



FACULTY  
OF INFORMATICS  
Masaryk University

# Use of Transactions within a Reactive Microservices Environment

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Bc. Martin Štefanko

# Microservices

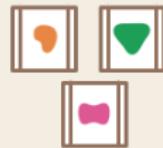
*A monolithic application puts all its functionality into a single process...*



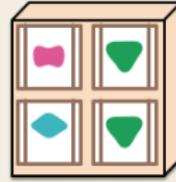
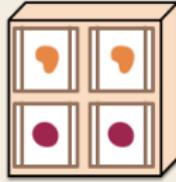
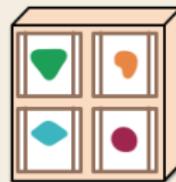
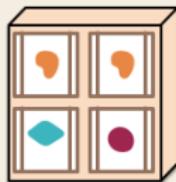
*... and scales by replicating the monolith on multiple servers*



*A microservices architecture puts each element of functionality into a separate service...*



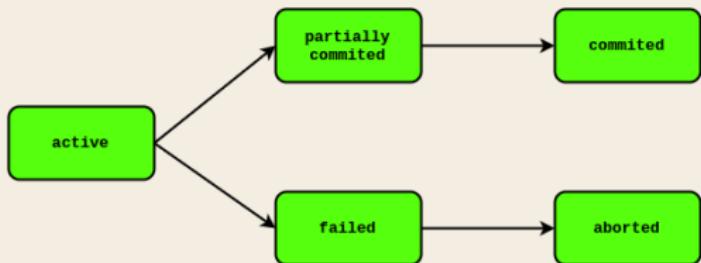
*... and scales by distributing these services across servers, replicating as needed.*



# Transactions

"A transaction is a unit of processing that provides all-or-nothing property to the work that is conducted within its scope, also ensuring that shared resources are protected from multiple users" [1].

- sequence of operations
- commit or rollback



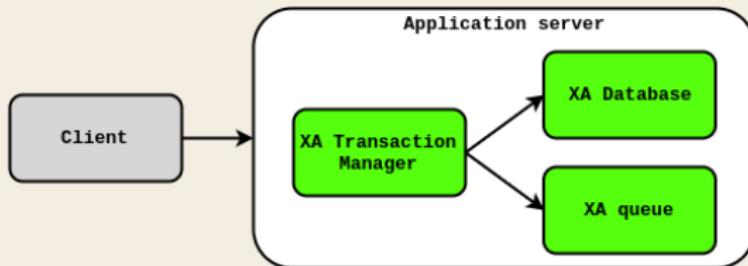
## ACID transaction

- Atomicity
- Consistency
- Isolation
- Durability

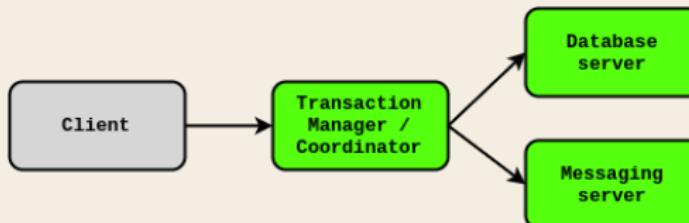


# Distributed transactions

- XA



- Distributed system



# Transaction

Lewis Carroll

'Twas brillig, and the slithy toves  
Did gyre and gimble in the wabe;  
All mimsy were the borogoves,  
And the mome raths outgrabe.

"Beware the Jabberwock, my son!  
The jaws that bite, the claws that catch!  
Beware the Jubjub bird, and shun  
The frumious Bandersnatch!"



# Lists and locales

*Lorem ipsum dolor sit amet*

- Nulla nec lacinia odio.  
Curabitur urna tellus.
  - Fusce id sodales dolor. Sed id metus dui.
    - » Cupio virtus licet mi vel feugiat.
- 1. Donec porta, risus porttitor egestas scelerisque video.
  - 1.1 Nunc non ante fringilla, manus potentis cario.
  - 1.1.1 Pellentesque servus morbi tristique.

Nechť již hříšné saxofony d'áblů rozzvučí sín úděsnými tóny waltzu, tanga a quickstepu! Nezvyčajné krdle šťastných figliarskych ďatľov učia pri kótovanom ústí Váhu mlkveho koňa Waldemara obžierať väčšie kusy exkluzívnej kôry. The quick, brown fox jumps over a lazy dog. DJs flock by when MTV ax quiz prog. "Now fax quiz Jack!"

## Text blocks

*In plain, example, and alert flavour*

This text is highlighted.

A plain block

This is a plain block containing some highlighted text.

An example block

This is an example block containing some highlighted text.

An alert block

This is an alert block containing some highlighted text.

## Definitions, theorems, and proofs

*All integers divide zero*

### Definition

$$\forall a, b \in \mathbb{Z} : a \mid b \iff \exists c \in \mathbb{Z} : a \cdot c = b$$

### Theorem

$$\forall a \in \mathbb{Z} : a \mid 0$$

### Proof

$$\forall a \in \mathbb{Z} : a \cdot 0 = 0$$

□

# Numerals and Mathematics

Formulae, equations, and expressions

$$1234567890 \quad 1234567890 \quad \hat{x}, \check{x}, \tilde{a}, \bar{a}, \dot{y}, \ddot{y} \quad \iint f(x, y, z) dx dy dz$$

$$\frac{1}{1 + \frac{1}{2 + \frac{1}{3+x}}} + \frac{1}{1 + \frac{1}{2 + \frac{1}{3+x}}} \quad F : \begin{vmatrix} F''_{xx} & F''_{xy} & F'_x \\ F''_{yx} & F''_{yy} & F'_y \\ F'_x & F'_y & 0 \end{vmatrix} = 0$$

$$\iint_{x \in \mathbb{R}^2} \langle x, y \rangle dx \quad \overline{a\alpha^2 + b\beta + d\delta} \quad ]0, 1[ + \lceil x \rceil - \langle x, y \rangle$$

$$e^x \approx 1 + x + x^2/2! + \dots + x^3/3! + x^4/4!$$
$$\binom{n+1}{k} = \binom{n}{k} + \binom{n}{k-1}$$

# Figures

Tables, graphs, and images

Faculty	With $\text{\TeX}$	Total	%
Faculty of Informatics	1 716	2 904	59.09
Faculty of Science	786	5 275	14.90
Faculty of Economics and Administration	64	4 591	1.39
Faculty of Arts	69	10 000	0.69
Faculty of Medicine	8	2 014	0.40
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Faculty of Sports Studies	3	2 062	0.15

Table: The distribution of theses written using  $\text{\TeX}$  during 2010–15 at MU

## Figures

Tables, graphs, and images

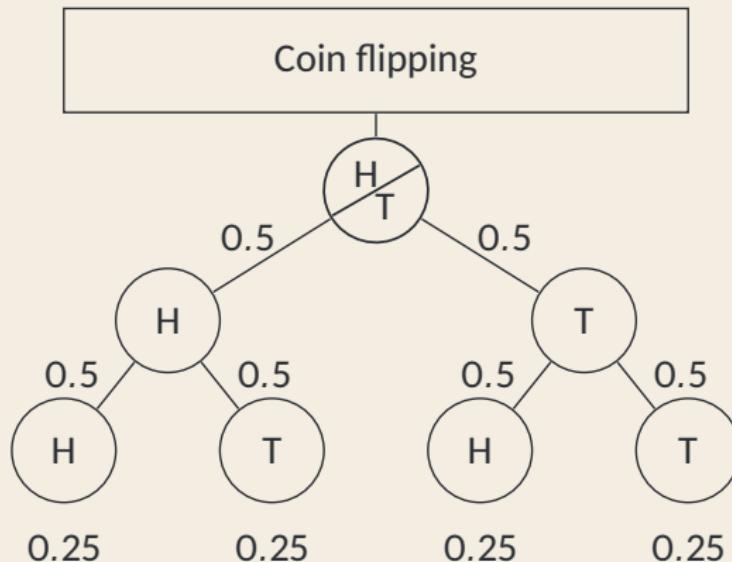


Figure: Tree of probabilities – Flipping a coin<sup>1</sup>

<sup>1</sup>A derivative of a diagram from [texexample.net](http://texexample.net) by cis, CC BY 2.5 licensed

# Code listings

An example source code in C

```
#include <stdio.h>
#include <unistd.h>
#include <sys/types.h>
#include <sys/wait.h>

// This is a comment
int main(int argc, char **argv)
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    while (--c > 1 && !fork());
    sleep(c = atoi(v[c]));
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    return 0;
}
```

# Citations

## $\text{\TeX}$ , $\text{\LaTeX}$ , and Beamer

$\text{\TeX}$  is a programming language for the typesetting of documents. It was created by Donald Erwin Knuth in the late 1970s and it is documented in *The  $\text{\TeX}$ book* [?].

In the early 1980s, Leslie Lamport created the initial version of  $\text{\LaTeX}$ , a high-level language on top of  $\text{\TeX}$ , which is documented in  *$\text{\LaTeX}$ : A Document Preparation System* [2]. There exists a healthy ecosystem of packages that extend the base functionality of  $\text{\LaTeX}$ ; *The  $\text{\LaTeX}$  Companion* [3] acts as a guide through the ecosystem.

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## Bibliography

- [1] M. Little, J. Maron, and G. Pavlik. *Java transaction processing*. Prentice Hall, 2004.
- [2] Leslie Lamport. *L<sup>A</sup>T<sub>E</sub>X: A Document Preparation System*. Addison-Wesley, 1986.
- [3] M. Goossens, F. Mittelbach, and A. Samarin. *The L<sup>A</sup>T<sub>E</sub>X Companion*. Addison-Wesley, 1994.
- [4] Till Tantau. *User's Guide to the Beamer Class Version 3.01*. Available at <http://latex-beamer.sourceforge.net>.

## Images

- [1] <https://www.martinfowler.com/articles/microservices.html>
- [2] <http://www.24pressrelease.com/assets/news/Propylene%20Glycol%20Solvent%2017614.jpg>.

# Jabberwocky

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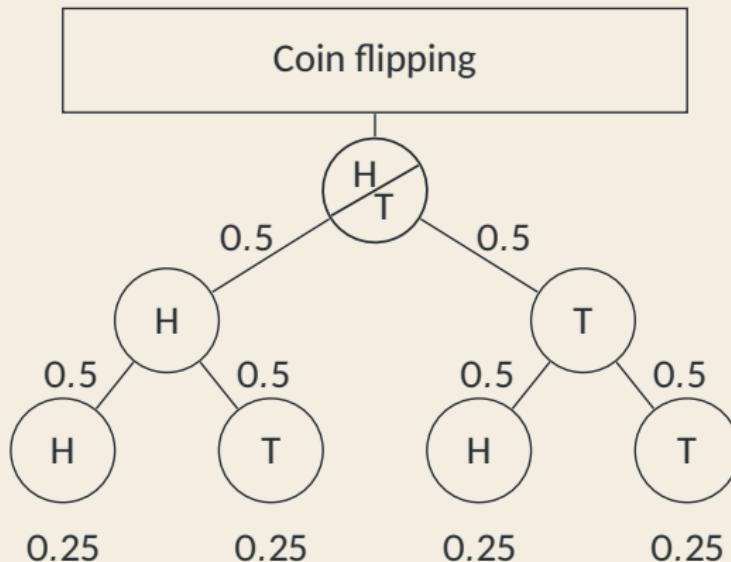


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