

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

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March 11, 2019

ION Administration Application Data Model
draft-birrane-dtn-adm-ionadmin-01

Abstract

This document describes the Application Data Model (ADM) for the administration of ION in compliance with the template provided by [[I-D.birrane-dtn-adm](#)].

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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 ION Administration ADM contains all of the functionality that is required for the proper configuration and management of ION nodes.

[1.1.](#) Technical Notes

- o This document describes Version 0.0 of the ION Admin ADM.
- o The AMM Resource Identifier (ARI) for this ADM is NOT correctly set. A sample ARI is used in this version of the specification and MAY change in future versions of this ADM until an ARI registry is established. This notice will be removed at that time.
- 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 administration of ION.

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 ION Admin ADM's structure is in accordance with [\[I-D.birrane-dtn-adm\]](#). This ADM contains metadata, edd, table templates, and controls. Externally Defined Data (EDD) are values that are calculated external to the ADM system. Table Templates are column templates that will be followed by any instance of this table available in the network. They may not be created dynamically within the network by Managers. Controls are predefined and sometimes parameterized opcodes that can be run on an Agent. Controls are preconfigured in Agents and Managers as part of ADM support. There are no variables, report templates, macros, constants, or operators in this ADM at this time.

The contents of this ADM are derived from the main functions and data that are needed to configure and manage the node on the local

computer that is running ION. The core functions of the administration of ION nodes that are included in this ADM deal with contacts (information about periods of data transmission), ranges (periods of time when the distance between two nodes is constant), occupancy limits (the maximum amount of megabytes of storage space in ION's SDR non volatile heap and/or local file system), rates of data production, congestion, consumption (rate of continuous data delivery to local BP applications), and time.

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 of the encoding.

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	DTN/ION/ionadmin
ADM Enumeration	7

Table 1: Namespace Information

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

Nickname	Collection
140	DTN/ION/ionadmin/Const
141	DTN/ION/ionadmin/Ctrl
142	DTN/ION/ionadmin/Edd
143	DTN/ION/ionadmin/Mac
144	DTN/ION/ionadmin/Oper
145	DTN/ION/ionadmin/Rptt
147	DTN/ION/ionadmin/Tblt
149	DTN/ION/ionadmin/Var
150	DTN/ION/ionadmin/Mdat
151-159	DTN/ION/ionadmin/Reserved

Table 2: ION Admin ADM Nicknames

4. ION Admin ADM JSON Encoding

The following is the JSON encoding of the ION Administration Application Data Model:

```
{
  "Mdat": [{
    "name": "name",
    "type": "STR",
    "value": "ion_admin",
    "description": "The human-readable name of the ADM."
  },
  {
    "name": "namespace",
    "type": "STR",
    "value": "DTN/ION/ionadmin",
    "description": "The namespace of the ADM."
  },
  {
    "name": "version",
    "type": "STR",
    "value": "v0.0",
    "description": "The version of the ADM."
  },
  {
    "name": "organization",
    "type": "STR",
    "value": "JHUAPL",
    "description": "The name of the issuing organization of the ADM."
  }
  ],
  "Edd": [{
    "name": "clock_error",
    "type": "UINT",
    "value": 0,
    "description": "The clock error of the ADM."
  }
  ]
}
```

```
    "value": "v0.0",
    "description": "The version of the ADM."
  },
  {
    "name": "organization",
    "type": "STR",
    "value": "JHUAPL",
    "description": "The name of the issuing organization of the ADM."
  }
  ],
  "Edd": [{
    "name": "clock_error",
    "type": "UINT",
    "value": 0,
    "description": "The clock error of the ADM."
  }
  ]
}
```

```

        "description": "This is how accurate the ION Agent's clock is
                        described as number of seconds, an absolute
                        value."
    },
    {
        "name": "clock_sync",
        "type": "UINT",
        "description": "This is whether or not the the computer on
                        which the local ION node is running has a
                        synchronized clock."
    },
    {
        "name": "congestion_alarm_control",
        "type": "UINT",
        "description": "This is whether or not the node has a control
                        that will set off alarm if it will become
                        congested at some future time."
    },
    {
        "name": "congestion_end_time_forecasts",
        "type": "UINT",
        "description": "This is the time horizon beyond which we don't
                        attempt to forecast congestion"
    },
    {
        "name": "consumption_rate",
        "type": "UINT",
        "description": "This is the mean rate of continuous data
                        delivery to local BP applications."
    },
    {
        "name": "inbound_file_system_occupancy_limit",
        "type": "UINT",

```

```

        "description": "This is the maximum number of megabytes of
                        storage space in ION's local file system that
                        can be used for the storage of inbound zero-copy
                        objects. The default heap limit is 1 Terabyte."
    },
    {
        "name": "inbound_heap_occupancy_limit",
        "type": "UINT",

```

```

      "description": "This is the maximum number of megabytes of
                      storage space in ION's SDR non-volatile heap
                      that can be used for the storage of inbound
                      zero-copy objects. The default heap limit is
                      20% of the SDR data space's total heap size."
    },
    {
      "name": "number",
      "type": "UINT",
      "description": "This is a CBHE node number which uniquely
                      identifies the node in the delay-tolerant
                      network."
    },
    {
      "name": "outbound_file_system_occupancy_limit",
      "type": "UINT",
      "description": "This is the maximum number of megabytes of
                      storage space in ION's local file system that
                      can be used for the storage of outbound
                      zero-copy objects. The default heap limit is
                      1 Terabyte."
    },
    {
      "name": "outbound_heap_occupancy_limit",
      "type": "UINT",
      "description": "This is the maximum number of megabytes of
                      storage space in ION's SDR non-volatile heap
                      that can be used for the storage of outbound
                      zero-copy objects. The default heap limit is
                      20% of the SDR data space's total heap size."
    },
    {
      "name": "production_rate",
      "type": "UINT",
      "description": "This is the rate of local data production."
    },
    {
      "name": "ref_time",
      "type": "TV",
      "description": "This is the reference time that will be used

```



```

        until the next revision of reference time."
    },
    {
        "name": "time_delta",
        "type": "UINT",
        "description": "The time delta is used to compensate for error
            (drift) in clocks, particularly spacecraft
            clocks. The hardware clock on a spacecraft
            might gain or lose a few seconds every month,
            to the point at which its understanding of the
            current time - as reported out by the operating
            system - might differ significantly from the
            actual value of Unix Epoch time as reported by
            authoritative clocks on Earth. To compensate for
            this difference without correcting the clock
            itself (which can be difficult and dangerous),
            ION simply adds the time delta to the Epoch
            time reported by the operating system."
    },
    {
        "name": "version",
        "type": "STR",
        "description": "This is the version of ION that is currently
            installed."
    }
],
"Tblt": [{
    "name": "contacts",
    "columns": [{
        "type": "TV",
        "name": "start_time"
    }, {
        "type": "TV",
        "name": "stop_time"
    }, {
        "type": "UINT",
        "name": "source_node"
    }, {
        "type": "UINT",
        "name": "dest_node"
    }, {
        "type": "UFAST",
        "name": "xmit_data"
    }, {
        "type": "UFAST",
        "name": "confidence"
    }
]

```

```
    }],  
    "description": "This table shows all scheduled periods of data  
                    transmission."  
  },  
  {  
    "name": "ranges",  
    "columns": [{  
      "type": "TV",  
      "name": "start"  
    }, {  
      "type": "TV",  
      "name": "stop"  
    }, {  
      "type": "UINT",  
      "name": "node"  
    }, {  
      "type": "UINT",  
      "name": "other_node"  
    }, {  
      "type": "UINT",  
      "name": "distance"  
    }],  
    "description": "This table shows all predicted periods of  
                    constant distance between nodes."  
  }  
],  
"Ctrl": [{  
  "name": "node_init",  
  "parmspec": [{  
    "type": "UINT",  
    "name": "node_nbr"  
  }, {  
    "type": "STR",  
    "name": "config_file"  
  }],  
  "description": "Until this control is executed, the local ION  
                  node does not exist and most ionadmin controls  
                  will fail. The control configures the local node  
                  to be identified by node_number, a CBHE node  
                  number which uniquely identifies the node in  
                  the delay-tolerant network. It also configures  
                  ION's data space (SDR) and shared working-memory  
                  region. For this purpose it uses a set of  
                  default settings if no argument follows  
                  node_number or if the argument following
```

node_number is ''; otherwise it uses the configuration settings found in a configuration

```
file. If configuration file name is provided,
then the configuration file's name is
implicitly 'hostname.ionconfig'; otherwise,
ion_config_filename is taken to be the explicit
configuration file name."
},
{
  "name": "node_clock_error_set",
  "parmspec": [{
    "type": "UINT",
    "name": "known_maximum_clock_error"
  ]],
  "description": "This management control sets ION's understanding
of the accuracy of the scheduled start and stop
times of planned contacts, in seconds. The
default value is 1."
},
{
  "name": "node_clock_sync_set",
  "parmspec": [{
    "type": "BOOL",
    "name": "new_state"
  ]],
  "description": "This management control reports whether or not
the computer on which the local ION node is
running has a synchronized clock."
},
{
  "name": "node_congestion_alarm_control_set",
  "parmspec": [{
    "type": "STR",
    "name": "congestion_alarm_control"
  ]],
  "description": "This management control establishes a control
which will automatically be executed whenever
ionadmin predicts that the node will become
congested at some future time."
},
{
```

```

"name": "node_congestion_end_time_forecasts_set",
"parmspec": [{
  "type": "UINT",
  "name": "end_time_for_congestion_forcasts"
}],
"description": "This management control sets the end time for
computed congestion forecasts. Setting
congestion forecast horizon to zero sets the
congestion forecast end time to infinite time

```

```

in the future: if there is any predicted net
growth in bundle storage space occupancy at all,
following the end of the last scheduled contact,
then eventual congestion will be predicted. The
default value is zero, i.e., no end time."
},
{
  "name": "node_consumption_rate_set",
  "parmspec": [{
    "type": "UINT",
    "name": "planned_data_consumption_rate"
  }],
  "description": "This management control sets ION's expectation
of the mean rate of continuous data delivery to
local BP applications throughout the period of
time over which congestion forecasts are
computed. For nodes that function only as routers
this variable will normally be zero. A value of
-1, which is the default, indicates that the
rate of local data consumption is unknown; in
that case local data consumption is not
considered in the computation of congestion
forecasts."
},
{
  "name": "node_contact_add",
  "parmspec": [{
    "type": "TV",
    "name": "start"
  }, {
    "type": "TV",
    "name": "stop"
  }

```

```

    }, {
      "type": "UINT",
      "name": "from_node_id"
    }, {
      "type": "UINT",
      "name": "to_node_id"
    }, {
      "type": "UVA",
      "name": "data_rate"
    }, {
      "type": "UVA",
      "name": "prob"
    }
  ],
  "description": "This control schedules a period of data
    transmission from source_node to dest_node. The
    period of transmission will begin at start_time

```

and end at stop_time, and the rate of data transmission will be xmit_data_rate bytes/second. Our confidence in the contact defaults to 1.0, indicating that the contact is scheduled - not that non-occurrence of the contact is impossible, just that occurrence of the contact is planned and scheduled rather than merely imputed from ast node behavior. In the latter case, confidence indicates our estimation of the likelihood of this potential contact."

```

  },
  {
    "name": "node_contact_del",
    "parmspec": [{
      "type": "TV",
      "name": "start"
    }, {
      "type": "UINT",
      "name": "node_id"
    }, {
      "type": "STR",
      "name": "dest"
    }
  ],
  "description": "This control deletes the scheduled period of
    data transmission from source_node to dest_node

```

```

        starting at start_time. To delete all contacts
        between some pair of nodes, use '*' as
        start_time."
    },
    {
        "name": "node_inbound_heap_occupancy_limit_set",
        "parmspec": [{
            "type": "UINT",
            "name": "heap_occupancy_limit"
        }, {
            "type": "UINT",
            "name": "file_system_occupancy_limit"
        }],
        "description": "This management control sets the maximum number
            of megabytes of storage space in ION's SDR
            non-volatile heap that can be used for the
            storage of inbound zero-copy objects. A value
            of -1 for either limit signifies 'leave
            unchanged'. The default heap limit is 30% of
            the SDR data space's total heap size."
    },
    {
        "name": "node_outbound_heap_occupancy_limit_set",

```

```

        "parmspec": [{
            "type": "UINT",
            "name": "heap_occupancy_limit"
        }, {
            "type": "UINT",
            "name": "file_system_occupancy_limit"
        }],
        "description": "This management control sets the maximum number
            of megabytes of storage space in ION's SDR
            non-volatile heap that can be used for the
            storage of outbound zero-copy objects. A value
            of -1 for either limit signifies 'leave
            unchanged'. The default heap limit is 30% of
            the SDR data space's total heap size."
    },
    {
        "name": "node_production_rate_set",
        "parmspec": [{

```

```

        "type": "UINT",
        "name": "planned_data_production_rate"
    ]],
    "description": "This management control sets ION's expectation
                    of the mean rate of continuous data origination
                    by local BP applications throughout the period
                    of time over which congestion forecasts are
                    computed. For nodes that function only as
                    routers this variable will normally be zero. A
                    value of -1, which is the default, indicates
                    that the rate of local data production is unknown;
                    in that case local data production is not
                    considered in the computation of congestion
                    forecasts."
},
{
    "name": "node_range_add",
    "parmspec": [{
        "type": "TV",
        "name": "start"
    }, {
        "type": "TV",
        "name": "stop"
    }, {
        "type": "UINT",
        "name": "node"
    }, {
        "type": "UINT",
        "name": "other_node"
    }, {

```

```

        "type": "UINT",
        "name": "distance"
    ]],
    "description": "This control predicts a period of time during
                    which the distance from node to other_node will
                    be constant to within one light second. The
                    period will begin at start_time and end at
                    stop_time, and the distance between the nodes
                    during that time will be distance light seconds."
},
{

```

```

    "name": "node_range_del",
    "parmspec": [{
        "type": "TV",
        "name": "start"
    }, {
        "type": "UINT",
        "name": "node"
    }, {
        "type": "UINT",
        "name": "other_node"
    }],
    "description": "This control deletes the predicted period of
                    constant distance between node and other_node
                    starting at start_time. To delete all ranges
                    between some pair of nodes, use '*' as
                    start_time."
},
{
    "name": "node_ref_time_set",
    "parmspec": [{
        "type": "TV",
        "name": "time"
    }],
    "description": "This is used to set the reference time that will
                    be used for interpreting relative time values
                    from now until the next revision of reference
                    time. Note that the new reference time can be
                    a relative time, i.e., an offset beyond the
                    current reference time."
},
{
    "name": "node_time_delta_set",
    "parmspec": [{
        "type": "UINT",
        "name": "local_time_sec_after_epoch"
    }],
    "description": "This management control sets ION's understanding

```

of the current difference between correct time and the Unix Epoch time values reported by the clock for the local ION node's computer. This delta is automatically applied to locally

obtained time values whenever ION needs to know the current time."

```
}  
]  
}
```

[5.](#) IANA Considerations

At this time, this protocol has no fields registered by IANA.

[6.](#) References

[6.1.](#) Informative References

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