

# Recovery of Congestion Isolation

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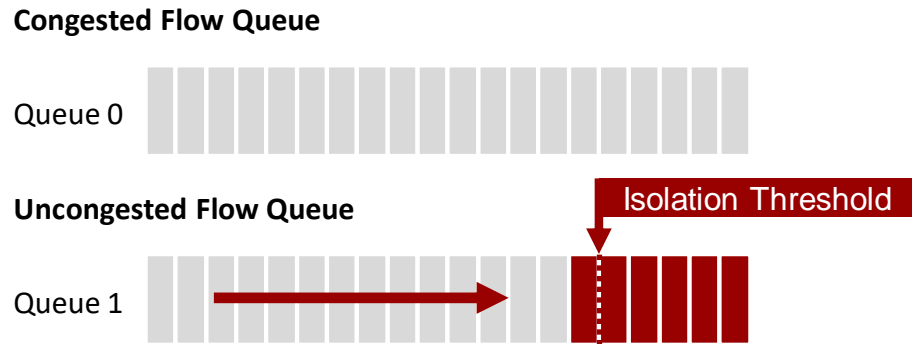
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# The Purpose of Congestion Deallocation

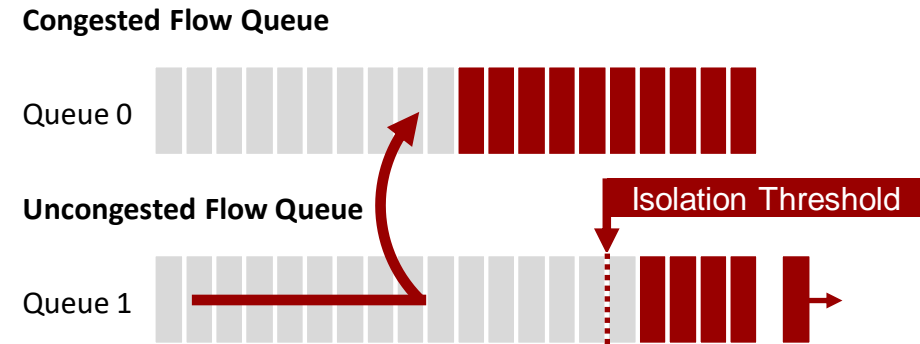
- To release the flow entry resource of the congested flow table and make it available for future congestion scenarios
- To release resources of the congested queue making them available to handle newly appearing congestion trees
- To return a flow to its normal priority and treat it as the uncongested flow

# Congestion Deallocation

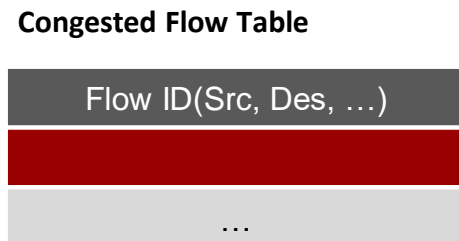
1. Identify the flow causing congestion.



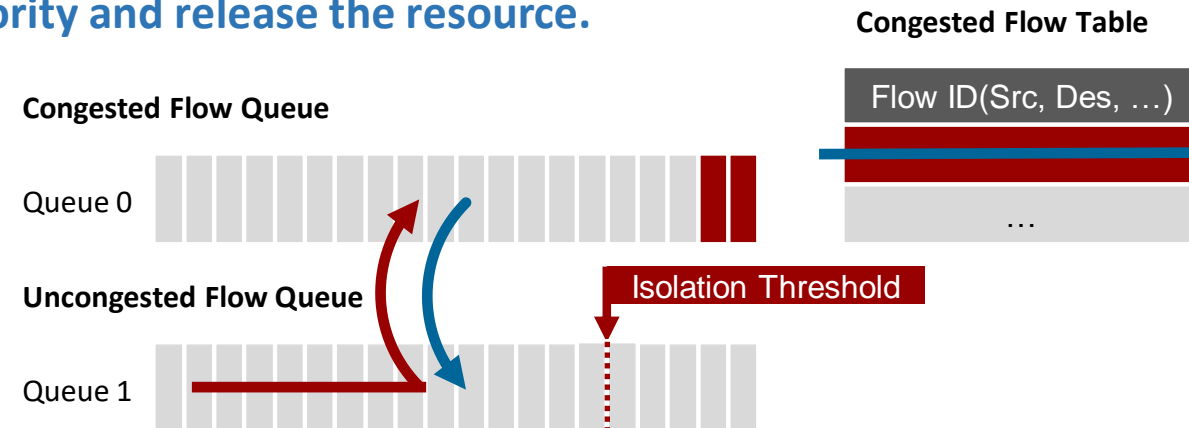
2. Isolate the congested flow to the congested flow queue.



3. Create a new entry in the congested flow table to mark the flow as a congested flow.



4. If the flow IS NOT "congested" any longer, we should change it back to the uncongested flow queue to recover its priority and release the resource.

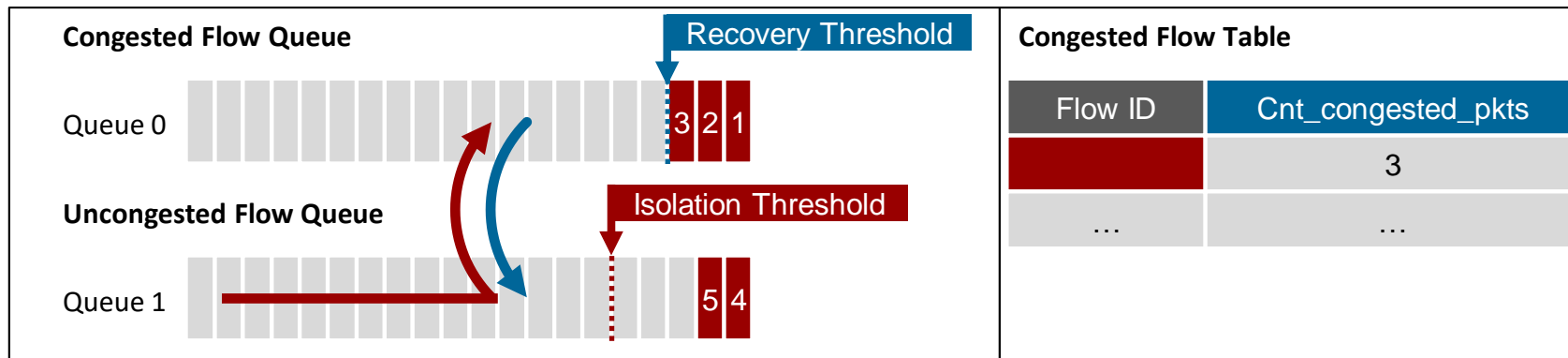


# How to Trigger the Isolation Recovery?

- Introduce 3 options(combinations are possible):
  - Define a **new Threshold** for the recovery of Congestion Isolation
    - Recovery Threshold: a condition to trigger the isolation recovery in case the congested queue is draining sufficiently.
      - Pro: Threshold approach helps deallocate quickly. Benefit to the victim flows
      - Con: There are still some packets in the congested queue, may involve out-of-order problem
  - Define a **new Item** in the Congested Flow Table to count packets
    - Cnt\_congested\_pkts: record the number of packets belonging to a congested flow in the congested flow queue.
      - Pro: Know the concrete packet number in the congested queue
      - Con: May be difficult to implement
  - Define a **new Item** in the Congested Flow Table timestamp activity
    - Last\_active: A timestamp that records the last time a packet was received by the congest flow
      - Pro: Simple to implement
      - Con: May leave the flows in the congested flow table longer than necessary

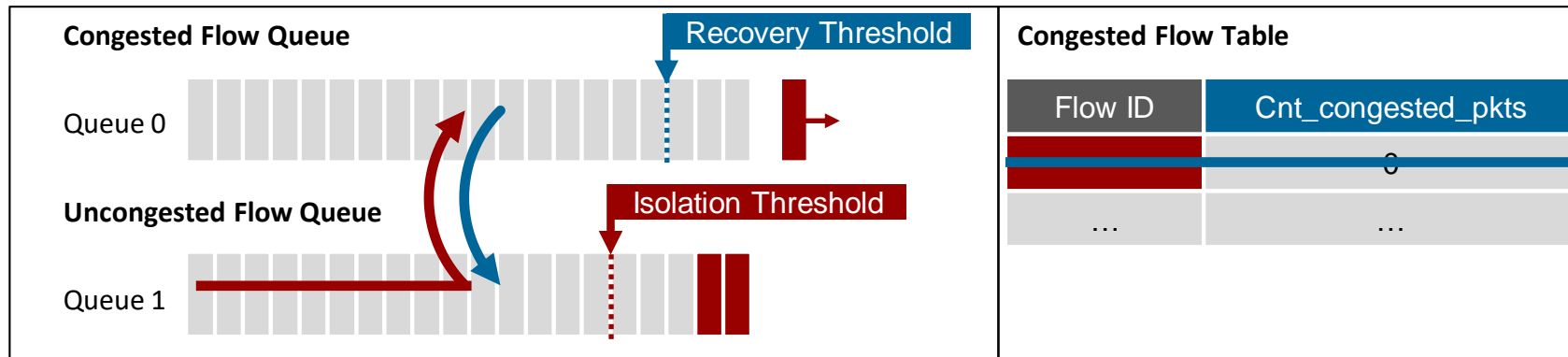
# How to Trigger the Isolation Recovery? 3-1

- **[Enqueue Operations]** Search in the congested flow table, if a flow is marked as congested, do:
  - If the depth of congested flow queue is lower than the recovery threshold, AND the uncongested flow queue meets some certain conditions (such as the uncongested flow queue is empty), trigger the isolation recovery and start to enqueue subsequent packets into the uncongested queue;
  - If the recovery is not triggered, push the packet into the congested flow queue and update `Cnt_congested_pkts`;



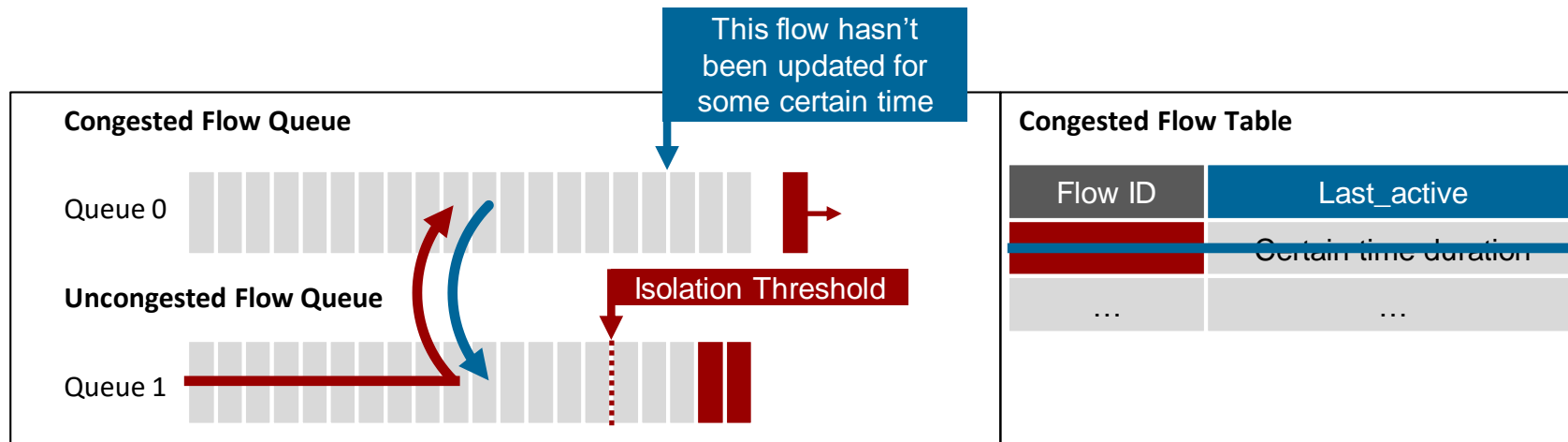
# How to Trigger the Isolation Recovery? 3-2

- **[Dequeue Operations]** When a packet is dequeued from the congested flow queue, do:
  - Update `Cnt_congested_pkts`;
  - If `Cnt_congested_pkts` is decreased to 0, remove the flow from the congested flow table.



# How to Trigger the Isolation Recovery? 3-3

- In the congested flow table, each item has a Last\_active timer. If a flow is marked as congested, do:
  - If Last\_active exceed a certain timer which means the congested flow has not been updated for some certain time ( $>$  the queue accumulation time), remove the flow from the congested flow table.



# Benefits

- Provide proper triggering conditions for isolation recovery, avoiding performance degradation of no-longer-congested flows;
- Quickly remove no-longer-congested flows from the congested flow table to save hardware resources.



**Thank you!**