Schema for xApp Descriptor

> **Obsolete Note**
>
> We are in the process of moving this xApp writing guide to https://docs.o-ran-sc.org.
>
> Please refer to App Writing Guide for latest guide.

JSON schema is used to describe the attributes and values in the xApp descriptor JSON file. The xApp onboarding process verifies the types and values of the xApp parameters in the descriptor.

If mismatches are found, xApp onboarding will return failure.

The schema file consists of two parts: sections that are static and cannot be changed for different xApp, and xApp specific controls section.

When an operator is onboarding an xApp that defines a control section, he/she will provide the controls section schema with together with the xApp descriptor.

The xapp_onboarder will combine the schema files into one.

How to Create Schema for the Controls Section

You can submit arbitrary schema for the controls section. However, if the xApp descriptor contains a controls section, you have to provide the correct schema that describes it.

If the xApp does not require a control section, you can ignore the control section schema.

It is highly recommended to use draft-07 schema. The following is a skeleton schema that you can use

```
{
        "$schema": "http://json-schema.org/draft-07/schema#",
        "$id": "#/controls",
        "type": "object",
        "title": "Controls Section Schema",
        "required": [
                "REQUIRED_ITEM_1",
                "REQUIRED_ITEM_2"
        ],
        "properties": {
                "REQUIRED_ITEM_1": {REQUIRED_ITEM_1_SUB_SCHEMA},
                "REQUIRED_ITEM_2": {REQUIRED_ITEM_2_SUB_SCHEMA}
        }
}
```

Please include the list of required items in the required section, and provide the corresponding sub_schema in the properties section.

You can download the skeleton schema file here

xApp Descriptor Schema

The overall schema file includes the following sections.

- **xapp_name**: xapp_name is a string variable. properties are as follows.

```
                    "xapp_name": {
                            "$id": "#/properties/xapp_name",
                            "type": "string",
                            "title": "The xApp Name",
                            "default": "xapp",
                            "examples": [
                                    "example_xapp"
                            ]
                    },
```

- **version**: version is a string variable that follows the semantic versioning syntax.

```
                    "version": {
                            "$id": "#/properties/version",
                            "type": "string",
                            "title": "The xApp version",
                            "default": "1.0.0",
                            "examples": [
                                    "1.0.0"
                            ],
                            "pattern": "^(0|[1-9]\\d*)\\.(0|[1-9]\\d*)\\.(0|[1-9]\\d*)(?:-((?:0|[1-9]
\\d*|\\d*[a-zA-Z-][0-9a-zA-Z-]*)(?:\\.(?:0|[1-9]\\d*|\\d*[a-zA-Z-][0-9a-zA-Z-]*))*))?(?:\\+([0-9a-zA-Z-]+
(?:\\.[0-9a-zA-Z-]+)*))?$"
                    },
```

- **containers**: containers is a list of container objects that includes name of the container, container image name, registry, tag, and entry command . It has a structure of

```
"containers": [
    {
        "name": "example_container_1",
        "image": {
            "registry": "example_image_registry_1",
            "name": "example_image_name_1",
            "tag": "example_image_tag_1"
        },
        "command": "example_command_1"
    },
    {
        "name": "example_container_2",
        "image": {
            "registry": "example_image_registry_2",
            "name": "example_image_name_2",
            "tag": "example_image_tag_2"
        }
    }
]
```

The following schema defines the above structure

```
                "containers": {
                        "$id": "#/properties/containers",
                        "type": "array",
                        "title": "The Container Schema",
                        "items": {
                                "$id": "#/properties/containers/items",
                                "type": "object",
                                "title": "The Container Items Schema",
                                "required": [
                                        "name",
                                        "image"
                                ],
                                "properties": {
                                        "name": {
                                                "$id": "#/properties/containers/items/properties/name",
```

```
                                        "type": "string",
                                        "title": "The xApp Container Name",
                                        "default": "xapp",
                                        "examples": [
                                                "xapp"
                                        ]
                                },
                                "image": {
                                        "$id": "#/properties/containers/items/properties/image",
                                        "type": "object",
                                        "title": "The Container Image",
                                        "required": [
                                                "registry",
                                                "name",
                                                "tag"
                                        ],
                                        "properties": {
                                                "registry": {
                                                        "$id": "#/properties/containers/items
/properties/image/properties/registry",
                                                        "type": "string",
                                                        "title": "The xApp Image Registry",
                                                        "default": "nexus3.o-ran-sc.org:10002",
                                                        "examples": [
                                                                "nexus3.o-ran-sc.org:10002"
                                                        ],
                                                        "pattern": "^[A-Za-z0-9\\.-]{1,}\\.[A-Za-
z]{1,}(?:\\:\\d+)?$"
                                                },
                                                "name": {
                                                        "$id": "#/properties/containers/items
/properties/image/properties/name",
                                                        "type": "string",
                                                        "title": "The xApp Image Name",
                                                        "default": "xapp",
                                                        "examples": [
                                                                "xapp"
                                                        ]
                                                },
                                                "tag": {
                                                        "$id": "#/properties/containers/items
/properties/image/properties/tag",
                                                        "type": "string",
                                                        "title": "The xApp Image Tag",
                                                        "default": "latest",
                                                        "examples": [
                                                                "latest"
                                                        ]
                                                }
                                        }
                                },
                                "command": {
                                        "$id": "#/properties/containers/items/properties
/command",
                                        "type": "string",
                                        "title": "Command To Run The xApp Container",
                                        "default": "command",
                                        "examples": [
                                                "command"
                                        ]
                                }
                        }
                },
        },
```

- **livenessProbe**: livenessProbe defines the k8s liveness probe for the xApp pod. It follows the following schema

```
        "livenessProbe": {
                "$id": "#/properties/livenessprobe",
```

```
            "type": "object",
                    "title": "The Liveness Probe Definition",
            "properties": {
                "exec": {
                                        "$id": "#/properties/livenessprobe/exec",
                    "type": "object",
                                        "title": "Script of Liveness Probe",
                    "properties": {
                         "command": {
                                                        "$id": "#/properties/livenessprobe/exec
/command",
                            "type": "array",
                            "items": [
                                {
                                                                                "$id": "#/properties
/livenessprobe/exec/command/item",
                                                                                "type": "string",
                                                                                "title": "The Command Item",
                                                                                "default": "/bin/sh",
                                                                                "examples": [
                                                                                        "/bin/sh"
                                                                                ]
                                }
                            ]
                        }
                    },
                    "required": [
                        "command"
                    ]
                },
                "httpGet": {
                                        "$id": "#/properties/livenessprobe/httpget",
                    "type": "object",
                                        "title": "Http of Liveness Probe",
                    "properties": {
                         "path": {
                                                                "$id": "#/properties/livenessprobe/httpget/path",
                                                                "type": "string",
                                                                "title": "The Path of Http Liveness Probe",
                                                                "default": "/health",
                                                                "examples": [
                                                                        "/health"
                                                                ]
                         },
                                                        "port": {
                                                                "$id": "#/properties/livenessprobe/httpget/port",
                                                                "type": "integer",
                                                                "title": "The Port of Http Liveness Probe",
                                                                "default": 80,
                                                                "examples": [
                                                                        80
                                                                ]
                         }
                    },
                    "required": [
                        "path",
                                        "port"
                    ]
                },
                "initialDelaySeconds": {
                    "$id": "#/properties/livenessprobe/initialdelayseconds",
                                        "type": "integer",
                                        "title": "Initial Delay of Liveness Probe",
                                        "default": 5,
                                        "examples": [
                                                5
                                        ]
                },
                "periodSeconds": {
                    "$id": "#/properties/livenessprobe/periodseconds",
                                        "type": "integer",
```

```
                                    "title": "Period of Liveness Probe",
                                    "default": 15,
                                    "examples": [
                                            15
                                    ]
                }
            },
                    "oneOf": [
                      {
                                "$id": "#/properties/livenessprobe/oneof/exec",
                                "required": ["exec", "initialDelaySeconds", "periodSeconds"]
                            },
                      {
                                "$id": "#/properties/livenessprobe/oneof/httpget",
                                "required": ["httpGet", "initialDelaySeconds", "periodSeconds"]
                            }
                    ]
        },
```

- **readinessProbe**: readinessProbe defines the k8s readiness probe for the xApp pod. It follows the following schema

```
        "readinessProbe": {
                "$id": "#/properties/readinessprobe",
            "type": "object",
                        "title": "The Readiness Probe Definition",
            "properties": {
                "exec": {
                                    "$id": "#/properties/readinessprobe/exec",
                    "type": "object",
                                    "title": "Script of Readiness Probe",
                    "properties": {
                         "command": {
                                                         "$id": "#/properties/readinessprobe/exec
/command",
                             "type": "array",
                             "items": [
                                 {
                                     "type": "string"
                                 }
                             ]
                         }
                    },
                    "required": [
                        "command"
                    ]
                },
                "httpGet": {
                                    "$id": "#/properties/readinessprobe/httpget",
                    "type": "object",
                                    "title": "Http of Readiness Probe",
                    "properties": {
                         "path": {
                                                        "$id": "#/properties/readinessprobe/httpget
/path",
                                                        "type": "string",
                                                        "title": "The Path of Http Readiness Probe",
                                                        "default": "/health",
                                                        "examples": [
                                                                "/health"
                                                        ]
                         },
                                                "port": {
                                                        "$id": "#/properties/readinessprobe/httpget
/port",
                                                        "type": "integer",
                                                        "title": "The Port of Http Readiness Probe",
                                                        "default": 80,
                                                        "examples": [
                                                                80
```

```
                                                    ]
                        }
                    },
                    "required": [
                        "path",
                                    "port"
                    ]
                },
                "initialDelaySeconds": {
                    "$id": "#/properties/readinessprobe/initialdelayseconds",
                                    "type": "integer",
                                    "title": "Initial Delay of Readiness Probe",
                                    "default": 5,
                                    "examples": [
                                            5
                                    ]
                },
                "periodSeconds": {
                    "$id": "#/properties/readinessprobe/periodseconds",
                                    "type": "integer",
                                    "title": "Period of Readiness Probe",
                                    "default": 15,
                                    "examples": [
                                            15
                                    ]
                }
            },
                    "oneOf": [
                      {
                                "$id": "#/properties/readinessprobe/oneof/exec",
                                "required": ["exec", "initialDelaySeconds", "periodSeconds"]
                        },
                      {
                                "$id": "#/properties/readinessprobe/oneof/httpget",
                                "required": ["httpGet", "initialDelaySeconds", "periodSeconds"]
                        }
                    ]
        },
```

- **messaging**: this schema defines the messaging parameters structure

```
            "messaging": {
                        "type": "object",
                        "$id": "#/properties/messaging",
                        "title": "The Messaging Schema",
                        "properties": {
                                "ports": {
                                         "$id": "#/properties/messaging/ports",
                                         "type": "array",
                                         "title": "The Ports for Messaging",
                                    "items":{
                                             "$id": "#/properties/messaging/ports/items",
                                             "type": "object",
                                             "title": "The Item of Port",
                                           "required": ["name", "container",
"port"],
                                       "dependencies": {
                                         "txMessages": ["rxMessages", "policies"],
                                             "rxMessages": ["txMessages", "policies"],
                                             "policies": ["rxMessages", "txMessages"]
                                       },
                                             "properties": {
                                                   "name": {
                                                           "$id": "#/properties/messaging/ports
/items/name",
                                                           "type": "string",
                                                           "title": "The Name of the Port",
```

```
                                                "default": "App",
                                                "examples": [
                                                        "App"
                                                ]
                                        },
                                        "container": {
                                                "$id": "#/properties/messaging/ports
/items/container",
                                                "type": "string",
                                                "title": "The Container of the Port",
                                                "default": "xapp",
                                                "examples": [
                                                        "xapp"
                                                ]
                                        },
                                        "port": {
                                                "$id": "#/properties/messaging/ports
/items/port",
                                                "type": "integer",
                                                "title": "The Port Number",
                                                "default": 8080,
                                                "examples": [
                                                        8080
                                                ]
                                        },
                                        "description": {
                                                "$id": "#/properties/messaging/ports
/items/description",
                                                "type": "string",
                                                "title": "The description for the port",
                                                "default": "port description",
                                                "examples": [
                                                        "port description"
                                                ]
                                        },
                                "txMessages": {
                                                "$id": "#/properties/messaging/ports
/items/txmessages",
                                    "type": "array",
                                                "title": "The txMessage Types",
                                    "items":{
                                                        "$id": "#/properties/messaging
/ports/items//txmessages/item",
                                                        "type": "string",
                                                        "title": "The txMessage Types
Item",
                                                        "default": "RIC_SUB",
                                                        "examples": [
                                                                "RIC_SUB"
                                                        ]
                                                }
                                },
                                "rxMessages": {
                                                "$id": "#/properties/messaging/ports
/items/rxmessages",
                                    "type": "array",
                                                "title": "The rxMessage Types",
                                    "items":{
                                                        "$id": "#/properties/messaging
/ports/items/rxmessages/item",
                                                        "type": "string",
                                                        "title": "The rxMessage Types
Item",
                                                        "default": "RIC_SUB",
                                                        "examples": [
                                                                "RIC_SUB"
                                                        ]
                                                }
                                },
                                "policies": {
                                                "$id": "#/properties/messaging/ports
```

```
/items/policies",
                                        "type": "array",
                                                        "title": "The Policies Types",
                                        "items":{
                                                                "$id": "#/properties/messaging
/ports/items/policies/item",
                                                                "type": "integer",
                                                                "title": "The Policy Types Item",
                                                                "default": 1,
                                                                "examples": [
                                                                        1
                                                                ]
                                                        }
                                    }
                                            }
                                    }
                                }
                    },
            "required": [
                "ports"
            ]

                },
```

- **metrics**: this schema defines the metrics structure

```
                "metrics": {
                        "type": "array",
                        "$id": "#/properties/metrics",
                        "title": "The Metrics Schema",
                        "items": {
                                "$id": "#/properties/metrics/items",
                                "type": "object",
                                "title": "The Metrics Items Schema",
                                "required": [
                                        "objectName",
                                        "objectInstance",
                                        "name",
                                        "type",
                                        "description"
                                ],
                                "properties": {
                                        "objectName": {
                                                "$id": "#/properties/metrics/items/objectname",
                                                "type": "string",
                                                "title": "The Object Name"
                                        },
                                        "objectInstance": {
                                                "$id": "#/properties/metrics/items/objectinstance",
                                                "type": "string",
                                                "title": "The Object Instance"
                                        },
                                        "name": {
                                                "$id": "#/properties/metrics/items/name",
                                                "type": "string",
                                                "title": "The Object Name"
                                        },
                                        "type": {
                                                "$id": "#/properties/metrics/items/type",
                                                "type": "string",
                                                "title": "The Object Type"
                                        },
                                        "description": {
                                                "$id": "#/properties/metrics/items/description",
                                                "type": "string",
                                                "title": "The Object Description"
                                        }
                                }
                        }
                }
        },
```

- **Controls**: This section will be replaced by the submitted control section schema. If the controls section schema is not provided, the following will be used to make sure that the xApp onboarder will reject an xApp descriptor with an undefined control section.

```
                "controls": {
                        "required": [
                                "__empty_control_section__"
                        ]
                }
```

You can download the schema file here