

Delay-Tolerant Networking
Internet-Draft
Intended status: Experimental
Expires: September 12, 2019

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March 11, 2019

Asynchronous Management Protocol Agent Application Data Model
draft-birrane-dtn-adm-agent-05

Abstract

This document describes an Application Data Model (ADM) for an Asynchronous Management Protocol (AMP) Agent. The AMP Agent represents a managed device in the Asynchronous Management Architecture. This document is in compliance with the template provided by [[I-D.birrane-dtn-adm](#)].

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Agent ADM

March 2019

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[1.](#) Introduction

An Application Data Model (ADM) provides a guaranteed interface for the management of an application or protocol in accordance with the Asynchronous Management Architecture (AMA) defined in [\[I-D.birrane-dtn-ama\]](#). The ADM described in this document complies with the ADM Template provided in [\[I-D.birrane-dtn-adm\]](#) as encoded using the JSON syntax.

The AMP Agent ADM provides the set of information necessary to remotely manage agents in accordance with the Asynchronous Management Protocol (AMP) defined in [\[I-D.birrane-dtn-amp\]](#). AMP provides a compact binary encoding of ADM objects and specifies a protocol for the exchange of those objects.

[1.1.](#) Technical Notes

- o This document describes Version 3.0 of the Agent ADM.
- o The namespace associated with this ADM has not been finalized and, therefore, any namespace references and associated encodings are subject to change until the moderated namespace for this ADM has been published.

- o Agent applications MAY choose to ignore the name, description, or other annotative information associated with the component definitions within this ADM where such items are only used to provide human-readable information or are otherwise not necessary to manage a device.

[1.2.](#) Scope

This ADM specifies those components of the Asynchronous Management Model (AMM) common to the management of any instance of any AMP Agent.

Any Manager software implementing this ADM MUST perform the responsibilities of an AMA Manager as outlined in [\[I-D.birrane-dtn-adm\]](#) as they relate to the objects included in this document.

Any Agent software implementing this ADM MUST perform the responsibilities of an AMA Agent as outlined in [\[I-D.birrane-dtn-adm\]](#) as they relate to the objects included in this document.

[1.3.](#) 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 [RFC 2119](#) [[RFC2119](#)].

[2.](#) Structure and Design of this ADM

The AMP Agent ADM's structure is in accordance to [\[I-D.birrane-dtn-adm\]](#). This ADM contains metadata, table templates, and controls, variables, report templates, macros, edd, and operators. The contents of this ADM are derived from the main functions and data that an agent needs to run AMP [\[I-D.birrane-dtn-amp\]](#).

The Metadata that is present in this document is common to all ADMs. All ADMs have metadata that includes the name, namespace, and version of the ADM as well as the name of the organization that is issuing that particular ADM. This is important for identification purposes of the ADMs and to ensure version control.

Because there are calculations done in various ADM objects that are needed for AMP, the operators that were chosen were ones that were the most common. For each of the most common operators, the only ones that were expressed in the document were ones that had the same input types and result types. This is to prevent a long list of operators that may never be used. The additional information provided in this ADM dealt with the number of known variables, macros, rules, controls and constants as well as the number of those instances that were running.

3. Naming and Identification

This section outlines the namespaces used to uniquely identify ADM objects in this specification.

3.1. Namespace and Nicknames

In accordance with [[I-D.birrane-dtn-adm](#)], every ADM is assigned a moderated Namespace. In accordance with [[I-D.birrane-dtn-amp](#)], these namespaces may be enumerated for compactness. The namespace and ADM identification for these objects is defined as follows.

Identifier	Value
Namespace	Amp/Agent
ADM Enumeration	1

Table 1: Namespace Information

Given the above ADM enumeration, in accordance with [[I-D.birrane-dtn-amp](#)], the following AMP nicknames are defined.

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Nickname	Collection
20	Amp/Agent/Const
21	Amp/Agent/Ctrl
22	Amp/Agent/Edd
23	Amp/Agent/Mac
24	Amp/Agent/Oper
25	Amp/Agent/Rptt
27	Amp/Agent/Tblt
29	Amp/Agent/Var
30	Amp/Agent/Mdat
31-49	Amp/Agent/Reserved

Table 2: Agent ADM Nicknames

4. AMP Agent ADM JSON Encoding

```
{
  "Mdat": [{
    "name": "name",
    "type": "STR",
    "value": "amp_agent",
    "description": "The human-readable name of the ADM."
  },
  {
    "name": "namespace",
    "type": "STR",
    "value": "Amp/Agent",
    "description": "The namespace of the ADM."
  },
  {
    "name": "version",
    "type": "STR",
    "value": "v3.1",
    "description": "The version of the ADM."
  },
  {
```

```
    "name": "organization",
    "type": "STR",
    "value": "JHUAPL",
    "description": "The name of the issuing organization of the
                    ADM."
  }
],
  "Edd": [{
    "name": "num_rpt_tpls",
    "type": "UINT",
    "description": "This is the number of report templates known to
                    the Agent."
  },
  {
```

```

    "name": "num_tbl_tpls",
    "type": "UINT",
    "description": "This is the number of table templates known to
                    the Agent."
},
{
    "name": "sent_reports",
    "type": "UINT",
    "description": "This is the number of reports sent by the
                    Agent."
},
{
    "name": "num_tbr",
    "type": "UINT",
    "description": "This is the number of time-based rules running
                    on the Agent."
},
{
    "name": "run_tbr",
    "type": "UINT",
    "description": "This is the number of time-based rules run by
                    the Agent since the last reset."
},
{
    "name": "num_sbr",
    "type": "UINT",
    "description": "This is the number of state-based rules running
                    on the Agent."
},
{
    "name": "run_sbr",
    "type": "UINT",
    "description": "This is the number of state-based rules run by

```

```

        the agent since the last reset."
    },
    {
        "name": "num_const",
        "type": "UINT",
        "description": "This is the number of constants known by the
                        Agent."
    },

```

```

{
  "name": "num_var",
  "type": "UINT",
  "description": "This is the number of variables known by the
                  Agent."
},
{
  "name": "num_macros",
  "type": "UINT",
  "description": "This is the number of macros known by the
                  Agent."
},
{
  "name": "run_macros",
  "type": "UINT",
  "description": "This is the number of macros run by the agent
                  since the last reset."
},
{
  "name": "num_controls",
  "type": "UINT",
  "description": "This is the number of controls known by the
                  Agent."
},
{
  "name": "run_controls",
  "type": "UINT",
  "description": "This is the number of controls run by the Agent
                  since the last reset."
},
{
  "name": "cur_time",
  "type": "TV",
  "description": "This is the current system time."
}
],

"Var": [{
  "name": "num_rules",
  "type": "UINT",

```

```

"initializer": {

```



```

        "type": "UINT",
        "postfix-expr": [{
            "ns": "Amp/Agent",
            "nm": "edd.num_tbr"
        }, {
            "ns": "Amp/Agent",
            "nm": "edd.num_sbr"
        }, {
            "ns": "Amp/Agent",
            "nm": "oper.plusUINT"
        }]
    },
    "description": "This is the number of rules known to the Agent
                    (#TBR + #SBR).",
}],

"Tblt": [
    {
        "name": "adms",
        "columns": [{
            "type": "STR",
            "name": "adm_name"
        }],
        "description": "This table lists all the ADMs that are supported
                        by the Agent."
    },
    {
        "name": "variables",
        "columns": [{
            "type": "ARI",
            "name": "ids"
        }],
        "description": "This table lists the ARI for every variable that
                        is known to the agent."
    },
    {
        "name": "rptts",
        "columns": [{
            "type": "ARI",
            "name": "ids"
        }],
        "description": "This table lists the ARI for every report
                        template that is known to the agent."
    },
    {
        "name": "macros",
        "columns": [{

```

```
        "type": "ARI",
        "name": "ids"
    ]],
    "description": "This table lists the ARI for every macro that is
                    known to the agent."
},
{
    "name": "rules",
    "columns": [{
        "type": "ARI",
        "name": "ids"
    }],
    "description": "This table lists the ARI for every rule that is
                    known to the agent."
},
{
    "name": "tblts",
    "columns": [{
        "type": "ARI",
        "name": "ids"
    }],
    "description": "This table lists the ARI for every table template
                    that is known to the agent."
}
],

"Rptt": [{
    "name": "full_report",
    "definition": [{
        "ns": "Amp/Agent",
        "nm": "mdat.name"
    }],
    {
        "ns": "Amp/Agent",
        "nm": "mdat.version"
    },
    {
        "ns": "Amp/Agent",
        "nm": "edd.num_rpt_tpls"
    },
    {
        "ns": "Amp/Agent",
        "nm": "edd.num_tbl_tpls"
    },
    {
```

```
"ns": "Amp/Agent",  
"nm": "edd.sent_reports"
```

```
},  
{  
  "ns": "Amp/Agent",  
  "nm": "edd.num_tbr"  
},  
{  
  "ns": "Amp/Agent",  
  "nm": "edd.run_tbr"  
},  
{  
  "ns": "Amp/Agent",  
  "nm": "edd.num_sbr"  
},  
{  
  "ns": "Amp/Agent",  
  "nm": "edd.run_sbr"  
},  
{  
  "ns": "Amp/Agent",  
  "nm": "edd.num_const"  
},  
{  
  "ns": "Amp/Agent",  
  "nm": "edd.num_var"  
},  
{  
  "ns": "Amp/Agent",  
  "nm": "edd.num_macros"  
},  
{  
  "ns": "Amp/Agent",  
  "nm": "edd.run_macros"  
},  
{  
  "ns": "Amp/Agent",  
  "nm": "edd.num_controls"  
},  
{  
  "ns": "Amp/Agent",
```

```

        "nm": "edd.run_controls"
    },
    {
        "ns": "Amp/Agent",
        "nm": "var.num_rules"
    }
],
"description": "This is all known meta-data, EDD, and VAR values
                known by the Agent."

```

```

    ]],
    "Ctrl": [
        {
            "name": "add_var",
            "parmspec": [{
                "type": "ARI",
                "name": "id"
            },
            {
                "type": "EXPR",
                "name": "def"
            },
            {
                "type": "BYTE",
                "name": "type"
            }
        ],
        "description": "This control configures a new variable
                        definition on the Agent."
    },
    {
        "name": "del_var",
        "parmspec": [{
            "type": "AC",
            "name": "ids"
        }],
        "description": "This control removes one or more variable
                        definitions from the Agent."
    },
    {
        "name": "add_rptt",

```

```

    "parmspec": [{
        "type": "ARI",
        "name": "id"
    },
    {
        "type": "AC",
        "name": "template"
    }
    ],
    "description": "This control configures a new report template
                    definition on the Agent."
},
{
    "name": "del_rptt",
    "parmspec": [{
        "type": "AC",

```

```

        "name": "ids"
    }],
    "description": "This control removes one or more report template
                    definitions from the Agent."
},

{
    "name": "desc_rptt",
    "parmspec": [{
        "type": "AC",
        "name": "ids"
    }],
    "description": "This control produces a detailed description of
                    one or more report template identifier(ARI)
                    known to the Agent."
},
{
    "name": "gen_rpts",
    "parmspec": [{
        "type": "AC",
        "name": "ids"
    },
    {
        "type": "TNVC",
        "name": "rxmgrs"
    }
    ],

```

```

    }
  ],
  "description": "This control causes the Agent to produce a
                  report entry for each identified report
                  templates and send them to one or more
                  identified managers(ARIs).",
},
{
  "name": "gen_tbls",
  "parmspec": [{
    "type": "AC",
    "name": "ids"
  },
  {
    "type": "TNVC",
    "name": "rxmgrs"
  }
],
  "description": "This control causes the Agent to produce a
                  table for each identified table templates and
                  send them to one or more identified managers."
},
{

```

```

    "name": "add_macro",
    "parmspec": [{
      "type": "STR",
      "name": "name"
    },
    {
      "type": "ARI",
      "name": "id"
    },
    {
      "type": "AC",
      "name": "def"
    }
  ],
  "description": "This control configures a new macro definition
                  on the Agent."
},
{

```

```

    "name": "del_macro",
    "parmspec": [{
      "type": "AC",
      "name": "ids"
    }],
    "description": "This control removes one or more macro
                    definitions from the Agent."
  },
  {
    "name": "desc_macro",
    "parmspec": [{
      "type": "AC",
      "name": "ids"
    }],
    "description": "This control produces a detailed description of
                    one or more macro identifier(ARI) known to the
                    Agent."
  },
  {
    "name": "add_tbr",
    "parmspec": [{
      "type": "ARI",
      "name": "id"
    }],
    {
      "type": "TV",
      "name": "start"
    },
    {
      "type": "TV",

```

```

    "name": "period"
  },
  {
    "type": "UFAST",
    "name": "count"
  },
  {
    "type": "AC",
    "name": "action"
  },
  {

```

```

        "type": "STR",
        "name": "description"
    }

],
"description": "This control configures a new time-based
                rule (TBR) definition on the Agent."
},
{
    "name": "add_sbr",
    "parmspec": [{
        "type": "ARI",
        "name": "id"
    },
    {
        "type": "TV",
        "name": "start"
    },
    {
        "type": "EXPR",
        "name": "state"
    },
    {
        "type": "UFAST",
        "name": "max_eval"
    },
    {
        "type": "UFAST",
        "name": "count"
    },
    {
        "type": "AC",
        "name": "action"
    },
    {
        "type": "STR",
        "name": "description"
    }
}

```

```

    }

],
"description": "This control configures a new state-based

```



```

        rule (SBR) definition on the Agent."
    },
    {
        "name": "del_rule",
        "parmspec": [{
            "type": "AC",
            "name": "ids"
        }],
        "description": "This control removes one or more rule
                        definitions from the Agent."
    },
    {
        "name": "desc_rule",
        "parmspec": [{
            "type": "AC",
            "name": "ids"
        }],
        "description": "This control produces a detailed description
                        of one or more rules known to the Agent."
    },
    {
        "name": "store_var",
        "parmspec": [{
            "type": "ARI",
            "name": "id"
        }],
        {
            "type": "EXPR",
            "name": "value"
        }
    },
    {
        "name": "reset_counts",
        "description": "This control resets all Agent ADM statistics
                        reported in the Agent ADM report."
    }
],

"Const": [{
    "name": "amp_epoch",
    "type": "TS",
    "value": "1504915200",
    "description": "This constant is the time epoch for the Agent."
}]

```

```
    }],  
  
    "Mac": [{  
      "name": "user_desc",  
      "parmspec": [{  
        "type": "AC",  
        "name": "RPTTs"  
      }],  
      {  
        "type": "AC",  
        "name": "Rules"  
      }  
    ]],  
  
    "definition": [{  
      "ns": "Amp/Agent",  
      "nm": "ctrl.desc_rptt",  
      "ap": [{  
        "type": "ParmName",  
        "value": "RPTTs"  
      }]  
    },  
    {  
      "ns": "Amp/Agent",  
      "nm": "ctrl.desc_rule",  
      "ap": [{  
        "type": "ParmName",  
        "value": "Rules"  
      }]  
    }  
  ],  
  "description": "This macro lists all of the user defined data."  
}],  
  
"Oper": [{  
  "name": "plusINT",  
  "result-type": "INT",  
  "in-type": ["INT", "INT"],  
  "description": "Int32 addition"  
},  
{  
  "name": "plusUINT",  
  "result-type": "UINT",  
  "in-type": ["UINT", "UINT"],  
  "description": "Unsigned Int32 addition"  
},  
{  
  "name": "plusVAST",
```

"result-type": "VAST",

```
    "in-type": ["VAST", "VAST"],
    "description": "Int64 addition"
  },
  {
    "name": "plusUVAST",
    "result-type": "UVAST",
    "in-type": ["UVAST", "UVAST"],
    "description": "Unsigned Int64 addition"
  },
  {
    "name": "plusREAL32",
    "result-type": "REAL32",
    "in-type": ["REAL32", "REAL32"],
    "description": "Real32 addition"
  },
  {
    "name": "plusREAL64",
    "result-type": "REAL64",
    "in-type": ["REAL64", "REAL64"],
    "description": "Real64 addition"
  },
  {
    "name": "minusINT",
    "result-type": "INT",
    "in-type": ["INT", "INT"],
    "description": "Int32 subtraction"
  },
  {
    "name": "minusUINT",
    "result-type": "UINT",
    "in-type": ["UINT", "UINT"],
    "description": "Unsigned Int32 subtraction"
  },
  {
    "name": "minusVAST",
    "result-type": "VAST",
    "in-type": ["VAST", "VAST"],
    "description": "Int64 subtraction"
  },
  {
```

```

    "name": "minusUFAST",
    "result-type": "UFAST",
    "in-type": ["UFAST", "UFAST"],
    "description": "Unsigned Int64 subtraction"
  },
  {
    "name": "minusREAL32",
    "result-type": "REAL32",

```

```

    "in-type": ["REAL32", "REAL32"],
    "description": "Real32 subtraction"
  },
  {
    "name": "minusREAL64",
    "result-type": "REAL64",
    "in-type": ["REAL64", "REAL64"],
    "description": "Real64 subtraction"
  },
  {
    "name": "multINT",
    "result-type": "INT",
    "in-type": ["INT", "INT"],
    "description": "Int32 multiplication"
  },
  {
    "name": "multUINT",
    "result-type": "UINT",
    "in-type": ["UINT", "UINT"],
    "description": "Unsigned Int32 multiplication"
  },
  {
    "name": "multVAST",
    "result-type": "VAST",
    "in-type": ["VAST", "VAST"],
    "description": "Int64 multiplication"
  },
  {
    "name": "multUFAST",
    "result-type": "UFAST",
    "in-type": ["UFAST", "UFAST"],
    "description": "Unsigned Int64 multiplication"
  },

```

```

{
  "name": "multREAL32",
  "result-type": "REAL32",
  "in-type": ["REAL32", "REAL32"],
  "description": "Real32 multiplication"
},
{
  "name": "multREAL64",
  "result-type": "REAL64",
  "in-type": ["REAL64", "REAL64"],
  "description": "Real64 multiplication"
},
{
  "name": "divINT",
  "result-type": "INT",

```

```

  "in-type": ["INT", "INT"],
  "description": "Int32 division"
},
{
  "name": "divUINT",
  "result-type": "UINT",
  "in-type": ["UINT", "UINT"],
  "description": "Unsigned Int32 division"
},
{
  "name": "divVAST",
  "result-type": "VAST",
  "in-type": ["VAST", "VAST"],
  "description": "Int64 division"
},
{
  "name": "divUVAST",
  "result-type": "UVAST",
  "in-type": ["UVAST", "UVAST"],
  "description": "Unsigned Int64 division"
},
{
  "name": "divREAL32",
  "result-type": "REAL32",
  "in-type": ["REAL32", "REAL32"],
  "description": "Real32 division"

```

```

},
{
  "name": "divREAL64",
  "result-type": "REAL64",
  "in-type": ["REAL64", "REAL64"],
  "description": "Real64 division"
},
{
  "name": "modINT",
  "result-type": "INT",
  "in-type": ["INT", "INT"],
  "description": "Int32 modulus division"
},
{
  "name": "modUINT",
  "result-type": "UINT",
  "in-type": ["UINT", "UINT"],
  "description": "Unsigned Int32 modulus division"
},
{
  "name": "modVAST",
  "result-type": "VAST",

```

```

  "in-type": ["VAST", "VAST"],
  "description": "Int64 modulus division"
},
{
  "name": "modUVAST",
  "result-type": "UVAST",
  "in-type": ["UVAST", "UVAST"],
  "description": "Unsigned Int64 modulus division"
},
{
  "name": "modREAL32",
  "result-type": "REAL32",
  "in-type": ["REAL32", "REAL32"],
  "description": "Real32 modulus division"
},
{
  "name": "modREAL64",
  "result-type": "REAL64",
  "in-type": ["REAL64", "REAL64"],

```

```

    "description": "Real64 modulus division"
  },
  {
    "name": "expINT",
    "result-type": "INT",
    "in-type": ["INT", "INT"],
    "description": "Int32 exponentiation"
  },
  {
    "name": "expUINT",
    "result-type": "UINT",
    "in-type": ["UINT", "UINT"],
    "description": "Unsigned int32 exponentiation"
  },
  {
    "name": "expVAST",
    "result-type": "VAST",
    "in-type": ["VAST", "VAST"],
    "description": "Int64 exponentiation"
  },
  {
    "name": "expUVAST",
    "result-type": "UVAST",
    "in-type": ["UVAST", "UVAST"],
    "description": "Unsigned Int64 exponentiation"
  },
  {
    "name": "expREAL32",
    "result-type": "REAL32",

```

```

    "in-type": ["REAL32", "REAL32"],
    "description": "Real32 exponentiation"
  },
  {
    "name": "expREAL64",
    "result-type": "REAL64",
    "in-type": ["REAL64", "REAL64"],
    "description": "Real64 exponentiation"
  },
  {
    "name": "bitAND",
    "result-type": "UVAST",

```

```

    "in-type": ["UFAST", "UFAST"],
    "description": "Bitwise and"
  },
  {
    "name": "bitOR",
    "result-type": "UFAST",
    "in-type": ["UFAST", "UFAST"],
    "description": "Bitwise or"
  },
  {
    "name": "bitXOR",
    "result-type": "UFAST",
    "in-type": ["UFAST", "UFAST"],
    "description": "Bitwise xor"
  },
  {
    "name": "bitNOT",
    "result-type": "UFAST",
    "in-type": ["UFAST"],
    "description": "Bitwise not"
  },
  {
    "name": "logAND",
    "result-type": "BOOL",
    "in-type": ["BOOL", "BOOL"],
    "description": "Logical and"
  },
  {
    "name": "logOR",
    "result-type": "BOOL",
    "in-type": ["BOOL", "BOOL"],
    "description": "Logical or"
  },
  {
    "name": "logNOT",
    "result-type": "BOOL",

```

```

    "in-type": ["BOOL"],
    "description": "Logical not"
  },
  {
    "name": "abs",

```



```

    "result-type": "UFAST",
    "in-type": ["VAST"],
    "description": "absolute value"
  },
  {
    "name": "lessThan",
    "result-type": "BOOL",
    "in-type": ["UNK", "UNK"],
    "description": "<"
  },
  {
    "name": "greaterThan",
    "result-type": "BOOL",
    "in-type": ["UNK", "UNK"],
    "description": ">"
  },
  {
    "name": "lessEqual",
    "result-type": "BOOL",
    "in-type": ["UNK", "UNK"],
    "description": "<="
  },
  {
    "name": "greaterEqual",
    "result-type": "BOOL",
    "in-type": ["UNK", "UNK"],
    "description": ">="
  },
  {
    "name": "notEqual",
    "result-type": "BOOL",
    "in-type": ["UNK", "UNK"],
    "description": "!="
  },
  {
    "name": "Equal",
    "result-type": "BOOL",
    "in-type": ["UNK", "UNK"],
    "description": "=="
  },
  {
    "name": "bitShiftLeft",
    "result-type": "UFAST",

```

```

    "in-type": ["UVAST", "UVAST"],
    "description": "<<"
  },
  {
    "name": "bitShiftRight",
    "result-type": "UVAST",
    "in-type": ["UVAST", "UVAST"],
    "description": ">>"
  },
  {
    "name": "STOR",
    "result-type": "UNK",
    "in-type": ["UNK", "UNK"],
    "description": "Store value of parm 2 in parm 1"
  }
]
}

```

5. IANA Considerations

This document defines a moderated Namespace: "Amp/Agent" with the ADM enumeration of 0.

6. References

6.1. Informative References

[I-D.birrane-dtn-ama]
 Birrane, E., "Asynchronous Management Architecture",
[draft-birrane-dtn-ama-07](#) (work in progress), June 2018.

6.2. Normative References

[I-D.birrane-dtn-adm]
 Birrane, E., DiPietro, E., and D. Linko, "AMA Application Data Model", [draft-birrane-dtn-adm-02](#) (work in progress), June 2018.

[I-D.birrane-dtn-amp]
 Birrane, E., "Asynchronous Management Protocol", [draft-birrane-dtn-amp-04](#) (work in progress), June 2018.

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", [BCP 14](#), [RFC 2119](#), DOI 10.17487/RFC2119, March 1997, <<https://www.rfc-editor.org/info/rfc2119>>.

Internet-Draft

Agent ADM

March 2019

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