B(T1)

B(T2)

B(T3)

I(T1, O1, A1)

D(T2, O2, B2)

B(T4)

U(T4, O3, B3, A3)

U(T1, O4, B4, A4)

C(T2)

CK(T1, T3, T4)

B(T5)

B(T6)

U(T5, O5, B5, A5)

A(T3)

CK(T1, T4, T5, T6)

B(T7)

A(T4)

U(T7, O6, B6, A6)

U(T6, O3, B7, A7)

B(T8)

A(T7)

guasto

O3 = B7

O6 = B6

O5 = B5

O4 = B4

O3 = B3

O2 = B2

D(O2)

UNDO(T1, T4, T5, T6, T7, T8)

REDO()

B(T_1)

U(T_1, O_1, B_1, A_1)

B(T_2)

I(T_1, O_2, A_2)

B(T_3)

D(T_3, O_3, B_2)

U(T_2, O_4, B_3, A_3)

CK(T_1, T_2, T_3)

I(T_3, O_5, B_4)

B(T_4)

U(T_4, O_6, B_4, A_5)

I(T_4, O_7, O_6)

U(T_4, O_2, B_5, A_7)

C(T_3)

I(T_2, O_8, A_9)

A(T_1)

U(T_4, O_3, B_7, A_{10})

guasto

UNDO(T_1, T_2, T_3) REDO()

UNDO(T_1, T_2, T_4) REDO(T_3)

UNDO:

$O_3 = B_7$

D(O_8)

$O_2 = B_5$

D(O_7)

$O_6 = B_4$

$O_4 = B_3$

D(O_2)

$O_1 = B_1$

REDO:

D(O_3)

$O_5 = A_4$

ANOMALIE

$r_1(x)$
$w_1(x)$
$r_2(y)$
$w_2(y)$
a_1 c_2

nessun problema

$r_1(x)$
$r_2(x)$
$r_2(y)$
$w_2(y)$
$r_1(z)$
a_1 c_2

nessun problema

$r_1(x)$
$r_2(x)$
$w_2(x)$
$w_1(x)$
c_1 c_2

perdita di aggiorn.

$r_1(x)$
$r_2(x)$
$w_2(x)$
$r_1(y)$
c_1 c_2

no problem

$r_1(x)$
$w_1(x)$
$r_2(x)$
$w_2(x)$
c_1 c_2

no problem

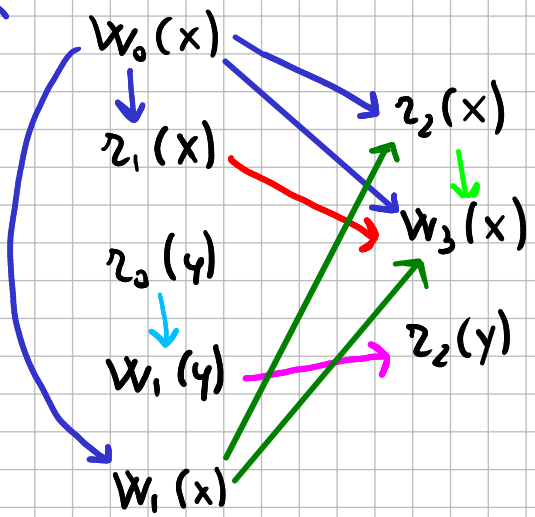
$r_1(x)$
$w_1(x)$
$r_2(x)$
$w_2(y)$
a_1 c_2

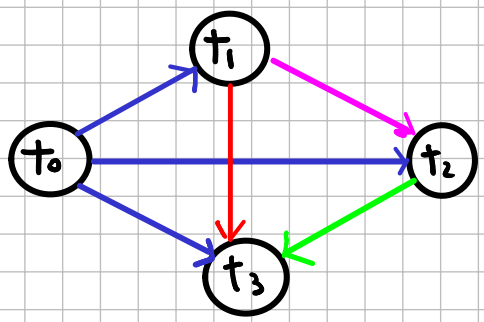
letture sporche

SCHEDULE

$\langle w_0(x)\ r_1(x)\ r_0(y)\ w_1(y)\ w_1(x)\ r_2(x)\ w_3(x)\ r_2(y) \rangle$

CSR

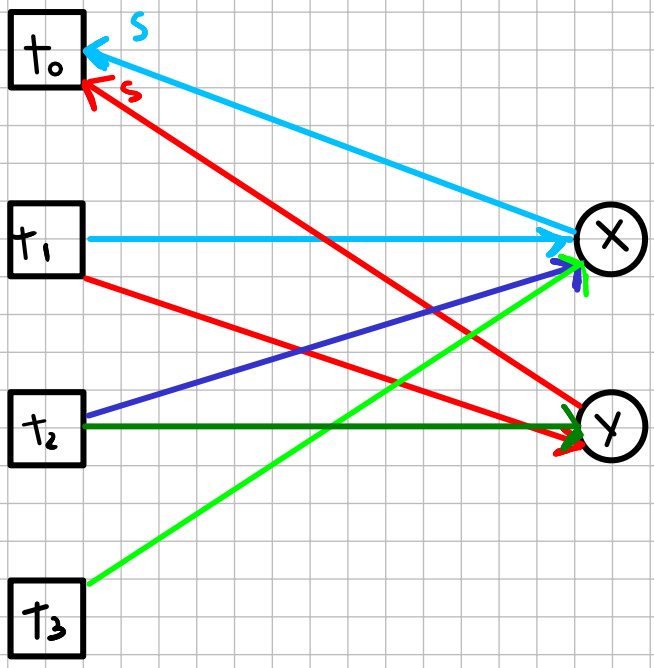




lo schedule è CSR perché $\nexists$ cicli

$\langle W_0(x)\ r_1(x)\ r_0(y)\ W_1(y)\ W_1(x)\ r_2(x)\ W_3(x)\ r_2(y) \rangle$

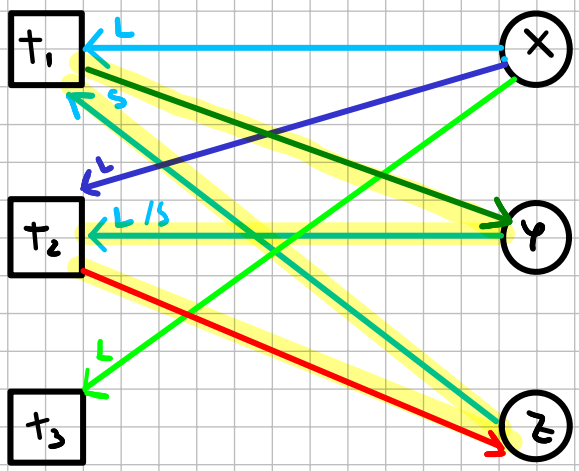
2PL



non ci sono cicli, quindi non ci sono deadlock

2PL

$\langle r_1(x), r_2(y), W_1(z), r_2(x), r_3(x), W_2(z), W_2(y), r_1(y) \rangle$



DEADLOCK (t_1, t_2)

t_1, t_2 ATTESA

$\langle r_1(x), r_2(y), W_1(z), r_2(x), r_3(x), W_2(z), W_2(y), r_1(y) \rangle$

CSR

$r_1(x)$

$r_2(y)$

$W_1(z)$

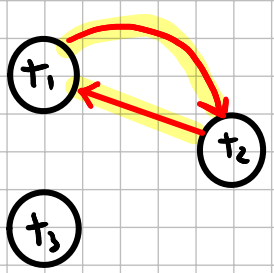
$W_2(z)$

$W_2(y)$

$r_1(y)$

$r_2(x)$

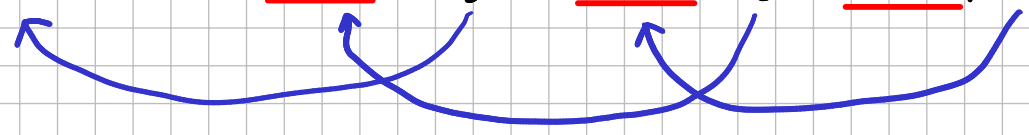
$r_3(x)$



non è in CSR

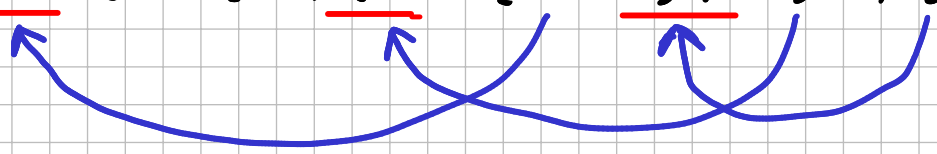
VSR

$\langle r_1(x), r_2(y), w_1(z), r_2(x), w_3(y), r_3(z), w_1(t), r_3(y), w_2(z), r_2(t), r_3(x) \rangle$



t_1 prima di t_3, t_1 prima di t_2

$\langle r_1(x), w_1(z), w_1(t), r_2(y), r_2(x), w_2(z), r_2(t), w_3(y), r_3(z), r_3(y), r_3(x) \rangle$



non è VSR ($r_3(z)$ dovrebbe leggere da $w_1(z)$ ma legge da $w_2(z)$)

3NF

$R = (A, B, C, D, E, F, G, H, I)$

$F = \{ A \to EI,\ BD \to H,\ C \to F \}$

CHIAVI

L	H	R
A		E
B		F
C		I
D		H

ABCDG è la chiave

3NF

$A^+ = \{A, E, I\}$; $BD^+ = \{B, D, H\}$; $C^+ = \{C, F\}$

$[A, B, C, D, G]$ chiave (perchè non compare mai)

- $G' = \{A, E, I\}$ $\quad F' = \{A \to EI\}$ $\quad \boxed{R' = (A, E, I)}$
- $G'' = \{B, D, H\}$ $\quad F'' = \{BD \to H\}$ $\quad \boxed{R'' = (B, D, H)}$
- $G''' = \{C, F\}$ $\quad F''' = \{C \to F\}$ $\quad \boxed{R''' = (C, F)}$

- $G^{IV} = \{A, B, C, D, G\}$; $F^{IV} = \emptyset$; $\boxed{R^{IV} = (A, B, C, D, G)}$

BCNF

$R = (A, B, C, D, E, F, G, H, I)$

$K = ABCDG$

$F = \{ A \to EI,\ BD \to H,\ C \to F \}$

$A \to EI$

$A^+ = \{A, E, I\}$

$R' = (A, E, I)$

BCNF $F' = \{A \to EI\}$

$R'' = R - (R' - A)$

$R'' = R - (EI)$

$R'' = (A, B, C, D, F, G, H)$

$F'' = \{ BD \to H,\ C \to F \}$

$BD \to H$

$BD^+ = \{B, D, H\}$

$R''' = (B, D, H)$

BCNF $F''' = \{BD \to H\}$

$R'^{V} = R'' - (R''' - BD)$

$R'^{V} = R'' - H$

$R'^{V} = (A, B, C, D, F, G)$

$F'^{V} = \{ C \to F \}$

$C \to F$

$C^+ = \{C, F\}$

$R^V = (C, F)$

BCNF $F^V = \{C \to F\}$

$R^{V1} = R'^{V} - (R^V - C)$

$R^{V1} = R'^{V} - F$

$R^{V1} = (A, B, C, D, G)$

BCNF $F^{V1} = \emptyset$