

Technical Manual

IPRCI Procedures and Explanations

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Contents

Document Copyrights.....	- 2 -
Disclaimer	- 2 -
1. INTRODUCTION.....	- 3 -
2. SUMMARY	- 4 -
3. NXIP PROCEDURES AND EXPLANATIONS	- 5 -
3.1. Unit Registration.....	- 5 -
3.2. IPRCI Capability Request/Response.....	- 7 -
3.3. Scrambling PCIF Command	- 10 -
3.4. IPRCI Control Request/Response	- 11 -
3.5. IPRCI Information	- 14 -
3.6. Unit Deregistration.....	- 14 -
4. DMR AIS PROCEDURES AND EXPLANATIONS.....	- 15 -
4.1. Unit Registration	- 15 -
4.2. IPRCI Capability Request/Response.....	- 17 -
4.3. Scrambling PCIF Command	- 19 -
4.4. IPRCI Control Request/Response	- 20 -
4.5. IPRCI Information	- 23 -
4.6. Unit Deregistration.....	- 23 -

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1. Introduction

This document focuses on IP packet transmission and reception of the IP Console in executing the IP Remote Control Interface (IPRCI) we provided and introduces Message examples.

This document is created based on our IP Console Interface Specification to provide basic steps for executing IPRCI.

This should contain helpful and useful information for developing your own PRCI Console or Packet analysis.

If you have any concerns or questions regarding the contents of this document, please carefully read and confirm the following documents.

Reference

- NXIP Console Interface V2.60
- AIS Console Interface for NXR V1.01
- IP Remote Control Interface Specifications

2. Summary

The following steps are required to allow your console to use the IPRCI.

Step 1: Unit Registration

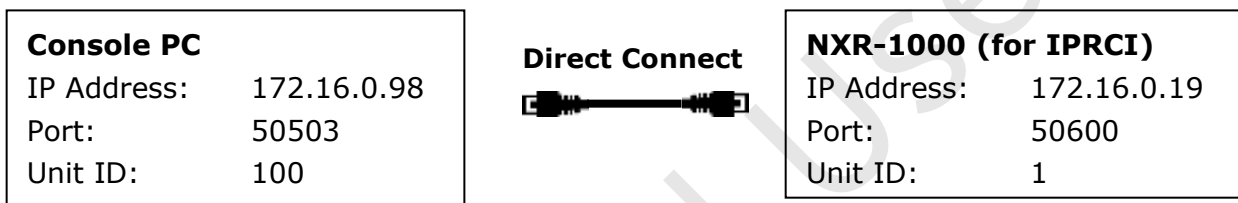
Step 2: IPRCI Capability Request / Response

Step 3: Scrambling PCIF Command

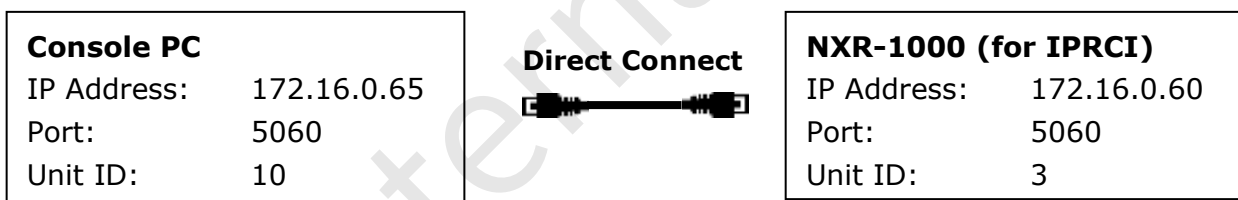
Step 4: IPRCI Control Command or IPRCI Information

IP Packet Messages in this document are simulated in use under the following environment. Please change the parameters according to your actual environment.

System : NXDN Conventional



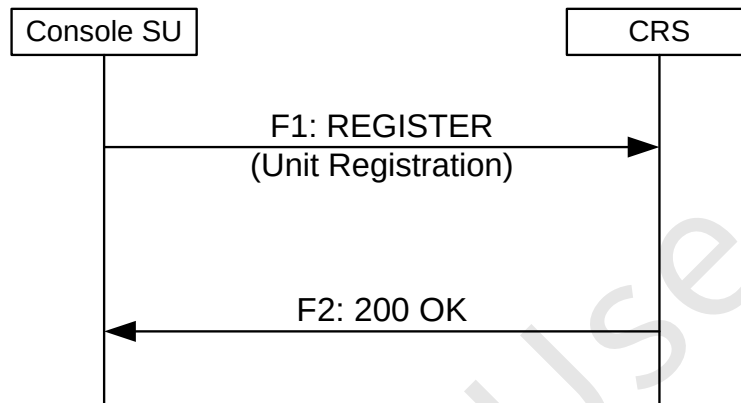
System : DMR Conventional



3. NXIP Procedures and Explanations

3.1. Unit Registration

The first step is to execute "Unit Registration" to NXR-1000 from the Console.
Please refer to section 20.1.1 "Registration Sequences (CRS)" in the NXIP Interface Specification for more specific details



Please move on to see the actual message on the next page.

Unit Registration

*****Tx*****

REGISTER sip:000.00000.c.nexedgedr SIP/2.0
Via: SIP/2.0/UDP 172.16.0.98:50503;branch=z9hG4bK37s599
From: <sip:c000000064@nexedgedr;user=x-nexedge-suid>;tag=dh2fjjhnlq
To: <sip:c000000064@nexedgedr;user=x-nexedge-suid>
Call-ID: 9df6c341-d3e2-49d0-ac17-0d8d201cf3db@172.16.0.98
CSeq: 2 REGISTER
Contact: <sip:c000000064@172.16.0.98:50503;user=x-nexedge-suid>
Expires: 10000
Max-Forwards: 70
Allow: ACK, BYE, CANCEL, INVITE, REGISTER, MESSAGE
Content-Length: 0

*****Rx*****

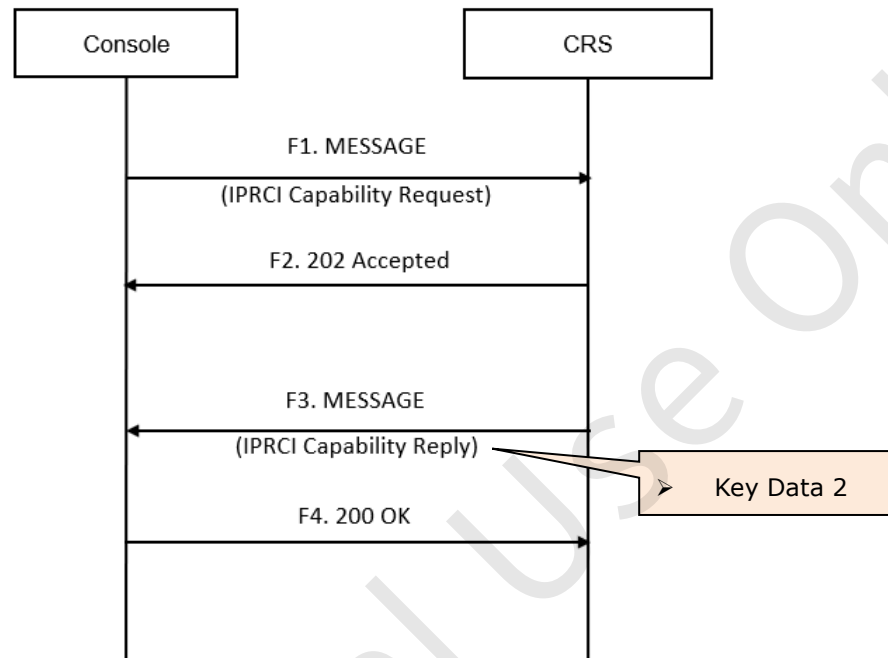
SIP/2.0 200 OK
Via: SIP/2.0/UDP 172.16.0.98:50503;branch=z9hG4bK37s599;received=172.16.0.98
From: <sip:c000000064@nexedgedr;user=x-nexedge-suid>;tag=dh2fjjhnlq
To: <sip:c000000064@nexedgedr;user=x-nexedge-suid>;tag=jy9757ac
Call-ID: 9df6c341-d3e2-49d0-ac17-0d8d201cf3db@172.16.0.98
CSeq: 2 REGISTER
Contact: <sip:c000000064@172.16.0.98:50503;user=x-nexedge-suid>;expires=10000
Allow: INVITE, CANCEL, ACK, BYE, REGISTER, MESSAGE, OPTIONS
Content-Length: 0

Supplementary Information

sip:c000000064 : This is a hexadecimal value converted from the console ID.

3.2. IPRCI Capability Request/Response

Subsequently, the Console executes an "IPRCI Capability Request" to the NXR-1000. Please refer to section 20.10.1 "IPRCI Capability Sequence (CRS)" in the NXIP Interface Specification for more specific details.



The NXR-1000 sends an IPRCI Capacity Reply when the IPRCI Capability Request is accepted.

The IPRCI Capability Reply contains Key Data 2. The Key Data 2 is used when encrypting and decrypting a PCIF Command.

Please move on to see the actual message on the next page.

IPRCI Capability Request

*****Tx*****

MESSAGE sip:c000000001@nexedgedr;user=x-nexedge-suid SIP/2.0

Via: SIP/2.0/UDP 172.16.0.98:50503;branch=z9hG4bK9cmdl3

Route: <sip:nexedge-isci-ciss-calling@000.00000.c.nexedgedr;lr>

Max-Forwards: 70

From: <sip:c000000064@nexedgedr;user=x-nexedge-suid>;tag=jmwnvdw7we

To: <sip:c000000001@nexedgedr;user=x-nexedge-suid>

Call-ID: e90095dc-a27d-4126-a387-f228106fe325@172.16.0.98

CSeq: 2 MESSAGE

Allow: ACK, BYE, CANCEL, INVITE, REGISTER, MESSAGE

MIME-Version: 1.0

Content-Disposition: signal; handling=required

Content-Type: application/x-nexedge-isci-rcimsg

Content-Length: 23

rci-com: rci-cap-rqst

*****Rx*****

SIP/2.0 202 Accepted

Via: SIP/2.0/UDP 172.16.0.98:50503;branch=z9hG4bK9cmdl3;received=172.16.0.98

From: <sip:c000000064@nexedgedr;user=x-nexedge-suid>;tag=jmwnvdw7we

To: <sip:c000000001@nexedgedr;user=x-nexedge-suid>;tag=1eve7nmo

Call-ID: e90095dc-a27d-4126-a387-f228106fe325@172.16.0.98

Content-Length: 0

Supplementary Information

sip:c000000001 : This is a hexadecimal value converted from the NXR-1000 Unit ID.

rci-com: rci-cap-rqst : This refers to the IPRCI Capability Request.

IPRCI Capability Response

```

*****Rx*****
MESSAGE sip:c000000064@172.16.0.98:50503;user=x-nexedge-suid SIP/2.0
Via: SIP/2.0/UDP 172.16.0.19:50600;branch=z9hG4bKigsz8f
Priority: normal
From: <sip:c000000001@nexedgedr;user=x-nexedge-suid>;tag=xqqqvjj5
To: <sip:c000000064@nexedgedr;user=x-nexedge-suid>
Call-ID: iiu531gv-x99b-dekb-taj8-9ee4dx9wfkhy@172.16.0.19
CSeq: 1 MESSAGE
Max-Forwards: 70
Allow: INVITE, CANCEL, ACK, BYE, REGISTER, MESSAGE, OPTIONS
MIME-Version: 1.0
Content-Disposition: session;handling=required
Content-Type: application/x-nexedge-isci-rcimsg
Content-Length: 53

rci-com: rci-cap-rep
rci-cause success
rci-kd: 29

*****Tx*****
SIP/2.0 200 OK
Via: SIP/2.0/UDP 172.16.0.19:50600;branch=z9hG4bKigsz8f;received=172.16.0.19
From: <sip:c000000001@nexedgedr;user=x-nexedge-suid>;tag=xqqqvjj5
To: <sip:c000000064@nexedgedr;user=x-nexedge-suid>;tag=6245726
Call-ID: iiu531gv-x99b-dekb-taj8-9ee4dx9wfkhy@172.16.0.19
CSeq: 1 MESSAGE
Content-Length: 0

```

Supplementary Information

rci-com: rci-cap-rep :This refers to the IPRCI Capability Response.

rci-cause success :This shows IPRCI execution result.

rci-kd: 29 :Key Data 2 (hexadecimal)

3.3. Scrambling PCIF Command

If this is your first time reading this document, please carefully review this section without skipping it, as it will be difficult to understand the subsequent sections.

If the IPRCI Capability Request in the previous section is executed successfully, PCIF Commands can actually be sent and received.

To be more specific, a PCIF Command will be sent as a part of an IPRCI Control Request Message which will be explained in the next session. What is important here is that the PCIF Commands must be encrypted by taking predetermined steps.

It is also important to note when receiving IPRCI Information, the PCIF Command in the received Message is encrypted, and therefore, the Command cannot be read correctly unless it is decrypted.

This document does not cover the encryption and decryption methods of the PCIF Command.

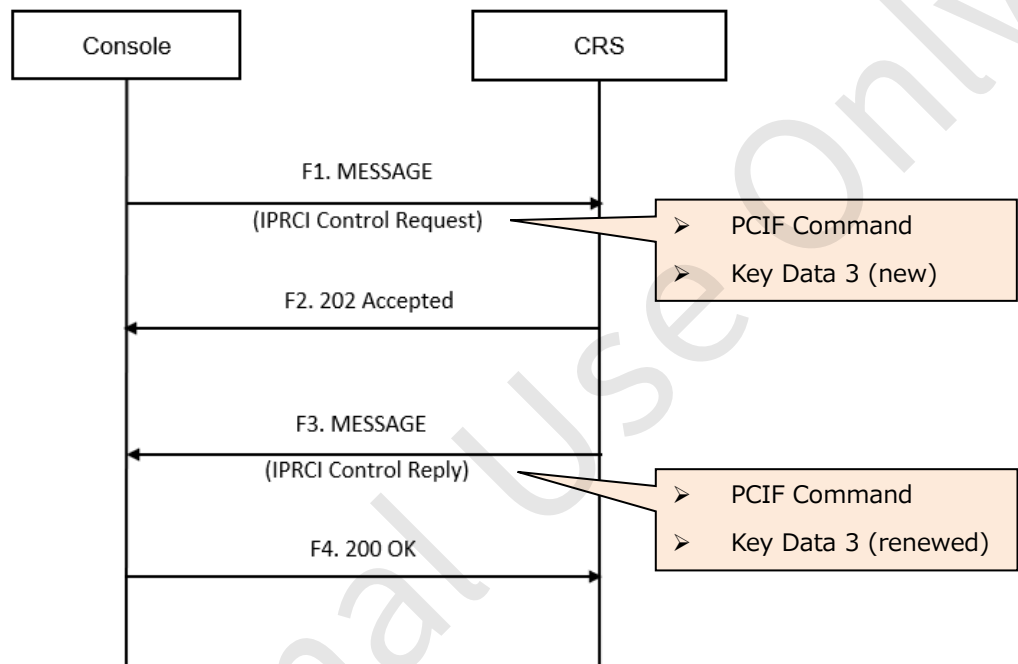
If needed, please refer to section 2 "Scramble of PCIF Command" of the IP Remote Control Interface Specifications.

3.4. IPRCI Control Request/Response

Transmission of the PCIF Command will be possible once the IPRCI Capacity Request is completed.

The Console executes the "IPRCI Control Request" to the NXR-1000.

Please refer to section 20.10.2 "IPRCI Control Sequence (CRS)" of the NXIP Interface Specification for more specific details.



The encrypted PCIF Command and Key Data 3 are included in the IPRCI Control Request Message and transmitted.

When the IPRCI Control Request is received, the NXR-1000 sends the IPRCI Control Reply. The encrypted PCIF Command and the renewed Key Data 3 will be included in the IPRCI Replay Message.

Please move on to see the actual message on the next page.

IPRCI Control Request (PCIF Command: Speech Call Start)

*****Tx*****

MESSAGE sip:c000000001@nexedgedr;user=x-nexedge-suid SIP/2.0

Via: SIP/2.0/UDP 172.16.0.98:50503;branch=z9hG4bKl4j1dm

Route: <sip:nexedge-isci-ciss-calling@000.00000.c.nexedgedr;lr>

Max-Forwards: 70

From: <sip:c000000064@nexedgedr;user=x-nexedge-suid>;tag=vetbnwizj2

To: <sip:c000000001@nexedgedr;user=x-nexedge-suid>

Call-ID: 775acae3-c919-4fec-9291-2c5c477d80a3@172.16.0.98

CSeq: 2 MESSAGE

Allow: ACK, BYE, CANCEL, INVITE, REGISTER, MESSAGE

MIME-Version: 1.0

Content-Disposition: signal; handling=required

Content-Type: application/x-nexedge-isci-rcimsg

Content-Length: 49

rci-com: rci-ctrl-rqst

rci-kd: 9A

rci-cmd: EC

*****Rx*****

SIP/2.0 202 Accepted

Via: SIP/2.0/UDP 172.16.0.98:50503;branch=z9hG4bKl4j1dm;received=172.16.0.98

From: <sip:c000000064@nexedgedr;user=x-nexedge-suid>;tag=vetbnwizj2

To: <sip:c000000001@nexedgedr;user=x-nexedge-suid>;tag=ldt0ri92

Call-ID: 775acae3-c919-4fec-9291-2c5c477d80a3@172.16.0.98

Content-Length: 0

Supplementary Information

rci-com: rci-ctrl-rqst : This indicates the IPRC Control Request
 rci-kd: 9A : Key Data 3 (hexadecimal)
 rci-cmd: EC : Encrypted PCIF Command (hexadecimal)

IPRCI Control Response (PCIF Command: ACK)

*****Rx*****

MESSAGE sip:c000000064@172.16.0.98:50503;user=x-nexedge-suid SIP/2.0

Via: SIP/2.0/UDP 172.16.0.19:50600;branch=z9hG4bK2wfe7o

Priority: normal

From: <sip:c000000001@nexedgedr;user=x-nexedge-suid>;tag=oqwcfbj

To: <sip:c000000064@nexedgedr;user=x-nexedge-suid>

Call-ID: oo80jsyi-bra2-zl52-0gkp-q1x5sn4xrdbx@172.16.0.19

CSeq: 1 MESSAGE

Max-Forwards: 70

Allow: INVITE, CANCEL, ACK, BYE, REGISTER, MESSAGE, OPTIONS

MIME-Version: 1.0

Content-Disposition: session;handling=required

Content-Type: application/x-nexedge-isci-rcimsg

Content-Length: 46

rci-com: rci-ctrl-rep

rci-kd: 97

rci-cmd: 90

*****Tx*****

SIP/2.0 200 OK

Via: SIP/2.0/UDP 172.16.0.19:50600;branch=z9hG4bK2wfe7o;received=172.16.0.19

From: <sip:c000000001@nexedgedr;user=x-nexedge-suid>;tag=oqwcfbj

To: <sip:c000000064@nexedgedr;user=x-nexedge-suid>;tag=6245726

Call-ID: oo80jsyi-bra2-zl52-0gkp-q1x5sn4xrdbx@172.16.0.19

CSeq: 1 MESSAGE

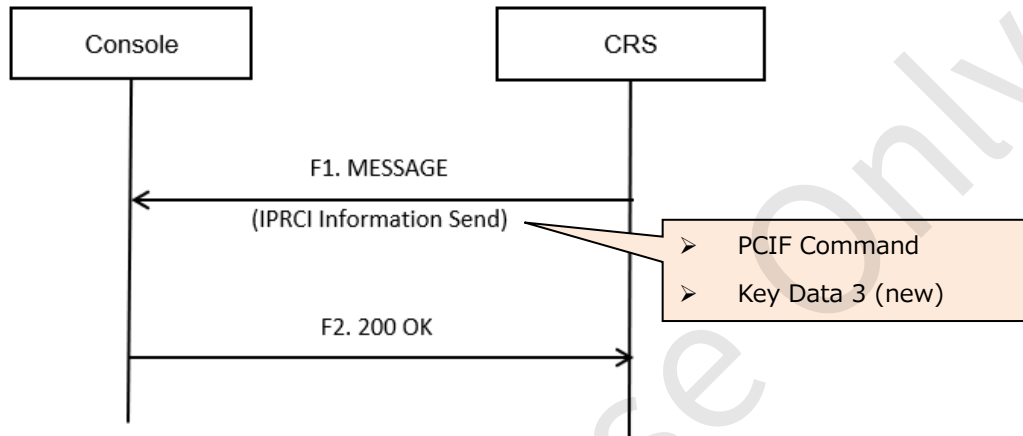
Content-Length: 0

Supplementary Information

rci-com: rci-ctrl-rep	:This indicates IPRCI Control Response
rci-kd: 97	:Key Data 3 (hexadecimal)
rci-cmd: 90	:Encrypted PCIF Command (hexadecimal)

3.5. IPRCI Information

Once the IPRCI Capability Request is completed, "IPRCI Information" can be sent. Please refer to section 20.10.3 "IPRCI Information Sequence (CRS)" in the NXIP Interface Specification for more specific details.



The IPRCI Information Message also includes the encrypted PCIF Command and Key Data 3, please decrypt the PCIF Command in predetermined steps.

If you have understood the contents up to this point, understanding incoming Messages should not be difficult. For that reason, no actual Message examples are provided here.

3.6. Unit Deregistration

When the Console executes "Unit Deregistration" to the NXR-1000, the Registration of the Console will be canceled. At this time, the transmission and reception of the PCIF Command will be deregistered.

Please refer to section 20.1.1 "Registration Sequences (CRS)" in the NXIP Interface Specification for more specific details.

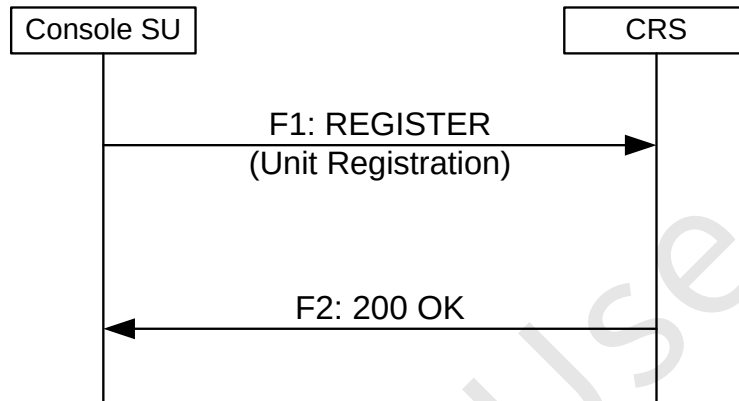
If you wish to transmit and receive the PCIF Command again after the deregistration, please execute again the steps of "Unit Registration > IPRCI Capability Request".

4. DMR AIS Procedures and Explanations

4.1. Unit Registration

The first step is to execute "Unit Registration" to NXR-1000 from the Console.

Please refer to section 3.5.1/3.6.1 "REGISTER" in the DMR AIS Interface Specification for more specific details



Please move on to see the actual message on the next page.

Unit Registration

*****Tx*****

REGISTER sip:172.16.0.60 SIP/2.0
Via: SIP/2.0/UDP 172.16.0.65:5060;branch=z9hG4bKl50hmo
Max-Forwards: 70
From: <sip:10@172.16.0.60>;tag=vfarwydjkm
To: <sip:10@172.16.0.60>
Call-ID: 7bd3559e-cbbb-42e0-a224-518507500550@172.16.0.65
CSeq: 2 REGISTER
Contact: <sip:10@172.16.0.65:5060>
Ais-Reach: individual
Content-Length: 0

*****Rx*****

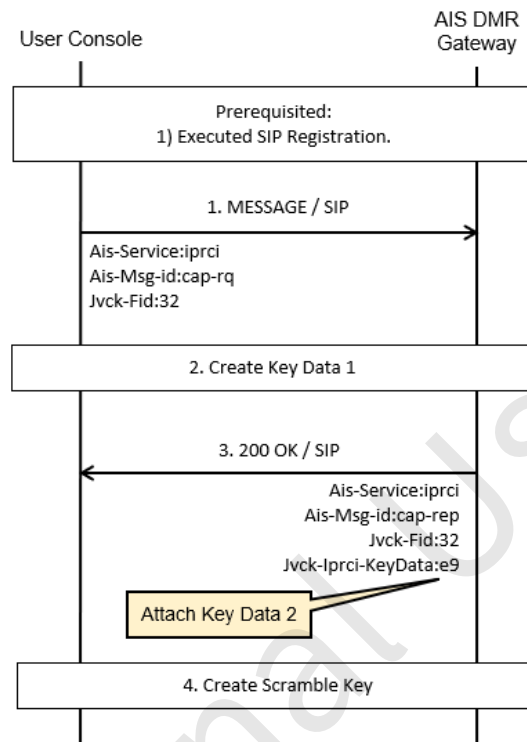
SIP/2.0 200 OK
Via: SIP/2.0/UDP 172.16.0.65:5060;branch=z9hG4bKl50hmo;received=172.16.0.65
Call-ID: 7bd3559e-cbbb-42e0-a224-518507500550@172.16.0.65
From: <sip:10@172.16.0.60>;tag=vfarwydjkm
To: <sip:10@172.16.0.60>;tag=10
CSeq: 2 REGISTER
Contact: <sip:10@172.16.0.65:5060>
Expires: 3600
Allow: INVITE,ACK,CANCEL,BYE,REGISTER,MESSAGE,OPTIONS
Content-Length: 0

Supplementary Information

sip:10 : This is the console ID.

4.2. IPRCI Capability Request/Response

Subsequently, the Console executes an "IPRCI Capability Request" to the NXR-1000. Please refer to section 7.5.1 "IPRCI Capability Request/Response" in the DMR AIS Interface Specification for more specific details.



The NXR-1000 sends an IPRCI Capacity Reply when the IPRCI Capability Request is accepted.

The IPRCI Capability Reply contains Key Data 2. The Key Data 2 is used when encrypting and decrypting a PCIF Command.

Please move on to see the actual message on the next page.

IPRCI Capability Request/Response

*****Tx*****

MESSAGE sip:3@172.16.0.60 SIP/2.0

Via: SIP/2.0/UDP 172.16.0.65:5060;branch=z9hG4bK5url92

Max-Forwards: 70

From: <sip:10@172.16.0.60>;tag=vfarwydjkm

To: <sip:3@172.16.0.60>

Call-ID: 7bd3559e-cbbb-42e0-a224-518507500550@172.16.0.65

Ais-Service: iprci

Ais-Msg-id: cap-rq

Ais-Reach: individual

Jvck-Fid: 32

CSeq: 4 MESSAGE

*****Rx*****

SIP/2.0 200 OK

Via: SIP/2.0/UDP 172.16.0.65:5060;branch=z9hG4bK5url92;received=172.16.0.65

Call-ID: 7bd3559e-cbbb-42e0-a224-518507500550@172.16.0.65

From: <sip:10@172.16.0.60>;tag=vfarwydjkm

To: <sip:3@172.16.0.60>;tag=3

CSeq: 4 MESSAGE

Ais-Msg-id: cap-rep

Ais-Reach: individual

Ais-Service: iprci

Jvck-Fid: 32

Jvck-Iprci-KeyData: 1e

Content-Length: 0

Supplementary Information

- sip:10 : This is the Unit ID of Console.
- Ais-Service: iprci : This indicates the IPRCI.
- Ais-Msg-id: cap-rq : This refers to the IPRCI Capability Request.
- Ais-Msg-id: cap-rep : This refers to the IPRCI Capability Response.
- Jvck-Iprci-KeyData: 1e : This is the hexadecimal value of the Key Data 2.

4.3. Scrambling PCIF Command

If this is your first time reading this document, please carefully review this section without skipping it, as it will be difficult to understand the subsequent sections.

If the IPRCI Capability Request in the previous section is executed successfully, PCIF Commands can actually be sent and received.

To be more specific, a PCIF Command will be sent as a part of an IPRCI Control Request Message which will be explained in the next session. What is important here is that the PCIF Commands must be encrypted by taking predetermined steps.

It is also important to note when receiving IPRCI Information, the PCIF Command in the received Message is encrypted, and therefore, the Command cannot be read correctly unless it is decrypted.

This document does not cover the encryption and decryption methods of the PCIF Command.

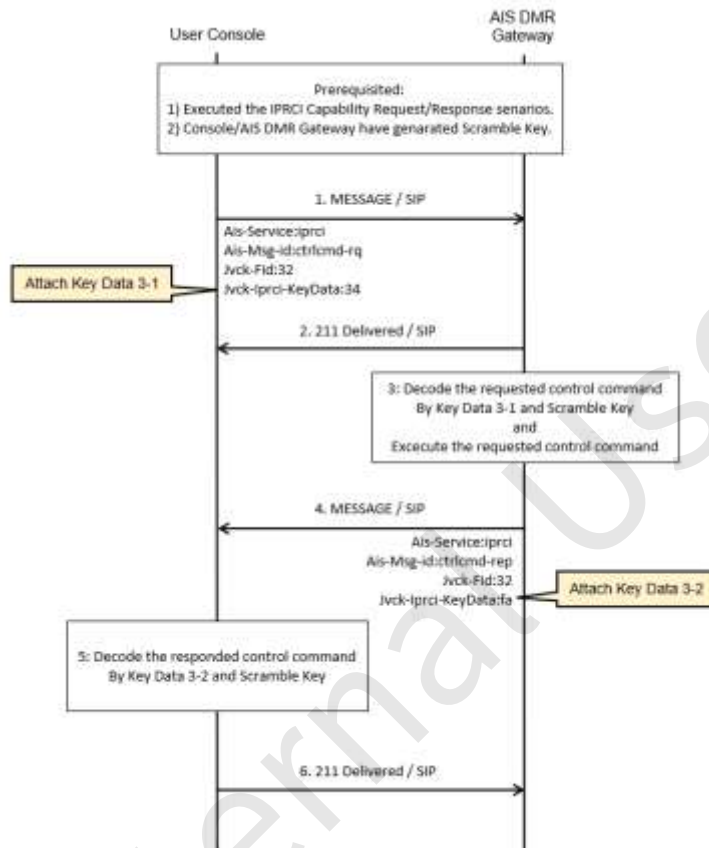
If needed, please refer to section 2 "Scramble of PCIF Command" of the IP Remote Control Interface Specifications.

4.4. IPRCI Control Request/Response

Transmission of the PCIF Command will be possible once the IPRCI Capacity Request is completed.

The Console executes the "IPRCI Control Request" to the NXR-1000.

Please refer to section 7.5.2 "IPRCI Control Command Request/Response" of the DMR AIS Interface Specification for more specific details.



The encrypted PCIF Command and Key Data 3-1 are included in the IPRCI Control Request Message and transmitted.

When the IPRCI Control Request is received, the NXR-1000 sends the IPRCI Control Reply. The encrypted PCIF Command and the renewed Key Data 3-2 will be included in the IPRCI Replay Message.

Please move on to see the actual message on the next page.

IPRCI Control Request (PCIF Command: Speech Call Start)

*****Tx*****

MESSAGE sip:3@172.16.0.60 SIP/2.0

Via: SIP/2.0/UDP 172.16.0.65:5060;branch=z9hG4bKt3sy2a

Max-Forwards: 70

From: <sip:10@172.16.0.60>;tag=vfarwydjkm

To: <sip:3@172.16.0.60>

Call-ID: 7bd3559e-cbbb-42e0-a224-518507500550@172.16.0.65

Ais-Service: iprci

Ais-Msg-id: ctrlcmd-rq

Ais-Reach: individual

Jvck-Fid: 32

Jvck-Iprci-KeyData: 08

CSeq: 5 MESSAGE

Content-Type: text/plain; charset=UTF-8

Content-Length: 1

AA

*****Rx*****

SIP/2.0 211 Delivered

Via: SIP/2.0/UDP 172.16.0.65:5060;branch=z9hG4bKt3sy2a;received=172.16.0.65

Call-ID: 7bd3559e-cbbb-42e0-a224-518507500550@172.16.0.65

From: <sip:10@172.16.0.60>;tag=vfarwydjkm

To: <sip:3@172.16.0.60>;tag=3

CSeq: 5 MESSAGE

Content-Length: 0

Supplementary Information

Ais-Msg-id: ctrlcmd-rq	: This indicates the IPRCI Control Request.
Jvck-Iprci-KeyData: 08	: This is the hexadecimal value of the Key Data 3-1.
AA	: This is encrypted PCIF Command byte data (0xAA).

IPRCI Control Response (PCIF Command: ACK)

```

*****Rx*****

MESSAGE sip:10@172.16.0.65:5060 SIP/2.0
Via: SIP/2.0/UDP 172.16.0.60:5060;branch=z9hG4bKZEYHJLJD
Max-Forwards: 70
Call-ID: 3701291977000000000009@172.16.0.60
From: <sip:3@172.16.0.60>;tag=3
To: <sip:10@172.16.0.65:5060>
CSeq: 1 MESSAGE
Ais-Msg-id: ctrlcmd-rep
Ais-Reach: individual
Ais-Service: iprci
Jvck-Fid: 32
Jvck-Iprci-KeyData: 73
MIME-Version: 1.0
Content-Length: 1
Content-Type: text/plain;charset=UTF-8

A0

*****Tx*****

SIP/2.0 211 Delivered
Via: SIP/2.0/UDP 172.16.0.60:5060;branch=z9hG4bKZEYHJLJD
From: <sip:3@172.16.0.60>;tag=3
To: <sip:10@172.16.0.65:5060>;tag=4555374
Call-ID: 3701291977000000000009@172.16.0.60
CSeq: 1 MESSAGE
Allow: REGISTER, INVITE, ACK, CANCEL, BYE, OPTIONS, MESSAGE
Contact: <sip:10@172.16.0.65:5060>
Content-Length: 0

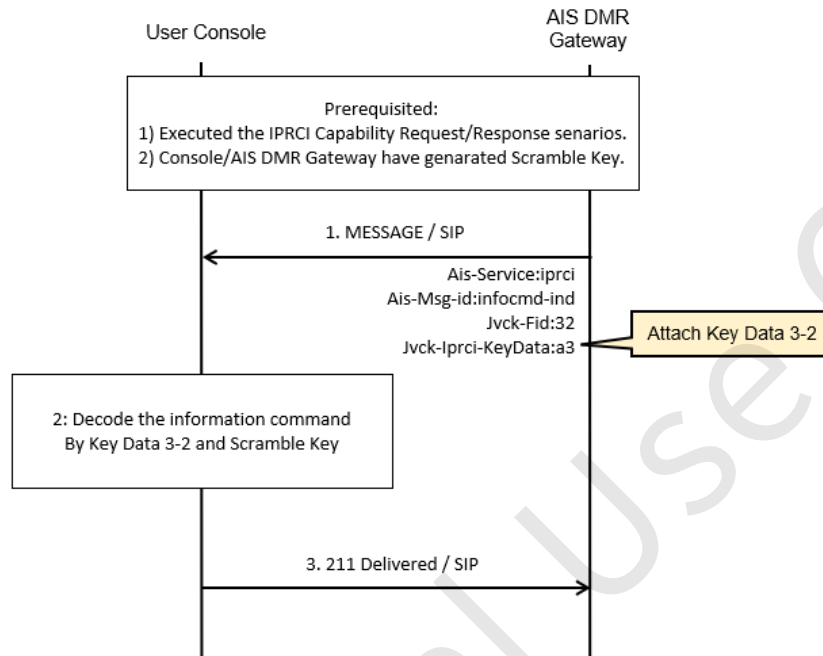
```

Supplementary Information

Ais-Msg-id: ctrlcmd-rep : This indicates the IPRCI Control Response.
 Jvck-Iprci-KeyData: 73 : This is the hexadecimal value of the Key Data 3-2.
 A0 : This is encrypted PCIF Command byte data (0xA0).

4.5. IPRCI Information

Once the IPRCI Capability Request is completed, "IPRCI Information" can be sent. Please refer to section 7.5.3 "IPRCI Information Command Notification" in the DMR AIS Interface Specification for more specific details.



The IPRCI Information Message also includes the encrypted PCIF Command and Key Data 3-2, please decrypt the PCIF Command in predetermined steps.

If you have understood the contents up to this point, understanding incoming Messages should not be difficult. For that reason, no actual Message examples are provided here.

4.6. Unit Deregistration

When the Console executes "Unit Deregistration" to the NXR-1000, the Registration of the Console will be canceled. At this time, the transmission and reception of the PCIF Command will be deregistered.

Please refer to section 3.5.1/3.6.1 "REGISTER" in the DMR AIS Interface Specification for more specific details.

If you wish to transmit and receive the PCIF Command again after the deregistration, please execute again the steps of "Unit Registration > IPRCI Capability Request".