                              DSA Metrics
                            (OSI-DS 34 (v3))

## Status of this Memo

   This memo provides information for the Internet community.  This memo
   does not specify an Internet standard of any kind.  Distribution of
   this memo is unlimited.

## Abstract

   This document defines a set of criteria by which a DSA implementation
   may be judged.  Particular issues covered include conformance to
   standards; performance; demonstrated interoperability.  The intention
   is that the replies to the questions posed provide a fairly full
   description of a DSA. Some of the questions will yield answers which
   are purely descriptive; others, however, are intended to elicit
   answers which give some measure of the utility of the DSA. The marks
   awarded for a DSA in each particular area should give a good
   indication of the DSA's capabilities, and its suitability for
   particular uses.

   Please send comments to the authors or to the discussion group
   <osi-ds@CS.UCL.AC.UK>.

## Table of Contents

1.  Overview

   The purpose of this document is to define some metrics by which DSA
   products can be measured.  Such metrics are valuable as whilst an
   X.500 DSA must conform to the specification in the standard - this is
   a sine qua non - protocol conformance is not in itself the hallmark
   of a usable implementation.  A DSA must perform operations within a
   reasonable time; a DSA must offer good throughput of queries; a DSA
   must be able to handle a reasonable volume of data; if modification
   operations are provided, some sort of access control must be
   provided; a DSA and its data must be manageable.

   In many respects, it is almost impossible to say that one DSA is
   better than other from looking at the responses to questions in this
   document.  For some, the cost or level of support will be the key
   criterion.  For another user, the flexibility of the schema
   management facilities, or the feasibility of running the DSA over an
   existing relational database, will be of prime importance.  In many
   respects DSAs will just be different, rather than better or worse.
   However, all other things being equal, the look-up speed of a DSA is
   very obviously measurable, and there is a substantial number of
   questions on the speed of the various X.500 operations, and in
   particular on the look-up operations.

   Throughout this document, some of the questions posed are annotated
   with a square-bracketed points score and an explanation as to how the
   points should be allocated.  For example, a question might be

appended with "[2 if yes]", indicating score 2 points for an
affirmative answer to that question.  These points scores should be
collated in Table 1 at the end of the document.  The questions on DSA
performance are judged to be important enough to have a separate
table for those results:  they appear in Table 2 (and optionally
Table 3).  Together, these tables constitute a measure of the DSA.

The metrics are on a section by section basis, which should help the
reader who is seeking, for example, a DSA with fast look-up
capabilities and extensive access control facilities, to focus on the
critical aspects of a DSA for their particular requirement.  No
conclusions should be inferred from adding the scores together into
one overall grand total and comparing such totals for different DSAs,
as no attempt is made to assign weights to the different
characteristics.

Whilst much of this document should usually be completed by the
developers or suppliers of an implementation, the section on
performance could be completed by anyone running the implementation.
Indeed, it will be beneficial if several sets of performance figures
can be gathered for each implementation, for a variety of hardware
platforms.

2.  General Information

This section contains general information about the implementation
under discussion.

   1.  Name of the information provider ...............................
       ...............................................................

   2.  Name of the implementation .....................................

   3.  Version number of the DSA described in this document ...........

   4.  Are there plans to implement the additional features describe in
       the 1992/3 standard?  [6 for full implementation, 4 if both
       access control and replication to be implemented, 2 for some
       1992 features] ................................................

   5.  Name and address of supplier or person to contact ..............
       ...............................................................
       ...............................................................
       ...............................................................
       ...............................................................
       ...............................................................
       ...............................................................

   6.  Describe the hardware and software platforms supported by the DSA
       [up to 4 points may be awarded for this question]

     (a)  Hardware (If appropriate, can summarise as, for example
          "generic UNIX platform") ................................

     (b)  O/S (state version if critical)

          i.   UNIX) (be sure to indicate which flavour - e.g.,
               SYSV [1], BSD [1], SUNOS, etc) .........................

         ii.   VMS) [1] ........................................

        iii.   MS-DOS [1] ......................................

         iv.   Macintosh [1] ....................................

          v.   Other) [1] ......................................

   7.  Name any other software required to run the system which is not
       supplied with the operating system or with the DSA software
       itself.  Examples might include a database package, or
       communications software .......................................
       ..............................................................

   8.  Is this DSA an integrated part of a software package, and in such
       case which ?  ................................................
       ..............................................................

   9.  Is the software free?  If the DSA needs other packages, are these
       also freely available?  [3 if completely free, 1 if requires
       commercial software package] .................................
       ..............................................................

   10. Is commercial support available for this implementation?  [3] ...

   11. Is free, best effort support available from the developers?  [2].

   12. Is free support available via user groups or email lists?  [2] ..

3.  Conformance to OSI Standards

3.1  Directory protocols

   13. Does the DSA implement DAP?

     (a)  Read ASE? [2] .........................................

       (b)  Search ASE? [2] .........................................

       (c)  Modify ASE? [2] .........................................

    14. Does the DSA implement DSP?

       (a)  Chained read ASE? [2] ....................................

       (b)  Chained search ASE? [2] ..................................

       (c)  Chained modify ASE? [2] ..................................

    15. Statement requirements according to section 9.2.1 in X.519.

       (a)  Supported application-contexts? ..........................

       (b)  Capable of acting as first-level DSA? [1] .................

       (c)  Chained mode supported?  [1] ..............................

       (d)  Security-level(s) supported?  [1 for strong + 1 for protected
            simple + 1 for simple authentication] ......................

       (e)  All attribute types according to X.520?  [1] ..............

       (f)  All object classes according to X.521?  [1] ..............

    16. Does the implementation meet the conformance clauses in section
        9.2.2 and 9.2.3 of X.519?
        Static requirements [2 if yes on all]

       (a)  Abstract syntaxes of application contexts ..................

       (b)  Abstract syntaxes of information framework .................

       (c)  Minimal knowledge .........................................

       (d)  Support of root context ...................................

       (e)  Abstract syntax - attribute types .........................

       (f)  Abstract syntax - object classes ..........................

        Dynamic requirements [2 if yes on all]

       (a)  Mapping onto underlying services ..........................

       (b)  Distributed operations - referrals ........................

       (c)  DirectoryAccessAC - referrals ................................

       (d)  DirectorySystemAC - referrals ................................

       (e)  Chained mode ..................................................

   17. Please list all conformance testing work applied to the
       implementation (specify conformance test version number).  [2 if
       any testing]
       .....................................................................
       .....................................................................
       .....................................................................
       .....................................................................

3.2  Implementors' agreements and profiles

   Does the DSA conform to the following implementors' agreements?  If
   so, state parts and version numbers.

   18. EWOS? [1] ...........................................................
       .....................................................................
       .....................................................................

   19. OIW? [1] ............................................................
       .....................................................................
       .....................................................................

   Does the DSA conform to the following profiles?  If so, state which
   version numbers.

   20. UK GOSIP? [1] .......................................................

   21. US GOSIP? [1] .......................................................


   State any other GOSIP profiles to which the DSA conforms ............

3.3  Protocol stacks

   22. Which of the following transport and network layer protocols does
       the DSA support:

       (a)  TP.x over CONS (state transport class)?  [2] ................

       (b)  TP.4 over CLNS? [2] ..........................................

       (c)  TP.x over X.25(1980) (state transport class)?  [2] ..........

## 3.4  DIT structure

23. A suggested DIT structure, detailing an object class hierarchy, is presented in X.521.  Does the DSA:

    (a)  Enforce this hierarchy?  .....................................

    (b)  Allow the enforcement of this hierarchy?  ...................

24. Are structure rules optional or mandatory?  .....................

## 4.  Other protocols

25. Not everybody uses OSI protocols at the network layer.  Does the DSA support other "network" layer protocols?

    (a)  TP.0 over RFC1006 over TCP/IP [3] ...........................

    (b)  State any other options supported.  .........................
         .........................................................

26. Does the DSA also run over any lightweight stack?  If so, describe it with reference to the OSI seven layer model [1] .....

27. Can local DUAs access the DSA directly by some method of inter-process communications?  [1] ..............................
    .........................................................

## 5.  Extensions to the 1988 Standard

## 5.1  Schema

28. Does the DSA fully support RFC1274, "The COSINE and Internet X.500 Schema"?  [2] ...........................................
    If not, please supply a list of all those object classes, attribute types and attribute syntaxes in RFC1274 which are supported on a separate sheet.  This might be summarised by saying, for example, "all those with standard attribute syntaxes", or "all except fooBar".

29. Does the DSA implement the schema management defined in the 1992 standard?  [2] ...........................................

30. If not, is the schema stored in the Directory?  In a distributed manner[2] or centralised[1] ?  .................................

31. Can a DSA manager extend the schema and add new

        (a)  Attribute types with existing syntaxes?  With compilation
             [1], or without compilation [2] ...........................

        (b)  Attribute syntaxes?  With compilation [1], or without
             compilation [2] ..........................................

        (c)  Attribute sets?  With compilation [1], or without compilation
             [2] .......................................................
             ...........................................................

        (d)  Object classes?  With compilation [1], or without compilation
             [2] .......................................................
             ...........................................................

    32. Is it possible to add in or modify DIT structure rules, with
        compilation [1], without compilation [2] .......................

5.2  Support for replication

    33. Does the DSA support the replication mechanisms as described in
        the 1992 standard [2]?
       ................................................................

    34. Does the DSA support any other replication mechanisms?  .........

        (a)  Replication part of RFC1276 [2] ...........................

        (b)  Other (please give a reference to any description of the
             mechanisms, and indicate whether these mechanisms are used by
             any other implementations) [1 for any mechanism] ...........
             ...........................................................
             ...........................................................
             ...........................................................

    35. If the DSA supports replication, does it support:

        (a)  Replication of a single entry?  [2] .......................

        (b)  Replication of a set of sibling entries?  [2] .............

        (c)  Replication of a subtree?  [2] ............................

5.3  Support for access control

    36. Does the DSA support access control as described in the 1992
        standard [3]?  .................................................

    37. If not, does the DSA have any access control mechanisms at all?

       [2] ...............................................................

   38. If yes, does the access control scheme support the following:

       (a)  Allow a user to maintain their own entry?  [1] ..............

       (b)  Allow a user to maintain some attributes in their own entry,
            but not all attributes?  [1] ...............................

       (c)  Give management rights to a DSA manager in a fashion analogous
            to the privileges given to a UNIX super-user?  [1] ..........

       (d)  Give management rights to a data manager on a per subtree
            basis?  [1] .................................................

       (e)  Give management rights (to an entry, group of entries,
            subtree, etc) to a group of users?  [1] .....................

       (f)  Give access rights to users on the basis of the leading
            portion of their Distinguished Name?  [1] ...................

       (g)  Is it possible to define a protection mechanism for each
            individual attribute type in one entry?  [1] ...............

       (h)  Maximum number of Distinguished Names that can be defined for
            one access right to one attribute in one entry? If unlimited,
            state the constraints.  [1 if more than 6 DNs are feasible] :

       (i)  Does the DSA support the extended access control techniques
            described in "An Access Control approach for Searching and
            Listing" by Hardcastle-Kille and Howes, in the Internet
            Draft, OSI-DS 21?  [2]
          ...............................................................

       (j)  If there are features of the access control mechanisms which
            are not brought out by the above questions, please describe
            these additional features [up to 2 for wonderful additional
            features!]  ...............................................
          ...............................................................
          ...............................................................
          ...............................................................

5.4  Miscellaneous

   39. Does the DSA fully support RFC1276, "Replication and Distributed
       Operations extensions to provide an Internet Directory using
       X.500"?  [2] .... If not, please give a list of features that are
       supported.

        ......................................................................
        ......................................................................

    40. If the DSA uses RFC1006 and/or X.25(1980) at the network layer,
        does the DSA conform to RFC1277, "Encoding Network Addresses to
        support operation over non-OSI lower layers" [3] ...............

6.  Miscellaneous characteristics

    41. Does the DSA use its own database, or can it be used in
        conjunction with a general-purpose database package such as
        Oracle?  [1 for own, 1 for ability to map onto general purpose
        databases, 1 if any such mappings have been made] ...............
        ......................................................................

    42. If the DSA runs as a static server, state the start-up time for a
        DSA with a database of 20000 entries.  If this varies widely
        according to configuration options, give figures for the various
        options.  ...........................................................
        ......................................................................

    43. What is the maximum number of simultaneous associations that the
        DSA may have open?  [1 if more than 15 associations] ............

    44. Maximum database size, in entries, megabytes, or as appropriate.
        If none, state what the constraints are.  [1 if a database of
        more than 100,000 entries is feasible] ..........................

    45. What is the run-time size of an entry as specified in section 10
        (on performance)?  This should be the marginal size of an entry
        and thus should include the overhead of default indexes, etc.  ..

    46. What is the on-disk database size of an entry as specified in
        section 10 on performance?  ......................................

    47. Does the DSA make of indexing?  [2 if yes] .....................

        If so:

      (a)  Can the database be fully inverted?  [1] ...................
           If not, state for which:

           i.  attributes indexes are automatically built ..............
               ......................................................................
               ......................................................................

           ii.  attributes/attribute syntaxes indexes may be built ......
                ......................................................................

                    ...............................................

        (b)  Does the index improve performance on:

             i.   Exact match [1] ......................................

            ii.   Leading substring match [1] ..........................

           iii.   Approximate match [1] .................................

            iv.   Any substring match [1] ...............................

             v.   Trailing substring match [1] ..........................

        (c)  What is the increase in run-time size of an entry when adding
             an index?
                 ...............................................

        (d)  What is the increase in on-disk database size of adding
             another index?
                 ...............................................

    48.  What sort of approximate match algorithm does the DSA use?
         Describe it briefly ...........................................
         ...............................................................
         ...............................................................
         ...............................................................

    49.  Does the DSA attempt to use relay DSAs (which have access to more
         than one network) in order to achieve connectivity with DSAs
         which are not on the same network?  [2] .......................

7.  Management tools

7.1  Dynamic system management

    50.  Are there tools for monitoring DSA activity, using:

        (a)  DAP? [1] ..................................................

        (b)  CMIP? [1] .................................................

        (c)  SNMP? [1] .................................................

    51.  Are there tools for controlling a run-time DSA? [2] ...........

7.2  Static system management

    52. If knowledge information is stored within the DIT, are there
        tools for knowledge management?  [2] ...........................

    53. Are there tools for checking that attributes with Distinguished
        Name syntax contain values of entries in the DIT (i.e., they do
        not contain "dangling pointers")?  [1] ........................

7.3  Data management

    54. If the DSA doesn't use a general-purpose database package, what
        data management tools are available?  .........................
        ..............................................................

    55. Are there any tools for arboriculture - the moving, copying or
        deleting of DIT subtrees?  [2] .................................

8.  Operational Use

    The DSA may have lots of wonderful features -- on paper!  But has the
    DSA been shown to work in practice?  The following measures are
    intended to give some measure of confidence that the DSA's viability
    has been demonstrated.

    56. How many entries in the largest DSA in use in operational use?  :

    57. What is the largest set of DSAs supporting an organisation?  ....

    58. What is the estimated number of organisations using this
        implementation for service use?  [8 if more than 100
        organisations, 5 if more than 50 organisations, 3 if more than 20
        organisations, 2 if more than 5 organisations, 1 if more than 1
        organisation] .................................................

    59. Is this DSA used commercially with an installed base of more than
        10 customers?  [2] .............................................

9.  Interoperability

    The X.500 Directory is the OSI Directory.  OSI stands for Open
    Systems Interconnection -- DSAs have to be able to inter-operate.
    They also have to be seen to interoperate.

    60. Is this DSA in use in X.500 pilots?  ..........................

       (a)  Is this DSA in use anywhere in the COSINE/Internet Pilot? [3]

              ...................................................

        (b)  Is this DSA in use in any other major pilot?  [2] ..........

   61. Name any other systems which you believe the system to
       interoperate with.  (It is not sufficient to say "any system
       which supports the conformance clauses ...")  ..................
       ...................................................................
       ...................................................................
       ...................................................................

   62. Please name all interoperability testing applied to the
       implementation, specify test suite and what other implementation
       that was used [1 per implementation, up to maximum of 5] ........
       ...................................................................
       ...................................................................
       ...................................................................
       ...................................................................
       ...................................................................
       ...................................................................

## 10.  Performance

   This section should give an outline to the expected performance of
   the DSA. A number of operations are timed in order to give a feel for
   the DSA's speed and throughput.  Note that all operations should be
   resolvable within a single DSA. Chaining and referral are not
   assessed, although it should be possible to infer, albeit
   approximately, the speed of distributed operations.

   i.   The tests should be made against an organisational database of
        20000 entries.  Some tests are against subsets of this data, and
        so the database should be set up according to the following
        instructions.

        Create an organisational DSA with 20000 entries below the
        organisation node.  Sub-divide this data into a number of
        organisational units, one of which should contain 1000 entries,
        another of which should contain 100 entries, and a third which
        should contain just 10 entries.  The entries, which should
        differ, should be created with the following attributes:

        (a)  Common Name

        (b)  Surname

        (c)  Telephone number

        (d)  Postal Address (of 100 characters)

        (e)  Object class

   ii. In all the tests, two timings should be taken.  In order to
       normalise the test results as much as possible, it is suggested
       that these tests be undertaken on an otherwise lightly loaded
       machine.

       (a)  A typical "cold start" reading should be given.  In this
            case the system will not have the advantage of any benefits
            that derive from operating system paging, or caching.

       (b)  A best possible figure should be given, which indicates the
            upper limit of DSA performance.

  iii. The timings should relate to the default set-up, and should be
       entered in Table 2.  If significant performance gains can be made
       by use of configuration options, such as building extra indexes
       to support searches, measures of the improved performance may
       also be given, and should be entered in Table 3.
       Attention should be also drawn to any optimisations, heuristic or
       otherwise, which are not evidenced in the following tests.

   iv. Please note that the tests should be made using a DUA and DSA
       with full 7-layer stacks, rather than some lightweight protocol.

## 10.1  Speed for various operations

The tests are described, one subsection per operation.  The results
should be entered in Table 2 (and Table 3 if a non-default set-up is
also measured).

## 10.1.1  Bind

The time it takes for a DUA to bind to the Directory.  This time
should include all the initialisation time a DUA process needs before
it can query the Directory: e.g., reading of tailor files, schema
information, etc.  Give the bind time for each of the following
levels of authentication.  State "n/a" if the implementation does not
support a particular level of authentication.

63. Anonymous

64. Simple

65. Simple protected

66. Strong

**10.1.2  List**

   Give the time for listing a set of organisational unit sibling
   entries.

   67. 10 entries

   68. 1000 entries

**10.1.3  Search**

   In this section, two sets of search operations should be performed on
   the DSA.

   i.  A single level search of 100 entries within an organisational
       unit.

   ii. An organisation subtree search, on the subtree of 20000 entries.

   The following searches should be tried.  Unless otherwise stated, the
   "XXX" or "YYY" part of the search filter should be chosen in such a
   way as to return a single result.  Unless stated otherwise the
   results should return all attributes for the entry.

   69. Exact match for a surname:

           surname=XXX

   70. Leading substring match for a common name:

           commonName=XXX*

   71. Any substring match for a common name:

           commonName=*XXX*

   72. Trailing substring match for a common name:

           commonName=*XXX

   73. Approximate match for a common name:

           commonName"=XXX

   74. More complex filter, searching by object class and two other
       attribute types:

                objectClass=person AND
                (commonName=XXX* OR telephoneNumber=*YYY)

    75. Search returning all entries (i.e., 100 entries in the single
        level search, and all 20000 entries in the subtree search:

                objectClass=*

        In this case, no attribute values should be returned in the
        result set.

## 10.1.4  Read

    76. A single read operation, returning all attributes.

## 10.1.5  Add entry

    77. Add an entry beneath an entry which has:

       (a)  0 children

       (b)  10 children

       (c)  1000 children

## 10.1.6  Modify entry

   Modify an attribute value, other than an RDN value, for an entry
   which has

   1.  10 siblings

   2.  1000 siblings

   78. Modify an entry

      (a)  Add description attribute

      (b)  Remove description attribute

## 10.1.7  Modify RDN

   Modify an RDN value for an entry with the following number of
   siblings.

   79. Modify RDN

      (a)  10 siblings

      (b)  1000 siblings

10.1.8  Query rate

   As the time taken for a single read will usually be negligible, the
   following list and set of reads should give a clearer indication of
   the query rate.

   80. A list to return 100 entries for persons, and then a read of each
       entry returning all attribute values.

10.2  The results

   The results of the tests just described should be entered in Table 2
   (and optionally Table 3), at the end of the document.

10.3  Environment used for benchmarking

   Date of test.......................................................
   Name of tester ....................................................
   The results will be directly correlated to the test set-up used, and
   in particular, the hardware.  Please answer the following questions
   to describe the test environment:

      (a)  Processor (make and model) ...................................

      (b)  Processor speed (MIPS) .......................................

      (c)  Primary memory available .....................................

      (d)  If disk-based DSA, disk I/O interface and disk speed ........

      (e)  O/S version ..................................................

      (f)  Network type and bandwidth (e.g., 10 Mbit Ethernet) .........

      (g)  Protocols in transport layer and below (e.g., TP 0, RFC1006,
           TCP/IP) ......................................................

      (h)  How/where timings obtained?

           o  C procedural interface ...................................

           o  DUA shell (e.g., Quipu's DISH) ...........................

| Section |  | Points | |
| --- | --- | --- | --- |
| No. | Description | Maximum | Scored |
| 2 | General Information | 20 | |
| 3 | Conformance to OSI | 35 | |
| 4 | Other protocols | 5 | |
| 5 | Extensions | Schema | 16 | |
| | to the | Replication | 10 | |
| | 1988 | Access Control | 15 | |
| | standard | Miscellaneous | 5 | |
| 6 | Miscellaneous characteristics | 15 | |
| 7 | Management tools | 10 | |
| 8 | Operational use | 10 | |
| 9 | Interoperability | 10 | |
| 10 | Performance | see table 2 | |

Table 1:  DSA Metrics

| Operation | Cold DSA | | Optimum Performance | |
|-----------|----------|---|----------|---|
| **Bind** | | | | |
|    --Anonymous | ............... | | ............... | |
|    --Simple | ............... | | ............... | |
|    --Simple Prot | ............... | | ............... | |
|    --Strong | ............... | | ............... | |
| **List** | | | | |
|    -- 10 entries | ............... | | ............... | |
|    -- 1000 entries | ............... | | ............... | |
| **Search** | single level | subtree | single level | subtree |
|    -- exact | .... | ...... | ..... | ...... |
|    -- leading sub | .... | ...... | ..... | ...... |
|    -- any sub | .... | ...... | ..... | ...... |
|    -- trailing sub | .... | ...... | ..... | ...... |
|    -- approx | .... | ...... | ..... | ...... |
|    -- complex | .... | ...... | ..... | ...... |
|    -- return all | .... | ...... | ..... | ...... |
| **Read** | ............... | | ............... | |
| **Add** | | | | |
|    0 siblings | ............... | | ............... | |
|    10 siblings | ............... | | ............... | |
|    1000 siblings | ............... | | ............... | |
| **Modify** | | | | |
|    10 siblings | ............... | | ............... | |
|    1000 siblings | ............... | | ............... | |
| **Modify RDN** | | | | |
|    10 siblings | ............... | | ............... | |
|    1000 siblings | ............... | | ............... | |
| **Query rate** | ............... | | ............... | |

Table 2:  Speed of operations - default set-up

| Operation | Cold DSA | | Optimum Performance | |
|---|---|---|---|---|
| Bind<br>   --Anonymous<br>   --Simple<br>   --Simple Prot<br>   --Strong | ..............<br>..............<br>..............<br>.............. | | ..............<br>..............<br>..............<br>.............. | |
| List<br>   -- 10 entries<br>   -- 1000 entries | ..............<br>.............. | | ..............<br>.............. | |
| Search | single level | subtree | single level | subtree |
|  | | | | |
| -- exact<br>-- leading sub<br>-- any sub<br>-- trailing sub<br>-- approx<br>-- complex<br>-- return all | ....<br>....<br>....<br>....<br>....<br>....<br>.... | ......<br>......<br>......<br>......<br>......<br>......<br>...... | .....<br>.....<br>.....<br>.....<br>.....<br>.....<br>..... | ......<br>......<br>......<br>......<br>......<br>......<br>...... |
| Read | .............. | | .............. | |
| Add<br>   0 siblings<br>   10 siblings<br>   1000 siblings | ..............<br>..............<br>.............. | | ..............<br>..............<br>.............. | |
| Modify<br>   10 siblings<br>   1000 siblings | ..............<br>.............. | | ..............<br>.............. | |
| Modify RDN<br>   10 siblings<br>   1000 siblings | ..............<br>.............. | | ..............<br>.............. | |
| Query rate | .............. | | .............. | |

Table 3:  Speed of operations - non-default set-up

Security Considerations

    Security issues are not discussed in this memo.

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