# Data bases 2

## Exercise session

Marco Abbadini

marco.abbadini@unibg.it

Università degli Studi di Bergamo

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# Schedule classification

# Ex. 1

Classify the following schedule:

$$r_1(x)\ r_4(x)\ w_4(x)\ r_1(y)\ r_4(z)\ w_4(z)$$
$$w_3(y)\ w_3(z)\ w_2(t)\ w_2(z)\ w_1(t)\ w_5(t)$$

If possible, add, remove or move one action in order to change the class of the schedule

# Ex. 2

Classify the following schedule

$$r_4(x)\ r_2(x)\ w_4(x)\ w_2(y)\ w_4(y)\ r_3(y)\ w_3(x)\ w_4(z)$$
$$r_3(z)\ r_6(z)\ r_8(z)\ w_6(z)\ w_9(z)\ r_5(z)\ r_{10}(z)$$

- Serial?
- CSR?
- VSR?
- 2PL-strict?
- 2PL?
- TS-mono?
- TS-multi?

# Ex. 3

Classify the following schedule

$$w_4(x)\ r_2(x)\ w_2(y)\ w_4(y)\ w_3(x)\ w_4(z)$$
$$r_3(z)\ r_6(z)\ r_8(z)\ w_9(z)\ w_5(z)\ r_{10}(z)$$

- Serial?
- CSR?
- VSR?

# Distributed deadlock: Obermarck algorithm

# Ex. 1

Consider the following waiting conditions:

$$
\begin{aligned}
Node_A &: E_D \rightarrow t_1,\ t_1 \rightarrow t_2,\ t_2 \rightarrow E_B \\
Node_B &: E_A \rightarrow t_2,\ t_2 \rightarrow t_4,\ t_4 \rightarrow E_C \\
Node_C &: E_B \rightarrow t_4,\ t_4 \rightarrow t_3,\ t_3 \rightarrow E_D \\
Node_D &: E_C \rightarrow t_3,\ t_3 \rightarrow t_1,\ t_1 \rightarrow E_A
\end{aligned}
$$

Indicate weather there is a deadlock

# Ex. 2

Consider the following waiting conditions:

$$
\begin{aligned}
Node_1 :& E_2 \to t_1,\ t_1 \to t_2,\ E_3 \to t_2,\ t_2 \to t_3,\ t_3 \to E_2,\ E_2 \to t_4,\\
& t_4 \to t_3\\
Node_2 :& E_1 \to t_3,\ t_3 \to t_5, t_5 \to t_6,\ t_6 \to E_3,\ E_3 \to t_7, t_7 \to t_6,\\
& t_9 \to t_4,\ t_4 \to E_1,\ t_1 \to E_1\\
Node_3 :& E_2 \to t_6,\ t_6 \to t_8,\ t_8 \to t_2,\ t_2 \to E_1,\ t_7 \to E_2
\end{aligned}
$$

Indicate whether there is a distributed deadlock

# Hierarchical locking scheme

# Ex. 1

Consider the following schedule occurring on a system with hierarchical lock over a hierarchy where $Pag_A$ contains tuples $t_1$ and $t_2$:

$$r_1(Pag_A),\ w_2(t_1),\ w_1(t_2)$$

Show the sequence of lock, unlock, lock escalation, and lock downgrade requests for transactions $T_1$ and $T_2$, taking into account that *the schedule has to be 2PL*.

# Ex. 2

Given the schedule:

$$r_1(x)\ r_2(x)\ r_3(y)\ w_3(y)\ w_1(x)\ w_2(y)$$

show the sequence of lock and unlock requests produced by the transactions in a 2PL execution, in a system providing the locks SL, UL and XL (where UL is the Update Lock)