The PHB information treatment in the Differentiated Service network

Seiichiro Toda
Graduate School of Media and Governance
Keio University
kiri@ht.sfc.keio.ac.jp

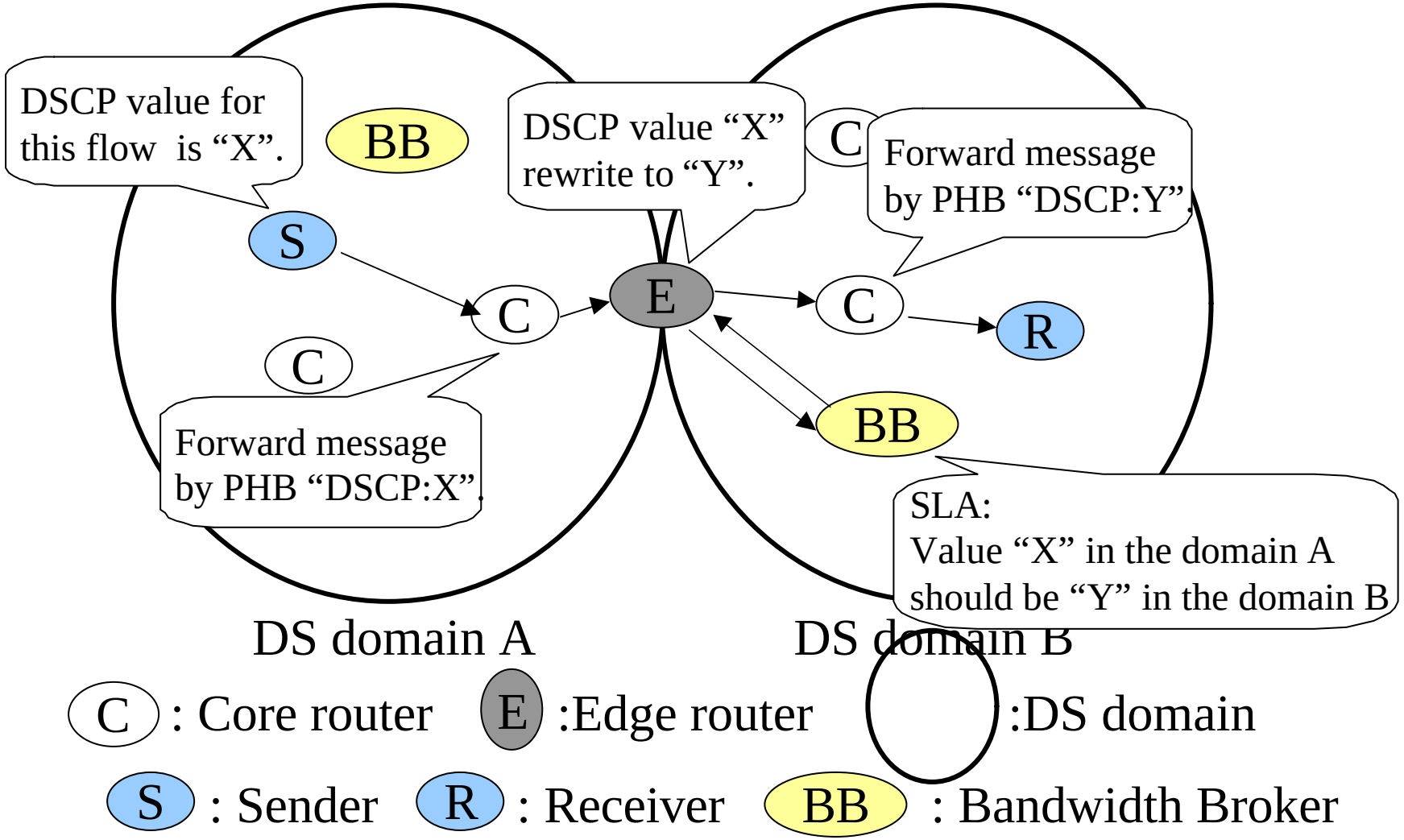
Summary

- Inter-domain usage of DiffServ architecture
- SLA (Service Level Agreement) is transmitted between BB(Bandwidth Broker)s
- Local allocation of DSCP(DiffServ Code Point) value is done by Local BB

Keywords of DiffServ architecture

- DS Domain
- DS boundary node (Edge router)
- DS interior node (Core router)
- BB(Bandwidth Broker)
- DSCP(DS CodePoint)
- PHB(Per Hop Behavior)
- SLA(Service Level Agreement)

DiffServ architecture



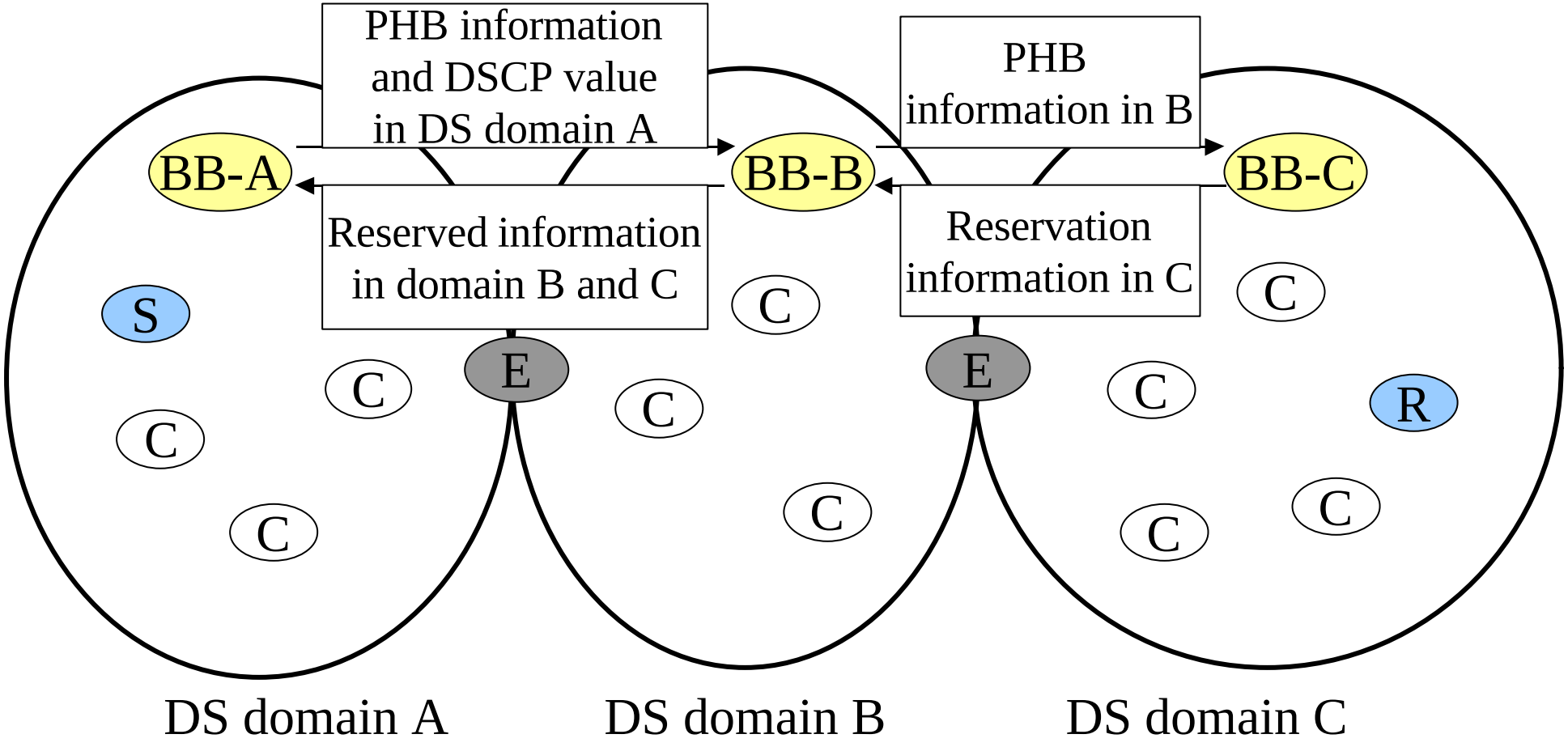
PHB information and SLA

- PHB is decided by BB administrator
- PHB information is different in every DS domain
- PHB information is exchanged between the DS domains as SLA(Service Level Agreement)

What is the problem of Inter-domain DS Architecture

- SLA have to be exchanged between DS administrators
  - SLA can not be configured dynamically
  - exchaged via phone, e-mail, etc…
- Cost for exchanging SLA in Inter-domain DS Architecture
  - Dynamic SLA configuration

A view of Dynamic SLA configuration



Advantages of this architecture

- Administrators do not need to configure each BB
- scalability
  - BBs only need to communicate with neighbor DS domain BBs
  - BBs do not take care about per-flow information

Parameters

- Parameters to exchange SLA information dynamically
  - DSCP value in each domain
  - PHB information
    - required bandwidth etc…
  - Time for the PHB to be available

Assumption

- BB knows neighbor DS domain BBs
- BB has bandwidth information about its managing domain

  – the solutions of these assumption are out of scope

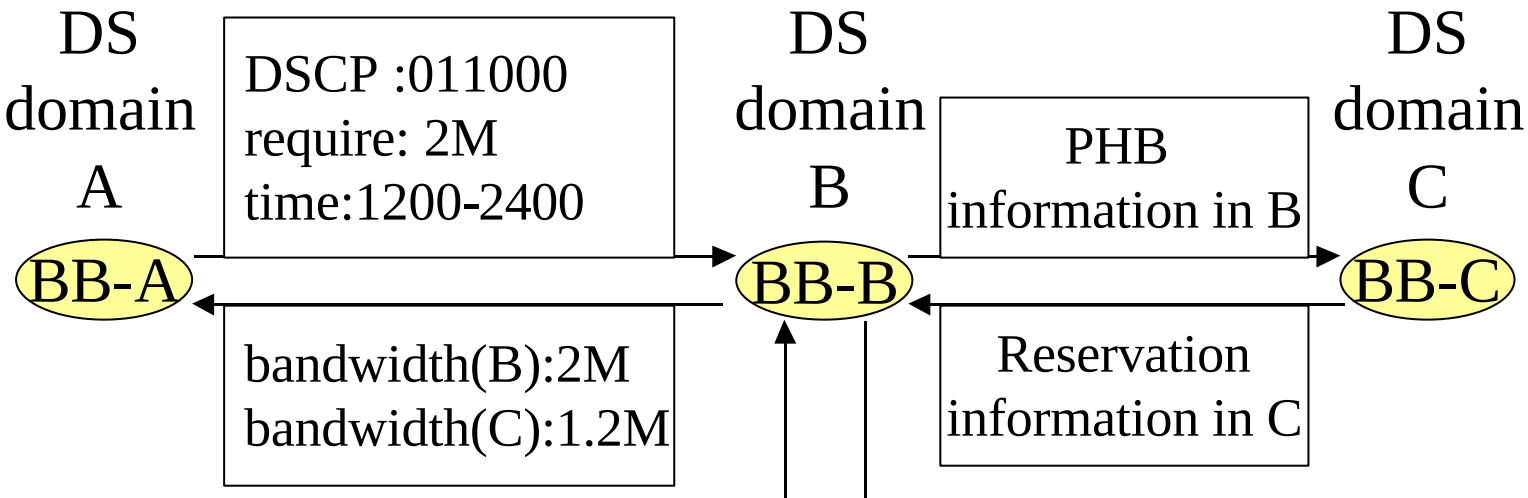
Message exchange

- Send parameters to BB within neighbor DS domain
- Next BB assigns new DSCP value for received PHB information
- Write about received information to PHB information table
- Send new parameters to next DS domain

PHB information table contents

- Maximum rate of bandwidth
- DSCP value
- DSCP value in neighbor DS domain
- Assigned bandwidth information
- Keep reservation time
- Domain ID which use this DSCP value

ex. Message exchange



PHB information table for A (Max bandwidth:5M)

DSCP in B	DSCP in A	assigned	time	domains
101000	011000	2M	1200-2400	A,D
⋮	⋮	⋮	⋮	⋮

Assign new DSCP value

- Define maximum bandwidth to allow reservation for each neighbor DS domain
- When required bandwidth is more than maximum
  - Assign DSCP value with maximum allowed bandwidth
- When required bandwidth is less than maximum
  - Assign DSCP value with required bandwidth

DSCP limitations

- 6 bits DSCP field can express only 64 types of PHBs
- Some request should aggregate
- Complex PHB information is difficult to describe
- When there are no more DSCP values…
  - Assign closest DSCP value in the PHB table
  - Stop exchanging PHB information

Static & Dynamic SLA

- This architecture gives SLA with simple PHB information
- Static SLA will be used when complex SLA is needed
- Some DSCP values are used for static SLA

PHB keep alive time information usage

- BBs cannot know when PHB information should be torn down
- Unused PHB information prevent others from reserving new DSCP value
- When required keep alive time for the PHB is out, BB delete its PHB information entry
  - But if other domain is using its DSCP, delete only domain name ID entry

Refresh message

- Routing information changes
- Unused DSCP value prevent others from reserving new DSCP value
- PHB information should be refreshed every keep-alive time
  - BBs can know the change of routing information

Security Issues

- Security
  - IPsec
- Integrity
  - something like RSVP integrity

Conclusion

- The dynamic SLA configuration model is defined
- By using this model, BB can exchange their own PHB information with neighbor BBs

Future schedule

- Design PHB information table details
- Add Integrity considerations to this model
- Design protocol for inter-domain PHB configuration

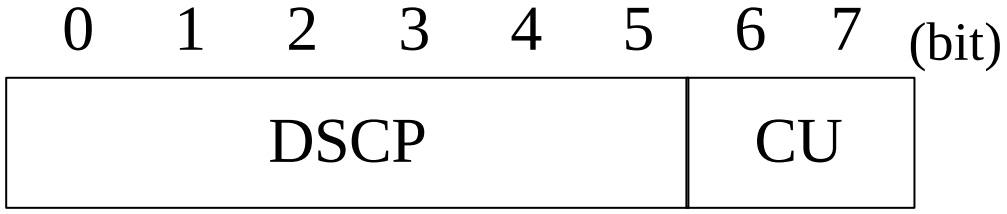
APPENDIX

DiffServ

- Distinguish packet from DSCP value
- DS interior nodes decide packet forwarding priority only checking DSCP value
- DS boundary nodes rewrite DSCP value for their own domain

DSCP (DS CodePoint)

- The (IPv4 TOS / IPv6 Traffic Class) octet →DS field
- Six bits of the DS field are used as a codepoint



DSCP : differentiated services codepoint
CU : currently unused

PHB (Per-Hop Behavior)

- DSCP value decided by PHB
- Consist of required bandwidth etc...

BB (Bandwidth Broker)

- Management correlation between PHB information and DSCP information
- Admission control
  - Compare flow information and PHB information