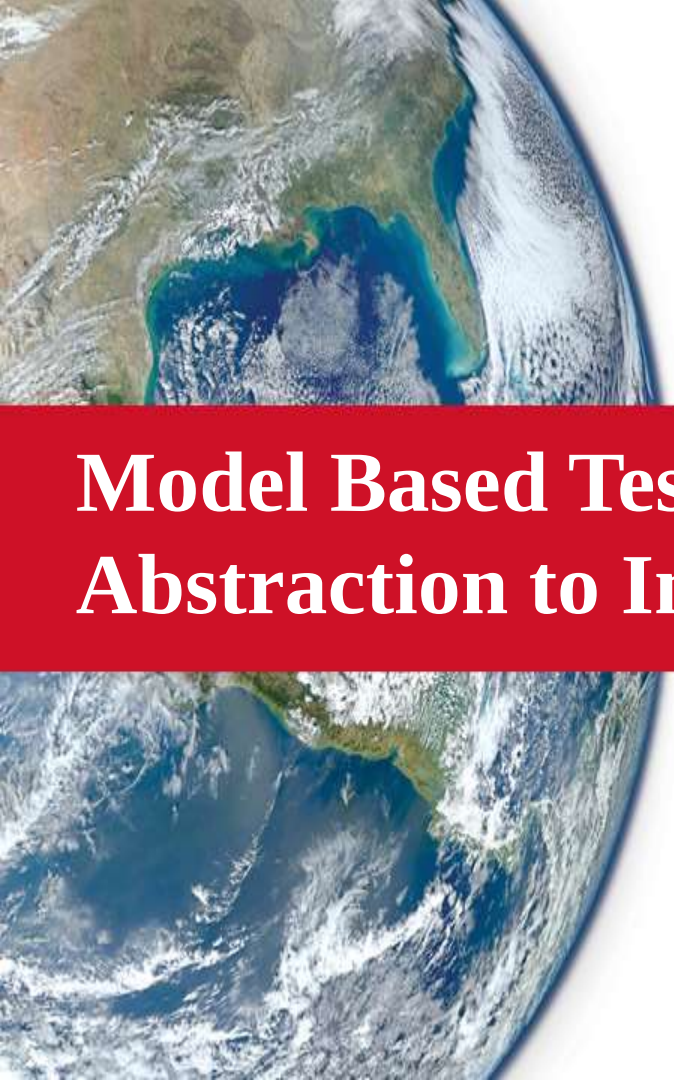

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Model Based Test Architecture: An Abstraction to Improve Reality

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Agenda

- Introduction
- Test Architecture Overview
- Test Architecture from Engineers Point of View
- Test Architecture Using Model Based Elements
- Knowledge Points and Development Process
- Test Architecture Implementation
- Conclusion

Introduction

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- **Test Architects** – chief builder of test
- **Test Architecture (TA)**– the explicit definition of a test program that Test Architects defines the structure in terms of components, connections, and constraints of a product, process or element[1]
- **Model Based Test Architecture (MBTA)**– the explicit definition of a model that supports the Test Architect to define the Test Architecture

[1]Maier, Mark W. and Eberhardt Rechtin. 2009. *The Art of Systems Architecting - 3rd Edition*. NewYork: CRC Press.

TA from Engineers POV

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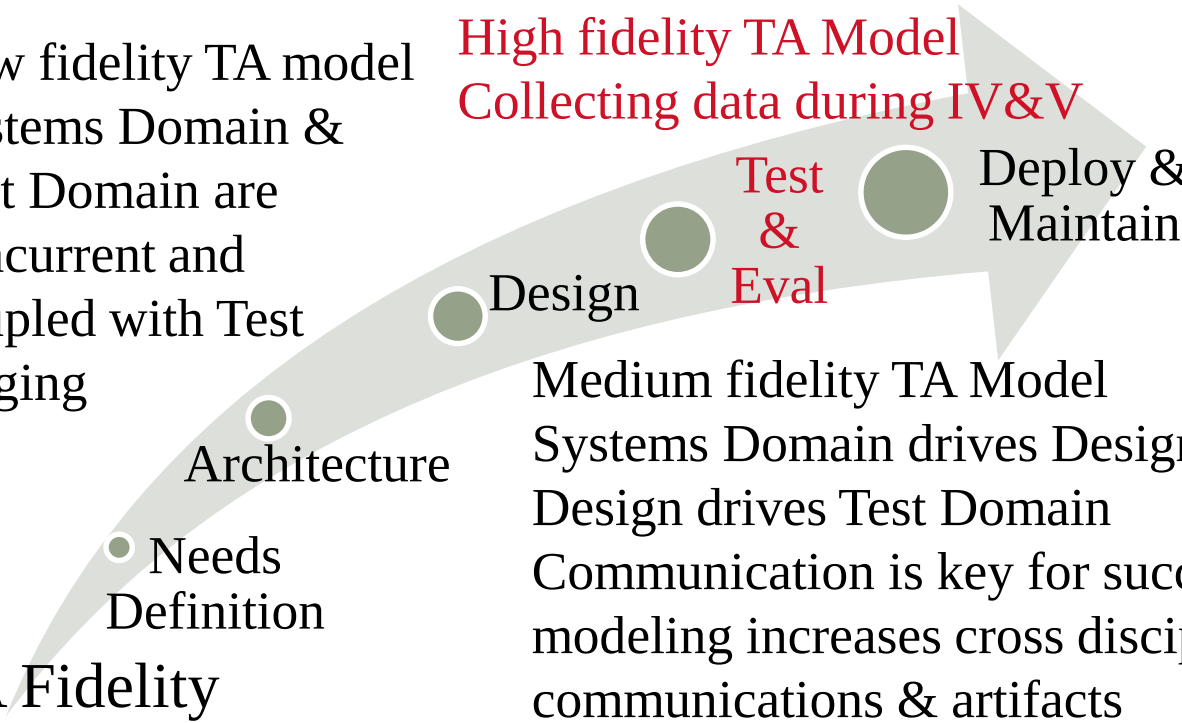
Low fidelity TA model
Systems Domain & Test Domain are concurrent and coupled with Test lagging

High fidelity TA Model
Collecting data during IV&V



Medium fidelity TA Model
Systems Domain drives Design
Design drives Test Domain
Communication is key for success, modeling increases cross discipline communications & artifacts

Modeling fidelity increases as the program matures

TA from Engineers POV

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- Systems Engineering & Test Architects working on modeling the Unit Under Test (UUT) and the Test Architecture (TA) concurrently will provide higher understanding with less defects by increasing multi-disciplined communication using a industry support language SysML and it associated tools
- Model Based Test Architecture (MBTA) enables managing data, generating artifacts and having information available to the entire team which is easier than traditional methods (distributed documents and sources)
- Architecture leads into design and design implementation becomes a UUT in its test environments (TEn)

As the slide rule is to the calculator the MBTA will be to test

Test Architecture Overview

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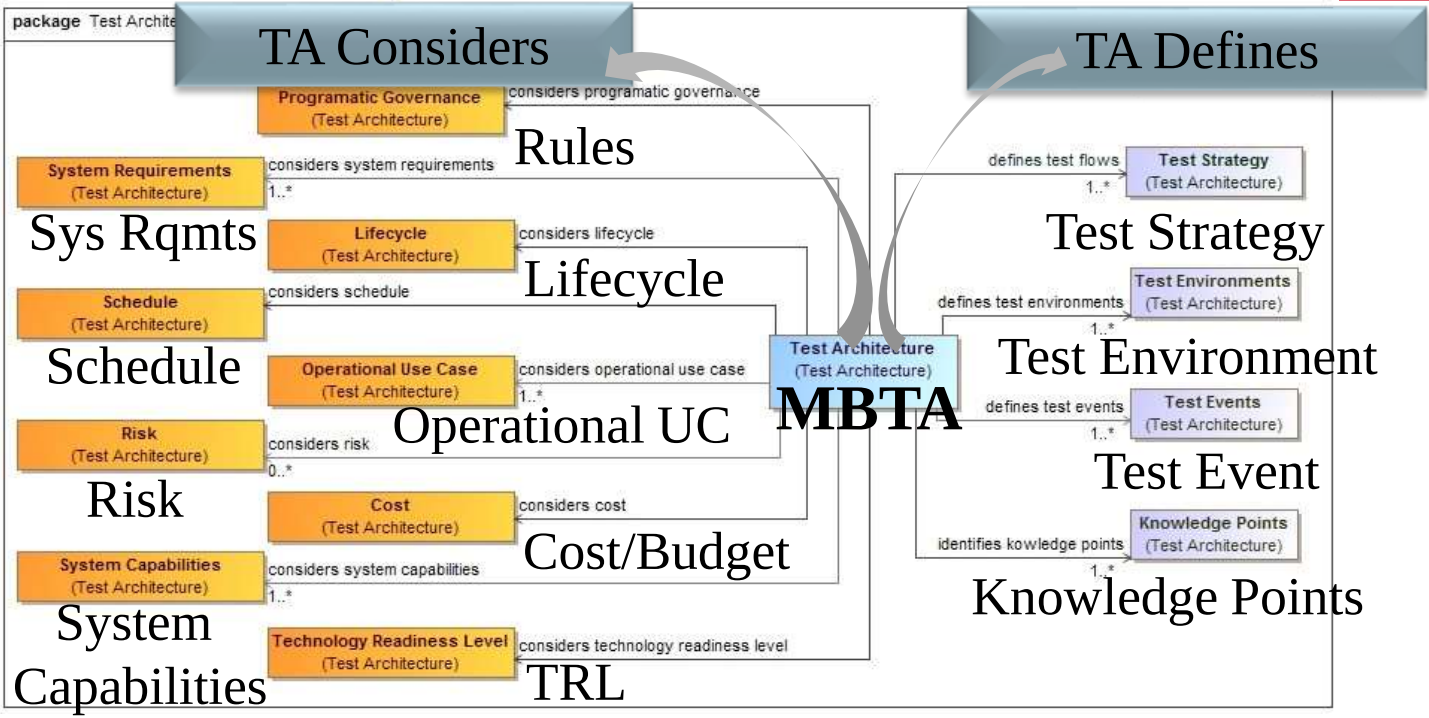

Foundation of the Model Based Test Architecture (MBTA)

Knowledge Points (KP)

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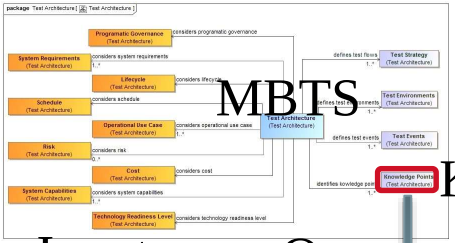
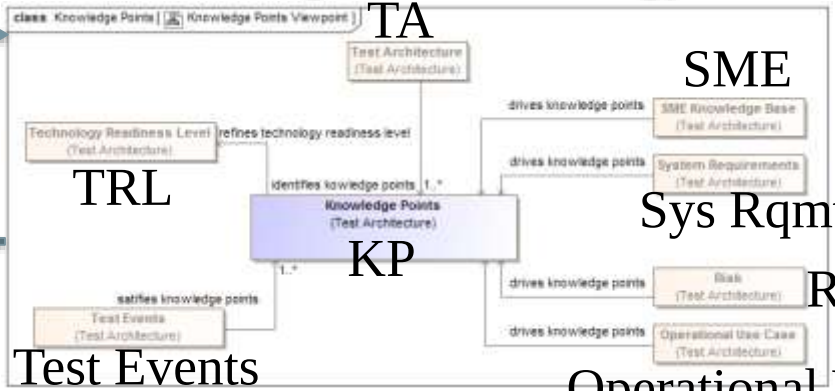


Captures what activities or what we need to know about the system that allows it to meet the system intended purpose

Knowledge Point Ontology



SysML Element

Maintaining the focus on what is required!

Test Events

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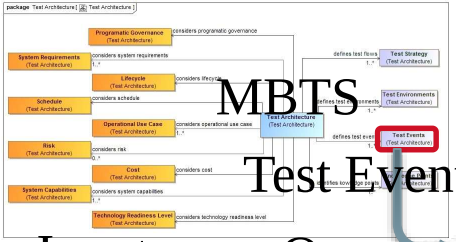


MBTS

Test Events

Inputs

Outputs

Primary purpose is to satisfy a KPs and to verify requirements when the data is produced and analyzed

Test Events Ontology

Test Architecture

SysML Element

«Test Event»
Test Event #1

Test Case

Procedure

Test Data

UUT Rqmts

Does or is something

KP

Risk

Facilities

TEn

UUT

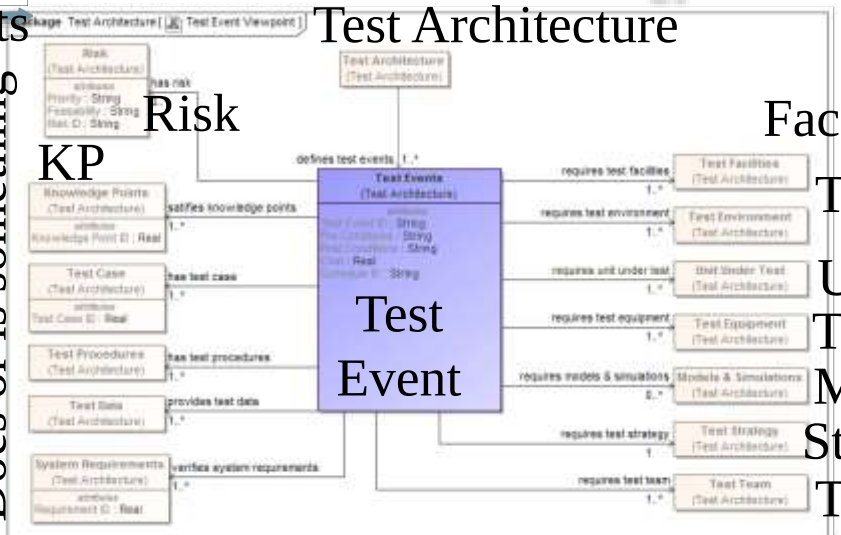
TE

M&S

Strategy

Team

required



Captures approach to obtain objective evidence!

Test Environment (TEn)

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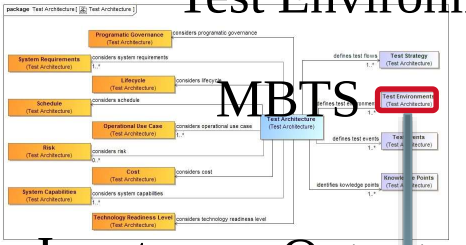
Test Environment



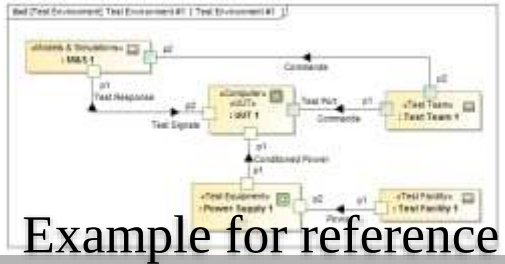
MBTS

Inputs

Outputs

SysML Element

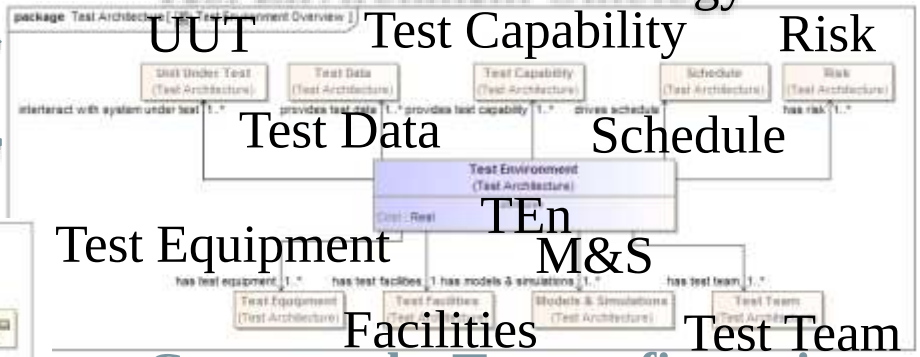
IBD Diagram



Example for reference

Provides the capabilities awareness that enable Test Engineers to determine which assets and artifacts are required to execute a test event.

Test Environment Ontology



Captures the Test configuration and Information flow.

Modeling the details of Test Environment

Test Strategy

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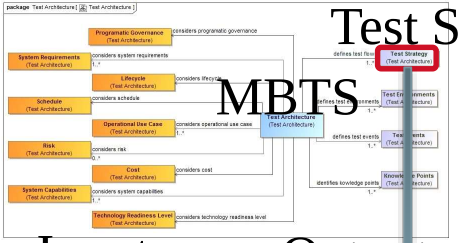
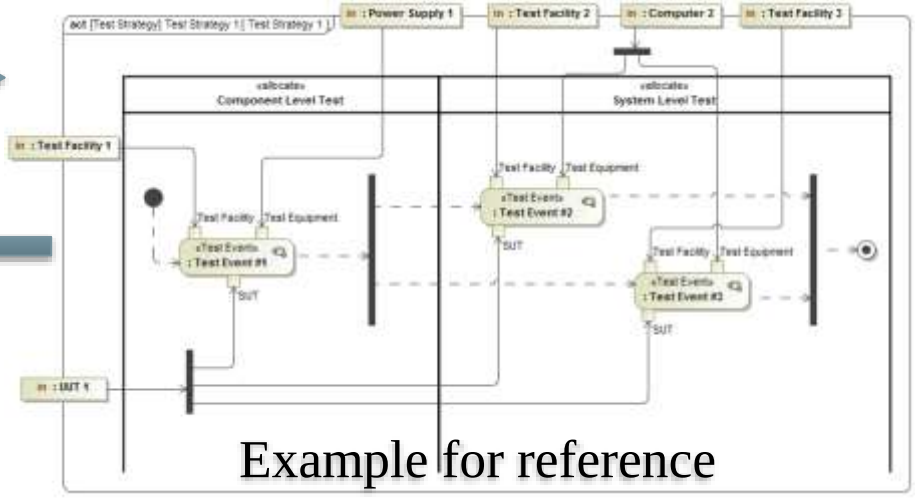


Test strategy is capable of evolving as the system progresses throughout its lifecycle.

SysML Activity Diagram



Example for reference

SysML Element

Modeling and generating a test strategy

Test Architecture Modeling

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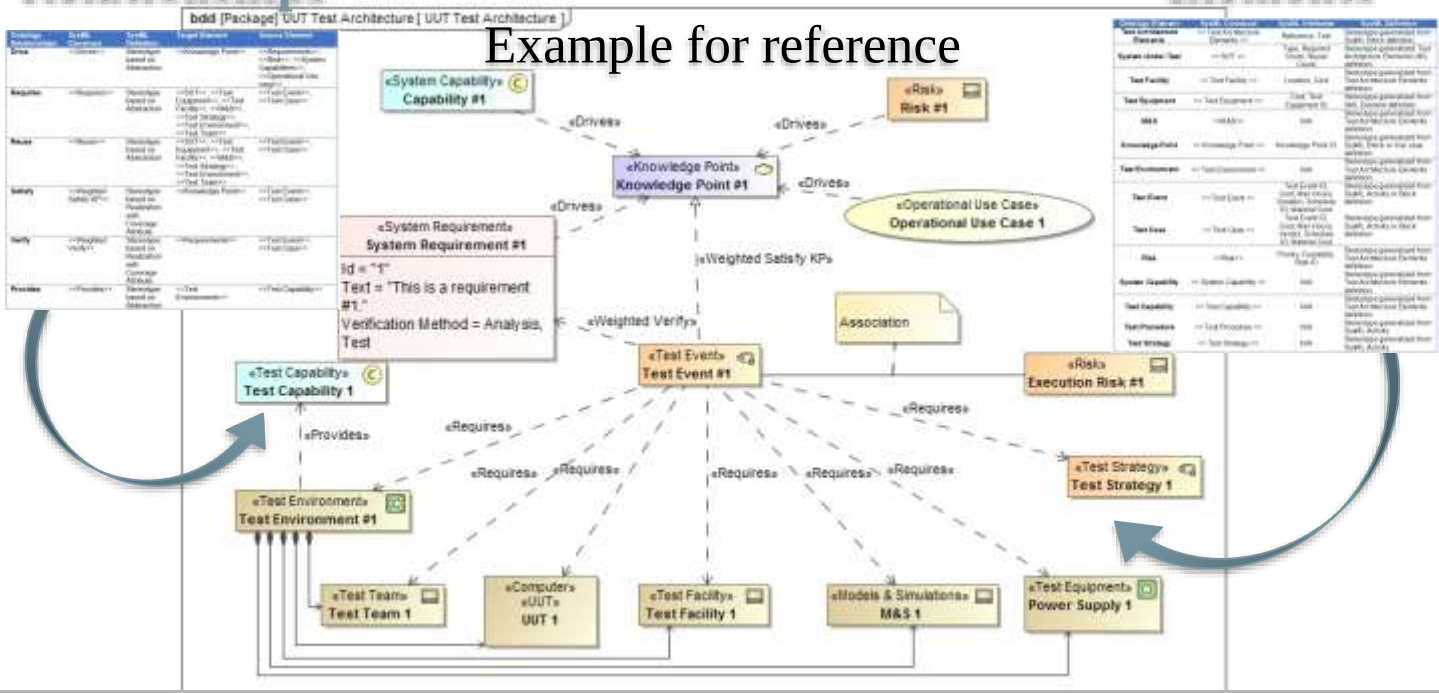
SysML Test Architecture Model

Relationships

Elements

Example for reference



Test Architecture Taxonomy from the Test Event perspective

Test Architecture perspectives

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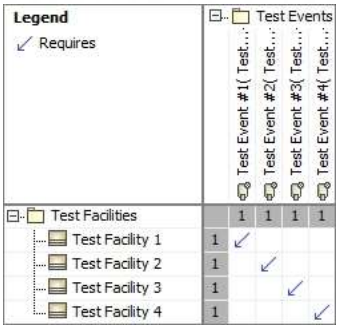
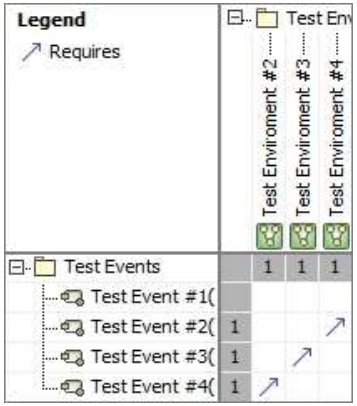
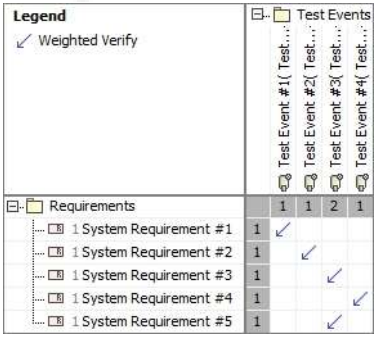
Facilities to Events



Events to TEn



Req's to Events



God's Eye View of the TA

Tool generated artifacts and views

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Knowledge Points and Dev Process

Establishes the framework that enables the creation of actionable events and assist in the overall synchronization of the test effort towards a common goal.

KP Identification

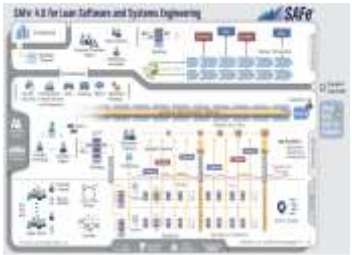
KP Definition

KP Generation

Sources of Knowledge

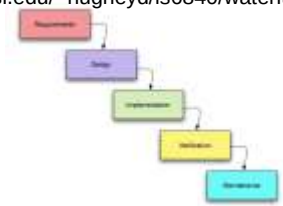
- Subject Matter Experts
- Risk
- System Requirements

Source: http://www.scaledagileframework.com/



Agile Methodology

Source: http://www.umsl.edu/~hugheyd/is6840/waterfall.html



Waterfall Methodology

KPs work with different workflow methods

Test Architecture Implementation

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- There is a cost of creating a Test Architecture from the start of a program and maintaining that model through the lifecycle
- The infrastructure and work processes will be different with the net results also being improved quality and execution of a product satisfying the customers needs which should justify the return on the investment (ROI)
- Increases repeatability of the work flow processes via the use of a model and a defined ontology
- The test architecture will provide the entire team increased knowledge of the test strategy and test details using a modeling tool

ROI is justified by increased quality and effective test results

Conclusion

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- Increased cross-disciplined communications equates to decreased defects and reduces over all costs and schedule complications
- Modeling using the language of test with the same language modeling the design enables interoperability modeling
- Defining the test language and defining the test architecture is critical for ensuring a test strategy is understood and available
- Modeling the test program supports traditional and alternative work flow process such Agile and waterfall methods

Questions?

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