Adaptive Data Streaming Service for Onboard Spacecraft Networks

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***Abstract*—Modern spacecrafts consist of many systems and sensors producing streaming traffic. The paper is concerned with the problem of the congestion network in spacecrafts. It occurs because of the equipment malfunction (routers, receive/transmit nodes, links). To solve this problem the analysis of streaming traffic, Quality of Service, features of streaming applications and the overview of streaming protocols were done. As a result the basic concepts of service for adaptive QoS control – Adaptive Data Streaming Service – were proposed.**

I. INTRODUCTION

Modern spacecrafts consist of different onboard equipments: Navigation Control System, Attitude and Orbit Control Computer, Onboard Control Complex, Heater Control, Power Control, Telecommand-telemetry Unit, Computing Machines, Radio Engineering Complex, Measurement and Radiation Monitoring System, sets of mission specific sensors [1, 2]. All these systems are communicated via data-handling spacecraft network [3, 4, 5].

There is a problem to support liveness and fault tolerance of the onboard network. The hardware reservation, triple redundancy are used for fault tolerance and failover in onboard spacecraft networks [1, 3, 4, 6]. The Star, Double-Star and Triple-Star networks are the most common spacecraft network topologies (Fig.1) [3, 6]. It provides an additional fault tolerance of the network, because of data could be delivered via different routes.

Unfortunately it does not provide absolute protection against internal and outside threats. No one can guarantee that the satellite will fail over 1 hour, 1 week, 1 month, 1-10 years of flight because of severe operating conditions. They are radiation, significant temperature differentials and high mechanical vibrations [1, 7]. For example, radiations cause the equipment malfunction. Another example – logical bugs will be admitted during planned configuring of the onboard equipment. As a result the data from sensors, telemetry data, critical data like control commands could not be passed to the target units via network congestion or link fails.

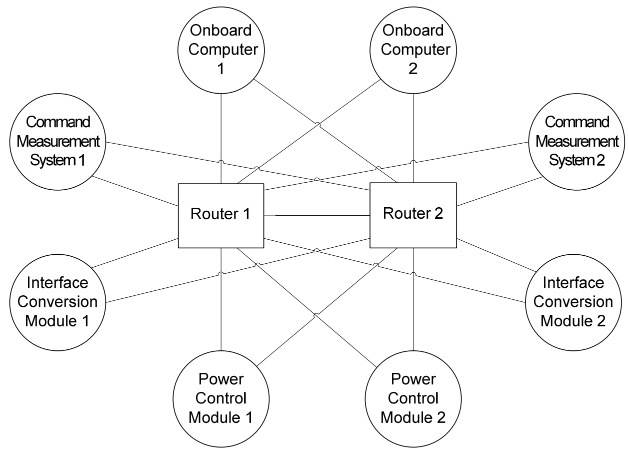

Fig. 1. Example of Double-Star network of Onboard Control Complex

The fact is the progress of microelectronics and space industry leads modern onboard networks to become bigger than previous one. The networks are built with large number of sensors and systems [8]. Large number of high rates sensor sampling produce high intensive data streams – streaming traffic – that generate high-rate coherent streams [9]. Every data stream is required a particular Quality of Service (QoS). For example, radio-navigation streams should be transmitted without long delays, command data should be guaranteed delivered. When there are failed link in the network, mission critical data and control commands could be transmitted with very long delays that it not accepted. Hence, the problem of fault tolerance becomes deeper. There is a challenge to provide minimal threshold QoS for significant streams (e.g., mission critical data) over the onboard spacecraft network under the conditions of faults. It will help to improve of spacecraft liveness. Especially, it is a significant problem for Deep space missions requiring a high level of autonomy.

To solve this problem the research of streaming traffic, features of modern streaming applications and analysis of existing streaming protocols was done. Next sections are described it.

II. Streaming: Definition, QoS and Applications

A. Streaming Traffic

Streaming traffic is an uniform traffic that is specified by the following features: fixed packet size (no wide spread of sizes) and periodic packet issue with stable intensity and characteristics [10].

The main advantage of streaming traffic is predicted data rate. The buffers volume could be forecasted and calculated. It allows to optimize and streamline sender/receiver equipment:

- small buffer and data priorities are useful, when it is the narrowband traffic;
- large buffer is useful, when it is the broadband traffic. Also they recommended using weighted data queues instead of data priorities, because there may be a channel monopolization;
- not large buffer is used, when the traffic is tolerant to packet corruption and sensitive to long delays. It is better to discard invalid packets than do the packet retransmission, because the latency for correct packets will grow via a retry.

B. Quality of Service

In general streaming traffic could be narrowband or broadband, tolerant to sporadic corruption of packets, sensitive to delays or not. To perform data streaming transfer it usually needs to use various types of QoS adjusted to the traffic characteristics and the requirements of mission specific applications. The most common QoS are the Best Effort, Guaranteed, Priority, Scheduling and Bandwidth Reservation.

1) The Best Effort QoS: It is used if there are no noise and fluctuations of available bandwidth in a channel. In this case data transfer could be transmitted without acknowledgements, retransmission, timeouts, etc. The data transfer may be connection-oriented, because there is no need to add, for example, a source destination address to every sent data packet. Instead of it connection should be established between two end-users. After that end-users know about communication between them. Hence, there is no need to transfer general information in packet: the length of address, a source address, etc. Data packets transfer has minimal overheads. The Best-Effort QoS is the most effective for the broadband traffic, exacting to time delays and loss tolerance. Also it can be applied to the narrowband traffic.

2) The Guaranteed QoS: It is used if there is noise or transmitted data is a critical information. To support this QoS the following mechanisms are used: selective confirmations, the immediate or postponed data retransmission, the numbering of packets, and timeouts for confirmation. In case of the Guaranteed QoS data packets are often transferred like datagrams. Thus the size of transmitted data can be changed depending on congestion of the device receiver/sender equipment and existence of interferences in the channel. So, for example, the receiver can request the video of a smaller size (bitrate) if it doesn't manage to process video with high resolution or big packets, which permanently reach with errors. This QoS is most effective for the narrowband traffic, not exacting to time delays and sensitive to losses. Also it can be applied to the broadband. The combinations of different mechanisms of the Guaranteed QoS give an opportunity to use it to transfer streaming traffics providing the guaranteed delivery or a speed/time delay of packet delivery.

3) The Priority Transmission QoS: It is used when it is necessary to send urgent information bypassing the current data streams. For example, there is a stream video translation and there is a need to send an urgent command or warning of some alerts. The high-priority packet will be immediately created and sent, for example, to an onboard control complex. Then a video broadcasting will proceed a stream. The transmission on priorities can be applied to any streaming traffic.

4) The Scheduling QoS: It is applied on networks for the purpose of the conflict resolution. The conflict appears when two or more nodes send data to one destination device at the same time. The Scheduling quality of service means that there is a single schedule for the whole network. This schedule gives an opportunity for the node to send data only during particular time-slots. Thus it prevents conflicts of a network resources usage [11].

5) The Bandwidth Reservation QoS: It is used for the same purposes like Scheduling QoS. The difference is the node is allowed to transmit particular volume of data.

TABLE I. Requirements for Streaming Traffic

Requirements	**Delay Tolerance (low delay requirements)**		**Sensitivity to delays (high delay requirements: digital speech communication – 200 ms; video – 30 ms)**	
	Corruption Sensitivity	**Corruption Tolerance**	**Corruption Sensitivity**	**Corruption Tolerance**
Narrowband	Guaranteed, datagrams Spacecraft control sensors	Guaranteed, datagrams/ connections Audio translation	Guaranteed, datagrams life-support system	Best-Effort, datagrams/ connections Tele-conferences
Broadband	Guaranteed, datagrams/ connections Telemetry streams	Guaranteed, datagrams/ connections Video translation	Guaranteed datagrams	Best-Effort, connections Cameras

The Priority Transmission, Scheduling and Bandwidth Reservation QoS could be used with all streaming traffics. Various combinations of QoS mechanisms to transmit streams with different requirements. Some public examples of the data rate, maximum size of packets, latencies, reliability and priorities requirements were presented in [12].

C. Features of Streaming Sensor Application

In the world the streaming is used for the next data transfer tasks: audio/video translation (end-to-end, multicast translations, broadcast teleconferences); file and images streams; high-rate informative streams (telemetry streams, sensor array streams (SAR, etc.)).

Analysis of prospective streaming sensor applications [9] shows that they typically have the following features:

1) Stable intensity of packet issue: It is supported by fixed packet size during the communication session and fixed period of packet issue. It follows from definition of streaming [10];

2) Sensitivity to delays: For example, control commands should be transmitted without long delays. If commands wait too long to transfer, then it is removed, because command becomes not actual. It is provided by timers, packet priorities, Schedule and Bandwidth Reservation QoS;

3) Corruption tolerance: Video, ADC streams could not be retransmitted. It is recommended to use Best Effort QoS;

4) Guaranteed delivery: There is a requirement that control critical data should be delivered in order and without errors. For this purpose the next mechanisms may be used: error packet detection (CRC, bit test), data sequence check, retransmission, selective acknowledgements.

5) Consistency of coherent data flows: The packet order is defined by sequence numbers and timestamps.

III. Streaming Oriented Protocols Review

Detailed overview of existing streaming protocols and standards was done. It is based on researches [13, 14, 15, 16, 17, 18, 19, 20]. They are:

- Internet, multimedia and real-time protocols of Transport layer: TCP, UDP, RTP, RTCP, SCTP, SSTP, RSVP, DCCP;
- Onboard and aerospace protocols of Transport layer: Saratoga, ECSS-E-50, CFDP, SCPS-TP, JRDDP, STP, STP-ISS rev.2;
- Protocol stacks specifying modern high-performance systems that could be used for streaming: SOIS, RapidIO, ARINC-818-2, SpaceWire, SpaceFibre.

Moreover, streaming protocols of Application layer (such as Apple HLS, Adobe RTMP and others) were reviewed, because they are mainstream streaming protocols [21].

A. Internet, multimedia and real-time protocols of Transport layer

1) TCP – Transmission Control Protocol: It provides reliable, ordered and error-checked delivery of data over an IP network [22].

2) UDP – User Datagram Protocol: It provides a procedure for application programs to send messages (datagrams) to other programs with a minimum of protocol mechanism. The protocol is transaction oriented, and delivery and duplicate protection are not guaranteed [23].

3) RTP – Real-Time Transport Protocol: It provides end-to-end network transport functions suitable for applications transmitting real-time data, such as audio, video or simulation data, over multicast or unicast network services. RTP does not address resource reservation and does not guarantee quality-of-service for real-time services [24].

4) RTCP – Real-Time Control Protocol: It provides monitoring of the data delivery in a manner scalable to large multicast networks, and to provide minimal control and identification functionality [24].

5) SCTP – Stream Control Transmission Protocol: It is a reliable transport protocol that provides a stable, ordered data transfer between two endpoints (like TCP) [25].

6) SSTP – Strutured Stream Transport Protocol: It is designed to address the needs of modern applications that need to juggle many asynchronous communication activities in parallel, such as downloading different parts of a web page simultaneously and playing multiple audio and video streams at once [26].

7) RSVP – Resource Reservation Protocol: It allows data receiver to request a special end-to-end QoS for its data flows. Real-time applications use RSVP to reserve necessary resources at routers along the transmission paths so that the requested bandwidth can be available when the transmission actually takes place. RSVP is a main component of the future Integrated Services Internet which can provide both best-effort and real-time service [27].

8) DCCP – Datagram Congestion Control Protocol: It provides bidirectional unicast connections of congestion-controlled unreliable datagrams. DCCP is suitable for applications that transfer fairly large amounts of data (e.g. streaming media, multiplayer online games, internet telephony), but can benefit from control over the tradeoff between timeliness and reliability [28].

B. Onboard and aerospace protocols of Transport layer

1) Saratoga – Scalable Data Transfer Protocol: It is a simple, lightweight, content dissemination protocol that builds on UDP, and optionally uses UDP-Lite. Saratoga is intended for use when moving files or streaming data between peers which may have only sporadic or intermittent connectivity, and is capable of transferring very large amounts of data reliably under adverse conditions [29].

2) ECSS-E-50-13 – Interface and communication protocol for MIL-STD-1553B: It defines the services for communication devices with MIL-STD-1553B interface and to describe their functionality. ECSS-E-50-13 is based on different spacecraft projects developing experience, including scientific, telecommunicational, space and space transportation system researches [30].

3) CFDP – CCSDS File Delivery Protocol: It serves for spacecraft needs in files (data blocks) transfer and receiving to and from onboard mass memory. Besides files transmission CFDP provides detection and retransmission of corrupted or lost data. Protocol can provide data transmission in the space-to-Earth, Earth-to-space or space-to-space directions [31].

4) SCPS-TP – Space Communications Protocol Specification – Transport Protocol: It is a protocol describing some extensions and modifications of TCP. It's aimed for use in spacecraft communications environments, characterized by potentially long delays and high error rates [32].

5) JRDDP – Joint Architecture Standard Reliable Data Delivery Protocol: It is a reliable data delivery protocol. It uses the lower-level SpaceWire data link layer to provide reliable data delivery services to one or more higher-level application [33].

6) STP – Streaming Transport Protocol: It is a connection-oriented protocol, designed for data streaming in onboard SpaceWire networks. STP is aimed for processing with stream-oriented information flow sources. It performs set-connection control, initialization of connection parameters and data flow control [34].

7) STP-ISS: It provides data transmission between the nodes of the SpaceWire network with required QoS (Best Effort, Guaranteed, Priorities, Scheduling). This protocol gives ability for data resending and error detection in receiving data, providing reliable data delivery. STP-ISS supports data transfer via datagrams and transport connections [35].

C. Multimedia streaming protocols of Application Layer

1) RTSP – Real Time Streaming Protocol: It was designed for use in media systems. RTSP gives to the client remote control over data stream from the server. It gives ability to run some commands, such as "play" and "pause". Also it provides real-time access to media files from the server. RTSP protocol can be used over RTP, RTCP, UDP or TCP [36].

2) RTMP – Adobe Real Time Messaging Protocol: It was designed for streaming video and audio over the Internet, between server and Adobe Flash-player. It is suitable for a wide variety of audio/video applications, one-to-one and one-to-many live broadcasting by video-on-demand services, and also for interactive conferencing applications [37].

3) MPEG-TS – MPEG Transport Stream: It is a protocol, which provides transmission and storage control over audio and video data. It is mainly used in broadcast systems such as DVB and ATSC. MPEG-TS provides connectivity with many traditional IPTV set-top boxes [38].

4) HLS – Apple HTTP Live Streaming: HLS is a communication protocol based on HTTP protocol. It is used for transferring unbounded streams of multimedia data. The protocol supports the encryption of mediadata and allows clients to choose from among different encodings (adaptive bitrate streaming) of the presentation. Media data can be transferred soon after it is created, allowing it to be played in near real-time [39].

5) HDS – Adobe HTTP Dynamic Streaming: It is a protocol for video streaming over HTTP-protocol with dynamic content quality scaling while playing [40].

6) MSS – Microsoft Smooth Streaming: It is a video content streaming protocol. By dynamically monitoring local bandwidth and video rendering performance, Smooth Streaming optimizes content playback by switching video quality in real-time [41].

According to statistics of streaming protocol usage for June-August 2014 (Fig.2) the most widespread streaming protocol is Apple HLS (usage 55,9%) [21, 42]. Second place goes to Adobe RTMP (26,6%). Third place – RTSP (15.5%). Adobe HDS is 5th. Microsoft Smooth Streaming (MSS) – 6th place.

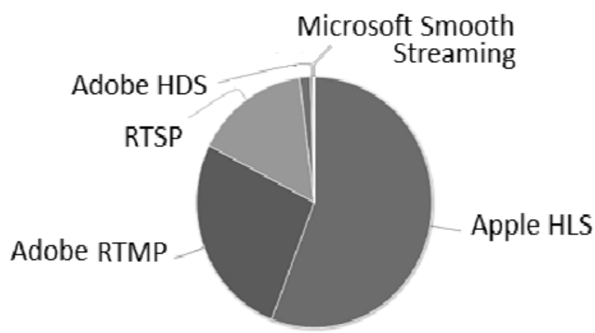

Fig. 2. WMSPanel: State of Streaming Protocols

D. High Performance Protocol Stacks

1) SOIS – Spacecraft Onboard Interface Services: The CCSDS SOIS Area has developed a layered set of communications services for flight avionics. This set of services is intended to cover the majority of onboard communications requirements. The services have been divided into those to be provided over the onboard communications media — the so-called Subnetwork Layer services — and those supporting onboard applications—the Application Support Layer services [43].

2) RapidIO – Rapid Input/Output Interface: It is a high-performance packet-switched, interconnect technology. RapidIO supports messaging, read/write and cache coherency semantics. RapidIO fabrics guarantee in-order packet delivery, enabling power- and area- efficient protocol implementation in hardware. RapidIO can be used as a chip-to-chip, board-to-board, and chassis-to-chassis interconnect [44].

3) ARINC-818-2 – Avionics Digital Video Bus: It is a video interface and protocol standard developed for high bandwidth, low latency, uncompressed digital video transmission in avionics systems [45].

4) SpaceWire: It is a data-handling network for use on-board spacecraft, which connects together instruments, mass-memory, processors, downlink telemetry, and other on-board sub-systems. SpaceWire is simple to implement and has some specific characteristics that help it support data-handling applications in space: high-speed, low-power, simplicity, relatively low implementation cost, and architectural flexibility making it ideal for many space missions. SpaceWire provides high-speed (2 Mbits/s to 200 Mbits/s), bi-directional, full-duplex data-links, which connect together SpaceWire enabled equipment [46].

5) SpaceFibre: It is a very high-speed serial link designed specifically for use onboard spacecraft. It aims to complement the capabilities of the widely used SpaceWire onboard networking standard: improving the data rate by a factor of 10 (2Gbit/s), reducing the cable mass and providing galvanic isolation. Multi-laning improves the data-rate further to well over 20 Gbits/s. SpaceFibre provides a coherent quality of service mechanism able to support best effort, bandwidth reserved, scheduled and priority based qualities of service. It substantially improves the fault detection, isolation and recovery (FDIR) capability compared to SpaceWire [47].

E. Comparision of streaming protocols

Streaming features of each reviewed internet and real-time transport protocols are given in the Table II.

Streaming features of each reviewed onboard and aerospace transport protocols are given in the Table III.

TABLE II. INTERNET AND REAL-TIME TRANSPORT PROTOCOLS COMPARISON

Features	TCP	UDP	RTP	RTCP	SCTP	SSTP	RSVP	DCCP
Header length, bytes	20-60	8	16	28	12	16	8	12-16
Max payload, bytes	64 K	64 K	Depends on data	20	64 K	1G	64 K	1020
On top what protocol should it work?	IP networks		UDP	UDP	IP networks			
Fixed packet size	-	-	-	+	-	-	-	-
Periodical data transfer	-	-	-	+	-	-	-	-
Stream Rate Flow Control	-	-	-	-	-	-	+	-
Actual data (timers)	+	-	-	+	-	+-	+	+
Priority QoS	+	-	+	-	+	+	+	+-
Bandwidth Reservation QoS	+-	-	-	+-	-	-	+	+
Scheduling QoS	-	-	-	-	-	-	-	-
Best Effort QoS	-	+	+	+	-	+	+	+
Data correctness check	+	-	+	-	+	+	-	+
Data sequence check	+	-	+	-	+	+	-	-
Data Retransmission	+	-	+	-	+	+	-	-
Selective acknowledgements	+	-	-	-	+	+	-	+
Timestamping	-	-	+	+	+-	-	-	-

TABLE III. ONBOARD AND AEROSPACE TRANSPORT PROTOCOLS COMPARISON

Features	SARATOGA	ECSS-E-50	CFDP	SCPS-TP	JRDDP	STP	STP-ISS rev.2
Header length, bytes	12	2	4	15	10	8	9
Max payload, bytes	256E	4K	64K	64K	64K	4G	2K or 64K
On top what protocol should it work?	UDP/ UDP-lite	MIL-STD-1553B	SCPS-SP, IPSec, IPv4/v6		SpaceWire		
Fixed packet size	+	-	+	-	-	+	-
Periodical data transfer	-	-	-	-	-	+	-

Stream Rate Flow Control	-	-	-	-	-	+	-
Actual data (timers)	+	-	-	+	-	+	+
Priority QoS	+	+	+	+	+	-	+
Bandwidth Reservation QoS	-	+	-	-	-	-	-
Scheduling QoS	-	+	-	-	-	-	+
Best Effort QoS	+	+	+	+	+	+	+
Data correctness check	+	+	+	+	+	-	+
Data sequence check	+	-	+	+	+	-	-
Data Retransmission	+	+	+	+	+	-	+
Selective acknowledgments	+	-	+	+	-	-	-
Timestamping	+	-	-	-	-	-	-

Streaming features of each reviewed internet and multimedia protocols of Application layer are given in the Table IV.

TABLE IV. INTERNET AND MULTIMEDIA APPLICATION PROTOCOLS COMPARISON

Features	**RTSP**	**Adobe RTMP**	**MPEG-TS**	**Apple HLS**	**Adobe HDS**	**Microsoft SS**
Header length, bytes	Not transferred data	18	4	4 (MPEG-TS)	16E (max.size of MP4)	
Max payload, bytes		16M	184	184 (MPEG-TS)		
On top what protocol should it work?	RTP, UDP, TCP	IP networks	Any transport networks	HTTP		
Fixed packet size	-	+	-	+	+	+
Periodical data transfer	-	-	-	-	-	-
Stream Rate Flow Control	-	-	-	-	-	-
Actual data (timers)	-	-	-	-	-	-
Priority QoS	-	-	-	-	-	-
Bandwidth Reservation QoS	-	+	+-	+-	+-	+-
Scheduling QoS	-	-	-	-	-	-
Best Effort QoS	-	+	+	+	+	+
Data correctness check	-	-	-	-	-	-
Data sequence check	-	+	+	+	+	+

Data Retransmission	-	-	-	-	-	-
Selective acknowledgments	-	-	-	-	-	-
Timestamping	-	+	+	+	+	+

Streaming features of each overviewed high-performance protocol stacks and standards are given in the Table V.

TABLE V. HIGH PERFORMANCE PROTOCOL STACKS COMPARISON

Features	**Spacecraft Onboard Interface Services**	**RapidIO**	**ARINC-818-2**	**SpaceWire**	**SpaceFibre**
Header length, bytes	Depends on data transfer protocols	4-8	24-28	Not limited	6
Max payload, bytes		64K	2112		256
Targets	Spacecraft	Avionics & Spacecraft	Avionics	Spacecraft	
Fixed packet size	+-	-	-	-	-
Periodical data transfer	+-	-	-	-	-
Stream Rate Flow Control	-	-	-	-	+-
Actual data (timers)	Depends on data transfer protocols	-	-	-	+
Priority QoS	+	+	-	-	+
Bandwidth Reservation QoS	+	+	-	-	+
Scheduling QoS	+	-	-	-	+
Best Effort QoS	+	+	+	+	-
Data correctness check	+	+	+	+	+
Data sequence check	Depends on data transfer protocols	+	-	-	-
Data Retransmission		+	-	-	+
Selective acknowledgments		+	-	-	+
Timestamping		-	+	-	-

According to the conducted analysis, nowadays, there is no streaming protocol which can provide all features of sensor applications. Currently existing protocols were designed for specific tasks. Internet and real-time transport protocols, such as TCP, UDP, RTP, SCTP, SSTP and others, are developed for the IP networks. They provide media content transfer via datagrams or transport connections. Only SSTP permits both data transfer mechanisms. But there is no update to the first release (2007 year) of SSTP protocol even though there is no internet draft submitted to the IETF to make as a standard protocol. So, it seems that there is no intention to make it standard so far [20]. Also internet and multimedia application protocols, such as RTSP and RTMP, are worked over IP networks. RTSP is used only to manage a media translation. Apple HLS, Adobe HDS and MSS are designed to work over HTTP networks. They support very useful streaming function – adaptive bitrate streaming. MPEG-TS doesn't support this option. However, it could be used over any transport networks. As it is clear seen from comparison the high-performance protocol stacks don't support all stated streaming functions.

Therefore, there is no streaming oriented transport protocol providing all features of sensor applications. Taking into account the streaming protocol analysis and the problem of network congestion the Adaptive Data Streaming Service (ADSS) is proposed.

IV. Adaptive Data Streaming Service

For onboard networks the key point is the fault tolerance and liveness. It means that the ability to work correctly with failed routers, nodes or links has the highest priority for the onboard spacecraft networks. To avoid and minimize the mission critical data losses ADSS is proposed.

ADSS is a service between Application and Transport layers. It will work over existing Transport protocols or Protocol stacks such as SpaceWire or SpaceFibre (Fig. 3).

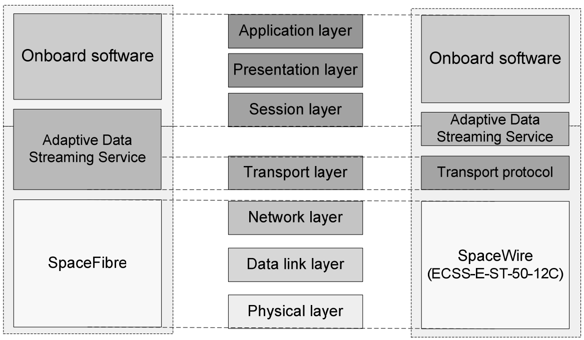

Fig. 3. ADSS and OSI model

ADSS will provide the following global mechanisms: QoS support and Adaptive QoS control.

1) QoS support: ADSS will provide missing QoS (Bandwidth Reservation, Scheduling and Priorities) for the entity of Transport protocol. These QoS types are significant. They allow to perform a traffic shaping. The Traffic shaping is used to optimize or guarantee performance, improve latency and/or increase usable bandwidth for some kinds of packets by delaying other kinds.

2) Adaptive QoS control: ADSS will perform adaptive control of QoS in the onboard network. For this purpose ADSS will provide two functions: monitoring of the network state and QoS control.

The monitoring is used to evaluate the real network state (size of packets queue in buffer of sender/receiver equipment, number of incorrect received packets, etc.).

The QoS control will be based on monitoring information and traffic requirements (rate, latency requirements, etc.). To minimize the subsequences of network congestion the QoS control can do the following operations: increase or decrease the packet priority; switch guaranteed delivery to Best Effort QoS; modify values of timers (e.g. packet life-timer); change the duration of time-slots; assign nodes for data transfer during specific time-slots; switch connection-oriented data transfer to datagrams and enable adaptive segmentation of packet size if large packet are lost.

These functions could help to adjust streaming under changing of the network state. ADSS is aimed to minimize the subsequences of the network congestion in spacecrafts.

V. Conclusion

The paper gave an overview of the congestion network problem in spacecrafts consisting of large number of sensors and systems. They produce high rate streaming traffic. The congestions occur because of equipment malfunction (routers, receive/transmit nodes, links). To minimize the subsequences of the network congestion the QoS control is required. To solve this problem the analysis of streaming traffic, its characteristics, QoS, features of streaming sensor applications and the overview of streaming protocols were done. It shows that there is no such streaming protocol providing Scheduling, Bandwidth Reservation and Priorities QoS, periodical data transfer and other required mechanisms for the sensor applications. Adaptive Data Streaming Service (ADSS) is proposed to solve this problem. Also, to minimize the network congestions ADSS will have specific mechanisms. They will perform the adaptive control of the QoS over the onboard network. The basic concepts of ADSS were presented in this paper.

Acknowledgment

The research leading to these results has received funding from the Ministry of Education and Science of the Russian Federation under the contract №14.578.21.0022.

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