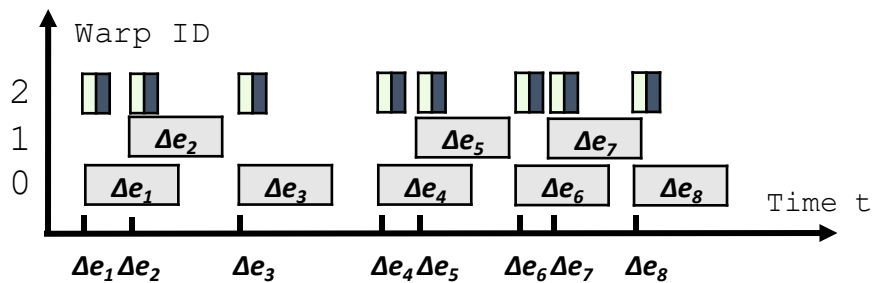
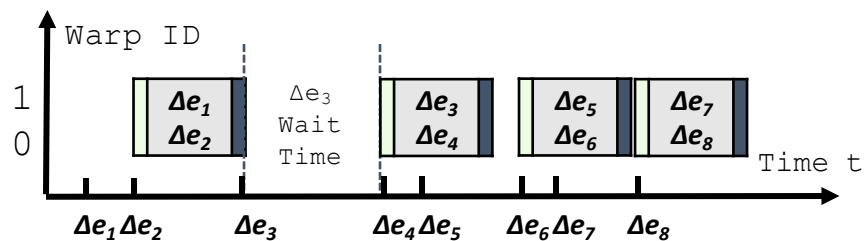
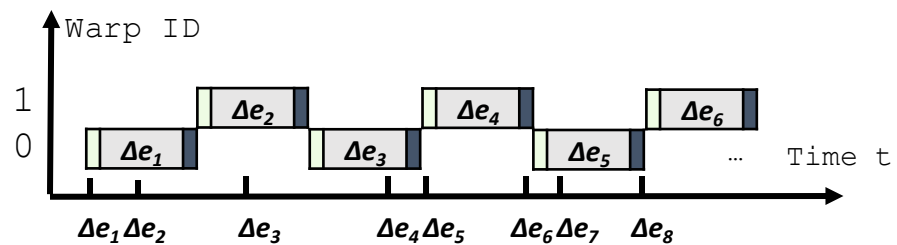
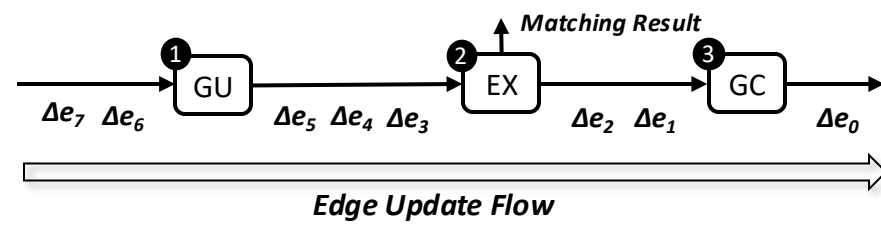
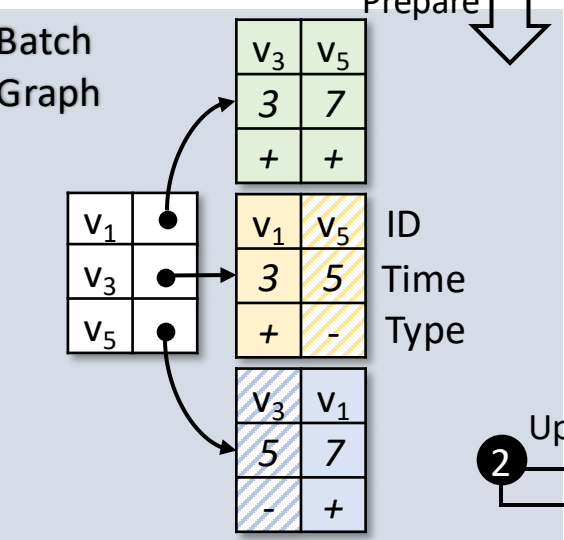
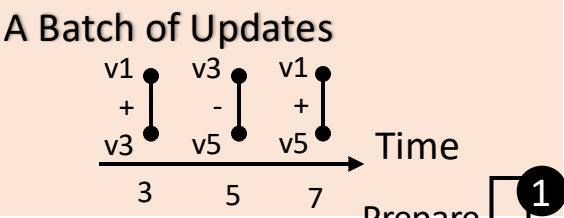


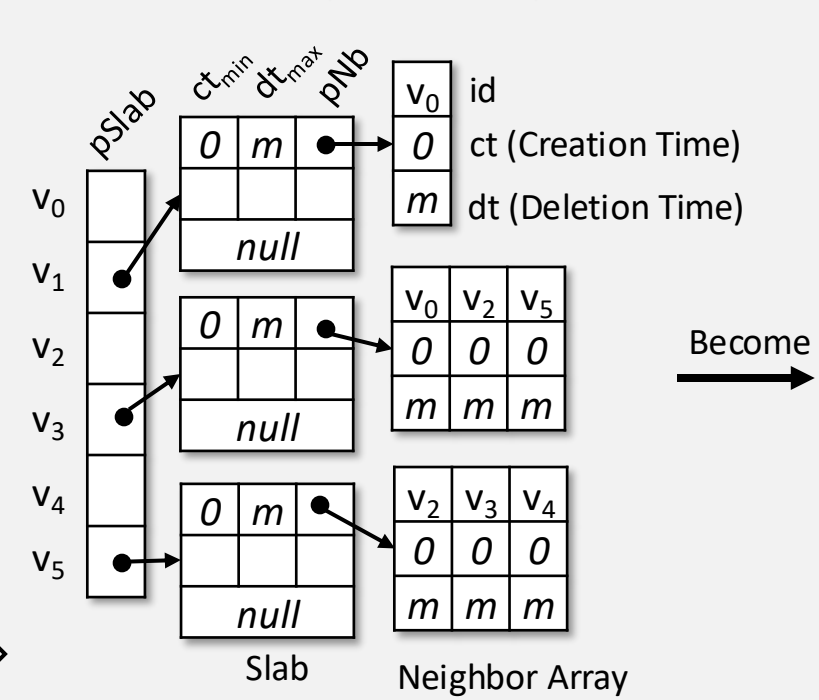
Prepare Batch Graph
 Incremental Matching
 Update Data Graph





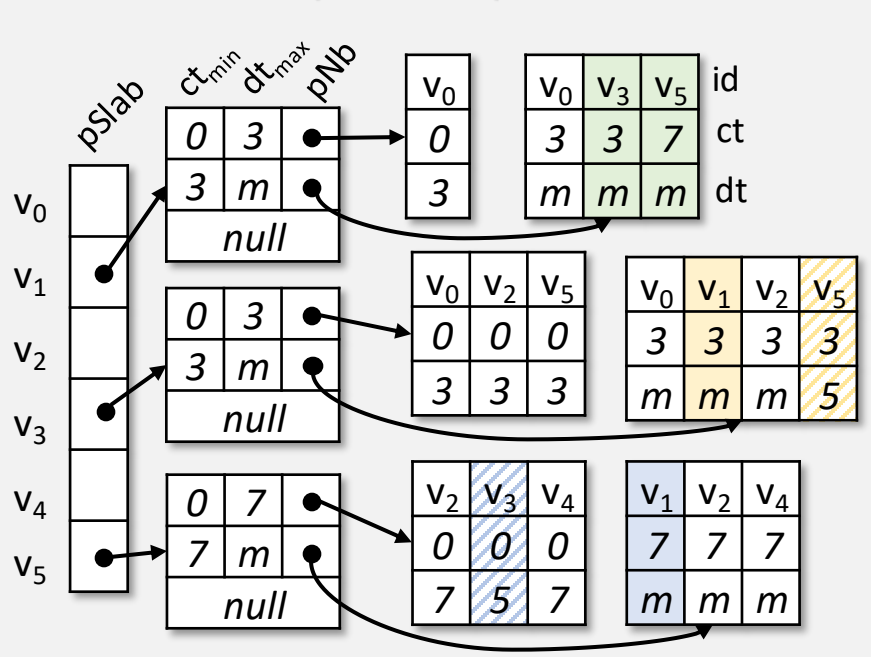


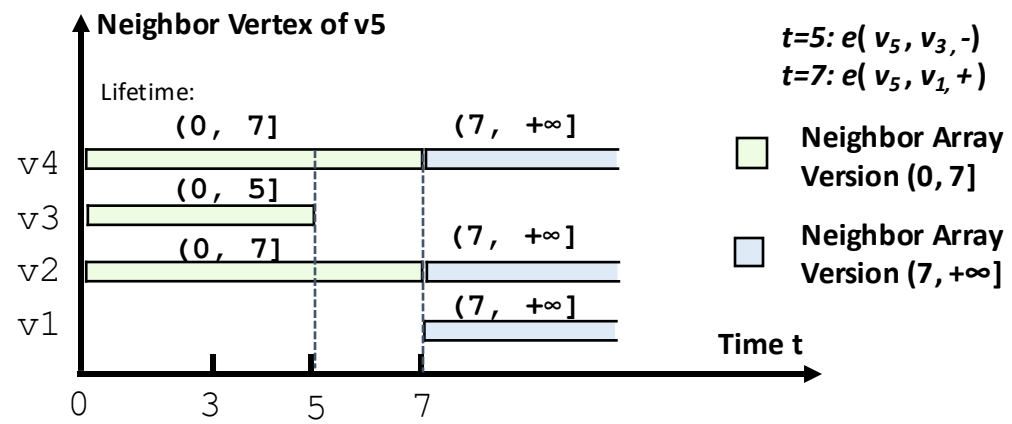
Multi-Version Graph Before Update



Become

Multi-Version Graph After Update





bps

0	1	1	1	4	4	4	
---	---	---	---	---	---	---	--

ps

↑ ② Broadcast

0	1	4	7				
---	---	---	---	--	--	--	--

size

↑ ① Prefix Sum

1	3	3					
---	---	---	--	--	--	--	--

np

*v ₁	*v ₃	*v ₅					
-----------------	-----------------	-----------------	--	--	--	--	--

bnp

↓ ② Broadcast

*v ₁	*v ₃	*v ₃	*v ₃	*v ₅	*v ₅	*v ₅	
-----------------	-----------------	-----------------	-----------------	-----------------	-----------------	-----------------	--

↑ ↑ ↑ ↑ ↑ ↑ ↑ ↑
0 1 2 3 4 5 6 7

thread id

dst

v ₀	v ₀	v ₂	v ₅	v ₂	v ₃	v ₄	
----------------	----------------	----------------	----------------	----------------	----------------	----------------	--

src

↑ ④ Async Copy

v ₀	v ₀	v ₂	v ₅	v ₂	v ₃	v ₄	
----------------	----------------	----------------	----------------	----------------	----------------	----------------	--

bnp

||

*v ₁	*v ₃	*v ₃	*v ₃	*v ₅	*v ₅	*v ₅	
-----------------	-----------------	-----------------	-----------------	-----------------	-----------------	-----------------	--

idx

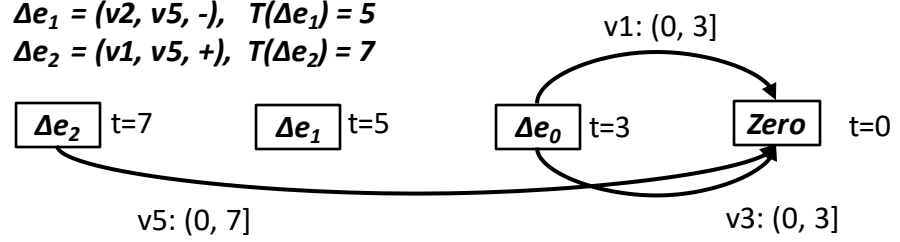
+ ③ Add

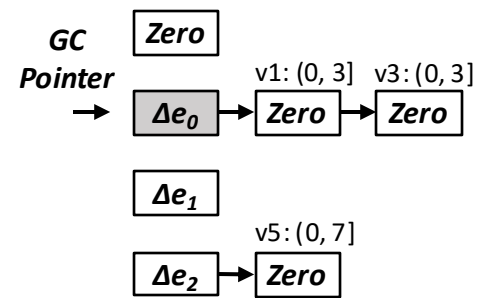
0	0	1	2	0	1	2	
---	---	---	---	---	---	---	--

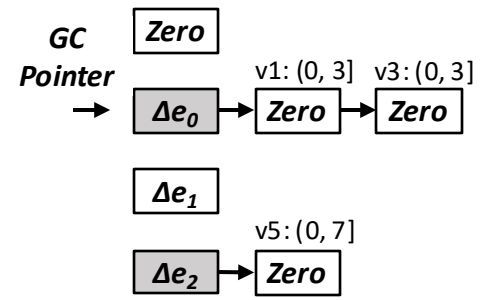
↑ ↑ ↑ ↑ ↑ ↑ ↑ ↑
0 1 2 3 4 5 6 7

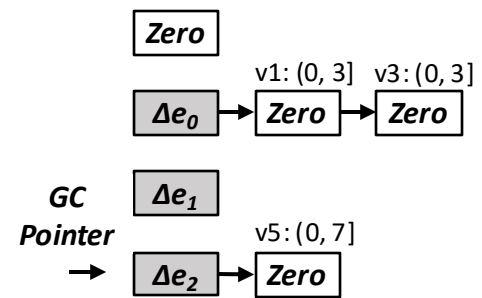
thread id

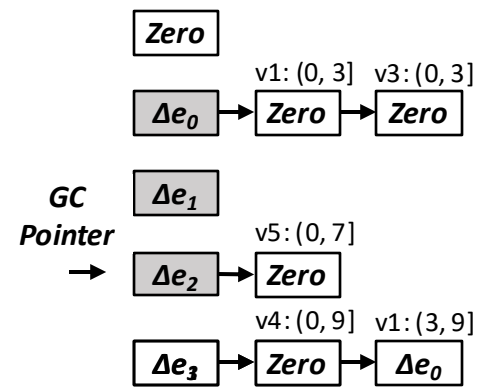
$\Delta e_0 = (v1, v3 +), T(\Delta e_0) = 3$
 $\Delta e_1 = (v2, v5, -), T(\Delta e_1) = 5$
 $\Delta e_2 = (v1, v5, +), T(\Delta e_2) = 7$

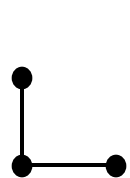






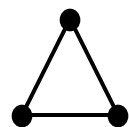






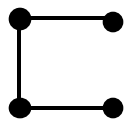
wedge

Q1



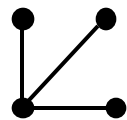
triangle

Q2



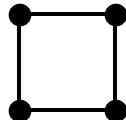
4-path

Q3



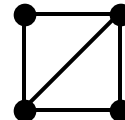
3-star

Q4



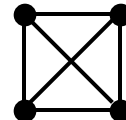
4-cycle

Q5



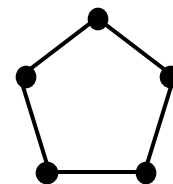
diamond

Q6



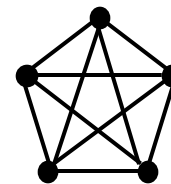
4-clique

Q7



5-cycle

Q8



5-clique

Q9

