Question 17/12 – Performance of packet-based networks and other networking technologies

(Continuation of Question 17/12)

1 Motivation

As critical communications services increase their reliance on new networking technologies like MPLS and Ethernet over various network domains, network performance remains important to the user's experience. When several network operators work together to provide end-to-end communications, each needs to understand how to achieve the end-to-end performance objectives. Such objectives must be both adequate for the service being offered and feasible based on the available networking technologies.

A framework is needed to guide the development of Recommendations for performance aspects of new network capabilities, transmission facilities, and transport services (e.g. forward error correction and retransmission protocols), including those supported by the emerging and heterogeneous infrastructure. Such a framework is also essential for relating performance

There is a continuing need for packet network performance parameters, performance metrics, methods of measurement and analysis, and these needs are met by contributions to, and subsequently the approved Recommendations developed by this Question. Other Questions, ITU Study Groups, and some Standardization Bodies should expect that unique needs in the area of packet network performance metrics will be satisfied by this Question's work, so that they can continue with their unique work plans without overlap.

When new networking technologies are proposed, it is not clear whether they will become sufficiently important to warrant the development of one or more new Recommendations on performance parameters, methods of measurement, and/or numerical objectives. Some investigation of each technology is worthwhile to determine whether it is an appropriate candidate.

The following major Recommendations, in force at the time of approval of this Question, fall under its responsibility:

G.1021, G.1022, I.350, I.351, I.353, I.355, I.356, I.357, I.381, Y.800, Y.1540, Y.1541, Y.1543, Y.1544, Y.1546, Y.1560, Y.1561, Y.1563, Y.1564, Y.1565, Y.1566

2 Question

Study items to be considered include, but are not limited to:

– General and cross-technology performance studies

  • How should the generic measurement points, reference events, communication functions, performance outcomes, and performance parameters defined in ITU-T Recommendations be supplemented to address new network capabilities (e.g. multipoint connections, multi-connection calls, and modification of connection attributes), new access arrangements (e.g. wireless, satellites, HFC, xDSL, Passive Optical Networking), and new services/applications (e.g. interactive multimedia communications, personal and terminal mobility including IMT-2020 systems, flexible routing and charging, security, IP network service access, web browsing, Network Function Virtualization, NFV, and virtual private networks)?

- How can the measurement of packet networks be improved, for example, to support more meaningful service level specifications between network operators and their customers?
- How can the measurement of packet networks be coordinated, to address the issues and complexities associated with large network scale?
- How should Recommendations on network performance address communications built on heterogeneous networking technologies, such as seamless wired-wireless communications support?
- What new metrics can be developed and specified to serve the packet network infrastructure, including the needs of measurement systems and other fundamental applications (such as timing systems)?
- How can the definition or the measurement of packet loss be improved to discriminate events that affect end systems and user applications?
- How can the definition or the measurement of packet delay variation be improved to provide more information to end-system designers?

– Network performance, including new technologies and existing technologies such as virtual network overlays, IP, MPLS, and Ethernet:
- Which layer(s) or other conventions have end-to-end significance in specifying performance the new technology?
- What reference events will be available to define performance parameters for these networks?
- What performance parameters and statistics should be standardized for such networks?
- How can complex topologies be assessed, such as multipoint-to-multipoint?
- What QoS levels will be needed by the services supported on these networks?
- How will the end-to-end QoS objectives for new services be achieved when more than one network participates in the provision of communications?
- To what extent will QoS commitments depend on the existence of traffic contracts that completely specify the characteristics of the offered traffic?
- How will QoS commitments of networks be verified?
  The above technologies are being deployed in new network domains, such as wired and wireless, access and transport, and within the home and business. The scope of this Question includes all these domains.

– What QoS class descriptions can assist the interconnection of network domains?
– IP network performance
- What additional performance objectives for systems employing application-layer packet loss compensation should be specified in Recommendation Y.1541?
- How will the end-to-end QoS objectives for IP-based services be achieved when more than one IP network participates in the provision of communications?
- How will users of IP-based services communicate their need for an IP QoS commitment?
- What additional performance objectives for compressed data (e.g. MPEG video, G.72x codec signals) should be specified in Recommendation Y.1541?

- In addition to the applications and services mentioned above, will machine to machine (M2M) and camera and sensor networks influence the objectives or require new QoS classes?
- TCP, UDP, QUIC, and other transport protocol performance
  - How will evolution of these protocols be reflected in new performance parameters?
  - How will evolution of these protocols influence IP objectives or QoS classes?
- Modelling transmission-related components of end-systems
  - What end-system components should be modelled, so that the UNI-UNI performance can be estimated in mid-path measurement deployment?
  - What verification procedures are useful, when models of performance cannot be standardized, but available systems can be tested?
- How should the study items areas be organized into tasks?

3 Tasks

Tasks include, but are not limited to:
- draft new Recommendation on new technology performance parameters;
- updates and maintenance of the Recommendation QoS class mapping between domains;
- updates and maintenance of the Recommendation on various performance parameters;
- updates and maintenance on Y.1540 IP performance parameters and Y.1541 IP-based network objectives;
- update the fundamental Recommendation on general aspects of quality of service and network performance in digital networks, I.350;
- continue to develop and expand the current Recommendations on assessment (testing) of key performance parameters to serve many audiences, including diagnostic and monitoring operations;
- new or revised Recommendation on IP/packet performance parameters;
- additions and updates to other existing Recommendations.

An up-to-date status of work under this Question is contained in the SG12 work programme http://www.itu.int/ITU-T/workprog/wp_search.aspx?q=17/12

4 Relationships

WSIS Action Lines
- C2

Sustainable Development Goals
- 9

Recommendations
- I.371, I.381, I.610, O.191, G.828, Y.1710, Y.1711, Y.1731

Questions
- 11/12, 13/12, 14/12

Study Groups

– ITU-T SG2, SG13, SG15, SG16, SG17

– ITU-R SG5, SG6

Other bodies

– MEF, IETF working groups on performance issues, IEEE 802 LAN/MAN Standards Committee, 3GPP, Broadband Forum, ETSI, ANSI, GSMA