What is SIP?

The **S**ession **I**nitiation **P**rotocol (SIP) is a signaling protocol used for establishing sessions in an IP network. A session in the VOIP world is simply a two-way telephone call or it could be a collaborative multi-media conference session. With the NEC Key/PBX system it is used for 3rd party station and 3rd party trunk connections to the CPU much in the way ISDN allows 3rd party ISDN station and trunk connection to the NEAX 2000 and NEAX 2400. The new NEC terminals for the SV8100 and SV8300 also use the SIP protocol for call control and delivery.

SIP is an RFC standard (RFC 3261) from the Internet Engineering Task Force (IETF), the body responsible for administering and developing the mechanisms that make up, and run, the Internet.

Although the "S" in SIP stands for Session it could also easily mean "Simple" as the protocol has been developed purely as a mechanism to establish sessions, it does not know about the details of a session, it just initiates, terminates and modifies sessions or phone calls in the case of the PBX/Key system. SIP in its simplest form could be likened to an event coordinator in that it establishes the event, monitors it, and then helps tear it all down when done.
SIP is designed to work with a broad spectrum of existing and future IP telephony protocols.
Just as an event coordinator would work with a wide variety of types of events.

SIP in this respect has 4 basic functions…..

- SIP allows for the establishment of the user location (i.e. translating from a user's name to their current network address. Functions very similar to the old NEAX 2400/2000 wireless roaming feature). This aspect of SIP does not come into play as much with SIP stations or trunks to the NEC PBX/Key system as the SIP station will always authorize to the Key/PBX CPU or SIP trunk to the SIP provider.
- SIP provides for feature negotiation so that all of the participants in a session can agree on the features to be supported among them. With an NEC SIP VOIP call this would be called and calling parties agreeing on the voice codec (G711, G729), and the voice packet size.
- SIP is a mechanism for call management - for example adding, dropping, or transferring participants. These functions you should already be familiar with in telephony.
- And finally SIP allows for changing features of a session while it is in progress. With an NEC VOIP call this could be interpreted as the user, during a call, pressing a function key on the IP telephone to invoke a feature such as Conference, Call Pickup or even Hold for example.

The new SIP terminals (DT700's) use what can be referred to as enhanced SIP. It is the basic SIP protocol with additional NEC proprietary information to provide the features and display information for the multiline phone.

Common SIP Messages (Verbs)

The following are the most common SIP messages (Verbs) that you will see with SIP communications to and from the NEC Key/PBX system……

***REGISTER*:-** This is the SIP station or the SIP trunk authenticating or logging into the network. The registration process confirms for the SIP station its connectivity and ID (ext number) to the Key/PBX system. It also notifies the Key/PBX system of the location (IP address or Domain name) of the SIP station. SIP trunks from the Key/PBX system register to the CO in much the same way as the SIP station. The SIP carrier will confirm the trunks circuits and address/domain name of the Key/PBX system. The registration occurs when the trunks are first connected and at regular intervals thereafter. Registration may also be performed with authentication where the SIP Carrier (for trunks) or Key/PBX system (for SIP stations) requests a password before allowing the device to register.

***INVITE*:-** The Invite is the setup message in the SIP world. It contains the calling party number and the called party number.

SUBSCRIBE:- The subscribe message is the SIP device requesting a specific feature. In the case of SIP terminals this could be the phone subscribing for the Message Waiting feature.

***NOTIFY*:-** A NOTIFY packet is information sent by a SIP device advising of a change in status or to convey the occurrence of a particular event. The notify message could be packets sent by the Key/PBX to the SIP station advising it to enable a message lamp. With the new NEC terminals (DT700's) each time a key is pressed on the terminal a Notify message is sent to the CPU advising of the action taken.

***ACK*:-** is the regular response from the SIP device after it gets a 200 (OK) response message.

***BYE*:-** This is the message to terminate a call sent by whoever hangs up first.

***CANCEL*:-** Simply a request to cancel a previously sent INVITE message.

Response Codes

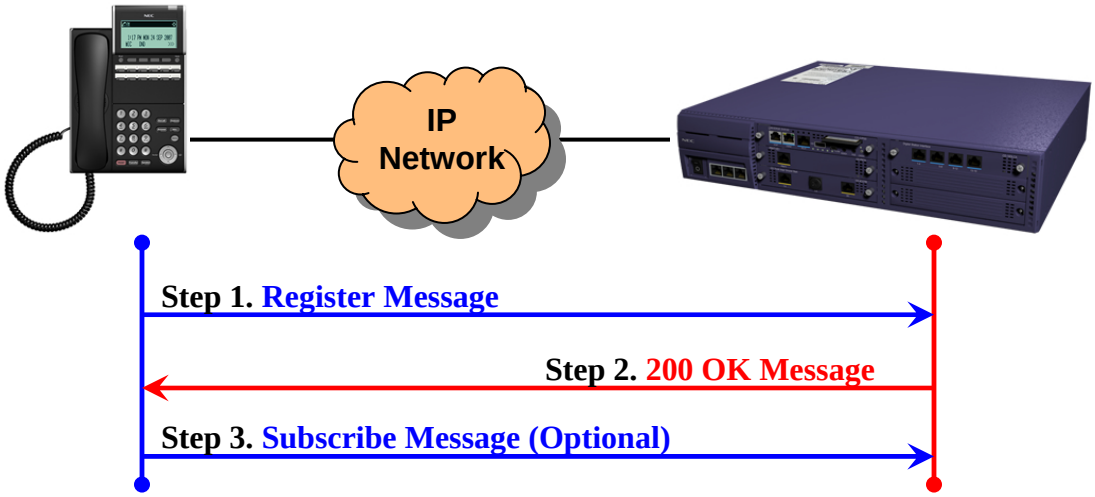
Each sent SIP message is typically answered with a response code from the receiving device. The codes are grouped into different ranges.

Codes	Function
100~199	Codes in this range are informational, and typically indicate that the server (Key/PBX system) is attempting to process the request. These are very similar to an ISDN Call Proceeding message.
200~299	200 range codes are success and acknowledgement codes. These codes indicate that the request has been processed.
300~399	Response codes in the 300 range indicate a type of service error called a redirection error. What this means is that the current host cannot handle the request, so the request is being redirected to another host.
400~499	Response codes in the 400 range are client errors, but they usually correspond to security events. For example, a station would receive an error code in this range if it supplied an invalid password during registration.
500~599	500 range response codes indicate a server error. For example, a code in this range would be generated if the server cannot be found or if it doesn't respond.
600~699	Codes in this range are global error codes.

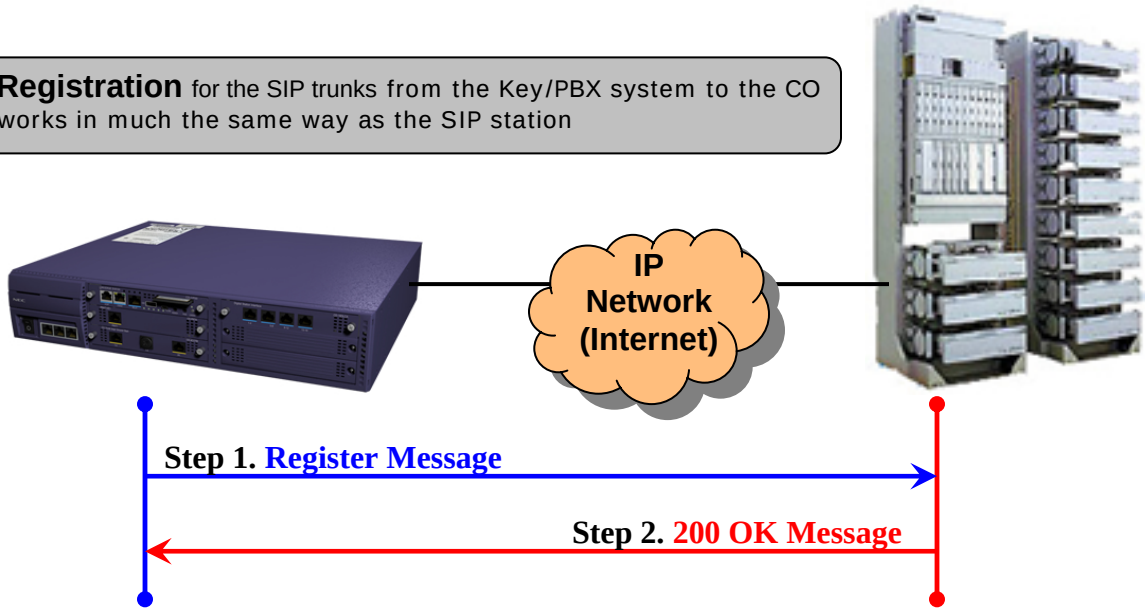
Call Flow Examples

The following are examples of basic call flows with the SIP protocol using SIP stations and SIP trunks.

Basic Registration is performed by the SIP station when it is first plugged in and then at regular intervals thereafter.

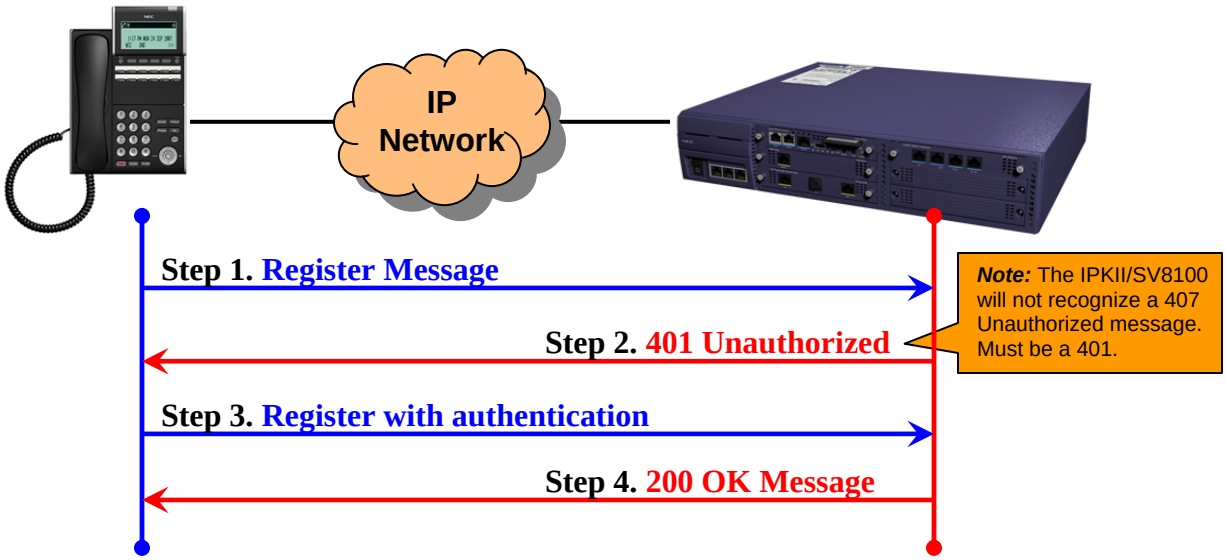


Registration for the SIP trunks from the Key/PBX system to the CO works in much the same way as the SIP station



Basic Registration (With Authentication)

Authentication is the KEY/PBX system (or SIP carrier in the case of SIP trunks) requesting a password when registering for service. Registration with authentication from the Key/PBX system to the SIP Carrier follows the same procedure.



Basic SIP call.

Below is an example of a call made from a regular station out SIP trunks connected to the Key/PBX system. The call messaging is the same between the SIP station and the Key/PBX when the SIP station makes or receives a call.