

Technical Note

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In this guide we will configure Duo Push along with username and password validation through Active Directory to implement a two factor authentication for our sample application. In this example, the authentication used with the application server is Kerberos Constrained Delegation (KCD).



Once configured the user flow for accessing the application will look like this:



The flow is outlined below:

- 1. The user provides their username and password.
- 2. The LoadMaster queries the Duo RADIUS proxy for the user.
- 3. A connection to Duo Security is established.
- 4. An authentication request is sent to the user's Duo app.
- 5. The user validates the request on the app.

6. The LoadMaster performs pre-authentication using the supplied username and password with the Local Domain Controller.

- 7. Authentication is successful.
- 8. The resource is accessed through Kerberos Constrained Delegation.

1.1 Related Firmware Version

Published with LMOS version 7.2.48.4 LTS. This document has not required substantial changes since 7.2.48.4 LTS. However, the content is in sync with the latest LoadMaster LTS firmware.

1.2 Add an Application to Duo

First you must log in to the Duo Admin Panel and navigate to **Applications > Protect an application**. Click **Radius**. Then, follow the remaining steps in the sub-sections below.

1.2.1 Install Duo Auth Proxy on Linux

The following Duo guide outlines the steps on installing Duo Authentication Proxy: <u>Authentication</u> <u>Proxy - Reference</u>.

Below is an example configuration using CentOS with Wget installed:

yum install gcc make libffi-devel perl zlib-devel wget https://dl.duosecurity.com/duoauthproxy-latest-src.tgz tar xzf duoauthproxy-latest-src.tgz cd duoauthproxy-5.1.1-7484191-src/ make cd duoauthproxy-build/ ./install At this point step through the prompts, for example:

In what directory do you wish to install the Duo Authentication Proxy?



[/opt/duoauthproxy]

Enter the name of a user account under which the Authentication Proxy should be run. We recommend a non-privileged and locked down account.

Or you can press <Enter> and our default locked down user will be created for you:

[duo_authproxy_svc]

Enter the name of a group under which the Authentication Proxy logs will be readable. Or press <Enter> and a default group will be created for you:

[duo_authproxy_grp]

1.2.2 Create an Application in Duo

To create an application in Duo, follow these steps:

DU O	Q. Search for users, groups, applications, or devices Barglee ID: 3770-8332-13 Barry Gleeson ~
Dashboard	Daahboard > Acplications > Protect an Application
Applications	Protect an Application
Protect an Application Users	Add an application that you'd like to protect with Duo two-factor authentication. You can start with a small "proof-of-concept" installation — it takes just a few minutes, and you're the only one that will see it, until you decide to add others.
Groups	Documentation: Getting Started C
2FA Devices	Choose an application below to get started.
Reports	raduaj

1. Log in to Duo and go to **Dashboard > Applications > Protect an Application** and search for **radius**.

2. Set the app Name and Users that can access the app.

DUO-StockApplication			
See the RADIUS documentation 🗹 to integrate Duo into your RADIUS-enabled platform.			
Details			
Integration key	DIS1YSDW3KSFRKLX2W1S	select	
Secret key		select	
	Don't write down your secret key or share it with anyone.		
API hostname	api-e0c2593d.duosecurity.com	select	

3. Copy the values for:

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- Integration key
- Secret key
- API hostname

1.2.3 Configure Duo Auth Proxy and Start

To configure the Duo auth proxy, you must modify the **authproxy.cfg** file. For example:

vi /opt/duoauthproxy/conf/authproxy.cfg

Below is an example configuration containing the details copied above in addition to the IP address of the LoadMaster which is the RADIUS Client (**radius_ip_1**) and the RADIUS password to use (**radius_secret_1**).

In our case we are only doing one validation step with Duo so use:

```
client= duo_only_client
```

[main] test_connectivity_on_startup=true [duo_only_client] [radius_server_auto] ikey=DIS1YSDW3KSFRKLX2W1S skey=eEqgB1BUP7dfasdasdasdhAPDZOSwLvLp api_host=api-e0c2593d.duosecurity.com radius_ip_1=10.1.151.61 radius_secret_1=duoradius client=duo_only_client port=1812

1.2.3.1 Add a Firewall Rule to Allow Inbound RADIUS

This may vary across Linux OSS:

firewall-cmd --add-service=radius --permanent

sudo firewall-cmd --reload

1.2.3.2 Start Duo Auth Proxy

Whenever changes are made the configuration you must stop and start the process.

[root@localhost log]# /opt/duoauthproxy/bin/authproxyctl start

Running The Duo Authentication Proxy Connectivity Tool. This may take several minutes... [info] Testing section 'main' with configuration:

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[info] {'test_connectivity_on_startup': 'true'} [info] There are no configuration problems [info] ------[info] Testing section 'duo_only_client' with configuration: [info] {} [info] There are no configuration problems [info] ------[info] Testing section 'radius_server_auto' with configuration: [info] {'api_host': 'api-e0c2593d.duosecurity.com', 'client': 'duo_only_client', 'ikey': 'DIS1YSDW3KSFRKLX2W1S', 'port': '1812', 'radius_ip_1': '10.1.151.61', 'radius_secret_1': '****', 'skey': '*****[40]'} [info] There are no configuration problems [info] ------[info] Testing section 'main' with configuration: [info] {'test_connectivity_on_startup': 'true'} [info] There are no connectivity problems with the section. [info] ------[info] Testing section 'duo_only_client' with configuration: [info] {} [info] No testing to be done for section. [info] ------[info] Testing section 'radius_server_auto' with configuration: [info] {'api_host': 'api-e0c2593d.duosecurity.com', 'client': 'duo_only_client', 'ikey': 'DIS1YSDW3KSFRKLX2W1S', 'port': '1812', 'radius_ip_1': '10.1.151.61', 'radius_secret_1': '****', 'skey': '*****[40]'} [info] The RADIUS Server has no connectivity problems. [info] ------[info] SUMMARY [info] No issues detected

```
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```



The results have also been logged in /opt/duoauthproxy/log/connectivity_tool.log Checking updates for Duo Authentication Proxy...

[info] No updates detected. Your Duo Authentication Proxy is up to date.

1.2.4 Configure the LoadMaster

Create an SSO domain using LDAP and RADIUS. To do this, follow the steps below:

- 1. In the LoadMaster User Interface (UI), go to **Certificates & Security > LDAP Configuration**.
- 2. Specify the name of the LDAP endpoint configuration and click Add.

LDAP Endpoint 10.1.151.250			
LDAP Server(s)	10.1.151.250 Set LDAP Server(s)		
LDAP Protocol	Unencrypted V		
Validation Interval	60 Set Interval		
Referral Count	0 Set Referral Count		
Server Timeout	5 Set Timeout		
Admin User	administrator@exampl Set Admin User		
Admin User Password	••••• Set Admin User Password		

- 3. Configure the settings of the LDAP endpoint as needed.
- 4. In the LoadMaster UI, go to Virtual Services > Manage SSO.

Client Side Single Sign On Configurations		
Add new Client Side Configuration		
Add		

5. Enter the name of the SSO configuration in the text box under **Add new Client Side Configuration** and click **Add**.



Domain LDAPDUO	
Authentication Protocol	RADIUS and LDAP
LDAP Endpoint	10.1.151.250 V Manage LDAP Configuration
RADIUS Server(s)	10.1.151.250 Set RADIUS Server(s)
RADIUS Shared Secret	••••• Set Shared Secret
Send NAS Identifier	
Domain/Realm	example.com Set Domain/Realm Name
Logon Format (Phase 1 RADIUS)	Principalname 🗸
Logon Format (Phase 2 LDAP)	Principalname 🗸
Logon Transcode	Disabled V
Failed Login Attempts	0 Set Failed Login Attempts
	Public - Untrusted Environment Private - Trusted Environment
	900 Set Idle Time 900 Set Idle Time
Session Timeout	1800 Set Max Duration 28800 Set Max Duration
	Use for Session Timeout: idle time 🗸
Use LDAP Endpoint for Healthcheck	
Test User	Set Test User
Test User Password	Set Test User Password

- 6. Select **RADIUS and LDAP** as the **Authentication Protocol**.
- 7. Select the relevant LDAP Endpoint.
- 8. Configure the other settings as needed.
- 9. In the LoadMaster UI, go to Virtual Services > View/Modify Services.
- 10. Click Modify on the relevant Virtual Service (or add a new one).
- 11. Expand the **ESP Options** section.

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▼ ESP Options	
Enable ESP	
ESP Logging	User Access: 🗹 Security: 🗹 Connection: 🗹
Client Authentication Mode	Form Based 🗸
SSO Domain	LDAPDUO V
Allowed Virtual Hosts	*.* Set Allowed Virtual Hosts
Allowed Virtual Directories	/* Set Allowed Directories
Pre-Authorization Excluded Directories	Set Excluded Directories
Permitted Groups	Set Permitted Groups
Permitted Group SID(s)	Set Permitted Group SIDs
Include Nested Groups	
Multi Domain Permitted Groups	
Steering Groups	Set Steering Groups
SSO Image Set	Dual Factor Authentication
SSO Greeting Message	Set SSO Greeting Message
Logoff String	/logoff Set SSO Logoff String
Display Public/Private Option	
Disable Password Form	
Enable Captcha	
Use Session or Permanent Cookies	Session Cookies Only
User Password Change URL	Set Password Change URL
Server Authentication Mode	Basic Authentication 🗙

- 12. Select the Enable ESP check box.
- 13. Select the relevant SSO Domain.
- 14. Configure any other settings as needed.

1.3 Create the Duo Image Set

In this example the dual factor custom image set is updated to include an image prompt for the user to authorize access using the app. You can customize this to use your chosen image. In this example, the custom image form is modified to include just one Username and one Password input field and an image is added to indicate to the user that they must approve access in response to the initiated Duo push. The image being displayed in this example is **PhoneApprove.png** and must be added to the custom image set manifest directory (as described in the **Add the Image Name to the Manifest** section). For details on how to modify a custom image set, refer to the following document: Custom Authentication Form Technical Note.

1.3.1 Modify Im_initial_dfa.html

Modify the **lm_initial_dfa.html** file to add the following HTML:

```
<script type="text/javascript">
```

function picture(){

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```
var pic = "/lm_auth_proxy?LMimage=PhoneApprove.png"
document.getElementById('bigpic').src = pic.replace('90x90', '225x225');
document.getElementById('bigpic').style.display='block';
```

}

</script>

```
<script>
function hidebutton(button){
button.style.visibility = "hidden";
}
```

</script>

Change Submit Action:

Before

```
<form action="/lm_auth_proxy?LMLogon" method="post" id="logonForm" autocomplete="off" onSubmit="return save_usernames_dfa(this.dusername, this.username, this.pubpriv);">
```

After

```
<form action="/lm_auth_proxy?LMLogon" method="post" id="logonForm" autocomplete="off" onSubmit="return save_usernames_dfa(this.dusername, this.dusername, this.pubpriv);">
```

Before

```
<label for="remotecreds"><b>Remote Credentials</b></label>
```

<label for="dpasscode">Passcode:</label>

Before

```
<input class="txt" id="dpasscode" type="password" name="dpasscode" autocomplete=off
required maxlength=128 />
```

After

```
<input class="txt" id="dpasscode" value="XXX" type="hidden" name="dpasscode"
autocomplete=off maxlength=128 />
```

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Before

```
<label for="interncreds"><b>Internal Credentials</b></label>
<label for="username">Internal Username:</label>
```

After

<label for="username">Ignore Username:</label>

Before

<input type="submit" value="Log On" name="submit" />

After

```
<input type="submit" value="Log On" onclick="hidebutton(this);picture();" name="submit" />
```

```
<label for="interncreds"><b><img max-
width:45px; max-height:45px; id="bigpic" src="bigpic" style="display:none;"
/></b></label>
```

1.3.2 Modify Im_sso.js

Replace all references to username with dusername.

1.3.3 Add the Image Name to the Manifest

Add the image used to the manifest and include in the imageset/Duo directory, for example, **PhoneApprove.png**.

Within the <head> portion of the page, add the following JavaScript to enable dynamic display of the Duo image and hiding of the button once credentials are entered.

```
Add:
<script type="text/javascript">
function picture(){
var pic = "/lm_auth_proxy?LMimage=PhoneApprove.png"
document.getElementById('bigpic').src = pic.replace('90x90', '225x225');
document.getElementById('bigpic').style.display='block';
}
</script>
```

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```
<script>
function hidebutton(button){
button.style.visibility = "hidden";
}
</script>
```

Remove the use of two separate usernames. This enables the same username to be used for both Duo (RADIUS) and LDAP queries.

Replace:

```
<form action="/lm_auth_proxy?LMLogon" method="post" id="logonForm" autocomplete="off" onSubmit="return save_usernames_dfa(this.dusername, this.username, this.pubpriv);">
```

With:

```
<form action="/lm_auth_proxy?LMLogon" method="post" id="logonForm" autocomplete="off" onSubmit="return save_usernames_dfa(this.dusername, this.dusername, this.pubpriv);">
```

Remove the following section because there is no need for separate remote credentials:

```
<label for="remotecreds"><b>Remote Credentials</b></label>
```

Remove the first password field from view.

Replace:

```
<label for="dpasscode">Passcode:</label>
```

With:

Update the RADIUS password to have a pre-populated value which in this case is not used because the RADIUS query requires the username only to trigger the push notification.

Replace:

```
<input class="txt" id="dpasscode" type="password" name="dpasscode" autocomplete=off required maxlength=128 /\!\!>
```

With:

```
<input class="txt" id="dpasscode" value="XXX" type="hidden" name="dpasscode" autocomplete=off maxlength=128 />
```

Remove the second username field:

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<label for="interncreds">Internal Credentials</label>

Remove the displaying of the internal username because we will reuse a single username.

Replace:

<label for="username">Internal Username:</label>

With:

```
<label for="username">Ignore Username:</label>
```

Update the internal password field to simply be called password.

Replace:

```
<label for="password">Internal Password:</label>
```

With:

```
<label for="password">Password:</label>
```

On submit, ensure the Duo image is displayed.

Replace:

```
<input type="submit" value="Log On" name="submit" />
```

With:

```
<input type="submit" value="Log On" onclick="hidebutton(this);picture();" name="submit" />
```

Below is the updated file completed:

<!DOCTYPE html>

<html>

<head>

```
<meta http-equiv="Content-Type" content="text/html; CHARSET=utf-8">
```

<title>Kemp Login Screen</title>

```
<meta content="NOINDEX, NOFOLLOW" name="Robots">
```

```
<link rel="shortcut icon" href="/lm_auth_proxy?LMimage=favicon.ico" type="image/x-icon">
<link href="/lm_auth_proxy?LMimage=kmgstyle.css" type="text/css" rel="stylesheet">
```

<style type="text/css">

body

{

```
font-family:Tahoma,Arial,Helvetica;
```

```
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```



```
font-size:70%;
}
input, button
{
font-family:Tahoma,Arial,Helvetica;
}
.mid
{
font-size:70%;
}
input, button, label, table
{
font-size:100%;
}
</style>
<script>
var xx_msg10 = "Login Failed - The security service has blocked your request. Please
contact your System Administrator.<br>';
var xx_msgl1 = "Login Failed - Please make sure that both your remote and internal
credentials are correct, and then try again.<br>>";
</script>
<script type="text/javascript" src="/lm_auth_proxy?LMimage=lm_sso.js"></script>
<script type="text/javascript">
function picture(){
var pic = "/lm_auth_proxy?LMimage=PhoneApprove.png"
document.getElementById('bigpic').src = pic.replace('90x90', '225x225');
document.getElementById('bigpic').style.display='block';
}
</script>
<script>
function hidebutton(button){
button.style.visibility = "hidden";
}
</script>
</head>
<body style="font-size:100%" onload='sso_setup("%s", "%s", "%s", %s, %s, %s);'>
```



```
<noscript>
<div id="dvErr">
<img src="/lm_auth_proxy?LMimage=kmgerror.gif" alt="">
To use LoadMaster ESP Login, javascript must be enabled in your
browser.
</div>
</noscript>
<form action="/lm_auth_proxy?LMLogon" method="post" id="logonForm" autocomplete="off" onSubmit="return save_usernames_dfa(this.dusername, this.dusername, this.pubpriv);">
<input type="hidden" id="curl" name="curl" value="">
<input type="hidden" id="curlid" name="curlid" value="">
<input type="hidden" id="curlmode" name="curlmode" value="0">
<img src="/lm_auth_proxy?LMimage=esptop.gif">
```

```
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```



```
<span style="display:none" id="expired_msg">Your password has expired.</span>
<span style="display:none" id="exp_p_msg">Password will expire in </span>
<span style="display:none" id="exp_p_numb"></span>
<span style="display:none" id="exp_p_numb_plur"> days</span>
<span style="display:none" id="exp_p_numb_sing"> day</span>
<span id="reset_msg">&nbsp;</span>&nbsp;
<a id="reset_link" href="#">Click Here</a>
<colgroup>
<col class="nowrap">
<col class="w100">
<col>
<input type=radio id=pubr name="pubpriv" value=0 checked="checked">
<label for="pubr">This is a public or shared computer</label>
<input type=radio id=pubp name="pubpriv" value=1>
<label for="pubp">This is a private computer</label>
```

```
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```



```
<label for="dusername">Username:</label>
<input class="txt" id="dusername" name="dusername" type="text"/>
<input class="txt" id="dpasscode" value="XXX" type="hidden" name="dpasscode"
autocomplete=off maxlength=128 />
<label for="username">Ignore Username:</label>
<input class="txt" id="username" name="username" type="text"/>
<label for="password">Password:</label>
<input class="txt" id="password" type="password" name="password" autocomplete=off</pre>
required maxlength=128 />
 
<input type="submit" value="Log On" onclick="hidebutton(this);picture();" name="submit"</pre>
/>
```



```
<label for="interncreds"><b><img max-
width:45px; max-height:45px; id="bigpic" src="bigpic" style="display:none;"
/></b></label>
<div class="g-recaptcha" id=captchabox style="display:none" data-sitekey=""></div></div></div></div></div></div></div></div></div></div></div></div></div></div></div></div></div></div></div></div></div></div></div></div></div></div></div></div></div></div></div></div></div></div></div></div></div></div></div></div></div></div></div></div></div></div></div></div></div></div></div></div></div></div></div></div></div></div></div></div></div></div></div></div></div></div></div></div></div></div></div></div></div></div></div>
Secured by Kemp LoadMaster
© 2002-2020 Kemp Technologies Inc. All rights
reserved.
 
<img src="/lm_auth_proxy?LMimage=espbottom.gif" alt="">
</form>
</body>
</html>
```

2 References



2 References

For further details, refer to the following Duo document: Authentication Proxy - Reference.

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