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Advancement of MIB specifications on the IETF Standards Track

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A revised version of this draft document will be submitted to the RFC
editor as a BCP (Best Current Practice) documenting an IESG procedure
for the Internet Community. Discussion and suggestions for
improvement are requested. This document will expire before January,
1999. Distribution of this draft is unlimited.

2. Abstract

The Internet Standards Process [1] requires that all IETF Standards
Track specifications must have "multiple, independent, and
interoperable implementations" before they can be advanced beyond
Proposed Standard status. This document specifies the process which
the IESG will use to determine if a MIB document meets these
requirements. It also discusses the rationale for this process.

3. **The Nature of the Problem**

   The Internet Standards Process [1] requires that for a IETF
   specification to advance beyond the Proposed Standard level, at least
   two genetically unrelated implementations must be shown to
   interoperate correctly with all features and options. There are two
   distinct reasons for this requirement.

   The first reason is to verify that the text of the specification is
   adequately clear and accurate. This is demonstrated by showing that
   multiple implementation efforts have used the specification to
   achieved interoperable implementations.

   The second reason is to discourage excessive options and "feature
   creep". This is accomplished by requiring interoperable
   implementation of all features, including options. If an option is
   not included in at least two different interoperable implementations,
   it is safe to assume that it has not been deemed useful and must be
   removed before the specification can advance.

   In the case of a protocol specification which specifies the "bits on
   the wire" exchanged by executing state machines, the notion of
   "interoperability" is reasonably intuitive - the implementations must
   successfully "talk to each other", exchanging "bits on the wire",
   while exercising all features and options.

   In the case of an SNMP Management Information Base (MIB)
   specification, exactly what constitutes "interoperation" is less
   obvious. This document specifies how the IESG has decided to judge
   "MIB interoperability" in the context of the IETF Standards Process.

   There are a number of plausible interpretations of MIB
   interoperability, many of which have merit but which have very
   different costs and difficulties in realization.

   The aim is to ensure that the dual goals of specification clarity and
   feature evaluation have been met using an interpretation of the
   concept of MIB interoperability that strikes a balance between
   testing complexity and practicality.

4. **On The Nature of MIBs**

   Compared to "state machine" protocols which focus on procedural
   specifications, a MIB is much more data oriented. To over-
   generalize, in a typical MIB the collection of data type and instance
   specifications outnumbers inter-object procedural or causal semantics
   by a significant amount.

A central issue is that a MIB does not stand alone; it forms the
access interface to the instrumentation underneath it. Without the
instrumentation, a MIB has form but no values. Coupled with the large
number of objects even in a simple MIB, a MIB tends to have more of
the look and feel of an API or a dictionary than a state machine
protocol.

It is important to distinguish between assessing the interoperability
of applications which may use or interact with MIBs, and the MIBs
themselves. It is fairly obvious that "black-box testing" can be
applied to such applications and that the approach enjoys a certain
maturity in the software engineering arts. A MIB, on the other hand
is not readily amenable to black box test plans.

5. Discussion and Recommended Process

In order to meet their obligations under the IETF Standards Process
the Operations and Management Area Directors and the IESG must be
convinced that each MIB specification advanced to Draft Standard or
Internet Standard status is clearly written, that there are the
required multiple interoperable implementations, and that all options
have been implemented. There are multiple ways to achieve this goal.
Appendix A lists some testing approaches that could be used when
attempting to document multiple implementations.

The Full Coverage or Stimulus-Response approaches are very through,
and would increase confidence that the requirement has been met, if
applied. However, experience in real-world software engineering
makes it clear that such confidence comes at an extremely high price;
even with the most exhaustive testing, it is often not clear what
precisely has been demonstrated by such testing. We believe that
both of those standards of evidence are materially beyond what can be
reasonably accomplished in an operational sense, and achieving the
requisite semantic specifications are even more unlikely.

Therefore, the Operations and Management Area and the IESG have
adopted a more pragmatic approach to determining the suitability of a
MIB specification for advancement on the standards track beyond
Proposed Standard status. Each MIB specification suggested for
advancement must have one or more advocates who can make a convincing
argument that the MIB specification meets the multiple implementation
and feature support requirements of the IETF Standards Process. The
specific way to make the argument is left to the advocate, but will
normally include reports that basic object comparison testing has
been done.

Thus any recommendation for the advancement of a MIB specification
must be accompanied by an implementation report, as is the case with

all requests for the advancement of IETF specifications. The
implementation report must include the reasons why the IESG should
believe that there are multiple implementations of the MIB in
question and that the all of the MIB objects in the specification to
be advanced are supported in more than one implementation. But note
that the prime concern of the IESG will be that the underlying
reasons for the interoperable implementations are met, i.e. that the
text of the specification is clear and unambiguous, and that features
of the specification which have not garnered support have been
removed.

The implementation report will be placed on the IETF web page along
with the other pre-advancement implementation reports and will be
specifically referred to in the IETF Last-Call. As with all such
implementation reports, the determination of adequacy is made by the
Area Director(s) of the relevant IETF Area. This determination of
adequacy can be challenged during the Last-Call period.

[6]. Security Considerations

Some may view this policy as possibly leading to a reduction in the
level of confidence people can have in MIBs but the O&M Area
Directors and the IESG feel that it will adequately ensure a
reasonable evaluation of the level of clarity of MIB specifications
and to ensure that unused options can be identified and removed
before the advancement of a specification.

Good, clearly written MIBs can be of great assistance in the
management of the Internet and other networks and thus assist in the
reduction of some types of security threats.

[8]. References

[RFC2026] "The Internet Standards Process -- Revision 3", Bradner,
October 1996

[9]. Author's Addresses

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Appendix A

[A](#). Some Testing Alternatives

   The IESG debated a number of interoperability and testing
   models in formulating this specification. The following
   list is not an exhaustive enumeration of the alternatives,
   but it does capture the major plausible models which were
   examined in the course of the discussion.

[A.1](#) Basic Object Comparison

   Assume the requisite two genetically unrelated implementations of
   the MIB in an SNMP agent and an SNMP management station which can
   do a "MIB Dump" (extract the complete set of MIB object types and
   values from the agent implementation). Extract a MIB Dump from
   each implementation and compare the two dumps to verify that both
   provide the complete set of mandatory and optional objects and
   that the individual objects are of the correct types.

[A.2](#) Stimulus/Response Testing

   Proceed as in A.1, but in addition, comprehensively exercise the
   two (network) elements containing the agent implementations to
   verify that all the MIB objects reflect plausible values in
   operational conditions. An even stricter interpretation would
   require that the MIB objects in the two network elements track
   identically given the identical stimulus. While this would
   test "read-only" or "monitoring" information obtained from the
   underlying instrumentation, it is important to observe that
   such instrumentation is actually an *application* which uses
   the MIB and is not part of the MIB itself.

A.3 Full Coverage Testing

   This model extends the notion of Stimulus/Response Testing to its
   logical extreme. The MIB is viewed as an API and the
   software engineering notion of full coverage testing is
   applied to a MIB. This involves exercising all paths through the
   causal semantics and verifying that all objects change state
   correctly in all cases. Again, note that much more than the
   MIB definition is being exercised and evaluated.