

## NAME

ovn-ic-sb – OVN\_IC\_Southbound database schema

This database holds configuration and state for interconnecting different OVN deployments. The content of the database is populated and used by the **ovn-ic** program in each OVN deployment, and not supposed to be directly used by CMS or end user.

The OVN Interconnection Southbound database is shared by **ovn-ic** program in each OVN deployment. It contains interconnection information from all related OVN deployments, and is used as the intermediate store for each OVN deployment to exchange the information. The **ovn-ic** program in each deployment is responsible for syncing the data between this database and the its own northbound and southbound databases.

## Database Structure

The OVN Interconnection Southbound database contains classes of data with different properties, as described in the sections below.

### *Availability Zone Specific Information*

These tables contain objects that are availability zone specific. Each object is owned and populated by one availability zone, and read by other availability zones.

The **Availability\_Zone**, **Gateway**, **Encap** and **Port\_Binding** tables are the availability zone specific tables.

### *Global Information*

The data that does not belong to any specific availability zone but is common for all availability zones.

The **Datapath\_Binding** table contains the common datapath binding information.

### *Common Columns*

Each of the tables in this database contains a special column, named **external\_ids**. This column has the same form and purpose each place it appears.

**external\_ids**: map of string-string pairs  
Key-value pairs for use by **ovn-ic**.

## TABLE SUMMARY

The following list summarizes the purpose of each of the tables in the **OVN\_IC\_Southbound** database. Each table is described in more detail on a later page.

| Table                    | Purpose                             |
|--------------------------|-------------------------------------|
| <b>IC_SB_Global</b>      | IC Southbound configuration         |
| <b>Availability_Zone</b> | Availability Zone Information       |
| <b>Gateway</b>           | Interconnection Gateway Information |
| <b>Encap</b>             | Encapsulation Types                 |
| <b>Datapath_Binding</b>  | Transit Switch Datapath Bindings    |
| <b>Port_Binding</b>      | Transit Port Bindings               |
| <b>Route</b>             | Route                               |
| <b>Connection</b>        | OVSDb client connections.           |
| <b>SSL</b>               | SSL configuration.                  |

## TABLE RELATIONSHIPS

The following diagram shows the relationship among tables in the database. Each node represents a table. Tables that are part of the “root set” are shown with double borders. Each edge leads from the table that contains it and points to the table that its value represents. Edges are labeled with their column names, followed by a constraint on the number of allowed values: ? for zero or one, \* for zero or more, + for one or more. Thick lines represent strong references; thin lines represent weak references.



## IC\_SB\_Global TABLE

Interconnection Southbound configuration. This table must have exactly one row.

### Summary:

*Status:*

|                            |                            |
|----------------------------|----------------------------|
| <b>nb_ic_cfg</b>           | integer                    |
| <i>Common Columns:</i>     |                            |
| <b>external_ids</b>        | map of string-string pairs |
| <b>options</b>             | map of string-string pairs |
| <i>Connection Options:</i> |                            |
| <b>connections</b>         | set of <b>Connections</b>  |
| <b>ssl</b>                 | optional <b>SSL</b>        |

### Details:

*Status:*

This column allow a client to track the overall configuration state of the system.

**nb\_ic\_cfg:** integer

Sequence number for the configuration. When a CMS or **ovn-ic-nbctl** updates the Interconnect northbound database, it increments the **nb\_ic\_cfg** column in the **NB\_IC\_Global** table in the Interconnect northbound database. when **OVN-ICs** updates the southbound database to bring it up to date with these changes, one **OVN-IC** updates this column to the same value.

*Common Columns:*

**external\_ids:** map of string-string pairs

See **External IDs** at the beginning of this document.

**options:** map of string-string pairs

*Connection Options:*

**connections:** set of **Connections**

Database clients to which the Open vSwitch database server should connect or on which it should listen, along with options for how these connections should be configured. See the **Connection** table for more information.

**ssl:** optional **SSL**

Global SSL configuration.

## Availability\_Zone TABLE

Each row in this table represents an Availability Zone. Each OVN deployment is considered an availability zone from OVN control plane perspective, with its own central components, such as northbound and southbound databases and **ovn-northd** daemon.

### Summary:

|                  |                                      |
|------------------|--------------------------------------|
| <b>name</b>      | string (must be unique within table) |
| <b>nb_ic_cfg</b> | integer                              |

### Details:

**name:** string (must be unique within table)

A name that uniquely identifies the availability zone.

**nb\_ic\_cfg:** integer

This column is used by the **OVN-IC** to inform that this IC instance is aligned with the changes in INB

## Gateway TABLE

Each row in this table represents a interconnection gateway chassis in an availability zone.

### Summary:

|                                     |                                      |
|-------------------------------------|--------------------------------------|
| <b>name</b>                         | string (must be unique within table) |
| <b>availability_zone</b>            | <b>Availability_Zone</b>             |
| <b>hostname</b>                     | string                               |
| <i>Common Columns:</i>              |                                      |
| <b>external_ids</b>                 | map of string-string pairs           |
| <i>Encapsulation Configuration:</i> |                                      |
| <b>encaps</b>                       | set of 1 or more <b>Encaps</b>       |

### Details:

**name:** string (must be unique within table)

The name of the gateway. See **name** column of the OVN Southbound database's **Chassis** table.

**availability\_zone:** **Availability\_Zone**

The availability zone that the gateway belongs to.

**hostname:** string

The hostname of the gateway.

### *Common Columns:*

The overall purpose of these columns is described under **Common Columns** at the beginning of this document.

**external\_ids:** map of string-string pairs

### *Encapsulation Configuration:*

OVN uses encapsulation to transmit logical dataplane packets between gateways.

**encaps:** set of 1 or more **Encaps**

Points to supported encapsulation configurations to transmit logical dataplane packets to this gateway. Each entry is a **Encap** record that describes the configuration. See **encaps** column of the OVN Southbound database's **Chassis** table.

## Encap TABLE

The **encaps** column in the **Gateway** table refers to rows in this table to identify how OVN may transmit logical dataplane packets to this gateway.

### Summary:

|                     |   |
|---------------------|---|
| <b>type</b>         | string, one of <b>geneve</b> , <b>stt</b> , or <b>vxlan</b> |
| <b>options</b>      | map of string-string pairs                                  |
| <b>ip</b>           | string  |
| <b>gateway_name</b> | string  |

### Details:

**type:** string, one of **geneve**, **stt**, or **vxlan**

The encapsulation to use to transmit packets to this gateway. See **type** column of the OVN Southbound database's **Encap** table.

**options:** map of string-string pairs

Options for configuring the encapsulation, which may be **type** specific. See **options** column of the OVN Southbound database's **Encap** table.

**ip:** string

The IPv4 address of the encapsulation tunnel endpoint.

**gateway\_name:** string

The name of the gateway that created this encap.

## Datapath\_Binding TABLE

Each row in this table represents a logical datapath for a transit logical switch configured in the OVN Interconnection Northbound database's **Transit\_Switch** table.

### Summary:

|                        |   |
|------------------------|---|
| <b>transit_switch</b>  | string  |
| <b>tunnel_key</b>      | integer, in range 1 to 16,777,215 (must be unique within table) |
| <i>Common Columns:</i> |   |
| <b>external_ids</b>    | map of string-string pairs                                      |

### Details:

**transit\_switch:** string

The name of the transit logical switch that is configured in the OVN Interconnection Northbound database's **Transit\_Switch** table.

**tunnel\_key:** integer, in range 1 to 16,777,215 (must be unique within table)

The tunnel key value to which the logical datapath is bound. The key can be generated by any **ovn-ic** but the same key is shared by all availability zones so that the logical datapaths can be peered across them. A tunnel key for transit switch datapath binding must be globally unique.

For more information about the meanings of a tunnel key, see **tunnel\_key** column of the OVN Southbound database's **Datapath\_Binding** table.

### Common Columns:

The overall purpose of these columns is described under **Common Columns** at the beginning of this document.

**external\_ids:** map of string-string pairs

## Port\_Binding TABLE

Each row in this table binds a logical port on the transit switch to a physical gateway and a tunnel key. Each port on the transit switch belongs to a specific availability zone.

### Summary:

#### Core Features:

|                          |   |
|--------------------------|---|
| <b>transit_switch</b>    | string                                  |
| <b>logical_port</b>      | string (must be unique within table)    |
| <b>availability_zone</b> | <b>Availability_Zone</b>                |
| <b>encap</b>             | optional weak reference to <b>Encap</b> |
| <b>gateway</b>           | string                                  |
| <b>tunnel_key</b>        | integer, in range 1 to 32,767           |
| <b>address</b>           | string                                  |

#### Common Columns:

|                     |                            |
|---------------------|----------------------------|
| <b>external_ids</b> | map of string-string pairs |
|---------------------|----------------------------|

### Details:

#### Core Features:

**transit\_switch:** string

The name of the transit switch that the corresponding logical port belongs to.

**logical\_port:** string (must be unique within table)

A logical port, taken from **name** in the OVN\_Northbound database's **Logical\_Switch\_Port** table. The logical port name must be unique across all availability zones.

**availability\_zone:** **Availability\_Zone**

The availability zone that the port belongs to.

**encap:** optional weak reference to **Encap**

Points to supported encapsulation configurations to transmit logical dataplane packets to this gateway. Each entry is a **Encap** record that describes the configuration.

**gateway:** string

The name of the gateway that this port is physically located.

**tunnel\_key:** integer, in range 1 to 32,767

A number that represents the logical port in the key (e.g. STT key or Geneve TLV) field carried within tunnel protocol packets. The key can be generated by any **ovn-ic** but the same key is shared by all availability zones so that the packets can go through the datapath pipelines of different availability zones.

The tunnel ID must be unique within the scope of a logical datapath.

For more information about tunnel key, see **tunnel\_key** column of the OVN Southbound database's **Port\_Binding** table.

**address:** string

The Ethernet address and IP addresses used by the corresponding logical router port peering with the transit switch port. It is a string combined with the value of **mac** column followed by the values in **networks** column in **Logical\_Router\_Port** table.

#### Common Columns:

**external\_ids:** map of string-string pairs

See **External IDs** at the beginning of this document.



## Route TABLE

Each row in this table represents a route advertised.

### Summary:

#### Core Features:

|                          |  |
|--------------------------|--|
| <b>transit_switch</b>    | string   |
| <b>availability_zone</b> | <b>Availability_Zone</b>                         |
| <b>route_table</b>       | string   |
| <b>ip_prefix</b>         | string   |
| <b>nexthop</b>           | string   |
| <b>origin</b>            | string, either <b>connected</b> or <b>static</b> |

#### Common Columns:

|                     |                            |
|---------------------|----------------------------|
| <b>external_ids</b> | map of string-string pairs |
|---------------------|----------------------------|

### Details:

#### Core Features:

**transit\_switch:** string

The name of the transit switch, upon which the route is advertised.

**availability\_zone:** **Availability\_Zone**

The availability zone that has advertised the route.

**route\_table:** string

Route table within which this route was created. Empty value means *<main>* routing table.

Routes for directly-connected networks will be learned to *<main>* routing table and if Logical Routers have more than one Transit Switch, which interconnects them, directly-connected routes will be added via each transit switch port and configured as ECMP routes.

Static routes within route tables will be advertised and learned only if interconnecting transit switch's LRP's will have same value in **options:route\_table** as NB **route\_table** or ICSB **route\_table** value respectively.

**ip\_prefix:** string

IP prefix of this route (e.g. 192.168.100.0/24).

**nexthop:** string

Nexthop IP address for this route.

**origin:** string, either **connected** or **static**

Can be one of **connected** or **static**. Routes to directly-connected subnets - LRP's CIDRs are inserted to OVN IC SB DB with **connected** value in **origin**. Static routes are inserted to OVN IC SB DB with **static** value. Next when route is learned to another AZ NB DB by ovn-ic, route origin is synced to **options:origin**.

#### Common Columns:

**external\_ids:** map of string-string pairs

See **External IDs** at the beginning of this document.

## Connection TABLE

Configuration for a database connection to an Open vSwitch database (OVSDB) client.

This table primarily configures the Open vSwitch database server (**ovsdb-server**).

The Open vSwitch database server can initiate and maintain active connections to remote clients. It can also listen for database connections.

### Summary:

#### Core Features:

**target** string (must be unique within table)

#### Client Failure Detection and Handling:

**max\_backoff** optional integer, at least 1,000

**inactivity\_probe** optional integer

#### Status:

**is\_connected** boolean

**status : last\_error** optional string

**status : state** optional string, one of **ACTIVE**, **BACKOFF**, **CONNECTING**, **IDLE**, or **VOID**

**status : sec\_since\_connect** optional string, containing an integer, at least 0

**status : sec\_since\_disconnect** optional string, containing an integer, at least 0

**status : locks\_held** optional string

**status : locks\_waiting** optional string

**status : locks\_lost** optional string

**status : n\_connections** optional string, containing an integer, at least 2

**status : bound\_port** optional string, containing an integer

#### Common Columns:

**external\_ids** map of string-string pairs

**other\_config** map of string-string pairs

### Details:

#### Core Features:

**target:** string (must be unique within table)

Connection methods for clients.

The following connection methods are currently supported:

**ssl:host[:port]**

The specified SSL *port* on the given *host*, which can either be a DNS name (if built with unbound library) or an IP address. A valid SSL configuration must be provided when this form is used, this configuration can be specified via command-line options or the **SSL** table.

If *port* is not specified, it defaults to 6640.

SSL support is an optional feature that is not always built as part of Open vSwitch.

**tcp:host[:port]**

The specified TCP *port* on the given *host*, which can either be a DNS name (if built with unbound library) or an IP address (IPv4 or IPv6). If *host* is an IPv6 address, wrap it in square brackets, e.g. **tcp:[::1]:6640**.

If *port* is not specified, it defaults to 6640.

**pssl:[port][:host]**

Listens for SSL connections on the specified TCP *port*. Specify 0 for *port* to have the kernel automatically choose an available port. If *host*, which can either be a DNS name (if built with unbound library) or an IP address, is specified, then connections are restricted to the resolved or specified local IP address (either IPv4 or IPv6 address). If *host* is an IPv6 address, wrap in square brackets, e.g. **pssl:6640:[::1]**. If *host* is not specified then it listens only on IPv4 (but not IPv6) addresses. A valid SSL configuration must be

provided when this form is used, this can be specified either via command-line options or the **SSL** table.

If *port* is not specified, it defaults to 6640.

SSL support is an optional feature that is not always built as part of Open vSwitch.

#### **ptcp:[port][:host]**

Listens for connections on the specified TCP *port*. Specify 0 for *port* to have the kernel automatically choose an available port. If *host*, which can either be a DNS name (if built with unbound library) or an IP address, is specified, then connections are restricted to the resolved or specified local IP address (either IPv4 or IPv6 address). If *host* is an IPv6 address, wrap it in square brackets, e.g. **ptcp:6640:[::1]**. If *host* is not specified then it listens only on IPv4 addresses.

If *port* is not specified, it defaults to 6640.

When multiple clients are configured, the **target** values must be unique. Duplicate **target** values yield unspecified results.

#### *Client Failure Detection and Handling:*

**max\_backoff**: optional integer, at least 1,000

Maximum number of milliseconds to wait between connection attempts. Default is implementation-specific.

**inactivity\_probe**: optional integer

Maximum number of milliseconds of idle time on connection to the client before sending an inactivity probe message. If Open vSwitch does not communicate with the client for the specified number of seconds, it will send a probe. If a response is not received for the same additional amount of time, Open vSwitch assumes the connection has been broken and attempts to reconnect. Default is implementation-specific. A value of 0 disables inactivity probes.

#### *Status:*

Key-value pair of **is\_connected** is always updated. Other key-value pairs in the status columns may be updated depends on the **target** type.

When **target** specifies a connection method that listens for inbound connections (e.g. **ptcp**: or **punix**:), both **n\_connections** and **is\_connected** may also be updated while the remaining key-value pairs are omitted.

On the other hand, when **target** specifies an outbound connection, all key-value pairs may be updated, except the above-mentioned two key-value pairs associated with inbound connection targets. They are omitted.

**is\_connected**: boolean

**true** if currently connected to this client, **false** otherwise.

**status : last\_error**: optional string

A human-readable description of the last error on the connection to the manager; i.e. **strerror(errno)**. This key will exist only if an error has occurred.

**status : state**: optional string, one of **ACTIVE**, **BACKOFF**, **CONNECTING**, **IDLE**, or **VOID**

The state of the connection to the manager:

**VOID** Connection is disabled.

**BACKOFF**

Attempting to reconnect at an increasing period.

**CONNECTING**

Attempting to connect.

**ACTIVE**

Connected, remote host responsive.

**IDLE** Connection is idle. Waiting for response to keep-alive.

These values may change in the future. They are provided only for human consumption.

**status : sec\_since\_connect:** optional string, containing an integer, at least 0

The amount of time since this client last successfully connected to the database (in seconds). Value is empty if client has never successfully been connected.

**status : sec\_since\_disconnect:** optional string, containing an integer, at least 0

The amount of time since this client last disconnected from the database (in seconds). Value is empty if client has never disconnected.

**status : locks\_held:** optional string

Space-separated list of the names of OVSDDB locks that the connection holds. Omitted if the connection does not hold any locks.

**status : locks\_waiting:** optional string

Space-separated list of the names of OVSDDB locks that the connection is currently waiting to acquire. Omitted if the connection is not waiting for any locks.

**status : locks\_lost:** optional string

Space-separated list of the names of OVSDDB locks that the connection has had stolen by another OVSDDB client. Omitted if no locks have been stolen from this connection.

**status : n\_connections:** optional string, containing an integer, at least 2

When **target** specifies a connection method that listens for inbound connections (e.g. **ptcp:** or **pssl:**) and more than one connection is actually active, the value is the number of active connections. Otherwise, this key-value pair is omitted.

**status : bound\_port:** optional string, containing an integer

When **target** is **ptcp:** or **pssl:**, this is the TCP port on which the OVSDDB server is listening. (This is particularly useful when **target** specifies a port of 0, allowing the kernel to choose any available port.)

*Common Columns:*

The overall purpose of these columns is described under **Common Columns** at the beginning of this document.

**external\_ids:** map of string-string pairs

**other\_config:** map of string-string pairs

## SSL TABLE

SSL configuration for ovn-sb database access.

### Summary:

|                          |                            |
|--------------------------|----------------------------|
| <b>private_key</b>       | string                     |
| <b>certificate</b>       | string                     |
| <b>ca_cert</b>           | string                     |
| <b>bootstrap_ca_cert</b> | boolean                    |
| <b>ssl_protocols</b>     | string                     |
| <b>ssl_ciphers</b>       | string                     |
| <i>Common Columns:</i>   |                            |
| <b>external_ids</b>      | map of string-string pairs |

### Details:

**private\_key:** string

Name of a PEM file containing the private key used as the switch's identity for SSL connections to the controller.

**certificate:** string

Name of a PEM file containing a certificate, signed by the certificate authority (CA) used by the controller and manager, that certifies the switch's private key, identifying a trustworthy switch.

**ca\_cert:** string

Name of a PEM file containing the CA certificate used to verify that the switch is connected to a trustworthy controller.

**bootstrap\_ca\_cert:** boolean

If set to **true**, then Open vSwitch will attempt to obtain the CA certificate from the controller on its first SSL connection and save it to the named PEM file. If it is successful, it will immediately drop the connection and reconnect, and from then on all SSL connections must be authenticated by a certificate signed by the CA certificate thus obtained. **This option exposes the SSL connection to a man-in-the-middle attack obtaining the initial CA certificate.** It may still be useful for bootstrapping.

**ssl\_protocols:** string

List of SSL protocols to be enabled for SSL connections. The default when this option is omitted is **TLSv1,TLSv1.1,TLSv1.2**.

**ssl\_ciphers:** string

List of ciphers (in OpenSSL cipher string format) to be supported for SSL connections. The default when this option is omitted is **HIGH:!aNULL:!MD5**.

### Common Columns:

The overall purpose of these columns is described under **Common Columns** at the beginning of this document.

**external\_ids:** map of string-string pairs