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Summary

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Keywords

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# 1 List of Contributors

The following member of the FGNET2030 participated in the development of this document and have requested to be included in this list:

# 2 References

[ITU-T X.yyy] Recommendation ITU-T X.yyy (date), *Title*.

# 3 Terminology

# 4 Introduction

This Recommendation uses the following abbreviations and acronyms:

<abbr> <expansion>

<Include all abbreviations and acronyms used in this Recommendation>

This document focus on routing requirements for NET2030 based on the services and use cases outputs from sub-group 1 and 2.

# 5 Routing in NET2030

Routing protocols play a very important role in today’s networks and have evolved over years to meet the ever-changing requirements. With the new developments and use cases for NET2030, existing routing protocols need to be improved and there will be new routing protocols to achieve the following goals on top of what’s already there today.

* Predictive routing

Fast convergence has always been one merit for routing protocols. The reason for routing protocol to re-converge is mainly due to network topology change caused by router or link failure, adding or removing routers.

Predictive routing means the movement of a router/host is predictable, hence routing algorithm can predict the routes change. There is a category of new applications that may benefit from predictive routing, such as cars driving on highway, robots moving in a factory.

* Domain specific routing protocol/algorithm

There are new routing protocols being developed at IETF for data centers, e.g. RIFT and LSVR. In the near future, there might be more domain specific cases that require new routing protocols or algorithms, such as routing for satellite communications.

* Application aware routing

Traditional routing protocols have been calculating best/shortest path based on metric, a relatively static calculation. New factors should be considered when calculate path, such as network resources (bandwidth, storage etc.), dynamic traffic distribution, service location.

* Security

Routing protocols have been running in a relatively benign environment, with the development of new applications and more hosts/IOTs are being added to the network, security is becoming more and more important.

# 6 Requirements and Gaps



* Mobility

There have been different proposals trying to solve this problem.

One category of solutions is about locator and id separation, and one example is LISP. (Experimental RFCs published by IETF: <https://datatracker.ietf.org/doc/rfc6830/> ) However due to its complexity etc., the deployment is limited.

In QUIC (https://datatracker.ietf.org/doc/draft-ietf-quic-transport/), a connection ID is used to ensure that changes in addressing at loser protocol layers (UDP, IP) don’t affect a QUIC connection.

* Security

Current routing protocols are built on the assumption of high degree of trust. IGPs are typically running within a controlled secured domain, and BGP connected with trusted neighbours. For NET2030 there are two possible solution directions (not exclusive of each other):

* Making existing routing protocols more secure by adding new authentication mechanisms/algorithms etc.
* New secured protocol, e.g. SCION

  Resilience

In case of failures, routing protocol should be able to provide fast convergence and maintain an acceptable level of services (limited packet drops etc.)

* Manageability and easy operation

Easy configuration and debugging. Currently, network management is focusing more on single device, and this will become harder to do and more costly as the number of devices in the network keeps growing. Future routing protocols should support Zero Touch Provisioning (ZTP), and real time state notifications to facilitate control plane telemetry.

* Scalability

With IoT, the number of connected devices is expected to grow to billions, and it is common for a Data center network to have more than tens of thousands end points. Currently IGPs can only scale to thousands, and this should be increased to tens of thousands level by either evolving of existing protocols (OSPR/ISIS) or new routing protocols.

* Application driven routing

Based on the requirements from applications, routing protocols should be able to provide a path or a set of paths that satisfy the requirements, such as going through a particular router for a service or meeting a minimum bandwidth requirement.

* Cloud interconnection

This is a new topic and the exact requirement is not clear, more research needs to be done. One example: someone might be connected to Verizon and using VNFs in Amazon, and storage in Google.

* Cross domain service function chaining.

# 7 New Routing Protocols

* RIFT
* LSVR
* SCION

Annex A  
  
<Annex Title>

(This annex forms an integral part of this Recommendation.)

<Body of annex A>

Appendix I  
  
<Appendix Title>

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

<Body of appendix I>

Bibliography

[b-ITU-T X.yyy] Recommendation ITU-T X.yyy (date), *Title*.

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