

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

Series L

Supplement 25

(04/2016)

SERIES L: ENVIRONMENT AND ICTS, CLIMATE
CHANGE, E-WASTE, ENERGY EFFICIENCY;
CONSTRUCTION, INSTALLATION AND PROTECTION
OF CABLES AND OTHER ELEMENTS OF OUTSIDE
PLANT

ITU-T L.1502 – Best practices for infrastructure adaptation to climate change

ITU-T L-series Recommendations – Supplement 25

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Supplement 25 to ITU-T L-series Recommendations

ITU-T L.1502 – Best practices for infrastructure adaptation to climate change

Summary

Supplement 25 to the ITU-T L-series of Recommendation provides general principles and illustrates best practices on how information and communication technology (ICT) infrastructure can be adapted to cope with the effects of climate change.

Examples cited provide countermeasures to climate vulnerabilities identified in the Checklist in Recommendation ITU-T L.1502. These are: temperature rise, humidity, wind loading, sea level rise, rainfall, floods, landslides, snow and ice fall, lightning strikes and species damage.

Continuity of electric power supply is an important consideration in the event of electric grid failure, or failure of any other primary source of power. Functions that before were all in the same local system will have some of their functions possibly located hundreds of kilometres away, in a data centre. Such data centres may belong to services other than telecommunications. This will pose new challenges to primary service availability and continuity in case of occurrence of extreme events such as loss of power.

History

Edition	Recommendation	Approval	Study Group	Unique ID*
1.0	ITU-T L Suppl. 25	2016-04-27	5	11.1002/1000/12893

Keywords

Climate change adaptation, infrastructure, protection systems, resilience, telecommunications network.

* 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.

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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Supplement 25 to ITU-T L-series Recommendations

ITU-T L.1502 – Best practices for infrastructure adaptation to climate change

1 Scope

This Supplement provides general principles and examples of best practices which demonstrate information and communication technologies (ICTs) which can enable telecommunications infrastructure to adapt to the effects of climate change.

Examples cited provide countermeasures to climate vulnerabilities identified in the ITU-T L.1502 Checklist. These are: temperature rise, humidity, wind loading, sea level rise, rainfall, floods, landslides, snow and ice fall, lightning strikes and species damage.

Examples of resilient networks are included in this Supplement.

Continuity of electric power supply is an important consideration in the event of electric grid failure or failure of any other primary source of power.

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.1502] Recommendation ITU-T L.1502 (2015), *Adapting information and communication technology infrastructure to the effects of climate change*.

3 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

FG-DR&NRR	Focus Group on Disaster Relief Systems, Network Resilience and Recovery
G	Generation (of mobile network type, e.g., third generation, 3G)
ING	Intelligent Network Gateway
IP	Internet Protocol
IUG	Intelligent User Gateway
NFV	Network Function Virtualization
PSTN	Public Switched Telephone Network
QoE	Quality of Experience
QoS	Quality of Service
SDH	Synchronous Digital Hierarchy
SDN	Software Defined Network
SLA	Service Level Agreement
TV	Synchronous Digital Hierarchy
UPS	Uninterruptible Power Supply
USAID	United States Agency for International Development

4 Resilience in telecommunications networks

Although not targeted at any specific climate-change vulnerability, networks can be made more resilient by providing duplication of paths to access telecommunications services. Such networks can withstand at least one failure before access to essential services is cut off. Resilience is commonly provided by network operators where the traffic of more than 100 users is aggregated onto a common path.

The ITU-T Focus Group on Disaster Relief Systems, Network Resilience and Recovery (FG-DR&NRR) was established by ITU-T Telecommunication Standardization Advisory Group (TSAG) in Geneva, 10-13 January 2012 and concluded with a number of technical reports in June 2014 [b-ITU-T FG]. An overview of resilience in telecommunications networks can be found in [b-Overview] and several other technical reports also discuss resilience in the context of disaster relief systems. The gap analysis [b-ITU-T FG-Gap] includes a review of ITU-T Recommendations on lightning strikes, protection switching, natural disasters, electricity provision and backup, as well as systems for disaster relief.

5 Examples of resilience in fixed and mobile telecommunications infrastructure

An example of resilient network design which represents best practices for both fixed telecommunications and cellular network types is shown in Figure 1.

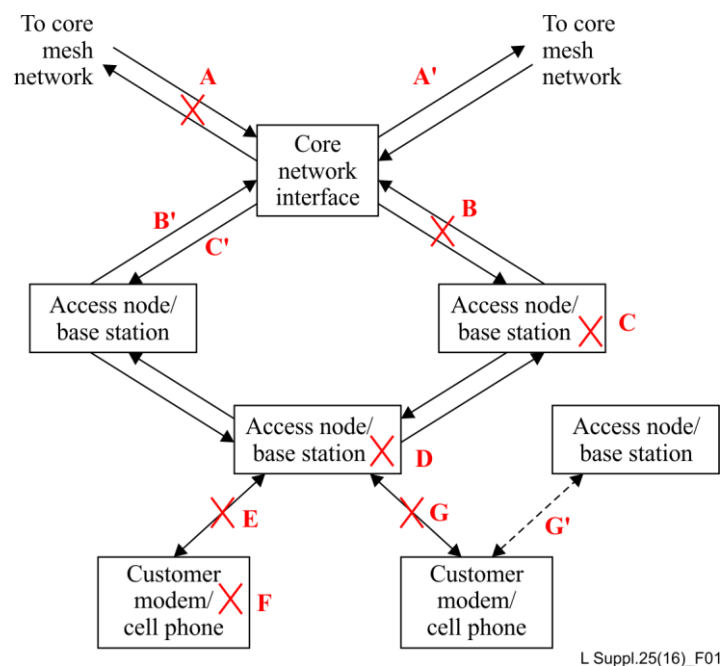


Figure 1 – Resilient network design

The core network is shown at the top of the figure and is connected to a fully meshed set of core network switches which include international gateways. The meshed core network is inherently resilient against single and some multiple failures. Examples of customer nodes are shown at the bottom of the figure. The access and backhaul network is at the centre. This forms a bi-directional ring which may be looped back at any node in the event of a path or node failure. Once looped-back, it becomes a single "folded ring". A number of failure/resilience modes are shown with the letters A-F.

- In case A, the network is protected against a single point of failure by path A'. When path A fails, path A' takes over the traffic.