Bundle Protocol Agent Application Data Model
draft-birrane-dtn-adm-bp-03

Abstract

   This document describes the Application Data Model (ADM) for a Bundle
   Protocol Agent (BPA) 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.

   Bundle Protocol Agents (BPAs) are software instances that implement
   functionality required by the Bundle Protocol ([I-D.ietf-dtn-bpbis]).
   The BPA ADM provides the set of information necessary to remotely
   manage such agents.

1.1. Technical Notes

   o This document describes Version 0.1 of the BP 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 management of any instance of a BPA.

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 Agent ADM's structure is in accordance to [I-D.birrane-dtn-adm]. This ADM contains metadata, edd, report templates, and controls. Externally Defined Data (EDD) are values that are calculated external to the ADM system. Report Templates are ordered sets of data descriptions that show how values will be represented in a corresponding report. 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, table 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 bundle protocol operations on an ION node.

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 main elements of BP that are discussed in this ADM are endpoints, the priority of bundles/bytes, and whether or not the bundles/bytes were transferred successfully.

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/bp_agent |
            |                |              |
            | ADM Enumeration |     2       |
            +----------------+--------------+
```

                  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          |
          +----------+-----------------------------+
          |    40    |     DTN/bp_agent/Const       |
          |          |                              |
          |    41    |     DTN/bp_agent/Ctrl        |
          |          |                              |
          |    42    |      DTN/bp_agent/Edd        |
          |          |                              |
          |    43    |      DTN/bp_agent/Mac        |
          |          |                              |
          |    44    |     DTN/bp_agent/Oper        |
          |          |                              |
          |    45    |     DTN/bp_agent/Rptt        |
          |          |                              |
          |    47    |     DTN/bp_agent/Tblt        |
          |          |                              |
          |    49    |      DTN/bp_agent/Var        |
          |          |                              |
          |    50    |     DTN/bp_agent/Mdat        |
          |          |                              |
          |  51-59   |   DTN/bp_agent/Reserved      |
          +----------+-----------------------------+
```

                  Table 2: BP Agent ADM Nicknames

[4](). BP Agent ADM JSON Encoding

   The following is the JSON encoding for the Bundle Protocol Agent ADM:

```
{
  "Mdat": [{
      "name": "name",
      "type": "STR",
      "value": "bp_agent",
      "description": "The human-readable name of the ADM."
    },
    {
      "name": "namespace",
      "type": "STR",
      "value": "DTN/bp_agent",
      "description": "The namespace of the ADM."
    },
    {
      "name": "version",
      "type": "STR",
      "value": "v0.1",
      "description": "The version of the ADM"
    },
    {
      "name": "organization",
      "type": "STR",
      "value": "JHUAPL",
      "description": "The name of the issuing organization of the
                     ADM."
    }
  ],

  "Edd": [{
      "name": "bp_node_id",
      "type": "STR",
      "description": "The node administration endpoint"
    },
    {
      "name": "bp_node_version",
      "type": "STR",
      "description": "The latest version of the BP supported by this
                     node"
    },
    {
      "name": "available_storage",
      "type": "UVAST",
      "description": "Bytes available for bundle storage"
    },
```

```
        {
          "name": "last_reset_time",
          "type": "UVAST",
          "description": "The last time that BP counters were reset,
                          either due to execution of a reset control or
                          a restart of the node itself"
        },
        {
          "name": "num_registrations",
          "type": "UINT",
          "description": "number of registrations"
        },
        {
          "name": "num_pend_fwd",
          "type": "UINT",
          "description": "number of bundles pending forwarding"
        },
        {
          "name": "num_pend_dis",
          "type": "UINT",
          "description": "number of bundles awaiting dispatch"
        },
        {
          "name": "num_in_cust",
          "type": "UINT",
          "description": "number of bundles"
        },
        {
          "name": "num_pend_reassembly",
          "type": "UINT",
          "description": "number of bundles pending reassembly"
        },
        {
          "name": "bundles_by_priority",
          "type": "UINT",
          "parmspec": [{
            "type": "UINT",
            "name": "mask"
          }],
          "description": "Number of bundles for the given priority.
                          Priority is given as a priority mask where
                          Bulk=0x1, normal=0x2, express=0x4. Any bundles
                          matching any of the masked priorities will be
                          included in the returned count"
        },
        {
          "name": "bytes_by_priority",
          "type": "UINT",
```

```
      "parmspec": [{
        "type": "UINT",
        "name": "mask"
      }],
      "description": "Number of bytes of the given priority. Priority
                      is given as a priority mask where bulk=0x1,
                      normal=0x2, express=0x4. Any bundles matching
                      any of the masked priorities will be included
                      in the returned count."
    },
    {
      "name": "src_bundles_by_priority",
      "type": "UINT",
      "parmspec": [{
        "type": "UINT",
        "name": "mask"
      }],
      "description": "Number of bundles sourced by this node of the
                      given priority. Priority is given as a priority
                      mask where bulk=0x1, normal=0x2, express=0x4.
                      Any bundles sourced by this node and matching
                      any of the masked priorities will be included
                      in the returned count."
    },
    {
      "name": "src_bytes_by_priority",
      "type": "UINT",
      "parmspec": [{
        "type": "UINT",
        "name": "mask"
      }],
      "description": "Number of bytes sourced by this node of the
                      given priority. Priority is given as a priority
                      mask where bulk=0x1, normal=0x2, express=0x4.
                      Any bundles sourced by this node and matching
                      any of the masked priorities will be included
                      in the returned count"
    },
    {
      "name": "num_fragmented_bundles",
      "type": "UINT",
      "description": "number of fragmented bundles"
    },
    {
      "name": "num_fragments_produced",
      "type": "UINT",
      "description": "Number of bundles with fragmentary payloads
                      produced by this node"
```

```
        },
        {
          "name": "num_failed_by_reason",
          "type": "UINT",
          "parmspec": [{
            "type": "UINT",
            "name": "mask"
          }],
          "description": "Number of bundles failed for any of the given
                          reasons. (noInfo=0x1, Expired=0x2, UniFwd=0x4,
                          Cancelled=0x8, NoStorage=0x10, BadEID=0x20,
                          NoRoute=0x40, NoContact=0x80, BadBlock=0x100)"
        },
        {
          "name": "num_bundles_deleted",
          "type": "UINT",
          "description": "number of bundles deleted by this node"
        },
        {
          "name": "failed_custody_bundles",
          "type": "UINT",
          "description": "number of bundle fails at this node"
        },
        {
          "name": "failed_custody_bytes",
          "type": "UINT",
          "description": "number bytes of fails at this node"
        },
        {
          "name": "failed_forward_bundles",
          "type": "UINT",
          "description": "number bundles not forwarded by this node"
        },
        {
          "name": "failed_forward_bytes",
          "type": "UINT",
          "description": "number of bytes not forwaded by this node"
        },
        {
          "name": "abandoned_bundles",
          "type": "UINT",
          "description": "number of bundles abandoned by this node"
        },
        {
          "name": "abandoned_bytes",
          "type": "UINT",
          "description": "number of bytes abandoned by this node"
        },
```

```
      {
        "name": "discarded_bundles",
        "type": "UINT",
        "description": "number of bundles discarded by this node"
      },
      {
        "name": "discarded_bytes",
        "type": "UINT",
        "description": "number of bytes discarded by this node"
      },
      {
        "name": "endpoint_names",
        "type": "STR",
        "description": "CSV list of endpoint names for this node"
      },
      {
        "name": "endpoint_active",
        "type": "UINT",
        "parmspec": [{
          "type": "STR",
          "name": "endpoint_name"
        }],
        "description": "is the given endpoint active? (0=no)"
      },
      {
        "name": "endpoint_singleton",
        "type": "UINT",
        "parmspec": [{
          "type": "STR",
          "name": "endpoint_name"
        }],
        "description": "is the given endpoint singleton? (0=no)"
      },
      {
        "name": "endpoint_policy",
        "type": "UINT",
        "parmspec": [{
          "type": "STR",
          "name": "endpoint_name"
        }],
        "description": "Does the endpoint abandon on fail (0=no)"
      }
    ],

    "Rptt": [{
        "name": "full_report",
        "definition": [
          {
```

```
      "ns": "DTN/bp_agent",
      "nm": "Mdat.name"
    },
        {
      "ns": "DTN/bp_agent",
      "nm": "Mdat.version"
    },
        {
      "ns": "DTN/bp_agent",
      "nm": "Edd.bp_node_id"
    },
        {
      "ns": "DTN/bp_agent",
      "nm": "Edd.bp_node_version"
    },
        {
      "ns": "DTN/bp_agent",
      "nm": "Edd.available_storage"
    },
        {
      "ns": "DTN/bp_agent",
      "nm": "Edd.last_reset_time"
    },
        {
      "ns": "DTN/bp_agent",
      "nm": "Edd.num_registrations"
    },
        {
      "ns": "DTN/bp_agent",
      "nm": "Edd.num_pend_fwd"
    },
        {
      "ns": "DTN/bp_agent",
      "nm": "Edd.num_pend_dis"
    },
        {
      "ns": "DTN/bp_agent",
      "nm": "Edd.num_in_cust"
    },
        {
      "ns": "DTN/bp_agent",
      "nm": "Edd.num_pend_reassembly"
    },
        {
      "ns": "DTN/bp_agent",
      "nm": "Edd.bundles_by_priority(1)"
    },
        {
```

      "ns": "DTN/bp_agent",
      "nm": "Edd.bundles_by_priority(2)"
    },
          {
      "ns": "DTN/bp_agent",
      "nm": "Edd.bundles_by_priority(4)"
    },
          {
      "ns": "DTN/bp_agent",
      "nm": "Edd.bytes_by_priority(1)"
    },
          {
      "ns": "DTN/bp_agent",
      "nm": "Edd.bytes_by_priority(2)"
    },
          {
      "ns": "DTN/bp_agent",
      "nm": "Edd.bytes_by_priority(4)"
    },
          {
      "ns": "DTN/bp_agent",
      "nm": "Edd.src_bundles_by_priority(1)"
    },
          {
      "ns": "DTN/bp_agent",
      "nm": "Edd.src_bundles_by_priority(2)"
    },
          {
      "ns": "DTN/bp_agent",
      "nm": "Edd.src_bundles_by_priority(4)"
    },
          {
      "ns": "DTN/bp_agent",
      "nm": "Edd.src_bytes_by_priority(1)"
    },
          {
      "ns": "DTN/bp_agent",
      "nm": "Edd.src_bytes_by_priority(2)"
    },
          {
      "ns": "DTN/bp_agent",
      "nm": "Edd.src_bytes_by_priority(4)"
    },
          {
      "ns": "DTN/bp_agent",
      "nm": "Edd.num_fragmented_bundles"
    },
          {

```
      "ns": "DTN/bp_agent",
      "nm": "Edd.num_fragments_produced"
    },
        {
      "ns": "DTN/bp_agent",
      "nm": "Edd.num_failed_by_reason(1)"
    },
        {
      "ns": "DTN/bp_agent",
      "nm": "Edd.num_failed_by_reason(2)"
    },
        {
      "ns": "DTN/bp_agent",
      "nm": "Edd.num_failed_by_reason(4)"
    },
        {
      "ns": "DTN/bp_agent",
      "nm": "Edd.num_failed_by_reason(8)"
    },
        {
      "ns": "DTN/bp_agent",
      "nm": "Edd.num_failed_by_reason(16)"
    },
        {
      "ns": "DTN/bp_agent",
      "nm": "Edd.num_failed_by_reason(32)"
    },
        {
      "ns": "DTN/bp_agent",
      "nm": "Edd.num_failed_by_reason(64)"
    },
        {
      "ns": "DTN/bp_agent",
      "nm": "Edd.num_failed_by_reason(128)"
    },
        {
      "ns": "DTN/bp_agent",
      "nm": "Edd.num_failed_by_reason(256)"
    },
        {
      "ns": "DTN/bp_agent",
      "nm": "Edd.num_bundles_deleted"
    },
        {
      "ns": "DTN/bp_agent",
      "nm": "Edd.failed_custody_bundles"
    },
        {
```

```
      "ns": "DTN/bp_agent",
      "nm": "Edd.failed_custody_bytes"
   },
         {
      "ns": "DTN/bp_agent",
      "nm": "Edd.failed_forward_bundles"
   },
         {
      "ns": "DTN/bp_agent",
      "nm": "Edd.failed_forward_bytes"
   },
         {
      "ns": "DTN/bp_agent",
      "nm": "Edd.abandoned_bundles"
   },
         {
      "ns": "DTN/bp_agent",
      "nm": "Edd.discarded_bundles"
   },
         {
      "ns": "DTN/bp_agent",
      "nm": "Edd.discarded_bytes"
   },
         {
      "ns": "DTN/bp_agent",
      "nm": "Edd.endpoint_names"
   }
       ],
       "description": "This is all known meta-data, EDD, and VAR
                       values known by the agent."
     },
     {
       "name": "endpoint_report",
       "parmspec": [{
         "type": "STR",
         "name": "endpoint_id"
       }],
       "definition": [{
           "ns": "DTN/bp_agent",
           "nm": "edd.endpoint_active",
           "ap": [{
             "type": "ParmName",
             "value": "endpoint_id"
           }]
         },
         {
           "ns": "DTN/bp_agent",
           "nm": "edd.endpoint_singleton",
```

```
          "ap": [{
            "type": "ParmName",
            "value": "endpoint_id"
          }]
        },
        {
          "ns": "DTN/bp_agent",
          "nm": "edd.endpoint_policy",
          "ap": [{
            "type": "ParmName",
            "value": "endpoint_id"
          }]
        }
      ],
      "description": "This is all known endpoint information"
    }
  ],

  "Ctrl": [{
    "name": "reset_all_counts",
    "description": "This control causes the Agent to reset all counts
                    associated with bundle or byte statistics and to
                    set the last reset time of the BP primitive data
                    to the time when the control was run."
  }]
}
```

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", 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.

   [I-D.ietf-dtn-bpbis]
             Burleigh, S., Fall, K., and E. Birrane, "Bundle Protocol
             Version 7", draft-ietf-dtn-bpbis-12 (work in progress),
             November 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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