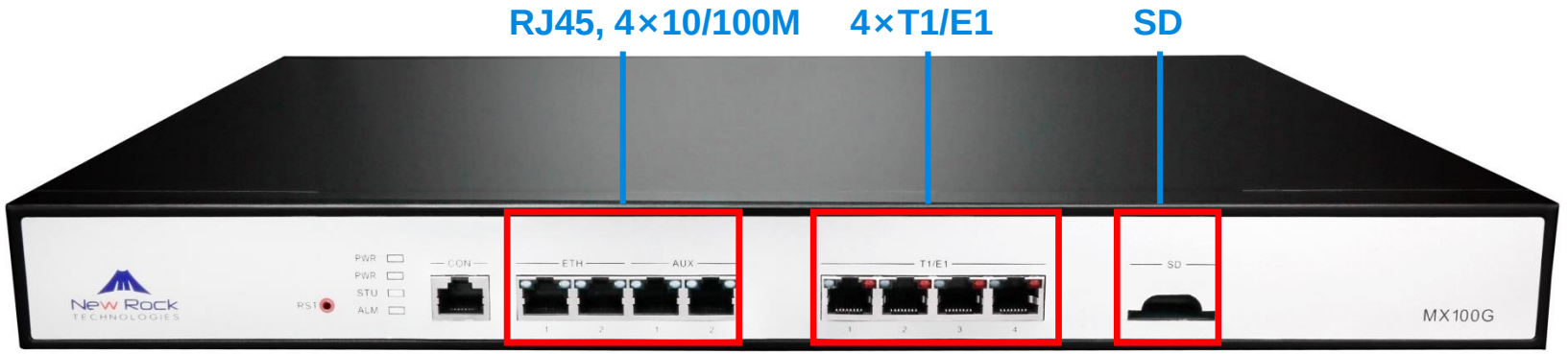
MX100G-S SIP-ISDN Trunking Gateway

By New Rock Global Services Team

Contents

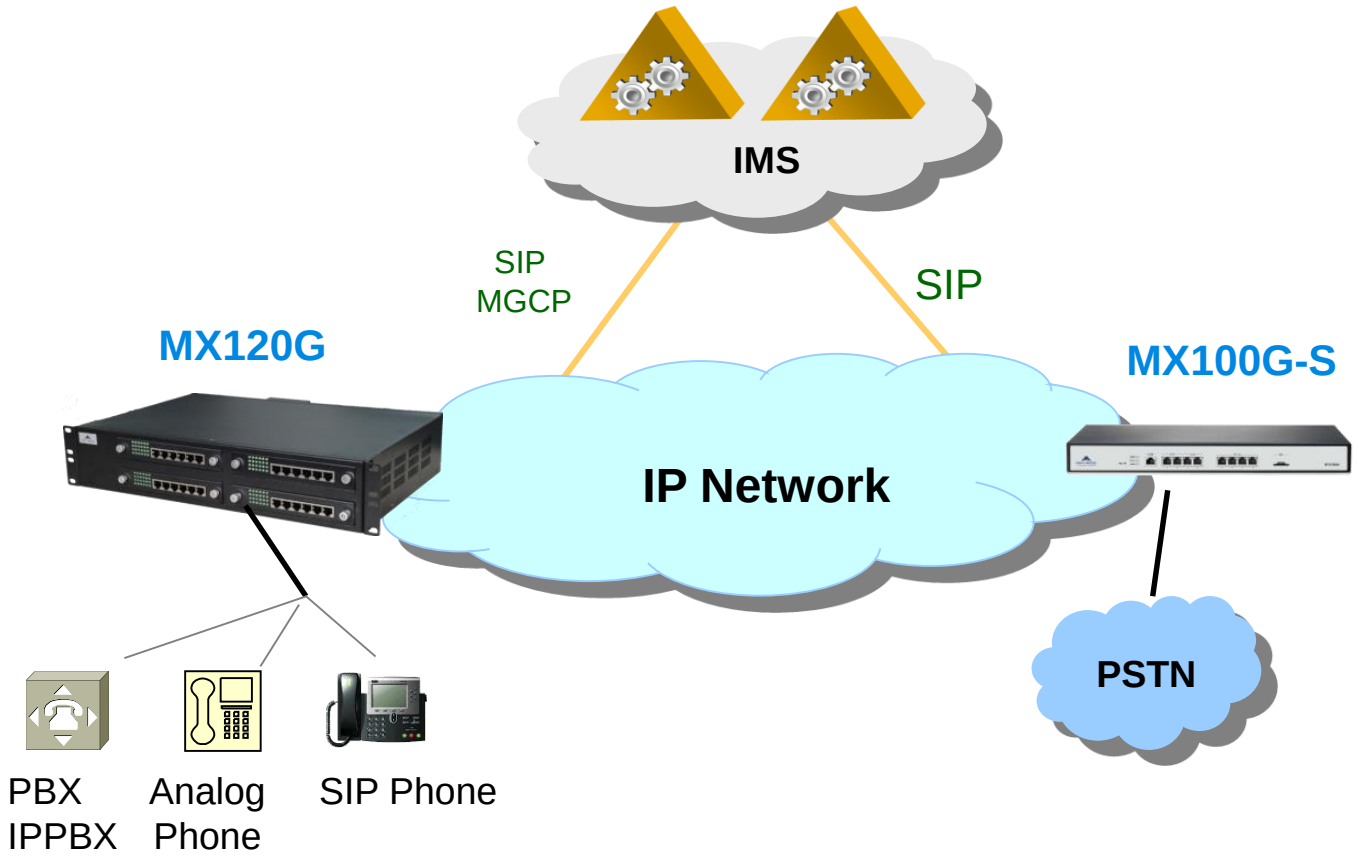
Have a Glance



440×300×44mm

120 concurrent calls

Application Scenario



Main Functions

- Interconnection between **SIP-ISDN PRI**
- Interconnection between ISDN PRI and ISDN RPI
- Up to **4 T1 or E1** spans, compatible with NI-2, 5ESS, EWDS
- Up to **500** rules for routing and number transformation(keep, remove, replace and add prefix/suffix to number).
- **120** simultaneous VoIP calls
- G.711, G.729A, and G.723.1, GSM, iLBC, G.168 echo cancellation, RFC2833 and SIP INFO for DTMF transmission and fax relay (**T.38**)
- Password management, ciphertext data storage, IP table for external network access control, and system log backup.
- Web based GUI to configure parameters, upgrade firmware, import/export configuration files, monitor status, visit history, call traces
- Remote management with auto-provisioning, SNMP, TR069
- Supports protocols including SIP, RTP, TFTP, FTP, HTTP, STUN, and SNMP
- ISDN maintainability (BERT, near and loop back)
- Registration and authentication of SIP terminals

Front Panel

Item	Description
RST	Press RST button for more than 3s to restore factory settings.
PWR/STU/ALM	Indicators for power supply, system status and alarm.
CON	A configuration interface.
ETH	ETH1 and ETH2 share the same IP address for allowing access to the external network. Dual-LAN redundancy is supported.
AUX	RJ45 interfaces AUX1 and AUX2 share the same IP address for local management and configuration.
T1/E1	RJ45 interface. Each T1 interface supports the maximum 24 voice channels; each E1 interface supports the maximum 30 voice channels with ISDN PRI signaling.
SD	A SD card socket.

Indicators on the Front Panel

	Status	Description
PWR	Green	Power on.
	Off	Power off.
STU	Green Flash	Normal operation.
	Red	System in the process of power up and not in the normal operation mode.
	Red Flash	System in a diagnostic mode and able to execute limited operation.
	Off	System locked and inactive.
ALM	Green	No alarms.
	Red Flash	New alarms occurred but not confirmed.
	Red	Alarms existed and all alarm information confirmed.
ETH/AUX	Long Green	The link has been established but no service traffic is transmitted.
	Blinking green	Service traffic is being transmitted on the link.
	Off	The link is not established.
T1/E1	Long Green	The connection works normally.
	Blinking green	A remote alarm is generated.
	Long Red	A local alarm is generated.
	Off	No connection is established.

Back Panel

Item	Description
AC power socket	Power supply: 100 to 240V; 50/60Hz; 1A
Ground pole	Use the grounding cable to connect MX100G-S and the grounding terminal of the rack.

***Critical Installation Verifications**:*

1. *Enough clearance around the ventilation openings of the gateway.*
2. *The protection ground is connected properly.*
3. *Proper power is used as specified.*
4. *Device correctly connected to console terminal and other devices.*

Hardware Specifications

Item	Description
System Memory	256 MB
System Flash	32 MB
Processor	TI AM3352
DSP	TI C5509
Power	~100-240V, 50/60Hz, 1A
Power Consumption	18 W (Max)
Size	44×440×300 mm(H×W×D) , 1U form factor
Weight	Net weight: 3 kg; gross weight(with box): 5 kg
Operating Environment	0 to 40℃, Non-Condensing Humidity 10% to 95%

Other Specifications

Security	Encryption Type / Method	Key Length
Auto provision	Advanced Encryption Standard (AES)	256 bit
Password	Advanced Encryption Standard (AES)	192 bit
Security Certification : NSFOCUS		

Call Capacity	1E1	2E1	4E1
Max. concurrent calls	30	60	120
Calls per Second (CPS)	4	4	4
Busy Hour Call Completion (BHCC)	12798	13012	12905
Call duration	8s	15s	30s

Contents

Log in to Web Interface

Open Web browser and enter the default IP address **192.168.2.240**

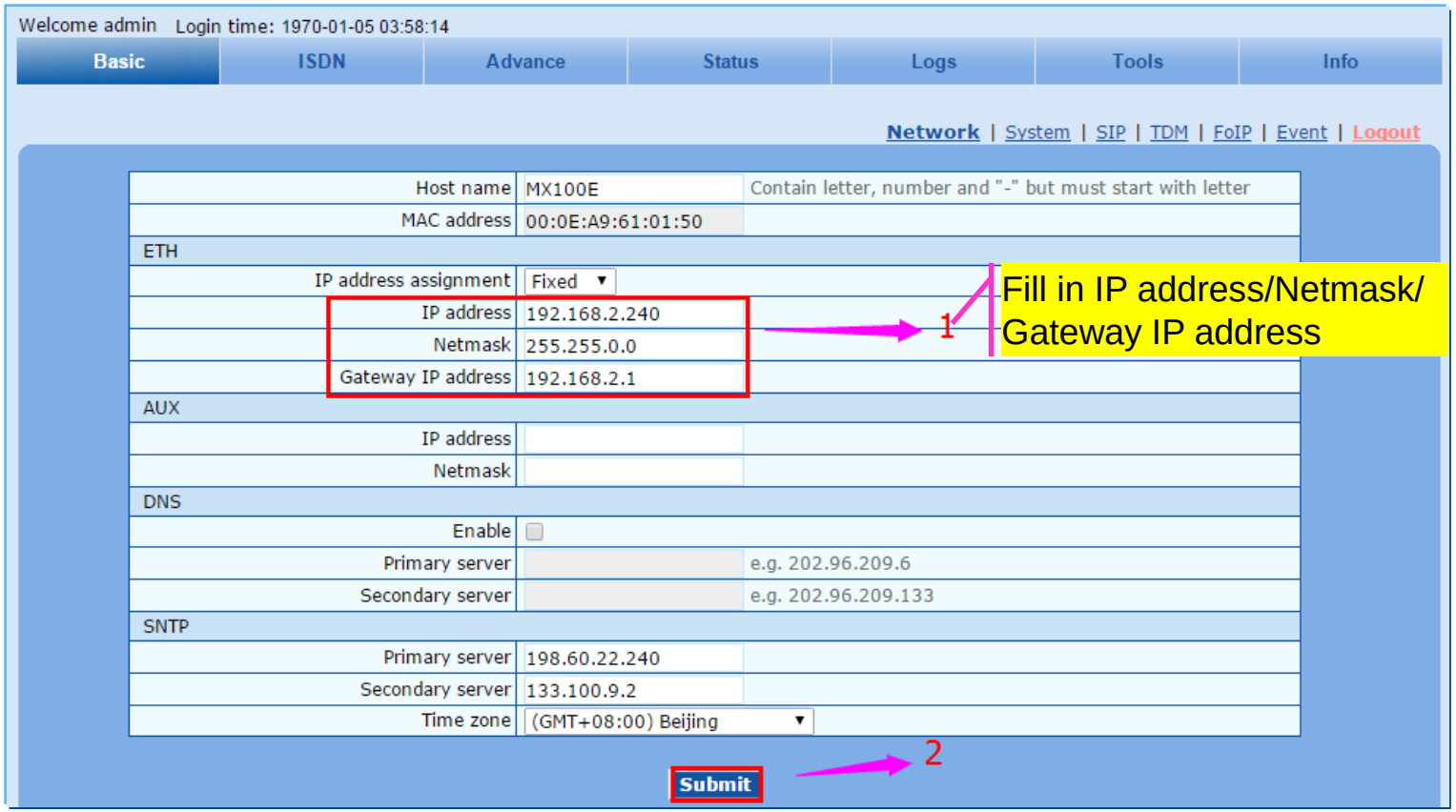
Support IE, Mozilla Firefox, Google Chrome

Select User as **Admin**

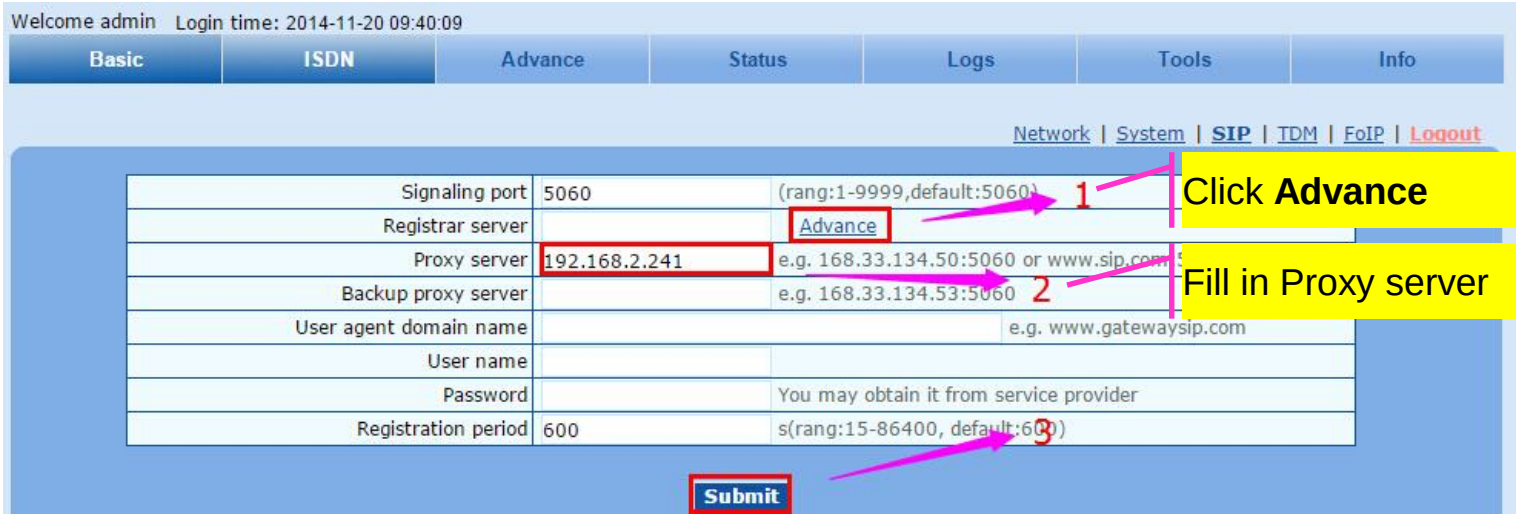
Enter the default password **voip**

- *The system will confirm timeout if users do not conduct any operation within 10 minutes after login. Users are required to log in again for continuing operations.*
- *Upon completion of configuration, click the **Logout** button to return to the login page, so as not to affect the login permission of other users.*

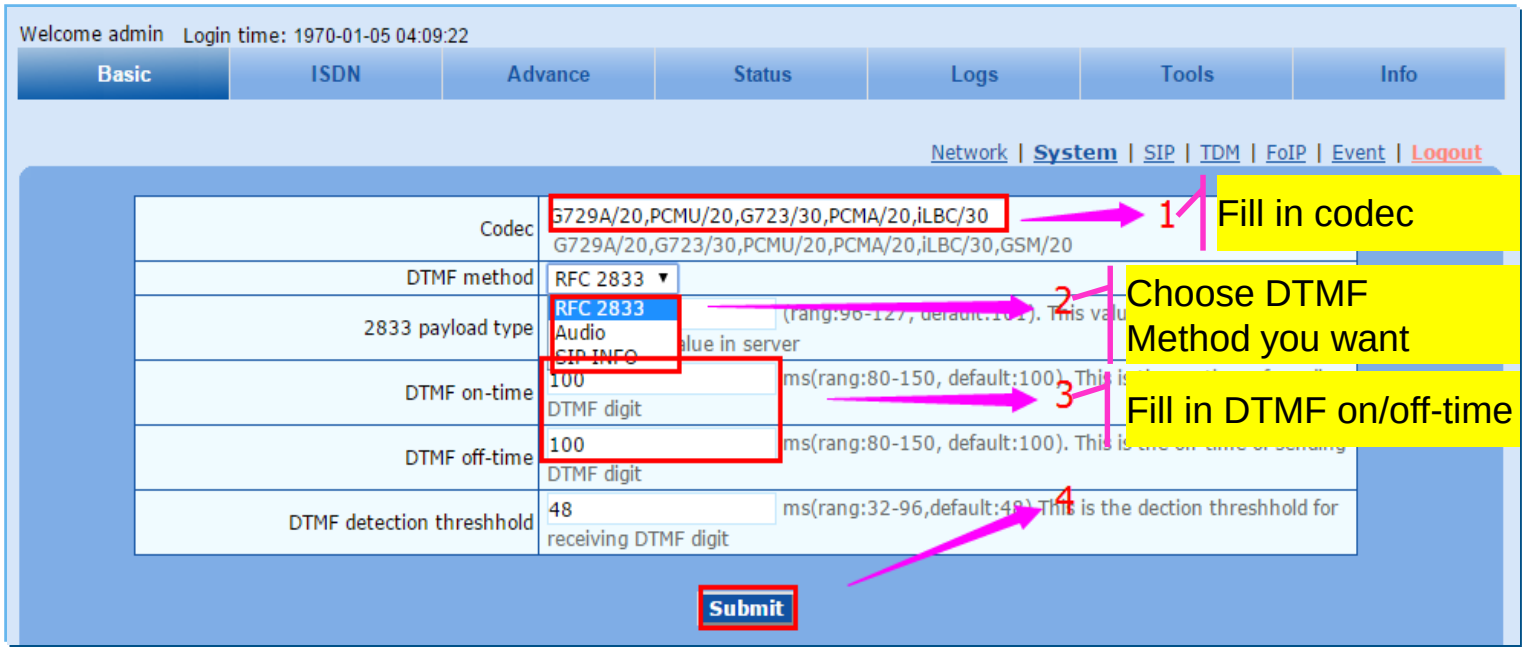
Basic Network Configuration



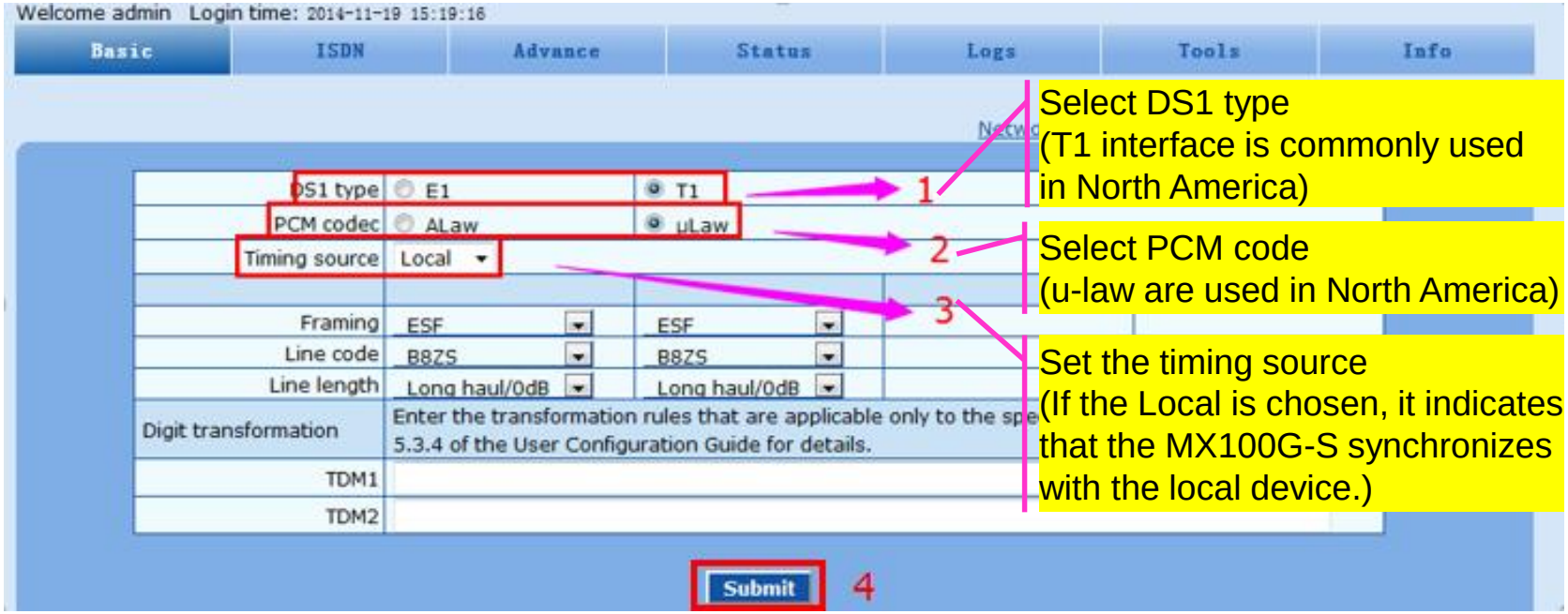
Basic SIP Configuration



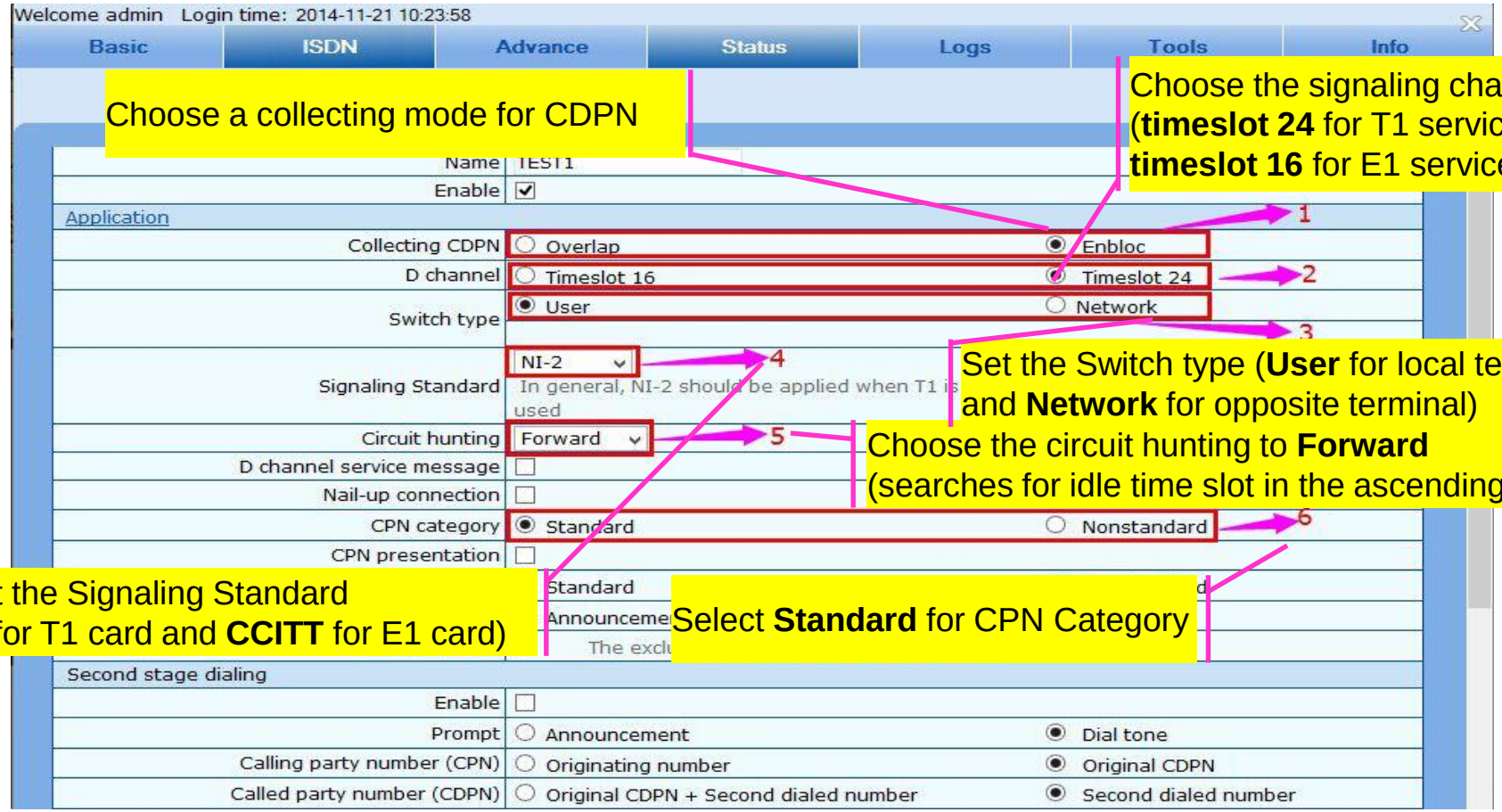
Basic System Configuration



Basic TDM Configuration



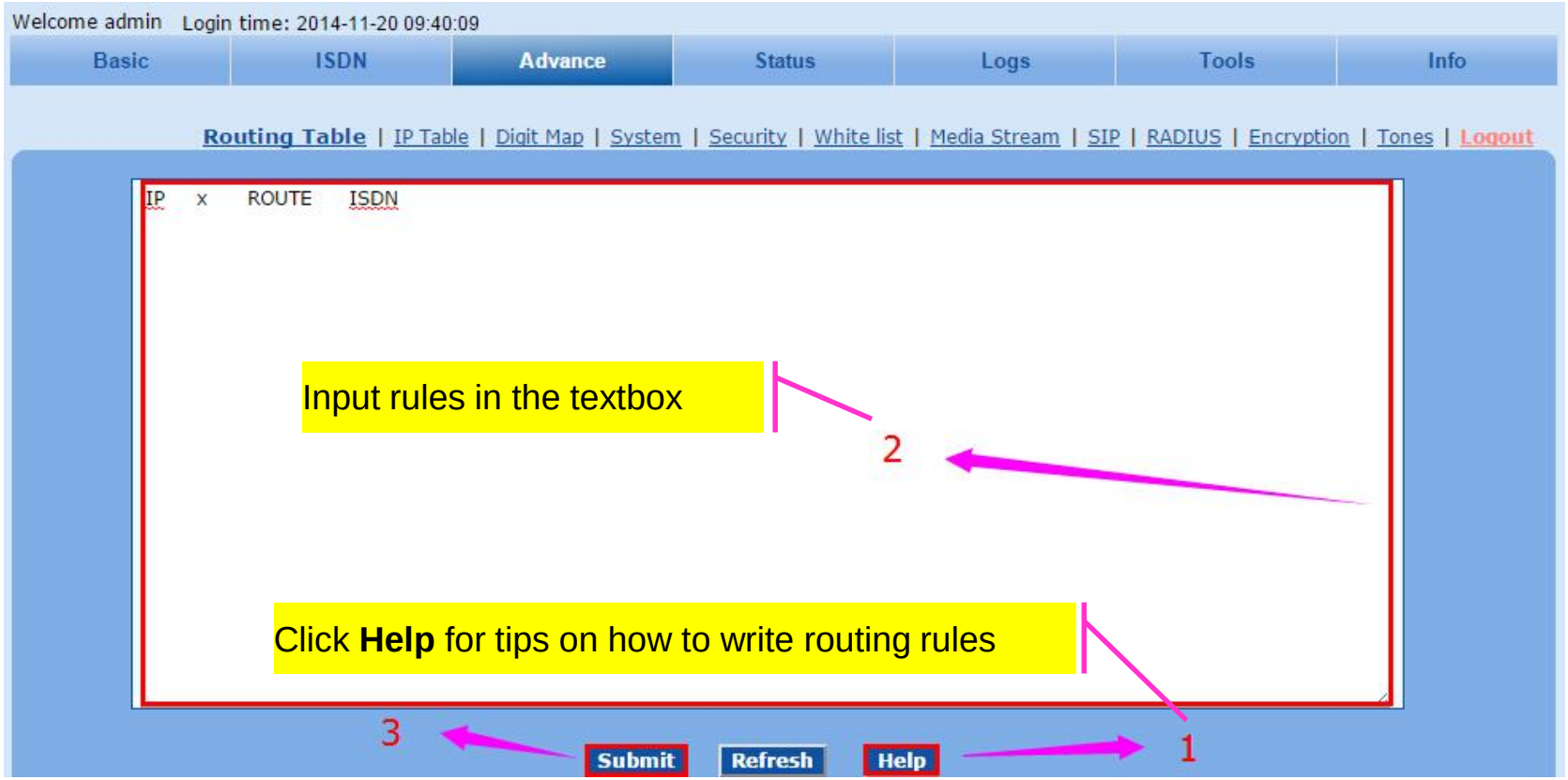
ISDN Application Configuration-1



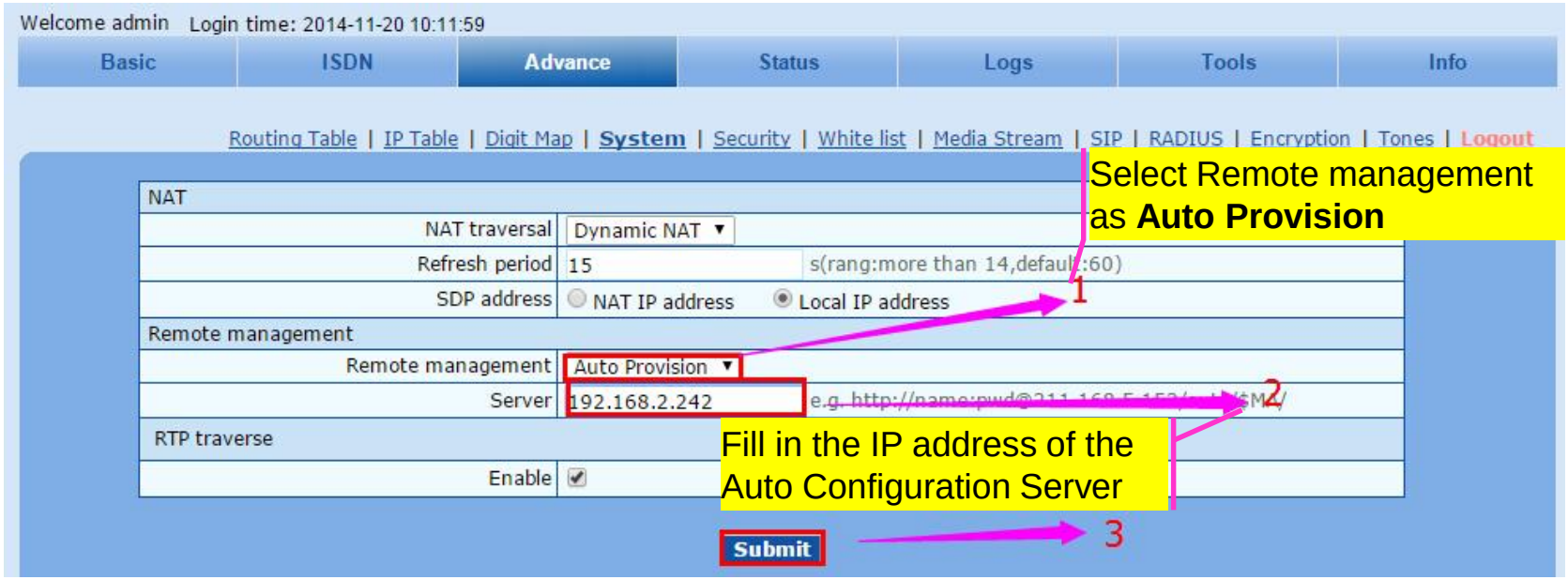
ISDN Application Configuration-2 Circuit Hunting

Search mode	Description
Forward	The search mode searches for an idle timeslot in the ascending order until idle timeslot is found. *e.g. In the case of an incoming call, the MX100G-S first checks whether timeslot 1 is idle. If not, the MX100G-S checks whether timeslot 2 is idle. Then the process proceeds in the ascending order.*
Backward	The search mode searches for an idle timeslot in the descending order until idle timeslot is found. *e.g. In the case of an incoming call, the MX100G-S first checks whether timeslot 24 is idle. If not, the MX100G-S checks whether timeslot 23 is idle. Then the process proceeds in the descending order.*
Cycle	The search mode searches for the next idle timeslot from left to right. *e.g. In the case of an incoming call, the MX100G-S first checks whether timeslot from left is idle. If not, the MX100G-S checks whether any next timeslot is idle going to right.*

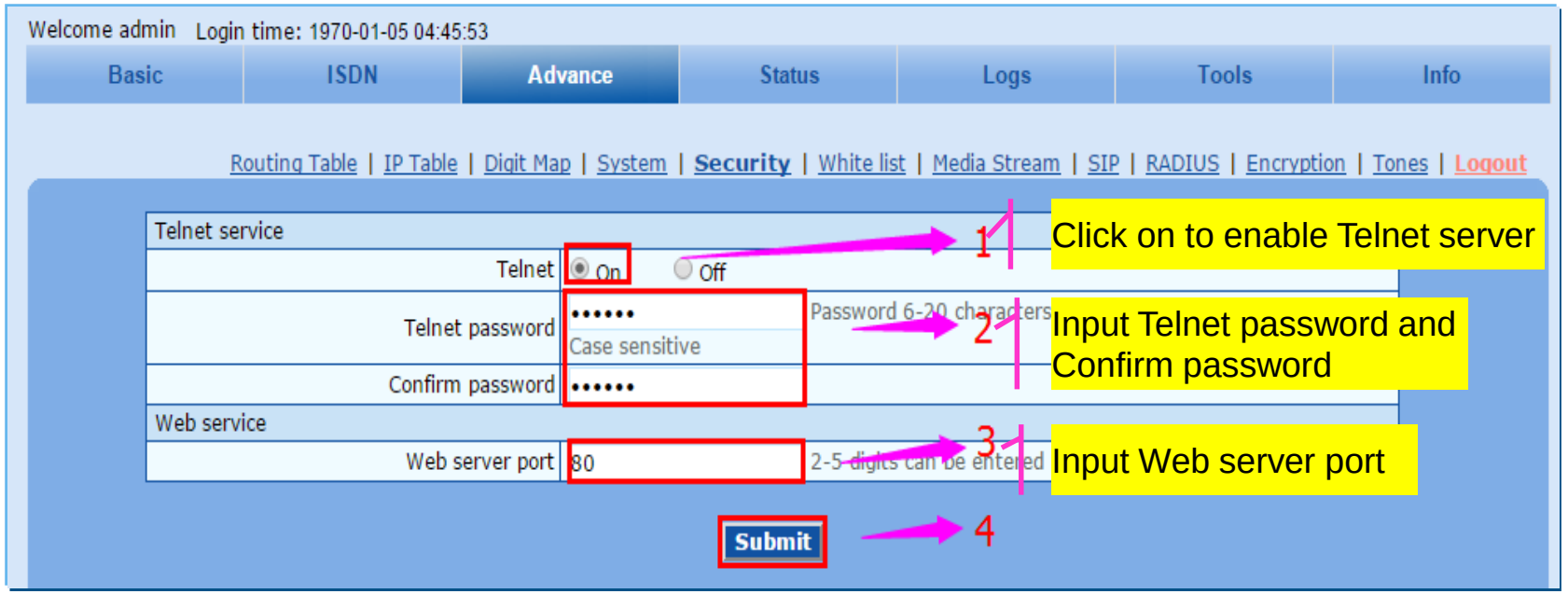
Advance Routing Table Configuration



Advance System Configuration



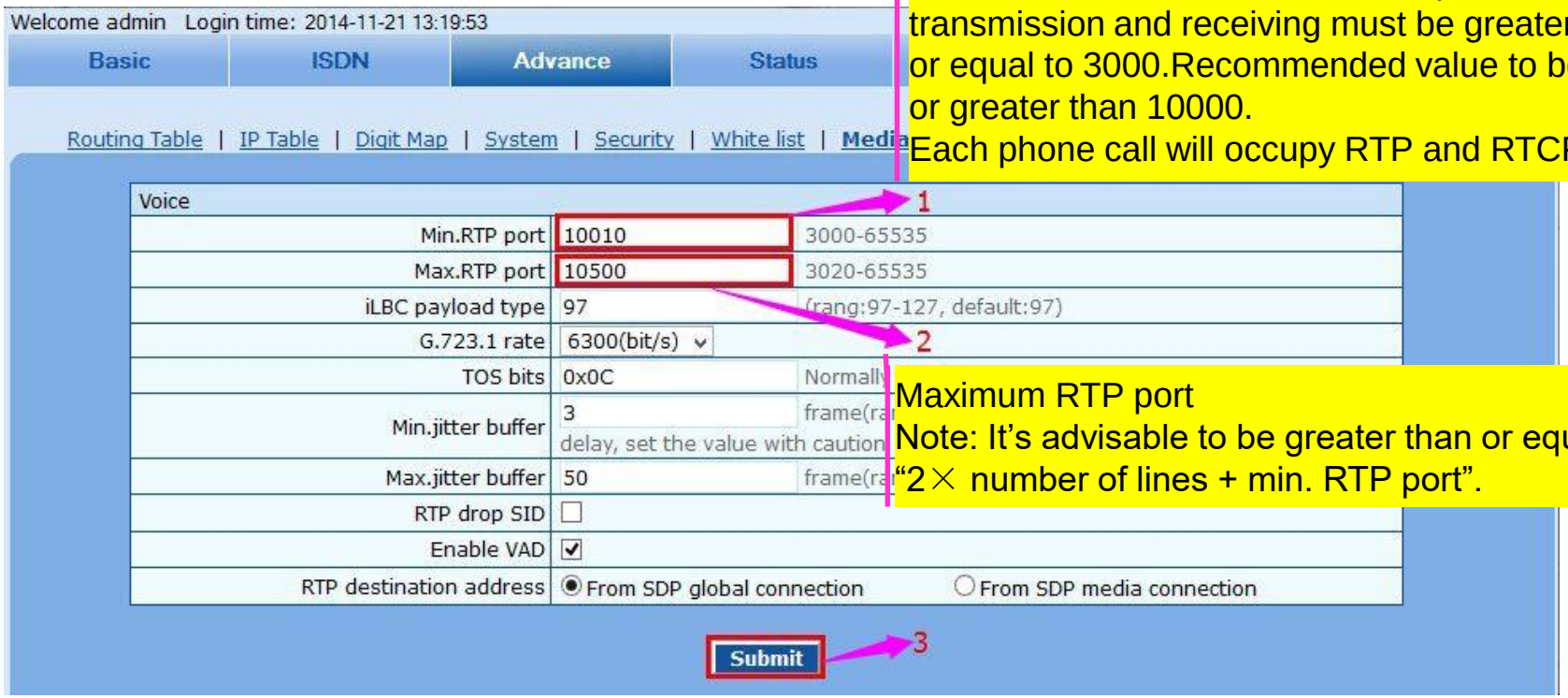
Advance Security Configuration-1



Advance Security Configuration-2

Tips	Security Measures
1	To ensure the device security, **changing the web GUI and Telnet passwords** periodically is recommended.
2	**Disabling Telnet services** is highly recommended for MX100G-S so that there will be no Telnet-based access to the device is permitted.
3	The default web server port is 80. It is also recommended to **change the port number of the Web server.** The value is a 2-5 digits number.
4	Administrators can add the authorized IP addresses to **IP table**. This table is designed to ensure the safe use of gateways as it will only process the information from authorized IP addresses.
5	Administrators can add up to maximum of 20 IP Addresses to the **Whitelist** on the MX100G-S.Only the addresses on the list are allowed to access the web and telnet services.
6	Configure the UDP signaling port for transmitting and receiving SIP messages (default value is 5060). If the MX100G-S is connected directly to the Internet, it's recommended to **change the default signaling port** value to prevent hacker attacks.

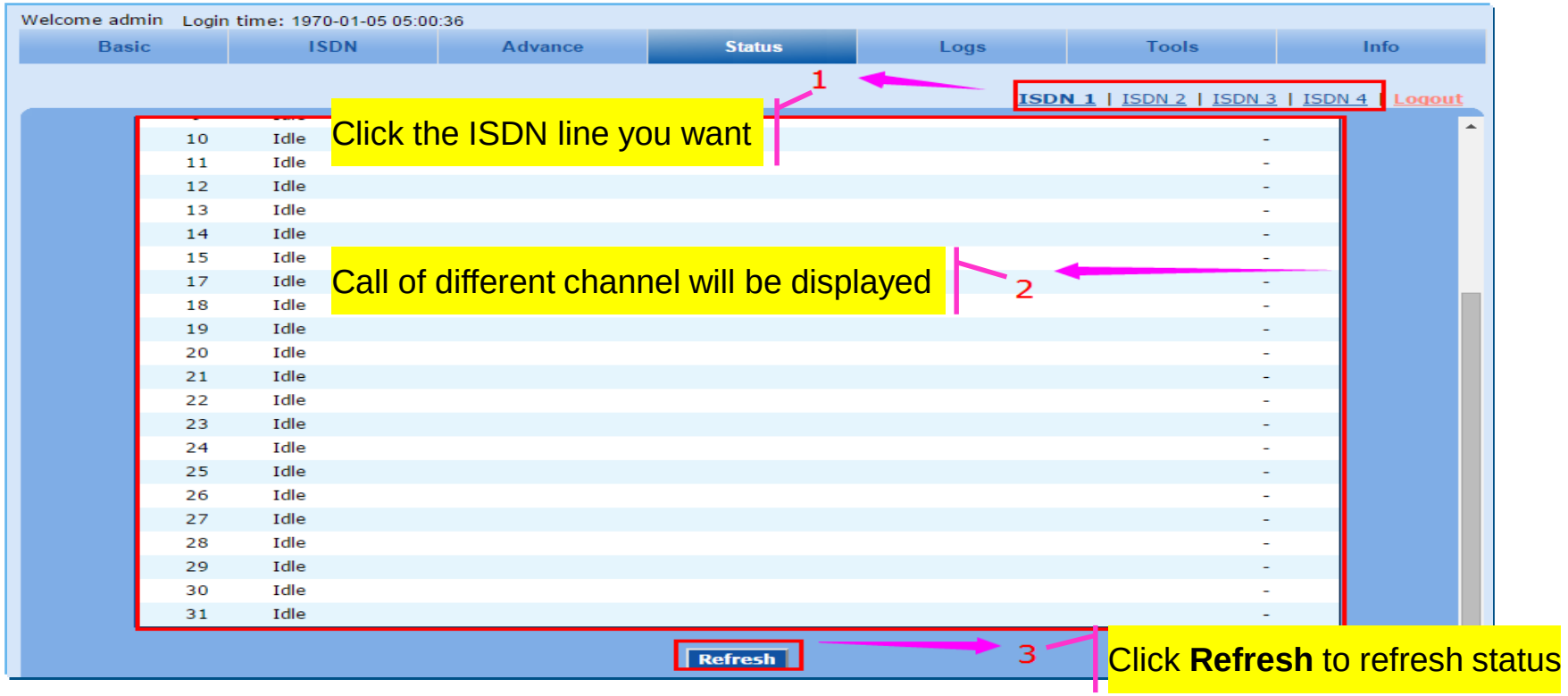
Advance Media Stream Configuration



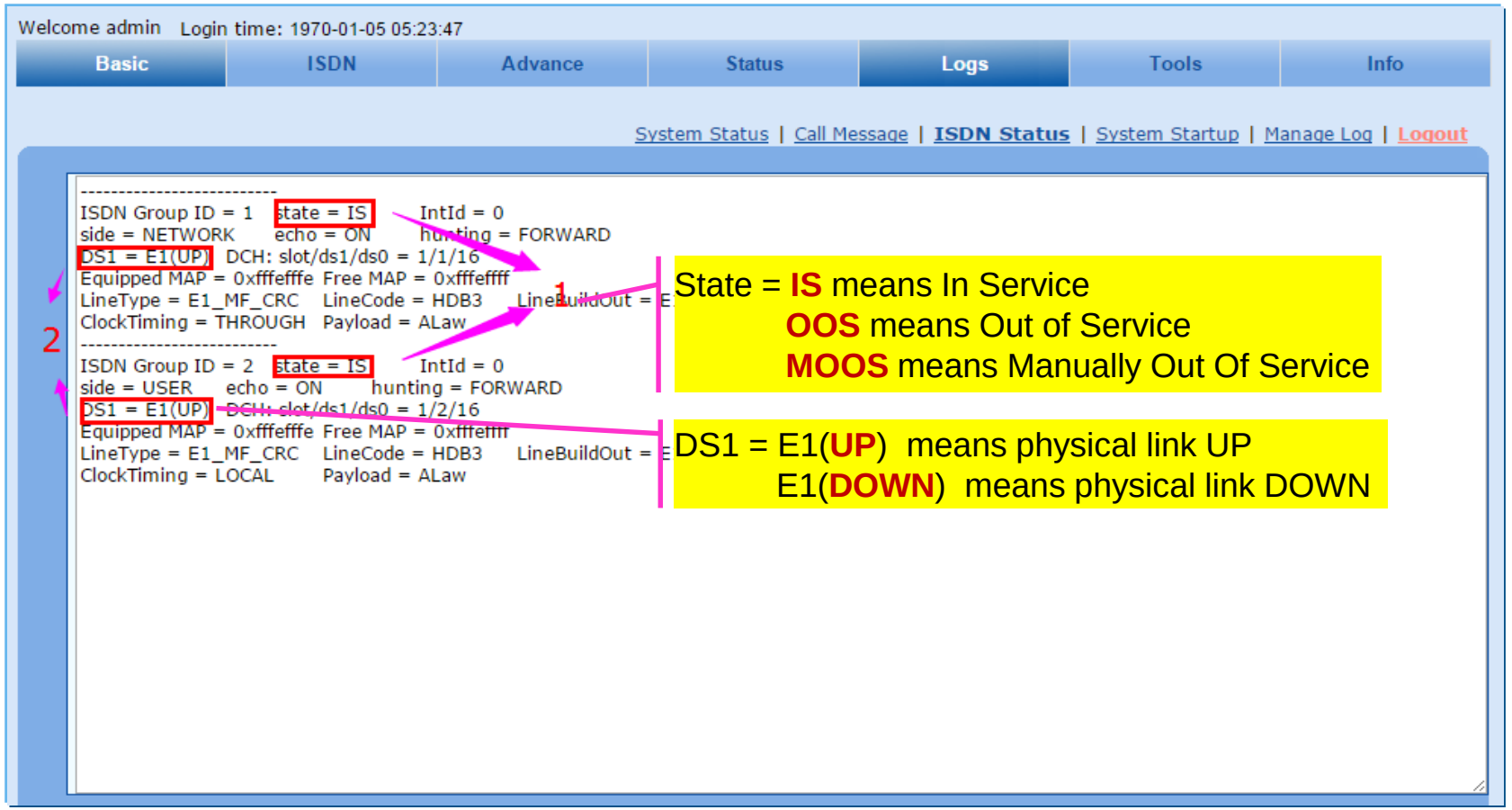
Input Minimum RTP port
Note: The minimum value of UDP ports for RTP transmission and receiving must be greater than or equal to 3000.Recommended value to be equal or greater than 10000.
Each phone call will occupy RTP and RTCP ports.

Maximum RTP port
Note: It's advisable to be greater than or equal to "2× number of lines + min. RTP port".

Status ISDN Call

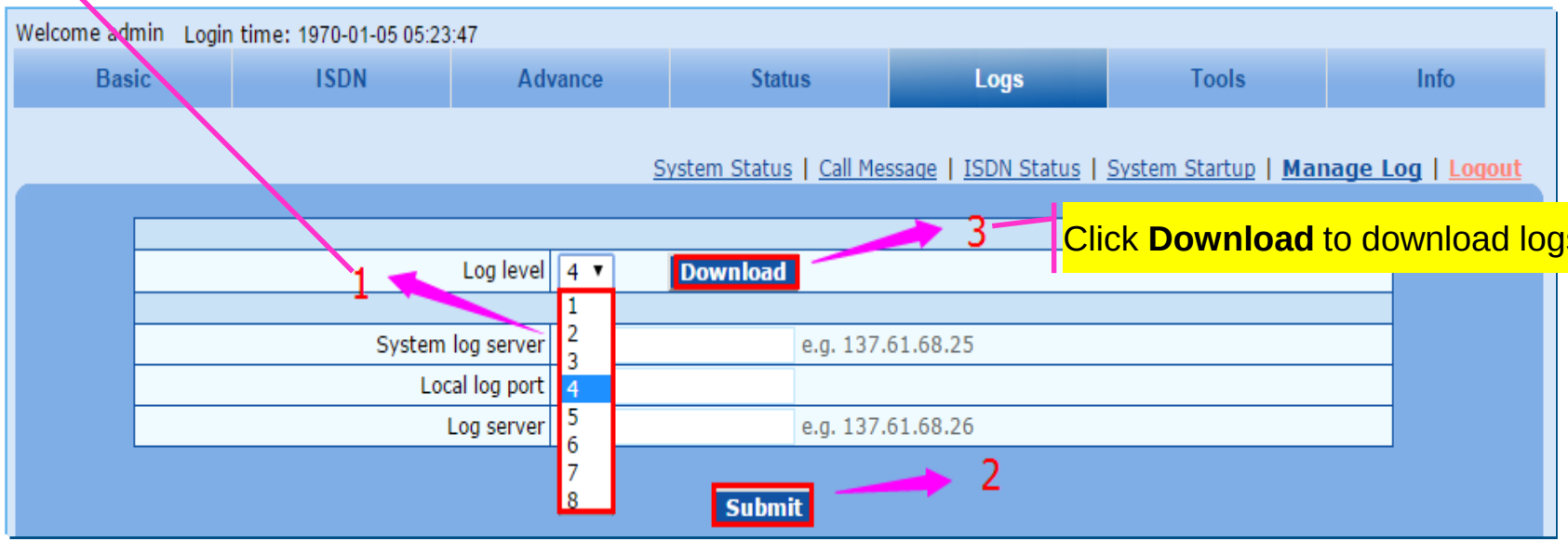


Logs ISDN Status



Log Management

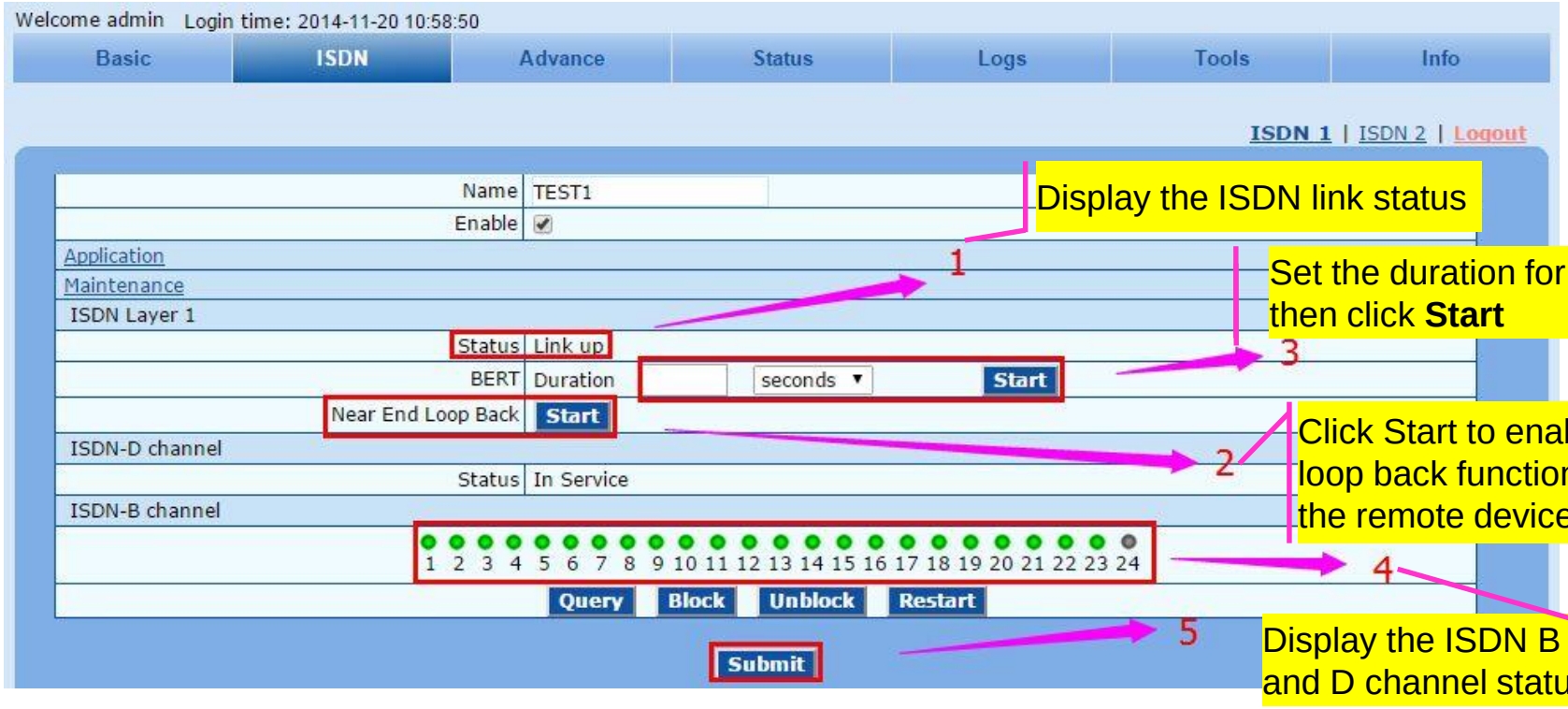
Choose log level (Default is 4.The higher the level goes, the more details the log file will be)
Log level should be set to be 4 or lower when gateway is used in normal operation, avoiding influencing the system performance.



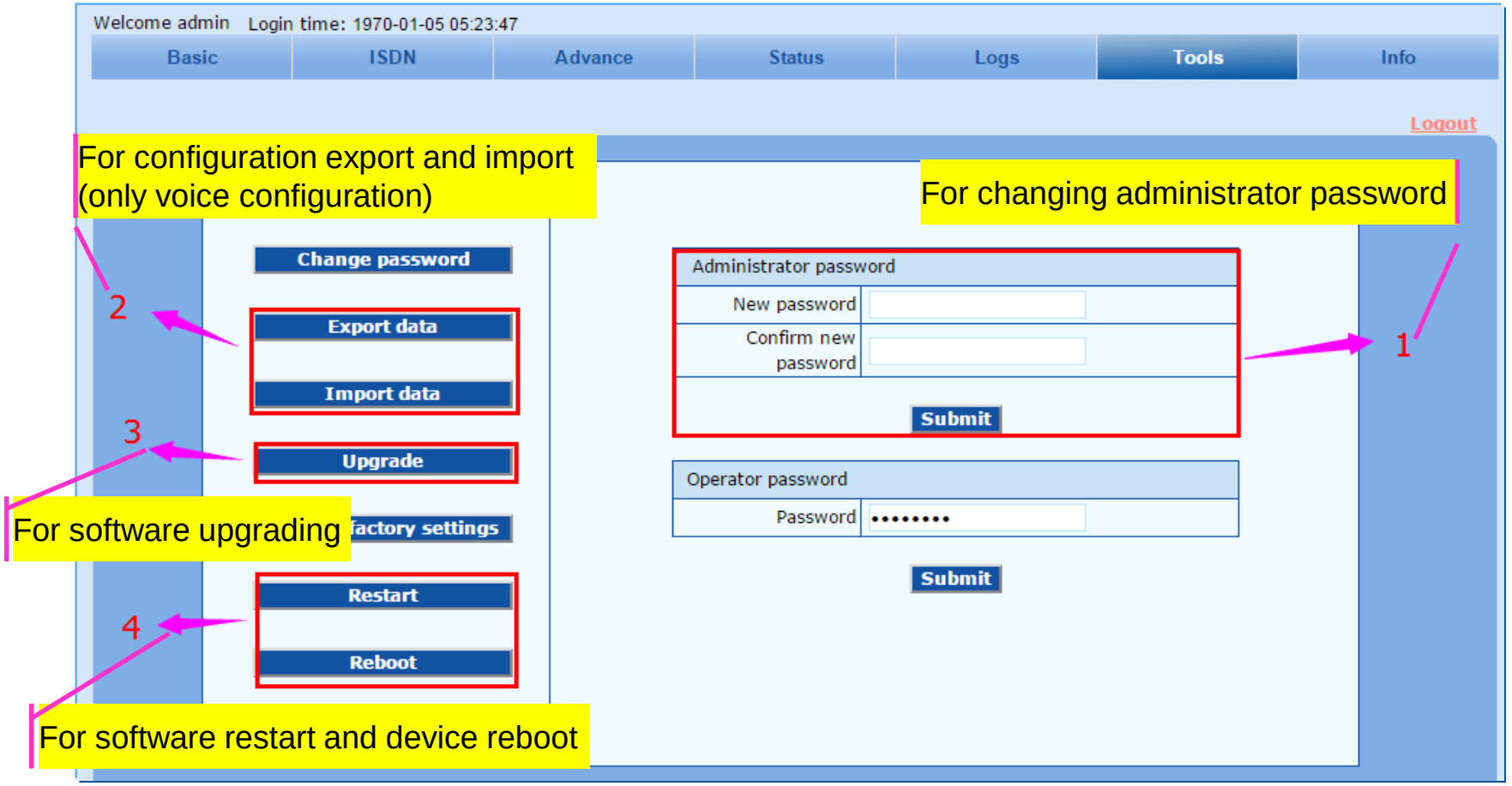
Log Level	Description	Log Level	Description
1	System Information	5	Call Information
2		6	RTP Event
3	DSP Instructions	7	T38 Fax Information
4	DSP Event	8	Registration Information

Contents

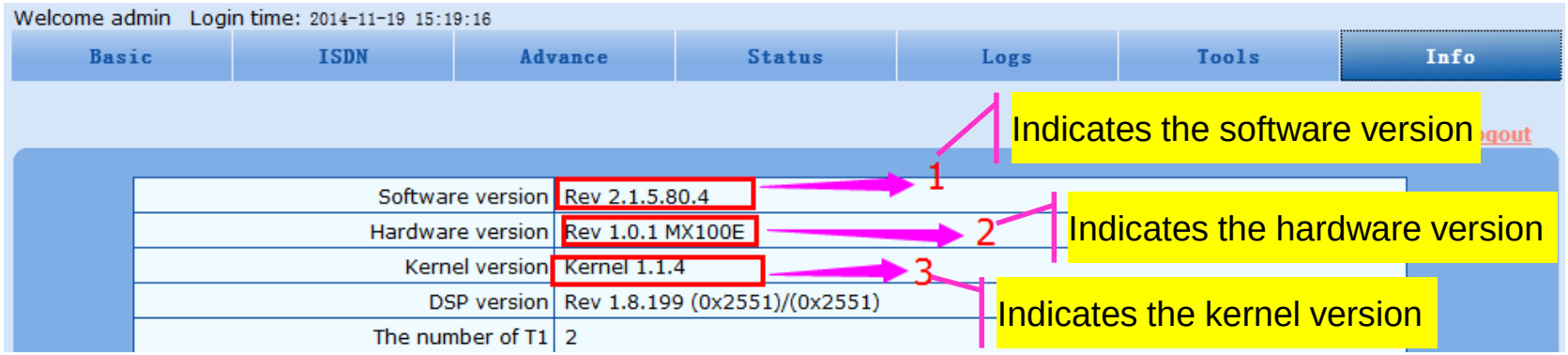
ISDN Maintenance Configuration



Maintenance Tools

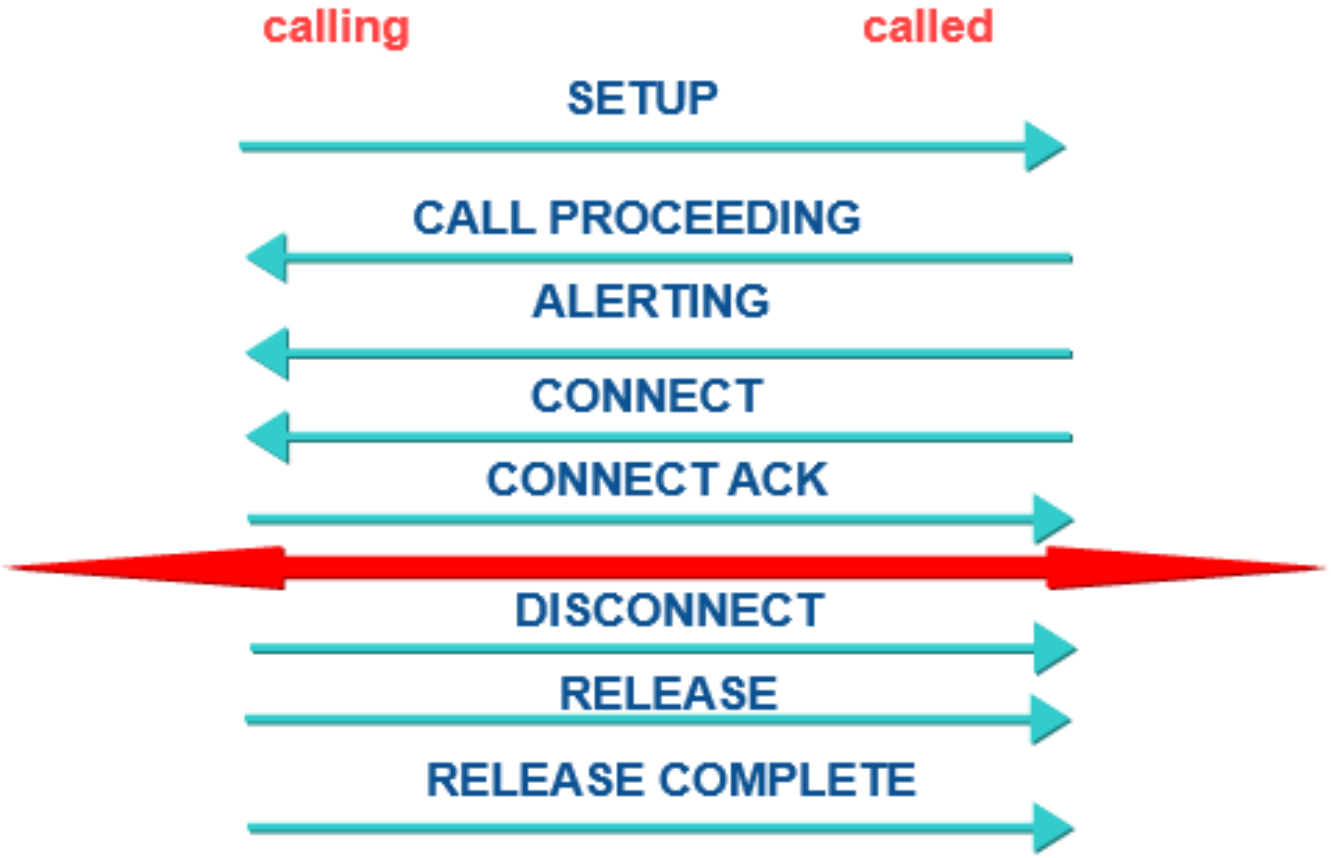


Device Information



Contents

ISDN Basic Call Process (Q.931)



ISDN Protocol Analysis on Log Level 4 (DSP Events)

[01/02 02:00:35.877754]TX ISDN-1, NS=61, NR=104, P=0, **MSG=SETUP**, callref=32a, len=46
[01/02 02:00:35.877964]TX raw - 00017AD0 0802032A 05A10403 8090A318 03A98385
[01/02 02:00:35.878115]TX raw - 6C0A4183 38363137 37393939 700C8031 33393135
[01/02 02:00:35.878258]TX raw - 36323637 31360000 00000018 00000018 0000000A

*** *The first line format is <date/time> <Transmitted/Received> <ISDN Interface> <Node Sending> <Node Receiving> <ISDN message ID> <Call Reference ID> <Message length>.. If the message is an ISDN level message, then the decoded message on the log will show the various information that make up the message.*

e.g: calling or called party number, ISDN B-Channel used for this call, Caller ID Category, etc.

ISDN Message ID and Hexadecimal Value

SETUP message:

[01/02 02:00:35.877754]TX ISDN-1, NS=61, NR=104, P=0, **MSG=SETUP**, callref=32a, len=46
[01/02 02:00:35.877964]TX raw - 00017AD0 0802032A **05**A10403 8090A318 03A98385
[01/02 02:00:35.878115]TX raw - 6C0A4183 38363137 37393939 700C8031 33393135
[01/02 02:00:35.878258]TX raw - 36323637 31360000 00000018 00000018 0000000A

*** *The information shows that the ISDN message ID is SETUP and can be verified by its hexadecimal value of 05. SETUP message indicate the starts of the call.*

ISDN Message ID	Hexadecimal Value
SETUP	05
CALL_PROC	02
ALERT	01
CONNECT	07
CON_ACK	0F
DISCONNECT	45
RELEASE	4D
REL_COM	5A

Calling & Called Party Number

[01/02 02:00:35.877754]TX ISDN-1, NS=61, NR=104, P=0, MSG=SETUP, callref=32a, len=46
[01/02 02:00:35.877964]TX raw - 00017AD0 0802032A 05A10403 8090A318 03A98385
[01/02 02:00:35.878115]TX raw - **6C**0A4183 3**8**3**6**3**1**3**7** 3**7**3**9**3**9**3**9** **7**0**0**C803**1** 3**3**3**9**3**1**3**5**
[01/02 02:00:35.878258]TX raw - 3**6**3**2**3**6**3**7** 3**1**3**6**0000 00000018 00000018 0000000A

*** *The hex value **6C** is the identifier for the calling party number.*
The 8th number after 6C, determines the first digit of the caller ID and then every other number next to 8th until hex value 70 determines the remaining digits for CID.
*Thus, the **calling party number** is **86177999***

*** *The hex value **70** is the identifier for the called party number.*
The 6th number after 70, determines the first digit of the caller ID and then every other number next to 6th until hex value 00 determines the remaining digits for CID.
*Thus, the **called party** number is **13915626716***

ISDN B-Channel

[01/02 02:00:35.877754]TX ISDN-1, NS=61, NR=104, P=0, MSG=SETUP, callref=32a, len=46
[01/02 02:00:35.877964]TX raw - 00017AD0 0802032A 05A10403 8090A318 03A983**85**
[01/02 02:00:35.878115]TX raw - 6C0A4183 38363137 37393939 700C8031 33393135
[01/02 02:00:35.878258]TX raw - 36323637 31360000 00000018 00000018 0000000A

*** *The last 2 hexadecimal digits are used to calculate the ISDN B-Channel.*
The calculation method:
last 2 hex digits – 80 = ISDN B-Channel(hex value converted to decimal)

For example:
***85**, so the calculation method is 85-80=5. Thus the ISDN B-Channel is **5**.*
*If it is **9C**, so the calculation method is 9C-80=1C. Thus the ISDN B-Channel is **28 (1C=28).***

Caller ID Category

[01/02 02:00:35.877754]TX ISDN-1, NS=61, NR=104, P=0, MSG=SETUP, callref=32a, len=46
[01/02 02:00:35.877964]TX raw - 00017AD0 0802032A 05A10403 8090A318 03A98385
[01/02 02:00:35.878115]TX raw - 6C0A**4**183 38363137 37393939 700C8031 33393135
[01/02 02:00:35.878258]TX raw - 36323637 31360000 00000018 00000018 0000000A

The 3rd number after 6C indicates the Caller ID Category.

- *0 is UNKNOWN*
- *1 is INTERNATIONAL*
- *2 is NATIONAL*
- *4 is SUBSCRIBER*

Note: If user defined (set CPN/CPDN category to standard) then :

- *CID start from 0 is NATIONAL (National code can be changed if it is in CHINA e.g. 400/800)*
- *CID start from 00 is INTERNATIONAL,*
- *CID start from 1-9 is SUBSCRIBER.*

Call Reference ID

[01/02 02:00:35.877754]TX ISDN-1, NS=61, NR=104, P=0, MSG=SETUP, **callref=32a**, len=46
[01/02 02:00:35.877964]TX raw - 00017AD0 0802**032A** 05A10403 8090A318 03A98385
[01/02 02:00:35.878115]TX raw - 6C0A4183 38363137 37393939 700C8031 33393135
[01/02 02:00:35.878258]TX raw - 36323637 31360000 00000018 00000018 0000000A

*** *Every call should have a unique identifier, similar to the Call_ID in the sip protocol.*

*Thus, the Call Reference ID for this call is **032a.***

TX/RX and Call Reference ID

SETUP message:

[01/02 02:00:35.877754]TX ISDN-1, NS=61, NR=104, P=0, MSG=SETUP, **callref=32a**, len=46
[01/02 02:00:35.877964]TX raw - 00017AD0 0802032A 05A10403 8090A318 03A98385
[01/02 02:00:35.878115]TX raw - 6C0A4183 38363137 37393939 700C8031 33393135
[01/02 02:00:35.878258]TX raw - 36323637 31360000 00000018 00000018 0000000A

CALL_PROCEEDING message:

[01/02 02:00:35.915048]RX ISDN-1, NS=104, NR=62, P=0, MSG=CALL_PROC, callref=**832a**, len=14
[01/02 02:00:35.915262]RX raw - 0201D07C 0802832A 021803A9 8385A318 03A18395

*** *Every call should have TX & RX. When the calling router transmits the set up message, the telco switch will respond with the call proceeding. This indicates that the network is processing the call.*

The corresponding Call reference ID for RX will be (TX call_ref ID hex value + 8 to the most significant byte)

For example: If, TX call reference ID is 032a,

then, RX call reference ID should be 832a.

ISDN Cause Codes

[04/29 17:18:39.873698]TX ISDN-1, NS=36, NR=101, P=0, MSG=DISCONNECT, callref=3283, len=13

[04/29 17:18:39.873906]TX raw - 000148CA 08023283 45080280 9F01E8E4 108621D8

*** *If the received message information from ISDN is "disconnect", then a corresponding cause code value can be used to analyze the issue*

Cause code of disconnect is 9F, need check caller id type

The calculation method:

hex value – 80 = Cause Codes (hex value converted to decimal)

For example:

***9F**, so the calculation method is 9F-80=1F. Thus the Cause code is **31**(1F=31)*

Reference for Detailed ISDN Cause Codes

http://cnes.com/causecodes.html

***"Cause No. 31 - normal. unspecified .**This cause is used to report a normal event only when no other cause in the normal class applies. "*

Most Common Cause Codes

Hex Value	Cause code #	Reason
82	2	No route to specified transit network (national use)
90	10	Normal call clearing
91	17	User busy
92	18	No user responding
93	19	No answer from user (user alerted)
94	20	Subscriber absent
95	21	Call rejected
96	22	Number changed
9A	26	Non-selected user clearing
9B	27	Destination out of order
9C	28	Invalid number format (address incomplete)
9D	29	Facilities rejected
9E	30	Response to STATUS INQUIRY
9F	31	Normal. Unspecified seem
AF	47	Resource unavailable, unspecified
DB	91	Invalid transit network selection (national use)
DF	95	Invalid message, unspecified
E0	96	Mandatory information element is missing
E1	97	Message type non-existent or not implemented

Communication without Limits

Thank you!