International Telecommunication Union

ITU-T G.8264/Y.1364

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

Amendment 1
(09/2010)

SERIES G: TRANSMISSION SYSTEMS AND MEDIA, DIGITAL SYSTEMS AND NETWORKS

Packet over Transport aspects – Quality and availability targets

SERIES Y: GLOBAL INFORMATION INFRASTRUCTURE, INTERNET PROTOCOL ASPECTS AND NEXT-GENERATION NETWORKS

Internet protocol aspects – Transport

Distribution of timing information through packet networks

Amendment 1: Use of synchronous Ethernet in a multi-operator context

Recommendation ITU-T G.8264/Y.1364 (2008) – Amendment 1

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Recommendation ITU-T G.8264/Y.1364

Distribution of timing information through packet networks

Amendment 1

Use of synchronous Ethernet in a multi-operator context

Summary

Amendment 1 to Recommendation ITU-T G.8264/Y.1364 contains additional material to be incorporated in Recommendation ITU-T G.8264/Y.1364, Distribution of timing information through packet networks.

History

Edition	Recommendation	Approval	Study Group
1.0	ITU-T G.8264/Y.1364	2008-10-29	15
1.1	ITU-T G.8264/Y.1364 (2008) Cor. 1	2009-11-13	15
1.2	ITU-T G.8264/Y.1364 (2008) Amend. 1	2010-09-22	15

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.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

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

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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/.

Recommendation ITU-T G.8264/Y.1364

Distribution of timing information through packet networks

Amendment 1

Use of synchronous Ethernet in a multi-operator context

1) Scope

This amendment contains updated material to be added to Recommendation ITU-T G.8264/Y.1364.

2) References

Add the following reference to clause 2:

[ITU-T G.709] Recommendation ITU-T G.709/Y.1331 (2009), *Interfaces for the Optical Transport Network (OTN)*.

3) Abbreviations and acronyms

Add the following abbreviations:

BS Base Station

EPL Ethernet Private Line

EVPL Ethernet Virtual Private Line

MTIE Maximum Time Interval Error

NC Network Controller

RAN Radio Access Network

TDEV Time Deviation

4) Additional material to be added to Recommendation ITU-T G.8264/Y.1364

4.1) *Renumber existing clause 12*, Synchronization management aspects, *to clause 13*.

4.2) *Insert the following as new clause 12*:

12 Use of synchronous Ethernet in a multi-operator context

There may be scenarios where timing reference needs to be distributed in a multi-operator context. This situation corresponds to a case where the timing signal of an operator is carried over the network of another operator. This timing signal may be sent towards end equipment which may require a timing reference (e.g., a base station).

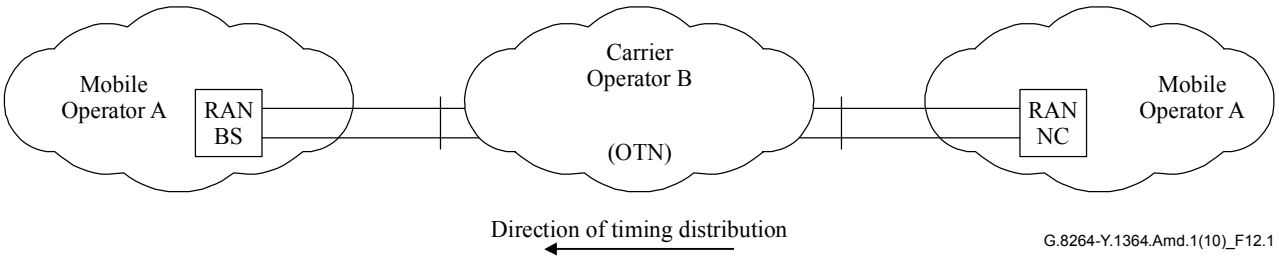

Figure 12-1 – Illustration of the multi-operator context

Note that the terms "carrier operator" and "mobile operator" will be used in the following descriptions in order to illustrate the discussion with a realistic case; however, the intention is not to restrict the discussion to this unique case, and the depicted cases should be considered as possibly more generic.

In the case the timing is carried by synchronous Ethernet, two different approaches involving the carrier operator network may be envisaged in order to deliver a timing reference to the end equipment, depending if the synchronous Ethernet client signal is transported transparently or not from the timing perspective.

Indeed, depending on the type of Ethernet managed service that is proposed by the carrier operator, a synchronous Ethernet signal from a mobile operator may not be transparently transported in terms of its timing reference (for instance, when the physical layer of the carrier network is Ethernet). In such a situation of non-timing transparency, the Ethernet client signal at the output of the Ethernet managed service is not carrying the original synchronous Ethernet timing reference.

In the case of an OTN network, timing transparency is supported in [ITU-T G.709]. For example, the use of the TTT+GMP mapping specified in [ITU-T G.709] enables a timing transparent transport of 1 Gigabit synchronous Ethernet client signals through OTN.

The case of a timing transparent Ethernet managed service is discussed in clause 12.1, and the case of a non-timing transparent Ethernet managed service is discussed in clause 12.2.

12.1 Timing transparent transport of synchronous Ethernet client signals

This first approach assumes that the timing information of synchronous Ethernet client signals can be transported transparently over the carrier operator network. This may be achieved, for instance, using an OTN network, with an appropriate timing transparent mapping. As mentioned, an example is the transport of 1000BASE-X client signal using a TTT+GMP mapping, as defined in [ITU-T G.709]. Such mapping allows transporting the client signal bit stream over the transport network, including the timing and ESMC message.

The carrier operator maps and demaps the synchronous Ethernet client signal and carries the timing signal and ESMC messages transparently over the OTN transport network (the OTN network is unaware of the presence of timing and ESMC messages in the client signal). The entire connection over the carrier operator is based on OTN equipment. This scenario is illustrated in Figure 12-2.

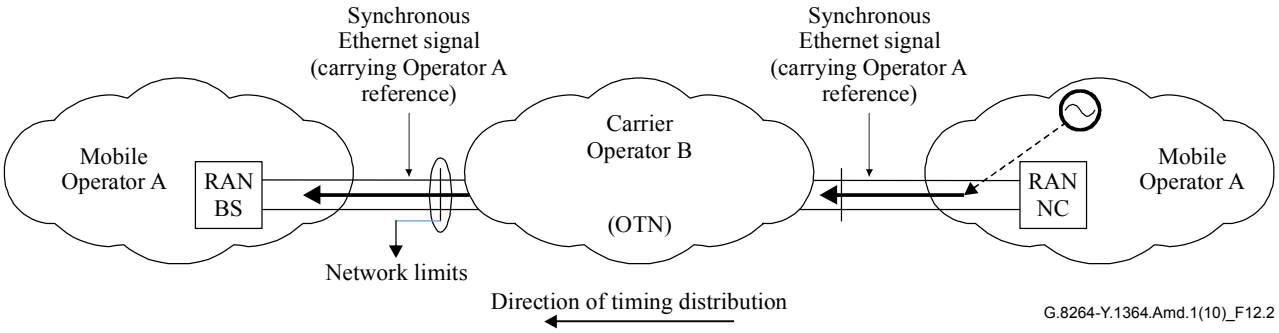

Figure 12-2 – Illustration of a timing transparent transport of the synchronous Ethernet client signals in the multi-operator context

In this scenario:

– The synchronous Ethernet signal generated by the mobile operator carries the timing reference of the mobile operator, including ESMC messages.

– The synchronous Ethernet signal is carried transparently over the carrier operator network (the bit stream is transparently transported including the timing and ESMC messages).

– The mobile operator receives and uses its own timing reference, including ESMC messages, which have been carried transparently over the carrier operator's network to synchronize end equipment in the mobile operator network.

It has to be noted that this approach is fully in line with the traditional case of a timing transparent transport of TDM signals (e.g., PDH transported in PDH network, SDH transported in OTN).

The network limits at the output of the carrier operator network corresponds to the synchronous Ethernet network limits, as defined in clause 9.2.1 of [ITU-T G.8261].

12.2 Synchronization service provided by the carrier operator based on an interface providing a physical timing reference (generation of synchronous Ethernet interface)

This second approach covers the case where the carrier operator network is a packet network (e.g., Ethernet) and is not transparent to physical layer timing signals such as synchronous Ethernet. For instance, this may be the case when Ethernet private line (EPL and EVPL) services, as defined in [b-ITU-T G.8011.1] and [b-ITU-T G.8011.2], are used (i.e., all Ethernet frames are transported from ingress to egress of the carrier operator network, but the timing is not transported).

The carrier operator may, however, offer to deliver a timing reference to the mobile operator. For instance, the synchronous Ethernet signal delivered at the output of the carrier operator network may be generated with the carrier operator timing reference. This case implies an agreement between the two operators. This scenario is illustrated in Figure 12-3.

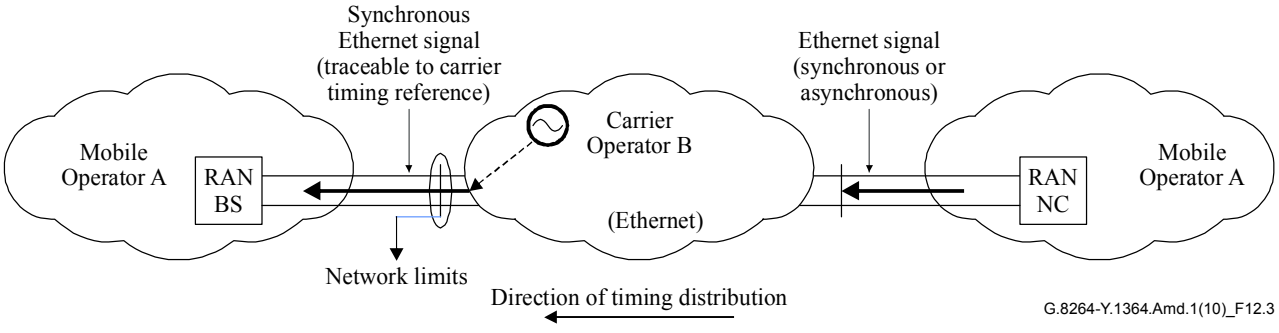

Figure 12-3 – Illustration of a synchronous Ethernet synchronization service in the multi-operator context

In this scenario:

– The mobile operator subscribes to a specific synchronization service (which could be part of the mobile backhaul connectivity offer).

– The mobile operator sends an Ethernet signal carrying his traffic, but the timing reference of the source cannot be carried over the carrier network. ESMC messages from the mobile operator are not passed through the carrier operator network. Note that in this case, the input Ethernet signal does not need to be a synchronous Ethernet signal.

– The carrier operator provides the timing, including the ESMC, at the edge of the carrier network resulting in the synchronous Ethernet signal being traceable to the clock within the carrier network. Note that this approach assumes that the ESMC messages generated by the carrier operator can be inserted in the output synchronous Ethernet signal together with the mobile operator data traffic. The specific cases when ESMC insertion may not be properly processed (e.g., bit transparent services) are for further study.

– Equipment within the mobile operator uses the timing reference and ESMC messages delivered by the carrier operator network.

It has to be noted that this second approach is only applicable in case the end equipment requires an absolute timing reference (PRC traceability). For instance, in order to deliver a timing reference to a base station, instead of sending the timing reference of the mobile operator, traceable to UTC, to the base station, the carrier operator timing reference, also traceable to UTC, may be used.

For TDM end applications traceable to a PRC requiring the control of slip rate, it has to be mentioned that this situation can be considered similar to the pseudo-synchronous mode defined in [b-ITU-T G.810] that is sometimes used within the same operator domain (e.g., when several PRCs are used), and that still ensures that a potential TDM slip rate is controlled according to [ITU-T G.822].

The network limits at the output of the carrier operator network should correspond to the synchronous Ethernet network limits, as defined in clause 9.2.1 of [ITU-T G.8261].

In this second approach, the synchronous Ethernet signal at the output of the carrier operator network must carry an SSM value via the ESMC. The information contained within the ESMC is part of the agreement between the operators.

5) Bibliography

Add the following references to the Bibliography:

[b-ITU-T G.810] Recommendation ITU-T G.810 (1996), *Definitions and terminology for synchronization networks*.

[b-ITU-T G.8011.1] Recommendation ITU-T G.8011.1/Y.1307.1 (2009), *Ethernet private line service*.

[b-ITU-T G.8011.2] Recommendation ITU-T G.8011.2/Y.1307.2 (2009), *Ethernet virtual private line service*.

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