

Network Working Group
Request for Comments: 3261
Obsoletes: 2543
Category: Standards Track

J. Rosenberg
dynamicsoft
H. Schulzrinne
Columbia U.
G. Camarillo
Ericsson
A. Johnston
WorldCom
J. Peterson
Neustar
R. Sparks
dynamicsoft
M. Handley
ICIR
E. Schooler
AT&T
June 2002

SIP: Session Initiation Protocol

Status of this Memo

This document specifies an Internet standards track protocol for the Internet community, and requests discussion and suggestions for improvements. Please refer to the current edition of the "Internet Official Protocol Standards" (STD 1) for the standardization state and status of this protocol. Distribution of this memo is unlimited.

Copyright Notice

Copyright (C) The Internet Society (2002). All Rights Reserved.

Abstract

This document describes Session Initiation Protocol (SIP), an application-layer control (signaling) protocol for creating, modifying, and terminating sessions with one or more participants. These sessions include Internet telephone calls, multimedia distribution, and multimedia conferences.

SIP invitations used to create sessions carry session descriptions that allow participants to agree on a set of compatible media types. SIP makes use of elements called proxy servers to help route requests to the user's current location, authenticate and authorize users for services, implement provider call-routing policies, and provide features to users. SIP also provides a registration function that allows users to upload their current locations for use by proxy servers. SIP runs on top of several different transport protocols.

Table of Contents

1	Introduction	8
2	Overview of SIP Functionality	9
3	Terminology	10
4	Overview of Operation	10
5	Structure of the Protocol	18
6	Definitions	20
7	SIP Messages	26
7.1	Requests	27
7.2	Responses	28
7.3	Header Fields	29
7.3.1	Header Field Format	30
7.3.2	Header Field Classification	32
7.3.3	Compact Form	32
7.4	Bodies	33
7.4.1	Message Body Type	33
7.4.2	Message Body Length	33
7.5	Framing SIP Messages	34
8	General User Agent Behavior	34
8.1	UAC Behavior	35
8.1.1	Generating the Request	35
8.1.1.1	Request-URI	35
8.1.1.2	To	36
8.1.1.3	From	37
8.1.1.4	Call-ID	37
8.1.1.5	CSeq	38
8.1.1.6	Max-Forwards	38
8.1.1.7	Via	39
8.1.1.8	Contact	40
8.1.1.9	Supported and Require	40
8.1.1.10	Additional Message Components	41
8.1.2	Sending the Request	41
8.1.3	Processing Responses	42
8.1.3.1	Transaction Layer Errors	42
8.1.3.2	Unrecognized Responses	42
8.1.3.3	Vias	43
8.1.3.4	Processing 3xx Responses	43
8.1.3.5	Processing 4xx Responses	45
8.2	UAS Behavior	46
8.2.1	Method Inspection	46
8.2.2	Header Inspection	46
8.2.2.1	To and Request-URI	46
8.2.2.2	Merged Requests	47
8.2.2.3	Require	47
8.2.3	Content Processing	48
8.2.4	Applying Extensions	49
8.2.5	Processing the Request	49

8.2.6	Generating the Response	49
8.2.6.1	Sending a Provisional Response	49
8.2.6.2	Headers and Tags	50
8.2.7	Stateless UAS Behavior	50
8.3	Redirect Servers	51
9	Canceling a Request	53
9.1	Client Behavior	53
9.2	Server Behavior	55
10	Registrations	56
10.1	Overview	56
10.2	Constructing the REGISTER Request	57
10.2.1	Adding Bindings	59
10.2.1.1	Setting the Expiration Interval of Contact Addresses	60
10.2.1.2	Preferences among Contact Addresses	61
10.2.2	Removing Bindings	61
10.2.3	Fetching Bindings	61
10.2.4	Refreshing Bindings	61
10.2.5	Setting the Internal Clock	62
10.2.6	Discovering a Registrar	62
10.2.7	Transmitting a Request	62
10.2.8	Error Responses	63
10.3	Processing REGISTER Requests	63
11	Querying for Capabilities	66
11.1	Construction of OPTIONS Request	67
11.2	Processing of OPTIONS Request	68
12	DIALOGS	69
12.1	Creation of a Dialog	70
12.1.1	UAS behavior	70
12.1.2	UAC Behavior	71
12.2	Requests within a Dialog	72
12.2.1	UAC Behavior	73
12.2.1.1	Generating the Request	73
12.2.1.2	Processing the Responses	75
12.2.2	UAS Behavior	76
12.3	Termination of a Dialog	77
13	Initiating a Session	77
13.1	Overview	77
13.2	UAC Processing	78
13.2.1	Creating the Initial INVITE	78
13.2.2	Processing INVITE Responses	81
13.2.2.1	1xx Responses	81
13.2.2.2	3xx Responses	81
13.2.2.3	4xx, 5xx and 6xx Responses	81
13.2.2.4	2xx Responses	82
13.3	UAS Processing	83
13.3.1	Processing of the INVITE	83
13.3.1.1	Progress	84
13.3.1.2	The INVITE is Redirected	84

13.3.1.3	The INVITE is Rejected	85
13.3.1.4	The INVITE is Accepted	85
14	Modifying an Existing Session	86
14.1	UAC Behavior	86
14.2	UAS Behavior	88
15	Terminating a Session	89
15.1	Terminating a Session with a BYE Request	90
15.1.1	UAC Behavior	90
15.1.2	UAS Behavior	91
16	Proxy Behavior	91
16.1	Overview	91
16.2	Stateful Proxy	92
16.3	Request Validation	94
16.4	Route Information Preprocessing	96
16.5	Determining Request Targets	97
16.6	Request Forwarding	99
16.7	Response Processing	107
16.8	Processing Timer C	114
16.9	Handling Transport Errors	115
16.10	CANCEL Processing	115
16.11	Stateless Proxy	116
16.12	Summary of Proxy Route Processing	118
16.12.1	Examples	118
16.12.1.1	Basic SIP Trapezoid	118
16.12.1.2	Traversing a Strict-Routing Proxy	120
16.12.1.3	Rewriting Record-Route Header Field Values	121
17	Transactions	122
17.1	Client Transaction	124
17.1.1	INVITE Client Transaction	125
17.1.1.1	Overview of INVITE Transaction	125
17.1.1.2	Formal Description	125
17.1.1.3	Construction of the ACK Request	129
17.1.2	Non-INVITE Client Transaction	130
17.1.2.1	Overview of the non-INVITE Transaction	130
17.1.2.2	Formal Description	131
17.1.3	Matching Responses to Client Transactions	132
17.1.4	Handling Transport Errors	133
17.2	Server Transaction	134
17.2.1	INVITE Server Transaction	134
17.2.2	Non-INVITE Server Transaction	137
17.2.3	Matching Requests to Server Transactions	138
17.2.4	Handling Transport Errors	141
18	Transport	141
18.1	Clients	142
18.1.1	Sending Requests	142
18.1.2	Receiving Responses	144
18.2	Servers	145
18.2.1	Receiving Requests	145

18.2.2	Sending Responses	146
18.3	Framing	147
18.4	Error Handling	147
19	Common Message Components	147
19.1	SIP and SIPS Uniform Resource Indicators	148
19.1.1	SIP and SIPS URI Components	148
19.1.2	Character Escaping Requirements	152
19.1.3	Example SIP and SIPS URIs	153
19.1.4	URI Comparison	153
19.1.5	Forming Requests from a URI	156
19.1.6	Relating SIP URIs and tel URLs	157
19.2	Option Tags	158
19.3	Tags	159
20	Header Fields	159
20.1	Accept	161
20.2	Accept-Encoding	163
20.3	Accept-Language	164
20.4	Alert-Info	164
20.5	Allow	165
20.6	Authentication-Info	165
20.7	Authorization	165
20.8	Call-ID	166
20.9	Call-Info	166
20.10	Contact	167
20.11	Content-Disposition	168
20.12	Content-Encoding	169
20.13	Content-Language	169
20.14	Content-Length	169
20.15	Content-Type	170
20.16	CSeq	170
20.17	Date	170
20.18	Error-Info	171
20.19	Expires	171
20.20	From	172
20.21	In-Reply-To	172
20.22	Max-Forwards	173
20.23	Min-Expires	173
20.24	MIME-Version	173
20.25	Organization	174
20.26	Priority	174
20.27	Proxy-Authenticate	174
20.28	Proxy-Authorization	175
20.29	Proxy-Require	175
20.30	Record-Route	175
20.31	Reply-To	176
20.32	Require	176
20.33	Retry-After	176
20.34	Route	177

Explore Litigation Insights



Docket Alarm provides insights to develop a more informed litigation strategy and the peace of mind of knowing you're on top of things.

Real-Time Litigation Alerts



Keep your litigation team up-to-date with **real-time alerts** and advanced team management tools built for the enterprise, all while greatly reducing PACER spend.

Our comprehensive service means we can handle Federal, State, and Administrative courts across the country.

Advanced Docket Research



With over 230 million records, Docket Alarm's cloud-native docket research platform finds what other services can't. Coverage includes Federal, State, plus PTAB, TTAB, ITC and NLRB decisions, all in one place.

Identify arguments that have been successful in the past with full text, pinpoint searching. Link to case law cited within any court document via Fastcase.

Analytics At Your Fingertips



Learn what happened the last time a particular judge, opposing counsel or company faced cases similar to yours.

Advanced out-of-the-box PTAB and TTAB analytics are always at your fingertips.

API

Docket Alarm offers a powerful API (application programming interface) to developers that want to integrate case filings into their apps.

LAW FIRMS

Build custom dashboards for your attorneys and clients with live data direct from the court.

Automate many repetitive legal tasks like conflict checks, document management, and marketing.

FINANCIAL INSTITUTIONS

Litigation and bankruptcy checks for companies and debtors.

E-DISCOVERY AND LEGAL VENDORS

Sync your system to PACER to automate legal marketing.