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SERIES F: NON-TELEPHONE TELECOMMUNICATION SERVICES

Multimedia services

Requirements for unified status monitoring of networks and services

Recommendation ITU-T F.746.8

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Recommendation ITU-T F.746.8

Requirements for unified status monitoring of networks and services

Summary

Recommendation ITU-T F.746.8 describes requirements and functional architecture for a unified status monitoring (USM) system that allows network providers and application service providers (ASPs) to get the status information they need. The USM system, which consists of a USM server and a set of USM agents, collects both static and dynamic status information from network providers and ASPs. It can also parse the status requests from network providers and ASPs, generate the status reports and send the reports back to them.

History

Edition	Recommendation	Approval	Study Group	Unique ID*
1.0	ITU-T F.746.8	2018-08-29	16	11.1002/1000/13659

Keywords

Application service provider, network provider, status monitoring, two-way information sharing.

* To access the Recommendation, type the URL http://handle.itu.int/ in the address field of your web browser, followed by the Recommendation's unique ID. For example, http://handle.itu.int/11.1002/1000/11830-en.

FOREWORD

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The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

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In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

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As of the date of approval of this Recommendation, ITU had not received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementers are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database at http://www.itu.int/ITU-T/ipr/.

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Requirements for unified status monitoring of networks and services

1 Scope

This Recommendation describes requirements for a unified status monitoring (USM) system. The USM system collects status information from application service providers (ASPs) as well as network providers and sends analysed results back to them.

This Recommendation covers:

– requirements for the USM system and its key components;

– functional architecture of the USM system.

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

[ITU-T L.25] Recommendation ITU-T L.25 (2015), *Optical fibre cable network maintenance*.

[ITU-T L.311] Recommendation ITU-T L.311/L.93 (2014), *Optical fibre cable maintenance support, monitoring and testing systems for optical fibre trunk networks*.

[ITU-T Y.2201] Recommendation ITU-T Y.2201 (2009), *Requirements and capabilities for ITU-T NGN*.

[ITU-T Y.2701] Recommendation ITU-T Y.2701 (2007), *Security requirements for NGN release 1*.

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 application service provider (ASP) [b-ITU-T H.360]: A service provider providing application services.

NOTE – The same business entity may act as both network operator and application service provider.

3.1.2 network provider [b-ITU-T H.780]: The organization that maintains and operates the network components required to support a service or set of services.

3.2 Terms defined in this Recommendation

This Recommendation defines the following term:

3.2.1 unified status monitoring (USM): A type of monitoring that allows network providers and application service providers to get the status information they need in a unified way.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

ALTO Application-Layer Traffic Optimization

ASP Application Service Provider

DASH Dynamic Adaptive Streaming over Hypertext transfer protocol

I/O Input/Output

ISP Internet Service Provider

MOCC Multimedia Optimization Control Components

QoE Quality of Experience

USM Unified Status Monitoring

5 Conventions

This Recommendation employs the following conventions.

– The expression "**is required to**" indicates a requirement which must be strictly followed and from which no deviation is permitted if conformance to this Recommendation is to be claimed.

– The expression "**is recommended**" indicates a requirement which is recommended but not absolutely required. Thus, this requirement need not be present to claim conformance.

6 Overview

In current networks, network providers or Internet service providers (ISPs) monitor the status of networks by all kinds of measurement methods. However, there is lack of easy way for ASPs, e.g., video-sharing websites or providers, to get status information about the underlying networks, i.e., network-level status information. There are some efforts that try to provide some network-level status information to the ASPs. For example, both application-layer traffic optimization (ALTO) of [b-IETF RFC 7285] and multimedia optimization control components (MOCCs) of [b-ITU-T F.746] define one-way information-sharing mechanisms that help specific applications to get reliable information about underlying networks, e.g., network topology information. Such information can be used by ASPs to select an appropriate server or switch to another network to achieve better performance.

On the other hand, more and more ASPs adopt their own end-to-end measurement methods, such as dynamic adaptive streaming over hypertext transfer protocol (DASH) ([b-ISO/IEC TR 23009-3], [b-Stockhammer]), and adjust the behaviour of their applications based on the measurements and the inferred network status. However, this end-to-end measurement information and the decisions of ASPs, called the application-level status information, are still unknown to network providers.

To enhance the performance of applications and networks, ASPs and network providers should have better understanding of the status of the network level, as well as that of the application level, which means two-way information sharing is needed. One possible way is to establish a USM system that collects both static and dynamic status information from network providers and ASPs. The static status information includes local configurations, e.g., the network topology, and the locations of servers. The dynamic status information includes real-time raw status data, e.g., the link state, and the load on a server. It can also parse status requests from network providers and ASPs, generate status reports, and send reports back to them.

For example, the status of optical fibres is monitored by optical fibre network owners. Cuts in fibre cable can be detected by traditional link detection technologies as in [ITU-T L.25], [ITU-T L.311] or more sophisticated path and trail monitoring technologies such as M-Trail in [b-Wu]. If the ASP can get the information in a timely fashion, it may switch traffic to another ISP that is not using the failed cable. At the same time, status information about traffic demand among different data centres can be

measured by these ASPs. If the network provider can get this information, it can achieve much better bandwidth utilization and less congestions [b-Jain].

7 Requirements for the USM system

This clause addresses the requirements for the USM system.

7.1 General requirements

GEN-01: The USM system is required to collect static status information and dynamic status information from network providers and ASPs.

GEN-02: The USM system is required to manage status information, including static status information and dynamic status information, of network providers and ASPs.

GEN-03: The USM system is required to generate status reports according to requests from network providers and ASPs using static status information and dynamic status information.

7.2 Requirements for an USM agent

UA-01: A USM agent is required to support interaction with network providers or ASPs on behalf of the USM server.

UA-02: A USM agent is required to support the static status information management function to receive static status information that is sent by a network provider or an ASP and forward that information to the USM server.

UA-03: A USM agent is required to support the dynamic status information management function to query dynamic status information about a network provider or an ASP according to the command of the USM server and forward retrieved dynamic status information to the USM server.

UA-04: A USM agent is required to support the supplementary information management function to request status reports from the USM server and forward those reports to the network provider or ASP.

7.3 Requirements for the USM server

US-01: A USM server is required to support the unified data management function to store static status information collected from network providers and ASPs.

US-02: A USM server is required to support the parse/synthesize function to parse the status request.

US-03: A USM server is required to support the parse/synthesize function to retrieve the needed raw data by querying the unified data management module and the dynamic information management modules of one or more USM agents, if necessary.

US-04: A USM server is required to support the parse/synthesize function to synthesize the retrieved raw status data to generate a status report and send it back to the USM agents.

US-05: A USM server is recommended to store the retrieved dynamic status information.

8 Functional architecture of the USM system

Figure 8-1 shows the functional architecture of the USM system. A USM system consists of a USM server and a set of USM agents. The USM system interacts with network providers and ASPs. The functional entities of networks providers and ASPs lie outside the scope of this Recommendation. The USM system collects the status information from network providers and ASPs. The USM system can parse the status requests from network providers and ASPs, generate the status reports, and send the reports back to them.

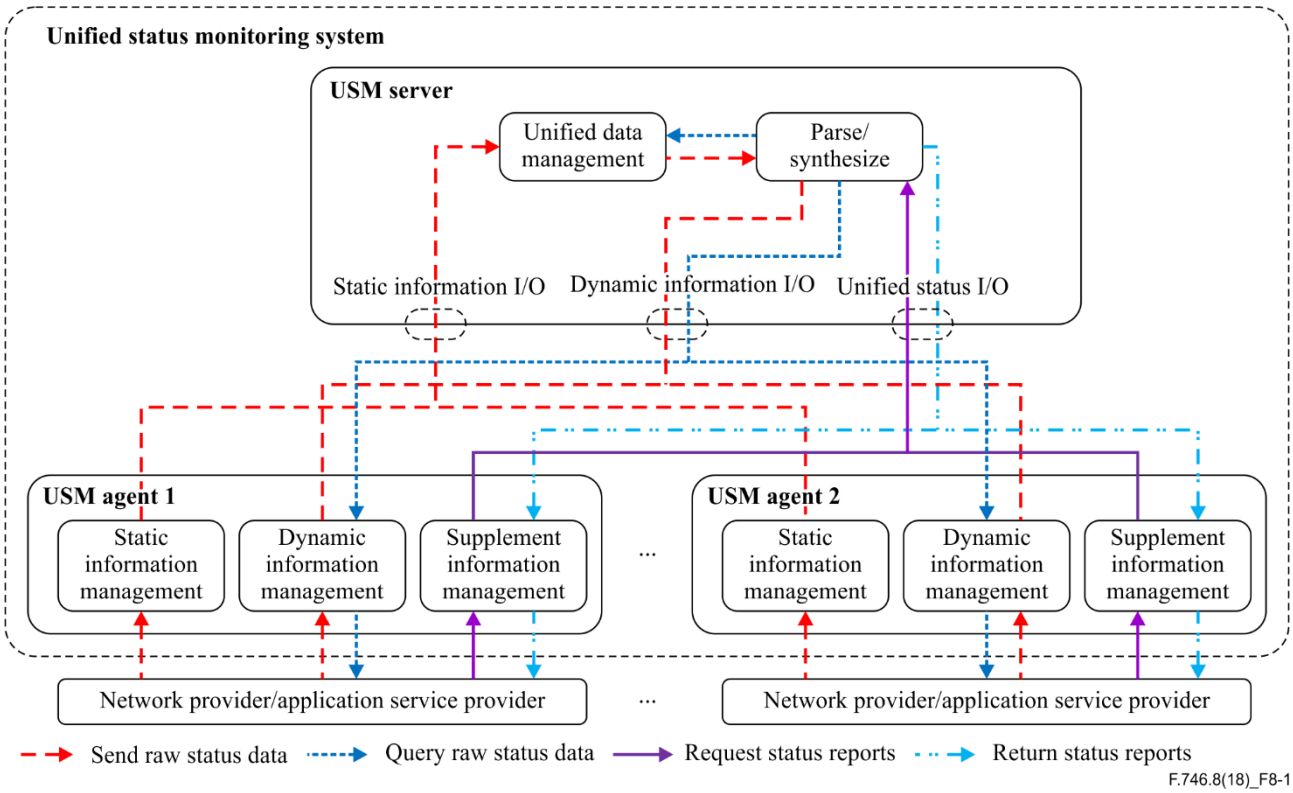

Figure 8-1 – Functional architecture of the unified status monitoring system

8.1 USM agent

A USM agent is responsible for interacting with a network provider or an ASP on behalf of the USM server. There are three modules in the USM agent, i.e., static information management module, dynamic information management module and supplementary information management module.

The static information management module is used to receive static status information, such as network topology or locations of application servers, from a network provider or ASP. It then forwards the collected information to the USM server.

The dynamic information management module is responsible for querying dynamic status information, e.g., real-time raw status data of providers according to the command of the USM server and sending the retrieved status data to the USM server.

The supplementary information management module is responsible for requesting status reports from the USM server on behalf of network providers and ASPs and returning the received status reports. Such information can be used by providers for further optimization.

8.2 USM server

The USM server is responsible for managing status information, including static status information and dynamic status information, of network providers and ASPs. There are two major functional modules in the USM server, the unified data management module and the parse/synthesize module, and three input/output (I/O) interfaces, including static information I/O, dynamic information I/O and unified status I/O.

The unified data management module is responsible for storing the static status information collected from network providers and ASPs through the static information I/O.

The parse/synthesize module is used to parse the status request, which is received from the unified status I/O, and then retrieves the needed raw status data by querying the unified data management module of the USM server and dynamic information management modules of one or more USM

agents, if necessary. After collecting all needed raw status data, the parse/synthesize module synthesizes these data and sends the reports generated to the USM agents through the unified status I/O.

9 Security considerations

It is recommended that the security requirements of [ITU-T Y.2201], [ITU-T Y.2701], and applicable ITU-T X-series, ITU-T Y-series and ITU-T M-series security Recommendations, be taken into consideration, which includes access control, authentication, data confidentiality, communications security, data integrity, availability and privacy.

Appendix I

Use cases of the unified status monitoring system

(This appendix does not form an integral part of this Recommendation.)

I.1 Use case 1: USM providing extra status information for network upgrading

Network upgrading is often done to improve performance and reliability, and support new applications. It is very important to monitor the upgraded network and the impact on applications. If status information about applications [such as the quality of experience (QoE)] is available to the network provider, it can have a better chance to make appropriate decisions rather than making too conservative or too aggressive decisions.

I.2 Use case 2: USM providing extra status information for application-level optimization

When a client of an application has a bad QoE, it may want to switch to another server to achieve a better QoE. If the bad QoE is results from traffic congestion on the ISP, it is useless to switch to another server. In this scenario, if the application client has been provided with extra information about network status, such useless switching can be avoided.

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