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A YANG Data Model for LMAP Measurement Agents  
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## Abstract

This document defines a data model for Large-Scale Measurement Platforms (LMAP). The data model is defined using the YANG data modeling language.

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Internet-Draft

LMAP Data Model

April 2015

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[1.](#) Introduction

This document defines a data model for Large-Scale Measurement Platforms (LMAP) [[I-D.ietf-lmap-framework](#)]. The data model is defined using the YANG [[RFC6020](#)] data modeling language. It aims to be consistent with the LMAP Information Model [[I-D.ietf-lmap-information-model](#)].

[1.1.](#) Terminology

This document uses the LMAP terminology defined in [[I-D.ietf-lmap-framework](#)].

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 [[RFC2119](#)].

[1.2.](#) Tree Diagrams

A simplified graphical representation of the data model is used in this document. The meaning of the symbols in these diagrams is as follows:

- o Brackets "[" and "]" enclose list keys.

- o Abbreviations before data node names: "rw" means configuration (read-write), and "ro" means state data (read-only).
- o Symbols after data node names: "?" means an optional node, "!" means a presence container, and "\*" denotes a list and leaf-list.

- o Parentheses enclose choice and case nodes, and case nodes are also marked with a colon (":").
- o Ellipsis ("...") stands for contents of subtrees that are not shown.

## 2. Data Model Overview

The tree diagram below shows the structure of the configuration model.

```

module: ietf-lmap-control
  +--rw lmap
    +--rw agent
      | +--rw agent-id?          yang:uuid
      | +--rw device-id?       inet:uri
      | +--rw credentials?     string
      | +--rw group-id?        string
      | +--rw report-agent-id? boolean
      | +--rw controller-lost-timeout? uint32
    +--rw schedules
      | +--rw schedule* [name]
      |   +--rw name          string
      |   +--rw action* [name]
      |     | +--rw name          string
      |     | +--rw task          -> /lmap/tasks/task/name
      |     | +--rw option* [name]
      |     |   | +--rw name      string
      |     |   | +--rw value?   string
      |     | +--rw destination* [name]
      |     |   +--rw name        string
      |     |   +--rw output*     uint16
      |     |   +--rw schedule    -> /lmap/schedules/schedule/name
      |     |   +--rw action      -> /lmap/schedules/schedule[name = current(
      |   +--rw timing        -> /lmap/timings/timing/name
  
```

```

+--rw suppression
|   +--rw enabled?          boolean
|   +--rw stop-running?    boolean
|   +--rw start?           yang:date-and-time
|   +--rw end?             yang:date-and-time
|   +--rw task*            -> /lmap/tasks/task/name
|   +--rw schedule*       -> /lmap/schedules/schedule/name
+--rw channels
|   +--rw channel* [name]
|       +--rw name          string
|       +--rw target?      inet:uri
|       +--rw credentials? string

```

```

|   +--rw interface?      -> /if:interfaces/interface/name
+--rw tasks
|   +--rw task* [name]
|       +--rw name          string
|       +--rw (task-identification)
|           | +--:(registry)
|           | | +--rw registry?          inet:uri
|           | +--:(program)
|           | | +--rw program?          string
|       +--rw option* [name]
|           | +--rw name      string
|           | +--rw value?   string
|       +--rw tag*          string
|       +--rw suppress-by-default? boolean
+--rw timings
|   +--rw timing* [name]
|       +--rw name          string
|       +--rw (timing-type)?
|           | +--:(periodic)
|           | | +--rw periodic
|           | | | +--rw interval      uint32
|           | | | +--rw start?       yang:date-and-time
|           | | | +--rw end?         yang:date-and-time
|           | +--:(calendar)
|           | | +--rw calendar
|           | | | +--rw month*        union
|           | | | +--rw weekday*     union
|           | | | +--rw day-of-month* union
|           | | | +--rw hour*        union

```

```

| | +--rw minute*          union
| | +--rw second*         union
| | +--rw timezone-offset?  timezone-offset
| | +--rw start?          yang:date-and-time
| | +--rw end?            yang:date-and-time
| +--:(one-off)
| | +--rw one-off-time     yang:date-and-time
| +--:(immediate)
| | +--rw immediate       empty
| +--:(startup)
| | +--rw startup         empty
+--rw random-spread?     int32

```

The tree diagram below shows the structure of the state model.

```

module: ietf-lmap-control
+--ro lmap-state
  +--ro agent
  | +--ro agent-id          yang:uuid
  | +--ro device-id        inet:uri
  | +--ro hardware         string
  | +--ro firmware         string
  | +--ro version          string
  | +--ro last-started     yang:date-and-time
+--ro tasks
  +--ro task* [name]
    +--ro name              string
    +--ro (task-identification)
    | +--:(registry)
    | | +--ro registry?    inet:uri
    | +--:(program)
    | +--ro program?      string
    +--ro last-completion? yang:date-and-time
    +--ro last-status?    status-code
    +--ro last-message?   string
    +--ro last-failed-completion? yang:date-and-time
    +--ro last-failed-status? status-code

```

+++ro last-failed-message? string

The tree diagram below shows the structure of the notification (reporting) model.

```
module: ietf-lmap-report
notifications:
  +---n report
    +--ro date          yang:date-and-time
    +--ro agent-id?    yang:uuid
    +--ro group-id?    string
    +--ro task* [name]
      | +--ro name          string
      | +--ro (task-identification)
      | | +---:(registry)
      | | | +--ro registry?      inet:uri
      | | +---:(program)
      | |   +--ro program?      string
      | +--ro option* [name]
      | | +--ro name          string
```

```

| | +--ro value?  string
| +--ro tag*      string
| +--ro suppress-by-default?  boolean
+--ro header
| +--ro column*  string
+--ro row*
    +--ro start      yang:date-and-time
    +--ro end?       yang:date-and-time
    +--ro conflict*  string
    +--ro value*     string

```

### 3. Relationship to the Information Model

The LMAP information model [[I-D.ietf-lmap-information-model](#)] is divided into six sections. They are mapped into the YANG data model as explained below:

- o Pre-Configuration Information: This is not modeled explicitly since it is a subset of the configuration information.
- o Configuration Information: This is modeled in the /lmap/agent subtree and the /lmap/schedules, /lmap/tasks, and /lmap/channels subtrees described below. Some items have been left out because they are expected to be dealt with by the underlying protocol.
- o Instruction Information: This is modeled in the /lmap/suppression subtree and the /lmap/schedules, /lmap/tasks, and /lmap/channels subtrees described below.
- o Logging Information: Some of the logging information, in particular 'success/failure/warning messages in response to information updates from the Controller', will be handled by the

protocol used to manipulate the lmap specific configuration.

[[CREF1: It needs to be discussed whether we can rely on informal syslog messages that can be accessed via protocols such [RFC 5277](#) or whether we want to define specific notifications in the YANG data model. --JS]]

- o Capability and Status Information: Some of the status information is modeled in the /lmap-state/agent subtree. Information about

network interfaces can be obtained from the interfaces YANG data model [RFC7223]. The list of supported tasks is modeled in the /lmap-state/tasks subtree including information about the last execution and the last failed execution.

- o Reporting Information: This is modeled by the report notification.

These six sections are build on the following common information objects:

- o Schedules: This is modeled in the /lmap/schedules subtree.
- o Channels: This is modeled in the /lmap/channels subtree.
- o Task Configurations: This is modeled in the /lmap/tasks subtree.
- o Timing Information: This is modeled in the /lmap/timings subtree.

#### 4. YANG Modules

The modules import definitions from [RFC6991] and [RFC7223].

```
<CODE BEGINS> file "ietf-lmap-control@2015-04-10.yang"
module ietf-lmap-control {

    namespace "urn:ietf:params:xml:ns:yang:ietf-lmap-control";
    prefix "lmapc";

    import ietf-yang-types {
        prefix yang;
    }
    import ietf-inet-types {
        prefix inet;
    }
    import ietf-interfaces {
        prefix if;
    }

    organization
```



```

contact
  "WG Web:   <http://tools.ietf.org/wg/lmap/>
  WG List:  <mailto:lmap@ietf.org>

  Editor:   Juergen Schoenwaelder
            <j.schoenwaelder@jacobs-university.de>

  Editor:   Vaibhav Bajpai
            <v.bajpai@jacobs-university.de>";

description
  "This module defines a data model for controlling measurement
  agents that are part of a Large-Scale Measurement Platform
  (LMAP).";

revision "2015-04-10" {
  description
    "Initial version";
  reference
    "RFC XXX: A YANG Data Model for LMAP Measurement Agents";
}

/*
 * Typedefs
 */

typedef weekday {
  type enumeration {
    enum sunday {
      value 0;
      description "Sunday of the week";
    }
    enum monday {
      value 1;
      description "Monday of the week";
    }
    enum tuesday {
      value 2;
      description "Tuesday of the week";
    }
    enum wednesday {
      value 3;
      description "Wednesday of the week";
    }
    enum thursday {
      value 4;

```

---

```
        description "Thursday of the week";
    }
    enum friday {
        value 5;
        description "Friday of the week";
    }
    enum saturday {
        value 6;
        description "Saturday of the week";
    }
}
description
    "A type modeling the weekdays in the Greco-Roman
    tradition.";
}

typedef month {
    type enumeration {
        enum january {
            value 1;
            description "January of the Julian and Gregorian calendar";
        }
        enum february {
            value 2;
            description "February of the Julian and Gregorian calendar";
        }
        enum march {
            value 3;
            description "March of the Julian and Gregorian calendar";
        }
        enum april {
            value 4;
            description "April of the Julian and Gregorian calendar";
        }
        enum may {
            value 5;
            description "May of the Julian and Gregorian calendar";
        }
        enum june {
            value 6;
            description "June of the Julian and Gregorian calendar";
        }
        enum july {
            value 7;
            description "July of the Julian and Gregorian calendar";
        }
    }
}
```

```
enum august {
    value 8;
```

```
        description "August of the Julian and Gregorian calendar";
    }
    enum september {
        value 9;
        description "September of the Julian and Gregorian calendar";
    }
    enum october {
        value 10;
        description "October of the Julian and Gregorian calendar";
    }
    enum november {
        value 11;
        description "November of the Julian and Gregorian calendar";
    }
    enum december {
        value 12;
        description "December of the Julian and Gregorian calendar";
    }
}
description
    "A type modeling the month in the Julian and Gregorian
    tradition.";
}

typedef wildcard {
    type string { pattern '\*'; }
    description
        "A wildcard for calendar scheduling entries.";
}

typedef status-code {
    type int32;
    description
        "A status code returned by the execution of a task. Note that
        the actual range is implementation dependent but it should
        be portable to use values in the range 0..127. By convention,
        0 indicates successful termination.";
}
}
```

```

typedef timezone-offset {
  type string {
    pattern 'Z|[\+\-]\d{2}:\d{2}';
  }
  description
    "A timezone-offset as it is use in the yang:date-and-time
    type. The value Z is equivalent to +00:00. The value -00:00
    indicates and unknown time-offset.";
}

```

```

/*
 * Groupings
 */

grouping timing-start-end-grouping {
  description
    "A grouping that provides start and end times for
    timing objects.";
  leaf start {
    type yang:date-and-time;
    description
      "The date and time when the timing object
      starts to create triggers.";
  }
  leaf end {
    type yang:date-and-time;
    description
      "The date and time when the timing object
      stops to create triggers.

      It is generally a good idea to always configure
      an end time and to refresh the configuration
      of timing object as needed to ensure that agents
      that loose connectivity to their controller
      do not continue their tasks forever.";
  }
}

grouping task-options-grouping {
  description
    "A list of options of a task. Each option is a name/value
    pair (where the value may be absent).";
}

```

```

list option {
  key "name";
  ordered-by user;

  description
    "A list of options passed to the task. It is a list of
    key / value pairs and may be used to model options.
    Options may be used to identify the role of a task
    or to pass a channel name to a task.";

  // XXX This is kind of broken since making the option name
  // XXX a key means that a certain option may only appear once.
  // XXX This is not workable since some tests require a list of
  // XXX targets. Turning this into a leaf-list of args also
  // XXX does not work since YANG requires leaf-list values to

```

```

// XXX be unique. Oops.

leaf name {
  type string;
  description
    "The name of the option.";
}

leaf value {
  type string;
  description
    "The value of the option.";
}
}

grouping task-grouping {
  description
    "A grouping that defines the configuration of a task.";

  list task {
    key name;
    description
      "The list of tasks configured on the LMAP agent.";

```

```

leaf name {
  type string;
  description
    "The unique name of a task.";
}

choice task-identification {
  mandatory true;
  description
    "Information that identifies the task.";

  leaf registry {
    type inet:uri;
    description
      "The registry entry identifying the configured task.";
  }

  leaf program {
    type string;
    description
      "The (local) program to invoke in order to execute
        the task.";
  }
}

```

```

}

uses task-options-grouping {
  description
    "The list of task specific options.";
}

leaf-list tag {
  type string;
  description
    "A tag contains additional information that is passed
      with the result record to the collector. A tag can be
      used to carry the Measurement Cycle ID.";
}

leaf suppress-by-default {
  type boolean;
  default true;
}

```

```

        description
            "Indicates whether the task will be suppressed by
            a default supression.";
    }
}

/*
 * Configuration data nodes
 */

container lmap {
    description
        "Configuration of the LMAP agent.";

    /*
     * Common Information Objects: Configuration
     */

    container agent {
        description
            "Configuration of parameters affecting the whole
            measurement agent.";

        leaf agent-id {
            type yang:uuid;
            description
                "The agent-id identifies a measurement agent with
                a very low probability of collision. In certain
                deployments, the agent-id may be considered

```

```

        sensitive and hence this object is optional.";
    }

    leaf device-id {
        type inet:uri;
        description
            "The device-id identifies a property of the
            device running the measurement agent. In certain
            deployments, the device-id may be considered
            sensitive and hence this object is optional.";
    }
}

```

```

leaf credentials {
    type string;
    description
        "The credentials of the agent.";
    // XXX: This is way too simplistic. Credentials are
    //       specific to the authentication mechanism used
    //       by a protocol. Hence, this needs to be a far
    //       more complex and extensible choice or it might
    //       not be needed since the protocol data models
    //       already cover it.
}

leaf group-id {
    type string;
    description
        "The group-id identifies a group of measurement
        agents. In certain deployments, the group-id
        may be considered less sensitive than the
        agent-id.";
}

leaf report-agent-id {
    type boolean;
    default false;
    // XXX: write a must expression that requires
    // group-id to be configured when this is true?
    description
        "The 'report-agent-id' controls whether the
        'agent-id' is reported to collectors if the
        'group-id' is configured. If the 'group-id'
        is not configured, the agent-id is always
        reported.";
}

leaf controller-lost-timeout {
    type uint32;

```

```

units "";
description
    "A timer is started after each successful contact
    with a controller. When the timer reaches the

```



```

        controller-lost-timeout, all schedules will be
        disabled.";
    }
}

/*
 * Common Information Objects: Schedules
 */

container schedules {
    description
        "Configuration of LMAP schedules. Schedules control with
        tasks are executed by the LMAP implementation.";

    list schedule {
        key name;
        description
            "Configuration of a particular schedule.";

        leaf name {
            type string;
            description
                "The locally-unique, administratively assigned name for
                this scheduled task.";
        }

        list action {
            key name;
            description
                "An action describes a task that is invoked by the
                schedule. Multiple actions are invoked sequentially.";

            leaf name {
                type string;
                description
                    "The unique identifier for this action.";
            }

            leaf task {
                type leafref {
                    path "/lmap/tasks/task/name";
                }
                mandatory true;
                description

```

```
    "The tasks invoked by this action.";
}

uses task-options-grouping {
  description
    "The list of action specific options that are
    appended to the list of task specific options.";
}

list destination {
  key "name";
  description
    "A destination receives information from the task
    associated with this action. A queue is internally
    used to pass the information to another (scheduled)
    action.";

  leaf name {
    type string;
    description
      "The name of this destination (queue) that passes
      information to another (scheduled) action.";
  }

  leaf-list output {
    type uint16;
    description
      "The list of outputs of a task directed to another
      (scheduled) action. If no output is specified,
      then all output is directed to another (scheduled)
      action.";
  }

  leaf schedule {
    type leafref {
      path "/lmap/schedules/schedule/name";
    }
    mandatory true;
    description
      "The schedule of the (scheduled) action receiving
      the output.";
  }

  leaf action {
    type leafref {
      path "/lmap/schedules/schedule"
        + "[name = current()/../schedule]"
    }
  }
}
```

```
+ "/action/name";
```

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```
    }
    mandatory true;
    description
      "The (scheduled) action receiving the output (the
       destination consuming the data from the queue).";
  }
}

leaf timing {
  type leafref {
    path "/lmap/timings/timing/name";
  }
  mandatory true;
  description
    "The timing source controlling the start of the scheduled
     tasks.";
}
}

/*
 * Suppression
 */

container suppression {
  description
    "Suppression information to prevent schedules to start
     certain tasks.";

  leaf enabled {
    type boolean;
    default false;
    description
      "Setting 'enabled' to true will suppress all tasks for
       which suppress-by-default is true.";
  }

  leaf stop-running {
    type boolean;
```

```
default false;
description
  "Setting 'stop-running' to true will cause running
  tasks to be terminated if suppression is enabled
  (the 'enabled' leaf is set to true). Otherwise,
  running tasks will not be affected if suppression
  is enabled.";
}
```

```
leaf start {
  type yang:date-and-time;
  description
    "The date and time when suppression starts to
    become effective. If not present, suppression
    becomes effective immediately when 'enabled'
    is set to true.";
}

leaf end {
  type yang:date-and-time;
  description
    "The date and time when suppression stops to
    be effective. If not present, suppression
    continues indefinite until 'enabled' is set
    to false.";
}

leaf-list task {
  type leafref {
    path "/lmap/tasks/task/name";
  }
  description
    "A specific task to suppress. If no tasks are
    listed, then all tasks will be suppressed.";
}

leaf-list schedule {
  type leafref {
    path "/lmap/schedules/schedule/name";
  }
  description
    "A specific schedule to suppress. If no schedules
```

```

        are listed, then all schedules will be suppressed.";
    }
}

/*
 * Common Information Objects: Channels
 */

container channels {
    description
        "A channel describes properties of an LMAP control or
        reporting channel.";

    list channel {

```

```

    key name;
    description
        "The list of channels configured on the LMAP agent.";

    leaf name {
        type string;
        description
            "The unique name of a channel.";
    }

    leaf target {
        type inet:uri;
        description
            "The remote endpoint of the channel.";
    }

    leaf credentials {
        type string;
        description
            "The credentials of the channel.";
        // XXX: This is way too simplistic. Credentials are
        //       specific to the authentication mechanism used
        //       by a protocol. Hence, this needs to be a far
        //       more complex and extensible choice.
    }

```

```

leaf interface {
  type leafref {
    path "/if:interfaces/if:interface/if:name";
  }
  description
    "The local interface used to reach the remote
    endpoint of the channel. If not present, the
    system will select a suitable interface.";
}
}
}

/*
 * Common Information Objects: Task Configurations
 */

container tasks {
  description
    "Configuration of LMAP tasks.";

  uses task-grouping;
}

```

```

/*
 * Common Information Objects: Timing Information
 */

container timings {
  description
    "Configuration of LMAP timings.

    Implementations may be forced to delay acting
    upon triggers in the face of local constraints.
    A task triggered therefore not rely on the accuracy
    provided by the scheduler implementation.";

  list timing {
    key name;
    description
      "The list of timings configured on the LMAP agent.";

    leaf name {

```

```

    type string;
    description
        "The unique name of a timing.";
}

choice timing-type {
    description
        "Different types of timing objects are handled by
        different branches of this choices.";

    case periodic {
        container periodic {
            description
                "A periodic timing object triggers periodically
                driven by a regular interval.";

            leaf interval {
                type uint32;
                units "milliseconds";
                mandatory true;
                description
                    "The number of milliseconds between two triggers
                    generated by this periodic timing object.

                    The execution system must not generate triggers
                    for periodic timing objects that have a interval
                    value of 0. A timing object with an interval of
                    0 milliseconds will therefore never trigger.";
            }
        }
    }
}

```

```

    uses timing-start-end-grouping;
}

case calendar {
    container calendar {
        description
            "A calendar timing object trigger based on the
            current calendar date and time.";

        leaf-list month {
            type union {

```

```

        type month;
        type wildcard;
    }
    description
        "A month at which this calendar timing will
        trigger. The wildcard means all months.";
}

leaf-list weekday {
    type union {
        type weekday;
        type wildcard;
    }
    description
        "A weekday at which this calendar timing will
        trigger. The wildcard means all weekdays.";
}

leaf-list day-of-month {
    type union {
        type int8 { range "-31..-1 | 1..31"; }
        type wildcard;
    }
    description
        "A day in the month at which this calendar
        timing will trigger. Negative numbers indicate
        days counted backwards from the end of the
        months. The wildcard means all days of a month.";
}

leaf-list hour {
    type union {
        type int8 { range "0..23"; }
        type wildcard;
    }
    description

```

```

        "An hour at which this calendar timing will
        trigger. The wildcard means all hours of a day.";
    }

    leaf-list minute {

```



```

    type union {
      type int8 { range "0..59"; }
      type wildcard;
    }
    description
      "A minute at which this calendar timing will
      trigger. The wildcard means all minutes of
      an hour.";
  }

  leaf-list second {
    type union {
      type int8 { range "0..59"; }
      type wildcard;
    }
    description
      "A second at which this calendar timing will
      trigger. The wildcard means all seconds of
      a minute.";
  }

  leaf timezone-offset {
    type timezone-offset;
    description
      "The timezone in which this calendar timing
      object will be evaluated.";
  }
  uses timing-start-end-grouping;
}

case one-off {
  leaf one-off-time {
    type yang:date-and-time;
    mandatory true;
    description
      "This one-off timing object triggers once at the
      configured one-off-time.";
  }
}

case immediate {
  leaf immediate {

```

```

        type empty;
        mandatory true;
        description
            "This immediate timing object triggers immediately
            when it is configured.";
    }
}

case startup {
    leaf startup {
        type empty;
        mandatory true;
        description
            "This startup timing object triggers whenever the
            LMAP agent (re)starts.";
    }
}

leaf random-spread {
    type int32;
    units milliseconds;
    description
        "This optional leaf adds a random spread to the
        computation of the trigger.";
}
}
}

/*
 * The state subtree provides information about the capabilities
 * and the current status of the MA.
 */

container lmap-state {
    config false;
    description
        "A tree exporting state information about the LMAP agent.";

    container agent {
        description
            "Operations state of the measurement agent.";

        leaf agent-id {
            type yang:uuid;
            mandatory true;
            description

```

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```
    "The agent-id identifies a measurement agent with
      a very low probability of collision. In certain
      deployments, the agent-id may be considered
      sensitive and hence this object is optional.";
  }

  leaf device-id {
    type inet:uri;
    mandatory true;
    description
      "The device-id identifies a property of the
        device running the measurement agent. In certain
        deployments, the device-id may be considered
        sensitive and hence this object is optional.";
  }

  leaf hardware {
    type string;
    mandatory true;
    description
      "A short description of the hardware the measurement
        agent is running on. This should include the version
        number of the hardware";
  }

  leaf firmware {
    type string;
    mandatory true;
    description
      "A short description of the firmware the measurement
        agent is running on. This should include the version
        number of the firmware.";
  }

  leaf version {
    type string;
    mandatory true;
    description
      "A short description of the software implementing the
        measurement agent. This should include the version
        number of the measurement agent software.";
  }

  leaf last-started {
    type yang:date-and-time;
    mandatory true;
```

```
description
  "The date and time the measurement agent last started.";
}
}

container tasks {
```

```
description
  "Available LMAP tasks, including information about their
  last execution and their last failed execution.";

list task {
  key name;
  description
    "The list of tasks available on the LMAP agent.";

  leaf name {
    type string;
    description
      "The unique name of a task.";
  }

  choice task-identification {
    mandatory true;
    description
      "Information that identifies the task.";

    leaf registry {
      type inet:uri;
      description
        "The registry entry identifying the configured task.";
    }

    leaf program {
      type string;
      description
        "The (local) program to invoke in order to execute
        the task.";
    }
  }

  leaf last-completion {
```

```

    type yang:date-and-time;
    description
        "The date and time of the last completion of this task.";
}

leaf last-status {
    type status-code;
    description
        "The status code returned by the last execution of
        this task.";
}

leaf last-message {

```

```

    type string;
    description
        "The status message produced by the last execution
        of this task.";
}

leaf last-failed-completion {
    type yang:date-and-time;
    description
        "The date and time of the last failed invocation
        of this task.";
}

leaf last-failed-status {
    type status-code;
    description
        "The status code returned by the last failed execution
        of this task. ";
}

leaf last-failed-message {
    type string;
    description
        "The status message produced by the last failed
        execution of this task.";
}
}
}

```

```
}  
}  
<CODE ENDS>
```

```
<CODE BEGINS> file "ietf-lmap-report@2015-04-10.yang"  
module ietf-lmap-report {  
  
    namespace "urn:ietf:params:xml:ns:yang:ietf-lmap-report";  
    prefix "lmapr";  
  
    import ietf-yang-types {  
        prefix yang;  
    }  
    import ietf-lmap-control {  
        prefix lmapc;  
    }  
  
    organization
```

```
"IETF Large-Scale Measurement Platforms Working Group";
```

```
contact
```

```
"WG Web: <http://tools.ietf.org/wg/lmap/>
```

```
WG List: <mailto:lmap@ietf.org>
```

```
Editor: Juergen Schoenwaelder  
<j.schoenwaelder@jacobs-university.de>
```

```
Editor: Vaibhav Bajpai  
<v.bajpai@jacobs-university.de>";
```

```
description
```

```
"This module defines a data model for reporting results from  
measurement agents that are part of a Large-Scale Measurement  
Platform (LMAP).";
```

```
revision "2015-04-10" {
```

```
    description
```

```
        "Initial version";
```

```
    reference
```

```

    "RFC XXX: A YANG Data Model for LMAP Measurement Agents";
}

notification report {
  description
    "The result record produced by a certain task.";

  leaf date {
    type yang:date-and-time;
    mandatory true;
    description
      "The date and time when this report was sent.";
      // XXX It is unclear why this is useful. The receiver can
      // XXX easily timestamp when data was received.
  }

  leaf agent-id {
    type yang:uuid;
    description
      "The agent-id of the agent from which this
      report originates.";
  }

  leaf group-id {
    type string;
    description
      "The group-id of the agent from which this

```

```

    report originates.";
}

uses lmapc:task-grouping;
// XXX We would prefer to just send a configuration version
// XXX number such that the configuration can be identified
// XXX that was active XXX when the report was generated. It
// XXX would be nice to have a generic configuration version
// XXX number that we could reuse. If this works out, we can
// XXX inline the grouping as well.

// XXX Note that task-grouping contains stuff that is not
// XXX relevant here, perhaps using a grouping is not helpful
// XXX here. It is also missing stuff, such as the options

```

```

// XXX in the schedule entry.

container header {
  description
    "The header of the result records.";

  leaf-list column {
    type string;
    description
      "A header of a column in the result rows.";
  }
}

list row {
  description
    "The rows of the result record.";

  leaf start {
    type yang:date-and-time;
    mandatory true;
    description
      "The date and time when the measurement producing
      this result row started.";
  }

  leaf end {
    type yang:date-and-time;
    description
      "The date and time when the measurement producing
      this result row stopped.";
  }

  leaf-list conflict {
    type string;
  }
}

```

```

  description
    "The name of a task overlapping with the execution
    of the task that has produced this result record.";
}

leaf-list value {
  type string;
}

```



```
        description
          "The value of a cell in the result.";
        // XXX We could make this a union / choice in order to a
        // XXX more compact encoding of numbers in certain encodings
        // XXX (e.g. JSON)
      }
    }
  }
}
<CODE ENDS>
```

## [5.](#) Security Considerations

TBD

## [6.](#) IANA Considerations

This document registers a URI in the "IETF XML Registry" [[RFC3688](#)]. Following the format in [RFC 3688](#), the following registrations have been made.

```
URI: urn:ietf:params:xml:ns:yang:ietf-lmap-control
Registrant Contact: The IESG.
XML: N/A; the requested URI is an XML namespace.
```

```
URI: urn:ietf:params:xml:ns:yang:ietf-lmap-report
Registrant Contact: The IESG.
XML: N/A; the requested URI is an XML namespace.
```

This document registers a YANG module in the "YANG Module Names" registry [[RFC6020](#)].

name: ietf-lmap-control  
namespace: urn:ietf:params:xml:ns:yang:ietf-lmap-control  
prefix: lmapc  
reference: RFC XXXX

name: ietf-lmap-report  
namespace: urn:ietf:params:xml:ns:yang:ietf-lmap-report  
prefix: lmapr  
reference: RFC XXXX

## 7. Acknowledgements

Juergen Schoenwaelder and Vaibhav Bajpai work in part on the Leone research project, which receives funding from the European Union Seventh Framework Programme [FP7/2007-2013] under grant agreement number 317647.

## 8. References

### 8.1. Normative References

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[RFC6020] Bjorklund, M., "YANG - A Data Modeling Language for the Network Configuration Protocol (NETCONF)", [RFC 6020](#), October 2010.

[RFC6991] Schoenwaelder, J., "Common YANG Data Types", [RFC 6991](#), July 2013.

[RFC7223] Bjorklund, M., "A YANG Data Model for Interface Management", [RFC 7223](#), May 2014.

### 8.2. Informative References

[I-D.ietf-lmap-framework]  
Eardley, P., Morton, A., Bagnulo, M., Burbridge, T., Aitken, P., and A. Akhter, "A framework for Large-Scale Measurement of Broadband Performance (LMAP)", [draft-ietf-lmap-framework-12](#) (work in progress), March 2015.

[I-D.ietf-lmap-information-model]  
Burbridge, T., Eardley, P., Bagnulo, M., and J. Schoenwaelder, "Information Model for Large-Scale Measurement Platforms (LMAP)", [draft-ietf-lmap-information-model-05](#) (work in progress), April 2015.

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[RFC3688] Mealling, M., "The IETF XML Registry", [BCP 81](#), [RFC 3688](#), January 2004.

#### [Appendix A](#). Example Configuration (XML)

```
<data xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
  <lmmap xmlns="urn:ietf:params:xml:ns:yang:ietf-lmap-control">

    <agent>
      <agent-id>550e8400-e29b-41d4-a716-446655440000</agent-id>
      <device-id>urn:dev:mac:0024beffffe804ff1</device-id>
      <group-id>wireless measurement at the north-pole</group-id>
      <report-agent-id>true</report-agent-id>
    </agent>

    <schedules>
      <schedule>
        <name>weekdays-hourly</name>
        <action>
          <name>udp-latency-weekdays-hourly</name>
          <task>udp-latency-measurement</task>
          <destination>
            <name>q-all</name>
            <schedule>daily</schedule>
            <action>report-daily</action>
          </destination>
        </action>
        <timing>hourly</timing>
      </schedule>

      <schedule>
        <name>hourly</name>
        <action>
          <name>icmp-latency-hourly</name>
          <task>icmp-latency-measurement</task>
          <destination>
            <name>q-all</name>
            <schedule>daily</schedule>
            <action>report-daily</action>
          </destination>
        </action>
        <timing>hourly</timing>
      </schedule>
    </schedules>
  </lmmap>
</data>
```

```
</schedule>
```

```
<schedule>  
  <name>daily</name>  
  <action>
```

```
    <name>report-daily</name>  
    <task>lmap-reporting-task</task>  
    <option>  
      <name>channel</name>  
      <value>default-collector-channel</value>  
    </option>  
  </action>  
  <timing>daily</timing>  
</schedule>
```

```
<schedule>  
  <name>immediate</name>  
  <action>  
    <name>icmp-latency-immediate</name>  
    <task>icmp-latency-measurement</task>  
    <destination>  
      <name>q-all</name>  
      <schedule>immediate</schedule>  
      <action>report-immediate</action>  
    </destination>  
  </action>  
  <action>  
    <name>report-immediate</name>  
    <task>lmap-reporting-task</task>  
    <option>  
      <name>channel</name>  
      <value>default-collector-channel</value>  
    </option>  
  </action>  
  <timing>immediate</timing>  
  <!-- for how long does this task stick around? -->  
</schedule>  
</schedules>  
  
<suppression>  
  <enabled>true</enabled>
```

```
<start>2014-09-02T14:06:11+02:00</start>
<task>iperf-server</task>
<schedule>hourly</schedule>
<schedule>weekdays-hourly</schedule>
</suppression>

<channels>
  <channel>
    <name>default-collector-channel</name>
  </channel>
</channels>
```

```
<tasks>
  <task>
    <name>udp-latency-measurement</name>
    <registry>urn:....</registry>
  </task>
  <task>
    <name>icmp-latency-measurement</name>
    <registry>urn:....</registry>
  </task>
  <task>
    <name>iperf-server</name>
    <program>iperf</program>
    <option>
      <name>role</name>
      <value>server</value>
    </option>
    <suppress-by-default>>false</suppress-by-default>
  </task>
  <task>
    <name>lmap-reporting-task</name>
    <program>lmap-reportd</program>
  </task>
</tasks>

<timings>
  <timing>
    <name>hourly</name>
    <periodic>
      <interval>3600000</interval>
```

```
        <start>2014-09-01T17:44:00+02:00</start>
        <end>2014-09-30T00:00:00+02:00</end>
    </periodic>
</timing>
<timing>
    <name>daily</name>
    <calendar>
        <hour>04</hour>
    </calendar>
</timing>
<timing>
    <name>tuesday-thursday-sunday</name>
    <calendar>
        <weekday>tuesday</weekday>
        <weekday>thursday</weekday>
        <weekday>sunday</weekday>
        <hour>18</hour>
        <minute>04</minute>
        <second>42</second>
    </calendar>
</timing>
</timing>
```

```
        <end>2014-09-30T00:00:00+02:00</end>
    </calendar>
</timing>
<timing>
    <name>once-every-six-hours</name>
    <calendar>
        <hour>0</hour>
        <hour>6</hour>
        <hour>12</hour>
        <hour>18</hour>
        <minute>0</minute>
        <second>0</second>
    <end>2014-09-30T00:00:00+02:00</end>
    </calendar>
    <random-spread>21600000</random-spread>
</timing>
<timing>
    <name>immediate</name>
    <immediate/>
</timing>
<timing>
    <name>startup</name>
</timing>
```

```
    <startup/>
    <random-spread>12345</random-spread>
  </timing>
</timings>
```

```
</lmap>
```

```
<lmap-state xmlns="urn:ietf:params:xml:ns:yang:ietf-lmap-control">
```

```
  <agent>
    <agent-id>550e8400-e29b-41d4-a716-446655440000</agent-id>
    <device-id>urn:dev:mac:0024beffffe804ff1</device-id>
    <hardware>ACME home router</hardware>
    <firmware>OpenWrt version 10.03.1</firmware>
    <version>Measurement Agent Daemon (MAD) 4.2</version>
    <last-started>2015-04-10T17:24:42+02:00</last-started>
  </agent>
```

```
  <tasks>
    <task>
      <name>udp-latency-measurement</name>
      <registry>urn:....</registry>
    </task>

    <task>
      <name>icmp-latency-measurement</name>
```

```
    <registry>urn:....</registry>
  </task>
```

```
  <task>
    <name>iperf</name>
    <program>iperf</program>
  </task>
```

```
  <task>
    <name>lmap-reporting-task</name>
    <program>lmap-reportd</program>
    <last-completion>2015-01-23T12:00:00+01:00</last-completion>
    <last-status>0</last-status>
    <last-message>OK</last-message>
    <last-failed-completion>2015-01-23T03:00:00+01:00</last-failed-completi
```

```

    <last-failed-status>42</last-failed-status>
    <last-failed-message>connection timed out</last-failed-message>
  </task>
</tasks>

</lmap-state>
</data>

```

[Appendix B](#). Example Configuration (JSON)

```

{
  "ietf-lmap-control:lmap": {
    "agent": {
      "agent-id": "550e8400-e29b-41d4-a716-446655440000",
      "device-id": "urn:dev:mac:0024beffffe804ff1",
      "group-id": "wireless measurement at the north-pole",
      "report-agent-id": true
    },
    "schedules": {
      "schedule": [
        {
          "name": "weekdays-hourly",
          "action": [
            {
              "name": "udp-latency-weekdays-hourly",
              "task": "udp-latency-measurement",
              "destination": [
                {
                  "name": "q-all",
                  "schedule": "daily",
                  "action": "report-daily"
                }
              ]
            }
          ]
        }
      ]
    }
  }
}

```

```

    }
  ]
}
],
"timing": "hourly"
},
{
  "name": "hourly",

```



```

"action": [
  {
    "name": "icmp-latency-hourly",
    "task": "icmp-latency-measurement",
    "destination": [
      {
        "name": "q-all",
        "schedule": "daily",
        "action": "report-daily"
      }
    ]
  }
],
"timing": "hourly"
},
{
  "name": "daily",
  "action": [
    {
      "name": "report-daily",
      "task": "lmap-reporting-task",
      "option": [
        {
          "name": "channel",
          "value": "default-collector-channel"
        }
      ]
    }
  ],
  "timing": "daily"
},
{
  "name": "immediate",
  "action": [
    {
      "name": "icmp-latency-immediate",
      "task": "icmp-latency-measurement",
      "destination": [
        {
          "name": "q-all",

```

"schedule": "immediate",

```

        "action": "report-immediate"
      }
    ]
  },
  {
    "name": "report-immediate",
    "task": "lmap-reporting-task",
    "option": [
      {
        "name": "channel",
        "value": "default-collector-channel"
      }
    ]
  }
],
"timing": "immediate"
}
]
},
"suppression": {
  "enabled": true,
  "start": "2014-09-02T14:06:11+02:00",
  "task": [
    "iperf-server"
  ],
  "schedule": [
    "hourly",
    "weekdays-hourly"
  ]
},
"channels": {
  "channel": [
    {
      "name": "default-collector-channel"
    }
  ]
},
"tasks": {
  "task": [
    {
      "name": "udp-latency-measurement",
      "registry": "urn:...."
    },
    {
      "name": "icmp-latency-measurement",
      "registry": "urn:...."
    }
  ],
},

```

---

```
{
  "name": "iperf-server",
  "program": "iperf",
  "option": [
    {
      "name": "role",
      "value": "server"
    }
  ],
  "suppress-by-default": false
},
{
  "name": "lmap-reporting-task",
  "program": "lmap-reportd"
}
]
},
"timings": {
  "timing": [
    {
      "name": "hourly",
      "periodic": {
        "interval": 3600000,
        "start": "2014-09-01T17:44:00+02:00",
        "end": "2014-09-30T00:00:00+02:00"
      }
    }
  ],
  {
    "name": "daily",
    "calendar": {
      "hour": [
        04
      ]
    }
  }
},
{
  "name": "tuesday-thursday-sunday",
  "calendar": {
    "weekday": [
      "tuesday",
      "thursday",
      "sunday"
    ],
    "hour": [
      18
    ]
  }
},
```

```
"minute": [
  04
```

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```
    ],
    "second": [
      42
    ],
    "end": "2014-09-30T00:00:00+02:00"
  }
},
{
  "name": "once-every-six-hours",
  "calendar": {
    "hour": [
      0,
      6,
      12,
      18
    ],
    "minute": [
      0
    ],
    "second": [
      0
    ],
    "end": "2014-09-30T00:00:00+02:00"
  },
  "random-spread": 21600000
},
{
  "name": "immediate",
  "immediate": [null]
},
{
  "name": "startup",
  "startup": [null],
  "random-spread": 12345
}
]
}
},
"ietf-lmap-control:lmap-state": {
```

```
"agent": {
  "agent-id": "550e8400-e29b-41d4-a716-446655440000",
  "device-id": "urn:dev:mac:0024beffffe804ff1",
  "hardware": "ACME home router",
  "firmware": "OpenWrt version 10.03.1",
  "version": "Measurement Agent Daemon (MAD) 4.2",
  "last-started": "2015-04-10T17:24:42+02:00"
},
"tasks": {
```

```
  "task": [
    {
      "name": "udp-latency-measurement",
      "registry": "urn:...."
    },
    {
      "name": "icmp-latency-measurement",
      "registry": "urn:...."
    },
    {
      "name": "iperf",
      "program": "iperf"
    },
    {
      "name": "lmap-reporting-task",
      "program": "lmap-reportd",
      "last-completion": "2015-01-23T12:00:00+01:00",
      "last-status": 0,
      "last-message": "OK",
      "last-failed-completion": "2015-01-23T03:00:00+01:00",
      "last-failed-status": 42,
      "last-failed-message": "connection timed out"
    }
  ]
}
}
```

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