Resource reSerVation Protocol RSVP

Lecture for S-38.180 QoS in the Internet

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Purpose

- In IntServ applications have to set up a reservation before transmitting traffic
  - RSVP is a signaling protocol for applications to reserve resources by setting up state in hosts and routers

RSVP properties

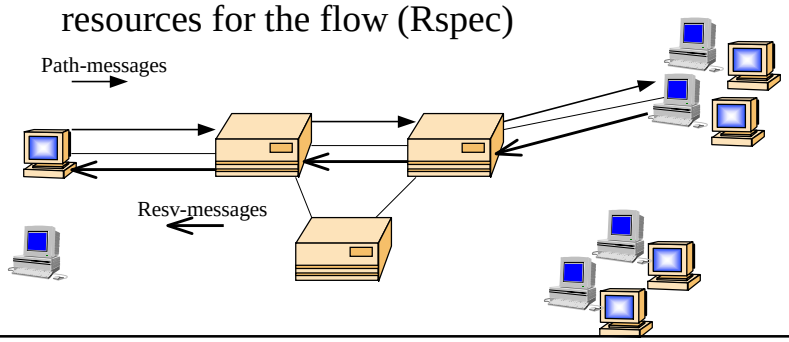
- End-to-end
  - requests from applications
- Per-flow method of signaling
  - fine-granularity
- Originally intended for IP multicast
  - receiver-oriented setup
  - reservations are one-way only

RSVP design

- Not a routing protocol
  - designed to operate with current and future routing protocols
- Policy independent
  - RSVP is independent of the service architecture
- Soft state
  - times out unless state is refreshed
  - allows for state modification (original and refresh messages identical)
- Transparent operation through Non-RSVP clouds
- Reservations may be shared or not

Method of establishing flow state

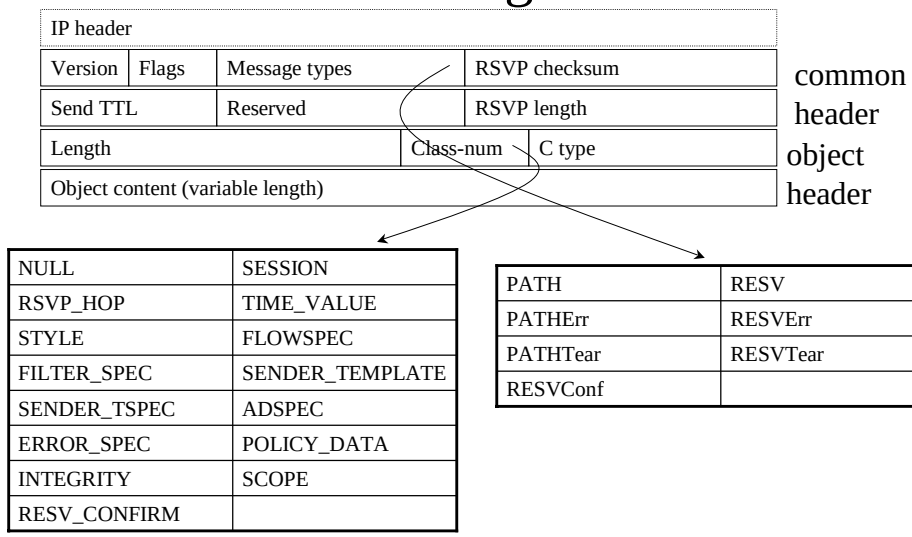
- sender sends a PATH –message to the receiver specifying the traffic characteristics (Tspec) and setting up the path
- receiver responds with RESV-message to request resources for the flow (Rspec)



RSVP messages

- Sent either as raw IP (protocol 46) or in UDP
- PATH
  - sent downstream along the data path installing path state
- RESV
  - reservation requests sent by the receivers

RSVP message format

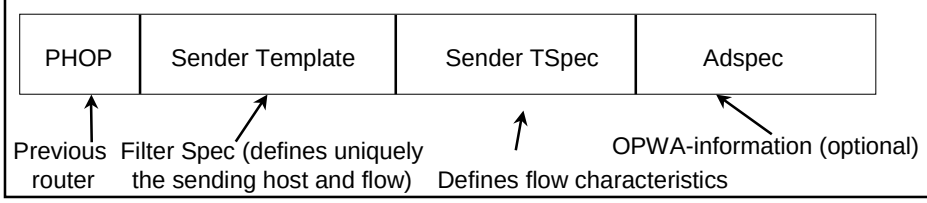


NULL	SESSION
RSVP_HOP	TIME_VALUE
STYLE	FLOWSPEC
FILTER_SPEC	SENDER_TEMPLATE
SENDER_TSPEC	ADSPEC
ERROR_SPEC	POLICY_DATA
INTEGRITY	SCOPE
RESV_CONFIRM	

PATH	RESV
PATHErr	RESVErr
PATHTear	RESVTear
RESVConf	

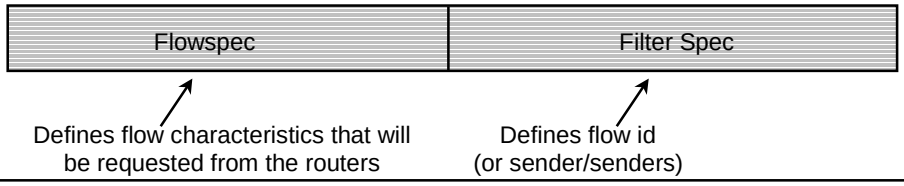
PATH-message

- Sent by the source
- Includes flow identification and flow characterization
- Sets up PATH-state in the router



RESV-message

- Sent by the receiver to reserve resources
- Contains the flow characterization and filter specification
- Sets up RESV-state in the router
- Flowspec may include
  - Tspec (both Guaranteed and Controlled-load)
  - Rspec (only in Guaranteed service)



Reservation types

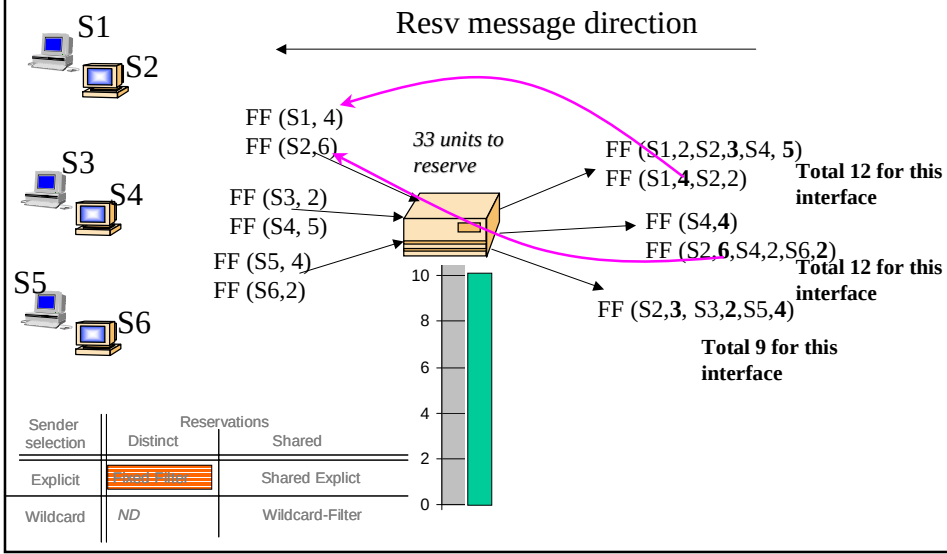
- Three reservation types are defined
  - Wild-card filter
  - Fixed-Filter
  - Shared-explicit
- WF and SE are designed for multicast

Sender selection	Reservations: Distinct	Reservations: Shared
Explicit	Fixed Filter	Shared Explict
Wildcard	*ND*	Wildcard-Filter

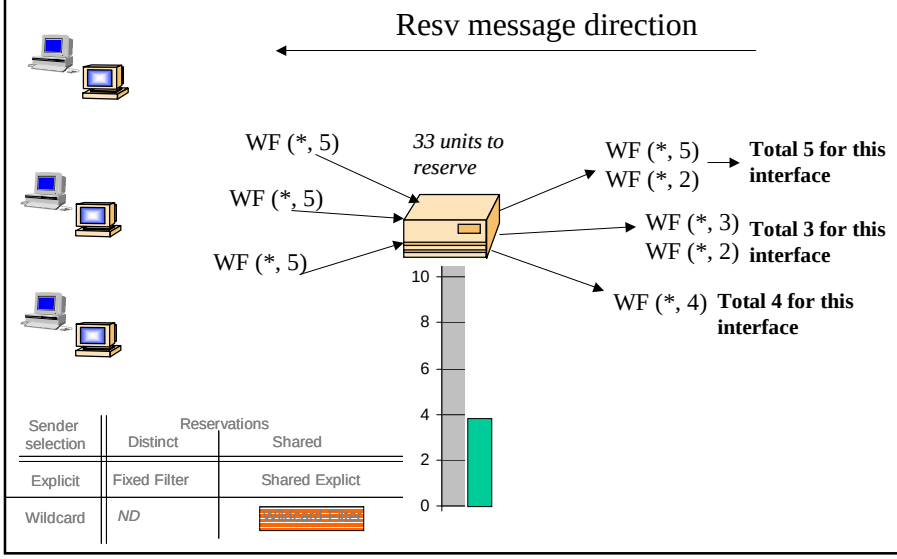
Reservation merging

- Reservations may be shared or merged
  - Depending on the reservation type and possible only within same type
  - router calculates the filterspec and flowspec to be sent to previous hop(s) according to reservation type

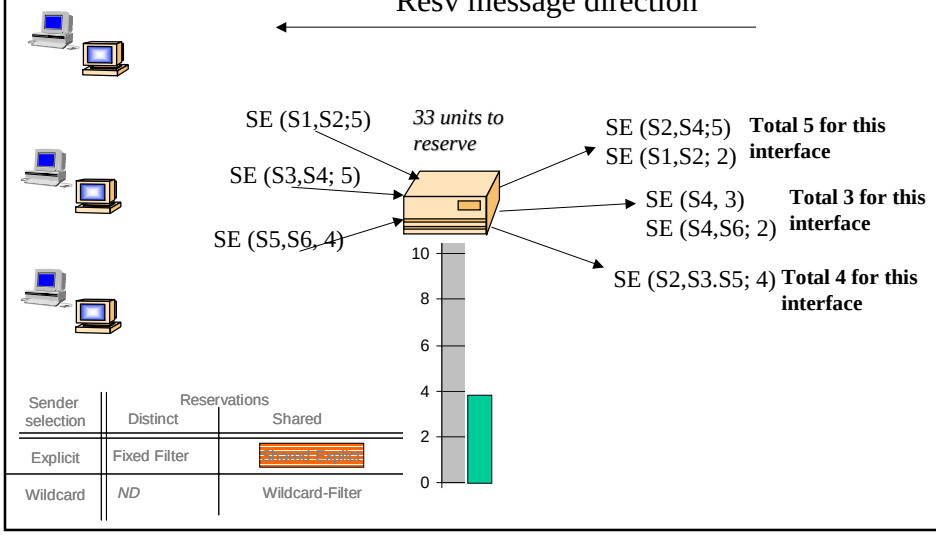
Reservations in action - FF



Reservations in action – WF



Reservations in action - SE



Adspec

- optional object in the PATH-message
- Consists of
  - default general parameters
  - Guaranteed Service fragment
  - Controlled Load Service fragment
- advertise receivers the characteristics of the end-to-end **path**

Adspec – Default general parameters

- Minimum Path Latency
- Path bandwidth
- Global break bit
  - cleared when Adspec is created by the sender
- IntServ Hop Count
- PathMTU

Adspec – Guaranteed Service fragment

- Ctot, Dtot, Csum and Dsum
- Guaranteed Service break bit
- Guaranteed Service General Parameters
  - overrides the values in default general parameters

Adspec – Controlled load service fragment

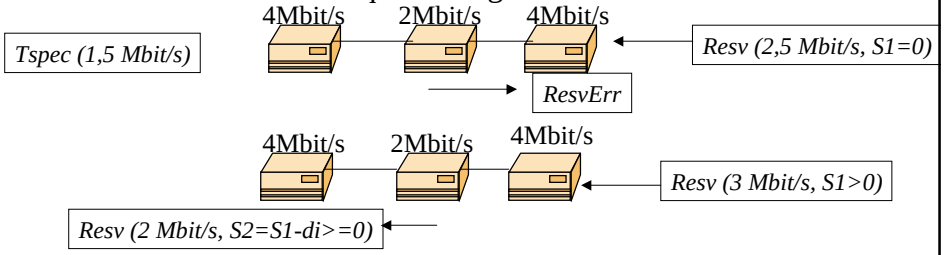
- Controlled-load service break bit
- Controlled-load service general parameters
  - overriding those presented in default general parameters

OPWA

- One pass with advertise
  - Sender includes Adspec in the PATH-message
  - with the aid of Ctot and Dtot the receiver is able to determine the path characteristics and form a more accurate RESV-message
  - receiver includes R and S (the slack term) in the RESV-message Rspec
    - Rspec includes also reservation type, filter specification, flow specification with Tspec and Rspec
- Without Adspec we have OP (One pass) and the RESV-message includes only the Tspec

Slack term

- Indicates the difference between the desired delay and the actual delay obtained with current R (bandwidth reservation)
- Allows the reservations some flexibility
  - balance between queue usage and service rate



Confused?

- PATH(Tspec) describes how the traffic will behave
  - PATH will also establish the route
- The receiver calculates (maybe based on Adspec) what kind of reservations have to be made and puts this reservation request into RESV(Rspec)
  - RESV will make the reservations on the route

RSVP problems

- Implementation
  - RSVP is somewhat vague in its definitions and therefore difficult to implement consistently
    - RSVP API found in latest MS Windows APIs
    - compatibility between operating systems
  - For IntServ to function every node on the path must implement the IntServ functionality
    - especially true for the Guaranteed service

Alternative uses of RSVP and future issues

- RSVP-TE
  - RSVP with traffic engineering extensions
  - Will be presented in the MPLS-lecture
- Accounting and billing need to be integrated
- Authentication issues need to be resolved

Future of IntServ (and RSVP)

- In core there might be large amount of reservations to be update, so you have to:
  - not isolate individual flows
  - map flows into fixed number of service classes
  - don't bother RSVP messages
  - keep state on the edges
  - > DiffServ

Integrated Services will be deployed first in intranets and other local environments where scaling and policy control are much less challenging.
- Bob Braden-