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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This Internet-Draft will expire on September 12, 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 ION Administration ADM contains all of the functionality that is required for the proper configuration and management of ION nodes.

1.1. Technical Notes

- This document describes Version 0.0 of the ION Admin ADM.

- 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.

- 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.

<table>
<thead>
<tr>
<th>Identifier</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Namespace</td>
<td>DTN/ION/ionadmin</td>
</tr>
<tr>
<td>ADM Enumeration</td>
<td>7</td>
</tr>
</tbody>
</table>

Table 1: Namespace Information

Given the above ADM enumeration, in accordance with
[I-D.birrane-dtn-amp], the following AMP nicknames are defined.
<table>
<thead>
<tr>
<th>Nickname</th>
<th>Collection</th>
</tr>
</thead>
<tbody>
<tr>
<td>140</td>
<td>DTN/ION/ionadmin/Const</td>
</tr>
<tr>
<td>141</td>
<td>DTN/ION/ionadmin/Ctrl</td>
</tr>
<tr>
<td>142</td>
<td>DTN/ION/ionadmin/Edd</td>
</tr>
<tr>
<td>143</td>
<td>DTN/ION/ionadmin/Mac</td>
</tr>
<tr>
<td>144</td>
<td>DTN/ION/ionadmin/Oper</td>
</tr>
<tr>
<td>145</td>
<td>DTN/ION/ionadmin/Rptt</td>
</tr>
<tr>
<td>147</td>
<td>DTN/ION/ionadmin/Tblt</td>
</tr>
<tr>
<td>149</td>
<td>DTN/ION/ionadmin/Var</td>
</tr>
<tr>
<td>150</td>
<td>DTN/ION/ionadmin/Mdat</td>
</tr>
<tr>
<td>151-159</td>
<td>DTN/ION/ionadmin/Reserved</td>
</tr>
</tbody>
</table>

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:

```json
{
    "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",
"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 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": "The name of the issuing organization of the ADM."
}]
"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
for interpreting relative time values from now 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": "UVAST",
 "name": "xmit_data"
 },
 { "type": "UVAST",
 "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."


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_forecasts"
}],
"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": "UVAST",    "name": "data_rate"  }, {    "type": "UVAST",    "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 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."}
"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

[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",
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[I-D.birrane-dtn-amp]
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,

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