Database development unit test with tSQLt

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Slide and demo: https://bit.ly/2SfYK0K

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Speaker bio

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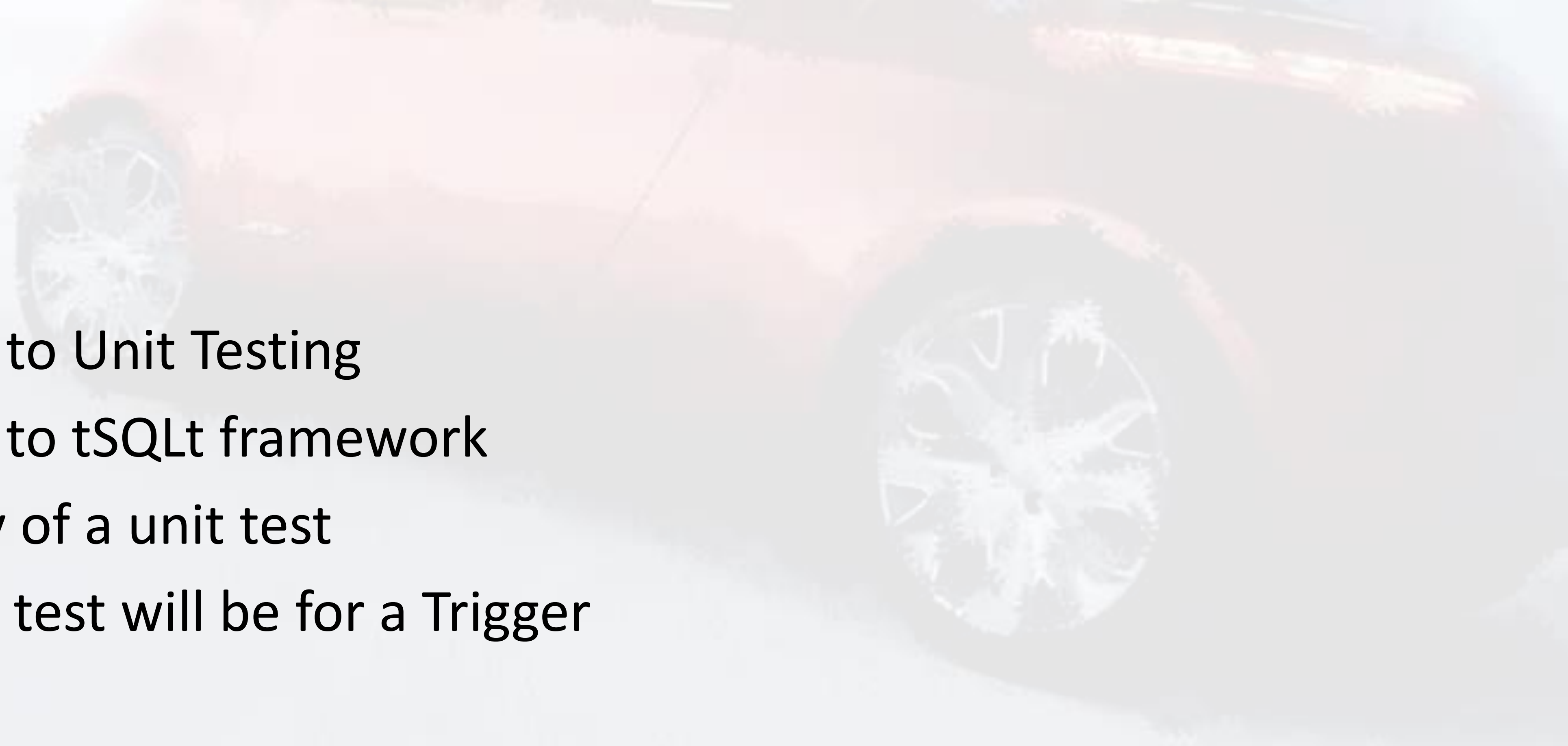
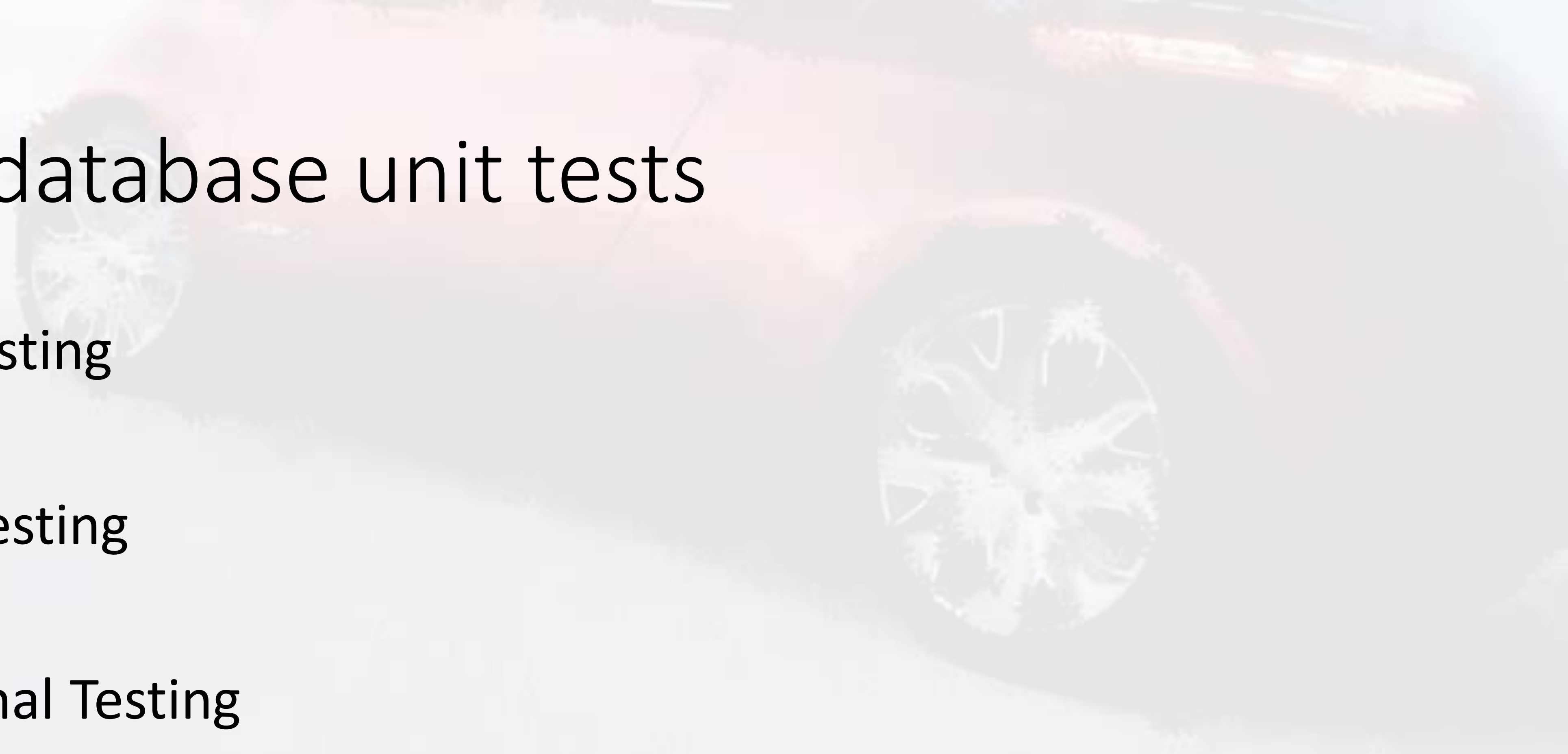


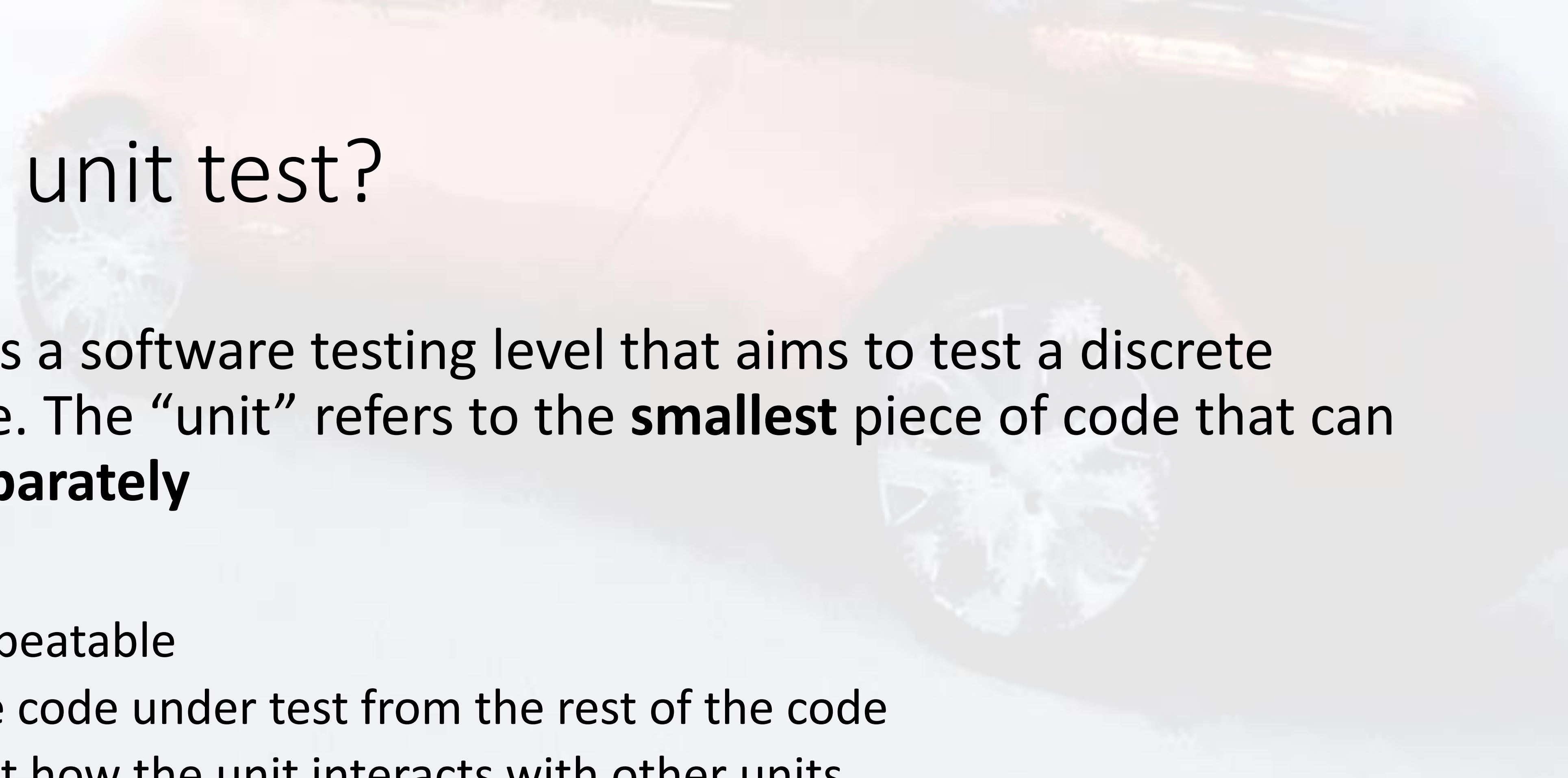
Agenda

- Introduction to Unit Testing
- Introduction to tSQLt framework
- The anatomy of a unit test
- Our first unit test will be for a Trigger



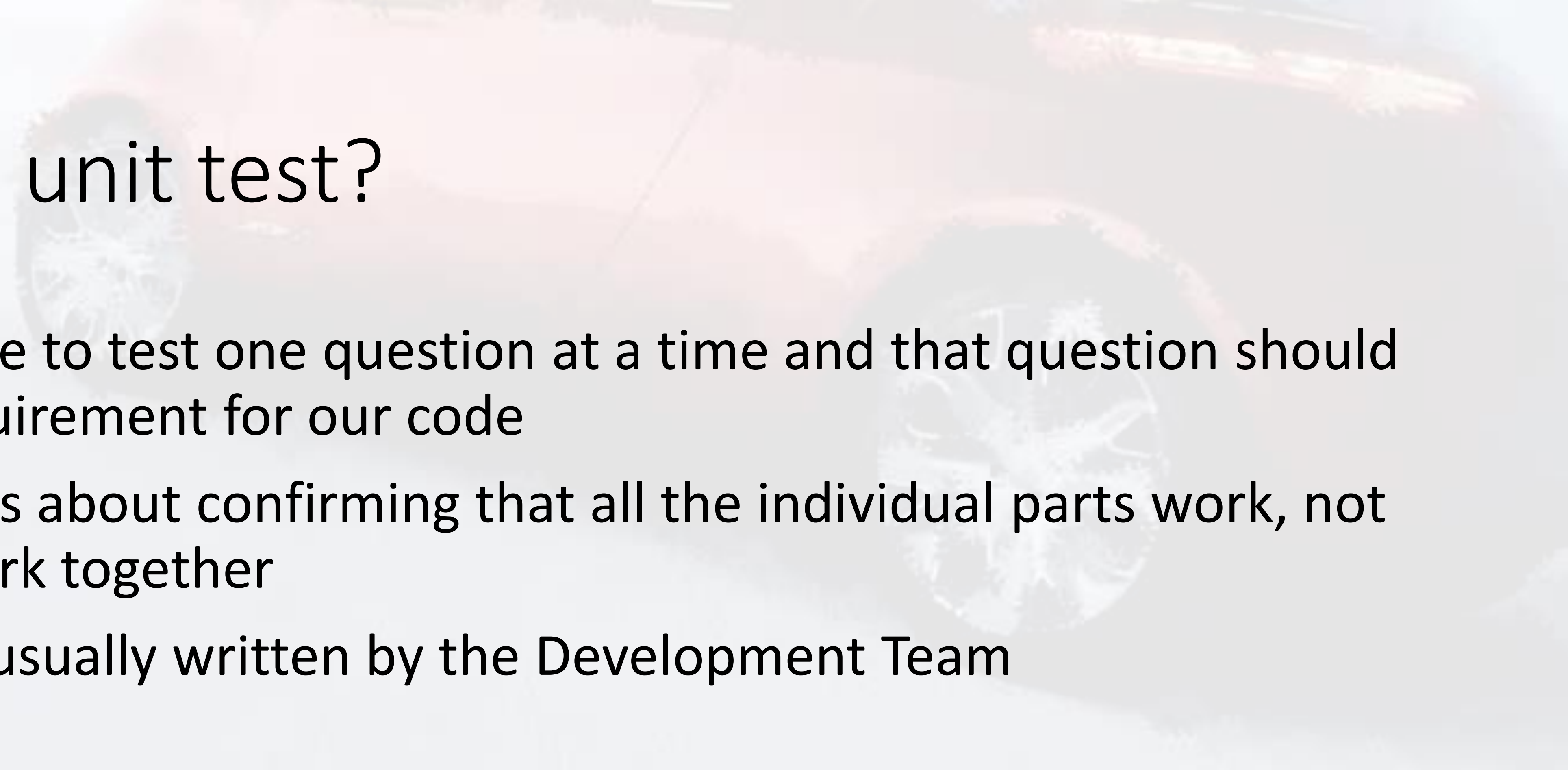
Types of database unit tests

- Structural Testing
- Functional Testing
- Non-functional Testing



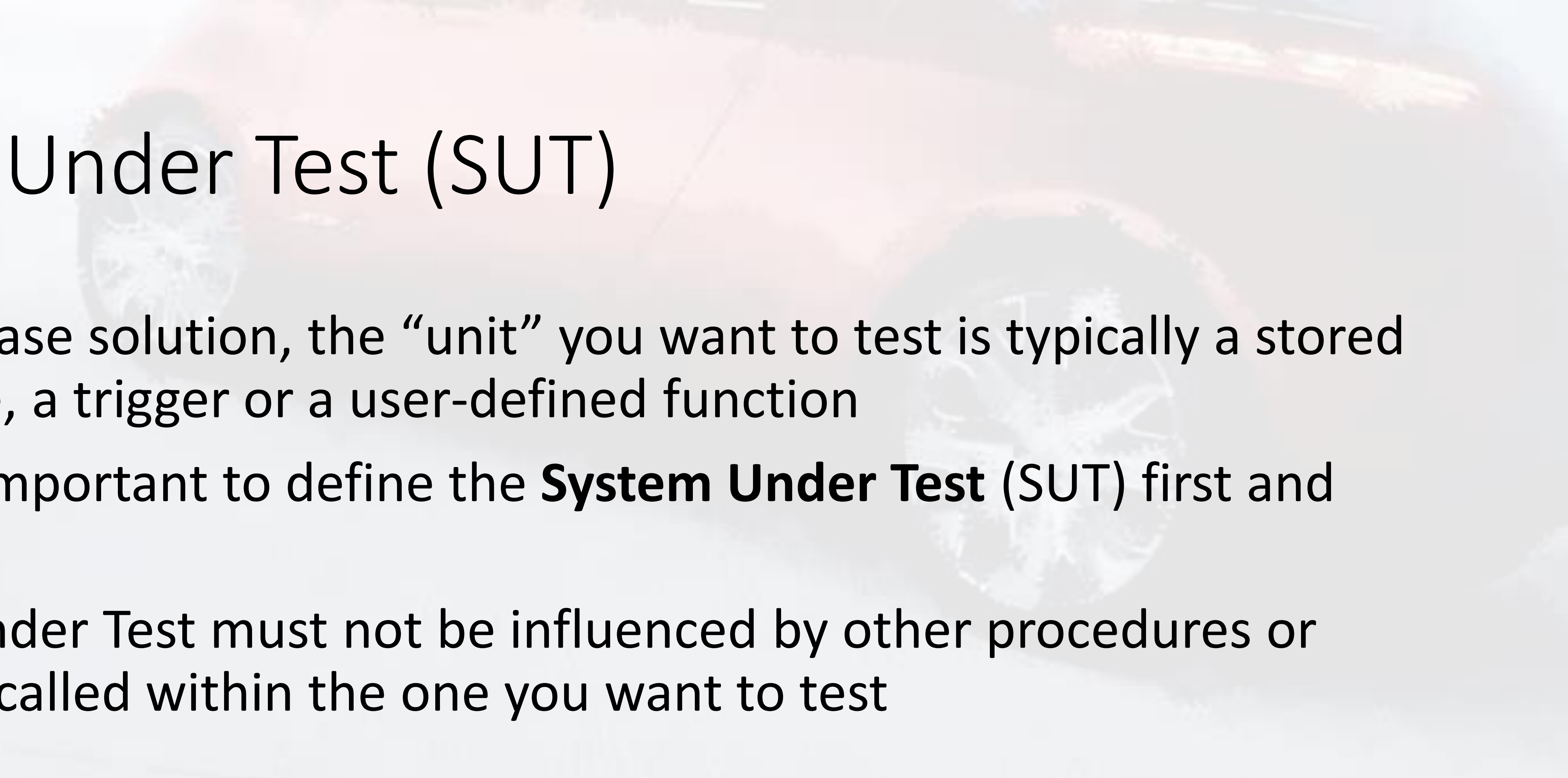
What is a unit test?

- Unit testing is a software testing level that aims to test a discrete piece of code. The “unit” refers to the **smallest** piece of code that can be tested **separately**
- Unit test
  - Must be repeatable
  - Isolates the code under test from the rest of the code
  - Doesn’t test how the unit interacts with other units



What is a unit test?

- Unit test have to test one question at a time and that question should reflect a requirement for our code
- Unit testing is about confirming that all the individual parts work, not that they work together
- Unit tests is usually written by the Development Team



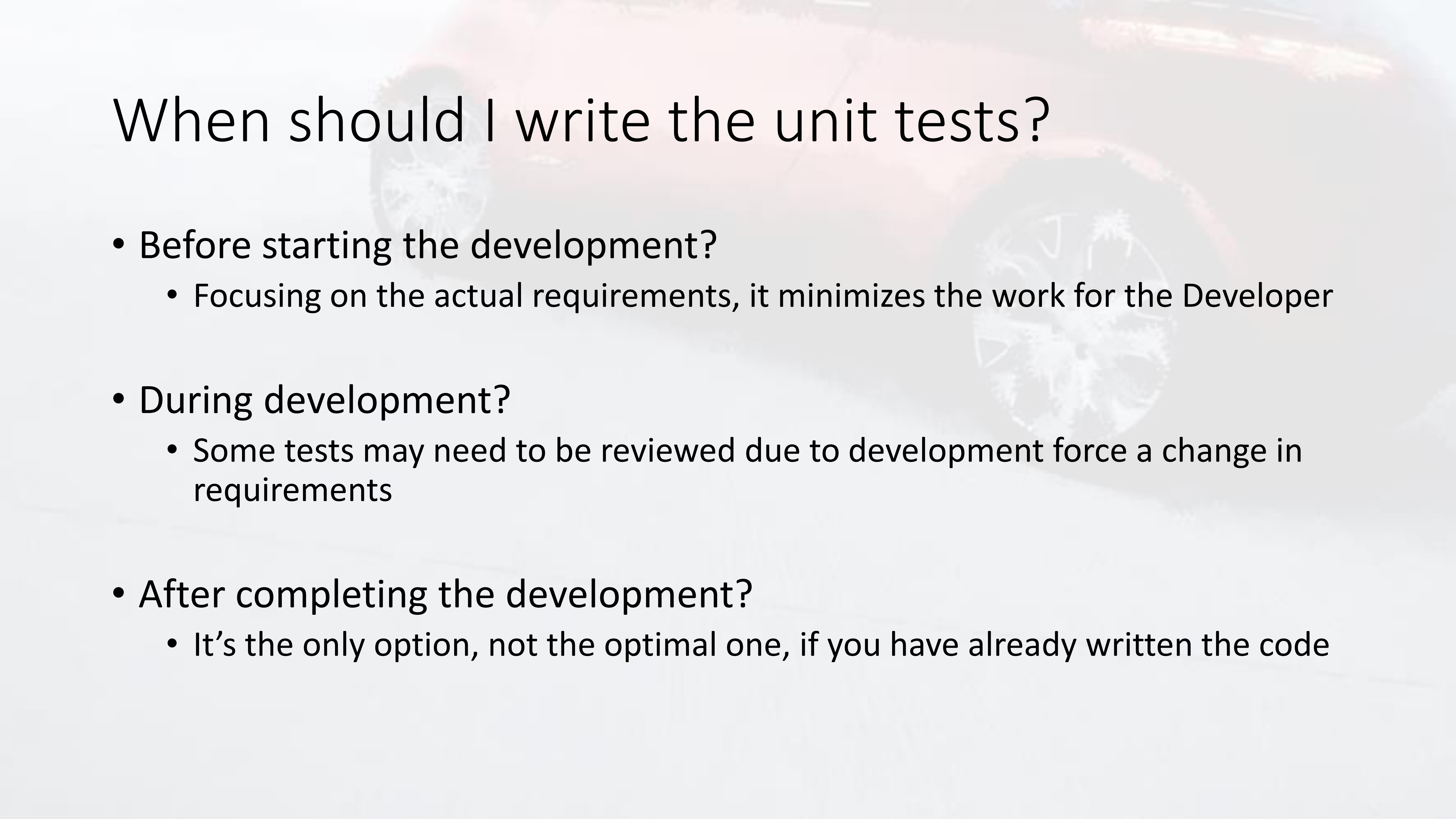
System Under Test (SUT)

- In a database solution, the “unit” you want to test is typically a stored procedure, a trigger or a user-defined function
- It is very important to define the **System Under Test** (SUT) first and isolate it!
- System Under Test must not be influenced by other procedures or functions called within the one you want to test

What does a unit test give me?

- Unit tests convey safety
- Unit tests provide documentation of the software requirements
- Unit tests are preparatory to the design phase (TDD methodology), they force you to think how to organize properly
- Unit tests simplify the error checking process

When should I write the unit tests?



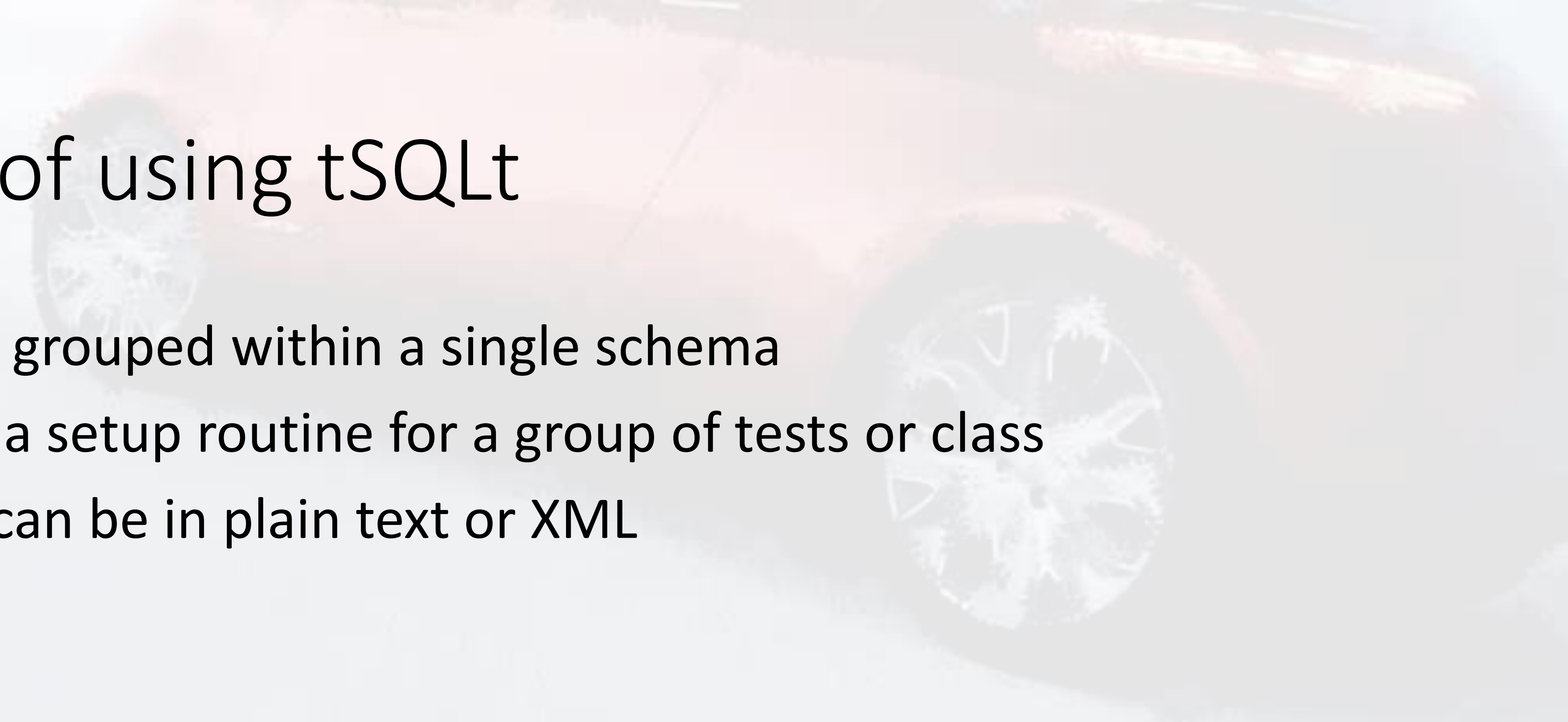
- Before starting the development?
  - Focusing on the actual requirements, it minimizes the work for the Developer
- During development?
  - Some tests may need to be reviewed due to development force a change in requirements
- After completing the development?
  - It's the only option, not the optimal one, if you have already written the code

Introduction to tSQLt

- The **framework tSQLt** was developed by Sebastian Meine and Dennis Lloyd, it’s an open source framework for implementing unit tests in T-SQL for SQL Server and Azure SQL Database
- It works with
  - All editions of SQL Server starting from SQL Server 2005 SP2
  - Azure SQL Database
- It requires SQL CLR enabled

Benefits of using tSQLt

- Unit tests will be written in T-SQL, you don’t need to learn new programming language ☺
- Data manipulation will be rolled back at the end of the test so you don’t need any data cleanup
- Mock objects are supported
- tSQLt can be integrated into SSDT projects or 3rd party tools

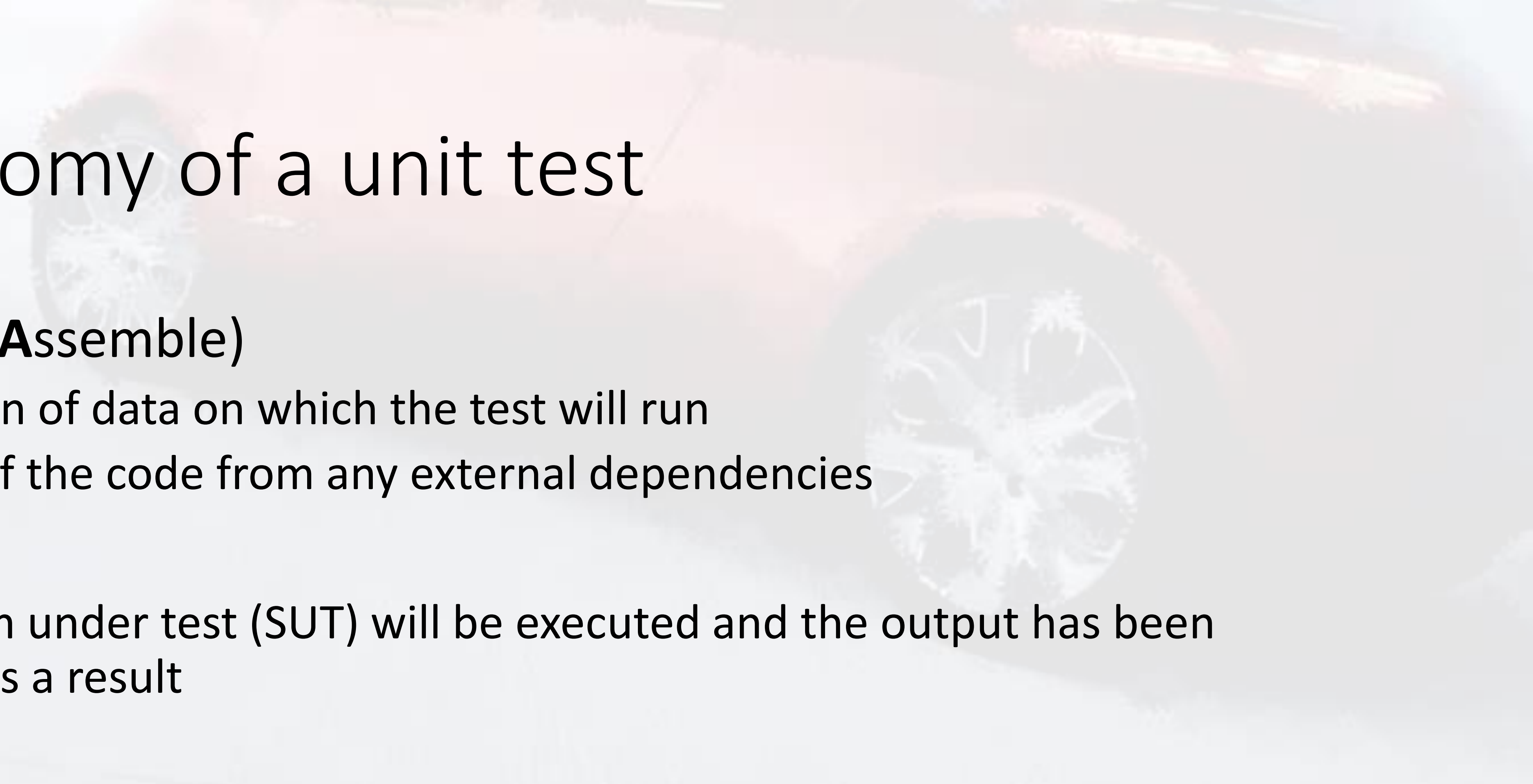


Benefits of using tSQLt

- Tests can be grouped within a single schema
- You can use a setup routine for a group of tests or class
- The output can be in plain text or XML

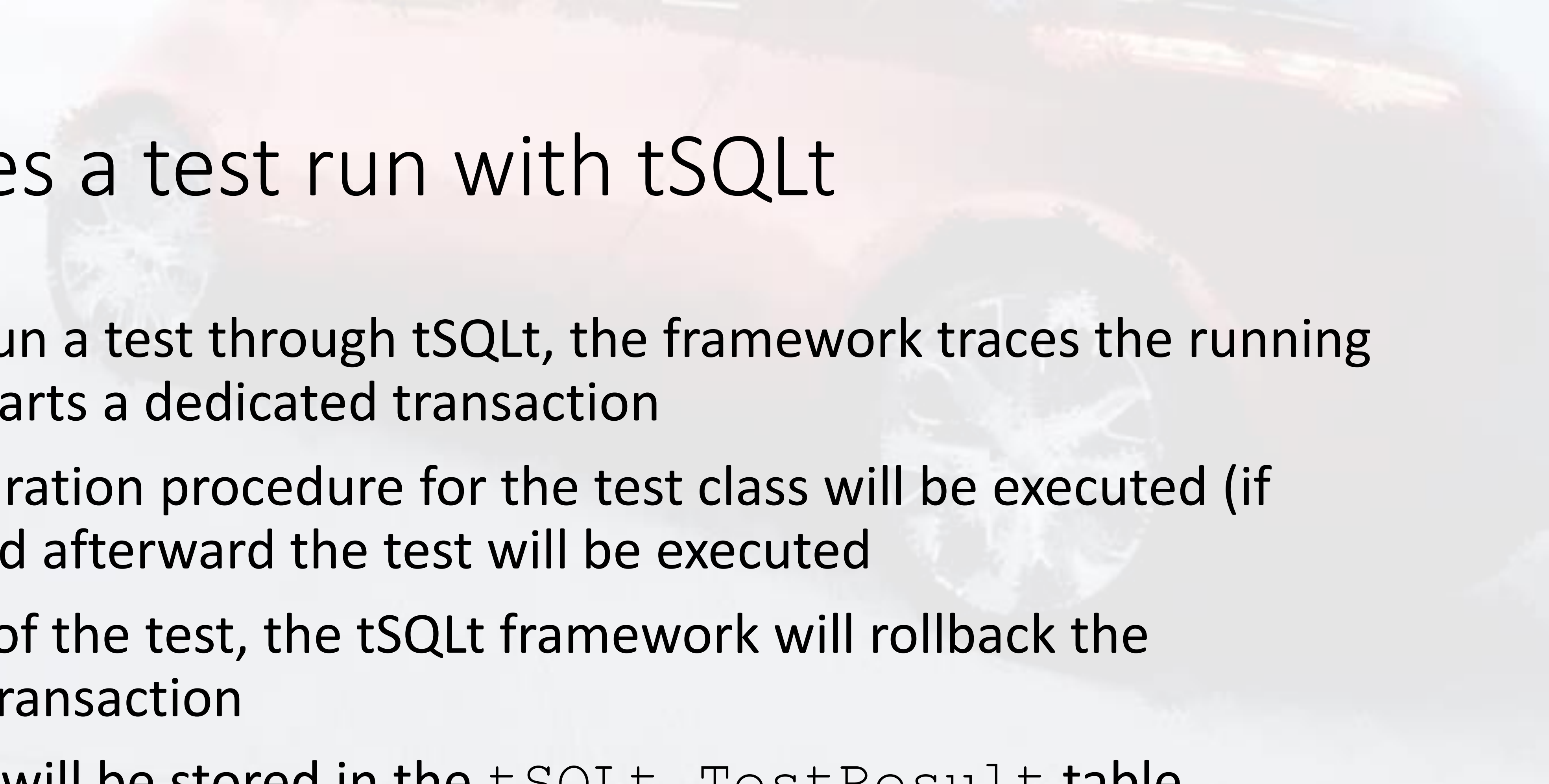
Demo

tSQLt Setup



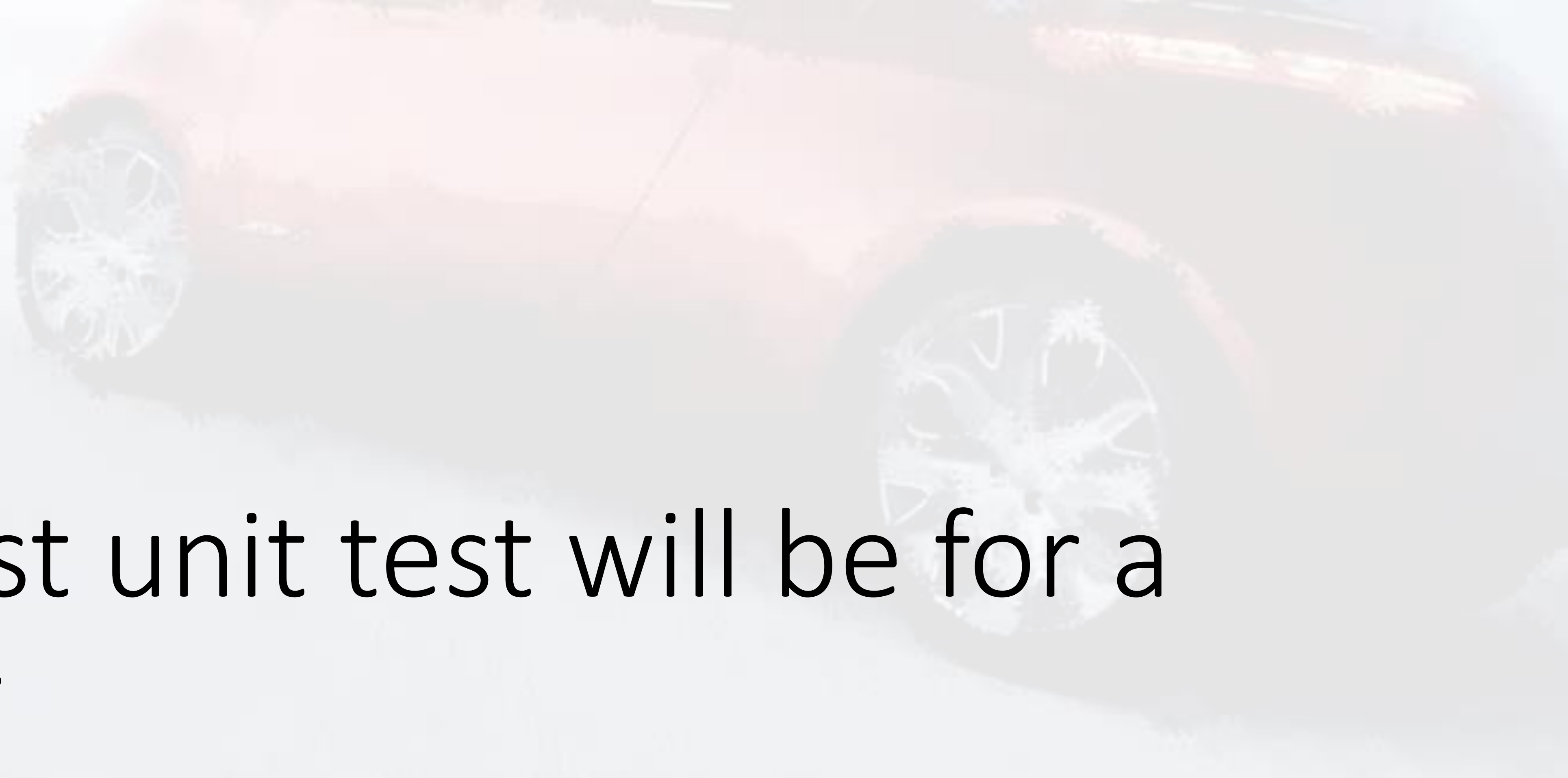
The anatomy of a unit test

- **A**rrange (or **A**ssemble)
  - Preparation of data on which the test will run
  - Isolation of the code from any external dependencies
- **A**ct
  - The system under test (SUT) will be executed and the output has been acquired as a result
- **A**ssert
  - The expected result will be compared with the obtained one, the test will fail or will have a positive outcome according to this comparison



How does a test run with tSQLt

- When we run a test through tSQLt, the framework traces the running tests and starts a dedicated transaction
- The configuration procedure for the test class will be executed (if existing) and afterward the test will be executed
- At the end of the test, the tSQLt framework will rollback the dedicated transaction
- The results will be stored in the `tSQLt.TestResult` table



Our first unit test will be for a Trigger

Our first unit test will be for a Trigger ☺

- You developed a Trigger for AdventureWorks2017 to prevent the insertion of new products with values less than 10 as a “safety stock”
- The Company Adventure Works LTD wishes to always have a warehouse stock of no less than 10 units for each product
- To make our trigger simple, it will only respond to the OnInsert event, for INSERT commands

Our first unit test will be for a Trigger

```
CREATE TRIGGER Production.TR_Product_SafetyStockLevel ON Production.Product
AFTER INSERT AS
BEGIN
  /* Avoid to insert products with safety stock level lower than 10! */
  DECLARE @SafetyStockLevel SMALLINT;
  SELECT
    @SafetyStockLevel = SafetyStockLevel
  FROM
    inserted;
  IF (@SafetyStockLevel < 10)
  BEGIN
    -- Error!!
    EXEC Production.usp_Raiserror_SafetyStockLevel
      @Message = 'Safety stock level cannot be lower than 10!';
  END;
END;
```

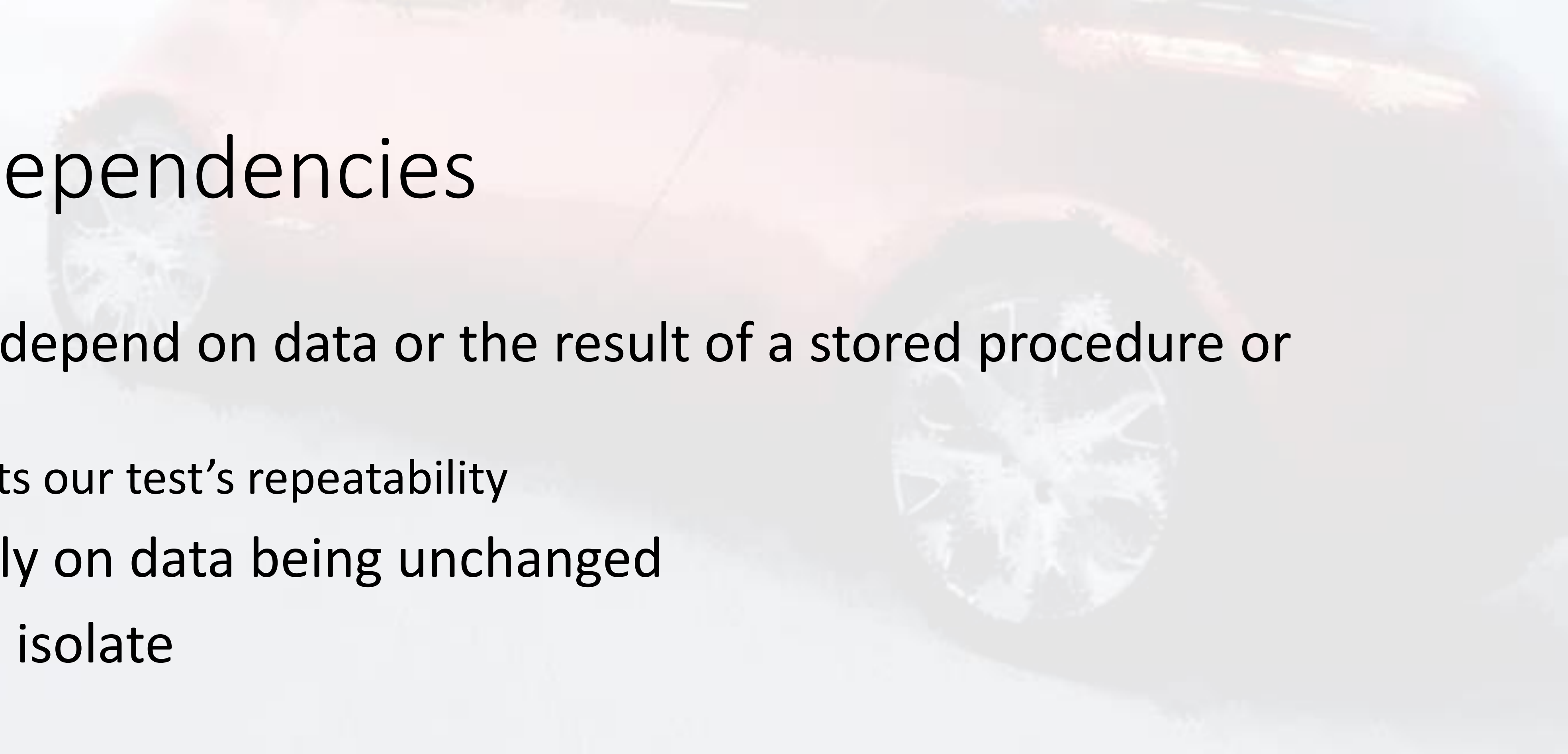
Possible test

- Try to insert one correct row
- Try to insert one wrong row and observe the error caught by the Trigger
- Try to insert multiple rows in a single statements
    - Wrong and correct rows
    - Does the order matter?
- Let’s start!! ☺

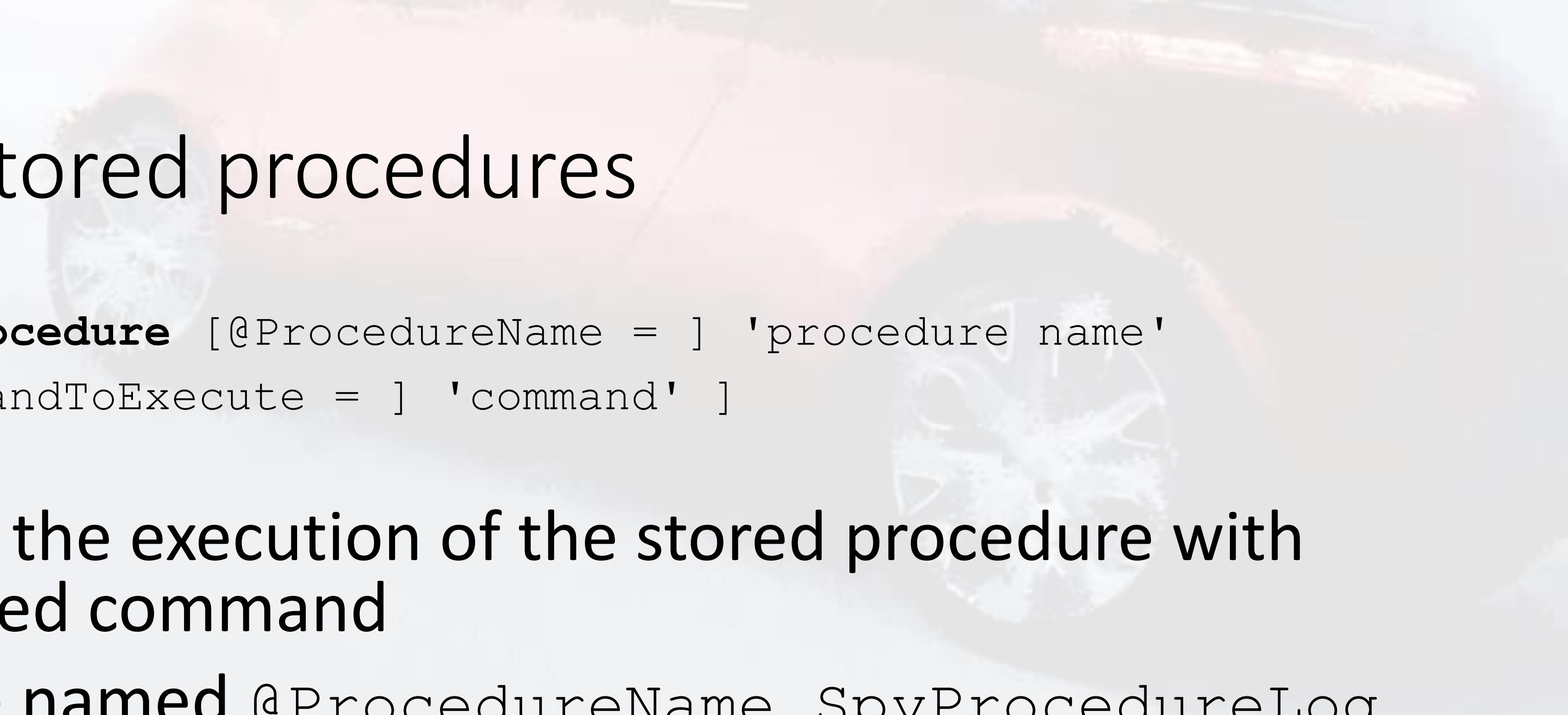
Demo

Let’s write our first unit test!

Isolate dependencies



- Tests often depend on data or the result of a stored procedure or function
    - This affects our test’s repeatability
- We can’t rely on data being unchanged
- We need to isolate
    - Data
    - Table constraints
    - Stored procedures
    - Functions



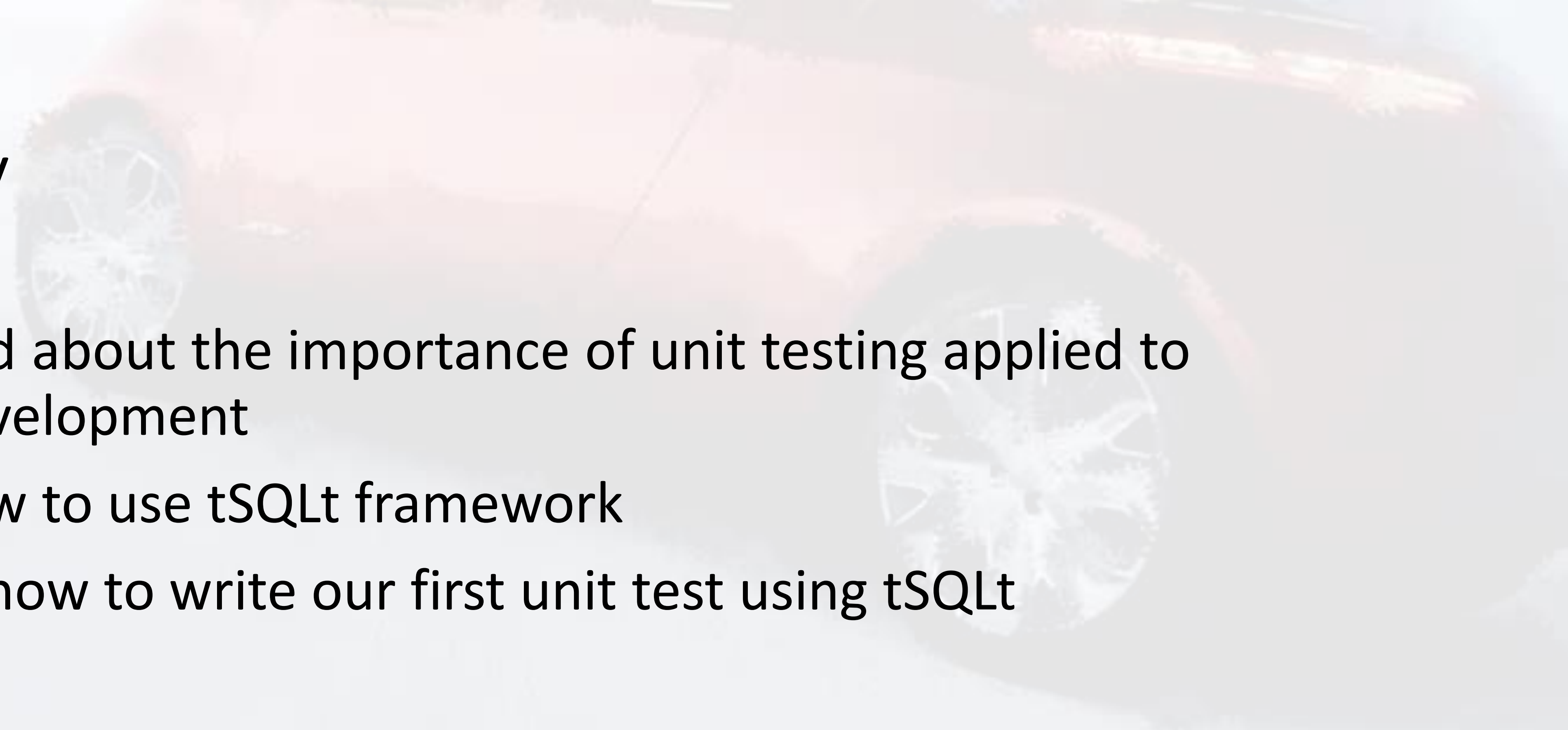
Isolate stored procedures

```
tSQLt.SpyProcedure [@ProcedureName = ] 'procedure name'
  [, [@CommandToExecute = ] 'command' ]
```

It replaces the execution of the stored procedure with the specified command

A log table named `@ProcedureName_SpyProcedureLog` is created and a new log entry is made for each fake execution of the “spied” procedure

https://bit.ly/2XWVZBl

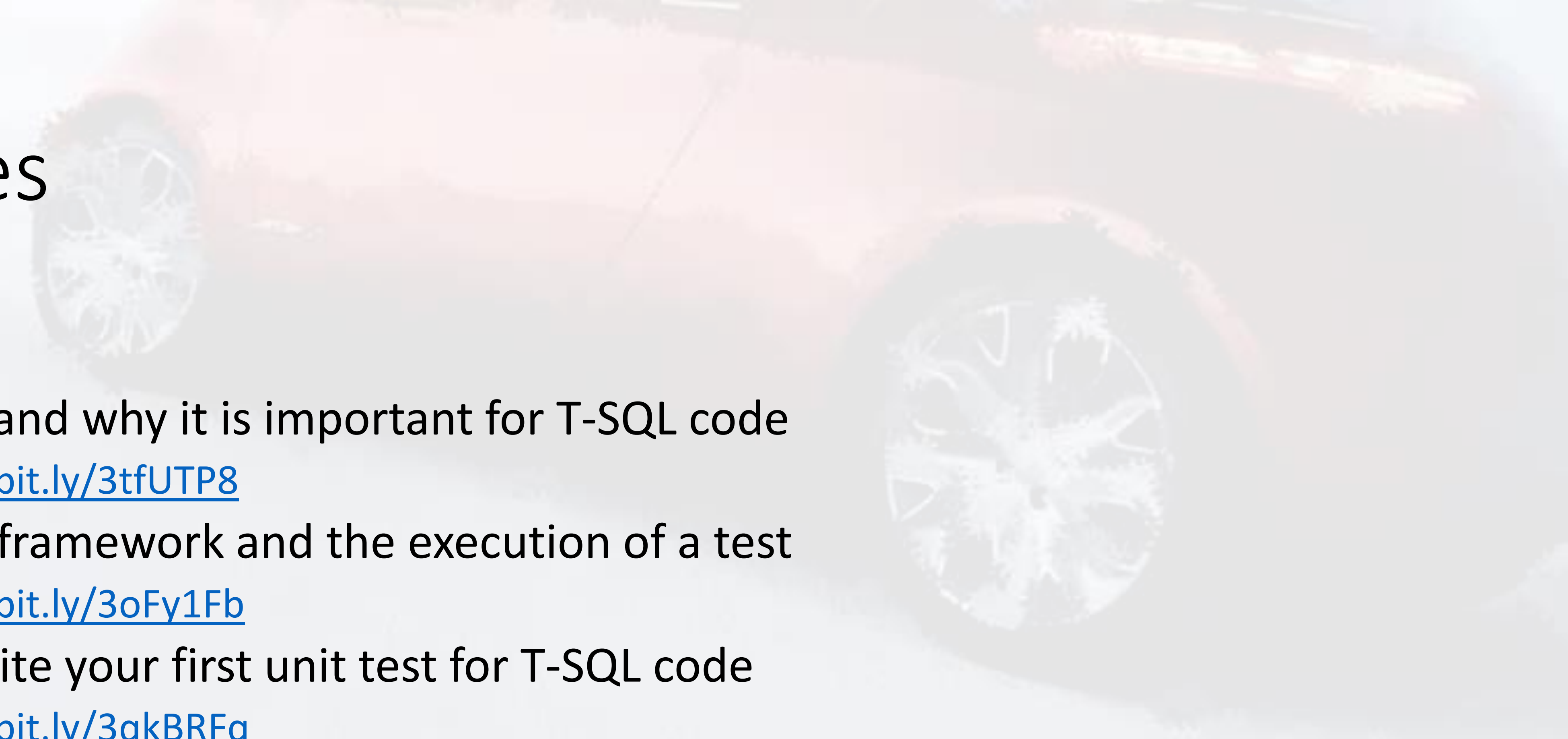


Summary

- We discussed about the importance of unit testing applied to database development
- We learn how to use tSQLt framework
- We learned how to write our first unit test using tSQLt

- Think about triggers, SP and complex functions you wrote (those with more than 200 lines of code just to be clear ☺) would you feel safe in modifying them? If the answer is “No” the first thing to do is to write the unit tests, now you know how!

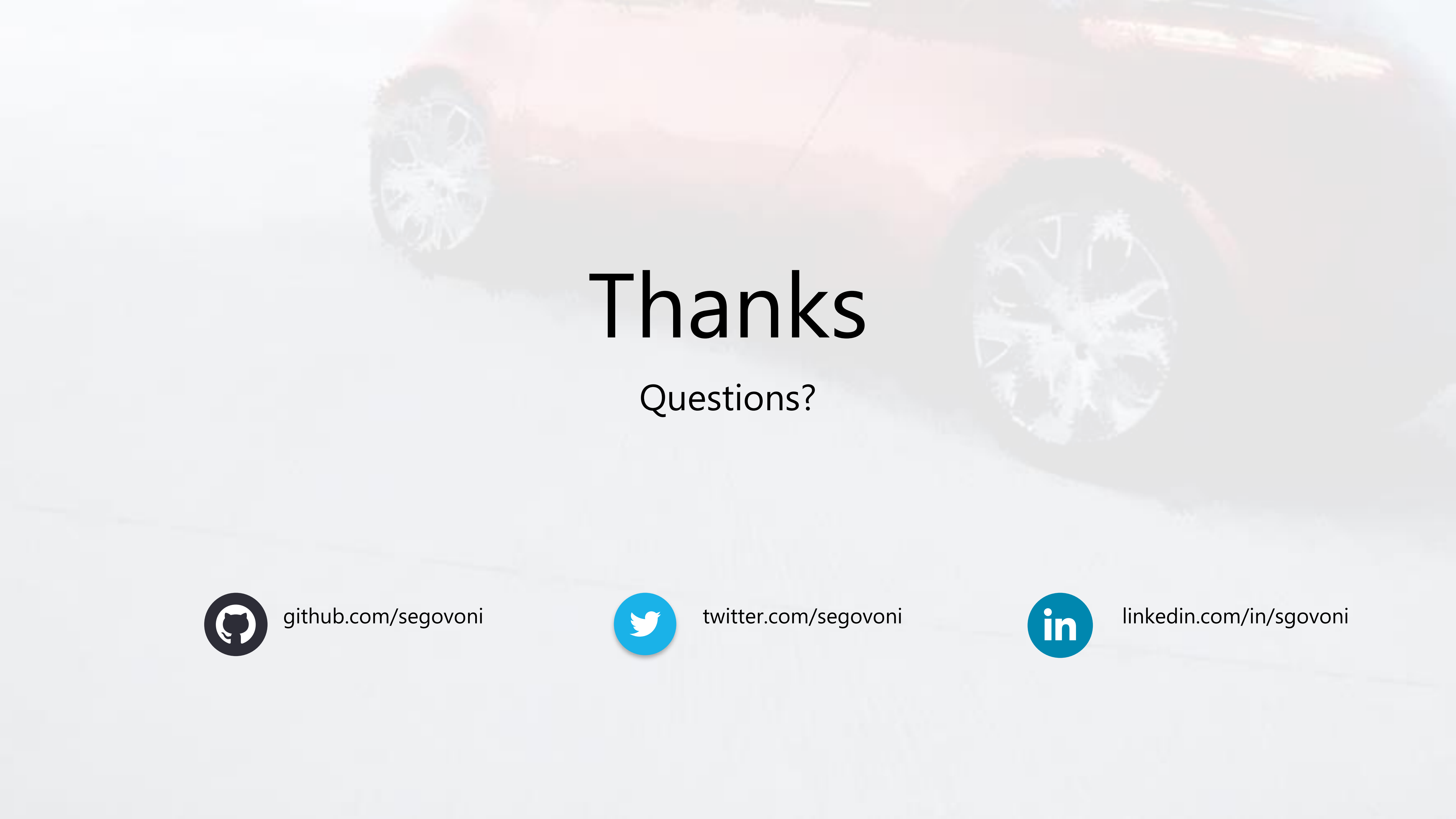
Resources



- Articles
  - What it is and why it is important for T-SQL code
    - https://bit.ly/3tfUTP8
  - The tSQLt framework and the execution of a test
    - https://bit.ly/3oFy1Fb
  - How to write your first unit test for T-SQL code
    - https://bit.ly/3qkBRFq
- tSQLt - https://tsqlt.org

Resources

- Videos
  - Implementare unit testing su Sql Server - Alessandro Alpi
    - https://www.youtube.com/watch?v=7tIHg3P0ea0
  - Continuous Deployment, portare SQL Server nel mondo DevOps - Alessandro Alpi
    - https://www.youtube.com/watch?v=1jBm4MFFlPg
- Tools
  - Red-Gate SQL Test
    - https://www.red-gate.com/products/sql-development/sql-test/
- TSQLUnit
  - https://github.com/aevdokimenko/tsqlunit



Thanks

Questions?

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