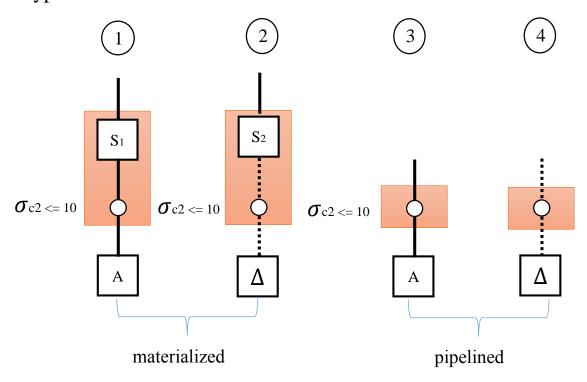
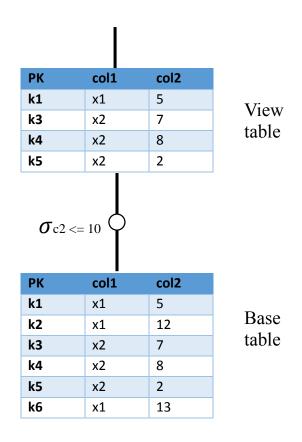
Types



Tables



Type 1(materialized, raw)



Seq	Ор	Tuples	
1	put	(k1, x1, 10)	
2	put	(k2, x2, 8)	
3	put	(k2, x1, 8)	
5	delete	(k2)	



Internal Execution

Seq	Ор	Tuples
1	put	(k1, x1, 10)
2	put	(k2, x2, 8)
3	put	(k2, x1, 8)
4	delete	(k1)
5	delete	(k2)
7	put	(k4, x3, 9)
8	delete	(k3)



 \mathbf{S}_1

 $\sigma_{c2} <= 10$

Input stream

Seq	Ор	Tuples
1	put	(k1, x1, 10)
2	put	(k2, x2, 8)
3	put*	(k2, x1, 8)
4	put*	(k1, x1, 15)
5	delete	(k2)
6	put	(k3, x1, 28)
7	put	(k4, x3, 9)
8	delete	(k3)

Cost diagram

P = (Insert + Update) * ST

D = Delete + Update*(1 - ST)

Cost = P*weight(P) + D*weight(D)

Type 2(materialized, delta)

Output stream

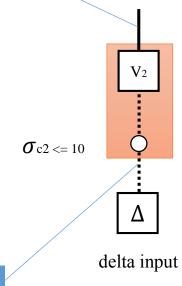
Seq	Ор	Tuples
2	put	(k2, x2, 8)
3	put	(k2, x1, 8)
5	delete	(k2)



Internal Execution

Seq	Ор	Tuples
1	put	(k1,x1,10)
2	put	(k2, x2, 8)
3	put	(k2, x1, 8)
4	delete	(k1)
5	delete	(k2)
7	put	()



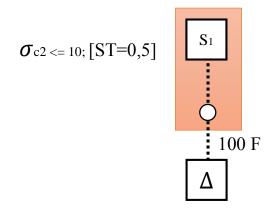


Input

stream

Seq	Ор	Tuples
1	put	(k1,(null , null), (x1,10))
2	put	(k2,(null,null),(x2,8))
3	put	(k2,(x2,8),(x1,8))
4	put	(k1, (x1,10), (x1,15))
5	put	(k2, (x1,8), (null,null))
6	put	(k3,(null , null), (x1,28))
7	put	(k4, (null , null), (x3,9))
8	put	(k3, (x1,28), (null , null))

Cost diagram



Seq	Ор	Tuples	
1	put	(k1, x1, 10)	
2	put	(k2, x2, 8)	
3	put*	(k2, x1, 8)	
4	put*	(k1, x1, 15)	
5	delete	(k2)	
6	put	(k3, x1, 28)	
7	put	(k4, x3, 9)	
8	delete	(k3)	

$$\begin{split} P &= (Insert + Update) * ST \\ D &= Delete * ST + Update(deselbed) * (1 - ST) \end{split}$$

Type 3(pipelined, raw)

Output stream

Seq	Op	Tuples	
1	put	(k1, x1, 10)	
2	put	(k2, x2, 8)	
3	put	(k2, x1, 8)	
4	delete	(k1)	
5	delete	(k2)	
7	put	(k4, x3, 9)	
8	delete	(k3)	

Internal Execution



SELECT * WHERE c2 <= 10

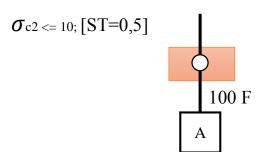
 $\sigma_{c2} <= 10$

raw input



Input
stream

Seq	Ор	Tuples
1	put	(k1, x1, 10)
2	put	(k2, x2, 8)
3	put*	(k2, x1, 8)
4	put*	(k1, x1, 15)
5	delete	(k2)
6	put	(k3, x1, 28)
7	put	(k4, x3, 9)
8	delete	(k3)



$$Puts = 0$$
$$Deletes = 0$$

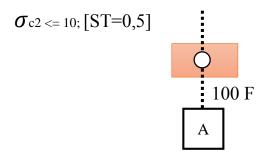
Type 4(pipelined, delta)

	Seq	Ор	Tuples	
	1	put	(k1,(null , null), (x1,10))	
	2	put	(k2,(null,null),(x2,8))	
Output	3	put	(k2,(x2,8),(x1,8))	
Output	4	put	(k1, (x1,10), (null , null))	
stream	5	put	(k2, (x1,8), (null,null))	
	7	put	(k4, (null,null), (x3,9))	
Internal Execution		SELECT	* WHERE c2 <= 10	$\sigma_{c2<5}$ Δ pipelined
	Seq	Ор	Tuples	

Input stream

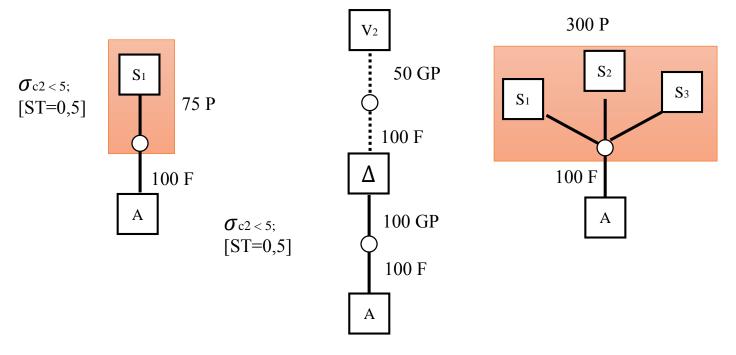
Seq	Ор	Tuples
1	put	(k1,(null , null), (x1,10))
2	put	(k2,(null,null),(x2,8))
3	put	(k2,(x2,8),(x1,8))
4	put	(k1, (x1,10), (x1,15))
5	put	(k2, (x1,8), (null,null))
6	put	(k3,(null , null), (x1,28))
7	put	(k4, (null , null), (x3,9))
8	put	(k3, (x1,28), (null , null))

Cost diagram

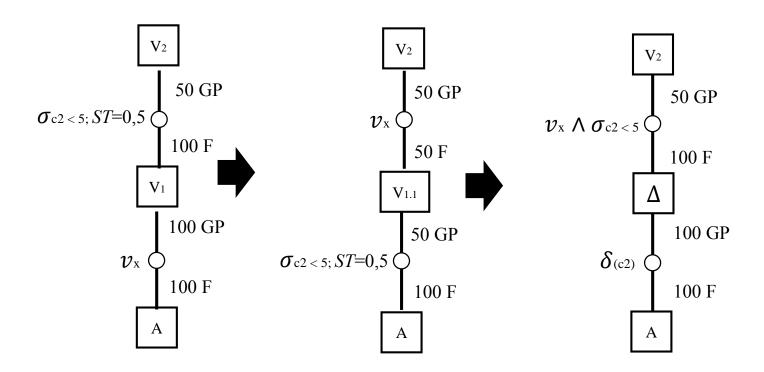


$$Puts = 0$$
$$Deletes = 0$$

Cost diagram



Selection – Reordering/Pipelining



Selection – Reordering/Pipelining

