Annex A (normative):  
Cell state handling

# A.1 Relation between the administrative state and the "Pre-operation state of the gNB-DU Cell"

The administrative state indicates the permission to use or prohibition against using the cell, imposed through the OAM services. The administrative state has three values: "LOCKED", "SHUTTING DOWN" or "UNLOCKED"

The meanings of these values are defined in ITU T Recommendation X.731 [18].

The relation between the administrative state and the "Pre-operation state of the gNB-DU Cell" is defined in clause 8.5 of TS 38.401 [4]. See below an extract from clause 8.5 of TS 38.401 [4] on the F1 startup and cell activation.

If the operationalState is "ENABLED" (i.e. the resource is physically installed and working) and if the administrativeState is "UNLOCKED", the step "0: Pre-operational state" will exit and the step "1: F1 Setup Request" will be executed."

8.5 F1 Startup and cells activation

This function allows to setup the F1 interface between a gNB-DU and a gNB-CU and it allows to activate the gNB-DU cells.



Figure 8.5-1: F1 startup and cell activation

# A.2 Combined state diagram for gNB cell

This is the Combined state diagram for gNB cell.



Figure A.2-1: Combined gNB cell state diagram

The gNB-DU maintains cell states. The following table is the gNB cell state transition table.

In 3-split and 2-split deployment scenarios, the interactions between gNB-CU and gNB-DU are standardized. The interactions specified under the column "The state transition events and actions" of "The gNB Cell state transition table" below shall be present for the state transition.

In the non-split deployment scenarios, the interactions between gNB-CU and gNB-DU are not standardized. The interactions between gNB-CU and gNB-DU specified under the column "The state transition events and actions" of "The gNB Cell state transition table" can be replaced by other means that is not standardized.

Table A.2-1: The gNB Cell state transition table

|  |  |
| --- | --- |
| Transition number | The state transition event and actions |
| 1 | Event: Receive request to unlock.  Action: None. |
| 2 | Event: Receive request to lock.  Action: None. |
| 2a | Event: Receive request to lock  Action: Send to gNB-CU the "gNB-DU Configuration Update message" with served cell to delete. |
| 3 | Event: When the required cell resource is physically installed and working.  Action: none. |
| 4 | Event: When the required cell resource is not physically installed or is not working.  Action: Send to gNB-CU the "gNB-DU Configuration update message" with cell to delete. |
| 4a | Event: When the required cell resource is physically uninstalled or is not working.  Action: Send to gNB-CU the "GNB-DU Configuration Update message" with served cell to delete. |
| 5 | Event: Receive from gNB-CU the "F1 Setup Response message" (identifying the cell to be activated).  The cell is activated successfully.  Actions: Do nothing or send gNB-CU the "gNB-DU Configuration Update message" with Cell stated as active'  ----- or -----  Event: Receive from gNB-CU the "gNB-CU Configuration Update message" (identifying cell to be activated e.g., in case that the cell was not activated using the "F1 Setup Response message").  Actions:  The cell is activated successfully.  Send to gNB-CU the "gNB-CU Configuration Update Response" to confirm the cell is in active state.  ----- or -----  Event: Receive from gNB-CU the "gNB-DU Configuration Update Acknowledge message" (identifying cell to be activated e.g., in case that the cell was not activated using the "F1 Setup Response message") and  the cell is activated successfully  Actions: Do nothing. |
| 6 | Event: Receive from gNB-CU the "gNB-CU Configuration Update message" and responds with gNB-CU Configuration Update Acknowledge messages.  Actions: Respond with gNB-CU Configuration Update Acknowledge messages.  ----- or -----  Event: Event: DU experiences an internal failure and decided to place the cell into inactive state.  Actions: Send to gNB-CU the "gNB-DU Cell status Update message" |
| 7 | Event: Send to gNB-CU the "F1 Setup request" (identifying the cell that is configured and ready to be activated).  Actions: none.  ----- or -----  Send to gNB-CU the "gNB-DU Configuration Update message" with the served cell to add.  Actions: none. |
| 8 | Event: Sends to gNB-CU the "gNB-DU Configuration Update message" with served cell to delete. Receive response from gNB-CU the "gNB-DU Configuration Update Acknowledge message".  Actions: None. |
| 9 | Event: Receive request to shut down.  Actions: None. |
| 10 | Event: Last user quit.  Actions: Send to gNB-CU the "GNB-DU Configuration Update message" with served cell to delete. |
| 11 | Event: When a cell is created and is configured.  Actions: None |
| 12 | Event: When a cell is deleted.  Action: None. |

Annex B (normative):  
NetworkSlice and NetworkSliceSubnet state handling

# B.1 NetworkSlice instance state handling

A NetworkSlice instance is a logical object in the management system that represents a complex grouping of resources that may be in various states. At any time, the management system needs to know the state of an NetworkSlice instance.

The ITU-T X.731 [18], to which [17] refers, has defined the inter-relation between the administrative state and operational state of systems in general.



Figure B.1: Combined NetworkSlice instance state diagram

The interactions specified under the column "The state transition events and actions" of " NetworkSlice instance state transition table" below shall be present for the state transition.

Table B.1: The NetworkSlice instance state transition table

|  |  |
| --- | --- |
| Trigger number | The state transition events and actions |
| 0 | Operation allocateNsi results in the creation of a NetworkSlice instance. The administrative state is set to LOCKED and operationalState is set to DISABLED  -- or –  CM operation creates a NetworkSlice instance. The administrative state is set to LOCKED and operationalState is set to DISABLED |
| 1 | CM operation sets administrative state to UNLOCKED. |
| 2 | CM operation sets administrative state to LOCKED |
| 2a | CM operation sets administrative state to SHUTTING DOWN |
| 2b | The last user of the NetworkSlice instance stops using the NetworkSlice instance |
| 3 | The related NetworkSliceSubnet instance (identified by NetworkSlice.networkSliceSubnetRef) changes state to UNLOCKED and ENABLED. |
| 4 | The related NetworkSliceSubnet instance (identified by NetworkSlice.networkSliceSubnetRef) changes state to LOCKED  -- or –  The related NetworkSliceSubnet instance (identified by NetworkSlice.networkSliceSubnetRef) changes state to DISABLED |
| 5 | Operation deallocateNsi results in the deletion of NetworkSlice instance  -- or –  CM operation deletes NetworkSlice instance |

# B.2 State handling of NetworkSliceSubnet instance

A NetworkSliceSubnet instance is a logical object in the management system that represents a complex grouping of resources that may be in various states. At any time the management system needs to know the state of an NetworkSliceSubnet instance.

The ITU-T X.731 [18], to which [17] refers, has defined the inter-relation between the administrative state and operational state of systems in general.



Figure B.2.1: Combined NetworkSliceSubnet instance state diagram

The interactions specified under the column "The state transition events and actions" of "NNetworkSliceSubnet instanceSSI state transition table" below shall be present for the state transition.

Table B.2.1: The NetworkSliceSubnet instance state transition table

|  |  |
| --- | --- |
| Trigger number | The state transition events and actions |
| 0 | Operation allocateNssi results in the creation of NetworkSliceSubnet instance. The administrative state is set to LOCKED and operationalState is set to DISABLED  -- or –  CM operation creates NetworkSliceSubnet instance. The administrative state is set to LOCKED and operationalState is set to DISABLED |
| 1 | CM operation sets administrative state to UNLOCKED. |
| 2 | CM operation sets administrative state to LOCKED |
| 2a | CM operation sets administrative state to SHUTTING DOWN |
| 2b | The last user of the NetworkSliceSubnet instance stops using the NetworkSliceSubnet instance |
| 3 | All constituent NetworkSliceSubnet instances (identified by NetworkSliceSubnet.networkSliceSubnetRef) change state to UNLOCKED and ENABLED. |
| 4 | At least one constituent NetworkSliceSubnet instance (identified by NetworkSliceSubnet.networkSliceSubnetRef) changes state to LOCKED  -- or –  At least one constituent NetworkSliceSubnet instance (identified by NetworkSliceSubnet.networkSliceSubnetRef) changes state to DISABLED |
| 5 | Operation deallocateNssi results in the deletion of NetworkSliceSubnet instance  -- or –  CM operation deletes NetworkSliceSubnet instance. |

Annex C (normative):  
Void

Annex D (normative):  
Void

Annex E (normative):  
Void

Annex F (normative):  
Void

Annex G (normative):  
Void