

Packet Classification

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What is Packet Classification?

Definition:

The function of identifying and categorizing packets of data moving across the network

Rule	Source IP	Dest IP	Action
R1	152.163.190.69/ 255.255.255.255	152.163.80.11/ 255.255.255.255	Deny
R2	152.168.3.0/ 255.255.255.0	152.163.200.157/ 255.255.255.255	Permit

Applications of Packet Classification

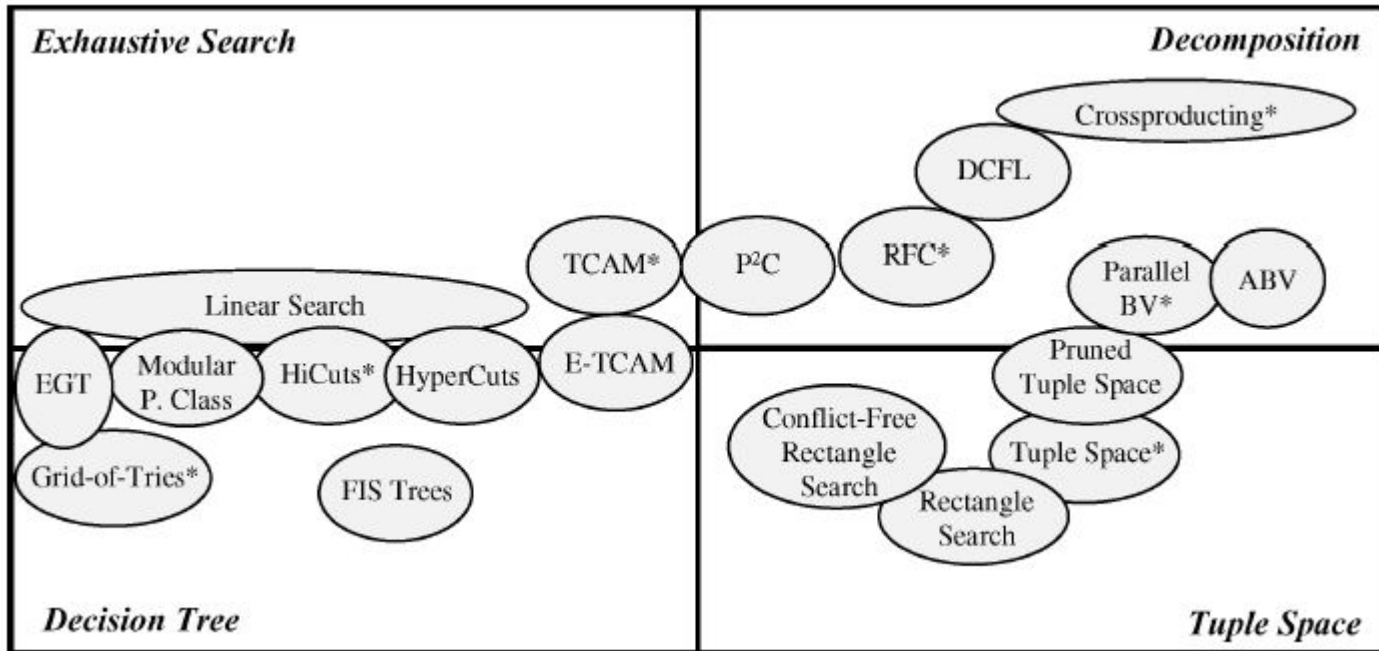
Switches , Routers, Firewalls, Intrusion Detection Systems (IDS)

- Packet Filtering
- Policy Routing
- Accounting and Billing
- Traffic Rate Limiting

Requirements

- Fast Search Speed
- Low Storage
- Scalability
- Faster updates
- Support any number of fields (?????)

Crowded Space



Linear Search

Link list of rules stored in decreasing order of priority

- Pros

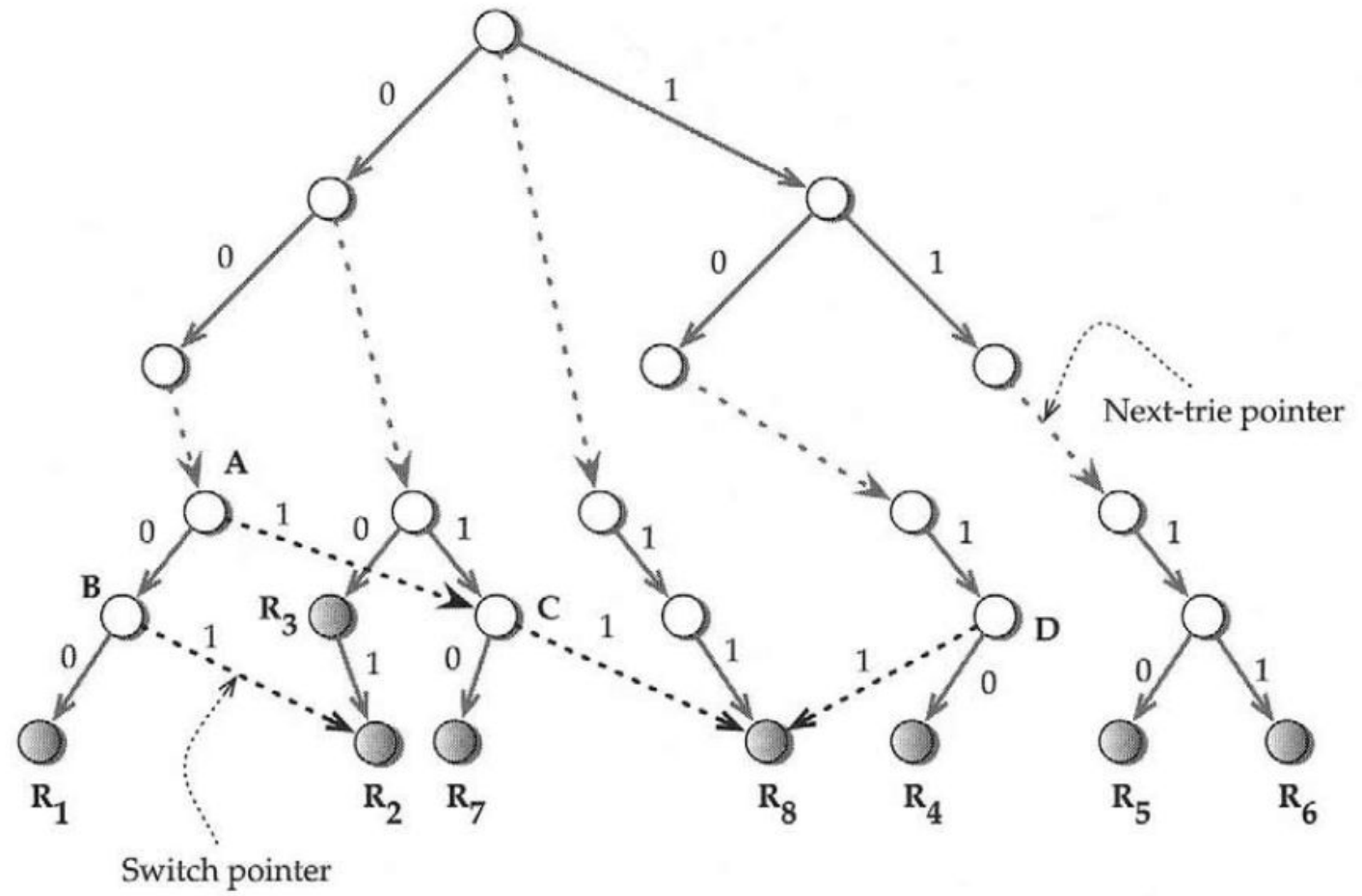
- Simple
- Memory efficient $O(N)$
- Fast Update

- Cons

- Prohibitively slow speed for large N - $O(N)$
 - Can use caching , parallel search with sublists

Grid of Tries

	F_1	F_2
R_1	00*	00*
R_2	0*	01*
R_3	0*	0*
R_4	10*	10*
R_5	11*	10*
R_6	11*	11*
R_7	0*	10*
R_8	*	11*

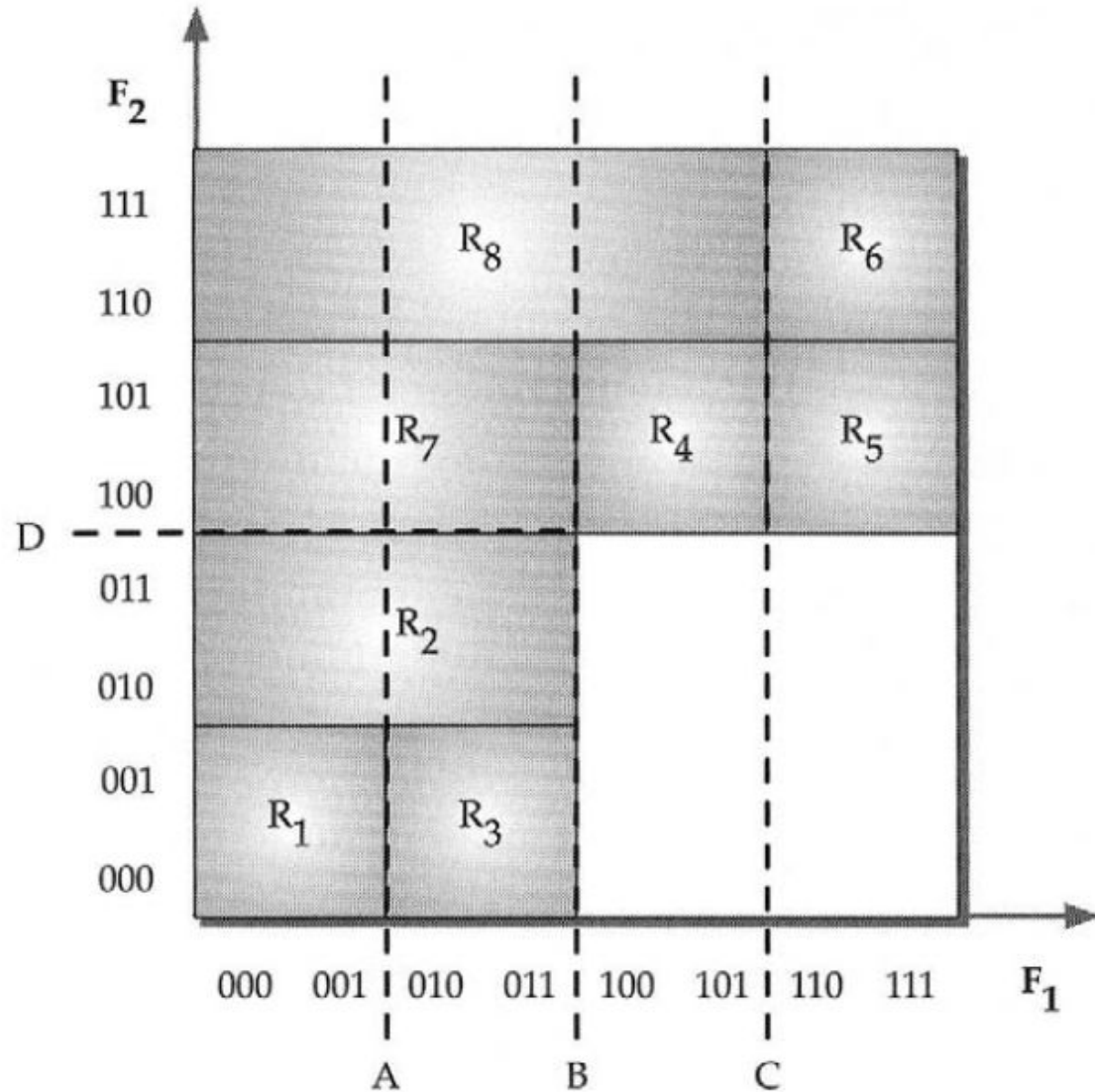


Grid of Tries

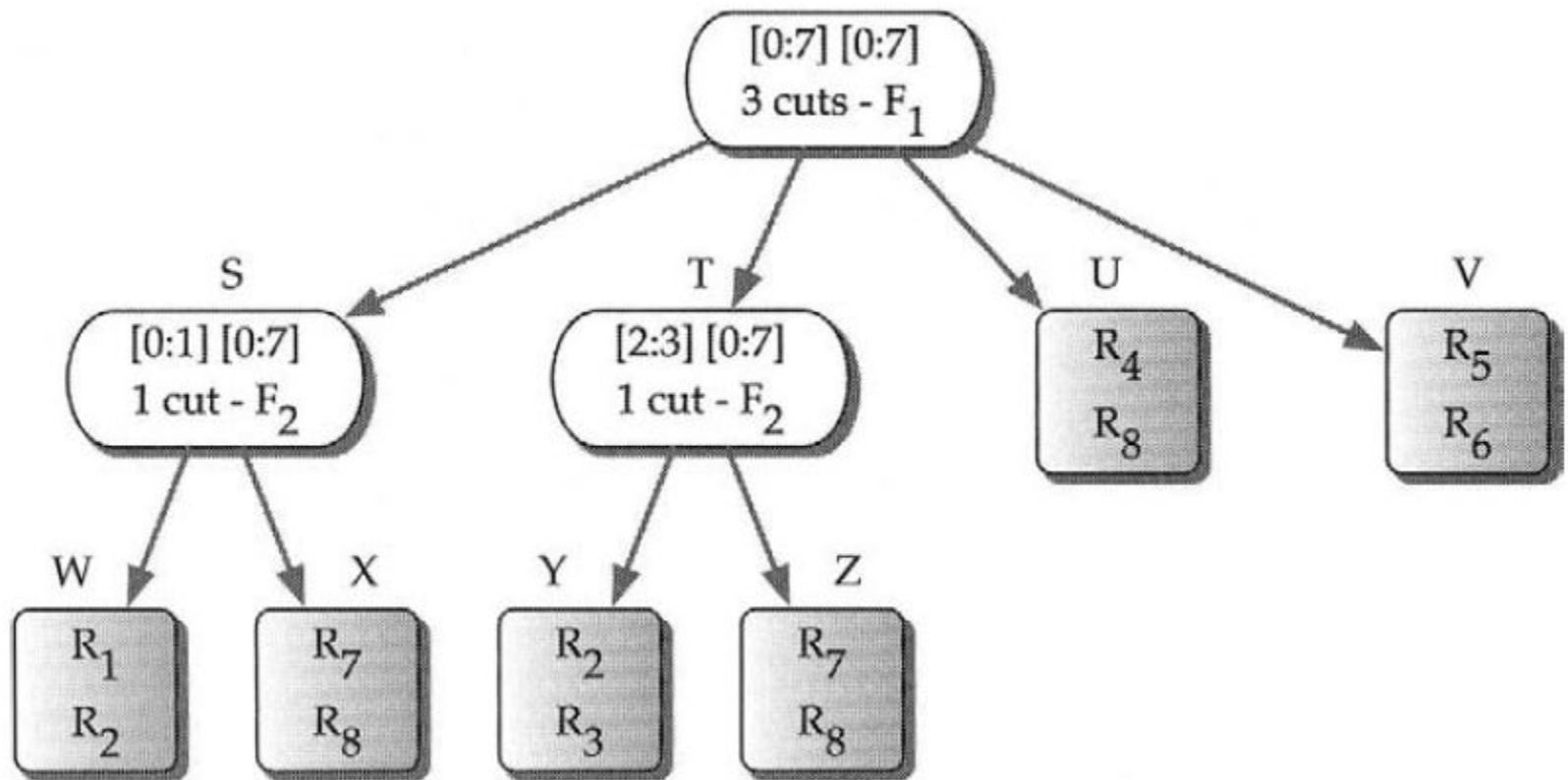
- Pros:
 - Fast Search $O(W)$
- Cons:
 - Does not scale with > 2 fields
 - Incremental updates are difficult
 - rebuilding in $O(NW)$ is suggested
 - Storage Complexity - $O(NW)$

HiCuts

	F_1	F_2
R_1	00*	00*
R_2	0*	01*
R_3	0*	0*
R_4	10*	10*
R_5	11*	10*
R_6	11*	11*
R_7	0*	10*
R_8	*	11*



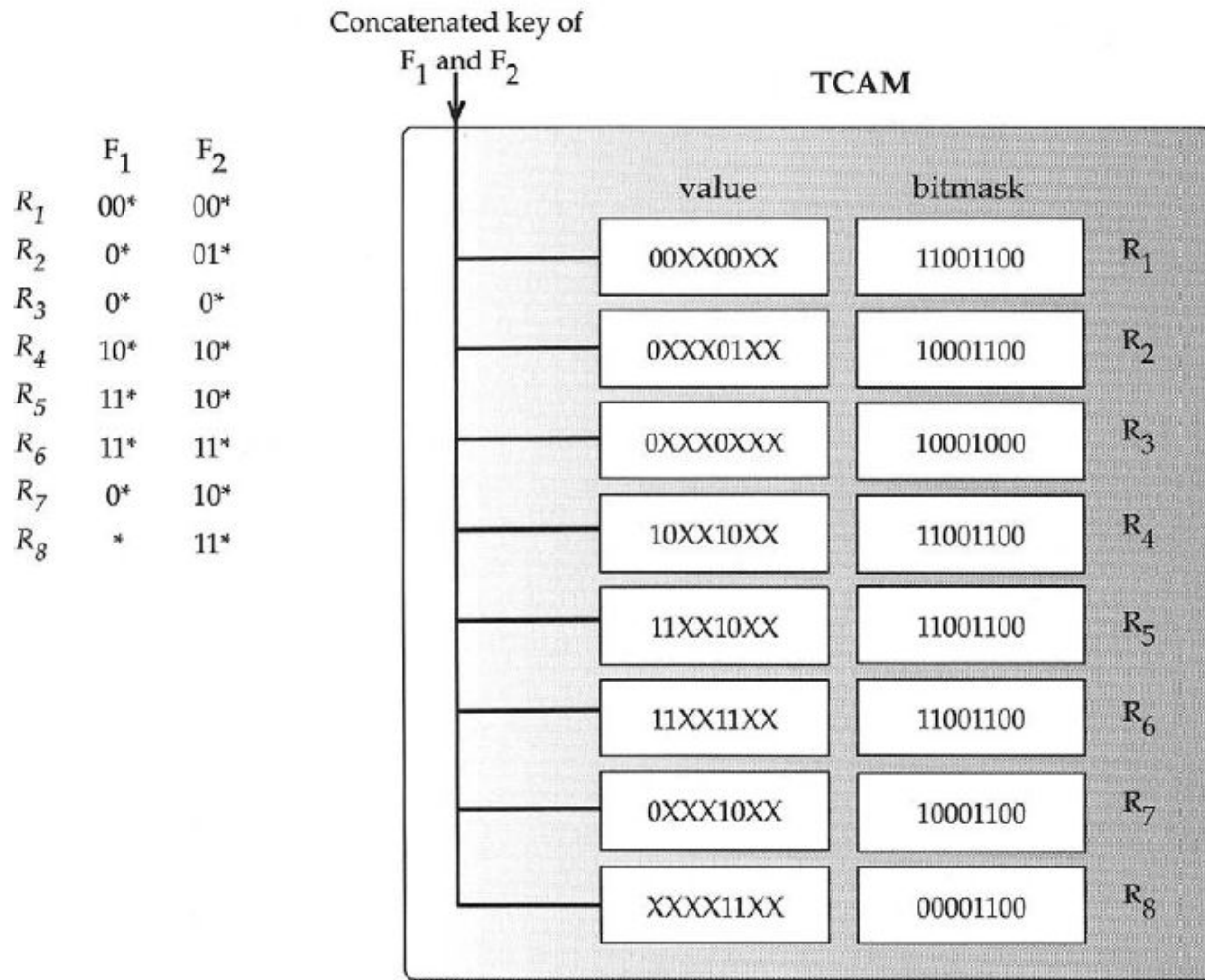
HiCuts



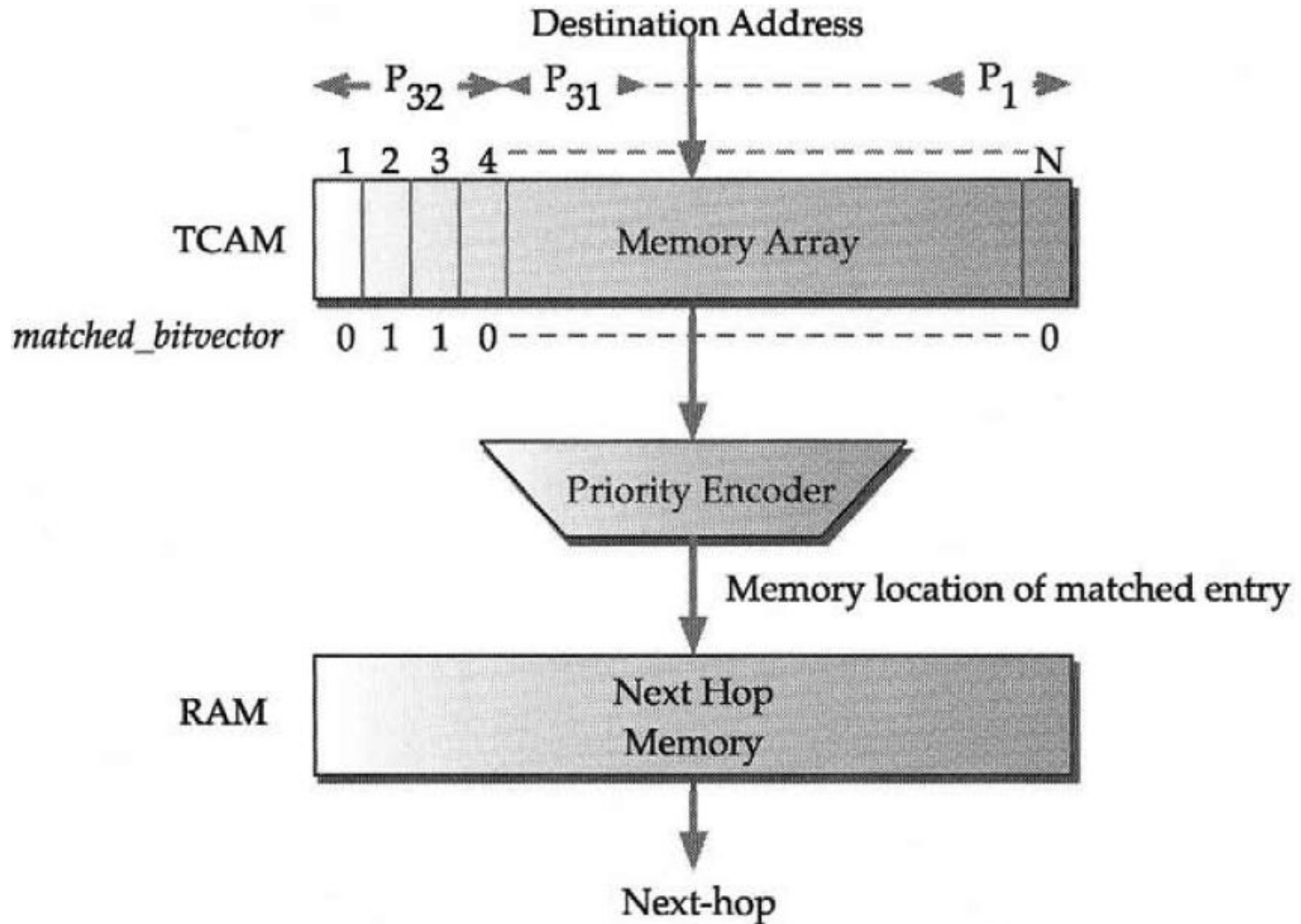
HiCuts

- Pros
 - fast
 - uses characteristics of real world classifiers
- Cons
 - precomputation required for building classifier
 - increment update can take time
 - Heuristics based

TCAM



TCAM



TCAM

- Pros
 - Very Fast
 - Supports wildcards
- Cons
 - High Cost
 - Extra circuitry required for handling wildcards
 - High power requirement

Why yet another packet classification method?

- Rules with wildcard need expansion
- Scalability with number of fields
- Incremental updates are complex
 - Precomputation required
 - Build the classifier from scratch