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Cross layer convention improvement for satellite correspondence

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ABSTRACT

In recent days internet satellites are one of the important components. New satellite system architectures are being expected to be fully IP based. It provides digital video broadcasting and channel protocols which are able to return. By using different layers of OSI and TCP/IP protocol stack we can make the upcoming satellite networks systems fully realizable and meeting advanced services. Geostationary – based architecture which deals with joint optimization of different transport control schemes and lower layers will be considered. The main is to prove that interactions are required because of increasing demand for high-speed internet services and multimedia broadband services. Based on the ISO/OSI reference model and internet protocol suite, internet protocol architecture is constrained which makes satellite network systems fully achieved to meet new services.

Keywords— *End to end congestion control, TCP over wireless links, TCP congestion control mechanism*

1. INTRODUCTION

The main purpose is to provide digital video broadcasting and automatic repeat request protocols. Large network sizes can be achieved by layered approach as it provides layer management flexible which needs a large scale adaptability. Due to errors caused by wireless channel, IP packets are lost. Thus may lower the bit rate, this is mainly caused without a cross-layer design. If it happens it requires a long time to recover. Sometimes it may lead to TCP timed out.

The cross-layer design should be addressed in system implementation and satisfying end to end-user service level agreements.

Due to the scarcity of bandwidth internet will become congested. Controlling best effort traffic leads to possible approaches. This is called an end to end congestion. End to end of a TCP connection in IP level depends on packet loss.

A final discussion of the cross-layer signalling methods and also CROSS LAYER SIGNALLING SHORTCUTS are introduced in this paper for the flexible, efficient and comprehensive scheme. This cross-layer signalling shortcut is also called CLASS.

Section 1: an end to end congestion for controlling best effort traffic in several possible approaches.
Section 2: TCP over wireless links and definitions for some TCP parameters.
Section 3: TCP congestion control mechanisms.
Section 4: cross-layer signalling methods explanation with diagrams.

Section 1:

End to end congestion control: This method is future protocols using best effort traffic, router mechanisms are needed to identify and restrict the bandwidth of selected high bandwidth. The paper discusses identifying those flows suitable for bandwidth regulation using several general approaches.

For controlling best effort traffic we can assume the internet will continue to become congested due to the scarcity of bandwidth which leads to several possible approaches.

- The first approach consists of packet scheduling deployment in routers that isolate each flow as much as possible from the effects of other flows. This method mechanism that separately generates the bandwidth of each best effort flow.
- The second approach is for incentives. These incentives are in the form of router mechanisms to restrict the bandwidth of best effort flows using a disproportionate share of bandwidth in congestion times. These mechanisms help to protocol designers to use end to end congestion control for best effort traffic.
- The third approach will able to provide additional bandwidth and develop effective pricing structures.

These three approaches give about:

a) Per-flow scheduling
b) Incentives for an end to end congestion
c) Pricing mechanisms are not necessarily mutually exclusive.

These three approaches give about an end to end congestion for best traffic. It also gives about different consequences in terms of increasing deployment of traffic on the internet.

Section 2

TCP over wireless links: In wireless data links transmission of TCP traffic causes problem TCP has packet loss sensitive behaviour. The error data packets are discarded by wireless data link which is the common behaviour. The above information states that TCP/IP stack cannot distinguish packet loss due to data corruption. Improving the error rate is generally expensive in order to improve the efficiency of TCP over wireless links.

TCP is a connection-oriented. It works as an end to end reliable transport protocol. It works between hosts in packets switched networks of possible topology. TCP is mainly designed to use in a wide spectrum of the communication system. In wireless links the performance problem, mainly on satellite links are becoming more.

The advantages with respect to wired links are as follows:

a) **Easy of scalability:** Installation is generally very quick and cheaper than cabling so a new user by acquiring appropriate transceiver can join a satellite network.
b) **Damage resilience:** It is not much affected by natural or war disasters like a wired network.
c) **Multicasting efficiency:** By using simple protocols we can efficiently have broadcasting and multicasting services.
d) **Easy of setup:** A completely private worldwide network can be set up by one individual large-scale organization.

To control the amount of outstanding data by using TCP sender that was injected into the network.

Definitions for some TCP parameters:

- **TCP segment:** TCP header and data i.e., the IP payload.
- **Receiver window:** Most recently advertised **receiver** window.
- **Congestion window:** ATCP state variable that limits the size of flight.
- **Initial window:** Value of congestion window at the end of three-way handshake.
- **Maximum segment size:** Size of largest segment usable for current connection.

Section 3:

TCP congestion control mechanism: Congestion avoidance and slow start are the algorithms used by TCP sender. It will control the amount of data injecting into the network.

Slow start: Network congestion is caused by an initial sudden burst of packets, in slow start, the sender's amount of material increases exponentially with time.
Two maximum segment size bytes are greater than the initial window congestion window. For each acknowledgement received that acknowledges new data, a TCP increases congestion window at most maximum segment sized bytes.

Congestion avoidance: Congestion avoidance starts when the congestion window exceeds the slow start threshold until congestion is detected the congestion avoidance continues. In this for each acknowledgement received the congestion window is increased by 1/congestion window.

The value of slow start is maximum when TCP sender detects a segment loss because of a retransmission.

To increase congestion window up to the new value of slow start threshold, the TCP sender uses the slow start algorithm.

Fast retransmit: TCP sends an acknowledgement indicating the next sequence number expected when out of sequence is received by TCP receiver. When the same acknowledgement is sent again and again it is called duplicate acknowledgement. This duplicate acknowledgement can be generated due to network problems I.e., packet reordering duplication or dropping.

After three duplicate acknowledgements received by the receiver without waiting for the retransmission timer to expire, the sender retransmits the missing segment. This process is called fast retransmit.

Fast recovery: After fast retransmit, in accordance with the first recovery algorithm new data is sent, until a non-duplicate acknowledgement is received.

Section 4:

Cross-layer signalling methods

1) Packet headers
2) ICMP messages
3) Network service
4) Local profiles

1) Packet headers

- Optical network information can be encoded in the additional header in IPV6.
- By taking advantage of this new feature, the interlayer signalling pipe stores cross-layer information in the wireless extension header.
- In this method, IP data packets are used as in-band message carriers which make of no need to use a dedicated internal message protocol.
- An IP packet is generally processed layer by layer.
- IP level header can be accessed by higher layers easily.
- For external IP level information exchange, this method is more suitable.
- For explicit loss notification only on a bit in TCP packet header was used by link layer software.
- If it is aware of the pack loss it will set ELN bit in TCP header. This generates in-band signalling as an MH feedback.
- This method does not bear complex information.

IPV6 header	Next header =TCP interlayer	Transport layer header+payload

Fig. 1: Extension header of cross-layer information

2) ICMP messages

- ICMP- internet control message protocol.
- It is the most widely used protocol in IP-based networks.
- ICMP messages are mainly used to punch holes in the protocol stack and it propagates information across layers.
- When a parameter changes beyond the thresholds than a new ICMP message will be generated.
- Generally, cross-layer communication is carried out through particular holes rather than a pipe.
- This method is more flexible and efficient.
- In an IP packet, ICMP messages are encapsulated.
- So, if the signalling is only desired between the link layer and application layer than the message has to pass by network layer.

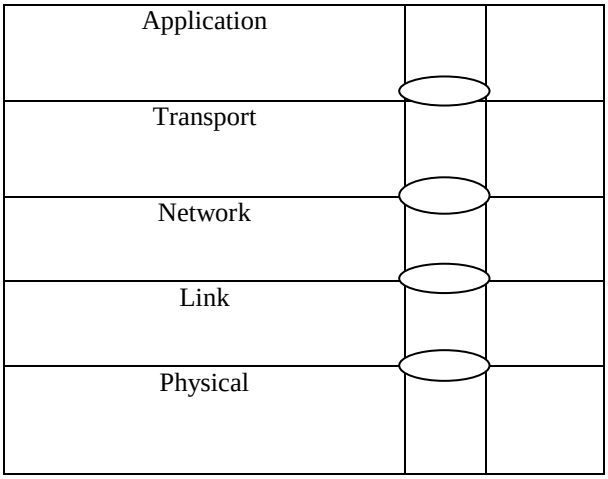

Fig. 2: Signalling pipe

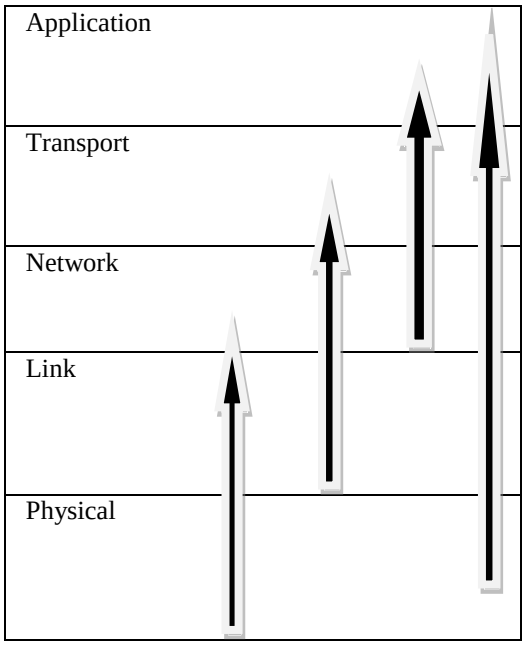

Fig. 3: Selected holes

3) Network service

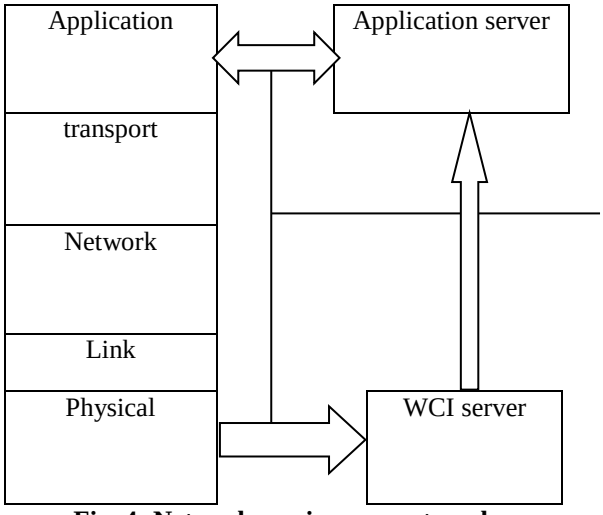

Fig. 4: Network service concept mode

- In this method from the physical layer and link layer, channel and link states are gathered, managed and abstracted.
- It is similar to the previous two schemes but further problems are considered in parameter definition, coding, decoding and abstraction.
- Any intensive use of this method would introduce considerable signalling overhead and delay over a radio access network.

4) Local profiles

- It is mainly used in an ad hoc network to store periodically updating information for a mobile host.
- From each necessary layer, cross layer information is abstracted.
- This information is stored in separate profiles within the host.
- Profiles are selected by other interesting layers for fetching desired information.

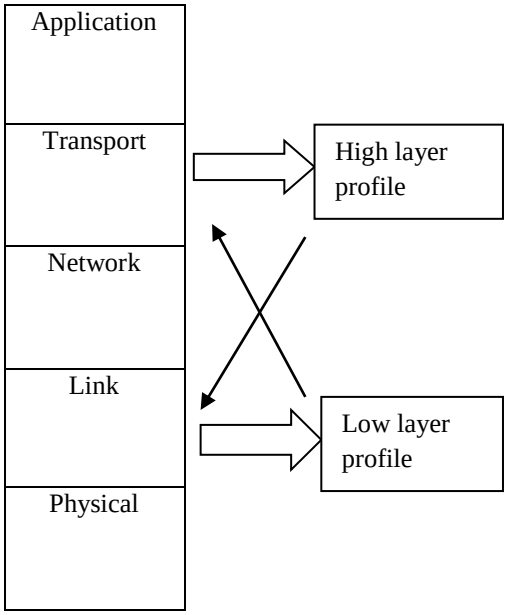

Fig. 5: The local profile concept model

- In packet header and ICMP messages methods, stores cross-layer information in memory.
- In network services, it stores information of cross-layer information.
- Local profiles are flexible because it can access the desired information directly.
- It will store the cross-layer information separately and keeps it ready for future use.
- In this method rather than external servers, internal profiles are applied.

2. CONCLUSION

Considering the interactions among different protocol layers the design of IP based satellite communication systems for system optimization is done. The protocol stacks are based on independent layers. So changing the system conditions accordingly to the adaption of each layer. The study of the impact and interaction of different layer is very complicated according to cross-layer design approach. The behaviour of higher layers are important functions in cross-layer signalling and it is needed to introduce in future satellite communication systems.

By using cross-layer protocol we can introduce different methods and techniques to improve satellite communication.

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