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Bundle Protocol Agent Application Data Model
draft-birrane-dtn-adm-ion-bpadmin-01

Abstract

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

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BP Admin 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 ION Bundle Protocol Administration ADM contains all of the functionality that is required for the configuration and management of BP on the local ION node.

[1.1.](#) Technical Notes

- o This document describes Version 0.0 of the ION BP Admin ADM.
- o The Asynchronous 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 configuration and management of Bundle Protocol in 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 BP Admin ADM's structure is in accordance to [\[I-D.birrane-dtn-adm\]](#). This ADM contains metadata, table templates, and controls. 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, constants, macros, edd, 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 BP in accordance with (WHICH VERSION OF BP).

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. The table templates and controls in this ADM deal with inducts, outducts, schemes, and protocols, the most important things needed for the proper administration of Bundle Protocol.

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/bpadmin/
ADM Enumeration	5

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
100	DTN/ION/bpadmin/Const
101	DTN/ION/bpadmin/Ctrl
102	DTN/ION/bpadmin/Edd
103	DTN/ION/bpadmin/Mac
104	DTN/ION/bpadmin/Oper
105	DTN/ION/bpadmin/Rptt
107	DTN/ION/bpadmin/Tblt
109	DTN/ION/bpadmin/Var
110	DTN/ION/bpadmin/Mdat
111-119	DTN/ION/bpadmin/Reserved

Table 2: ION BP ADM Nicknames

4. ION BP Admin ADM JSON Encoding

The following is the JSON encoding of the Bundle Protocol Admin Application Data Model:

```
{
  "Mdat": [{
    "name": "name",
    "type": "STR",
    "value": "ion_bp_admin",
    "description": "The human-readable name of the ADM."
  },
  {
    "name": "namespace",
    "type": "STR",
    "value": "DTN/ION/bpadmin",
    "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": "bp_version",
    "type": "STR",
    "description": "Version of installed ION BP Admin utility."
  }],
  "Tbtl": [{
```

```

    "name": "endpoints",
    "columns": [{
        "type": "STR",
        "name": "scheme_name"
    }, {
        "type": "STR",
        "name": "endpoint_nss"
    }, {
        "type": "UINT",
        "name": "app_pid"
    }, {
        "type": "STR",
        "name": "recv_rule"
    }, {
        "type": "STR",
        "name": "rcv_script"
    }
    ],
    "description": "Local endpoints, regardless of scheme name."
},
{
    "name": "inducts",
    "columns": [{
        "type": "STR",
        "name": "protocol_name"
    }, {
        "type": "STR",
        "name": "duct_name"
    }, {
        "type": "STR",
        "name": "cli_control"
    }
    ],
    "description": "Inducts established locally for the indicated
                    CL protocol."
}

```

```

},
{
    "name": "outducts",
    "columns": [{
        "type": "STR",
        "name": "protocol_name"
    }, {
        "type": "STR",

```

```

        "name": "duct_name"
    }, {
        "type": "UINT",
        "name": "clo_pid"
    }, {
        "type": "STR",
        "name": "clo_control"
    }, {
        "type": "UINT",
        "name": "max_payload_length"
    }
  ],
  "description": "If protocolName is specified, this table lists
                  all outducts established locally for the
                  indicated CL protocol. Otherwise, it lists all
                  locally established outducts, regardless of
                  their protocol."
},
{
  "name": "protocols",
  "columns": [{
    "type": "STR",
    "name": "name"
  }, {
    "type": "UINT",
    "name": "payload_bpf"
  }, {
    "type": "UINT",
    "name": "overhead_bpf"
  }, {
    "type": "UINT",
    "name": "protocol class"
  }
  ],
  "description": "Convergence layer protocols that can currently
                  be utilized at the local node."
},
{
  "name": "schemes",
  "columns": [{
    "type": "STR",
    "name": "scheme_name"
  }
  ],

```

```

  }, {

```



```

        "type": "UINT",
        "name": "fwd_pid"
    }, {
        "type": "STR",
        "name": "fwd_cmd"
    }, {
        "type": "UINT",
        "name": "admin_app_pid"
    }, {
        "type": "STR",
        "name": "admin_app_cmd"
    }
  ],
  "description": "Declared endpoint naming schemes."
},
{
  "name": "egress_plans",
  "columns": [{
    "type": "STR",
    "name": "neighbor_eid"
  }, {
    "type": "UINT",
    "name": "clm_pid"
  }, {
    "type": "UINT",
    "name": "nominal_rate"
  }
  ],
  "description": "Egress plans."
}
],
"Ctrl": [{
  "name": "endpoint_add",
  "parmspec": [{
    "type": "STR",
    "name": "endpoint_id"
  }, {
    "type": "UINT",
    "name": "type"
  }, {
    "type": "STR",
    "name": "rcv_script"
  }
  ],
  "description": "Establish DTN endpoint named endpointId on the
    local node. The remaining parameters indicate
    what is to be done when bundles destined for
    this endpoint arrive at a time when no
    application has the endpoint open for bundle
    reception. If type is 'x', then such bundles

```

```
are to be discarded silently and immediately.
If type is 'q', then such bundles are to be
enqueued for later delivery and, if recvScript
is provided, recvScript is to be executed."
},
{
  "name": "endpoint_change",
  "parmspec": [{
    "type": "STR",
    "name": "endpoint_id"
  }, {
    "type": "UINT",
    "name": "type"
  }, {
    "type": "STR",
    "name": "rcv_script"
  }],
  "description": "Change the action taken when bundles destined
                  for this endpoint arrive at a time when no
                  application has the endpoint open for bundle
                  reception."
},
{
  "name": "endpoint_del",
  "parmspec": [{
    "type": "STR",
    "name": "endpoint_id"
  }],
  "description": "Delete the endpoint identified by endpointId.
                  The control will fail if any bundles are
                  currently pending delivery to this endpoint."
},
{
  "name": "induct_add",
  "parmspec": [{
    "type": "STR",
    "name": "protocol_name"
  }, {
    "type": "STR",
    "name": "duct_name"
  }, {
    "type": "STR",
    "name": "cli_control"
  }],
  "description": "Establish a duct for reception of bundles via
                  the indicated CL protocol. The duct's data
```

acquisition structure is used and populated by
the induct task whose operation is initiated by

```
cliControl at the time the duct is started."
},
{
  "name": "induct_change",
  "parmspec": [{
    "type": "STR",
    "name": "protocol_name"
  }, {
    "type": "STR",
    "name": "duct_name"
  }, {
    "type": "STR",
    "name": "cli_control"
  }],
  "description": "Change the control used to initiate operation
                  of the induct task for the indicated duct."
},
{
  "name": "induct_del",
  "parmspec": [{
    "type": "STR",
    "name": "protocol_name"
  }, {
    "type": "STR",
    "name": "duct_name"
  }],
  "description": "Delete the induct identified by protocolName and
                  ductName. The control will fail if any bundles
                  are currently pending acquisition via this
                  induct."
},
{
  "name": "induct_start",
  "parmspec": [{
    "type": "STR",
    "name": "protocol_name"
  }, {
    "type": "STR",
    "name": "duct_name"
```

```

    }],
    "description": "Start the indicated induct task as defined for
                    the indicated CL protocol on the local node."
  },
  {
    "name": "induct_stop",
    "parmspec": [{
      "type": "STR",
      "name": "protocol_name"
    }],

```

```

    }, {
      "type": "STR",
      "name": "duct_name"
    }],
    "description": "Stop the indicated induct task as defined for
                    the indicated CL protocol on the local node."
  },
  {
    "name": "manage_heap_max",
    "parmspec": [{
      "type": "UINT",
      "name": "max_database_heap_per_acquisition"
    }],
    "description": "Declare the maximum number of bytes of SDR heap
                    space that will be occupied by any single bundle
                    acquisition activity (nominally the acquisition
                    of a single bundle, but this is at the
                    discretion of the convergence-layer input task).
                    All data acquired in excess of this limit will
                    be written to a temporary file pending extraction
                    and dispatching of the acquired bundle or
                    bundles. The default is the minimum allowed
                    value (560 bytes), which is the approximate size
                    of a ZCO file reference object; this is the
                    minimum SDR heap space occupancy in the event
                    that all acquisition is into a file."
  },
  {
    "name": "outduct_add",
    "parmspec": [{
      "type": "STR",
      "name": "protocol_name"
    }],

```

```

    }, {
      "type": "STR",
      "name": "duct_name"
    }, {
      "type": "STR",
      "name": "clo_command"
    }, {
      "type": "UINT",
      "name": "max_payload_length"
    }
  ],
  "description": "Establish a duct for transmission of bundles via
                  the indicated CL protocol. the duct's data
                  transmission structure is serviced by the outduct
                  task whose operation is initiated by
                  CLOcommand at the time the duct is started. A
                  value of zero for maxPayloadLength indicates

```

```

        that bundles of any size can be accommodated;
        this is the default."
    },
    {
      "name": "outduct_change",
      "parmspec": [{
        "type": "STR",
        "name": "protocol_name"
      }, {
        "type": "STR",
        "name": "duct_name"
      }, {
        "type": "STR",
        "name": "clo_control"
      }, {
        "type": "UINT",
        "name": "max_payload_length"
      }
    ],
      "description": "Set new values for the indicated duct's payload
                      size limit and the control that is used to
                      initiate operation of the outduct task for this
                      duct."
    },
    {
      "name": "outduct_del",

```

```

    "parmspec": [{
      "type": "STR",
      "name": "protocol_name"
    }, {
      "type": "STR",
      "name": "duct_name"
    }],
    "description": "Delete the outduct identified by protocolName
                    and ductName. The control will fail if any
                    bundles are currently pending transmission
                    via this outduct."
  },
  {
    "name": "outduct_start",
    "parmspec": [{
      "type": "STR",
      "name": "protocol_name"
    }, {
      "type": "STR",
      "name": "duct_name"
    }],
    "description": "Start the indicated outduct task as defined for
                    the indicated CL protocol on the local node."
  }

```

```

  },
  {
    "name": "egress_plan_block",
    "parmspec": [{
      "type": "STR",
      "name": "plan_name"
    }],
    "description": "Disable transmission of bundles queued for
                    transmission to the indicated node and
                    reforwards all non-critical bundles currently
                    queued for transmission to this node. This may
                    result in some or all of these bundles being
                    enqueued for transmission to the psuedo-node
                    limbo."
  },
  {
    "name": "egress_plan_unblock",
    "parmspec": [{

```

```

        "type": "STR",
        "name": "plan_name"
    }],
    "description": "Re-enable transmission of bundles to the
                    indicated node and reforwards all bundles in
                    limbo in the hope that the unblocking of this
                    egress plan will enable some of them to be
                    transmitted."
},
{
    "name": "outduct_stop",
    "parmspec": [{
        "type": "STR",
        "name": "protocol_name"
    }, {
        "type": "STR",
        "name": "duct_name"
    }],
    "description": "Stop the indicated outduct task as defined for
                    the indicated CL protocol on the local node."
},
{
    "name": "protocol_add",
    "parmspec": [{
        "type": "STR",
        "name": "protocol_name"
    }, {
        "type": "UINT",
        "name": "payload_bytes_per_frame"
    }, {

```

```

        "type": "UINT",
        "name": "overhead_bytes_per_frame"
    }, {
        "type": "UINT",
        "name": "nominal_data_rate"
    }],
    "description": "Establish access to the named convergence layer
                    protocol at the local node. The
                    payloadBytesPerFrame and overheadBytesPerFrame
                    arguments are used in calculating the estimated
                    transmission capacity consumption of each

```

bundle, to aid in route computation and congesting forecasting. The optional nominalDataRate argument overrides the hard coded default continuous data rate for the indicated protocol for purposes of rate control. For all promiscuous protocols—that is, protocols whose outducts are not specifically dedicated to transmission to a single identified convergence-layer protocol endpoint—the protocol's applicable nominal continuous data rate is the data rate that is always used for rate control over links served by that protocol; data rates are not extracted from contact graph information. This is because only the induct and outduct throttles for non-promiscuous protocols (LTP, TCP) can be dynamically adjusted in response to changes in data rate between the local node and its neighbors, as enacted per the contact plan. Even for an outduct of a non-promiscuous protocol the nominal data rate may be the authority for rate control, in the event that the contact plan lacks identified contacts with the node to which the outduct is mapped."

```

},
{
  "name": "protocol_del",
  "parmspec": [{
    "type": "STR",
    "name": "protocol_name"
  }],
  "description": "Delete the convergence layer protocol identified
                  by protocolName. The control will fail if any
                  ducts are still locally declared for this
                  protocol."
},
{

```

```

"name": "protocol_start",
"parmspec": [{
  "type": "STR",
  "name": "protocol_name"

```



```

    }],
    "description": "Start all induct and outduct tasks for inducts
                    and outducts that have been defined for the
                    indicated CL protocol on the local node."
  },
  {
    "name": "protocol_stop",
    "parmspec": [{
      "type": "STR",
      "name": "protocol_name"
    }],
    "description": "Stop all induct and outduct tasks for inducts
                    and outducts that have been defined for the
                    indicated CL protocol on the local node."
  },
  {
    "name": "scheme_add",
    "parmspec": [{
      "type": "STR",
      "name": "scheme_name"
    }, {
      "type": "STR",
      "name": "forwarder_control"
    }, {
      "type": "STR",
      "name": "admin_app_control"
    }],
    "description": "Declares an endpoint naming scheme for use in
                    endpoint IDs, which are structured as URIs:
                    schemeName:schemeSpecificPart. forwarderControl
                    will be executed when the scheme is started on
                    this node, to initiate operation of a forwarding
                    daemon for this scheme. adminAppControl will
                    also be executed when the scheme is started on
                    this node, to initiate operation of a daemon
                    that opens a custodian endpoint identified within
                    this scheme so that it can receive and process
                    custody signals and bundle status reports."
  },
  {
    "name": "scheme_change",
    "parmspec": [{
      "type": "STR",
      "name": "scheme_name"
    }],
    "description": "Declares an endpoint naming scheme for use in
                    endpoint IDs, which are structured as URIs:
                    schemeName:schemeSpecificPart. forwarderControl
                    will be executed when the scheme is started on
                    this node, to initiate operation of a forwarding
                    daemon for this scheme. adminAppControl will
                    also be executed when the scheme is started on
                    this node, to initiate operation of a daemon
                    that opens a custodian endpoint identified within
                    this scheme so that it can receive and process
                    custody signals and bundle status reports."
  }
]

```

```
    }, {
      "type": "STR",
      "name": "forwarder_control"
    }, {
      "type": "STR",
      "name": "admin_app_control"
    }
  ],
  "description": "Set the indicated scheme's forwarderControl and
                  adminAppControl to the strings provided as
                  arguments."
},
{
  "name": "scheme_del",
  "parmspec": [{
    "type": "STR",
    "name": "scheme_name"
  }],
  "description": "Delete the scheme identified by schemeName. The
                  control will fail if any bundles identified in
                  this scheme are pending forwarding,
                  transmission, or delivery."
},
{
  "name": "scheme_start",
  "parmspec": [{
    "type": "STR",
    "name": "scheme_name"
  }],
  "description": "Start the forwarder and administrative endpoint
                  tasks for the indicated scheme task on the local
                  node."
},
{
  "name": "scheme_stop",
  "parmspec": [{
    "type": "STR",
    "name": "scheme_name"
  }],
  "description": "Stop the forwarder and administrative endpoint
                  tasks for the indicated scheme task on the
                  local node."
},
{
  "name": "watch",
  "parmspec": [{
    "type": "UINT",
    "name": "status"
```

```
}, {
```

```
    "type": "STR",
    "name": "activity_spec"
  }],
  "description": "Enable/Disable production of a continuous stream
    of user selected Bundle Protocol activity
    indication characters. A watch parameter of 1
    selects all BP activity indication characters, 0
    deselects allBP activity indication characters;
    any other activitySpec such as acz~ selects all
    activity indication characters in the string,
    deselecting all others. BP will print each
    selected activity indication character to stdout
    every time a processing event of the associated
    type occurs: a new bundle is queued for
    forwarding, b bundle is queued for transmission,
    c bundle is popped from its transmission queue,
    m custody acceptance signal is received, w
    custody of bundle is accepted, x custody of
    bundle is refused, y bundle is accepted upon
    arrival, z bundle is queued for delivery to an
    application, ~ bundle is abandoned (discarded)
    on attempt to forward it, ! bundle is destroyed
    due to TTL expiration, & custody refusal
    signal is recieved, # bundle is queued for
    re-forwarding due to CL protocol failures,
    j bundle is placed in 'limbo' for possible
    future reforwarding, k bundle is removed from
    'limbo' and queued for reforwarding, $ bundle's
    custodial retransmission timeout interval
    expired."
  }
]
```

[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.

Birrane, et al. Expires September 12, 2019 [Page 17]

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[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>>.

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