

●—checkpoint
 ●—safe writeback
 ●—discard content
 x bit layout

	pw	rd	d	
...	x	x	x	①
R(a)	x	✓	x	②
R(b)	✓	✓	x	⑥
R(a)	✓	✓	x	

read dominated
w/o WAR

	pw	rd	d	
...	x	x	x	
R(a)	x	✓	x	
W(a)	x	✓	✓	③
R(b)	x	✓	x	

read dominated
w/ WAR

	pw	rd	d	
...	x	x	x	
R(a)	x	✓	x	
R(b)	✓	✓	x	
W(b)	✓	✓	✓	⑦
R(a)	x	✓	x	

pw & read dominated
w/ WAR

	pw	rd	d	
...	x	x	x	
W(a)	x	x	✓	①
R(a)	x	x	✓	
R(b)	x	✓	x	

write dominated
w/o WAR

	pw	rd	d	
...	x	x	x	
W(a)	x	x	✓	
R(a)	x	x	✓	
W(a)	x	x	✓	
R(b)	x	✓	x	

write dominated
w/ WAR

	pw	rd	d	
...	x	x	x	
R(a)	x	✓	x	
W(b)	✓	x	✓	⑤
W(a)	✓	✓	✓	
R(a)	x	✓	x	

pw & write dominated
w/ WAR