

Generalized Network Control Automation YANG Model

draft-bryskin-netconf-automation-yang-02

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Objectives

- **Purpose:** to manipulate network close loop automation via configuration of standardized Event-Condition-Action (ECA) containers
- **ECA** – a set of NETCONF style requests/primitives (e.g. get data, edit-config, call-rpc, etc), whose execution on the server is triggered by a specified event, and whose order of execution is conditioned by current and/or historical network states and/or their derivatives
- Explicit **non-goal:** introducing a new interpreter/language/scripting environment

ECAs, when and why

- Reaction to events could be articulated to the network server in advance
- To enhance network responsiveness to events
- To improve scalability of network control
- To configure on the server programmable by a client logic

Policy Variables

- **Policy Variable (PV)** is an ECA state, i.e. a structure to keep results of the ECA execution for immediate or future use
- **PV types: global** (shared between ECAs), **local** (ECA scope, static or dynamic)
- **PV content structure:**
of a common type (e.g. integer, uint64, etc.)

Or

of an existing YANG node pointed by XPath (e.g. TE_Topologies/links/te_link)

What could be done with PVs?

- **read from/write** to YANG data store
- Used as input/output when calling **YANG RPCs**
- Used to generate **notification** messages;
- Used as input/output for **function** calls, for example `Fmult(a, 0.75)` to calculate $0.75 * a$
- Used in XPath expressions with PVs referred to by their respective positions in the YANG tree

ECA Events

- Subscribable events:
 - **explicitly defined** by YANG modules
 - **YANG Push** or/and **smart filter** subscriptions
- Timers

ECA Conditions

- Logical expressions with YANG data store nodes and/or PVs
- A condition could be configured as:
 - a single XPath expression
 - a hierarchy of comparisons and logical combinations of thereof
(e.g. $(X == Y \ || \ A < B) \ \&\& \ (C \leq D \ || \ E > F)$)

ECA Actions

- NETCONF style primitives:
 - **get data, edit-config**, etc.
 - calling YANG defined **RPCs** (e.g. TE_TunnelPathComputation RPC defined by YANG TE Tunnel model)
 - sending **notification** messages to the client
 - adding/removing event notification **subscriptions**
- Starting/stopping **timers**
- Calling other **ECAs**
- Performing **operations on PVs** (e.g. function calls)

ECA Structure

- **Event** name
- List of local PVs
- **Normal** Condition-Action list
- **Cleanup** Condition-Action list (to undo actions from the normal Condition-Action list in case one of the normal actions was rejected by the server)

Changes since IETF101

- A mechanism is introduced to define ECA events via YANG PUSH subscriptions
- A structure is defined to correlate by the client ECA notifications with corresponding events

Defining ECA Events via YANG PUSH Subscriptions

- Client:
 - configures a PUSH subscription
 - configures an ECA event specifying the PUSH subscription name

Defining ECA Events via YANG PUSH Subscriptions

- Server (at the moment of event configuration):
 - registers the event interpreting the referred PUSH subscription trigger as event firing trigger
 - uses the PUSH subscription filters to auto-configure the event's ECA input in the form of ECA's local PVs
- Server (at the moment of even firing):
 - copies data store states pointed by the PUSH subscription filters into ECA's auto-configured local PVs and triggers the ECA's Condition-Action chain execution

ECA Events and Notifications Correlation

- ECA notification is the only ECA action that interacts directly with the client
- Multiple ECAs could be triggered simultaneously, each of which potentially generating multiple semantically different one-time and/or repetitive notifications
- Every ECA notification message includes mandatorily the event name and event-scope unique notification name to facilitate for the client event-notification correlation

Next Steps

- Solicit more discussions and feedback from WG