Synchronisation of Network Parameters
draft-bryant-rtgwg-param-sync-00

Abstract

   This document describes a mechanism for a link state routing protocol
   to coordinate the value of a network-wide parameter. The document
   also defines the solution to one specific case: the agreement of a
   common convergence timer value for use in network convergence.

Status of This Memo

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Table of Contents

1. Introduction

   There exist use cases where it desirable for a network to use a
   common value for a parameter across all nodes. In the past, these
   use cases have been addressed by setting the parameter to a constant
   value in the protocol definition itself, or by requiring that the
   same value of the parameter be configured at every node.

   Setting the parameter to a constant value in the protocol definition
   makes it very difficult to change the parameter, since a change would
   require formal modification to the protocol. In practice, such a
   change is impractical, so the constant value needs to be chosen
   conservatively. This may impose a fundamental restriction on the
   eventual use of the protocol.

   Manual or "static" configuration of the parameter is fraught for two
   reasons. First, it is always difficult to ensure that the correct
   value is installed in all of the routers. Second, if any change is
   introduced into the network that results in a need to change the
   value (for example due to a change in hardware or software version)
   then all of the routers need to be reconfigured to use the new
   parameter value.

This document describes a protocol extension that propagates a
parameter throughout the flooding domain. The method of choosing
between one or more different advertised values, the flooding scope,
and the action to be taken when the parameter changes MUST be
provided in the definition of the parameter type.

This document also creates one parameter type: Convergence Timer
intended for use in IP Fast-reroute applications [RFC5714] [RFC5715].

2. Requirements Language

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT",
"SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this
document are to be interpreted as described in RFC2119 [RFC2119].

3. Mechanism

The following mechanism is specified.

A new information element is introduced into the routing protocol
that specifies the parameter. Each router is expected to advertise a
specific value of the parameter, which that router determines based
mainly on considerations local to that router. In general, different
routers in the flooding domain will advertise different values of the
parameter.

A router receiving the parameter values advertised by all routers in
the flooding domain will use a well-defined method to select the
operational value of the parameter that it uses in the running of the
protocol. All routers MUST use the same method applied to the same
set of advertised parameter values. All routers SHALL therefore
choose the same operational value for the parameter.

Note the operational value for the parameter selected SHOULD NOT
directly affect the value for the parameter advertised a router.

The method of selecting from a range of advertised parameter values
MUST be provided in the parameter definition.

The definition of the parameter MUST specify the action to be taken
when a new parameter value is advertised that would cause a change in
the selected value.

The definition of the parameter MUST specify the action to be taken
in the legacy/migration case, where not all routers advertise the
parameter.

4. Protocol Details

   This section describes the protocol extensions needed to implement
   this functionality.

4.1. ISIS

   A new Network Wide Parameter (NWP) sub-TLV is introduced into the IS-
   IS Router CAPABILITY TLV (TLV #242 defined in [RFC4971]). The
   setting of the S-bit in TLV #242 (indicating whether the parameter
   should be leaked between levels) MUST be included in the specific NWP
   definition.

       Network Wide Parameter Sub-TLV
       TYPE: <TBD>
       Length: As defined by parameter definition.

           Sub-sub-TLV
           NWP Type: (16 bits) as defined in NWP Registry
           NWP Value: As defined by parameter definition

4.2. OSPF

   THIS NEEDS CHECKING OVER BY AN OSPF EXPERT

   A new OSPF Router Information LSA TLV is defined. This may be
   carried in a type 10 or type 11 OSPF Opaque LSA depending on the
   required flooding scope.

       Network Wide Parameter TLV
       TYPE: <TBD>
       Length: As defined by parameter definition.

           Sub-TLV
           NWP Type: (16 bits) as defined in NWP Registry
           NWP Value: As defined by parameter definition

5. Convergence Time

   Routers running a fast-reroute mechanism such as Maximally Redundant
   Tree (MRT) [RFC7812] fast re-route require a network wide convergence
   time value so that know how long they need continue using the repair
   path before it is safe to use the base path. This time is set to be
   the worst case time that any router will take to calculate the new
   topology, and to make the necessary changes to the FIB.

   The time taken by a router to complete each phase of the transition
   will be dependent on the size of the network and the design and

implementation of the router. It can therefore be expected that the
optimum delay will need to be tuned from time to time as the network
evolves.

5.1. Required Properties

The Convergence Time mechanism MUST have the following properties:

o The operational convergence delay time MUST be consistent among
  all routers that are converging on the new topology.

o The operational convergence delay time MUST be the highest delay
  time advertised by any router in the new topology.

o The mechanism MUST increase the delay when a new router in
  introduced to the network that requires a higher delay than
  is currently in use.

o When the router that had the longest delay requirements is
  removed from the topology, the convergence delay timer
  value MUST, within some reasonable time, be reduced to
  the longest delay required by the remaining routers.

o It MUST be possible for a router to change the
  convergence delay timer value that it requires.

o A router which is in multiple routing areas, or is running
  multiple routing protocols MAY signal a different loop-free
  convergence delay for each area.

How a router determines the time that it needs to execute each
convergence phase is an implementation issue, and outside the scope
of this specification. However a router that dynamically determines
its proposed delay value must do so in such a way that it does not
cause the synchronized value to continually fluctuate.

5.2. Definition of the Convergence Timer

The NWP value is 16 bits and is specified in milliseconds; this gives
a maximum value of about 65s.

The NWP value selected is the largest value advertised.

If a routing protocol message is issued that changes the Convergence
Timer value, but does not change the topology, the new timer value
MUST be taken into consideration during the next network transition,
but MUST NOT instigate a new transition.

If a routing protocol message is issued that changes both the
Convergence Timer value and the topology, a transition is instigated
and the new timer value MUST be taken into consideration.

The convergence mechanism MUST specify the action to be taken if a
timer change (only) message and a topology change message are
independently generated during the hold-off time.

All routers that support controlled convergence MUST advertise an NWP
specifying their required Convergence Time.

If the parameter is carried in ISIS the S-bit is set to zero
indicating that the Convergence Timer NWP MUST NOT be leaked between
levels.

If the parameter is carried in OSPF it is only carried in a type 10
Opaque LSA which prevents propagation outside the OSPF area.

6. IANA considerations

6.1. ISIS

IANA is requested to allocate a new Sub-TLVs for TLV 242 from the IS-
IS TLV Codepoints name space.

Value	Description	Reference
TBD	Network Wide Parameter	This Document

6.2. OSPF

IANA is requested to allocate a new OSPF Router Information (RI) TLV
from the Open Shortest Path First (OSPF) Parameters name space

Value	TLV Name	Reference
TBD	Network Wide Parameter	This document

A value in the range 12 to 32767 is requested.

6.3. Network Wide Parameter

IANA is requested to create a new Network Wide Parameter Registry
within its own name space, and to allocate one value from it.

```
   Value        Name                      Reference
   -------------------------------------------------
   0            Reserved                  This document
   1            Convergence Timer         This document
   2..65535     Reserved                  This document
```

   Allocations within this registry require documentation of the use of
   the allocated value and approval by the Designated Expert assigned by
   the IESG.

7. Security Considerations

   The introduction of this parameter advertizing mechanism does not
   introduce a significant vulnerability into the base routing protocol
   and is secured in exactly the same way as the other TLVs that are
   carried.

   A rouge router deliberately introducing an anomalous parameter value
   is just as capable of introducing many other anomalies into the
   routing domain.

   As far as possible, care should be taken to validate that the
   parameter is reasonable.

   In the specific case of the Convergence Time NWP, the following
   considerations apply.

   If an abnormally large timer value is proposed by a router, the there
   is a danger that the convergence process will take an excessive time.
   If during that time the routing protocol signals the need for another
   transition, the transition will be abandoned and the default best
   case (traditional) convergence mechanism used.

   The maximum value that can be specified in the LSP/LSA is limited
   through the use of a 16 bit field to about 65 seconds.

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9. References

9.1. Normative References

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