DRG
Digital Residential Gateway

DRG Dial Plan Guidelines

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1 Introduction

This document provides the Requirement Specification of the dial plan support offered by DRG

1.1 Purpose

This requirement specification describes the support of the DRG for dial plan, as well as the resolution of its conflict other functions supported by the DRG. This document is complementary to 42NET-03-043, DRG Requirement Specification [1].

1.2 Revision History

Rev	Date	Prepared by	Description
PA1	050830	Shu Shen	First issue
PA4	060320	Shu Shen	Add extensions to standard digit map
PA5	060414	Shu Shen	Reduced requirements for R2H
PA6	060717	Shu Shen	Change default dial plan, add hot-line.
A	090930	David Evans	PF document created

1.3 References and Applicable Standards

[1] 42NET-03-043, DRG Requirement Specification, PA4, 2004

[2] RFC3435, Media Gateway Control Protocol (MGCP), Version 1.0, 2003

2 Dial Plan

2.1 Dial plan and the standard digit map syntax

In H.323, a gatekeeper (or a proxy in SIP) can ask the DRG to collect dialed digits from the endpoints, such as the called party‟s phone numbers, access codes, credit card numbers, or other numbers requested by call control services.

In order to reduce the number of interactions, it is preferable to accumulate the dialed numbers in a buffer, and to transmit them in a single message from the DRG to the gatekeeper or the proxy.

The problem with this accumulation approach, however, is that it is hard for the DRG to predict how many numbers it needs to accumulate before transmission. For example, the dial plan from our desk phone may be as follows:

xxxx	Internal extensions
90+digits	Long distance numbers
900+digits	International numbers
9+up to 8 digits	Local fixed-line numbers
913+digits	Local mobile numbers

The solution to this problem is to load the DRG with a digit map that corresponds to the dial plan [2]. This digit map is expressed using a syntax derived from the UNIX system command, **egrep**. For example, the dial plan described above results in the following digit map:

```
( [0-8]xxx | 90[1-9]x.T | 900x.T | 9[2-9]xxxxxxx | 91[0-24-9]xxxxxx |
913x. )
```

The formal syntax of the digit map is described in the MGCP protocol [2] (see Appendix A for an exception).

A digit map, according to this syntax, is defined either by a (case insensitive) "string" or by a list of strings. Each string in the list is an alternative numbering scheme, specified either as a set of digits or timers, or as an expression over which the DRG will attempt to find a shortest possible match.

The following constructs can be used in each numbering scheme:

Digit	A digit from "0" to "9"
Timer	The symbol "T" matching a timer expiry
Letter	A digit, a timer, or one of the symbols "A", "B", "C", "D", "#", or "*"
xxxx	Internal extensions
90+digits	Long distance numbers
900+digits	International numbers
9+up to 8 digits	Local fixed-line numbers
913+digits	Local mobile numbers

A timer is only allowed if it appears in the last position in a string (e.g., 12T3 is not valid). Each string is an alternate numbering scheme.

The DRG will process the dial plan by comparing the current dial string against the dial plan:

- If the result is under-qualified (partial matches at least one entry) then it will do nothing further but wait until a full match is reached.
- If the result is over-qualified (no further digits could possibly produce a match) then it aborts the dial attempt and notifies end-user with an audio signal.
- Only a full match will trigger to initiate a call, by sending the dialed information to a gatekeeper.

The Timer T is activated when it is all that is required to produce a match. The period of timer T is 4 seconds by default (configurable). For example a dial plan of `( xxxT | xxxxx )` will match immediately if 5 digits are entered, it will also match after a 4 second pause when 3 digits are entered.

The digit map is the only standard-compliant way to specify what number and how many dialed digits the DRG shall collect before sending the dialed sequence to the gatekeeper.

The digit map can be a string up to 150 characters, and it is possible to configure the digit map from the DRG Element Manager, the DRG internal web server and the INI file.

The DRG uses `(xx.#|xx.T)` as the default digit map.

2.2 Extensions to standard digit map syntax

In addition to the standard digit map as described in Section 2.1, several useful extensions are defined in this section.

2.2.1 Substring substitution

A substring of keys can be automatically replaced with a different substring using an angle bracket notation:

```
„<“ dialed substring „:“ transmitted-substring „>“
```

For example, “<8:1860>xxx” would match “8123” and transmit “1860123”.

The DRG shall also support a “reverse” substitution from the transmitted-string to dialed substring. For example, when “1860123” is received as the caller ID, DRG shall look up the digit map “<8:1860>xxx” and display the caller ID as “8123”.

NOTE: In R2H release, the substitution is limited to prefix only. That is, the sub-string to be substituted can only be prefixes.

2.2.2 Configuring hot-line function

The prefix-substitution function can be used to enable flexible hot-line function in the following format as part of the dial plan:

```
<:NUMBER>T
```

where NUMBER is the hotline number and T enables the configuration of delay. If no number is to be dialed, then the pattern can simply be:

```
T
```

Below is an example dial plan that enables hotline function along with normal dialing:

```
(xx.#|xx.T|<:1860>T)
```

Substrings xx.# and xx.T are normal dial patterns, while <:1860>T enables hotline. If DIALTIMEOUT=4 (i.e., T=4), then the user will be able to dial any number that matches (xx.#|xx.T) within 4 seconds after off-hook. If no key is pressed within that duration, then hotline is activated and the number 1860 will be dialed. DIALTIMEOUT can be set as zero such that the hotline is triggered immediately.

2.2.3 Configurable inter-digit timers

NOTE: This section will not be implemented in R2H release.

There are two configurable parameters that allow more flexibly customizing the dial plan functionality than the standard T parameter:

- Inter-digit long timer (L) Specifies the maximum time (in seconds) allowed between dialed digits, when no candidate digit string is as yet complete. By default, L=4.

- Inter-digit short timer (S) Specifies the maximum time (in seconds) allowed between dialed digits, when at least one candidate digit string is complete as dialed. By default, S=0.

The default values of the above parameters (L=4 and S=0) make DRG work in the same way as the default value of the standard T timer (T=4).

There are several ways to override the inter-digit timers:

- Master override: The long and short inter-digit timers can be changed in the dial plan by preceding the entire dial plan with the following syntax: Long inter-digit timer: „L‟ „:‟delay-value„,‟ Short inter-digit timer: „S‟ „:‟delay-value„,‟ For example, “L:8,(…)” would set the inter-digit long timeout to 8 seconds; and “L:8:S:4,(…)” would set both the long and short timeout values.

- Local override: The long and short inter-digit timeout values can be changed for a particular sequence. For example, (9xxx.L5|0xxS1) will set the long timeout to 5 seconds for sequence “9xxx” and the short timeout to 1 second for the sequence “0xx”.

3 Call completion

Call completion means allowing user to skip the timer period T after finished dialing, by ending the sequence with „#“ (no other character is valid for this feature). The „#“ itself is removed from the dial string before is sent. The preceding digits can be any letters except „#“.

The call completion function can be configured ON/OFF from the DRG Element Manager, the DRG internal web server and the INI file.

When configured ON, the call completion function overrides the digit map even if the digit map requires a sequence with ending „#“ to be sent to the gatekeeper. See Section 5 for more information on solving conflicts.

4 Internal Class-5 services

Internal class 5 services are defined by Req. 2.2.2 – Req. 2.2.4 in [1]. They are configurable from the Element Manager and from the INI file.

The following table is the excerpt from [1] that lists the keypad sequences used by default in support of internal Class-5 services. Note that the „R‟ letter is equivalent to the „F‟ letter and both stand for the event of user pressing the hook flash.

End-user action	**Default keypad sequence**
HOLD	R0
DROP	R1
FLASH	R2
CONFERENCE	R3
CONFERENCE DROP	R5
CW ACTIVATION	*43#
CW DE-ACTIVATION	#43#
CW STATUS CHECK	*#43#

When the internal Class-5 services is configured ON, and if the keypad sequence for service commands is set to a value conflicting with the digit map, these commands overrides the digit map as described in Section 5.

Note that the configurable command sequence of internal class 5 services MUST start with „*‟, or „#‟, or „R‟.

5 Overriding rules for solving conflicts

Upon a keypad input event, the following rules will be examined one-by-one in the order they‟re given here and processed if applicable.

1. Rule 1

   If the DRG is configured to use the internal Class-5 service, any keypad sequences matches those configured as the commands of Class-5 services are handled as internal Class-5 commands; no further rules will be processed.

   If the DRG is not configured to use the internal Class-5 service, no action will be taken.

2. Rule 2

   If the call completion function is enabled, any keypad sequence with an ending „#‟ but not handled in Rule 1 with be handled by the call completion function and no further rules will be processed.

For example, given

- the Class-5 service configured ON and the command sequence for checking call-waiting status defined as *#43#, and
- the call completion function configured ON, and
- the digit map is defined as ([#*]x.[#*]),

then the keypad sequences are handled as follows:

Keypad sequence	**Action**
*#43#	Class-5 command, handled internally. The sequence is not sent to the gatekeeper
43#	Not Class-5 command, handled for call completion, 43 is sent to the gatekeeper
32093	Matching digit map, send to the gatekeeper immediately upon the last *

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