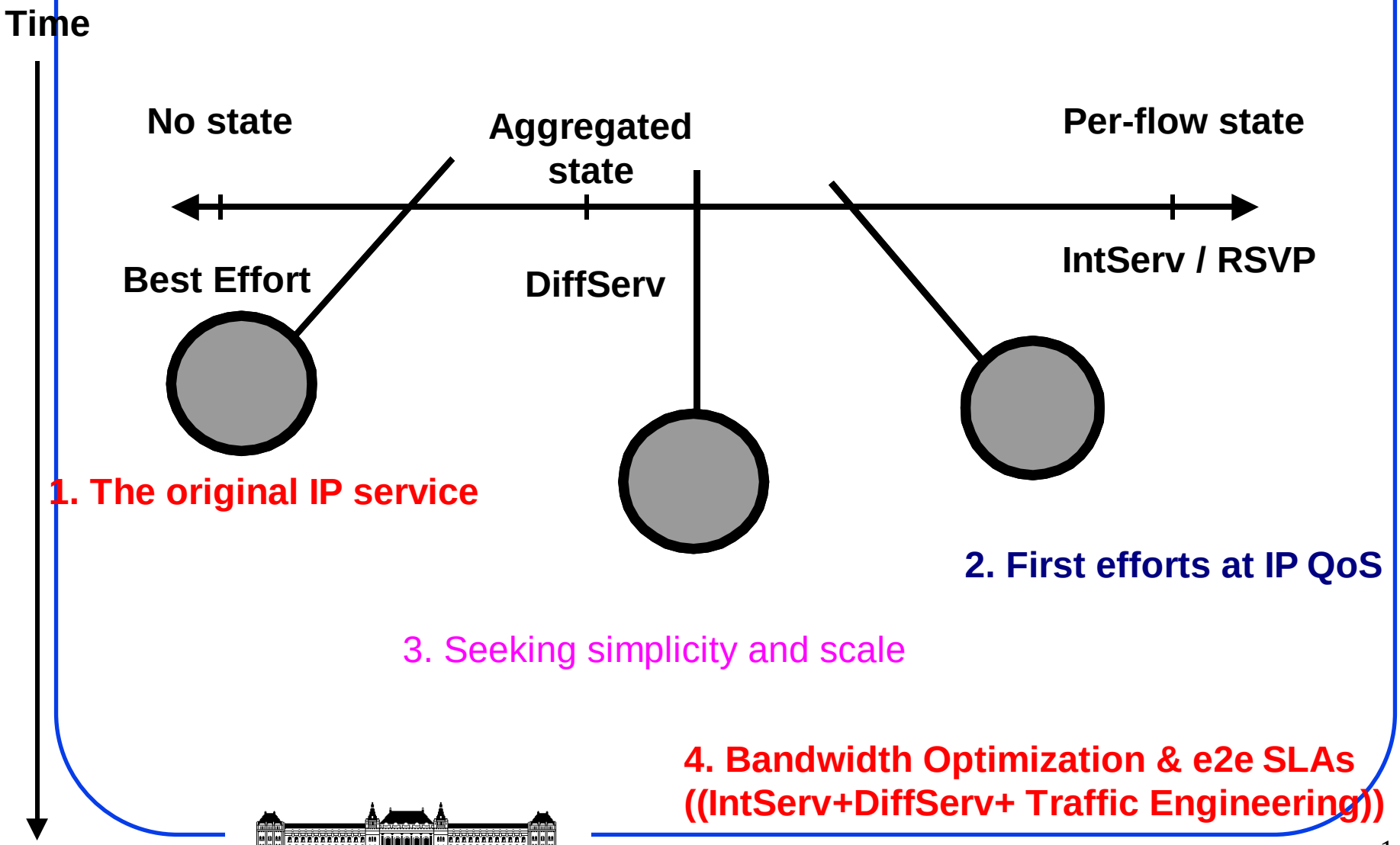

Time
No state
Aggregated state
Per-flow state
Best Effort
DiffServ
IntServ / RSVP
1. The original IP service
2. First efforts at IP QoS
3. Seeking simplicity and scale
4. Bandwidth Optimization & e2e SLAs
((IntServ+DiffServ+ Traffic Engineering))

IP hálózatok

- IntServ (Integrated Service Architecture)
- **DiffServ (Differentiated Service Architecture)**

Differentiated Services

- Intended to address the following difficulties with Intserv and RSVP;
- **Scalability**: maintaining states by routers in high speed networks is difficult sue to the very large number of flows
- **Flexible Service Models**: Intserv has only two classes, want to provide more qualitative service classes; want to provide ‘relative’ service distinction (Platinum, Gold, Silver, …)
- **Simpler signaling**: (than RSVP) many applications and users may only w ant to specify a more qualitative notion of service
- Approach:
  - Only simple functions in the core, and relatively complex functions at edge routers (or hosts)
  - Do not define service classes, instead provides functional components with which service classes can be built

DiffServ

- DS (Differentiated Service) domain
  - QoS szolgáltatás a jelzés és folyamonkénti állapot nyilvántartása nélkül
  - szolgáltatási osztályok definiálása a hálózatban
- SLA (Service Level Aggreement)
  - szerződés a szolgáltató és az előfizető (szervezetek, DS domain) között
  - szolgáltató a menedzsement eszközök segítségével beállítja a megfelelő paramétereket a routerekben, folyamatosan figyeli a QoS kialakulását

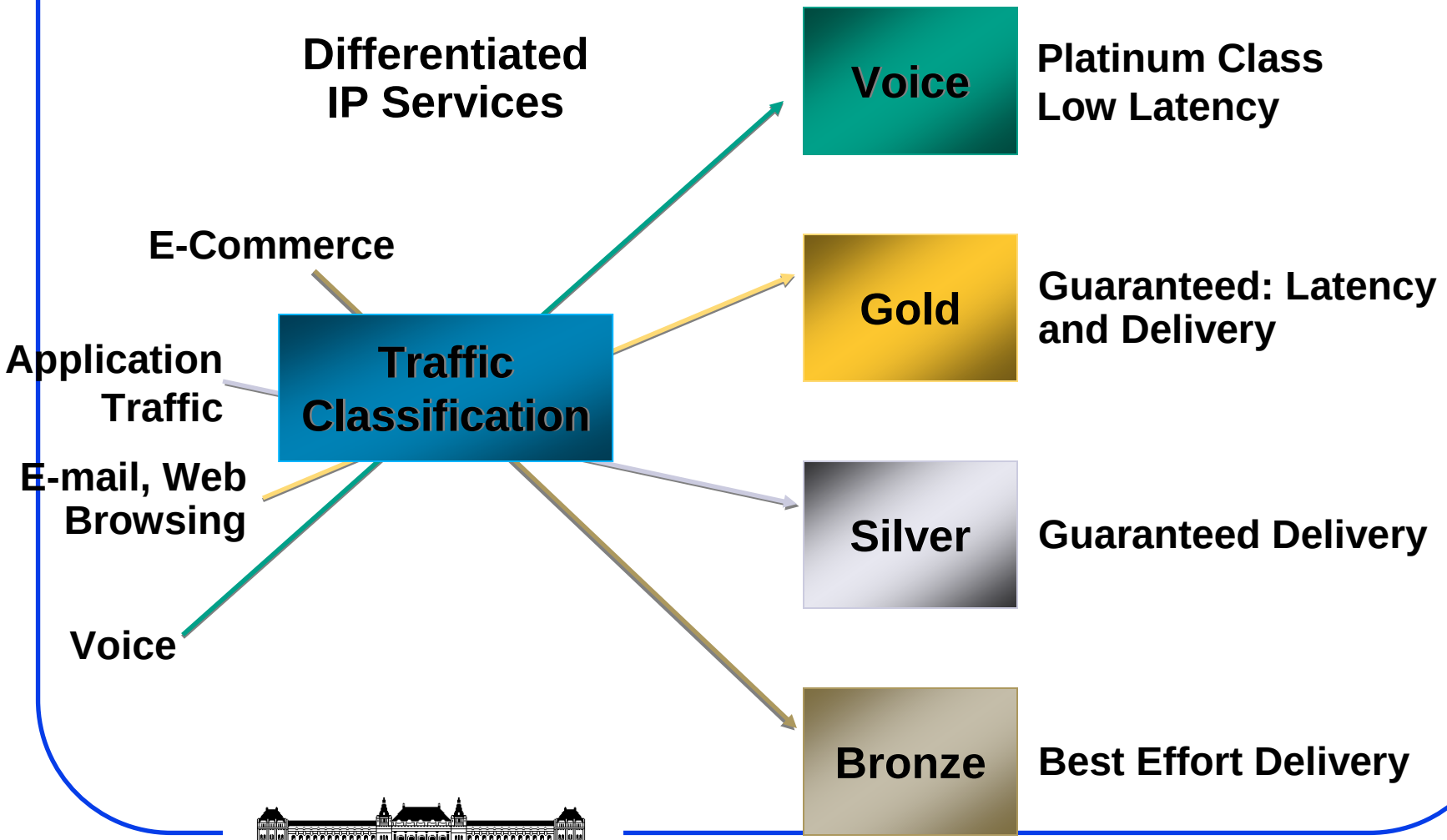
DiffServ

- SLA (Service Level Aggreement)
  - IP csomagok megkülönböztetése a DS byte segítségével
    - IPv4: TOS (Type of Service) byte
    - IPv6 traffic class octet
  - Forgalom paraméterek a lyukas vödör algoritmus alapján

DS domain

- Közös kiszolgálási politika kialakítása
- azonos PHB: PHB (Per Hop Behaviour) viselkedés egyeztetése
- azonos forgalmi monitorozási szabály
- azonos forgalmi felügyeleti szabály

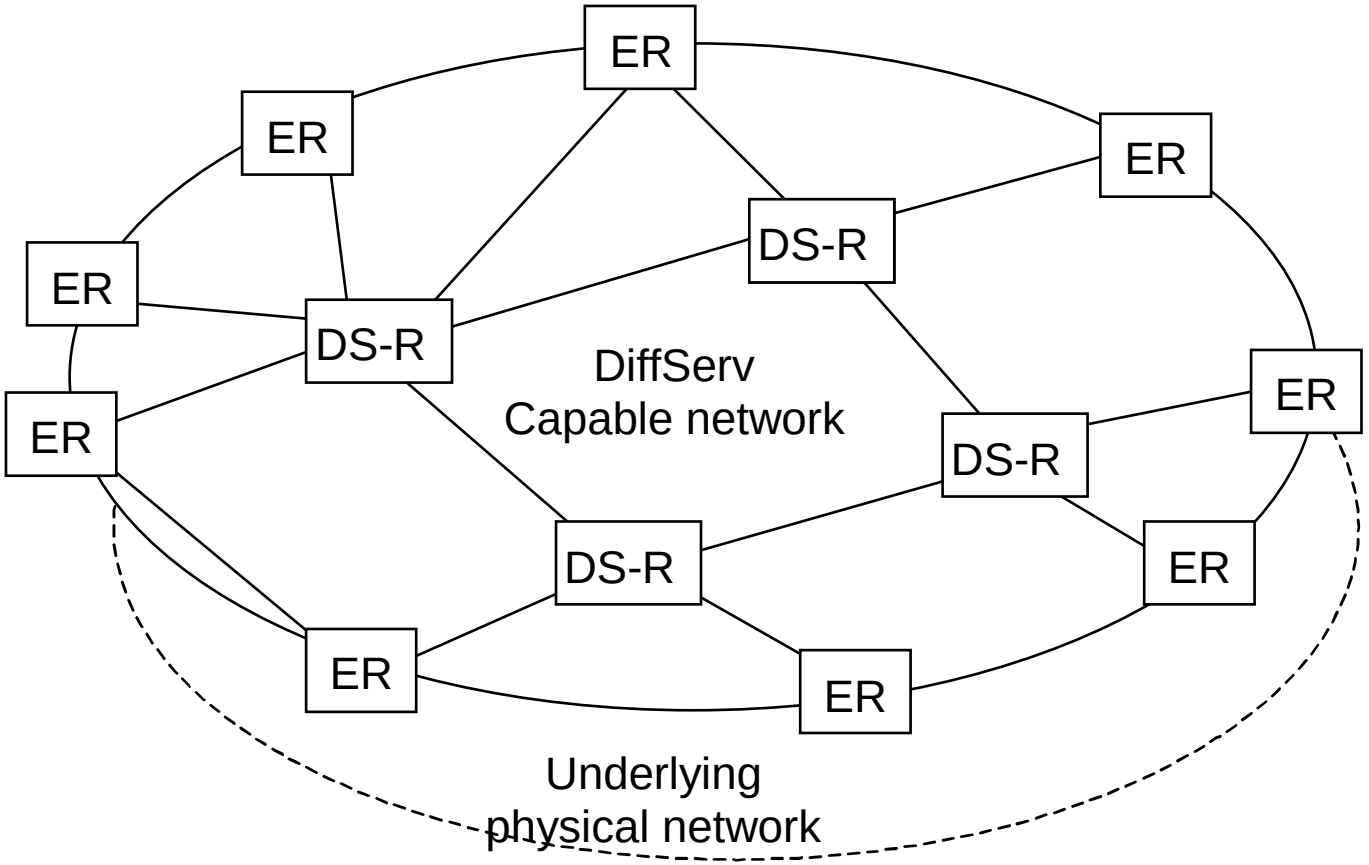
Differentiated Model Divide Traffic into Classes



Defined PHBs

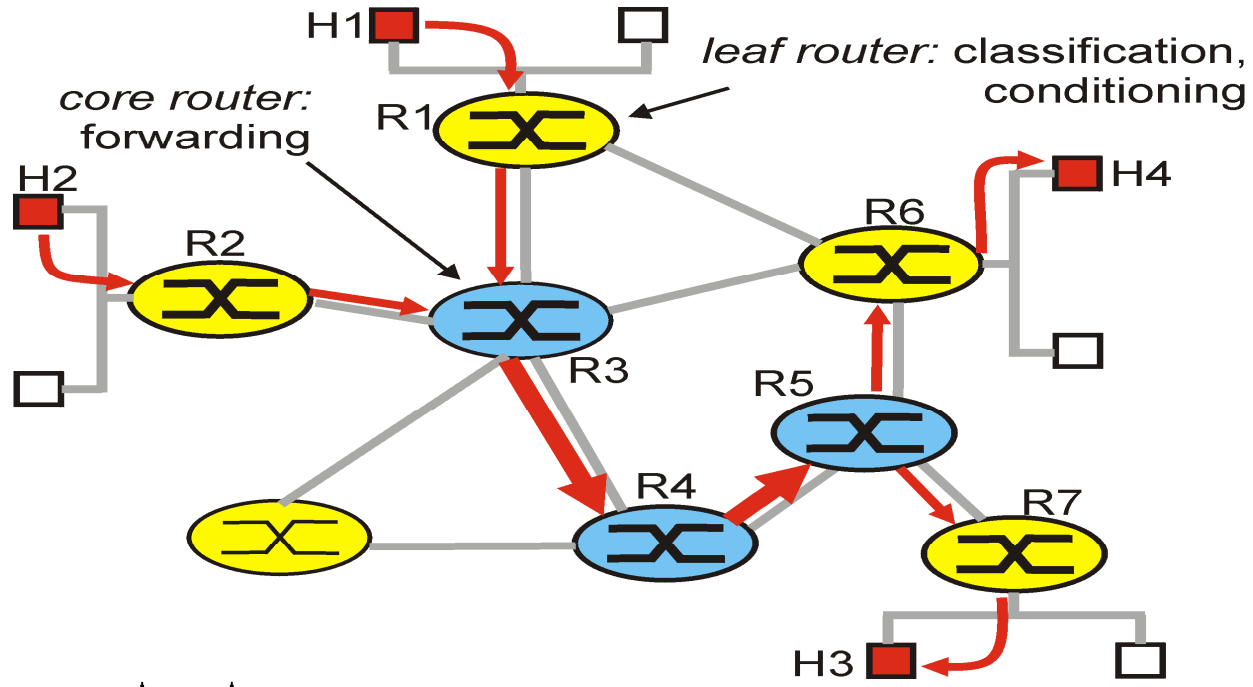
- Expedited Forwarding (EF): RFC2598
  - dedicated low delay queue
  - Comparable to Guaranteed B/W in IntServ
- Assured Forwarding (AF): RFC2597
  - 4 queues × 3 drop preferences
  - Comparable to Controlled Load in IntServ
- Class Selector: Compat. with IP Prec
- Default (best effort)

DiffServ domain



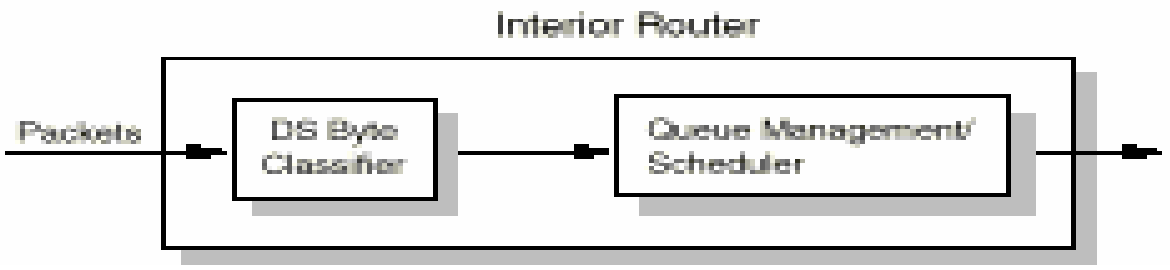
Edge Functions

- At DS-capable host or first DS-capable router
- **Classification**: edge node marks packets according to classification rules to be specified (manually by admin, or by some TBD protocol)
- **Traffic Conditioning**: edge node may delay and then forward or may discard



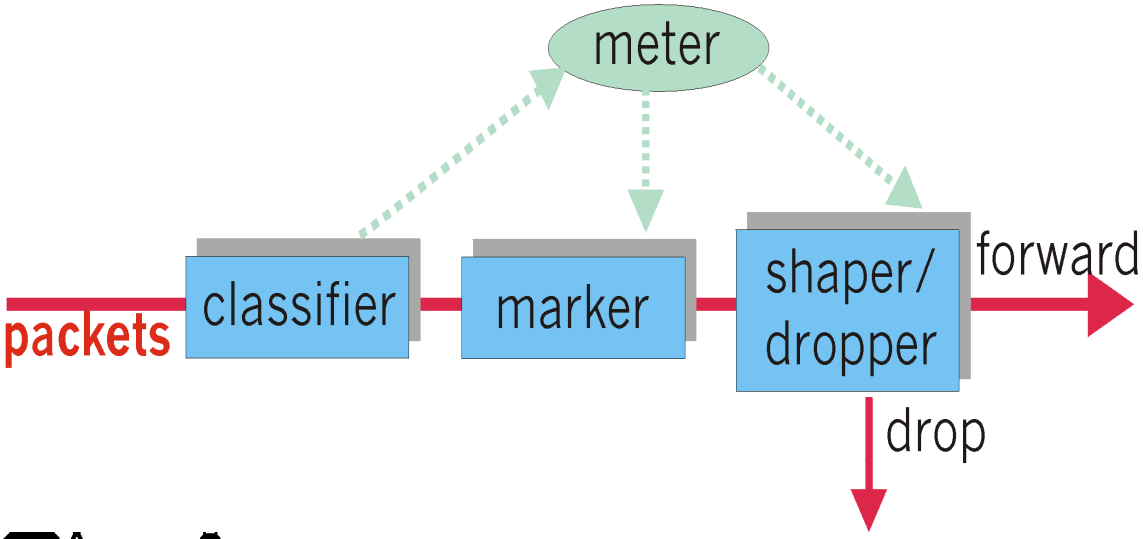
Core Functions

- **Forwarding**: according to “Per-Hop-Behavior” or PHB specified for the particular packet class; such PHB is strictly based on class marking (no other header fields can be used to influence PHB)
- No state info to be maintained by routers!



Classification and Conditioning

- Packet is marked in the Type of Service (TOS) in IPv4, and Traffic Class in IPv6
- 6 bits used for Differentiated Service Code Point (DSCP) and determine PHB that the packet will receive
- 2 bits are currently unused
- It may be desirable to limit traffic injection rate of some class; user declares traffic profile (eg, rate and burst size); traffic is metered and shaped if non-conforming



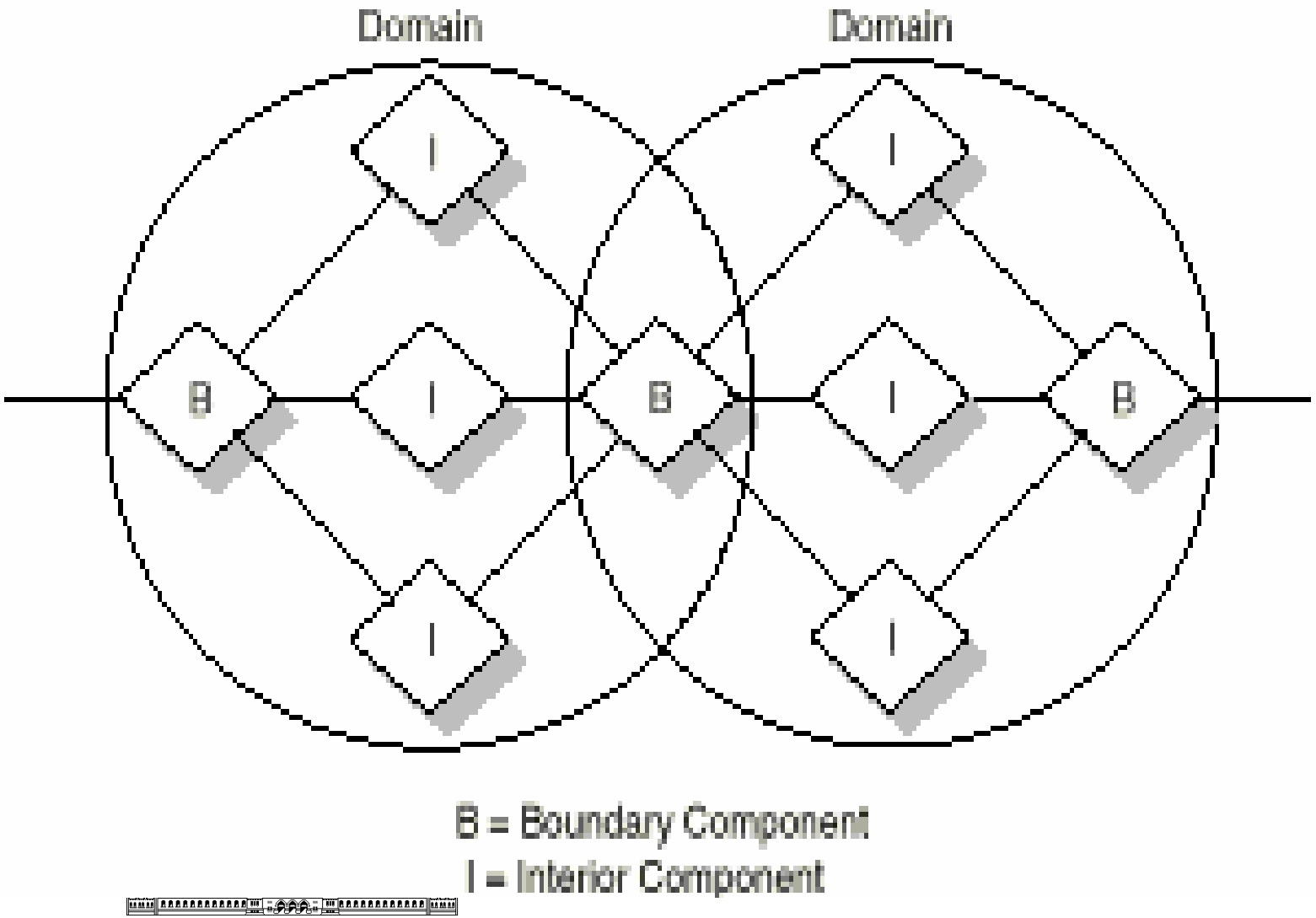
Osztályozó

- Osztályozó (Classifier)
  - MF (Multi-field): DS-en belül
    - DS
    - IP cím, portszám
  - BA (Behavior Aggregate): csak DS byte alapján, DS határán
- Meter: forgalomfelügyelet (SLA monitorozása)
- Marker a DS byte beállítása

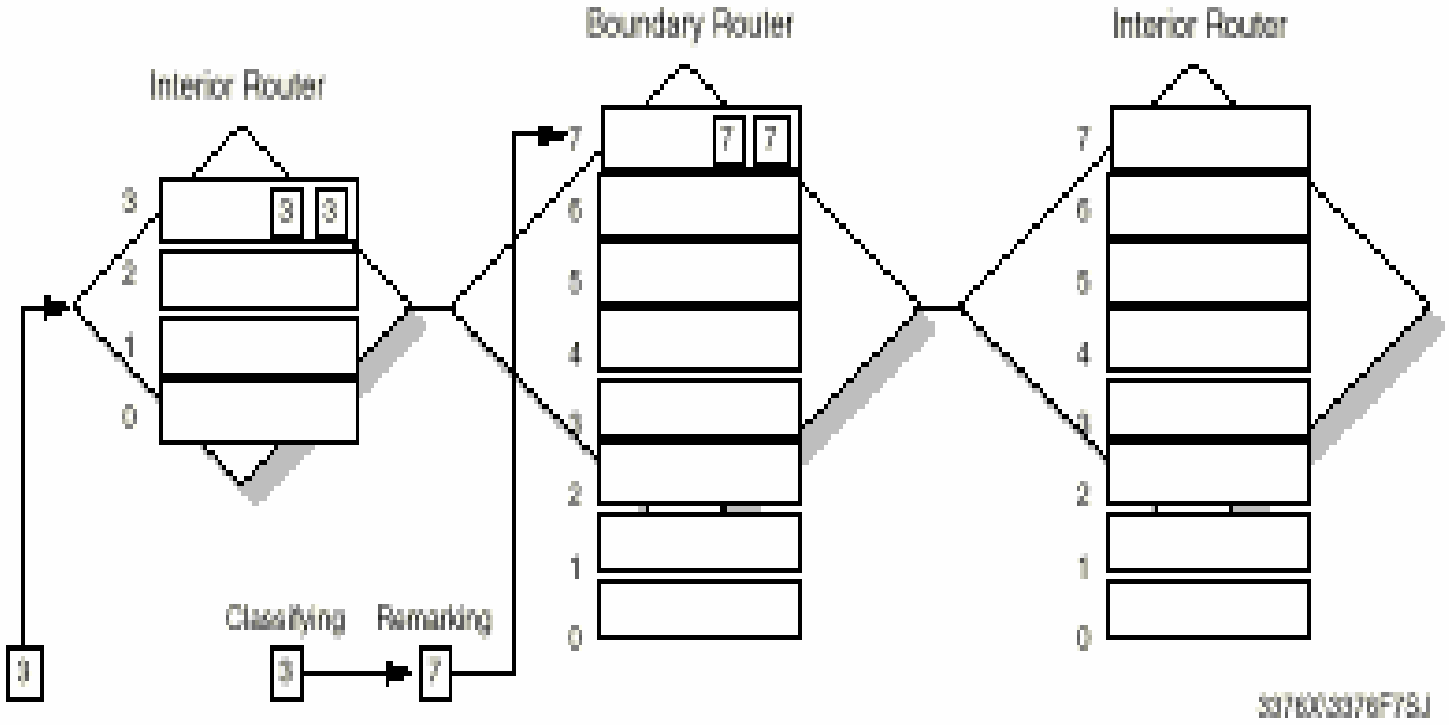
Forwarding (PHB)

- PHB result in a different observable (measurable) forwarding performance behavior
- PHB does not specify what mechanisms to use to ensure required PHB performance behavior
- Examples:
  - Class A gets x% of outgoing link bandwidth over time intervals of a specified length
  - Class A packets leave first before packets from class B
- PHBs under consideration:
  - **Expedited Forwarding**: departure rate of packets from a class equals or exceeds a specified rate (logical link with a minimum guaranteed rate)
  - **Assured Forwarding**: 4 classes, each guaranteed a minimum amount of bandwidth and buffering; each with three drop preference partitions

DS-ek együttműködése



Remarking


Interior Router
Boundary Router
Interior Router
3
2
1
0
7
6
5
4
3
2
1
0
Classifying
Remarking

DiffServ és IntServ együttműködése