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STANDARDIZATION SECTOR
OF ITU

SERIES D: TARIFF AND ACCOUNTING PRINCIPLES AND INTERNATIONAL TELECOMMUNICATION/ICT ECONOMIC AND POLICY ISSUES

Recommendations for international telecommunication/ICT economic and policy issues – International Internet connectivity; and Tariff, Charging Issues of Settlements Agreement of Trans-multi-country Terrestrial Telecommunication

Optimizing terrestrial cable utilization across multiple countries to boost regional and international connectivity

Recommendation ITU-T D.1040

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Recommendation ITU-T D.1040

Optimizing terrestrial cable utilization across multiple countries to boost regional and international connectivity

Summary

Recommendation ITU-T D.1040 provides a collaborative framework that can be applied in order to promote optimal cable utilization across multiple countries and boost regional and international connectivity. The framework is based on a proportional allocation model, which allocates circuits based on the length of fibre contributed to the terrestrial multi-country end-to-end cable network.

History

Edition	Recommendation	Approval	Study Group	Unique ID*
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Keywords

Cooperation model, end-to-end connectivity, Internet traffic boost, optimization of terrestrial cable use, trans-multi-country terrestrial cable, unified.

* 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

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications, information and communication technologies (ICTs). The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of ITU. ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

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

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

Compliance with this Recommendation is voluntary. However, the Recommendation may contain certain mandatory provisions (to ensure, e.g., interoperability or applicability) and compliance with the Recommendation is achieved when all of these mandatory provisions are met. The words "shall" or some other obligatory language such as "must" and the negative equivalents are used to express requirements. The use of such words does not suggest that compliance with the Recommendation is required of any party.

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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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Introduction

Most countries around the globe have completed the construction of their backbone terrestrial cable networks. However, the existing terrestrial cables are only effectively connected and utilized between two neighbouring countries. Once three or more countries are involved, the cables tend to be under-used because the transit countries over-charge other countries for their transit services. As a result, the terrestrial cables are not reaching their full potential in boosting regional and international connectivity.

It is of great benefit for Member States to optimize terrestrial cable utilization across multiple countries to boost regional and international connectivity for the following reasons, among others:

1) With more international internet traffic to carry, the capacity of the existing trans-border and domestic backbone networks can be put into full use.
2) A terrestrial cable route can provide backup for other submarine/terrestrial cable routes, which will increase network stability.
3) It is particularly conducive to solving the problems of landlocked countries in accessing international Internet.
4) Enhanced terrestrial connectivity will boost international internet traffic, which will eventually flow to submarine cables. The combination of terrestrial and submarine cables will greatly improve international connectivity.

The bottleneck for efficient utilization of the existing terrestrial cable resources is long existent and obvious: without a universally accepted cooperation model among telecom operators in different Member States, the intermediate countries often charges excessively high for transit services and the negotiations are usually complicated and ineffective, which makes it extremely difficult to form a trans-multi-country terrestrial cable network.

To address this problem, this Recommendation proposes a cooperation model to optimize the utilization of the existing terrestrial cables, so that they can play a larger role in boosting regional and international connectivity.

Recommendation ITU-T D.1040

Optimizing terrestrial cable utilization across multiple countries to boost regional and international connectivity

1 Scope

This Recommendation provides a cooperation model that can promote optimal cable utilization across multiple countries and boost regional and international connectivity. The model is based on proportional allocation method, which allocates end-to-end circuit capacity based on the length of fibre contributed to the trans-multi-country terrestrial cable network.

Throughout this Recommendation, the terms "cable" or "trans-multi-country terrestrial cable network" refer to existing terrestrial fibre cables already deployed.

The scope of this Recommendation is limited to the physical terrestrial cable network, i.e., the transport network. The various and more complicated factors that impact the charging and costs of the Internet, i.e., the Internet Protocol (IP) network, are not discussed herein. Recommendation ITU-T D.50 [b-ITU-T D.50] and its associated Supplements should be consulted for the provisions of IP-based international Internet connections.

2 References

The following ITU-T Recommendations and other references contain provisions that, through reference in this text, constitute provisions of the present 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.

None.

3 Definitions

3.1 Terms defined elsewhere

None.

3.2 Terms defined in this Recommendation

This Recommendation defines the following terms:

3.2.1 trans-multi-country terrestrial cable: An existing terrestrial cable that passes through multiple countries.

3.2.2 contribution (of fibre-optic cable): In a settlement agreement of trans-multi-country terrestrial cable, the fibre-optic cable committed by each member operator to be used in the route of the entire trans-multi-country terrestrial cable. To fulfil the commitment, they can build new cables or use the existing ones.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

DWDM Dense Wavelength Division Multiplexing

IP Internet Protocol

TTC Trans-multi-country Terrestrial Cable

5 Conventions

None.

6 Towards cooperation for boosting regional and international connectivity

6.1 In the context of the under-utilization of terrestrial cables, Member States are encouraged to foster international cooperation to boost connectivity and optimize the use of terrestrial cables.

6.2 Member States, Sector Members and other interested parties should cooperate, where applicable, to reduce the cost of connectivity, in particular for landlocked countries.

7 The proportional allocation method

7.1 In order to address the issues above, Member States, Sector Members and other interested parties may consider, as one of the options tackling this issue, a proportional allocation method, where each party involved contributes the cable strand that passes through its own country to form an end-to-end trans-multi-country terrestrial cable (TTC) network, and are allocated a portion of the designed capacity of the network that is in proportion to the length of its fibre contribution.

7.2 The key principle underlying this method is to allocate the designed circuit capacity of the end-to-end TTC to each operator in proportion to the length of cable it has contributed. Taking the three-country scenario as an example (see Figure 1 below), countries A, B, and C contribute their terrestrial cable resources L_A, L_B and L_C respectively to form an end-to-end TTC from N1 to N2.

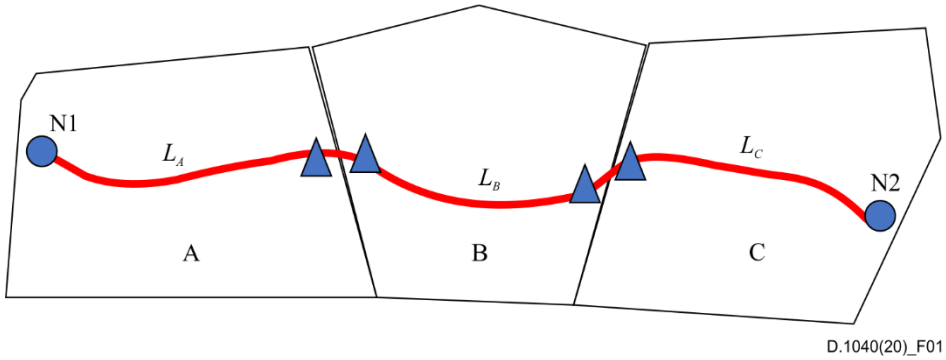

Figure 1 – The proportional allocation method

Countries A, B and C are all allocated a number of end-to-end TTC circuits in proportion to the length of their contribution. The allocated circuits may be for their own use or for sale.

If $\boldsymbol{X_i}$ is the number of circuits to be allocated to country i, the formula is as follows:

$$\boldsymbol{X_i = \left[\frac{L_i}{(L_A + L_B + L_C)} \times \lambda\right]}, \ \boldsymbol{i}\text{ = A, B or C, and }\boldsymbol{\lambda}\text{ is the total number of circuits.}[1]$$

Similarly, the values of b and c, which are the circuits allocated to countries B and C, can be calculated.

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1 Multiply the ratio of the contribution-length-by-country-*i* to the total-route-length by the total-number-of-circuits λ, and then round the value. λ is usually 40 or 80.

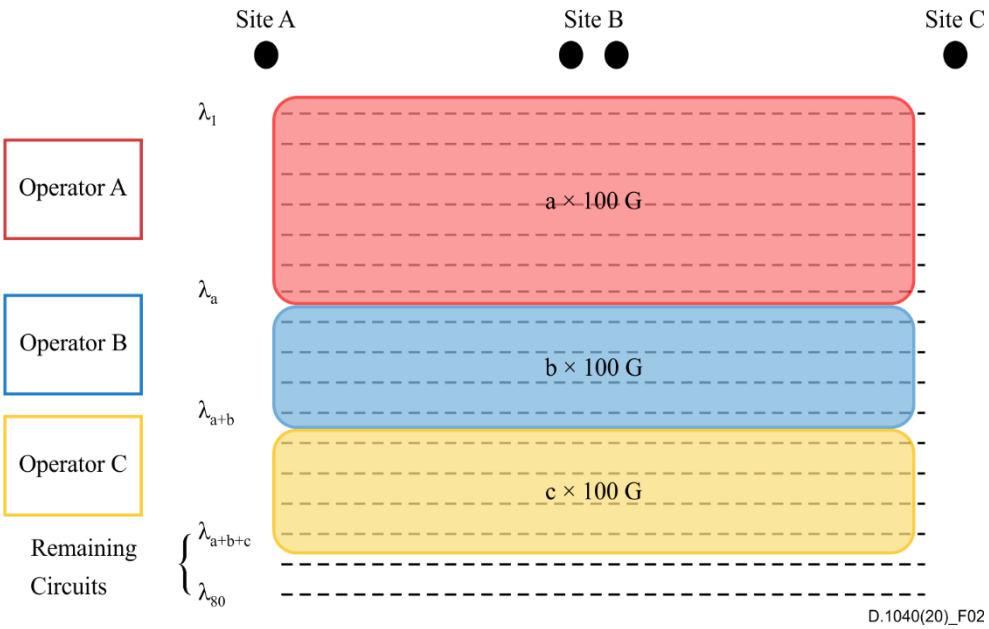

Figure 2 – The algorithm of circuit allocation (80×100Gbps DWDM system)

7.3 The remaining circuits (1 or 2 circuits) can be made available for sale. The benefits after sale can be divided by all member operators in proportion to their contribution. In addition, if a certain operator contributes a cable that is too short compared to other operators' contributions but is indispensable in the route, it is best to guarantee that this operator is allocated at least one circuit.

8 The TTC consortium for the proportional allocation method

8.1 In order to operationalize the proportional allocation method described in clause 7, a TTC consortium may be established, which would be responsible for the planning, construction and maintenance of the TTC.

8.2 The TTC consortium should adopt common technical standards, construction and maintenance, resource scheduling, fault handling, and one-stop configuration and management. The purpose is to connect the scattered networks and form a regional or international network based on the cooperation model.

9 Application of the present Recommendation

9.1 Member States, taking into account specific national or regional conditions, should consider encouraging their telecommunication operators to cooperate to optimize terrestrial cable utilization across multiple countries to boost regional and international connectivity, using models such as the one described in the present Recommendation.

Bibliography

[b-ITU-T D.50] Recommendation ITU-T D.50 (2011), *International Internet connection.*

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