THE INTEGRATED SERVICE ARCHITECTURE

CN Sessional

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The Integrated Service Architecture

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Quality of Service

There are applications (and customers) that need better performance assurances from the network than "the best that could be achieved under the circumstances."

A simple way of delivering a good service quality is by building a network with a sufficient capacity for any traffic. This strategy is called over-supply. Without major losses, the network will transport application traffic and deliver low-latency packets, assuming a decent routing scheme. Performance won't get better than that. The telephone system is to some degree over-supplied since it is impossible to pick up a handset and not obtain a telephone number immediately. The space is only so wide that demand can be met almost always.

This method is difficult because it is expensive. Basically, by throwing money on it eliminates the challenge. Quality service frameworks allow a network with a less cost-effective capacity to meet application requirements. Over-supply also impacts on scheduled traffic. Any bet is off if too much shifts in the traffic pattern. The network supports the guarantee of productivity that it provides even though demand peaks at the cost of refusing such requests with the consistency of its service mechanism.

Four problems need to be resolved in order to ensure quality of service:

1. What are the network applications intended.

2. How to track the network's traffic.

3. How routers can be reserved to ensure performance.

4. If the network can accept additional traffic safely.

No strategy solves all these issues effectively. A variety of techniques for use on network (and transport) layers have instead been developed. A broad variety of techniques provide realistic quality-of-service solutions. To that end, two variants of internet service quality, called Integrated and Differentiated Services, are defined.

Application Requirements

A source-to-destination packet set is called a stream (Clark, 1988). It can include all link packets in a connection-oriented network or all packets in a connection-free network from one process to another. Four primary parameters will define the needs of each flow: bandwidth, time delay, jitter and loss. The quality of service (QoS) required by the flow is determined by these combined.

Networks, in particular, must not fail out for successful file transfer and must not send audio and video playback packets within equal delays. Any losses can be re-transmitted and some jitter can be smoothed by buffering packets on the recipient side. However, whether the network has too little bandwidth or too much delay, implementations cannot remedy the problem.

Application	Bandwidth	Delay	Jitter	Loss
Email	Less	Less	Less	Intermediate
File sharing	More	Less	Less	Intermediate
Web access	Intermediate	Intermediate	Less	Intermediate
Remote login	Less	Intermediate	Intermediate	Intermediate
Audio on demand	Less	Less	More	Less
Video on demand	More	Less	More	Less
Telephony	Less	More	More	Less
Videoconferencing	More	More	More	Less

The Integrated service architecture

The IntServ architecture model (RFC 1633, June 1994) was influenced by the needs of real-time applications, including remote video and multimedia lectures. This provides a means of explicitly controlling network resources to provide end-to-end service quality (QoS), which real-time applications need to provide QoS with individual user packet streams (flows). It uses "Resource Reservation" and "Admission Control" to establish and sustain QoS as the key building blocks.

For the specific purpose of signaling a QoS need for application traffic along devices on the End-to-End Network Lane, IntServ uses the Resource Reservation Protocol. The originating application will begin to transmit if the required bandwidth can be reserved for each network device in the route.

In addition to end-to - end signalling, IntServ incorporates several router functions and path switches:

1. Admission control: determine whether a new flow is feasible without affecting existing reservations the requested QoS.

2. Classification: classify packages that involve a particular QoS level

3. Policing: take action if traffic is not consistent with its specified characteristics, including possibly falling packets.

4. Queuing and Scheduling: forward packets to some granted QoS requests

The IntServ model defines three service groups based on application delay requirements (from the highest to the lowest output) for the IP QoS architecture:

1. Guaranteed service: Bandwidth, minimum delay and no loss guarantees assured service class;
2. Controlled-load service: Approximate best efficiency class controlled-load service on a small network allowing for a kind of statistical delay service (nominee delay) agreement that is infringed more frequently than in an unloaded network;
3. Best-effort service comparable to the Internet service currently available, further divided into three categories:
    a. a. (e.g., web) interactive burst;
    b. b. Interactive (FTP) and interactive bulk
    c. c. Asynchronous (for example, e-mail)

The key point is that guaranteed service and controlled load groups are based on quantitative requirements for the service and both include signals and network node admission control. Depending on the concentration in the network at different stages, these services may be distributed either by flow or per-flow aggregate. While no particular signalling protocol is needed for the IntServ Architecture, the following Resource Reservation Protocol (RSVP) is sometimes referred to as the IntServ Signalling Protocol. On the other hand, no signalling isn’t needed for the best effort service.

RSVP

RSVP is a transport layer protocol which is used when accessing Internet applications in order to reserve computer network resources for different quality of service (QoS). It operates via the Internet Protocol (IP) and reserves resources from the end of the recipient.

Characteristics

- The RSVP is a signalling protocol which is receiver oriented. The recipient initiates and maintains the reserve.
- Used for both unicasting (sending data from one source to one target) and for multicasting (sending data to a group of destination computers at the same time).
- Dynamically automated network adaptations are supported by RSVP.
- It provides a number of reservation styles. It also provides support for addition of future styles.

RSVP Messages

There are two types of RSVP messages.

1. Path Messages: A path message is sent by the sender to all receivers by multicasting the path state of each node in its path. It stores the details needed to make a reservation for the receivers.
2. Reservation Messages (resv): The Resv Message is sent to the sender by the recipient in the reverse direction of the path message. It defines the resources needed by the data flow.

How reservation is made

- A potential sender begins to send RSVP path messages.
- A receiver, who would like to join the session, registers if required. For instance, a receiver would register itself with IGMP in a multicast application.
- Path messages are provided to the receiver.
- The recipient sends Resv messages to the sender. These messages contain a flow descriptor which routers can use on their link-layer media to make reservations.
- The sender receives Resv message and then begins to send application data.

Basic RSVP sessions are formed in the same way as LDP sessions. You allow RSVP packets to be exchanged and LSPs to be created by configuring both the MPLS and the RSVP on the appropriate transit interfaces. RSVP allows you to configure authentication for links, explicit LSP paths and coloring for links.

Advantages of IntServ architecture

The major advantage of IntServ is that it provides service classes that accurately reflect the different categories of application and requirements listed above. This is particularly important for vital, intolerant applications for example, in the guaranteed service class. On the other hand, managed load services will typically efficiently support critical, tolerant applications and some adaptive applications. The best effort service class accommodates other adaptive and elastic applications.

A key characteristic of IntServ is that it generally remains the same best effort class unchanged (with the exception of an additional class subdivision). This is a vital feature as IntServ can provide this service class almost as efficiently as the Internet itself. IntServ still maintains intact the network propagation process. The design is then gradually introduced, so that final systems that are not revised will assist IntServ in collecting data for all IntServ classes (with a likely lack of warranty).

At IntServ a very appealing selection of services offers the best approximation of the type of service required on a global telecommunications network, although they may not be suitable for any application.

Disadvantages of IntServ architecture

Although IntServ is a simple QoS model, service guarantees cannot be provided without all IntServ nodes. This is evident since any best effort node along any path is able to manage packages to split end-to-end services. When the IntServ QoS model is fully applied, the industry acknowledges severe scalability issues in the heart of the internet by endorsing per flow guarantees.

The key focus of the IntServ architecture, therefore is on scalability, since it requires end-to-end signals, and a per-flow state needs to be maintained in each router. Other issues include the authorisation and prioritization of reservation requests and the absence of end-to-end signals. IntServ is often agreed to be a stronger company network candidate (i.e. Access networks) for desktop user flows relative to large backbone providers because of these issues. It suggested that hybrid models (RSVP DS) using RSVP at the frontier and DiffServ at the backbone are and seem to win consensus.

Sources:

- http://tacs.eu/analyses/Internet/ip%20qos%20architectures/int-serv_architecture.htm
- https://www.juniper.net/documentation/en_US/junos/topics/topic-map/rsvp-overview.html