



LUND
UNIVERSITY

Exercise 4a: Test 2

ETSA01 INGENJÖRSPROCESSEN 1 - METODIK VT15



Agenda

- L4: Some quick reminders
- Testing in the projects
- Code inspection (T9-T10)
- Structural (white-box) testing (T11-T12)
- Test strategy (T13-T14)
- Work on test plan



Dokumentstrukturen

- ROOTMAPP: **ETSA01 Grupp XX**
- DOKUMENT MED LÄNKAR TILL PROJEKTETS LEVERANSER: Förteckning över projektets leveranser
- DOKUMENT: Projektplan & projektdokumentation
- MAPP: **Produktdokument**
 - MAPP: **1 Kravspecifikation**
 - » DOKUMENT: *Kravspecifikation 0.1 - Usecase 1 inför Ö1b och L1*
 - » DOKUMENT: *Kravspecifikation 0.2 - L2 Sanity Check*
 - » DOKUMENT: *Kravspecifikation 0.9 - För intern granskning på väg mot 0.99*
 - » DOKUMENT: *Kravspecifikation 0.99 - L3 För extern granskning*
 - » DOKUMENT: *Kravspecifikation 1.0 - L4 Milsolpe 1*
 - MAPP: **2 Testplan**
 - » DOKUMENT: *Testplan 1.0 - L5 Milsolpe 1 - för extern granskning*
 - MAPP: **3 Design**
 - » DOKUMENT: *Design 1.0 - L5 Milsolpe 1 - för extern granskning*
 - MAPP: **Externa granskningsprotokoll**
 - MAPP: **Interna granskningsprotokoll**
 - » DOKUMENT: *Granskningsprotokoll för granskning av Kravspecifikation 0.9*
 - DOKUMENT: *Installationsmanual*



Versionshistorik

The screenshot shows the Microsoft Word interface with the Developer tab selected. The ribbon includes sections for Visual Basic, Code, Controls, XML, and Templates. The main document area displays a table with the following data:

-Version-numbers			
«idVersionNumber» 0.8 «idVersionNumber»			
Table 1: Change Record			
«idChangeRecord» Date	Author	Version	Change-References
10/6/2011	STAFF\tavisreddick	0.1	
10/6/2011	STAFF\tavisreddick	0.2	
10/10/2011	STAFF\tavisreddick	0.3	Updated table-of-contents
10/20/2011	STAFF\tavisreddick	0.4	
10/21/2011	STAFF\tavisreddick	0.5	Added-in resource-area/business-function
10/21/2011	STAFF\tavisreddick	0.6	
10/21/2011	STAFF\tavisreddick	0.7	
10/21/2011	STAFF\tavisreddick	0.8	«idChangeRecord»



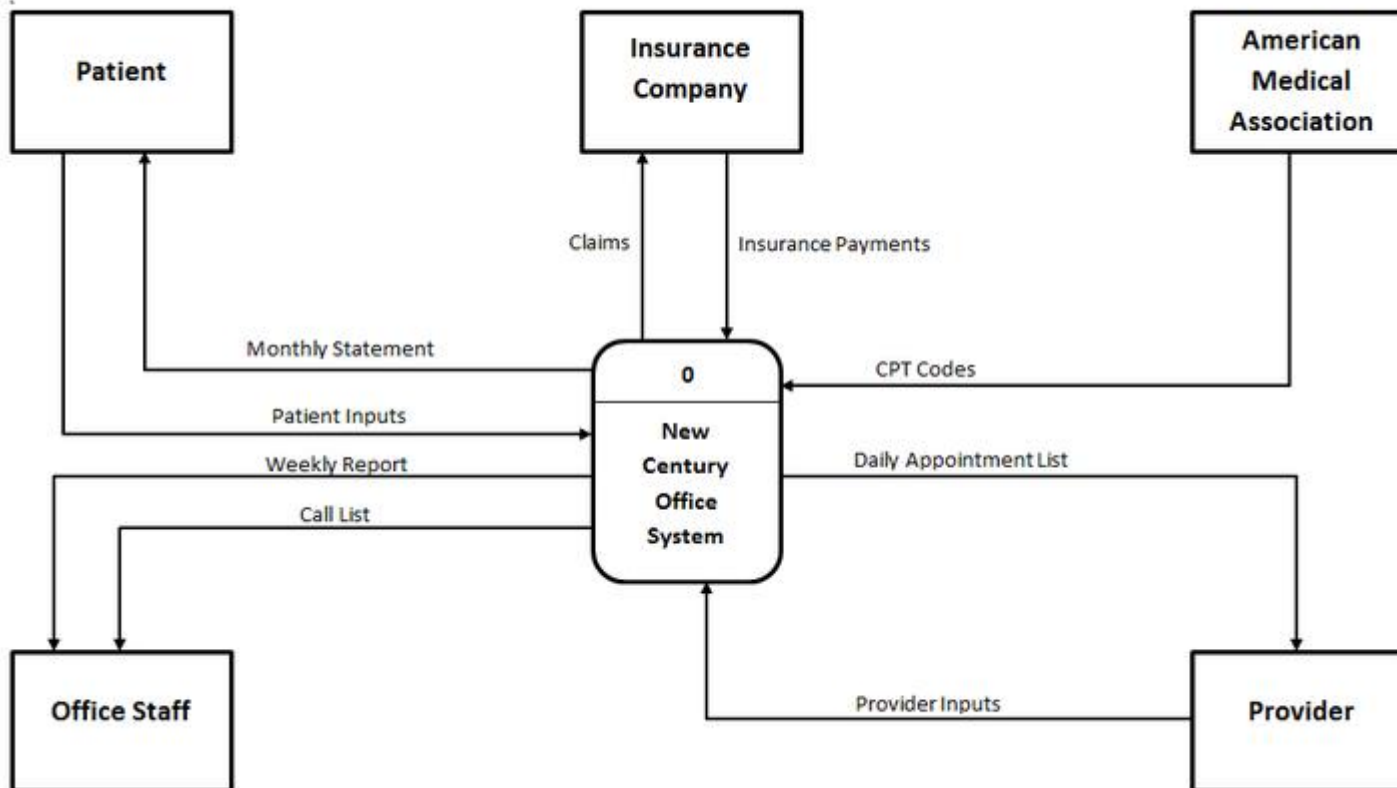
Mål

- Affärsmål
- Produktmål
- Projektmål



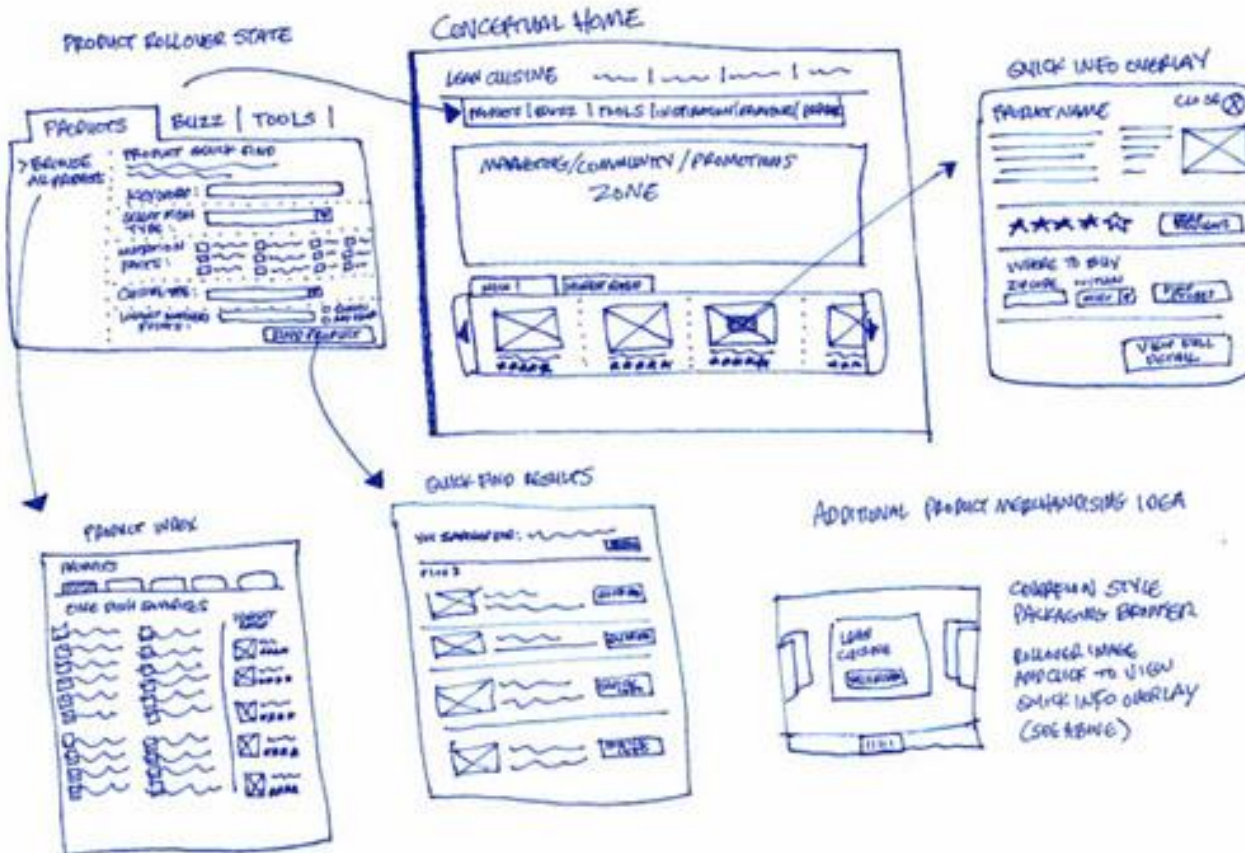
Kontextdiagram

New Century Health Clinic Context Diagram



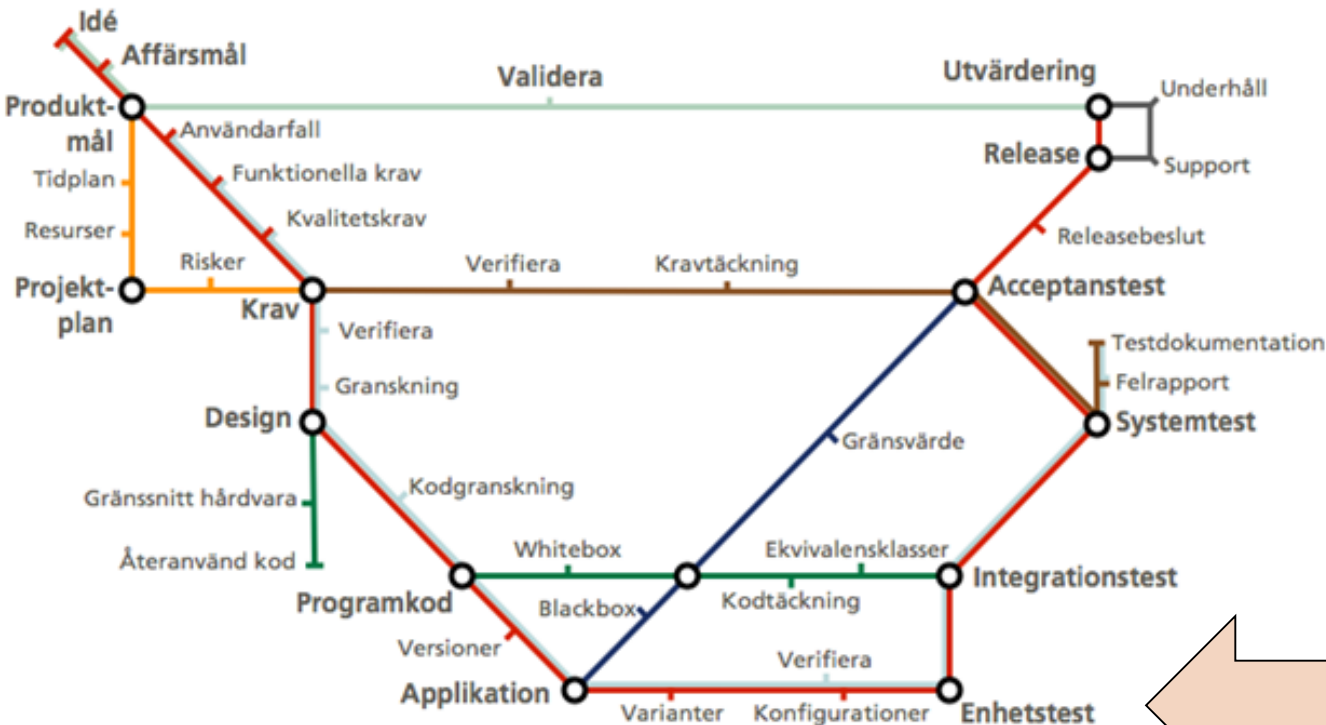
GUI

FIND PRODUCTS



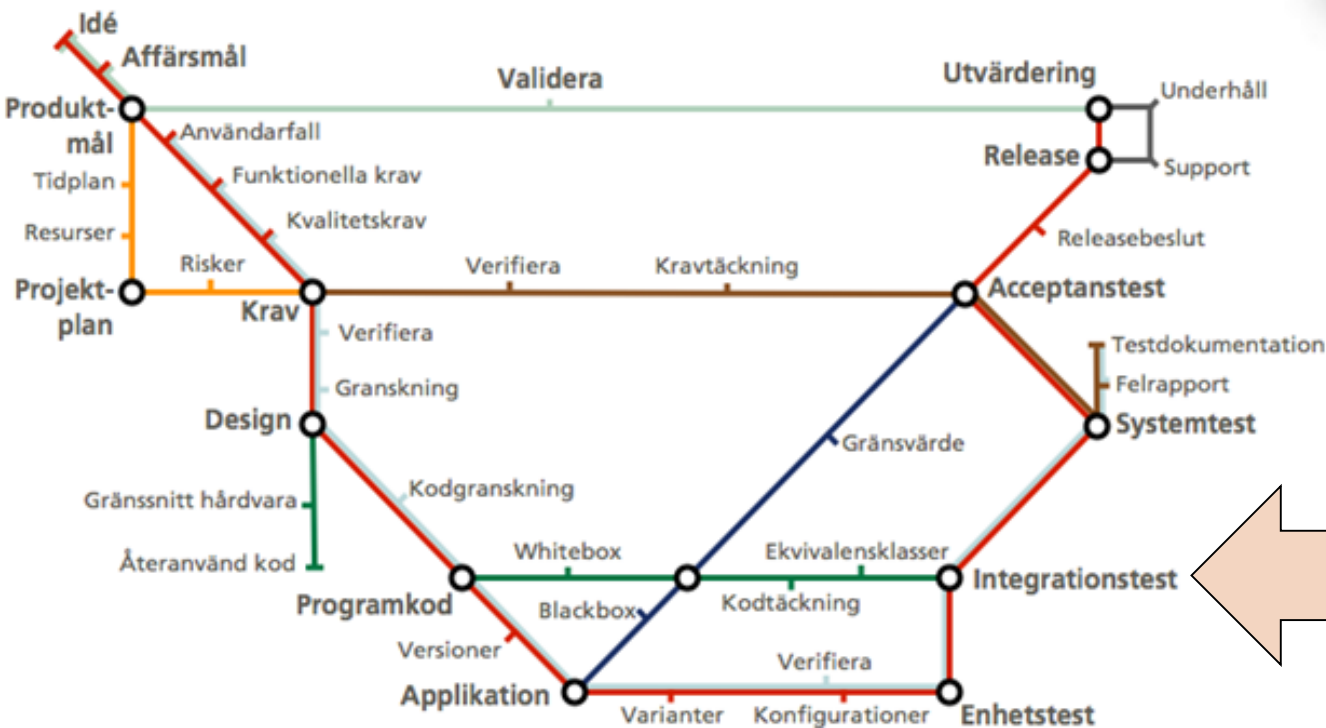
Enhetstest

- Test av minsta testbara komponent
 - Ofta klass eller metod



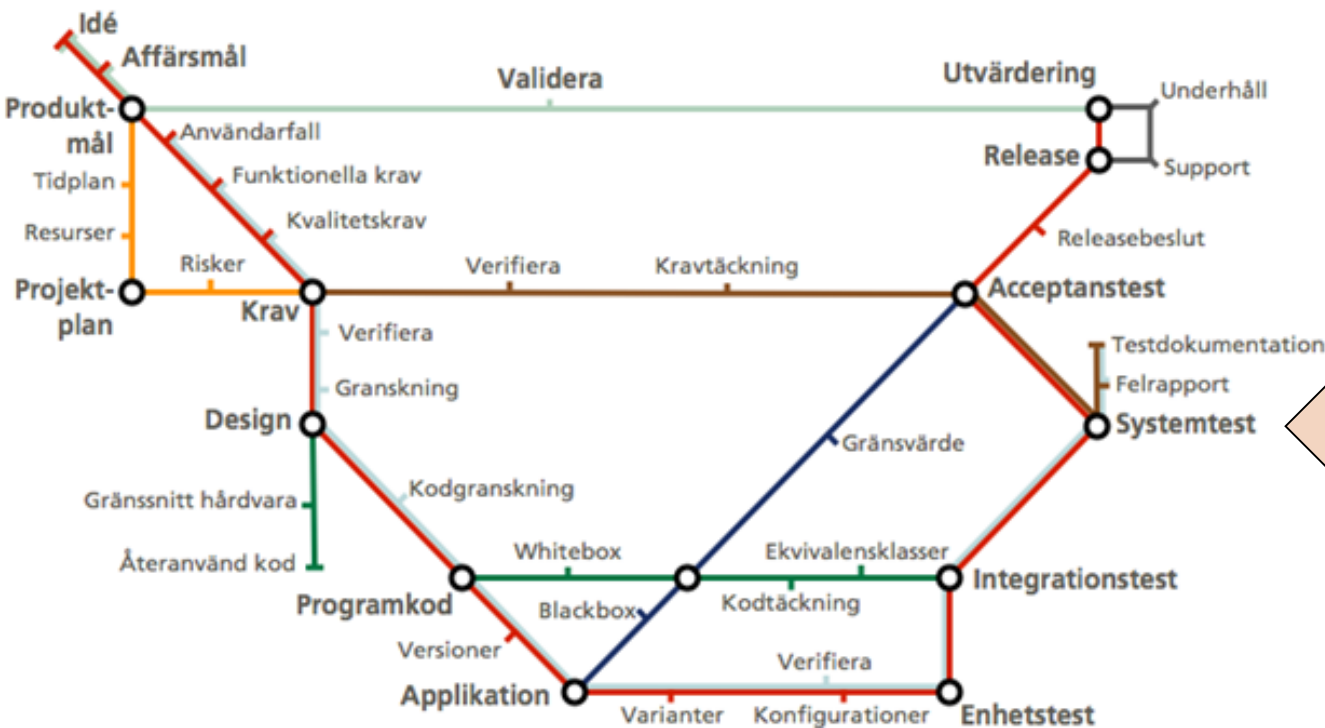
Integrationstest

- Testfall bestäms t ex baserat på specifikationer av gränssnitt i design
 - Test av subsystem



Systemtest

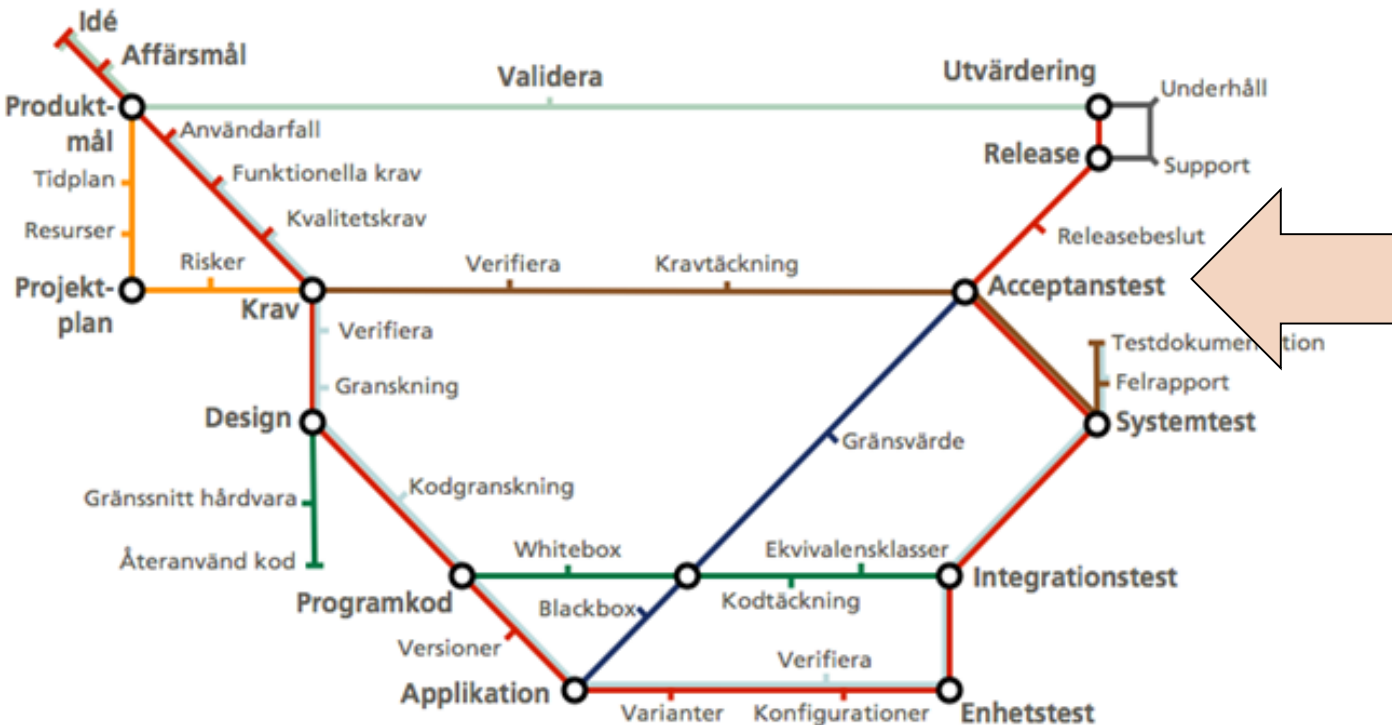
- Testar det fullständiga systemet
- Är kravspecifikationen uppfylld?



Acceptanstest



- Test för att säkerställa att utlovat system har utvecklats
 - Kan utföras av beställaren



T9: Defect log for program

Calculate statistics

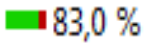
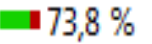
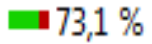
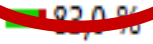
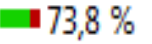
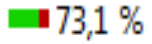
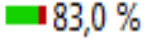
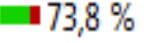
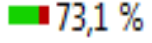
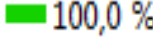
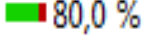
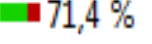
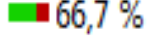
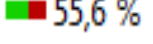
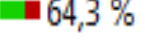
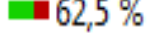
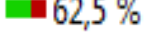
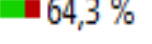
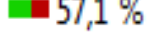
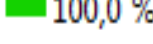
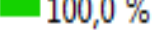
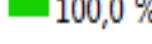
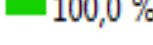
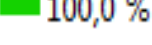
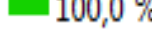
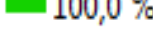
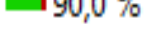
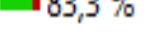
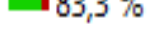



nr	line	description	Type	Inject	Remove
1	All	Language swe/eng?	1	Design	Test
2	Calculate Statistics 19	Letters missing	1	Coding	Test
3	24	Missing argument	3	Coding	Compiling
4	Statistics 16-20	No test for empty lists	6	Design	Testing
5	20	Division by 0. See nr 4.	6	Design	Testing
6	24-27	Wrong method comment	1	Coding	Code review
7	36	Missing type	4	Coding	Compiling
8	50	Missing type argument	4	Coding	Compiling
9	57	Unnecessary and incorrect line. Will change the order of elements in list	8	Coding	Test, post-release

T10: Using Historical Data?

- Assume that you have logged all defects according to this procedure in a project. How can you use this data after the project?
 - a) for the same product
 - b) in development of other products



T11: Why Planned Coverage <100% ?

Name	Statement	Branch	Loop	Term	?-Operator	Synchronized
ETSA01_Coverage	 83,0 %	 73,8 %	?	 73,1 %	?	?
IDTest	 83,0 %	 73,8 %	?	 73,1 %	?	?
IDNumber	 83,0 %	 73,8 %	?	 73,1 %	?	?
IDNumber	 100,0 %	–	?	–	?	?
assignUserCategory	 80,0 %	 71,4 %	?	 66,7 %	?	?
calculateUserCategory	 55,6 %	 64,3 %	?	 62,5 %	?	?
checkDateFormat	 62,5 %	 64,3 %	?	 57,1 %	?	?
checkDigits	 100,0 %	 100,0 %	?	 100,0 %	?	?
checkDigits	 100,0 %	 100,0 %	?	 100,0 %	?	?
getUserCategory	 100,0 %	–	?	–	?	?
registerDateOfBirth	 90,0 %	 83,3 %	?	 83,3 %	?	?
verifyChecksum	 90,9 %	 87,5 %	?	 91,7 %	?	?



T11: Why Planned Coverage <100%?

1. The nature of the tested unit
 - Some statements/branches/paths might not be reachable
 - The unit may be simple or non-critical
2. The lack of resources
 - Time set aside for testing not enough
 - The available testers do not have sufficient training
 - There is lack of tools to support complete coverage
3. Time-to-market is a higher priority



T11: Why Planned Coverage <100% ?

Name	Statement	Branch	Loop	Term	?-Operator	Synchronized
ETSA01_Coverage	83,0 %	73,8 %	?	73,1 %	?	?
IDTest	83,0 %	73,8 %	?	73,1 %	?	?
IDNumber	83,0 %	73,8 %	?	73,1 %	?	?
IDNumber	100,0 %	-	?	-	?	?
assignUserCategory	80,0 %	71,4 %	?	66,7 %	?	?
calculateUserCategory	55,6 %	64,3 %	?	62,5 %	?	?
checkDateFormat	62,5 %	64,3 %	?	57,1 %	?	?
checkDigits	100,0 %	100,0 %	?	100,0 %	?	?
checkDigits	100,0 %	100,0 %	?	100,0 %	?	?
getUserCategory	100,0 %	-	?	-	?	?
registerDateOfBirth	90,0 %	83,3 %	?	83,3 %	?	?
verifyChecksum	90,9 %	87,5 %	?	91,7 %	?	?

This is probably too low!



T12: Coverage Criteria for Bike Computer

- Statement coverage?
- Branch coverage?
- Simple path coverage?
- Path coverage?
- 80%? 90%? 100%?

The development of a bicycle computer with a clock, alarm clock and speed meter based on GPS technology. The GPS should be used to continuously monitor current position and use changes in position to derive distance, which together with the elapsed time can be used to determine the speed (max, mean, etc.).

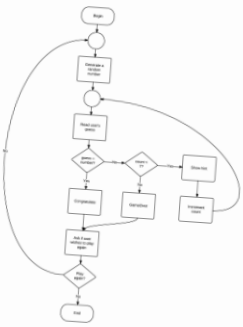
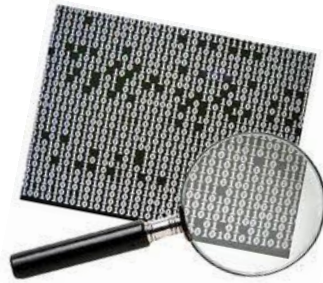


T12: Coverage Criteria for Bike Computer

- Statement coverage is the weakest coverage criteria
 - All nodes in control flow graph => 100%
 - Cheap, but not considered very useful for revealing defects
- Branch coverage requires at least as many test cases
 - All edges in control flow graph => 100%
 - Not much stronger than statement coverage...
- Simple path coverage
 - All linearly independent paths => 100%
 - Considerably stronger and more expensive criterion
- Full path coverage probably not reachable!
 - But maybe 80% is good enough?

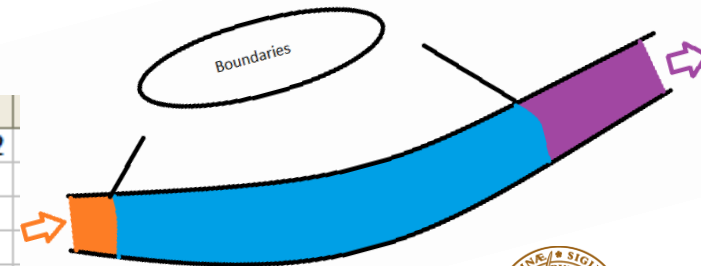


T13: Why Combine Testing Approaches?



```
47 CALL FUNCTION 'SALC_CACHE_GET_MTY_BY_CLASS'  
48 EXPORTING  
49   request           = request  
50   bypass_cache     = bypass_cache  
51 IMPORTING  
52   result           = result  
53 EXCEPTIONS  
54   OTHERS           = 99.  
55 IF sy-subrc <> 0.  
56   RAISE salc_internal_error.  
57 ENDIF.  
58  
59 READ TABLE result INDEX 1 ASSIGNING <fs_result>.  
60  
61 IF <fs_result>-rc >= al_rc_first_error.  
62   CASE <fs_result>-rc.  
63     WHEN al_rc_system_invalid. RAISE system_invalid.  
64     WHEN al_rc_no_route. RAISE system_not_available.  
65     WHEN al_rc_internal_error. RAISE salc_internal_error.  
66     WHEN al_rc_call_invalid. RAISE salc_internal_error.  
67     WHEN al_rc_group_not_in_repository.  
68       RAISE group_not_found_in_repository.  
69     WHEN al_rc_group_has_no_members.  
70       RAISE group_has_no_members.  
71     WHEN OTHERS. RAISE other_problem.  
72   ENDCASE.  
73  
74   THE LINES OF <fs_result>-tidtbl TO tids_for_mscclass.  
75 ENDIF.
```

	A	B
1	Param1	Param2
2	Value3	Value4
3	Value3	Value6
4	Value1	Value4
5	Value1	Value5
6	Value2	Value4
7	Value3	Value5
8	Value1	Value6
9	Value2	Value6
10	Value2	Value5



T13: Why Combine Testing Approaches?

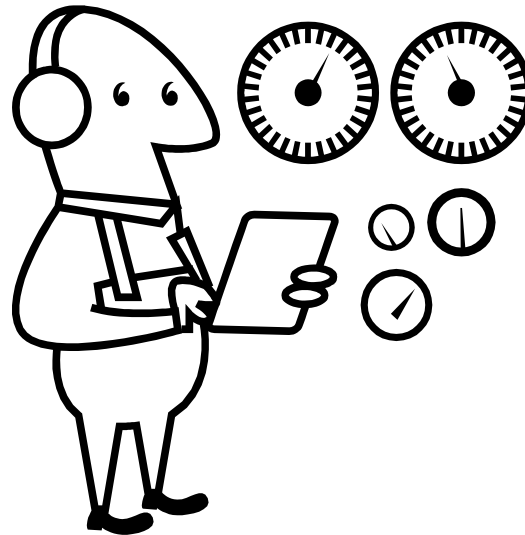
- No one test design is guaranteed to reveal all defects!
- Combination of testing strategies critical to reach high quality software
- Multiple approaches encourages testers to view software from different perspectives
 - More diversified testing
 - A set of testing tools can be used
- Stimulates tester interaction with other organizational units
 - Such as requirements engineers, designers
 - Several advantages with improved communication



T14: When to Stop Testing?

Stop testing too late?

Stop testing too soon?



Do we measure test progress properly?



T14: When to Stop Testing?

1. Project runs out of time or budget
2. All planned tests that were developed have been executed and passed
3. All specified coverage goals have been met
4. The detection of a specific number of defects has been accomplished
5. The rates of defect detection for a certain time period have fallen below a specified level



Intro till Ö4b

- Fortsätt påbörja testplan enligt exemplet i kompendiet.
- Publicera före Ö4b: Konkreta förslag på testfall rörande Användningsfall 1:
 - Pre-conditions (vad måste fungera innan detta körs)
 - Detaljer – testaren ska inte behöva gissa uppgifter
 - Endast observerbara steg



Användarfall: Ta in cykel i garaget

Framgångsscenario:

1. Cykelägaren läser cykelns streckkod m h a streckkodsläsare vid ingången.
2. Ingångsdörrens lås öppnas och cykeln registreras som inlämnad.
3. Cykelägaren placerar sin cykel i garaget och lämnar garaget genom extrautgången.

Undantag:

- 1a. Streckkoden finns inte i systemet
 - * PIN-kodsterminalens LED blickar rött i 2 sekunder
 - * Systemet registrerar den okända koden som ett intrångsförsök
 - * Dörren öppnas INTE
- 3a. Cykeln lämnas aldrig i garage
 - * Cykeln registreras som inlämnad (felaktigt)



Användarfall: Ta in cykel i garaget

- Vilka testfall?
- Vilka detaljer
- Vad behöver fungera först?
- Vilken ordning?
- Hur rapporterar vi resultatet?
(förklara i testplanen)

Framgångsscenario:

1. Cykelägaren läser cykelns streckkod m h a streckkodsläsare vid ingången.
2. Ingångsdörrens lås öppnas och cykeln registreras som inlämnad.
3. Cykelägaren placerar sin cykel i garaget och lämnar garaget genom extrautgången.

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