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Getting Started with DOORS

(Templates, Processes, Guidelines, Roll-Out, etc.)

A Successful Implementation at Schindler Elevators Corporation

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&

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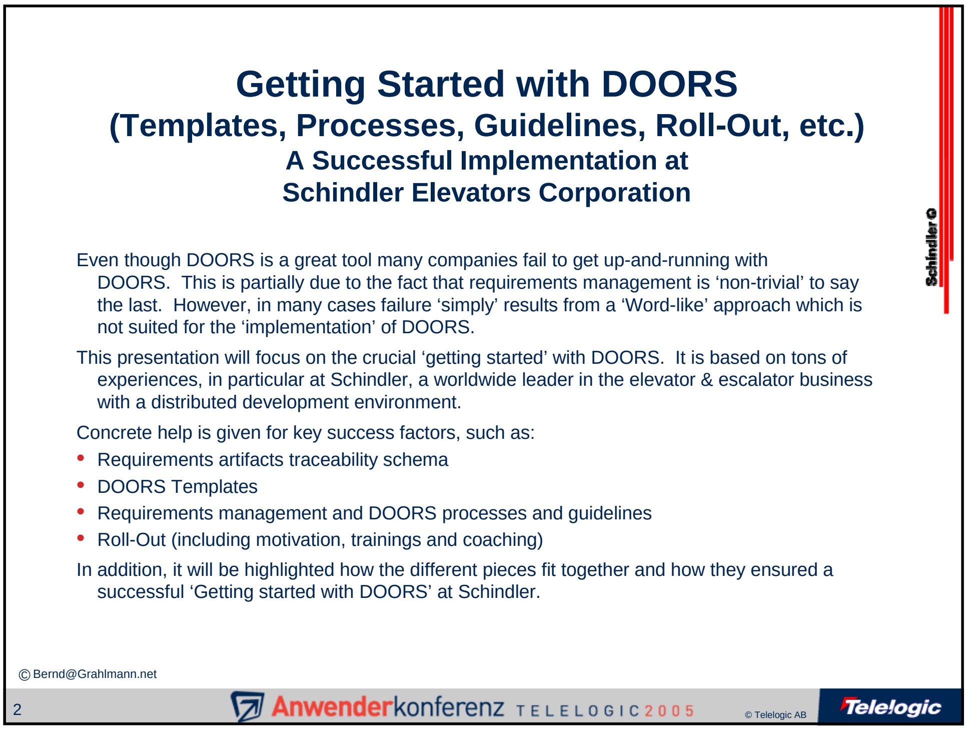
(Schindler Elevator Corporation)

Anwenderkonferenz
TELELOGIC2005

Telelogic



Getting Started with DOORS

(Templates, Processes, Guidelines, Roll-Out, etc.)

A Successful Implementation at Schindler Elevators Corporation

Schindler

Even though DOORS is a great tool many companies fail to get up-and-running with DOORS. This is partially due to the fact that requirements management is 'non-trivial' to say the last. However, in many cases failure 'simply' results from a 'Word-like' approach which is not suited for the 'implementation' of DOORS.

This presentation will focus on the crucial 'getting started' with DOORS. It is based on tons of experiences, in particular at Schindler, a worldwide leader in the elevator & escalator business with a distributed development environment.

Concrete help is given for key success factors, such as:

- Requirements artifacts traceability schema
- DOORS Templates
- Requirements management and DOORS processes and guidelines
- Roll-Out (including motivation, trainings and coaching)

In addition, it will be highlighted how the different pieces fit together and how they ensured a successful 'Getting started with DOORS' at Schindler.

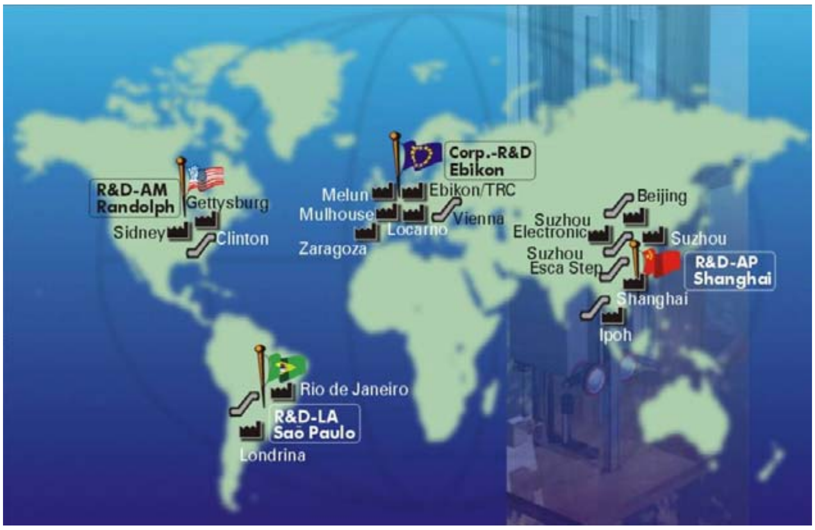
Schindler Elevator Corporation

Elevator and Escalator

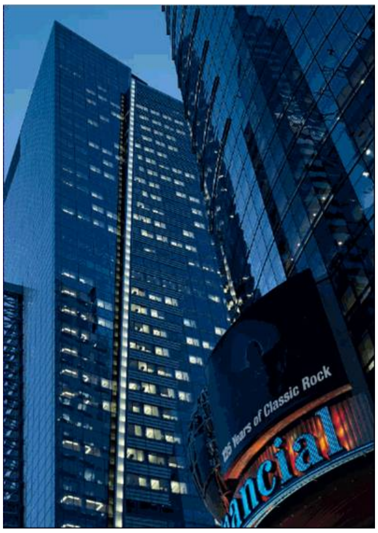
Every day, all over the world, Schindler elevators and escalators transport more than 700 000 000 people

Research & Development
Partners in success

Corporate R&D



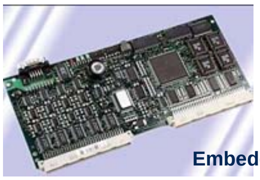
Software Development



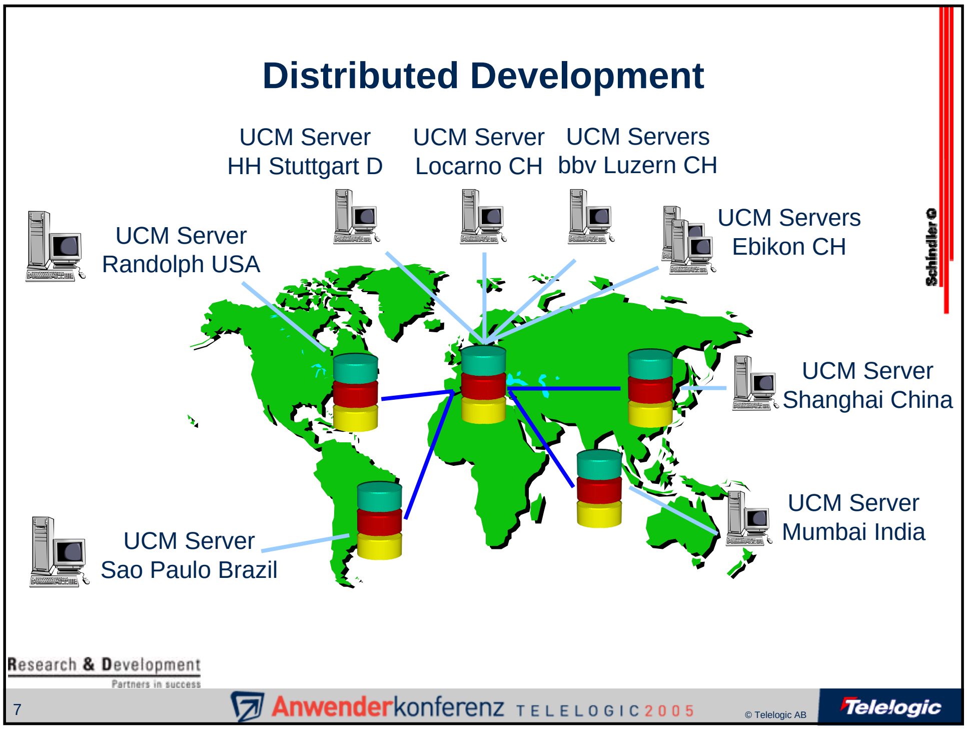
Visualization Software

Smart device Software

PC Software



Embedded Software



Distributed Development

UCM Server
HH Stuttgart D

UCM Server
Locarno CH

UCM Servers
bbv Luzern CH

UCM Server
Randolph USA

UCM Servers
Ebikon CH

UCM Server
Shanghai China

UCM Server
Mumbai India

UCM Server
Sao Paulo Brazil

Research & Development
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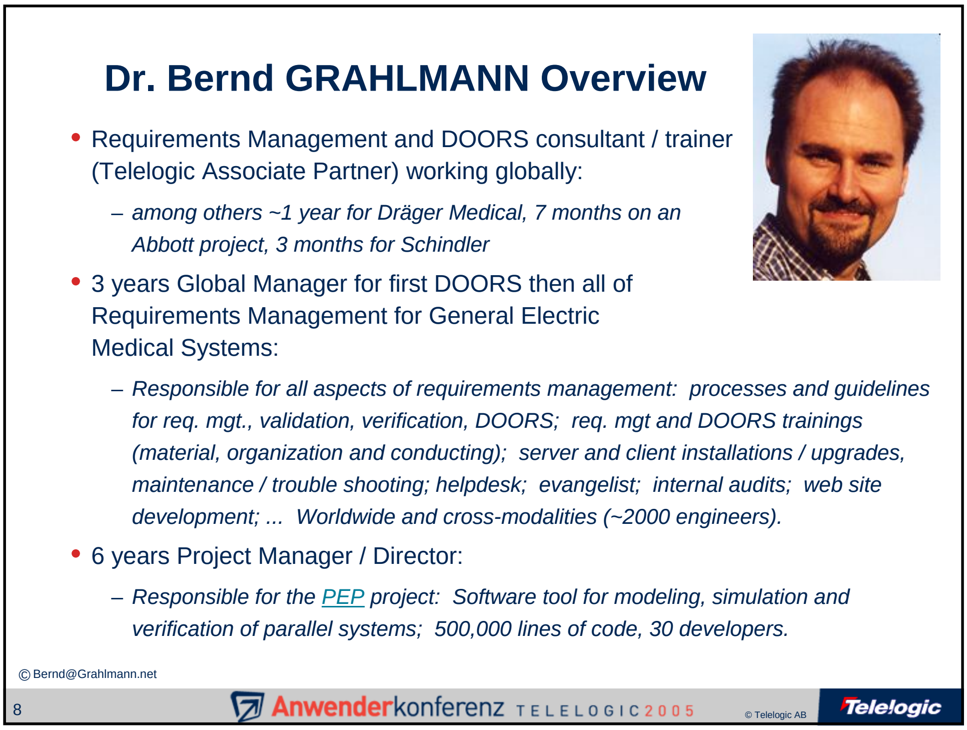


Dr. Bernd GRAHLMANN Overview

- Requirements Management and DOORS consultant / trainer (Telelogic Associate Partner) working globally:
  - *among others ~1 year for Dräger Medical, 7 months on an Abbott project, 3 months for Schindler*
- 3 years Global Manager for first DOORS then all of Requirements Management for General Electric Medical Systems:
  - *Responsible for all aspects of requirements management: processes and guidelines for req. mgt., validation, verification, DOORS; req. mgt and DOORS trainings (material, organization and conducting); server and client installations / upgrades, maintenance / trouble shooting; helpdesk; evangelist; internal audits; web site development; ... Worldwide and cross-modalities (~2000 engineers).*
- 6 years Project Manager / Director:
  - *Responsible for the PEP project: Software tool for modeling, simulation and verification of parallel systems; 500,000 lines of code, 30 developers.*

DOORS Status at Schindler (Starting Point)

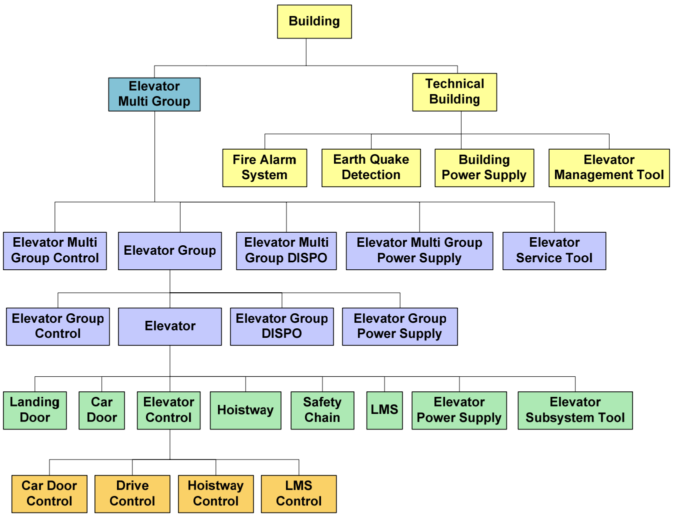
- Schindler bought DOORS licenses and about 5 days of training and consultancy years ago
- No internal DOORS ‘leader’ was assigned ☹
- Requirements artifacts were written in Word and Excel, only very few in DOORS ☹
- DOORS artifacts were not utilizing the power of DOORS (attributes, views, traceability, …) ☹
- Requirements management was not ‘optimal’, i.e. sometimes inefficient, often with a lot of redundancy (e.g., one document per product version), sometimes a lot of specifications only existed in the brains of the people, … ☹

DOORS Getting Started Approach

- Start with ‘**Information Architecture Workshops**’:
  - including ‘internal audit’ of existing artifacts and stakeholder interviews identifying current mistakes / opportunities / priorities
  - elaborating a precise scope level diagram
  - working out the list of artifacts (including rough content / purpose overview as well as owners) and their top-level traceability scheme
  - coming up with a DOORS database structure and naming conventions
- Do **‘Methodology’ trainings**
- Work out **templates** one-by-one (save the whole world, but step-by-step):
  - iterating the overall traceability scheme
  - solving key (non DOORS) issues such as getting a good use case model
  - writing documentation and guidelines
- Do **‘standard’ DOORS and company specific trainings**
- Emphasize ‘**coaching**’ & **motivation** / **getting buy-in**

Scope Levels Are Important (I)

- Start by getting the scope level diagram right, e.g.:



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Scope Levels Are Important

- A typical mistake when writing requirements specifications is to mix scope levels:
  - A requirements specification shall have exactly one scope level
  - It shall not contain requirements for a higher or lower scope level => those shall be in separate artifacts
  - Best choice is to identify owners for all requirements artifacts on all different scope levels
  - Even if a sub-system team has to write system specifications those shall be separate system level artifacts and not mixed into the sub-system artifacts.
  - A sub-system specification shall not talk about system product versions.

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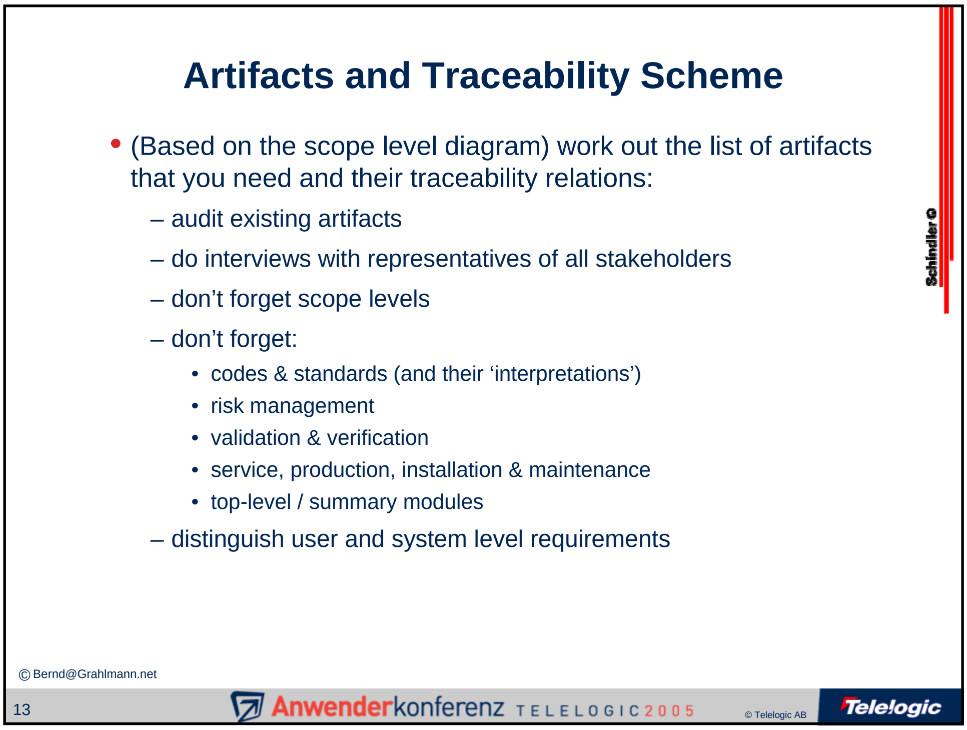
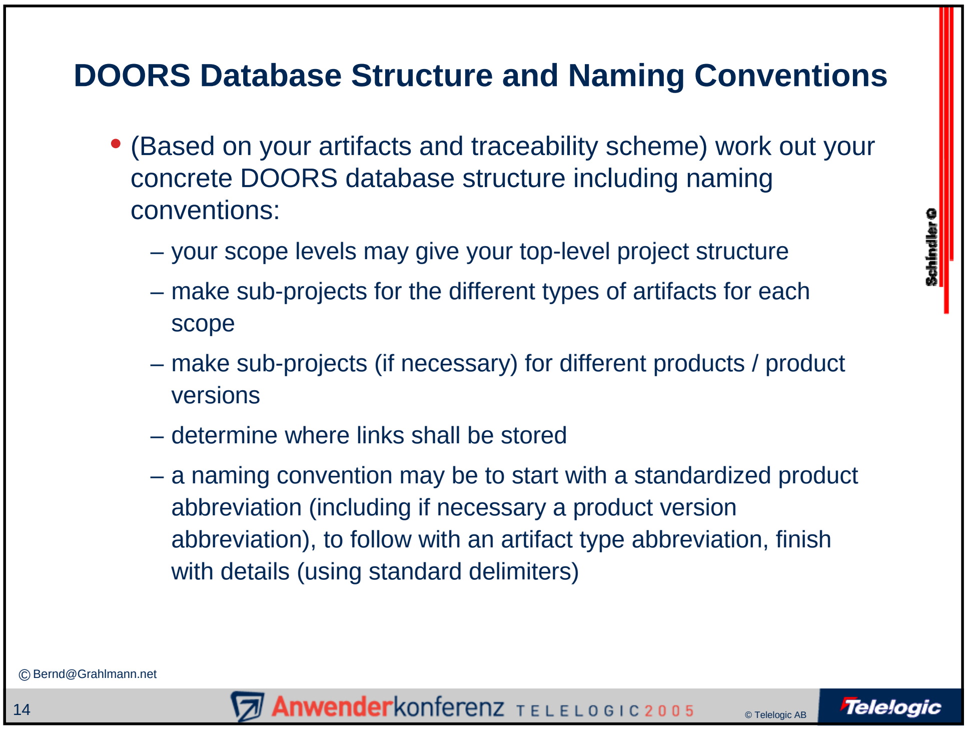


Artifacts and Traceability Scheme

- (Based on the scope level diagram) work out the list of artifacts that you need and their traceability relations:
  - – audit existing artifacts
  - – do interviews with representatives of all stakeholders
  - – don’t forget scope levels
  - – don’t forget:
    - codes & standards (and their ‘interpretations’)
    - risk management
    - validation & verification
    - service, production, installation & maintenance
    - top-level / summary modules
  - – distinguish user and system level requirements



DOORS Database Structure and Naming Conventions

- (Based on your artifacts and traceability scheme) work out your concrete DOORS database structure including naming conventions:
  - – your scope levels may give your top-level project structure
  - – make sub-projects for the different types of artifacts for each scope
  - – make sub-projects (if necessary) for different products / product versions
  - – determine where links shall be stored
  - – a naming convention may be to start with a standardized product abbreviation (including if necessary a product version abbreviation), to follow with an artifact type abbreviation, finish with details (using standard delimiters)

Templates (I)

- Based on the list of artifacts identify and prioritize the needed templates:
  - treat them one by one (keeping the big picture in mind and adapting it iteratively if necessary)
  - in a first step one template may cover more than one artifact
  - audit existing ‘documents’
  - interview representatives of the relevant stakeholder groups
  - determine first general attributes and their types (such as traceability, priority, status, etc.)
  - then the template specific ones (such as object type, satisfaction argument, expected result, test result, etc.)
  - determine the views which are needed to enter, analyze, review, print, backup, etc.

Templates (II)

- Don’t forget to:
  - document the outline
  - document the attributes and attribute types
  - document the views
  - include help
  - explain the usage of the template
  - document detailed traceability schemes

Template Documentation Example (Views)

- **Views for various aspects:**
  - View showing main attributes + V&V attributes:

    #asp V&V A3pt =

    ID + aPJ Flowname + aPJ UC-Ref + main + aPJ DXL Junction +
    aPJ Object Type + aPJ Verification Method + aPJ Verification Level +
    aPJ start version + aPJ last version
- **Impact and Traceability Views:**
  - Impact and Traceability views (showing DXL impact/traceability attribute(s) in addition to the main attributes; without memorizing any filter/display related settings):

    #trc all_trc filtered A3ls =

    ID + aPJ Flowname + aPJ UC-Ref + main + aPJ DXL Junction +
    aPJ Object Type + aPJ all traces filtered + aPJ DXL Notification +
    aPJ start version + aPJ last version

Attribute Examples

- **aPJ DXL Junction** [DXL attribute]

  (calculates ‘Junction’ information from attributes of linked objects)
- **aPJ DXL Notification** [DXL attribute]

  (calculates ‘Notification’ information from Object Text of linked objects)
- **aPJ Flowname** String

  (gives the name of the respective flow)
- **aPJ last version** atPJ versions

  (specify last version for which the requirements apply)
- **aPJ Satisfaction Argument** Text

  (gives a satisfaction argument explaining how the linked requirements from one level below do satisfy the requirement)
- **aPJ TPLHelp** Text

  (gives additional help on how to fill out the template)
- **BACKUP of DXL all traces** Text

  (allows to 'back up' the 'aPJ DXL all traces' attribute before doing a baseline such that the content remains unchanged)

View Naming Conventions

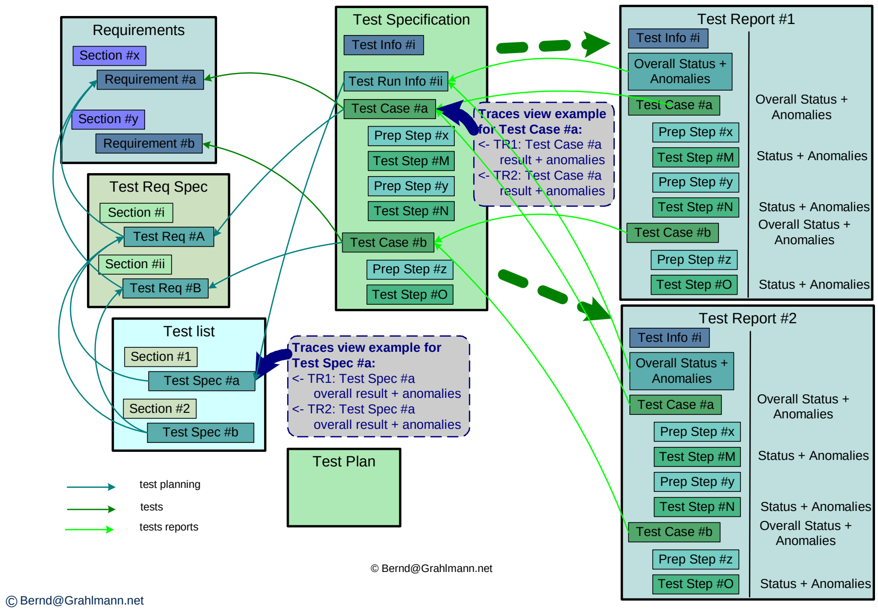
Templates should follow some naming standards, e.g.:

- View names begin with:
  - #hlp (for views offering help)
  - #std (for standard views)
  - #issues (for views showing issues, comments, etc.)
  - #trc (for views showing traceability)
  - #asp (for views focusing on other aspects)
- The next sign indicates filtering details:
  - ‘+’ (a view with a filter)
  - ‘-’ (a view explicitly without filter)
  - ‘ ‘ (filter remains unchanged)
- After that the other details follow.
- At the end it is indicated (e.g., via ***A3pt*** or ***letter***) if a view is tuned to fit on certain paper sizes when printing.

Traceability Approach

- All templates offer special DXL Traceability Attributes, e.g.:
  - ***aPJ DXL 1 trace***, ***aPJ DXL all traces***, ***aPJ DXL all traces filtered***
  - ***aPJ DXL 1 impact***, ***aPJ DXL all impact***, ***aPJ DXL all impact filtered***
- and views displaying these attributes, such as:
  - ***#trc 1_imp A3ls***, ***#trc all_imp_trc A3ls***, ***#trc all_imp filtered A3ls***
- The displayed traceability information is only re-calculate when you load the view or when you invoke *Tools->Refresh DXL Attributes*. This reduces scrolling delays ☺
- The DXL attributes depend (in order to display in a context sensitive way the relevant information) on the correct usage of:
  - the module level attribute ***aPJ Module Type*** and
  - the object level attribute ***aPJ Object Type***.

Detailed Traceability Scheme Example



Requirements
Section #x
Requirement #a
Section #y
Requirement #b

Test Req Spec
Section #i
Test Req #A
Section #ii
Test Req #B

Test list
Section #1
Test Spec #a
Section #2
Test Spec #b

Test Specification
Test Info #i
Test Run Info #ii
Test Case #a
Prep Step #x
Test Step #M
Prep Step #y
Test Step #N
Test Case #b
Prep Step #z
Test Step #O

Traces view example for Test Case #a:
<- TR1: Test Case #a
result + anomalies
<- TR2: Test Case #a
result + anomalies

Traces view example for Test Spec #a:
<- TR1: Test Spec #a
overall result + anomalies
<- TR2: Test Spec #a
overall result + anomalies

Test Plan

Test Report #1
Test Info #i
Overall Status + Anomalies
Test Case #a
Overall Status + Anomalies
Prep Step #x
Test Step #M
Status + Anomalies
Prep Step #y
Test Step #N
Status + Anomalies
Test Case #b
Overall Status + Anomalies
Prep Step #z
Test Step #O
Status + Anomalies

Test Report #2
Test Info #i
Overall Status + Anomalies
Test Case #a
Overall Status + Anomalies
Prep Step #x
Test Step #M
Status + Anomalies
Prep Step #y
Test Step #N
Status + Anomalies
Test Case #b
Overall Status + Anomalies
Prep Step #z
Test Step #O
Status + Anomalies

test planning
tests
tests reports

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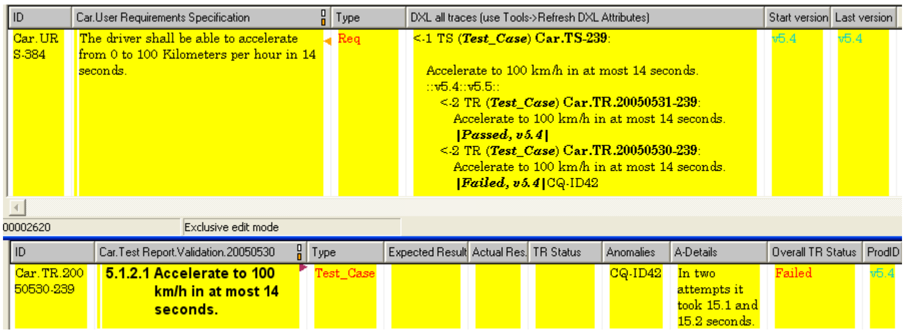
Demo of templates

- Some of the templates will be made available at www.grahlmann.net under ‘Templates’



ID	Car.User Requirements Specification	Type	DXL all traces (use Tools->Refresh DXL Attributes)	Start version	Last version
Car.UR S-384	The driver shall be able to accelerate from 0 to 100 Kilometers per hour in 14 seconds.	Req	<-1 TS (***Test_Case***) **Car.TS-239**: Accelerate to 100 km/h in at most 14 seconds. ::v5.4::v5.5:: <-2 TR (***Test_Case***) **Car.TR.20050531-239**: Accelerate to 100 km/h in at most 14 seconds. ***|Passed, v5.4|*** <-2 TR (***Test_Case***) **Car.TR.20050530-239**: Accelerate to 100 km/h in at most 14 seconds. ***|Failed, v5.4|***CQ-ID42	v5.4	v5.4

00002620 Exclusive edit mode

ID	Car.Test Report.Validation.20050530	Type	Expected Result	Actual Res.	TR Status	Anomalies	A-Details	Overall TR Status	ProdID
Car.TR.200 50530-239	**5.1.2.1 Accelerate to 100 km/h in at most 14 seconds.**	Test_Case				CQ-ID42	In two attempts it took 15.1 and 15.2 seconds.	Failed	v5.4

Trainings

- Trainings are a key factor for the successful roll-out
- You can start with (at least one-day) ‘methodology’ trainings
- Do the (at least two-days) DOORS trainings (with a lot of hand on exercises) shortly before the real roll-out
- Follow-up with (at least a few hours) training on your company specific DOORS templates, their usage and your processes
- (Half or one-day refresher) DOORS trainings may heavily improve the effectiveness of the trainings (in particular, if DOORS is not used immediately after the training)
- Try to have groups of 6-10 people
- Try to get an experienced (with DOORS **AND** requirements management) trainer who is involved in your DOORS roll-out

Methodology Trainings

- Requirements management is non-trivial, thus start with a training such as ‘Writing better requirements’ to:
  - make everyone aware of the importance of requirements management
  - introduce different types of requirements and scope levels
  - explain from whom and how to get requirements
  - explain how to write requirements in a good way
  - introduce the various aspects of validation & verification
  - introduce other process related aspects such as review and changes
  - give practical check lists
  - touch on use cases

DOORS Trainings

- DOORS is a powerful tool, thus follow with a DOORS training which uses examples which are similar to your templates and which:
  - – introduces the DOORS database structure top-down
  - – shows how to edit ‘requirements’ text
  - – really makes sure that everyone learns how to insert new requirements and headings at the correct level
  - – introduces the concept of attributes and shows how to edit values
  - – explains searching, filtering, sorting and the view concept
  - – covers links and traceability (explaining the concepts, touching on the set-up, showing how to create/delete links, and focuses on the link analysis and reporting)
  - – finishes with ‘on-demand’ advanced / optional topics (such as, creation of attributes / attribute types, history, baselines, OLE objects, import / export mechanisms, and suspect links)

Company Specific Trainings

- Everyone uses DOORS more or less differently, thus finish with company specific trainings which:
  - – introduce the concrete structure of your DOORS database and your naming schemes
  - – explain your traceability scheme
  - – present your templates including your outlines, attributes and views
  - – focus on your handling of product versions
  - – detail your requirements life-cycle

Coaching

- Continuous coaching is extremely important:
  - make sure to provide ‘expert’ coaching in particular at the beginning
  - encourage / enforce that your team starts writing in DOORS, but detail purpose, content and approach clearly in each step
  - have results reviewed by an expert silently in the background as well as interactively with the author on a regular basis
  - point out mistakes, showing how to do it correctly and how to repair them
  - your team members shall be the ‘editors’, the ‘expert’ only ‘coaches’
  - the coaching may result in adaptations of the templates, guidelines, …

(Internal / External) Resources

- Don’t waste time and take risks ‘re-inventing the wheel’
- Assign an internal requirements management & DOORS ‘leader’
- Don’t hesitate to get ‘professional’ help, but make sure that on the ‘long-term’ competencies get ‘migrated’ to your team and in particular to your ‘leader’ while the work gets done
- Establish (e.g., by power user trainings and more coaching) internal ‘gurus’ per team

Current Status and Outlook

- The scope level diagram is accepted
- The artifact list and the top-level traceability scheme is pretty mature
- Some detailed traceability schemes already exist
- Methodology trainings created awareness and provoked a change of mind-set
- Major non DOORS issues got resolved (e.g., a use case model was worked out and documented)
- First templates (e.g., for use case hierarchies, use cases, supplementary specifications, trip profiles, strategies, failure and event monitors) were established, documented and have been used to write artifacts in DOORS
- The core team got trained on DOORS (incl. power user trainings)
- The scope is being broadened step-by-step

Benefits

- The first major benefits are showing off:
  - A lot of redundancy is avoided ☺
  - Scope levels are not mixed any longer, thus people know where to find information and need to write / read / review fewer pages ☺
  - Skills of the team members improved, i.e., they better know what to write and how to write it ☺
  - Formerly ‘unspecified’ requirements get specified ☺
  - Important additional characteristics get specified in attributes ☺
  - Traceability views are established automatically ☺
  - Other tools, databases, shares, etc. got eliminated ☺
  - People are less frustrated, even enthusiastic ☺