



Function and Domain testing

Andrei Kutsko



AGENDA

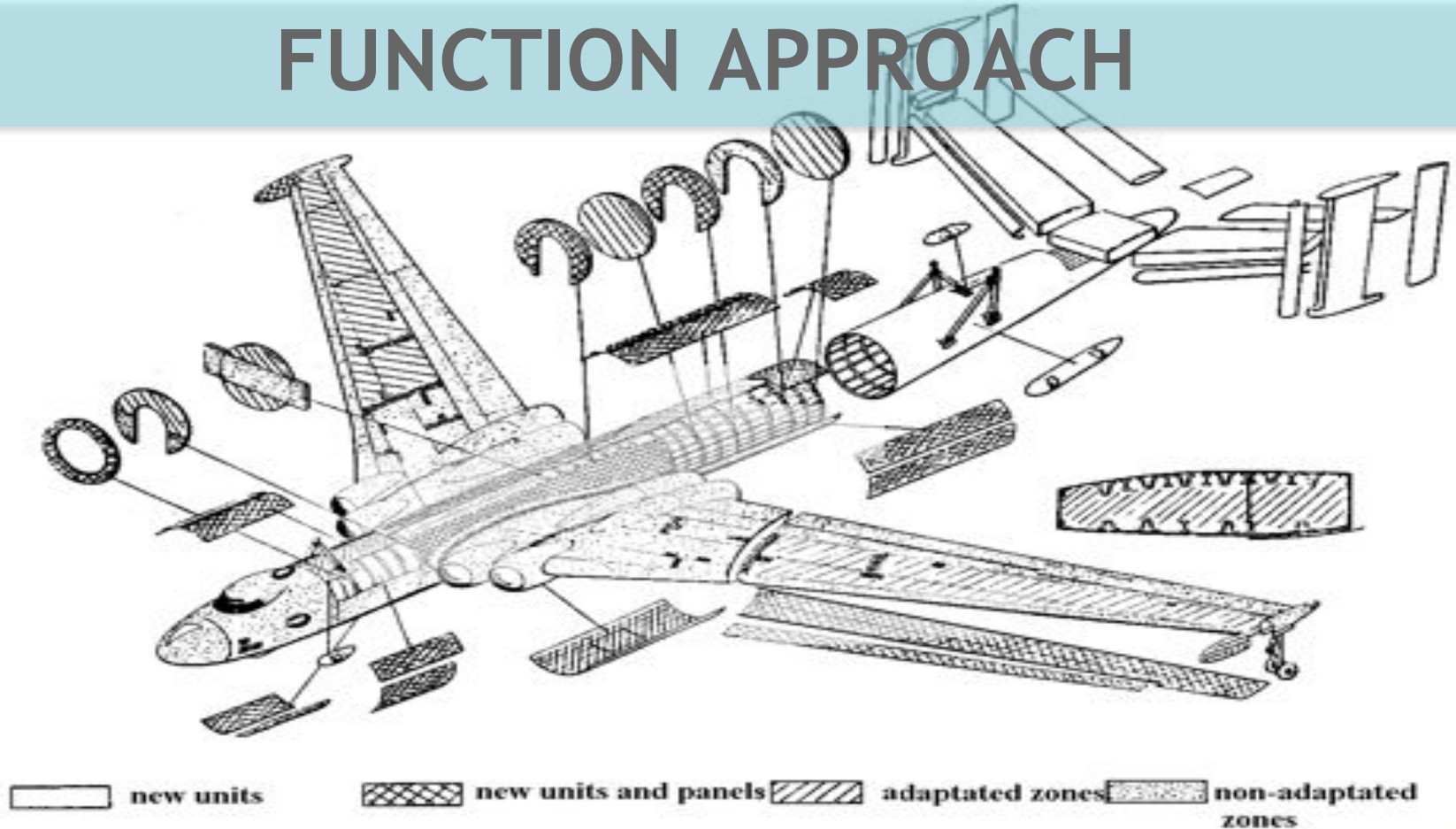
Function Approach

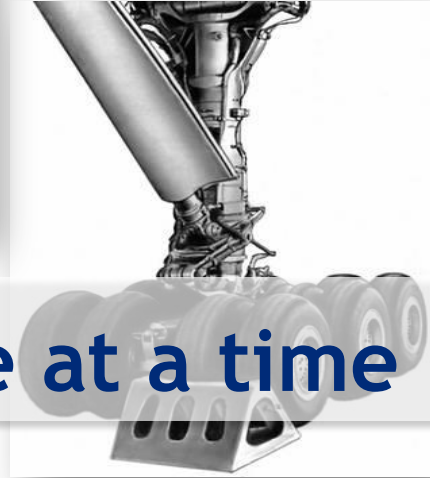
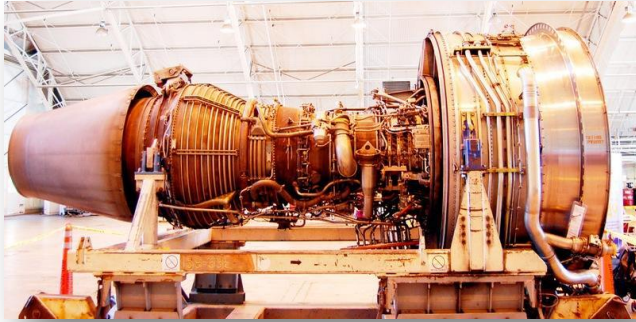
- Idea and Steps
- Example

Domain Approach

- Problem Description
- Equivalence Classes
- Idea and Steps
- Examples

FUNCTION APPROACH



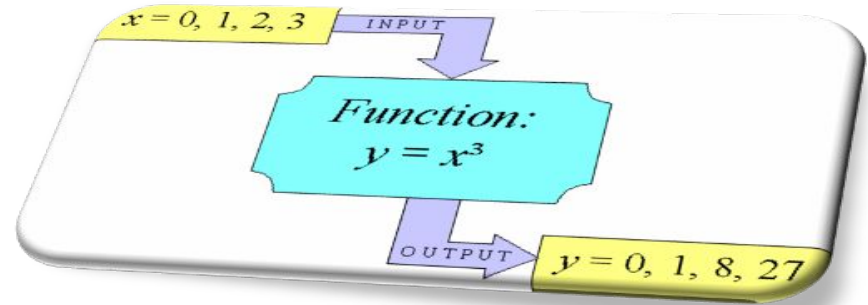


Test each function **thoroughly**, one at a time



FUNCTIONS

Function is something the product can do



Functions may be called features / commands or they may be identified only by what they do

THE FUNCTION LIST

- Category 1
 - Function 1
 - Input of the function
 - Output of the function
 - Possible scope of the function
 - Options / configurations of the function
 - Conditions in which the function behaves differently
 - Function 2
 - Input...



Steps

STEPS

1. Identify the program's **features** / commands
2. Identify **variables** used by the functions and test their **boundaries**
3. Identify possible **dependent** variables
4. Use each function in a **mainstream way** and push it in as many ways as possible, as **hard as possible**



That's
Domain
testing

HIDDEN TEXT FIELD

A text field, that takes value from another part of application

The screenshot shows the EPAM CDP dashboard. At the top right, the user's name "Aliaksandr Baranouski" is circled in red. Below the navigation bar, there's a section for "Latest activity across your projects". A "Late & Upcoming Milestones" section lists several items with their due dates and descriptions. Below this is a "Due in the next 14 days" calendar view. In the calendar, the date "11" (Friday) is highlighted, and a tooltip shows a hidden text field containing the text "Экзамен готов к использованию".

EPAM CDP

Dashboard To-Dos Milestones

Aliaksandr Baranouski My info

All People Search Templates

Latest activity across your projects

Late & Upcoming Milestones

- 3 days late: [Presentation Excellence зачитан](#) [EPAM CDP | WIDET - Trainings | Aliaksandr Baranouski]
- 3 days late: [Тренинг Personal Planning зачитан](#) [EPAM CDP | WIDET - Trainings | Yury Shilyaev]
- 3 days late: [Лекция "Публичное выступление" готова](#) [EPAM CDP | T-REX: Training for trainers ready for delivery | Yury Shilyaev]
- 5 days late: [Лекция "Handouts" готова](#) [EPAM CDP | T-REX: Training for trainers ready for delivery | Valeryia Kasabutskaya]
- 8 days late: [Тренинг разработан](#) [EPAM CDP | T-REX: Training for trainers ready for delivery | EPAM CDP]

[Show all 6 late milestones](#)

Due in the next 14 days

Mon	Tue	Wed	Thu	Fri	Sat	Sun
TODAY	Jun 8 План поиска разработчиков недостающих тренингов сфор	9	10	11 Экзамен готов к использованию	12	13
14	15	16	17	18 Тестовая зачитка тренинга состоялась	19	20

EPAM CDP — WIDET - Trainings

To-do [2] Разработать практику для тренинга Подготовка тренинга Completed by Aliaksandr B. TODAY

IDENTIFY HIDDEN TEXT FIELDS

EPAM PROJECT MANAGEMENT CENTER Logged in as Alena Yermokhina (Project Coordinator, Tester, Testing Team Lead) | [Logout](#) | [Contact Help Desk](#)

Main | **Communication & Support** | **Summary** | Reporting | Project Info | Settings | Help | Project: **ESS**

Time Journal | Time Report | Locked Time Periods

Project Team

- Ahmad Hamzawi
- Aksana Matchenia**
- Alen Bahachuk
- Alena Yermokhina
- Alesia Staslovich
- Alexander Ivanov
- Aliaksandra Sukhotskaya
- Andrei Kubashin
- Andrei Panemarov
- Andrei Savastsiuk
- Arkadiy Dobkin
- Artsem Iliasau
- Darya Tsiarashka
- Dmitry Shasholko
- Dzmitry Bachkarou-Komin
- Dzmitry Dolnikau
- Dzmitry Kuchko
- Eileen Weinstein
- Hanna Shuminskaya
- Igor Bondarenko
- Ihar Hancharenka
- Ihar Makushynski
- Inessa Potachits
- Iryna Rusetskaya
- Iryna Tsvirko
- Kathleen Walsh
- Katsiaryna Rabava
- Katsiaryna Talstashova
- Katsiaryna Yarsnova
- LouEllen Heckman
- Maksim Novik
- Marharyta Khamichuk
- Max Bogretsov
- Mikalai Tsishchanka
- Mikalai Zapolski
- Natalia Kabkova
- Pavel Sukharuchanka
- Priyank Mohan
- Siarhei Hnedzin
- Siarhei Melnikau
- Siarhei Varvaruk
- Tatsiana Aleksina
- Tatsiana Hrushneuskaya
- Vadim Kulaga
- Vadim Sotnikov

Time Journal for Aksana Matchenia

[Save Changes](#) | [Reset Changes](#) | [Search](#)

Filter: **All** | Period: **9/17/07 - 9/23/07**

◀ Previous Week | **Current Week** | Next Week ▶

	Mo	Tu	We	Th	Fr	Sa	Su
Total 0 (of 40)							
<input type="checkbox"/> <u>7.21 Functional Testing</u>							
<input type="checkbox"/> <u>7.5 Functional Testing</u>							
<input type="checkbox"/> <u>Dealing with hot-fixes: investigation, installation and testing</u>							
<input type="checkbox"/> <u>NAS Linux certification testing</u>							
<input type="checkbox"/> <u>Test Cases Creation and Update</u>							
Non-Project Activities							
<input type="checkbox"/> <u>EDU - Education & Trainings</u>							
<input type="checkbox"/> <u>ENV - Environment</u>							
<input type="checkbox"/> <u>MAN - Management</u>							
<input type="checkbox"/> <u>NBA - Bench Time</u>							
<input type="checkbox"/> <u>ORG - Org and Resource Administration</u>							
<input type="checkbox"/> <u>OTH - Other</u>							
<input type="checkbox"/> <u>QMS - Quality Management System</u>							
Vacation Info							
<input type="checkbox"/> <u>EXV - Exceptional Vacation</u>							
<input type="checkbox"/> <u>ILL - Illness</u>							
<input type="checkbox"/> <u>OVT - Overtime Vacation</u>							
<input type="checkbox"/> <u>POV - Leave Without Pay</u>							
<input type="checkbox"/> <u>VAC - Regular Vacation</u>							
Total 0 (of 40)							

◀ Previous Week | **Current Week** | Next Week ▶

[Save Changes](#) | [Reset Changes](#)

STEPS

1. Start from upper level
2. Use classes
3. Add questions where it is necessary
4. Collaborations with other apps?
5. Pairs dependencies



PMC TIME JOURNAL

EPAM PROJECT MANAGEMENT CENTER

Logged in as Alena Yermokhina (Project Coordinator, Tester, Testing Team Lead) | [Logout](#) | [Contact Help Desk](#)

[Main](#) | [Communication & Support](#) | [Summary](#) | [Reporting](#) | [Project Info](#) | [Settings](#) | [Help](#)

General

Project: **ESS**

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- Siarhei Hnedzin
- Siarhei Melnikau
- Siarhei Varvaruk
- Tatsiana Aleksina
- Tatsiana Hrushneuskaya
- Vadim Kulaga
- Vadim Satalikau

Time Journal for Aksana Matchenia

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[Search](#)

Filter: **All** | [...](#) | Period: **9/17/07 - 9/23/07** | [...](#)

[Previous Week](#) | [Current Week](#) | [Next Week](#)

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Total 0 (of 40)							

[Previous Week](#) | [Current Week](#) | [Next Week](#)

[Save Changes](#) | [Reset Changes](#)

Journal

GENERAL

Area	Function (Class)	Comment
General		
	Logged in	
		Name and Roles as text
		Dependence of functions on the rights
	Logout as link	
	Contact Help Desk as link	Mail to Help Desk
	Navigation tabs	
		Main (as link, as list)
		Communication & Support (as link, as list)
		Summary (as link, as list)
		Reporting (as link, as list)
		Project Info (as link, as list)
		Settings (as link, as list)
		Help (as link, as list)
	Project switcher	Projects as list
		Dependence of Project Team and Activities on the selected project

WHEN?

- ✓ **Initial testing of product**
 - Test new features of product
 - Fast scan for serious problems

- ✓ **Coverage issues**
 - Provide status for the whole app
 - Coverage for particular area

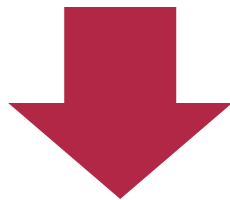
STRENGTH?

- ✓ Thorough analysis of each item tested

Blind spots?

- ✓ Misses feature interactions
- ✓ Misses load-related issues, interaction with background tasks, effects of interrupts
- ✓ Doesn't address user tasks

2. Identify **variables** used by the functions
and test their **boundaries**



Domain Approach

PROBLEM DESCRIPTION

Content Editor - Microsoft Internet Explorer

Content Editor

Authoring Tools -->

Submit Submit to Save Draft Cancel

▼ Author Content

* Document Title:

Access Levels: Public

das content: Content Area Visible

> 1 000 000 possible tests

▼ Attachments

▼ Document Information

Author:	<input type="button" value="Select"/> testuser55 testuser55	ID #:	
Assigned To:		Document Type:	abv_dt
Created:	<input type="text"/>	Unified Template:	aaa_template
Modified:	<input type="text"/>	Language:	English
		State:	Recommendation
		Review Date:	<input type="text"/> <input type="button" value="Calendar"/>
		Archive Date:	<input type="text"/> <input type="button" value="Calendar"/>

* = Required

Done Internet

IDEA

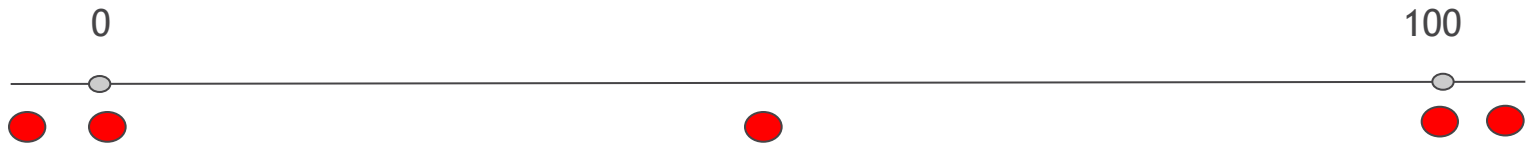
We need a **strategy**, that provides a **rationale for selecting** a few test cases from a huge number



Equivalence Classes

EQUIVALENCE CLASSES

Two values are equivalent if the program would take the **same path in response** to each.



DIMENSIONS

Producer

Size

Chocolate

Shape

Cover



Filling

STEPS

Identify variables

Identify dimensions

Define Borders (E.C.)

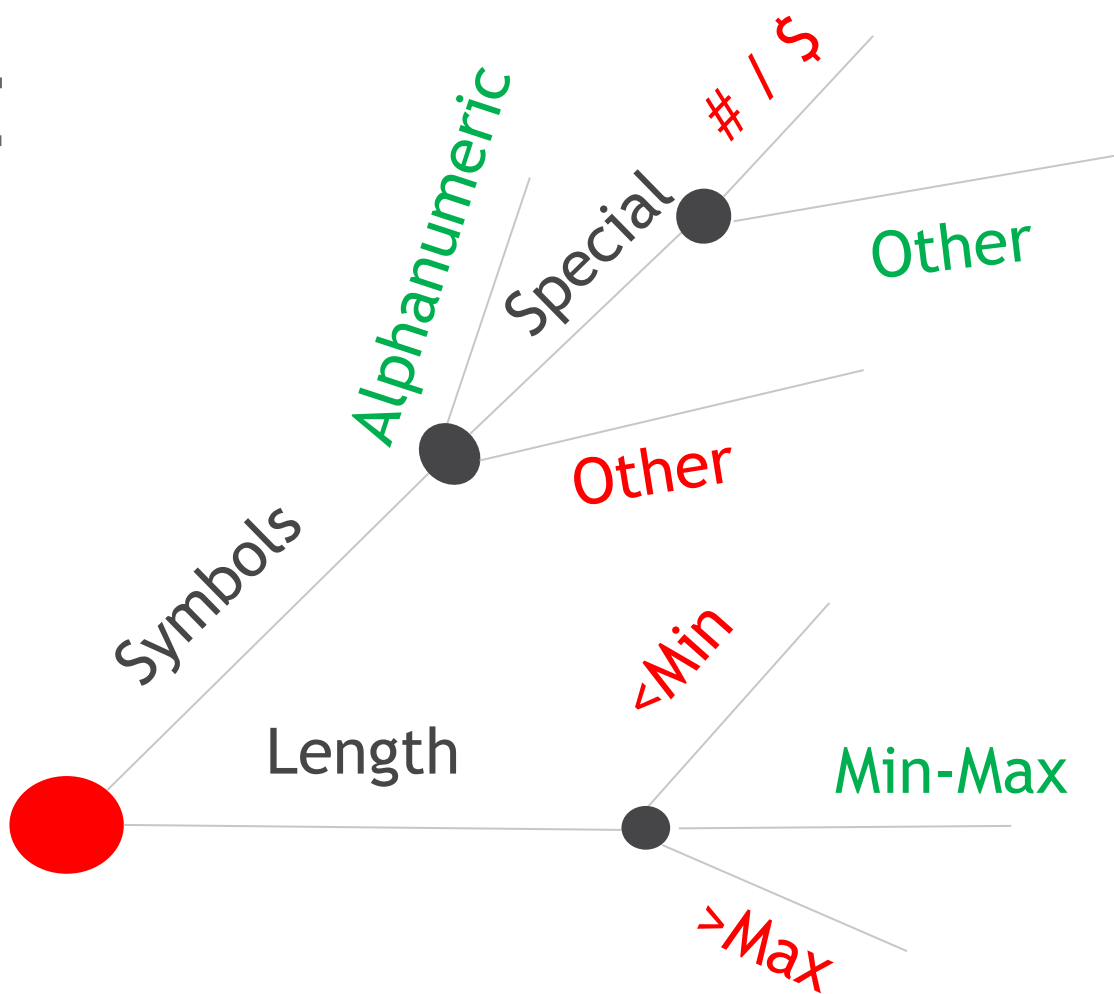
Select values

EXAMPLE



В поле вводится имя пользователя на английском языке. Недопустимо использование символов /, #, \$. Имя не должно содержать пробелов. Пробелы в начале и в конце «съедаются», для разделения используется _

TREE



RESULTS

Dimension	Classes	Sample values
Length, char	min-max, inclusive	min, max
	0-min-1	0, min-1
	max+1- infinity	max +1, very big
Symbols	alphanumeric	123abc
	special	!@#\$%^&*()_+ -=\{}[]:~';<>?,./
	not English	ÀÇÈÌÑÒÙΒàçèìñò
	double-byte	hieroglyphs
Spaces	no spaces	a
	leading, trailing	_a, _a_, a_
	in the middle	a_a
Unique + Case	different	aaa \ bbb
	exactly the same	aaa\ aaa
	same but in different case	aaa\ aAa

LET'S TRY...

Доменное имя должно содержать от двух до 63 символов, начинаться и заканчиваться буквой латинского алфавита или цифрой.

Промежуточными символами могут быть буквы латинского алфавита, цифры или дефис.

Доменное имя не может содержать дефисы одновременно в 3-й и 4-й позициях.

ОБЛАСТИ И КЛАССЫ

- Длина имени:

0-1, 2-63, 64-∞

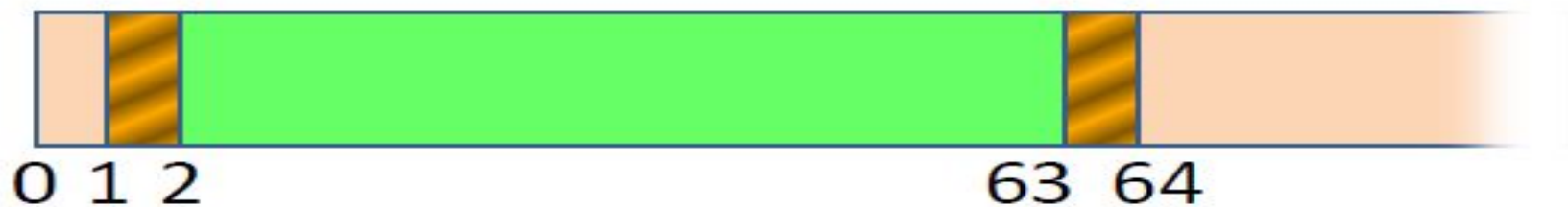
- Символы:

буквы латинского алфавита, цифры, дефис,
все остальные

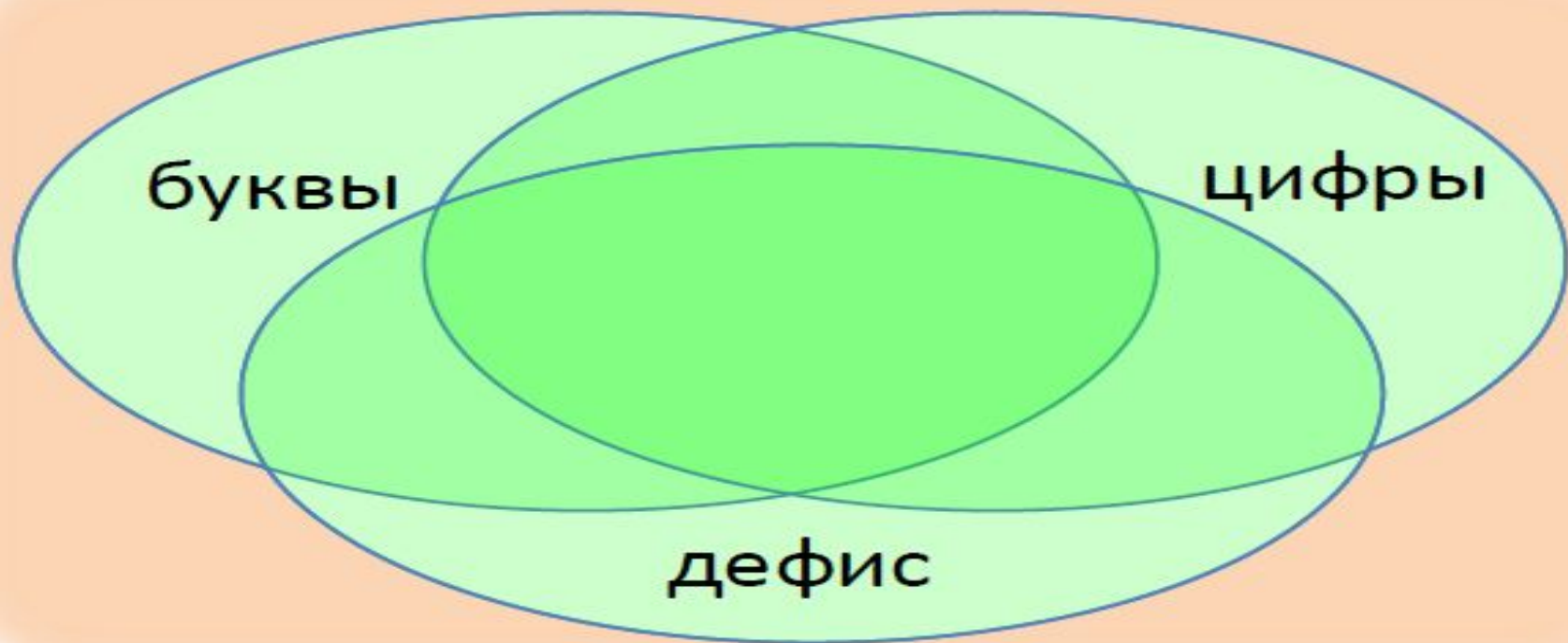
- Структура

в начале/конце стоит дефис/не дефис,
в 3 и 4 позиции дефисы/не дефисы

Интервалы



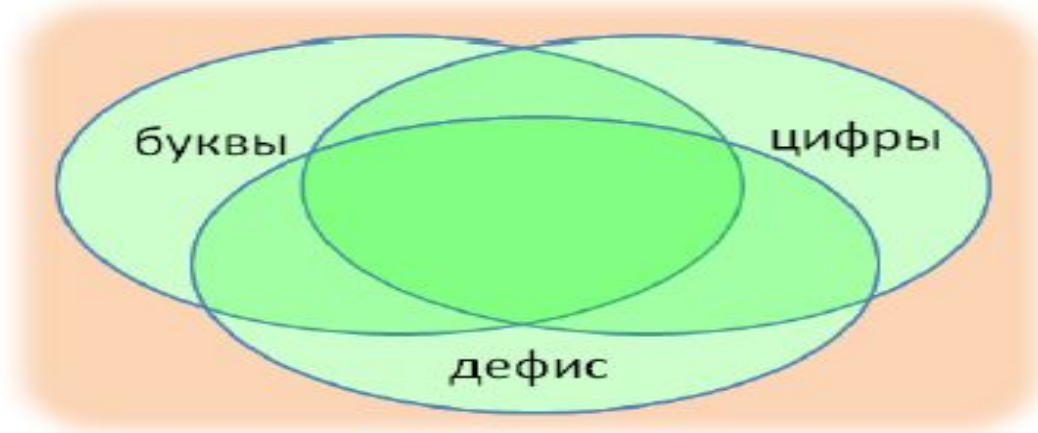
Покрытие и разбиение



Матрицы

Поз.3 Поз.4	Дефис	Не дефис
Дефис		
Не дефис		

Поз.3 \ Поз.4	Дефис	Не дефис
Дефис		
Не дефис		



BOUNDARIES



DIFFERENT CASES



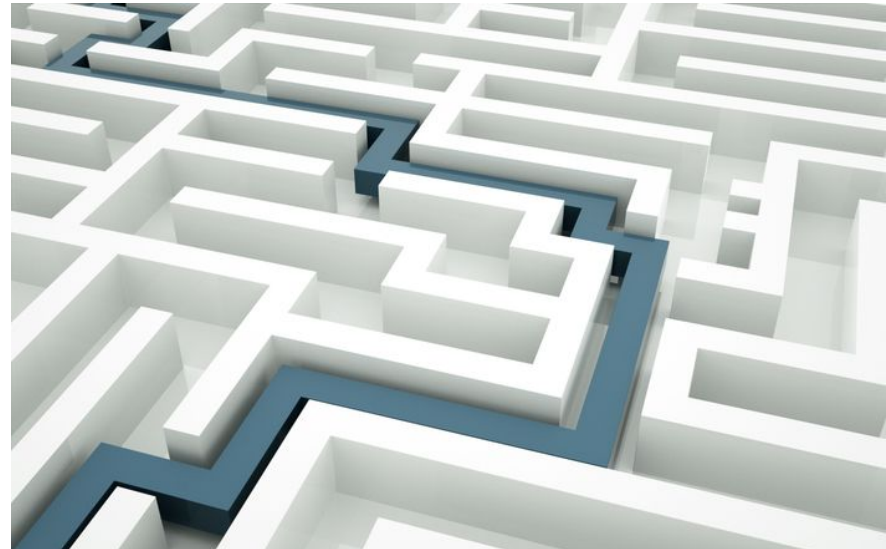
IF WE DO NOT KNOW EXACT BOUNDARIES:

If requirements do not specify allowed length, symbols, format, formula, etc:

- Developers may decline valid bugs
- Application may be inconsistent
- Bugs when not mainstream tests cause system down remain

WE DO NOT KNOW EXACT BOUNDARIES - SOLUTION

1. Create list of items and properties (not fields!)
2. Make reasonable assumptions
 - valid values
 - behavior when values are invalid
 - consult internet
3. Agree with developers
4. Approve with customer



WE DO NOT KNOW EXACT BOUNDARIES - EXAMPLE

Item property	Type	Required?	Unique?	Min	Max	Other (symbols allowed, format, formula,...)
Name	string	yes	yes	1	100	may contain any symbols from supported languages, not case sensitive
Password	string	yes	no	6	50	may contain any symbols from supported languages except spaces, case sensitive

WHEN?

- ✓ Identify ambiguities in descriptions of fields
- ✓ Find biggest / smallest values of a field and catch bugs on boundaries
- ✓ Pick few cases from huge number of equivalent cases



STRENGTH?

- ✓ Find highest probability errors with a relatively small set of tests.
- ✓ Intuitively clear approach, generalizes well

BLIND SPOTS?

- ✓ Errors that are not at boundaries or in obvious special cases.
- ✓ Also, the actual domains are often unknowable

Всем спасибо за внимание!

