

Regular Expressions in the Dial Plan

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Regular Expressions and the SIP Protocol

Within the SIP Protocol, a SIP URI identifies a communications resource. All URIs, SIP URIs may be placed in web pages, email messages, or printed literature. They contain sufficient information to initiate and maintain a communication session with the resource. SIP URI defined as **sip: user@host**.

A. "user" - identifier of a particular client resource at the host being addressed.

B. "host" - in this context frequently refers to a network domain. When using Regular Expressions to define a SIP URI, these expressions allow for the customization and flexibility to define SIP URIs as variables.

Let's take a look on an industry-standard regular expression notations:

Operator	Description
[abc]	Matches any character in the set a, b, or c.
[^abc]	Matches any character not in the set a, b, or c.
[a-z]	Any one of these; use a hyphen to indicate a range. This allows you to create a range like: "one through 8" [1-8], or a set like: "3, 6, or 9" [369].
.	Matches any single character.
,	Matches the minimum specified characters or more.
\d	Matches any decimal digit.
\D	Matches any non-digit.
\s	Matches any whitespace character.
\S	Matches any non-whitespace character.
\w	Matches any word (alphanumeric) character.
\W	Matches any non-word (alphanumeric) character.
(abc)	Matches whatever the expression abc would match, and saves it as a variable which may be used in later expressions. Also used for grouping.
\$	The \$ symbol is used to refer to expressions that have been stored using the () expression noted above. Variables are numbered according to the order that they appear. For example, \$1 refers to the first variable stored, and \$2 refers to the second variable stored.
a b	Matches whatever the expression a would match, or whatever the expression b would match.
+	Matches the preceding expression one or more times.
?	If the preceding is just a digit, allow that digit to be optional; if the preceding is inside brackets, then that sequence is optional.
*	Matches the null string or any number of repetitions of the preceding expression.
{m}	Matches exactly m repetitions of the one-character expression.
{m,n}	Matches between m and n repetitions of the preceding expression, inclusive.
{m,}	Matches m or more repetitions of the preceding expression.

Routing Calls using the Dial Plan

The dial plan is used to instruct the B2BUA about the routing path of calls, who to accept calls from, match on, where calls are going to, and where to send the call. When we add regular expressions into the dial plan, it allows us to specify a range of numbers, domains, or other sets of specific digits. Regular expressions are a flexible way of delivering patterns that match a unique set of criteria. For example: **[0-9]{7,}** - this means any digits from 0 to 9, repeated a maximum of 7 times. This is a regular telephone number.

Regular Expressions in the Matching From Header

The purpose of the Matching From Header is to provide source SIP URI matching, as well as source Transport and Network Address. In the regular expression we create a criteria for the From Header SIP URI of the SIP message. This is used when matching requests in the Dial Plan. For a request to match all criteria must be met.

Please see an example table:

SIP URI Example Description	Equivalent Standard Expression
7-digit number@ Any Domain	sip:[0-9]{7}@(.*)
7-digit number@ IP Address	sip:[0-9]{7}@12.34.56.78
7-digit number@ Domain	sip:[0-9]{7}@sip_domain.com
North American long-distance number @ Any Domain	sip:1[2-9][0-9]{9}@(.*)
North American long-distance number @ IP Address	sip:1[2-9][0-9]{9}@12.34.56.78
North American long-distance number @ Domain	sip:1[2-9][0-9]{9}@sip_domain.com
Toll-free number: 1+800+7 digits @ Any Domain	sip:18(00 66 77 88)[0-9]{7}@(.*)
Toll-free number: 1+800+7 digits @ IP Address	sip:18(00 66 77 88)[0-9]{7}@12.34.56.78
Toll-free number: 1+800+7 digits @ Domain	sip:18(00 66 77 88)[0-9]{7}@sip_domain.com
Local 7-digit number, beginning with optional 9 @ Any Domain	sip:9?[0-9]{7}@(.*)
Local 7-digit number, beginning with optional 9 @ IP Address	sip:9?[0-9]{7}@12.34.56.78
Local 7-digit number, beginning with optional 9 @ Domain	sip:9?[0-9]{7}@sip_domain.com
4-digit extension starting with 5 @ Any Domain	sip:5[0-9]{3}@(.*)
4-digit extension starting with 5 @ IP Address	sip:5[0-9]{3}@12.34.56.78
4-digit extension starting with 5 @ Domain	sip:5[0-9]{3}@sip_domain.com
4-digit number not starting with 36 @ Any Domain	sip:(?!36)[0-9]{4}@(.*)
4-digit number not starting with 36 @ IP Address	sip:(?!36)[0-9]{4}@12.34.56.78
4-digit number not starting with 36 @ Domain	sip:(?!36)[0-9]{4}@sip_domain.com
Any Username @ Any Domain	sip:(.*)@(.*)
Any Username @ IP Address	sip:(.*)@12.34.56.78
Any Username @ Domain	sip:(.*)@sip_domain.com

Regular Expressions in the Matching Request URI

The purpose of Matching Request URI is to match on the incoming Request URI Header of the SIP message that is being sent to SBC. Normally the "domain" portion of the URI is the SBC IP/fqdn.

In regular expressions we create criteria for the Request URI of the SIP message. This is used when matching requests in the Dial Plan. For a request to match all criteria must be met.

Port and Transport will match only if there are BOTH port and transport parameters contained in the SIP URI.

SIP URI Example Description	Equivalent Standard Expression
7-digit number@ Any Domain	sip:[0-9]{7}@(.*)
7-digit number@ IP Address	sip:[0-9]{7}@12.34.56.78
7-digit number@ Domain	sip:[0-9]{7}@sip_domain.com
North American long-distance number @ Any Domain	sip:1[2-9][0-9]{9}@(.*)
North American long-distance number @ IP Address	sip:1[2-9][0-9]{9}@12.34.56.78
North American long-distance number @ Domain	sip:1[2-9][0-9]{9}@sip_domain.com
Toll-free number: 1+800+7 digits @ Any Domain	sip:18(00 66 77 88)[0-9]{7}@(.*)
Toll-free number: 1+800+7 digits @ IP Address	sip:18(00 66 77 88)[0-9]{7}@12.34.56.78
Toll-free number: 1+800+7 digits @ Domain	sip:18(00 66 77 88)[0-9]{7}@sip_domain.com
Local 7-digit number, beginning with optional 9 @ Any Domain	sip:9?[0-9]{7}@(.*)
Local 7-digit number, beginning with optional 9 @ IP Address	sip:9?[0-9]{7}@12.34.56.78
Local 7-digit number, beginning with optional 9 @ Domain	sip:9?[0-9]{7}@sip_domain.com
4-digit extension starting with 5 @ Any Domain	sip:5[0-9]{3}@(.*)
4-digit extension starting with 5 @ IP Address	sip:5[0-9]{3}@12.34.56.78
4-digit extension starting with 5 @ Domain	sip:5[0-9]{3}@sip_domain.com
4-digit number not starting with 36 @ Any Domain	sip:(?!36)[0-9]{4}@(.*)
4-digit number not starting with 36 @ IP Address	sip:(?!36)[0-9]{4}@12.34.56.78
4-digit number not starting with 36 @ Domain	sip:(?!36)[0-9]{4}@sip_domain.com
Remove Prefix "1613" on Any Username @ Any Domain	sip:1613(.*)@(.*)
Remove Prefix "1613" on Any Username @ IP Address	sip:1613(.*)@12.34.56.78
Remove Prefix "1613" on Any Username @ Domain	sip:1613(.*)@sip_domain.com
Remove Prefix "1613" on 11-digit number@ Any Domain	sip:1613([0-9]{7})@(.*)
Remove Prefix "1613" on 11-digit number@ IP Address	sip:1613([0-9]{7})@12.34.56.78
Remove Prefix "1613" on 11-digit number@ Domain	sip:1613([0-9]{7})@sip_domain.com
Remove optional Prefix "+" on Any Username @ Any Domain	sip:\+?(.*)@(.*)
Remove optional Prefix "+" on Any Username @ IP Address	sip:\+?(.*)@12.34.56.78
Remove optional Prefix "+" on Any Username @ Domain	sip:\+?(.*)@sip_domain.com
Any Username @ Any Domain	sip:(.*)@(.*)
Any Username @ IP Address	sip:(.*)@12.34.56.78
Any Username @ Domain	sip:(.*)@sip_domain.com
Any Username @ Any Domain with Port	sip:(.*)@(.*):5060
Any Username @ IP Address with Port	sip:(.*)@12.34.56.78:5060
Any Username @ Domain with Port	sip:(.*)@sip_domain.com:5060
Any Username @ Any Domain with Port and Transport	sip:(.*)@(.*):5060;transport=UDP
Any Username @ IP Address with Port and Transport	sip:(.*)@12.34.56.78:5060;transport=UDP
Any Username @ Domain with Port and Transport	sip:(.*)@sip_domain.com:5060;transport=UDP

Regular Expressions in the Forward To

The purpose of the Forward To attribute in the Dial Plan is to define where to send the SIP traffic. A specific destination SIP URI address is defined to forward the call to. The user and domain portions of the SIP URI are statically defined to ensure that SIP traffic is relayed to the correct destination.

We may enter here regular expressions to the dial plan, used to define where and how the firewall should forward the request using the dial plan.

A regular expression refers to regular expression sub-expressions on the corresponding row in the MAtching Request-URI table.

Sub-expressions are numbered in the order of their starting parenthesis and referred to as ***\$number***

In the expression expression **(sip:(.+))@sangoma.com**, which matches any Request URI like sip:user@sangoma.com, there are 2 referablesub-expressions:

1. **sip:user** - which is referred to as **\$1**
2. **user** - which is referred to as **\$2**

We can always refer to the entire Request URI with **\$0**, as long as the match in the Matching Request URI table was made using a regular expression.

We may define lines in the dial plan that lacks a **Forward** definition. This becomes useful in case when you forward by ENUM.

SIP URI Example Description	Equivalent Standard Expression
911 @ IP Address	sip:911@12.34.56.78
911 @ Domain	sip:911@sip_domain.com
911 or 411 @ IP Address	sip:911 411@12.34.56.78
911 or 411 @ Domain	sip:911 411@sip_domain.com
7-digit number @ IP Address	sip:9630933@12.34.56.78
7-digit number @ Domain	sip:9630933@sip_domain.com
North American long-distance number @ IP Address	sip:16139630933@12.34.56.78
North American long-distance number @ Domain	sip:16139630933@sip_domain.com
Toll-free number: 1+800+7 digits @ IP Address	sip:18668090002@12.34.56.78
Toll-free number: 1+800+7 digits @ Domain	sip:18668090002@sip_domain.com
4-digit extension @ IP Address	sip:5177@12.34.56.78
4-digit extension @ Domain	sip:5177@sip_domain.com
Use Stored Variable @ IP Address	sip:\$1@12.34.56.78
Use Stored Variable @ Domain	sip:\$1@sip_domain.com
Use Stored Variable with B2BUA @ IP Address	sip:\$1@12.34.56.78;b2bua
Use Stored Variable with B2BUA @ Domain	sip:\$1@sip_domain.com;b2bua
Use Stored Variable with Port @ IP Address	sip:\$1@12.34.56.78:5060
Use Stored Variable with Port @ Domain	sip:\$1@sip_domain.com:5060
Use Stored Variable with Port and Transport @ IP Address	sip:\$1@12.34.56.78:5060;transport=UDP
Use Stored Variable with Port and Transport @ Domain	sip:\$1@sip_domain.com:5060;transport=UDP
Use To Header in Request URI @ IP Address	sip:\${to.user}@12.34.56.78
Use To Header in Request URI @ Domain	sip:\${to.user}@sip_domain.com
Use To Header in Request URI and To Host in Domain and send to specified address	sip:\${to.user}@\${to.host};maddr=12.34.56.78 sip:\${to.user}@\${to.host};maddr=sip_domain.com
Add +1 in front of To Header in Request URI @ IP Address	sip:+1\${to.user}@12.34.56.78
Add +1 in front of To Header in Request URI @ Domain	sip:+1\${to.user}@sip_domain.com