

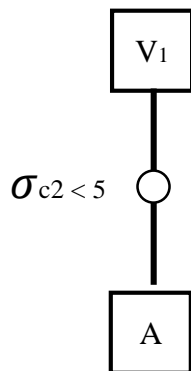
Types of streams

Materialized: Operator \rightarrow Table(GP)

Pipeline: Operator \rightarrow Operator, Operator \rightarrow Table(P)

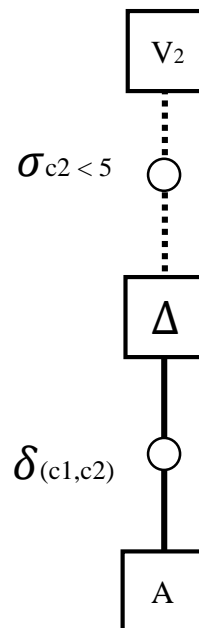
Raw stream (k1,c1,c2)

Seq	Op	Tuples
1	put	(k1, x1, 15)
2	put	(k2, x2, 8)
3	put	(k2, x1, 8)
4	put	(k1, x1, 10)
5	delete	(k2)
6	put	(k3, x1, 28)
7	delete	(k3)
8	put	(k1, x3, 22)



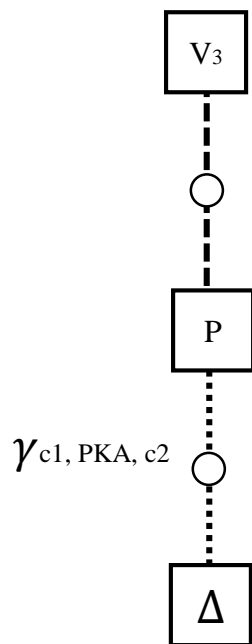
Delta stream (c1, c2)

Seq	Op	Tuples
1	put	(k1, null \rightarrow x1, null \rightarrow 15)
2	put	(k2, null \rightarrow x2, null \rightarrow 8)
3	put	(k2, x2 \rightarrow x1, 8 \rightarrow 8)
4	put	(k1, x1 \rightarrow x1, 15 \rightarrow 10)
5	put	(k2, x1 \rightarrow null , 8 \rightarrow null)
6	put	(k3, null \rightarrow x1, null \rightarrow 28)
7	put	(k3, x1 \rightarrow null , 28 \rightarrow null)
8	put	(k1, x1 \rightarrow x3, 10 \rightarrow 22)



Preaggregated stream (c1, c2)

Seq	Op	Tuples
1	put	(x1,(k1,15))
2	put	(x2,(k2,8))
3	put	(x2, (k2, null))
	put	(x1,(k1,15),(k2,8))
4	put	(x1,(k1,10),(k2,8))
5	put	(x1,(k1,10),(k2, null))
6	put	(x1,(k1,10),(k3,28))
7	put	(x1,(k1,10))
8	put	(k1, (x1,10), (x3,22))



Join stream (c1, c2)

Seq	Op	Tuples
1	put	(x1,(k1,15) (m1,4))
2	put	(x1,(k1,15) (m2,7))
3	put	(x1, (k2,8) (m1,4),(m2,7))
4	put	(x2,(k5,12))
5	put	(x2,(k5,10) (m6,3))
6	put	(x1, (k2, null) (m1,4),(m2,7))
7	put	(x1, (k1,15) (m1,4),(m2, null))
8	put	(x2,(k5,10) (m6,3),(m7,14))

