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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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BP 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 forwarded 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": [  
  {
```

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```
    "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

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