xRANc-SouthBound-API

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# Introduction

xRANc-AP

xRANc-AP

Control plane application

xRAN controller

xRANc-API

xRANc-API

xRAN Agent

Sch

L1/2/3

xRAN Agent

Sch

L1/2/3

Figure 1: Basic xRAN Architecture

The xRAN controller implements the control plane functionality interfacing with the eNodeB data-plane functionality through the xRANc-API. The control plane functionality will include, but is not limited to, UE Admission Control, Radio Bearer Admission and Modification, Handoffs, and Load Balancing, Inter-cell Interference Coordination etc.

# Message Description

## Transport Layer

The transport layer for the xRANc-API will be SCTP. It will be assumed that the topology information, along with the ecgi for each cells with corresponding IP/Port for the SCTP is available at the xran-controller aprior.

## Configuration Messages

On initiation, the xranc will send periodic CELL\_CONFIG\_REQUEST messages to the eNodeB, until it receives a response from the cells. The eNodeB will respond back with CELL\_CONFIG\_REPORT message. On receiving this response, the xranc will assume that the cell is up and running, and is under the purview of the xranc.

The xranc may send CELL\_CONFIG\_REQUEST messages periodically to check or get updates on the cell configuration.

In future, the API will be expanded to allow the xran-controller the ability to configure these messages as well as for the eNodeB to send the config report uninitiated, by the xran controller.

### XRANC\_CELL\_CONFIG

**eNodeB**

**xRANc**

CELL\_CONFIG\_REQUEST

CELL\_CONFIG\_REPORT

Figure 2: Cell-configuration

**CELL\_CONFIG\_REQUEST**

|  |  |  |
| --- | --- | --- |
| Parameters | Type/Values | Description |
| ecgi | ECGI | E-UTRAN Global Cell ID (PLMN ID + ENodeB ID + Cell ID) |

**ECGI**

|  |  |  |
| --- | --- | --- |
| Parameters | Type/Values | Description |
| PLMN-Identity | OCTET STRING (SIZE(3)) | PLMN identity - digits 0 to 9, encoded 0000 to 1001, - 1111 used as filler digit, two digits per octet, - bits 4 to 1 of octet n encoding digit 2n-1 - bits 8 to 5 of octet n encoding digit 2n -The Selected PLMN identity consists of 3 digits from MCC followed by either -a filler digit plus 2 digits from MNC (in case of 2 digit MNC) or -3 digits from MNC (in case of a 3 digit MNC). |
| EUTRANCellIdentifier | BIT STRING (SIZE (28)) |  |

**CELL\_CONFIG\_REPORT**

|  |  |  |
| --- | --- | --- |
| Parameters | Type/Values | Description |
| ecgi | ECGI | E-UTRAN Global Cell ID (PLMN ID + ENodeB ID + Cell ID) |
| pci | PhysCellId | Physical Cell Identity |
| candidate\_scells | SEQUENCE OF CandScell | PCI and Downlink EARFCN of the cells that can be configured as secondary cell with this cell’s primary component carrier |
| earfcn\_dl | ARFCN-Value | Downlink EARFCN |
| earfcn\_ul | ARFCN-Value | Uplink EARFCN |
| rbs\_per\_tti\_dl | INTEGER | Downlink Bandwidth (in RBs per TTI) |
| rbs\_per\_tti\_ul | INTEGER | Uplink Bandwidth (in RBs per TTI) |
| num\_tx\_antenna | INTEGER | Number of TX Antenna ports |
| duplex\_mode | ENUMERATED(fdd,tdd) | TDD(1) or FDD(0) |
| tdd\_config | INTEGER(0..6) OPTIONAL | TDD Uplink-Downlink config |
| tdd\_Spl\_sf\_config | INTEGER(0..8) OPTIONAL | TDD Special Subframe config |
| max\_num\_connected\_ues | INTEGER | Maximum number of UEs in RRC\_Connected State that the cell can support |
| max\_num\_bearers | INTEGER | Maximum number of bearers that the cell can support |
| max\_num\_ues\_sched\_per\_tti\_dl | INTEGER | Max number of UEs that can be scheduled for TX per TTI in the Downlink |
| max\_num\_ues\_sched\_per\_tti\_ul | INTEGER | Max number of UEs that can be scheduled for TX per TTI in the Uplink |
| dlfs\_sched\_enable | BOOLEAN | Sched does Frequency Selective Scheduling in the DL |

**CandScell**

|  |  |  |
| --- | --- | --- |
| Parameters | Type/Values | Description |
| pci | PhysCellId | Physical Cell Identity |
| earfcn-dl | ARFCN-Value | downlink EARFCN |

|  |  |  |
| --- | --- | --- |
| Parameters | Type/Values | Description |
| PhysCellId | INTEGER (0..503) |  |
| ARFCN-Value | INTEGER (0..65535) |  |

## Procedural Messages

### UE\_ADMISSION\_CONTROL



Figure 3: UE Admission Control

**UE\_ADMISSION\_REQUEST**

|  |  |  |
| --- | --- | --- |
| Parameters | Type/Values | Description |
| crnti | CRNTI | C-RNTI assigned to UE |
| ecgi | ECGI | Global cell Id of connecting cell |
| adm\_est\_cause | ENUMERATED (emergency, highp-access, mt-access, mo-signalling,mo-data) | Connection establishment cause |

**UE\_ADMISSION\_RESPONSE**

|  |  |  |
| --- | --- | --- |
| Parameters | Type/Value | Description |
| crnti | CRNTI | C-RNTI assigned to UE |
| ecgi | ECGI | Cell Id of connecting cell |
| adm\_est\_response | ENUMERATED(success, failure) | Success of Failure; Cause value if failure (TBD) |

**UE\_ADMISSION\_STATUS**

|  |  |  |
| --- | --- | --- |
| Parameters | Type/Value | Description |
| crnti | CRNTI | C-RNTI assigned to UE |
| ecgi | ECGI | Cell Id of connecting cell |
| adm\_est\_status | ENUMERATED(success, failure) | Success or Failure; Cause value if Failure |

**UE\_CONTEXT\_UPDATE**

|  |  |  |
| --- | --- | --- |
| Parameters | Type/Value | Description |
| crnti | CRNTI | C-RNTI assigned to UE |
| ecgi | ECGI | Cell Id of connecting cell |
| mme\_ue\_s1ap\_id | MME-UE-S1AP-ID | ID for UE association over the S1 interface within the MME |
| enb\_ue\_s1ap\_id | ENB-UE-S1AP-ID | ID for UE association over the S1 interface within the eNB |

**UE\_RECONFIG\_IND**

(sent from eNodeB to xRAN controller, on RRC Connection Re-Establishment complete)

|  |  |  |
| --- | --- | --- |
| Parameters | Type/Value | Description |
| crnti\_old | CRNTI | Old C-RNTI assigned to UE |
| ecgi | ECGI | Cell Id of connecting cell |
| crnti\_new | CRNTI | New C-RNTI assigned to UE |
| reconfig\_cause | ENUMERATED (rlf, ho-fail, others) | Cause value for Reconfig |

**UE\_RELEASE\_IND**

(eNodeB -> xRANc is indication when UE goes from RRC\_ACTIVE to RRC\_IDLE, and xRANc -> eNodeB is control when xRANc wants to deactivate the UE)

|  |  |  |
| --- | --- | --- |
| Parameters | Type/Value | Description |
| crnti | CRNTI | Old C-RNTI assigned to UE |
| ecgi | ECGI | Cell Id of connecting cell |
| release\_cause | ENUMERATED (inactivity, rlf, others) | releaseCause |

|  |  |  |
| --- | --- | --- |
| Parameters | Type/Values | Description |
| CRNTI | BIT STRING (SIZE (16)) |  |
| MME-UE-S1AP-ID | INTEGER (0..4294967295) |  |
| ENB-UE-S1AP-ID | INTEGER (0..16777215) |  |

### HANDOFF



Figure 4: Handoff

**HANDOFF\_REQUEST**

|  |  |  |
| --- | --- | --- |
| Parameters | Type/Value | Description |
| crnti | CRNTI | C-RNTI assigned to UE |
| ecgi\_s | ECGI | Cell ID of source cell |
| ecgi\_t | ECGI | Cell ID of target cell |

*Note: The xRAN controller sends the “HO request”message to both the Source and Target eNodeB. This way, the target eNodeB also is informed to expect an X2/S1 handover message from the source eNodeB. If the X2 interface does not exist between the source and the target eNode, the eNodeBs can do a S1 based HO.*

**HANDOFF\_FAILURE**

|  |  |  |
| --- | --- | --- |
| Parameters | Type/Value | Description |
| crnti | CRNTI | C-RNTI assigned to UE |
| ecgi\_s | ECGI | Cell ID of source cell |
| ho\_failure\_cause | ENUMERATED (other) | Cause for failure (TBD) |

*Note: If the source eNodeB gets a negative response from the target eNodeB as part of the “X2AP:Handover request ack”, then the source eNodeB sends the HO failure message to the eNodeB. If noth, then the source eNodeB sends a “RRC Connection Reconfig” message to the eNodeB.*

**HANDOFF\_COMPLETE**

|  |  |  |
| --- | --- | --- |
| Parameters | Type/Value | Description |
| crnti\_new | CRNTI | New c-RNTI assigned to the UE by the Target eNodeB |
| ecgi\_s | ECGI | Global Cell ID of source cell |
| ecgi\_t | ECGI | Global Cell ID of the target cell |

*Note: Sent to the xRAN controller, on receiving the “RRC Connection Reconfig” message by the target eNodeB.*

### XRANC\_BEARER\_MANAGEMENT

**eNodeB**

**xRANc**

Bearer

Admission Control

**XRANC\_BEARER\_ADMISSION\_STATUS**

**XRANC\_BEARER\_ADMISSION\_RESPONSE**

**XRANC\_BEARER\_ADMISSION\_REQUEST**

Figure 5: Bearer Admission and Modification

**XRANC\_BEARER\_ADMISSION\_REQUEST**

|  |  |  |
| --- | --- | --- |
| Parameters | Type/Value | Description |
| crnti | CRNTI | C-RNTI assigned to UE |
| ecgi | ECGI | Global Cell ID |
| ue\_ambr | UEAMBR | [UE AMBR DL, UE AMBL UL] |
| num\_erabs\_list | INTEGER(1..maxNumERABS) | Number of eRABS to be added or modified |
| erabs\_params | SEQUENCE (SIZE (1..maxNumERABS)) OF ERABParams-Item | List of ERABs to be added or modified with bearer\_params |

**XRANC\_BEARER\_ADMISSION\_RESPONSE**

|  |  |  |
| --- | --- | --- |
| Parameters | Type/Value | Description |
| crnti | CRNTI | C-RNTI assigned to UE |
| ecgi | ECGI | Global Cell ID |
| num\_erab\_list | INTEGER(1..maxNumERABS) | Number of eRABS to be added or modified |
| erabs\_status | SEQUENCE (SIZE (1..maxNumERABS)) OF ERABResponse-Item | Success or Failure (List of Causes) |

**XRANC\_BEARER\_ADMISSION\_STATUS**

|  |  |  |
| --- | --- | --- |
| Parameters | Type/Value | Description |
| crnti | CRNTI | C-RNTI assigned to UE |
| ecgi | ECGI | Global Cell ID |
| num\_erab\_list | INTEGER(1..maxNumERABS) | Number of eRABS to be added or modified |
| erabs\_status | SEQUENCE (SIZE (1..maxNumERABS)) OF ERABResponse-Item | Success or Failure (List of Causes) |

**XRANC\_BEARER\_RELEASE\_IND**

**(From eNodeB to xRANc)**

|  |  |  |
| --- | --- | --- |
| Parameters | Type/Value | Description |
| crnti | CRNTI | C-RNTI assigned to UE |
| ecgi | ECGI | Global Cell ID |
| num\_erab\_list | INTEGER(1..maxNumERABS) | Number of eRABS to be added or modified |
| erabs\_ids | SEQUENCE (SIZE (1..maxNumERABS) ) OF ERAB-ID | List of erabs released |

**UEAMBR**

|  |  |  |
| --- | --- | --- |
| Parameters | Type/Value | Description |
| ambr-dl | BitRate |  |
| ambr-ul | BitRate |  |

**ERABParams-Item**

|  |  |  |
| --- | --- | --- |
| Parameters | Type/Value | Description |
| id | ERAB-ID |  |
| direction | ERABDirection |  |
| type | ERABtype |  |
| qci | QCI |  |
| arp | INTEGER |  |
| gbr-dl | BitRate |  |
| gbr-ul | BitRate |  |
| mbr-dl | BitRate |  |
| mbr-ul | BitRate |  |

**ERABResponse-Item**

|  |  |  |
| --- | --- | --- |
| Parameters | Type/Value | Description |
| id | ERAB-ID |  |
| decision | ERABDecision |  |

|  |  |  |
| --- | --- | --- |
| Parameters | Type/Value | Description |
| BitRate | INTEGER (0..10000000000) |  |
| ERAB-ID | INTEGER (0..15, ...) |  |
| ERABDirection | ENUMERATED (dl, ul, both) |  |
| ERABType | ENUMERATED (default, dedicated) |  |
| QCI | INTEGER (0..255) |  |
| maxNumERABS | INTEGER ::= 11 | constant |

## Measurements

### EUTRAN Periodic Measurements

**eNodeB**

**UE**

**xRANc**

XRANC\_RS\_SIGNAL\_MEAS\_REPORT

XRANC\_RX\_SIGNAL\_MEAS\_CONFIG

RRC connection

reconfig

(meas. Config)

(

RRC meas. report

(periodic)

Figure 6: EUTRAN Periodic Measurements

**XRANC\_RX\_SIGNAL\_MEAS\_CONFIG**

|  |  |  |
| --- | --- | --- |
| Parameters | Type/Value | Description |
| ecgi | ECGI | Cell ID of associated cell |
| crnti | CRNTI | CRNTI of UE |
| report\_qty | ENUMERATED (RSRP = 0, RSRQ = 1, BOTH = 2) | RSRP/RSRQ/BOTH |
| meas\_cells | SEQUENCE OF PCI-ARFCN | PCI and downlink EARFCN of the cells to perform measurement on |
| report\_interval\_ms | ENUMERATED (ms-120, ms-240, ms-480,ms-640, ms-1024, ms-2048, ms-5120, ms-10240, min-1, min-6, min-12, min-30, min-60) | Time between sending two measurement reports |

**XRANC\_RX\_SIGNAL\_MEAS\_REPORT**

|  |  |  |
| --- | --- | --- |
| Parameters | Type/Value | Description |
| crnti | CRNTI | CRNTI of UE |
| cell\_meas\_reports | SEQUENCE OF RXSigReport | RSRP/RSRQ of cells on which measurement is performed |

**RXSigReport**

|  |  |  |
| --- | --- | --- |
| Parameters | Type/Value | Description |
| pci-arfcn | PCI-ARFCN |  |
| rsrp | RSRP-Range |  |
| rsrq | RSRQ-Range |  |

**PCI-ARFCN**

|  |  |  |
| --- | --- | --- |
| Parameters | Type/Values | Description |
| pci | PhysCellId | Physical Cell Identity |
| earfcn-dl | ARFCN-Value | Downlink EARFCN |

|  |  |  |
| --- | --- | --- |
| Parameters | Type/Value | Description |
| RSRP-Range | INTEGER(0..97) |  |
| RSRQ-Range | INTEGER(0..34) |  |

### L2 Measurements

**eNodeB**

**xRANc**

XRANC\_L2\_MEAS\_CONFIG

L2 Measurement

Reports

(periodic)

Figure 7: L2 Measurements

**XRANC\_L2\_MEAS\_CONFIG**

|  |  |  |
| --- | --- | --- |
| Parameters | Type/Value | Description |
| eCGI | ECGI | Cell ID of associated cell |
| report\_interval\_ms | INTEGER | Time between sending two measurement reports (T)  (min time – 100ms) |

**Note: For all L2 measurements, to support partial features, an invalid measurement value can be indicated by reporting 0xFFFF for that field.**

**XRANC\_RADIO\_MEAS\_REPORT\_PER\_UE**

|  |  |  |
| --- | --- | --- |
| Parameters | Type/Value | Description |
| ecgi | ECGI | Cell ID of associated cell |
| crnti | CRNTI | CRNTI of UE |
| radio\_report\_serv\_cells | SEQUENCE OF RadioRepPerServCell | Radio report over the set of serving cells |

**RadioRepPerServCell**

|  |  |  |
| --- | --- | --- |
| Parameters | Type/Value | Description |
| pci-arfcn | PCI-ARFCN |  |
| cqi\_hist | SEQUENCE (SIZE(maxNumCQIs)) OF INTEGER | CQI distribution reported by each UE over the measurement period (configured by xRANc) |
| ri\_hist | SEQUENCE (SIZE(maxNumRIs)) OF INTEGER | Number of rank 1 and rank 2 samples as reported by the UE over the measurement period (configured by xRANc) |
| pusch\_sinr\_hist | SEQUENCE (SIZE(sinrHistSize)) OF INTEGER | PUSCH SINR distribution measured by the eNodeB for the UE in ranges (-inf,-18], (-18,-15], (-15,-12], (-12,-9], (-9,-6], (-6,-3], (-3,-0], (-0,3], (3,6], (6,9], (9,12], (12,15], (15,18], (18,inf)} |
| pucch\_sinr\_hist | SEQUENCE (SIZE(sinrHistSize)) OF INTEGER | PUCCH SINR distribution measured by the eNodeB for the UE in ranges { (-inf,-18], (-18,-15], (-15,-12], (-12,-9], (-9,-6], (-6,-3], (-3,0], (0,3], (3,6], (6,9], (9,12], (12,15], (15,18], (18,inf)} |

**XRANC\_RADIO\_MEAS\_REPORT\_PER\_CELL**

|  |  |  |
| --- | --- | --- |
| Parameters | Type/Value | Description |
| ecgi | ECGI | Cell ID of associated cell |
| pusch\_intf\_pwr\_hist | SEQUENCE (SIZE(intrfHistSize)) OF INTEGER | PUSCH interference + noise power (dBm) distribution measured by the eNodeB on the uplink in ranges {(-inf,-120], (-120,-118], (-118,-116], (-116,-114], (-114,-112], (-112,-110], (-110,-108], (-108,-106], (-106,-104], (-104,-102], (-102,-100], (-100,-98], (-98,-96], (-96,-94], (-94,-92], (-92,-90], (-90,inf)} |
| pucch\_intf\_power\_hist | SEQUENCE (SIZE(intrfHistSize)) OF INTEGER | PUCCH interference + noise power (dBm) distribution measured by the eNodeB on the uplink in ranges {(-inf,-120], (-120,-118], (-118,-116], (-116,-114], (-114,-112], (-112,-110], (-110,-108], (-108,-106], (-106,-104], (-104,-102], (-102,-100], (-100,-98], (-98,-96], (-96,-94], (-94,-92], (-92,-90], (-90,inf)} |

**XRANC\_SCHED\_MEAS\_REPORT\_PER\_UE**

|  |  |  |
| --- | --- | --- |
| Parameters | Type/Value | Description |
| ecgi | ECGI | Cell ID of associated cell |
| crnti | CRNTI | CRNTI of UE |
| sched-report-serv-cells | SEQUENCE OF SchedMeasRepPerServCell | scheduler report over the set of serving cells |

**SchedMeasRepPerServCell**

|  |  |  |
| --- | --- | --- |
| Parameters | Type/Value | Description |
| pci-arfcn | PCI-ARFCN |  |
| qci\_vals | SEQUENCE (SIZE(1..maxNumSupQCI)) OF QCI | QCI values for which the following information is reported |
| prb\_usage | PRBUsage | Percentage of PRBs allocated to this CRNTI in downlink and uplink |
| mcs\_dl | SEQUENCE (SIZE(1..maxNumSupQCI)) OF INTEGER | DL MCS per UE per QCI, where each element is the average of the MCS allocated for that QCI for that UE over the time period |
| num\_sched\_ttis\_dl | SEQUENCE (SIZE(1..maxNumSupQCI)) OF INTEGER | DL Scheduled time per UE per QCI, i.e., total TTIs where that UE was scheduled on the DL for that QCI |
| mcs\_ul | SEQUENCE (SIZE(1..maxNumSupQCI)) OF INTEGER | UL MCS per UE per QCI, where each element is the average of the MCS allocated for that QCI for that UE over the time period |
| num\_sched\_ttis\_ul | SEQUENCE (SIZE(1..maxNumSupQCI)) OF INTEGER | UL Scheduled time per UE per QCI, i.e., total TTIs where that UE was scheduled on the UL for that QCI |
| rank\_dl-1 | SEQUENCE (SIZE(1..maxNumSupQCI)) OF INTEGER | Each element of the array containing the number of Rank 1 samples used by cell for that QCI |
| rank-dl-2 | SEQUENCE (SIZE(1..maxNumSupQCI)) OF INTEGER | Each element of the array containing the number of Rank 2 samples used by cell for that QCI |

**XRANC\_SCHED\_MEAS\_REPORT\_PER\_CELL**

|  |  |  |
| --- | --- | --- |
| Parameters | Type/Value | Description |
| ecgi | ECGI | Cell ID of associated cell |
| qci\_vals | SEQUENCE (SIZE(1..maxNumSupQCI)) OF QCI | QCI values for which the following information is reported |
| prb-usage-pcell | PRBUsage | Percentage of PRBs used for this ECGI as the primary cell |
| prb-usage-scell | PRBUsage | Percentage of PRBs used for this ECGI as the secondary cell |

**PRBUsage**

|  |  |  |
| --- | --- | --- |
| Parameters | Type/Value | Description |
| prb\_usage\_dl | SEQUENCE (SIZE(1..maxNumSupQCI)) OF INTEGER(0..100) | (Total number of PRBs allocated over period T in DL/ total number of PRBs \*100) for the reported qci-vals |
| prb\_usage\_ul | SEQUENCE (SIZE(1..maxNumSupQCI)) OF INTEGER(0..100) | (Total number of PRBs allocated over period T in DL/ total number of PRBs \*100) for for the reported qci-vals |

**XRANC\_PDCP\_MEAS\_REPORT\_PER\_UE**

(For definitions see TS 36.314)

|  |  |  |
| --- | --- | --- |
| Parameters | Type/Value | Description |
| ecgi | ECGI | Cell ID of associated cell |
| crnti | CRNTI | CRNTI of UE |
| qci\_vals | SEQUENCE (SIZE(1..maxNumSupQCI)) OF QCI | QCI values for which the following information is reported |
| data\_vol\_dl | SEQUENCE (SIZE(1..maxNumSupQCI)) OF INTEGER | PDCP SDU bits delivered from PDCP to RLC per QCI per UE |
| data\_vol\_ul | SEQUENCE (SIZE(1..maxNumSupQCI)) OF INTEGER | PDCP SDU bits received by PDCP at the eNB per QCI per UE |
| pkt\_delay\_dl | SEQUENCE (SIZE(1..maxNumSupQCI)) OF REAL | Average Pkt delay measured from PDCP arrival to MAC exit per QCI per UE |
| pkt\_discard\_rate\_dl | SEQUENCE (SIZE(1..maxNumSupQCI)) OF INTEGER | Average Pkt Discard rate at L2 per QCI per UE |
| pkt\_loss\_rate\_dl | SEQUENCE (SIZE(1..maxNumSupQCI)) OF INTEGER | Average Pkt Loss rate at DL per QCI per UE |
| pkt\_loss\_rate\_ul | SEQUENCE (SIZE(1..maxNumSupQCI)) OF INTEGER | Average Pkt Loss rate at UL per QCI per UE |
| throughput\_dl | SEQUENCE (SIZE(1..maxNumSupQCI)) OF REAL | DL throughput per QCI per UE in kbits/s |
| throughput\_ul | SEQUENCE (SIZE(1..maxNumSupQCI)) OF REAL | UL throughput per QCI per UE in kbit/s |

|  |  |  |
| --- | --- | --- |
| Parameters | Type/Value | Description |
| maxNumCQIs | INTEGER ::= 16 | Constant |
| maxNumRIs | INTEGER ::= 2 | Constant |
| sinrHistSize | INTEGER ::= 14 | Constant |
| intrfHistSize | INTEGER ::= 17 | Constant |
| maxNumSupQCI | INTEGER ::= 9 | Constant |

## xICIC/Coordinated Scheduling Controls

**eNodeB**

**xRANc**

**XRANC\_xICIC\_CONFIG**

ICIC Control

Figure 8: ICIC Controls

3.5.1 **XRANC\_xICIC\_CONFIG**

|  |  |  |
| --- | --- | --- |
| Parameters | Type/Value | Description |
| ecgi | ECGI | Cell ID of associated cell |
| crnti | CRNTI | UE identifier |
| pci-arfcn | PCI-ARFCN | PCI and downlink EARFCN of the CC to which the configuration is to be applied |
| p\_a | ENUMERATED (  dB-minus6,  dB-minus4dot77,  dB-minus3,  dB-minus1dot77,  dB-0,  dB-1,  dB-2,  dB-3) | PDSCH power offset for the UE (dB) |
| start\_prb\_dl | INTEGER(0..100) | Starting DL PRB allocated to UE. Valid Range 0 to 100 |
| end\_prb\_dl | INTEGER(0..100) | Ending DL PRB allocated to UE. Valid Range 0 to 100 |
| sub\_frame\_bitmask\_dl | BIT STRING (SIZE(10)) | DL ABS pattern – bitmask. Each bit corresponds to a sub-frame. 0 indicates SF to be allocated to the UE.  LSB corresponds to SubFrame0 |
| p0\_ue\_pusch | INTEGER(-8..7) | PUSCH power offset for the UE (dB). Valid Range [-8, 7] |
| start\_prb\_ul | INTEGER(0..100) | Starting UL PRB allocated to UE. Valid Range 0 to 100 |
| end\_prb\_ul | INTEGER(0..100) | Ending UL PRB allocated to UE. Valid Range 0 to 100 |
| sub\_frame\_bitmask\_ul | BIT STRING (SIZE(10)) | DL ABS pattern – bitmask. Each bit corresponds to a sub-frame. 0 indicates SF to be allocated to the UE.  LSB corresponds to SubFrame0 |