discipline: Enterprise Application Architecture.

It aims to engineer the Enterprise as a SYSTEM - i.e. the Digital Nervous System of the Enterprise.

It realizes the VISION for an Enterprise as defined by its Executive Management, through the use of Information Technologies & Information Management Systems.

As such it is about designing Architectural SOLUTIONS for the BUSINESS Enterprise (or any organization in general - i.e. Government or Non-profit organizations).



Need for Architecture in the Digital Age

A firm is kept in business by a core set of Business Processes and Systems performing thousands (...) of transactions, daily.

The sound structure of systems & processes supporting these transactions can help or hinder the efforts of a Company to compete.

Architecture is the explicit design of such systems & processes - fulfilling the Operating Model (OM) of the Enterprise.

It has a vital role in enabling (or constraining!): (a.) Business performance, (b.) Decision making, (c.) Strategy execution.

To generate a distinct competitive advantage, modern organizations no longer separate discussions about an IT Project and a Business Initiative.

Architecture aims to ensure that the Enterprise gets value back from investments in Technology and Information assets, across its organization.




Analogy of Application Architecture ...with Architecture

Environment Constraints

Impact of Technology

Blueprints, Standards & Principles

Design Viewpoints



Remarkable aspects of Application Architecture

1. Erection of piers and support spans.
Labels: span, pier, central tower, caisson, caisson.
2. Construction of work station on central tower.
Label: erection derrick.
3. Installation of temporary stay cables and first erection cables.
Labels: temporary backstay cable, backstay anchorage, erection cable, temporary forestay cable.
4. Extension of central span.
Labels: temporary backstay cable, erection cable, temporary forestay cable.
5. Completion of central span and removal of temporary cables.
Label: erection cable.

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An Engineering Discipline



Example: Bridge Construction Analogy

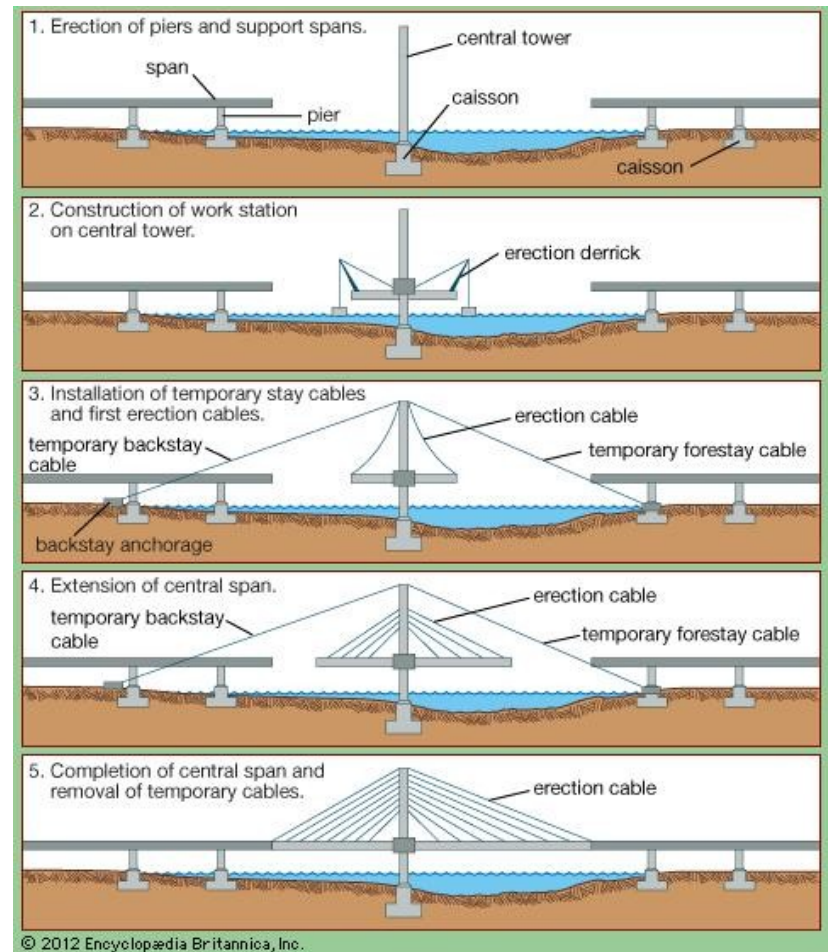
Architecture is a Planning and Engineering story before being a Manufacturing story.

The Solution design is defined as a Plan (planning activities).

The Solution design is represented as a Model (modeling activities).

The Solution design helps the sequencing and execution of the construction (material selection and procurement, manufacturing, many more).

...and Architectural oversight spans the ENTIRE life of the resulting construction.



Blueprints, Standards & Principles

In the building industry Nowadays all building construction materials are codified. Material properties (ex. resistance) are known.

Building a suspension bridge or a cable-strayed bridge remains a significant undertaking, but blueprints (i.e. styles) are made adjusted to local topologies.

The exact same pertains to Solution Architecture in the enterprise as we will uncover in the Module.



Impact of Technology

Within the building industry, new indoor and outdoor materials presenting new properties, push the limits of what can be built.

With every new Technology introduced comes new possibilities.

Ambitious architectures, yesterday not economically viable, are today enabled by new manufacturing methods, lowering down the cost of material construction materials.

The exact same pertains to Solution Architecture in the enterprise.

However it isn't all about the "cost of entry". It is also about managing the Enterprise's technical debt.

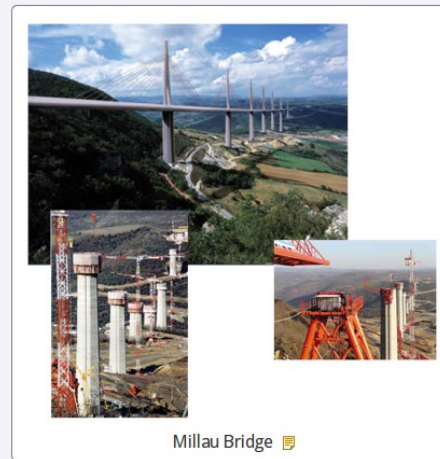


Environmental Constraints

Environmental constraints generate Architectural requirements that are not functional in nature.

When applied on the envisioned design, such constraints forces Architectural trade-offs.

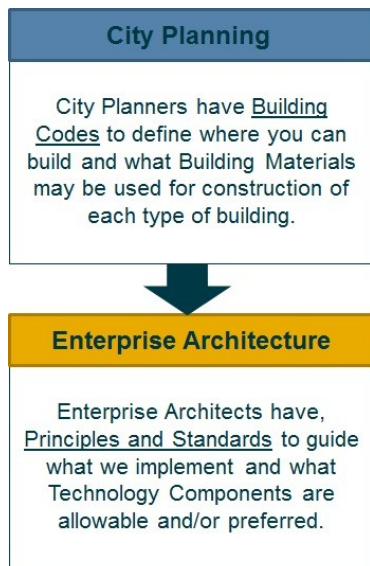
When applied on the envisioned design, such constraints inspire creative solutions.



Environment Constraints

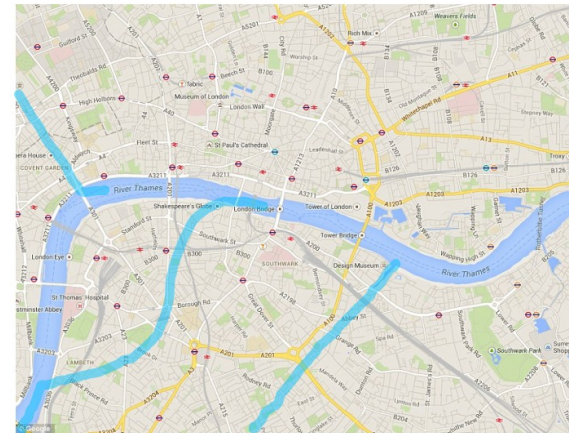


Example: City Planning Analogy



Purpose:
To provide documented architectural information that aids managers, project leaders, analysts, and developers in making correct IT choices.

Take a urban layout of a major city. Look at the river going through it.



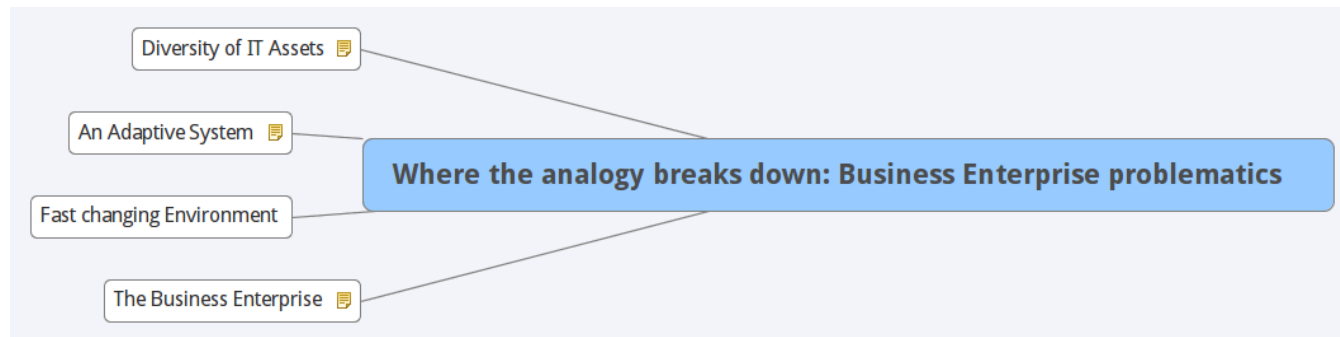
Imagine that every 3 weeks, a new affluent, confluent is added or removed. How do you plan? How do you operate your city?

Where the analogy breaks down: Business Enterprise problematics

The Enterprise is made of People, its workforce and main asset. The Enterprise is a People story before being a Product or Money story. An Enterprise is as good as its People are.

Life-span of Enterprise last (ideally) many years. People's expertise come and go... creating an undesirable side-effect: short-term memory syndrome.

Think of it as forgetting about what you did (and how you did it) every week, week after week. How do you sustain the long-term memory of your Company?



Need for Adaptive Systems

Building Architectures solve for the present defined problem: The resulting solution is a set of interacting or interdependent entities forming an integrated whole together respond to environmental changes, or changes in the interacting parts of the design.

IT Solution Architectures realize a VISION. Visions are moving targets. The life-long purpose and function of an EVOLUTIONARY Architecture is deliver value to its "users" overtime, in an ever-evolving given context of use.

Application Architecture must permit extension, refactoring of its constituents to from the existing Solution in an economically viable way, without throwing away the existing system(s).

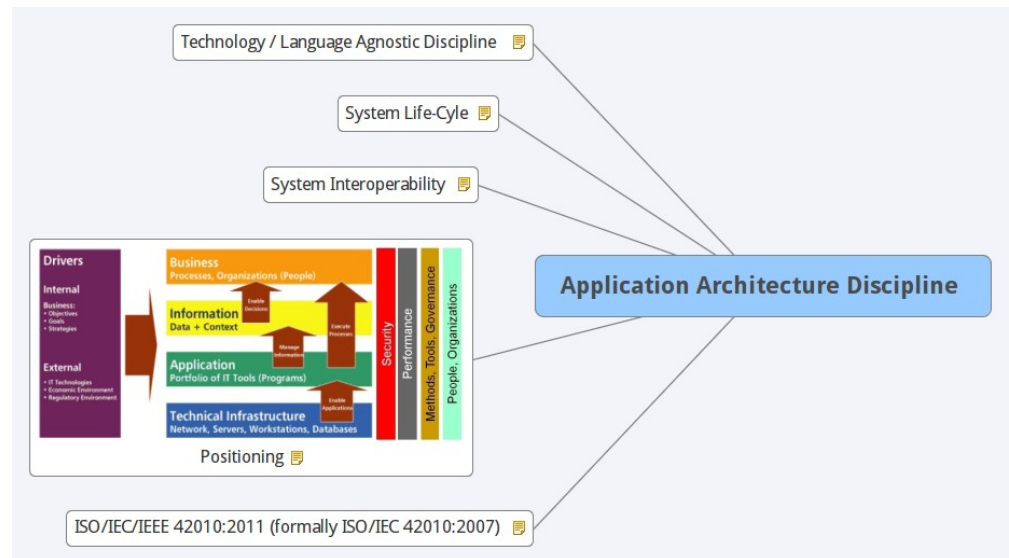


Application Architecture Discipline

Architecture provides deep insight on the structure and behavior of components, systems and how they interoperate between one another.

Architecture tries to AVOID having to delve into or reverse engineer existing applications/systems to understand what they do, and how they do it.

Architecture groups modules into components, components into systems, systems into services.



Architecture to Structure Solutions

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Architecture Definition

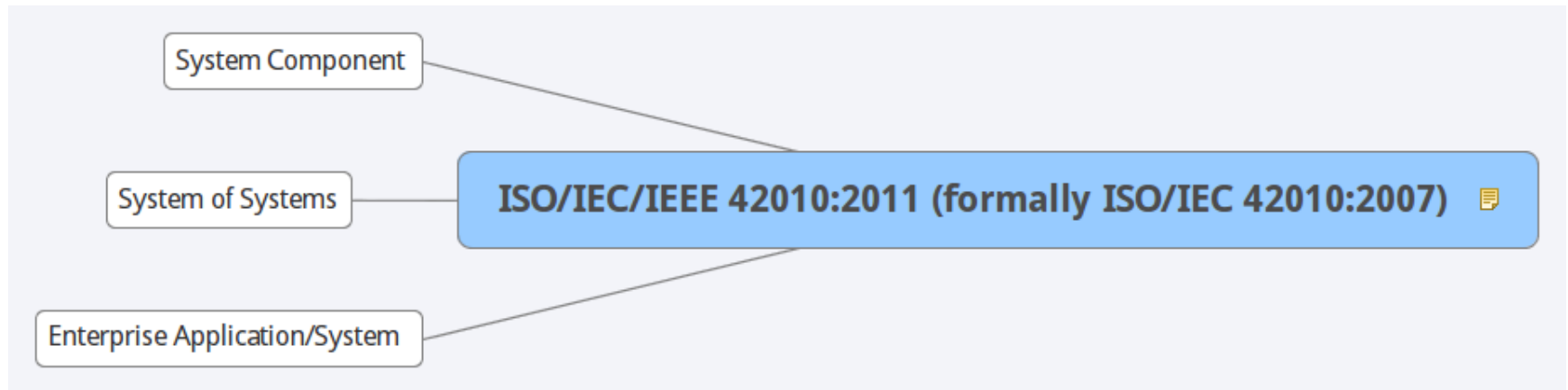
ISO/IEC/IEEE 42010:2011

The Architecture of a SYSTEM is the fundamental organization of that system embodied in its COMPONENTS,

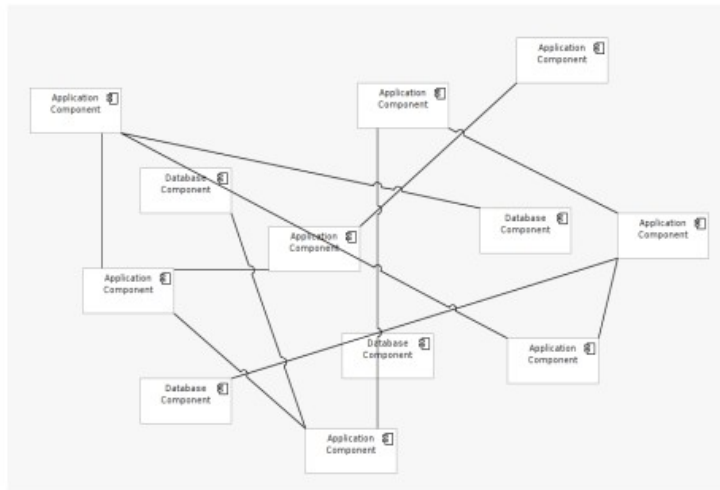
...their relationships to each other and to the ENVIRONMENT, (architecture components interoperate with other components by exchanging information/data)

...and the PRINCIPLES guiding its DESIGN and EVOLUTION.

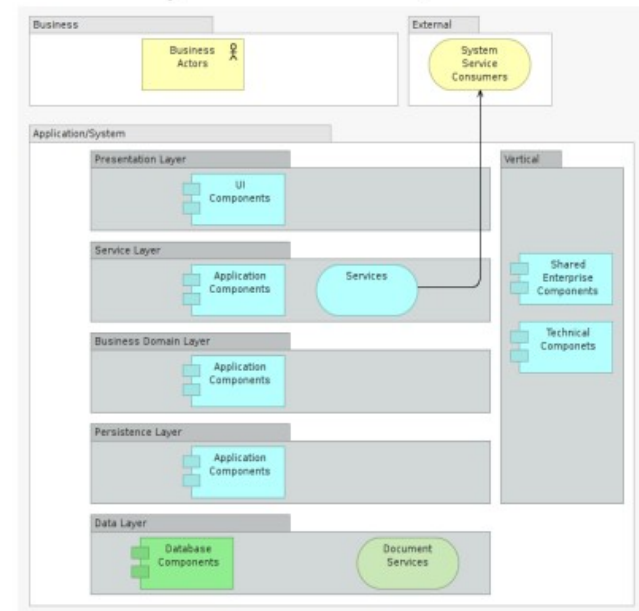
Or simply put “structure with a vision”.



Organize components in a structure



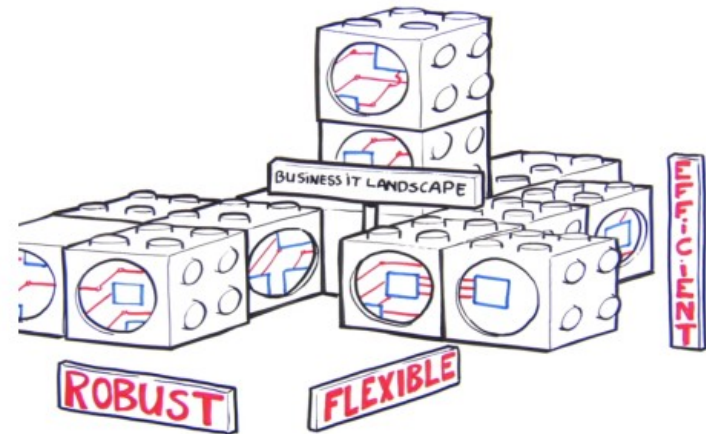
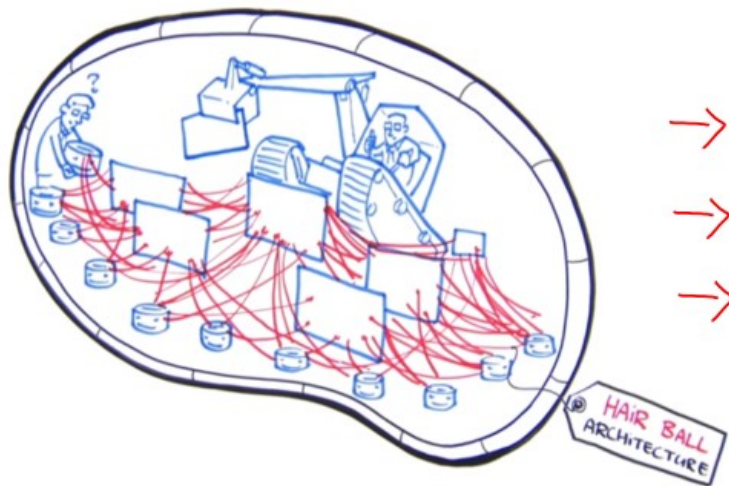
A Logical Blueprint



Traceability?
Completeness?
Fitness for Purpose?

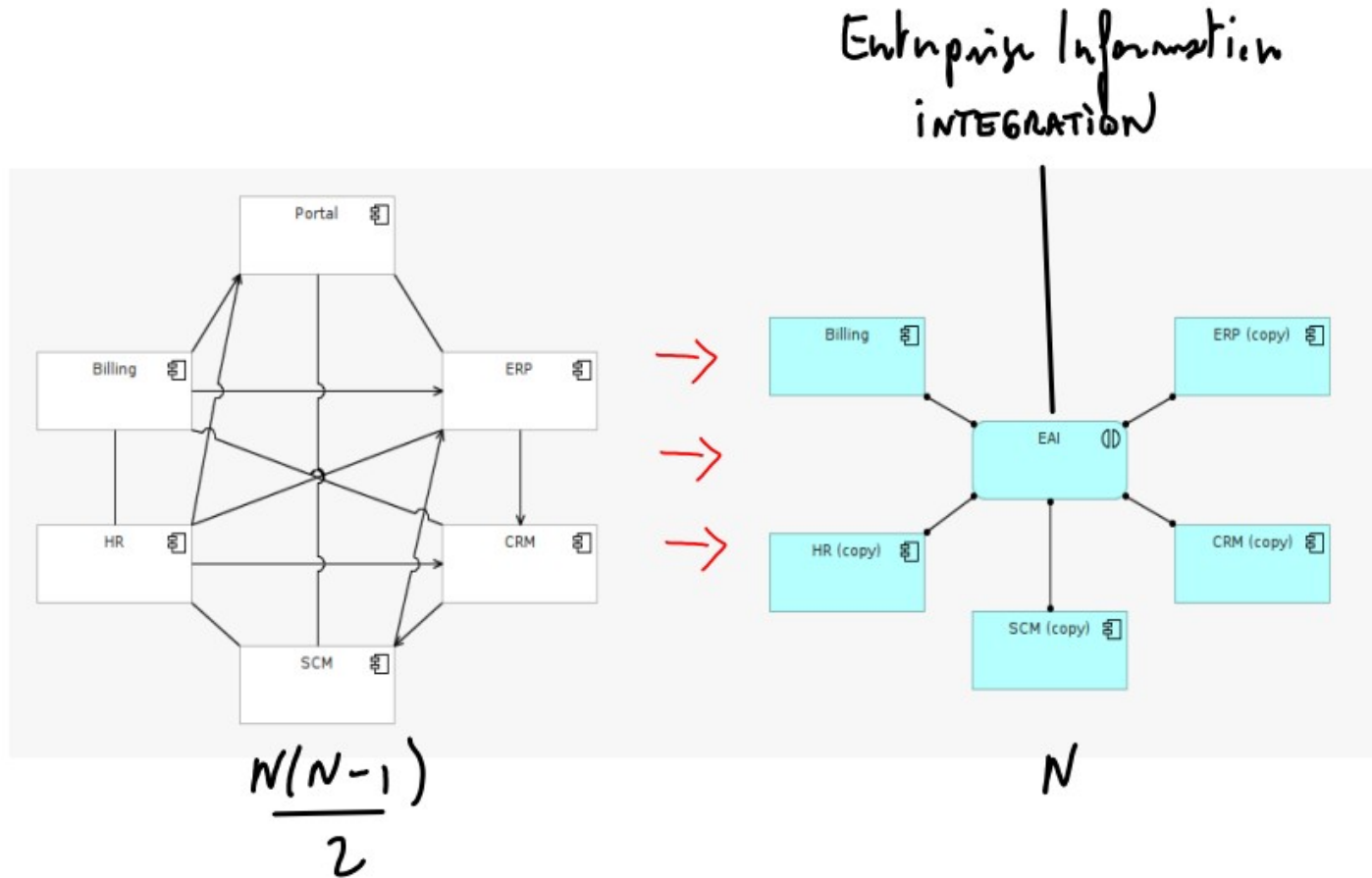


Organize dependencies in structure



Contract Interfaces
Interoperability
Interchangeable

Structure communications between components



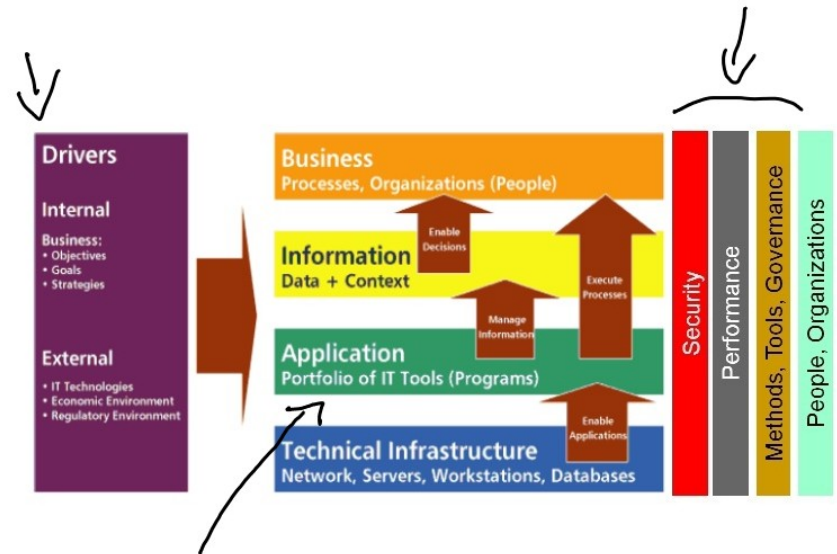
Domain structuring

Architecture describe the Operating Model (OM) of the Enterprise “as-a-system” using 4 Domains of skills/expertise.

Each domain is a classification and specialization of skills, techniques, tools, terminologies.

All Architectural Domains propose tangible deliverables falling into two broad categories:

- a formal description of a system, or a detailed plan of the system at component level
- a description of the structure of components and their relations



Business Architecture domain

The Business Architecture Domain describes the OM and OT of an Enterprise under the lenses of:

- (a.) its Business Capabilities,
- (b.) its Value Proposition Streams,
- (c.) the classification of its Information Assets,
- (d.) its Organizational design.



Information Architecture domain

The Information Architecture Domain describes the OM and OT of an Enterprise under the lenses of:

- (a.) the Structure of its logical and physical Data assets,
- (b.) the definition of its Data-interchange Standards and Contracts for Systems to productively inter-operate,
- (c.) the mechanisms guaranteing the Integrity & Reliability of its Enterprise Information Assets.



Application Architecture domain

The Application Architecture Domain describes the OM and OT of an Enterprise under the lenses of:

- (a.) the structure of its Systems & constituting Components, answering both Functional and Non-functional requirements,
- (b.) the responsibility of such Systems & constituting Components, supporting the execution of Business processes,
- (c.) the interactions between such Systems & constituting Components, the amount and nature of then relationships between each,
- (d.) the life-cycle and deployment of such Systems & constituting Components, on target Devices and Technology host platforms.



Technology Architecture domain

The Technology Architecture Domain describes the OM and OT of an Enterprise under the lenses of:

- (a.) the infrastructure capabilities required to support the deployment of business, data, and application solutions, from a Hardware and Software standpoint,
- (b.) the introduction, governance and management of the life-cycle for net new & existing Technology assets,
- (c.) the optimized management of infrastructure costs (i.e. middleware, networks, communications, storage & processing power), from the standpoint of "utilities".



Cross-cutting domains (verticals)

Transversal to Architectural Domains that are Internal Drivers (Goals, Objectives), and External Drivers (Market Forces).

Transversal to Architectural Domains are Perspectives answering Non-functional requirements, Technology Trends (i.e. Hype-Cycle).



Influenced by Technology, but...

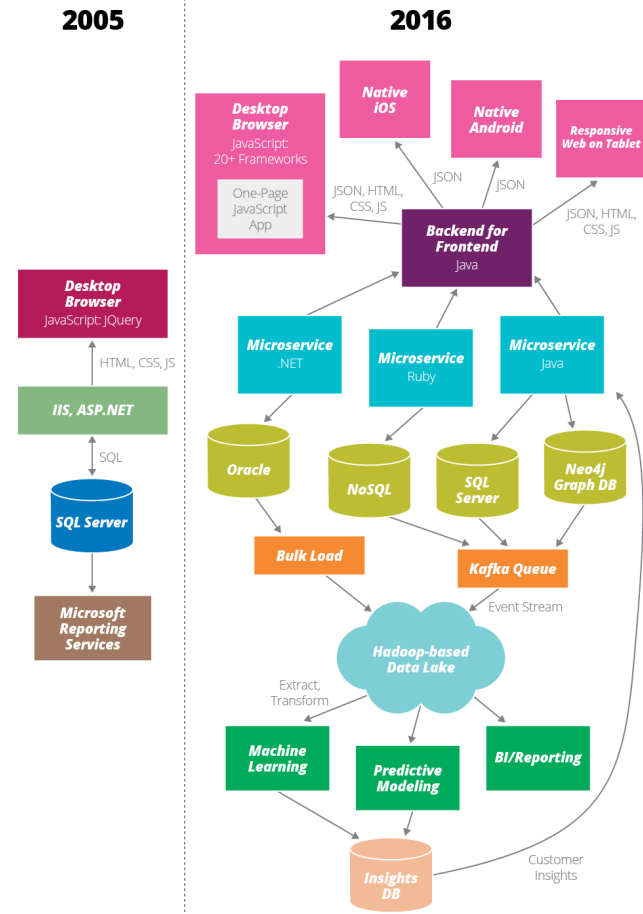
..the primary modeling blocks of Architecture are components, applications and System of Systems, not technologies.

Making sense of Architecture requires putting the above into the context of (1.) a structure, (2.) a flow

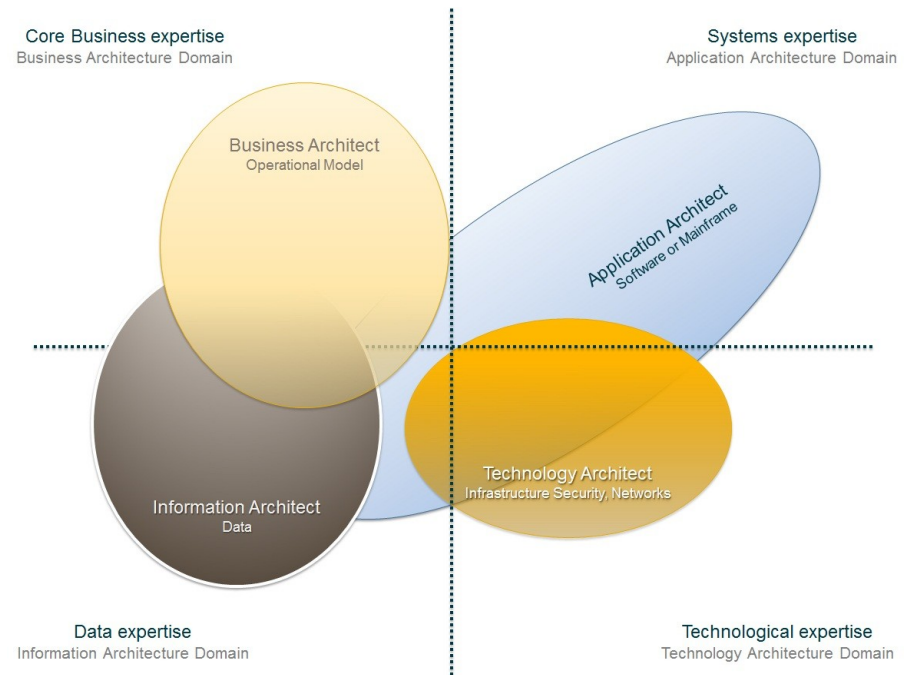
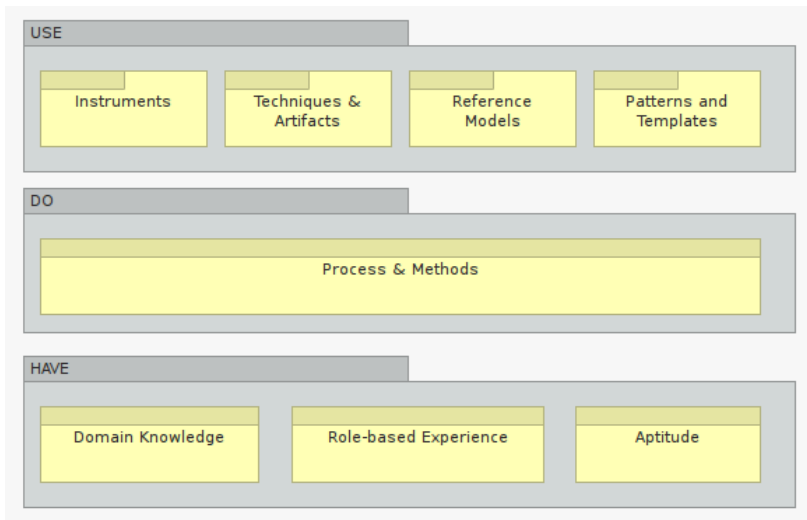
...aiming to SOLVE for a purpose/vision, or SOLVE for a problem.

Technology revolutions greatly influence generations architecture styles and patterns

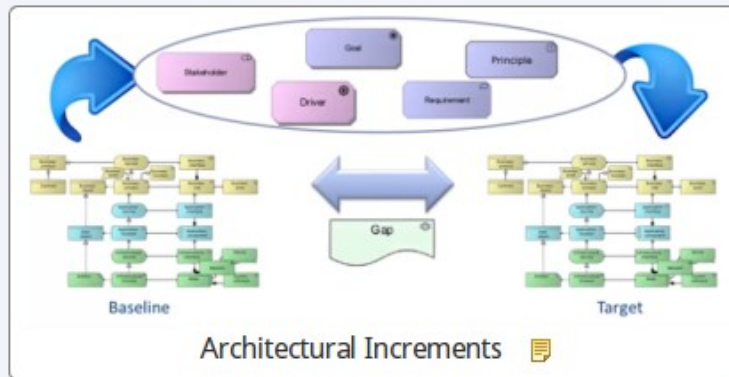
...but it is a secondary concern.



Architects Have, Do & Use



Purpose of Architecture

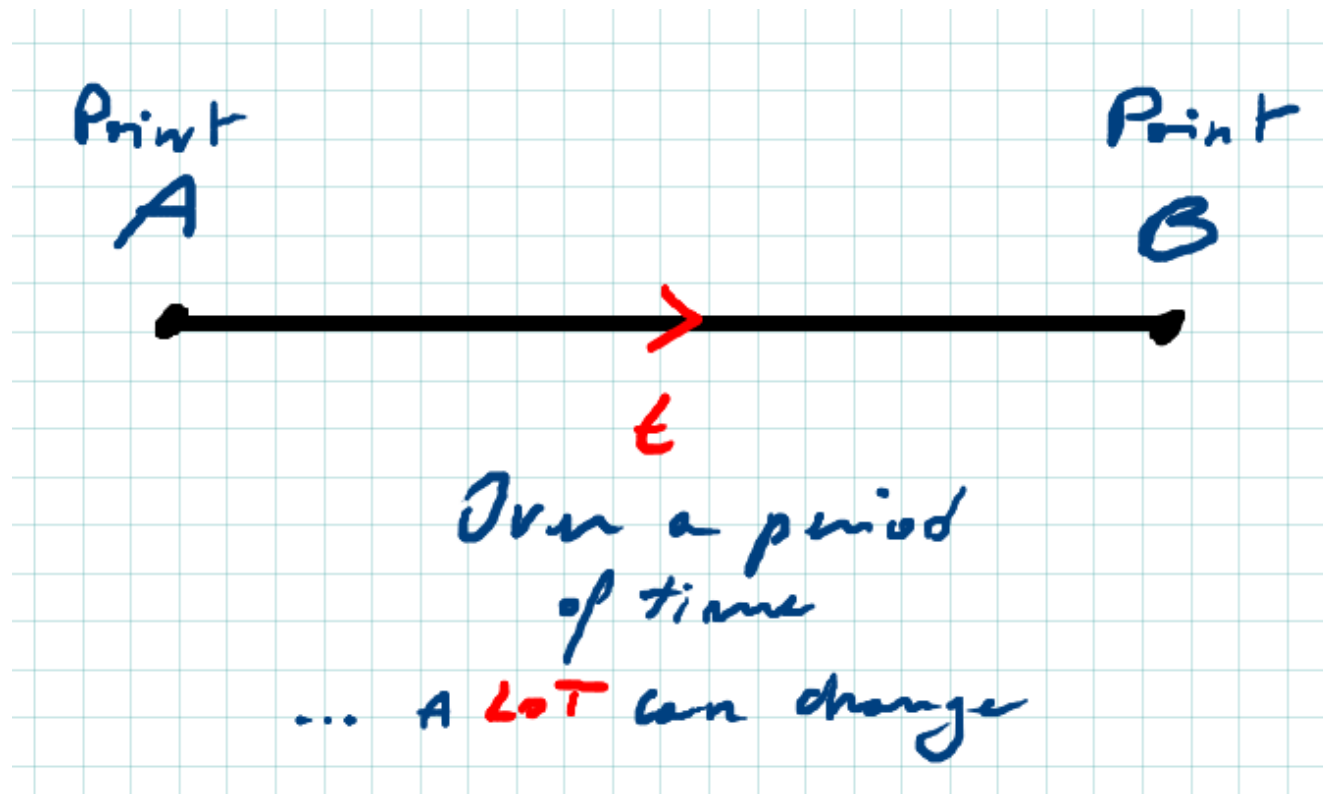


Architecture for Planning System Strategy

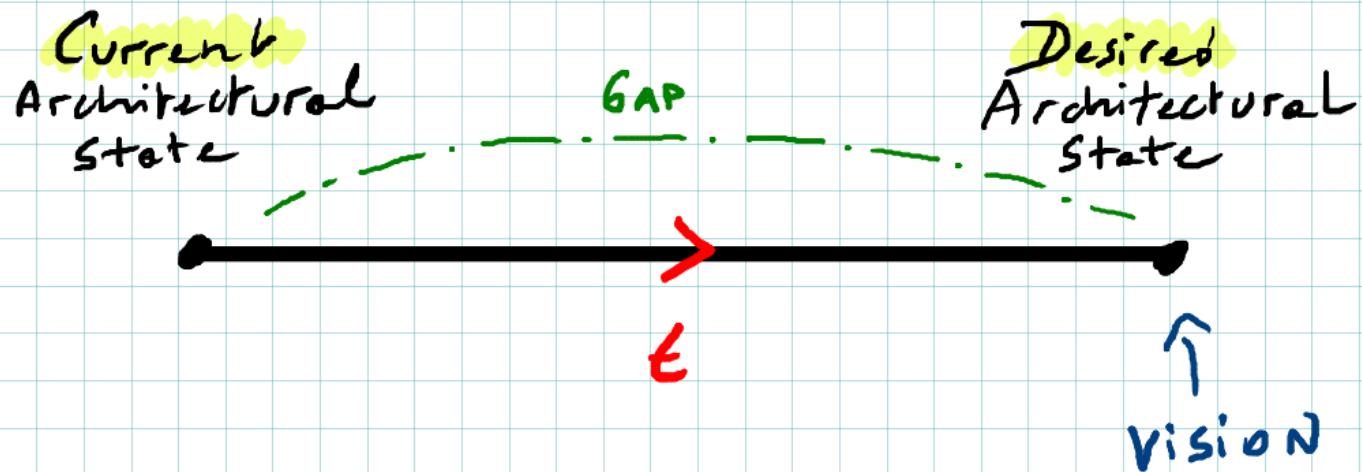
About "Strategy"



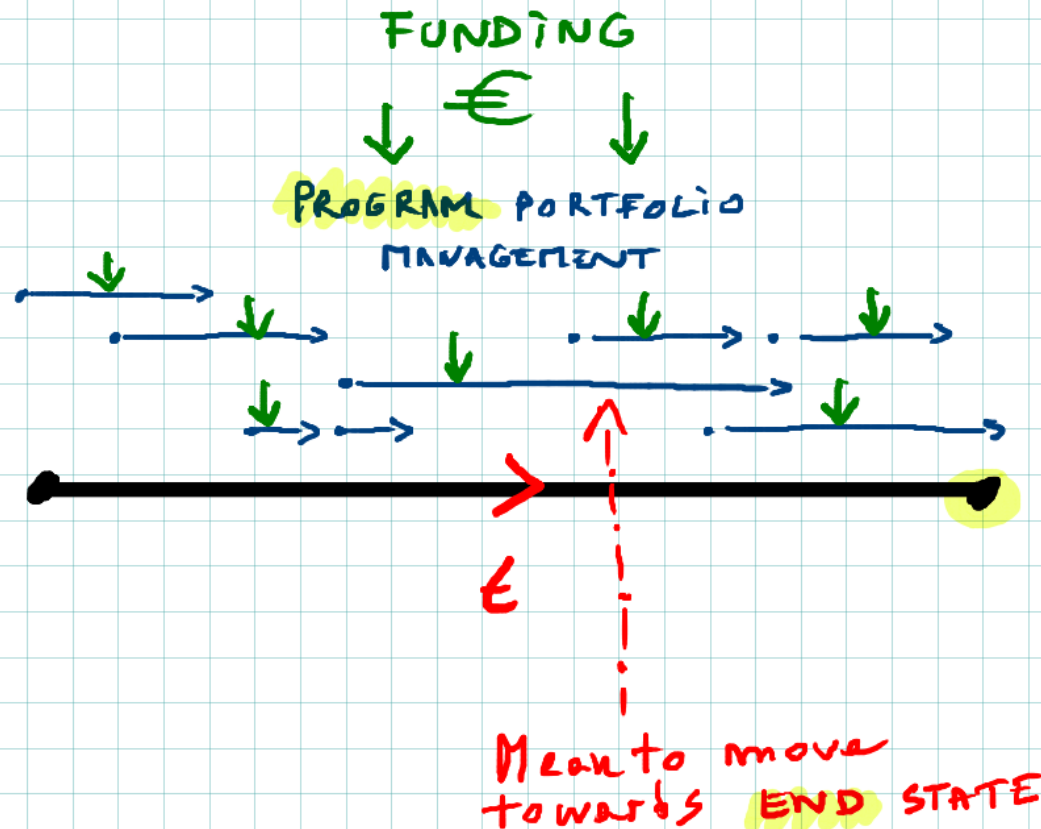
Strategy: To go from A to B



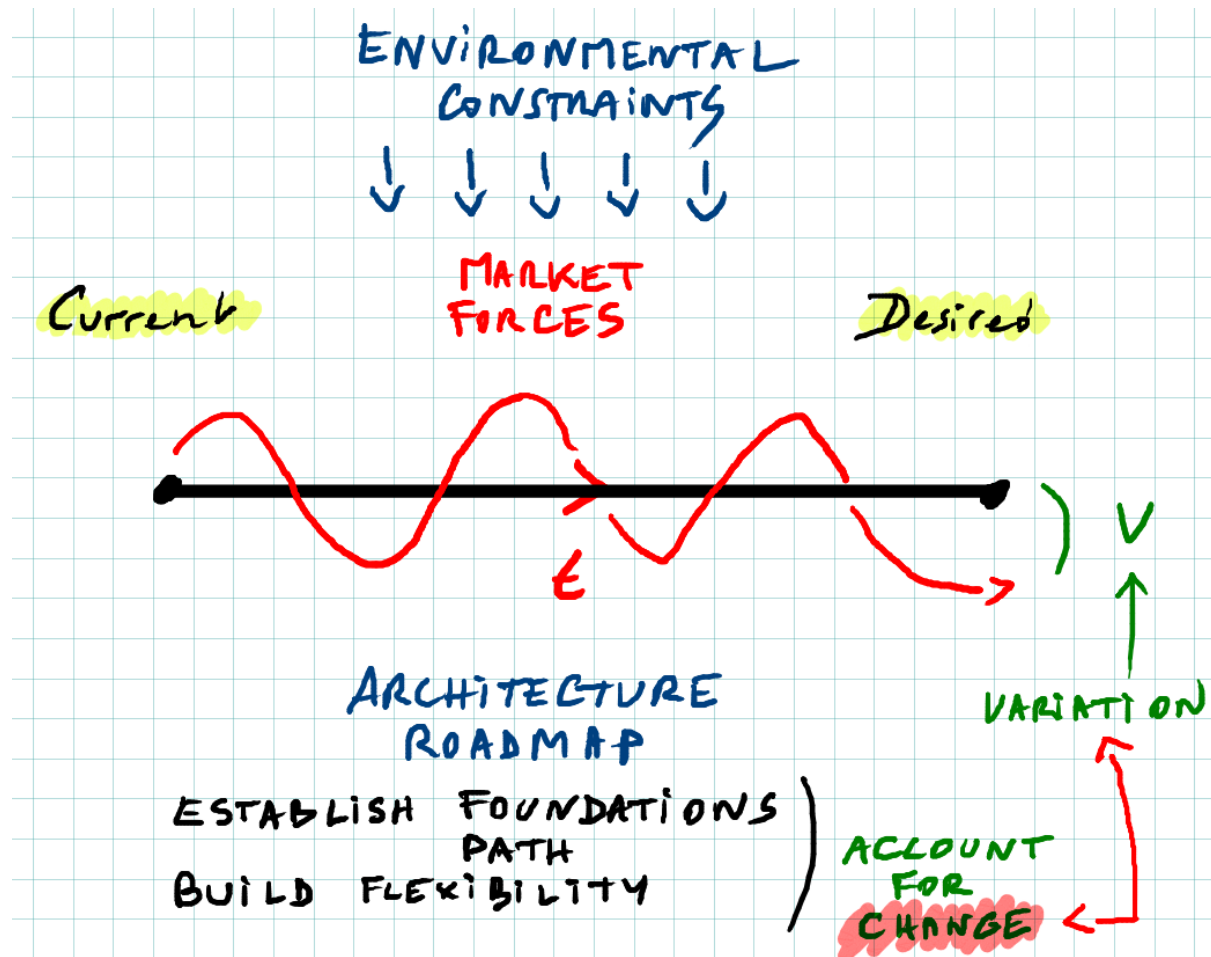
Strategy: To realize a Vision of the Enterprise



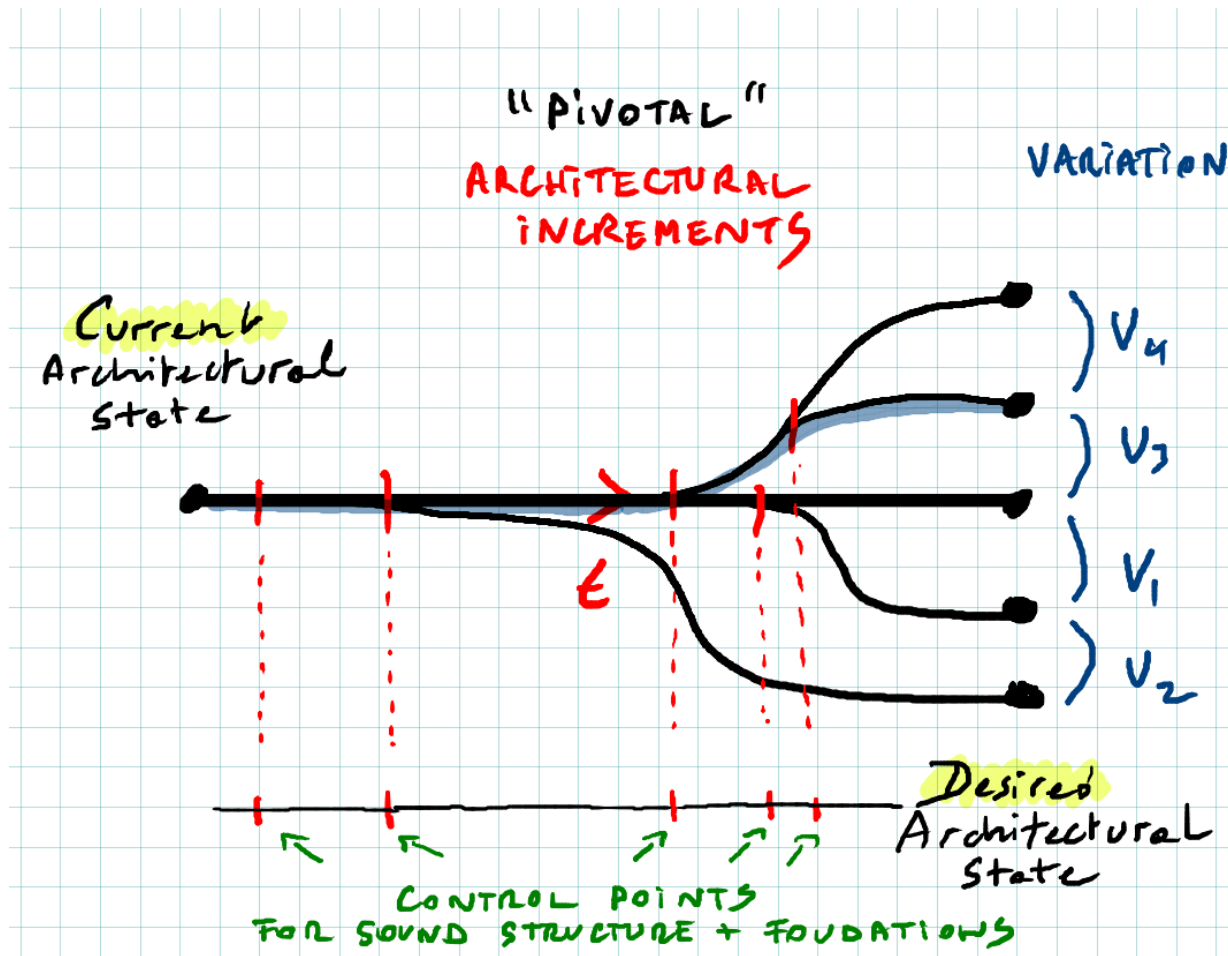
Means of moving a Strategy forward



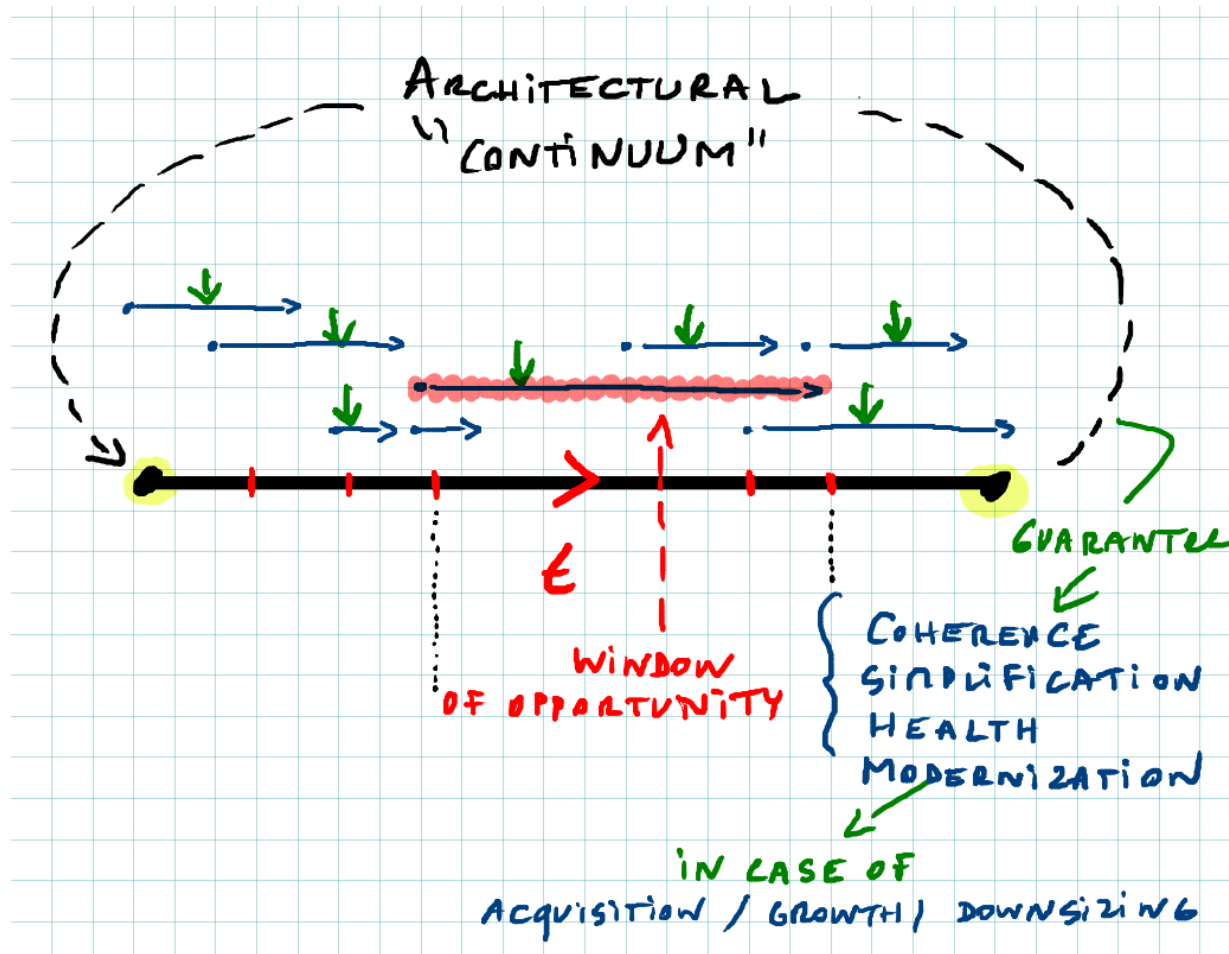
Manage complexity and change



Variations in strategy paths



Windows of opportunity (for change)

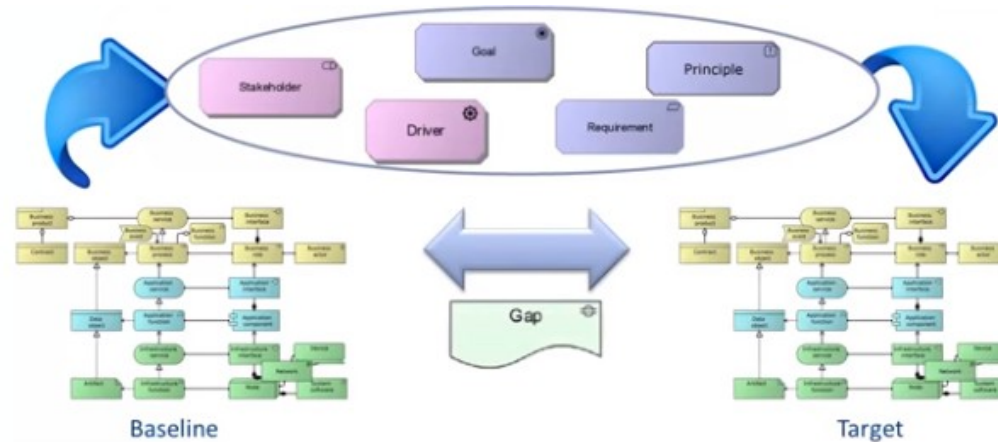


Addressing gaps in small increments

Any business initiative is a valuable source of funding and as such provides a window of opportunity for an architect to move towards a desired target state for the enterprise.

...for example to decommission "aging" systems.

For this reason, architecture is often referred as, "the next natural step after strategy".



Thinking like an Architect

Incremental specifications, with the expectation of spiraling back for changes, is the best approach to architecting.

A complex problem cannot be solved all at once. It requires an incremental approach. As the architect knows more about a solution, that knowledge is folded back into the specification.

How an architect determines when to drill down into a part to more fully specify it, or to address all parts at a coarse-grained level, is an individual decision.

It doesn't matter how an architect approaches the specification of an architecture, as long as the system functionality and semantic behavior are in the end well-defined: traceable decision, complete, fit for purpose.



Taming Complexity

“Complexity is the enemy of computer science, and it behooves us, as designers, to minimize it.” - Charles Thacker, CACM, July 2010.

Architects provide an answer to tame complexity and to manage it - aim to mitigate complexity BY DESIGN.

Mediocre architects jump to design without knowing the problem they are solving for, generating further complexity down the line.

Architecture is lives before design, it aims to understand what matters to a System - i.e. significant Architectural concerns, forces, constraints.

Architects simplify & precise the expression of "what to solve for" - ex. leaving out any elements that are not significant enough, can be resolved later down the road, or dismissed altogether.

