



Spark View

Administrator's Manual

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1. Overview

Spark View is world's first HTML5 RDP ([Remote Desktop Protocol](#)) client which provides end-users with remote access to following RDP hosts:

- RDP enabled Windows desktops, including: Windows 2000 Server, Windows XP Professional, MCE 2005, Windows Server 2003, Windows Vista Business or Ultimate, Windows Server 2008, Windows 7 Professional, Business or Ultimate, Windows Server 2008, Windows 2012, Windows 10, Windows 2016, Windows 2019.
- Linux desktops with XRDP installed.
- Any virtual machines under Oracle VM VirtualBox (with Remote Desktop Server enabled).

1.1. Features

Spark View is a RDP, VNC, SSH, TELNET, SMB2, SFTP proxy (gateway) with HTML5 client. It use [WebSocket](#), [Canvas](#), Web Audio, local storage etc HTML5 features to implement the Remote Desktop (RDP), RFB (VNC), SSH, SMB2 protocols. It has following advantages compared with traditional (native) clients:

- Zero installation on client side, no Java, no flash, no ActiveX, only HTML and JavaScript.
- Zero maintenance and management on client side. You don't need to worry about if user has installed the newest version of Spark View, JRE or flash player.
- Same interface and experience for final users.
- One solution runs on almost all platforms: Windows, Linux, Mac, iOS, Android, BlackBerry and Playbook OS etc.
- Better performance. It's even faster than native RDP client.
- More features like session recording, printing, session shadowing with multi-cursors etc.
- Control resource access and redirection in one place (Gateway).
- OAuth2, Active Directory, LDAP, RADIUS, Okta integration.
- Connect to Hyper-V console.
- RDP connection pool. Connect to your desktop and RemoteApp instantly. No waiting any more.
- Supports RDP, RFB(VNC), SSH, SFTP, TELNET, SMB2 .
- Seamless integration with F5, Array Networks, Cisco, Juniper, Dell SSL VPN.

RDP features implemented in Spark View:

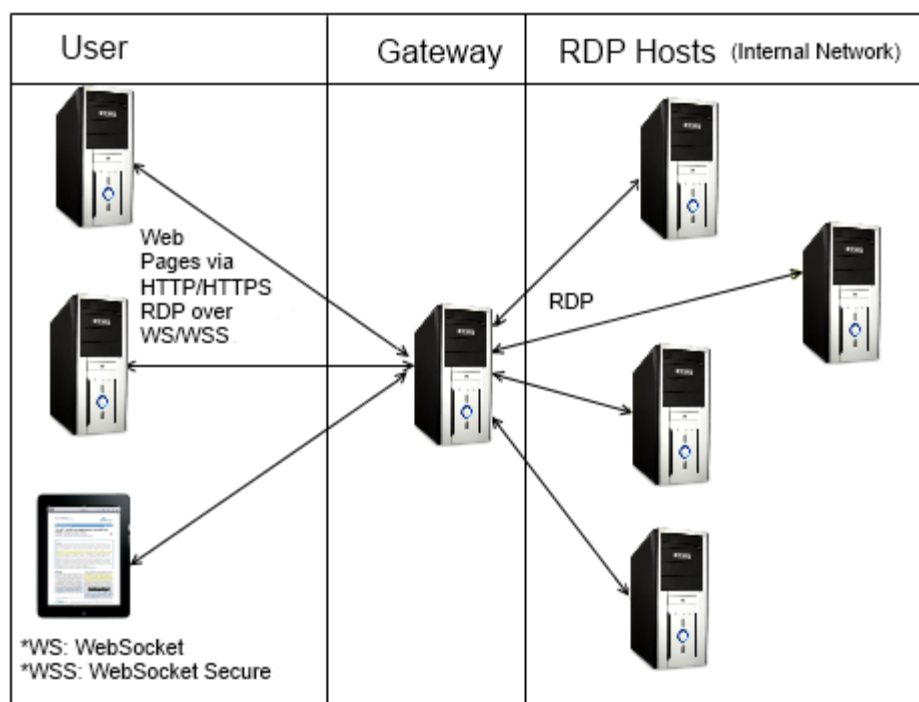
- TLS (SSL over RDP) and NLA (Network Level Authentication). CredSSP version 6 (Microsoft CredSSP updates for CVE-2018-0886);
- RemoteApp. It's the first time that you can use RemoteApp everywhere (on a Mac, iPad, Android etc.).
- RemoteFX (LAN only)
- Touch remoting on Windows 8 and Windows 2012.
- Seamless clipboard redirection which supports plain text, bitmap, JPG, WMF, RTF and HTML formats.
- Easy printing, don't need to install drivers for client side printers.
- Bring sound to local or leave it on remote computer.
- Remote audio recording.
- File downloading and uploading; Gateway side directory sharing.
- Smart card redirection.
- Lossless bitmap compression, give you the best quality you can get.
- Supports Remote Assistance.
- Client side IME support. You can use client side IME directly (Even Microsoft RDC cannot do that).
- International keyboard support.
- VirtualBox RDP video redirection support.
- Supports Multi-Monitor.
- Supports camera redirection.
- Supports scanner redirection.
- Supports native RDP shadowing.

1.2. Architecture

Spark View includes 2 components:

- Gateway, which is a WebSocket server and simple web server.
- Web resources (HTML files, CSS, JavaScript, images), which can be installed on Gateway or any other web servers.

This diagram describes how the components of Spark View work together:



You can also install gateway in RDP host.

1.3. What's the difference

Spark View is quite different compared with other similar solutions:

- It is designed to be a replacement of native client, not a complementary solution.
- It is designed for speed. It's even faster than our Java applet.
- It is feature rich, not feature less compared with native clients.
- Spark View only features:
 - RemoteApp (not Start program on connection)
 - Session Recording/Playback
 - Session Shadowing
 - Hyper-V console connection
 - Network Level Authentication
 - Windows 8 and 2012 with touch remoting support,
 - XRDP (Linux) support
 - RD Web Access Portal Integration

- OpenID integration
- Support both PostScript and PCL printers.
- Support more audio encodings. **80% less bandwidth usage** (when playing audio) compared with other HTML5 solutions
- Client side IME support. You can use client side IME directly (Microsoft RDC doesn't support client side IME).

2. Installation

Gateway is a Java application and can be installed on almost all operational systems. Web resources for Spark View are pure HTML and JavaScript, so it can be installed on Gateway(which is also a web server) or any other web servers.

2.1. Install J2SE Software Development Kit (JDK)

Download the Java 2 Standard Edition (J2SE) JDK, release version 1.8 or later, from:

<http://www.oracle.com/technetwork/java/javase/downloads/index.html>

<https://developers.redhat.com/products/openjdk/download>

<https://www.azul.com/downloads/zulu/>

<http://jdk.java.net/>

<https://aws.amazon.com/corretto/>

NOTE: Downloading the Java Runtime Environment (JRE) instead is not recommended.

Install the JDK according to the instructions included with the release.

Set an environment variable JAVA_HOME to the pathname of the directory into which you installed the SDK release:

```
echo "export JAVA_HOME=/usr/java/default/"> /etc/profile.d/java_home.sh
```

Verify the Java version you are using, run following command in a command prompt:

```
java -version
```

Open JDK 8, 11 and LTS versions are recommended. JRE is not recommended because it's updated automatically and the old version will be uninstalled. Please install JCE 8 if you are using Java 8:

<https://www.oracle.com/technetwork/java/javase/downloads/jce8-download-2133166.html>

If your RDP server has Network Level Authentication enabled, the connection may fail depends on what Java version you are using.

Java 1.8: Please install TLS 1.2 Windows update on Windows 7 and Windows 2008:

<https://support.microsoft.com/en-us/kb/3080079>

2.2. Install as a Windows service

Download Spark Gateway installer for Windows from:

<http://www.remotespark.com/view/SparkGateway-installer.exe>

Install Spark Gateway according the instructions of installer. During the installation, you can choose the JRE/JDK you want user if you have multiple JRE/JDK installed. You can also choose the gateway listening port (default is 8080).

If you have “This app can’t run on your PC” error, you may need to disable Smartscreen functionality and under Windows Updates – Developers: Allow Sideloads Apps.

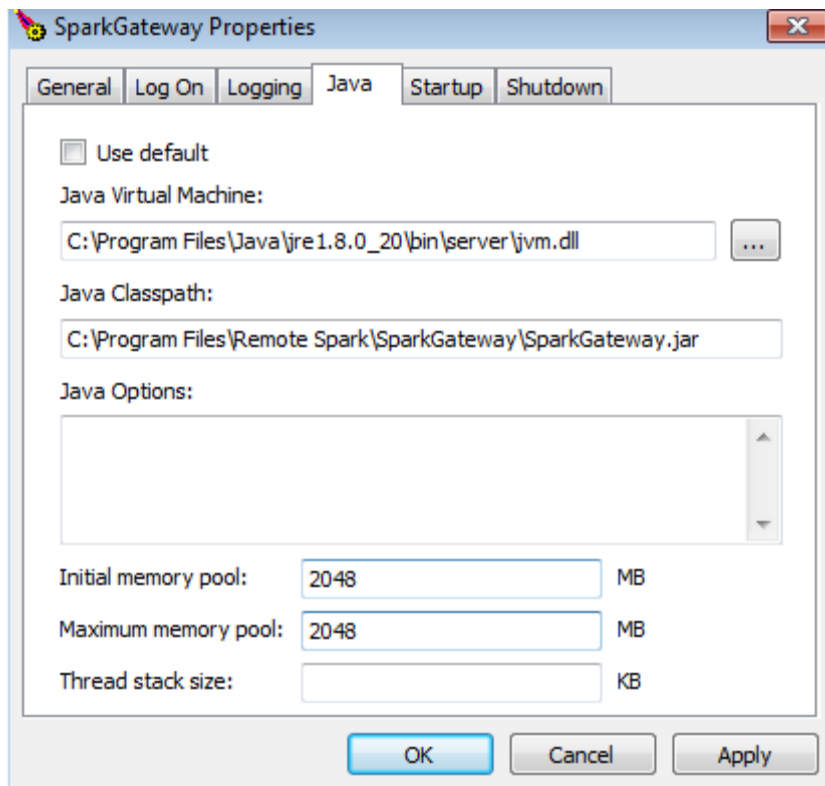
If you have IIS running on same machine and you want Spark Gateway listening on port 80 or 443, you must ensure that IIS is not bound to the IP address & Port you want to use for the Spark Gateway. You must set the bindings in the IIS Manager. However, it may also be necessary to change the HTTP service which by default listens on port 80 for all IP addresses. To do this you can use “netsh http add iplist ipaddress=xxx.xxx.xxx.xxx” to instruct the HTTP service to listen on IP addresses not used by the SparkGateway. Then you can use port 80 on the unused IP Addresses with the SparkGateway.

Change the name of your license file to “license” and copy it to installation directory if you are using the full version. You don’t need a license file for the evaluation version.

You can start the “Welcome” page to connect to a computer or “Configuration” page from the Start menu when installation is done.

Add SparkGateway.exe to your firewall exception list.

Make sure you allocate more memory to SparkGateway (in SparkGateway Manger, "Java" tab) if you have more users:



We are using Apache Procrun as a Windows service wrapper, for more information, please check

<http://commons.apache.org/daemon/procrun.html>

2.3. Install as Linux/Unix Daemon

Download Spark Gateway for Linux/Unix.

<http://www.remotespark.com/view/SparkGateway.zip>

Unzip it to your destination directory; here we use /usr/local/bin/SparkGateway.

Modify gateway.conf to change gateway listening port or other configurations.

Open gateway listening port (80):

```
firewall-cmd --permanent --add-port=80/tcp
```

```
firewall-cmd --reload
```

or

```
iptables -A INPUT -p tcp --dport 80 -j ACCEPT
```

If SparkGateway can not listen on port 80, 443 or any ports below 1024, you can try this command:

```
sudo setcap cap_net_bind_service=+epi `readlink -f `which java` ``
```

Test the gateway in console mode:

Java -jar SparkGateway.jar

You can install it as a service if it's working correctly in console mode:

For Systemd system:

Create file: /etc/systemd/system/SparkGateway.service with the following contents:

[Unit]

Description=Spark View Service

After=network.target

[Service]

User=yourUserName

WorkingDirectory=/usr/local/bin/SparkGateway

ExecStart=/usr/bin/java -jar /usr/local/bin/SparkGateway/SparkGateway.jar

SuccessExitStatus=143

[Install]

WantedBy=multi-user.target

Then notify the systemd for the new service: systemctl daemon-reload

Enable the service: systemctl enable SparkGateway

Start the service: systemctl start SparkGateway

Stop the service: systemctl stop SparkGateway

Check the status if the service is not started: systemctl status SparkGateway

Uninstall the service: systemctl disable SparkGateway

Please check the following documentation for SUSE:

http://remotespark.com/view/SUSE_Install.txt

For SysVinit init system:

To build the daemon wrapper you will need:

- GNU AutoConf (at least version 2.53)
- An ANSI-C compliant compiler (GCC is good)
- GNU Make
- A Java Platform 2 compliant SDK

yum groupinstall "Development Tools" (CentOS)

apt-get install build-essentials (Debian/Ubuntu)

Running following commands

```
cd /usr/local/bin/SparkGateway
tar xvfz commons-daemon-native.tar.gz
cd commons-daemon-1.0.10-native-src/unix
./configure
make
cp jsvc ../..
cd ../..
chmod a+x SparkGateway.sh
```

Change the name of your license file to “license” and copy it to installation directory if you are using the full version.

Modify gateway.conf file, change listening port and file path according to your installation directory.

Starting the daemon

```
./SparkGateway.sh start
```

Stopping the daemon

```
./SparkGateway.sh stop
```

We are using Apache Jsvc as a Linux/Unix daemon wrapper, for more information, please check

<http://commons.apache.org/daemon/jsvc.html>

The script (SparkGateway.sh) is only tested on CentOS, you may need to change it on other Linuxs.

Run as a service and start automatically

```
cp SparkGateway.sh /etc/init.d/SparkGateway
```

```
chmod +x /etc/init.d/SparkGateway
chkconfig --add SparkGateway
chkconfig SparkGateway on
Start the service: service SparkGateway start
Stop the service: service SparkGateway stop
```

2.4. Install as Mac OS X Daemon

1. cd /Library
2. sudo unzip SparkGateway.zip
3. sudo chown username SparkGateway
username should be the login name under which gateway will run
4. sudo chgrp admin SparkGateway
5. cd SparkGateway
6. sudo nano start.sh with following content:

```
#!/bin/sh
```

```
SPARK_HOME=/Library/SparkGateway
```

```
java -jar $SPARK_HOME/SparkGateway.jar -c=$SPARK_HOME/gateway.conf
```

7. Save the file and run sudo chmod a+x start.sh
8. Change the default directory and listening port if port 80 is occupied in gateway.conf:

```
port = 8080
logfile = /Library/SparkGateway/logs/gateway.log
html = /Library/SparkGateway/html
license = /Library/SparkGateway/license
```

9. use sudo ./start.sh to test if there are any errors within the script.
10. cd /Library/LaunchDaemons

11. sudo nano com.toremote.gateway.plist with following content:

```
<?xml version="1.0" encoding="UTF-8"?>

<!DOCTYPE plist PUBLIC "-//Apple Computer//DTD PLIST
1.0//EN" "http://www.apple.com/DTDs/PropertyList-1.0.dtd">

<plist version="1.0">

<dict>

<key>Label</key>

<string>com.toremote.gateway</string>

<key>Disabled</key>

<false/>

<key>OnDemand</key>

<false/>

<key>RunAtLoad</key>

<true/>

<key>ProgramArguments</key>

<array>

<string>/Library/SparkGateway/start.sh</string>

</array>

<key>EnvironmentVariables</key>

<dict>

<key>SPARK_HOME</key>

<string>/Library/SparkGateway</string>

</dict>

<key>StandardErrorPath</key>

<string>/Library/SparkGateway/logs/gateway.stderr</string>

<key>StandardOutPath</key>
```

```
<string>/Library/SparkGateway/logs/gateway.stdout</string>
```

```
<key>UserName</key>
```

```
<string>_appserver</string>
```

```
</dict>
```

```
</plist>
```

9. load the service:

```
sudo launchctl load /Library/LaunchDaemons/com.toremote.gateway.plist
```

unload the service:

```
sudo launchctl unload /Library/LaunchDaemons/com.toremote.gateway.plist
```

2.5. Install HTML Client on Other Web Servers

Spark View (the HTML5 Client part) doesn't include any server side logic; you can also install it on any other Web Servers, like IIS, Apache, Tomcat etc.

Recommended to use Gateway as the web server, or install it in Chrome Web Store.

3. Server Configuration

3.1. Gateway

You can configure gateway by editing gateway.conf file, here is a list of all options:

Key	Value
bindAddr	Binding address, if you have multiple IP addresses and want to bind on one of them. If you have IIS running on same machine, you must ensure that it is not bound to the IP address & Port you want to use for the SparkGateway. You must set the bindings in the IIS Manager. However, it may also be necessary to change the HTTP service which by default listens on port 80 for all IP addresses. To do this you can use “netsh http add iplisten ipaddress=xxx.xxx.xxx.xxx” to instruct the HTTP service to listen on IP addresses not used by the SparkGateway. Then you can use port 80 on the unused IP Addresses with the SparkGateway.
port	Listening port, default is 80. You can let Gateway listen on 2 ports at the same time, e.g. port = 80, 443
ssl	Use HTTPS and WSS (WebSocket Secure Connection), default is false. If gateway is listening on 2 port, the parameter can be configured as: ssl = false, true
credSSP	Network Level Authentication, Value can be "true", "false" or "auto". Default

	is false. "true" will slow down the connection speed a little bit . It's not necessary to use NLA if the gateway is connecting to internal RDP hosts only. It's better to enable credSSP if you are using Microsoft RD Broker for load balancing. "auto" will connect without credSSP at the first time, reconnect with credSSP if the connection failed.
backlog	How many connections can be queued, default is 50.
user	Path of user configuration file (JSON format).
server	Path of RDP hosts configuration file (JSON format).
html	HTML root directory.
directoryIndex	Default page for html directory, default is "rdp.html;index.html".
license	Path of license file.
logfile	Path of log file.
maxbytes	Limit the maximum number of bytes to write to any one log file, default is 30M.
maxfiles	Log file rotation, the number of log files to use, default is 99.
logHTTPHeader	If log http header, which may contains sensitive information. Default is true.
converter	Postscript to PDF converter, used for printing. Ghostscript is recommended: http://www.ghostscript.com/download/ Example: C:\\Program Files\\gs\\gs9.04\\bin\\gswin64c.exe
arguments	Arguments for converter. %1 is output pdf file name. %2 is input ps file name, they'll be replaced by program. Example: -dBATCH -dNOPAUSE -dUseCIEColor -dPDFSETTINGS=/printer -sDEVICE=pdfwrite -q -sOutputFile=%1 %2
plugin	Class name for your plug-in
pluginFile	The full path of your plug-in jar file
password	Password for reporting and management API
mime	Add extra mime types for web server: rdp:application/rdp;conf:text/plain
stderrLog	Set false to disable logging to stdout/stderr
keepDays	How many days the temporary files generated by system be kept, default is 1 day
disk	The name for the shared disk, used for file uploading/downloading
<u>webfeed</u>	RD Web Feed URL, for RD web access integration
<u>recording</u>	Session recording, 0: no recording; 1: recording graphic only. 3: recording graphic and audio.
<u>recdir</u>	Parent directory for session recording files.
<u>recwarning</u>	Warn user about the <u>recording</u> , default is true
<u>accessNotInList</u>	if logged in user can access computers which is not in their list (servers.json) or <u>webfeed</u> , default is false
<u>printer</u>	Printer name, default is "Remote Printer from Client". You can specify multiple printer names by using ";" as separator, e.g. "Printer1;Printer2". The first one will always be the default printer.
<u>printerDriver</u>	Printer driver name
<u>shadowing</u>	Shadowing switch (if allow joining a session), default is true.
<u>cipherSuites</u>	The cipher suites can be used by SSL encryption. You may want to use some good cipher suites only, for example: SSL_RSA_WITH_RC4_128_MD5, SSL_RSA_WITH_RC4_128_SHA, SSL_RSA_WITH_3DES_EDE_CBC_SHA,

	SSL_DHE_DSS_WITH_3DES_EDE_CBC_SHA, SSL_DHE_RSA_WITH_3DES_EDE_CBC_SHA, TLS_DHE_RSA_WITH_AES_128_CBC_SHA, TLS_DHE_DSS_WITH_AES_128_CBC_SHA, TLS_RSA_WITH_AES_128_CBC_SHA, TLS_DHE_RSA_WITH_AES_256_CBC_SHA, TLS_DHE_DSS_WITH_AES_256_CBC_SHA, TLS_RSA_WITH_AES_256_CBC_SHA You need to install Java Cryptography Extension (JCE) Unlimited Strength Jurisdiction Policy Files for AES 256 cipher suites. http://www.oracle.com/technetwork/java/javase/downloads/jce-6-download-429243.html
<u>webAddress</u>	HTTP server web address, used for OpenID login(redirection back). It's also used on client side for getting real gateway address (client side may not know that if you are using multiple gateways for load balancing).
<u>clientHost</u>	Customize the host name of the client user. Default is the host name or ip address. You can use following variables in the string: \${hostName}: Host name of the gateway machine. \${hostAddress}: Host address of the gateway machine. \${sequence}: a sequence number \${__ip}: client host name or IP. \${ _PARAM_SESSION_ID}: Session GUID. \${ _PARAM_NUMERIC_ID}: Session 9 digit number ID. \${any parameter transferred from client side} e.g. clientHost = RS-\${__ip}-\${sequence} , the result will be RS-ClientHostName-0, RS-ClientHostName-1, ...
<u>performanceflags</u>	Please check 3.4 RDP Host for more information. You may need this if you are connecting to a Terminal Server/Remote Desktop Session Host.
<u>remotefx</u>	If enable remotefx, default is false. RemoteFX is LAN and 32 bit only
<u>enableLookups</u>	Set to true if you want calls to perform DNS lookups in order to return the actual host name of the remote client. Set to false to skip the DNS lookup and return the IP address in String form instead (thereby improving performance). By default, DNS lookups are disabled.
<u>maxCacheTime</u>	How long (minutes) the session can be cached on gateway, default is 0 (RDP session cache on gateway is disabled by default).
<u>idleUserSession</u>	User session idle timeout, in milliseconds
<u>mail.smtp.host</u> <u>mail.smtp.port</u> <u>mail.user</u> <u>mail.password</u> <u>mail.from</u> <u>mail.to</u> <u>mail.smtp.auth</u> <u>mail.smtp.starttls.enable</u>	Email notification when license expire etc, following is for gamil: smtp.gmail.com 587 support@toremote.com xxxx support@toremotec.om xxx@toremote.com true true

	You can use “java -cp SparkGateway.jar com.toremote.gateway.Mailer title message” to send a test email.
<u>licenseAlert</u>	Float value, Email alert when license usage reached this number. If value < 1, it means percentage of your license number; If value > = 1, it means the actual concurrent license number.
<u>thumbnail.interval</u>	Interval for obtaining thumbnails of RDP session, milliseconds, default is 0 (no thumbnail). Client will not send thumbnail to server if screen is not changed.
<u>thumbnail.width</u>	Thumbnail width, it must be smaller than 640, default is 0 (no thumbnail)
<u>copyTimeout</u>	Timeout for clipboard copy operation, milliseconds, default is 3000. You may need to increase this value if your application need to copy very big data.
<u>savedSessionTimeout</u>	This is the maximum value (milliseconds) for saved session, default is 0, means user cannot save session on gateway.
<u>confirmJoin</u>	Confirmation needed when a user try to join a session, default is false
<u>keyStore</u>	Set up key store position when ssl is true
<u>keyStorePassword</u>	Key store password
<u>passwordEncrypted</u>	Encrypt the key store password and the reporting password, default is false. Please use following command to get encrypted password: java -cp SparkGateway.jar com.toremote.gateway.Encryption MyPassword
<u>assistance</u>	Enable Remote Assistance, default is false.
<u>ssh</u>	Enable SSH, default is false.
<u>telnet</u>	Enable TELNET, default is false.
<u>gatewayId</u>	Used for email notification etc.
<u>oauth2</u>	Path of oauth2 providers file (JSON format)
<u>disabledKeys</u>	Keys (scancode) will not be sent to server, e.g. 219,220 (left and right Windows key); 29+56+211,56+1 will disable Ctrl+Alt+Del and Alt+Esc
<u>dataEncrypted</u>	If enable encryption on data files: servers.json, users.json, symlink.json.
<u>webfeedCache</u>	If enable webfeed cache. false to disable it. Default is true. You'll need to restart the gateway after your webfeed content changed if it's true.
<u>redirectToHttps</u>	Redirect http trafic to https. Make sure gateway listen on both http and https
<u>log.level</u>	The value can be an integer or SEVERE, WARNING, INFO, CONFIG, FINE, FINER, FINEST. Check https://docs.oracle.com/javase/8/docs/api/java/util/logging/Level.html for more details
<u>connectif</u>	Create a new connection if you are joining symlink which doesn't connect to any hosts.
<u>randomIp</u>	Use a random ip if your host name has multiple ip address, default is false
<u>authorization</u>	“Basic”: enable HTTP Basic Authentication, default is null.
<u>headers</u>	Extra headers for HTTP response, For example: headers = Strict-Transport-Security: max-age=31536000\r\nContent-Security-Policy: script-src 'self'\r\nX-XSS-Protection: 1; mode=block\r\nX-Frame-Options: SAMEORIGIN\r\nX-Content-Type-Options: nosniff\r\n
<u>recFileSize</u>	Limit the size (in bytes) of recording file (auto rotation)
<u>file.filter</u>	File type filter for file uploading, for example “exe,jar”
<u>file.maxSize</u>	File size filter (in bytes) for file uploading.
<u>keepPrinting</u>	Keep the printing results (PDF) on gateway, default is false.
<u>resetOnJoin</u>	Don't use seamless session shadowing.
<u>timeoutWoL</u>	Time out (milliseconds) of Wake on LAN. This will enable WoL if the value is great that 0.
<u>symlinkOnly</u>	Gateway will only accept aymlink connection if symlinkOnly is true

<u>simpleFormatter</u>	Let gateway use SimpleFormatter which is slower but allow you to configure log format.
<u>pingClient</u>	Ping client interval (ms). CND or proxy may not close the websocket correctly and leave session alive forever on the gateway. You can enable this to fix this kind of issue. This is enabled by default since 5.6.
<u>sessionRecordParam</u>	You can enable session recording from the browser side (sessionRecord=on) if this is true. Default value is false.
<u>userGroup</u>	Path of user group configuration file in JSON format.
<u>serverGroup</u>	Path of server group configuration file in JSON format.
maxRequestBytes	Determines the upper limit for the total size of the request line and the headers. Its default setting is 8KB
maxPrintTime	Printing conversion timeout, default is 1200000 milliseconds (20 minutes)
httpCookie	Use HTTP Cookie for file uploading to make it more secure. Default is true.
fileUnprompted	Files can be download directly without asking user to confirm when user copy a file in RDP server. Depends on copyFile = true.
fileService	Enable SMB2, SFTB file proxy. Disabled by default.
deployment	Enable deployment service. User can deploy, test applications with the deploy agent via SSH, SFTP.
preferInteractive	Prefer keyboard-interactive method on SSH. Default is true.
fileService	Enable SMB2, SFTP file service, so user can use file.html to upload/download files from SMB2 share or SFTP server.
fileUnprompted	Files for downloading directly without prompt. For example, if the value is "pdf, zip", when user copy a PDF file, the gateway will prepare the downloading directly without ask use to confirm.
delSymlinkServer	The related server definition will be deleted too if a symlink is deleted or expired. Default is false.
trustStore	Trusted certificates for RDP or VNC server (when TLS encrypt is used, credSSP = true in gateway.conf).
trustStorePassword	Password for trustStore.
fileBlockSize	File transferring block size, default is 524288 bytes(5M). Reduce this value can reduce the bandwidth usage but increase uploading time.
keyDelay	Delay between keys (milliseconds). Default is 0.
authToken.name	The parameter name in the websocket URL.
authToken.exec	A path of executable or URL. If gateway found the authToken.name parameter in the websocket url, it'll execute the exe or HTTP Request. The connection can be only allow if the exe or HTTP Request Status Code is authToken.sucessCode.
authToken.sucessCode	Integer.
twoFA	1: Enable two-factor authentication; 0: Disable (default).
twoFAStore	Two-factor authentication storage path. Default is installDir\data\store.data. Make sure you back up this file. It's encrypted by default.
rec.timestampSubDir	Enable/disable timestamp sub directory for recdir. Default is true
rec.begin.exec	Run an executable before the session is recorded. Arguments: fileName, server, user, sessionId.
rec.end.exec	Run an executable after the session was recorded. Arguments: fileName, server, user, sessionId.
file.post	Run an executable after a file was uploaded. For example: file.post = C:\apps\scan.exe %1 %1 will be replaced by the file path of the uploaded file.
csv.file	Log session information to CSV file. Columns: Id, Server, Client, IP, Browser, Time ,NumericId, User, Domain, Join, Protocol, Symlink, Port, Action (CONNECT/DISCONNECT/LOGIN).
csv.size	Limit the maximum number of bytes to write the log file, default is 2G.

*Please always use absolute file path if you are running Gateway as a service.

You can also use config.html to configure gateway.conf. Use your browser navigate to:
<http://localhost/config.html>. For security reason, this page can be only accessed from local host.

←

→

↻

ⓘ

w-think/config.html

Gateway:w-think

Password:.....

This page can only be accessed from local computer. Set password and remoteManage=true in remote access.

Start Configuration

Gateway

Server

User

Symlink

Session

Gateway Configuration (Saved in gateway.conf)

Save

SSL (https and wss)

☐

Port(Default is 80 or 443(SSL))

80 or 443

Binding Address

Network Level Authentication

☒

Path of License File

C:\workspace\SparkGateway

Upload License File

Choose File

No file chosen

HTML Root Directory

C:\workspace\HTML5Client\

Default Web Page

rdp.html;index.html

Path of Log File

C:\Users\Yongtao\workspace

Size of Single Log File(bytes)

30720000

Maximum number of Log Files

99

Log HTTP header

☒

PDF Converter

D:\Programs\gs\gs9.16\bin\gs

PDF Converter Arguments

-dBATCH -dNOPAUSE -dUs

Plugin Class

Administration Password (for reporting API etc)

.....

Enable Remote Management/Configuration

☐

Temporary directory (for downloading/uploading)

D:\apps\share

Days of temporary files are kept

3

RD Web Access Webfeed

3.2. HTTPS and WSS (WebSocket Secure Connection)

Recommended to enable HTTPS and WSS. There is a self-signed certificate (keystore.jks) in the installation directory.

- Set ssl = true in gateway.conf file.
- Import your SSL certificate to a Java keystore, please check with your certificate issue and see how to buy and import certificate for Java application server. Please check following links for reference:
 - <https://support.comodo.com/index.php?/Default/Knowledgebase/Article/View/711/17/pfxp12-to-jks-java-keystore>
 - <https://knowledge.verisign.com/support/ssl-certificates-support/index?page=content&actp=CROSSLINK&id=AR234>
 - <http://www.agentbob.info/agentbob/79-AB.html>
 - <http://portecle.sourceforge.net/>
- Set up keyStore and keyStorePassword in gateway.conf.
keyStore=D:\\test\\SV\\spark.pl2
keyStorePassword = yourPassword
- Java 1.8 recommended which supports more and better cipher suites.
- Java 1.8 supports PKCS12 key store, it's better to use PKCS12 format directly.
- Self-signed certificate may not work in some cases.
- You can have multiple certificates in the Java key store, but Java will always use the first one by default.
- Disable SSLV3, set sslProtocols = SSLv2Hello,TLSv1 in gateway.conf and restart. You can also add TLSv1.1, TLSv1.2 into it for Java 8.
- You can expand the DK key size to 2048 in Java 8 by adding this Java option: -Djdk.tls.ephemeralDHKeySize=2048
- You can choose the cipher suites you want to use by setting cipherSuites in gateway.conf. You'll need to install Java Cryptography Extension (JCE) to support all the cipher suites:
<http://www.oracle.com/technetwork/java/javase/downloads/jce8-download-2133166.html>
<http://www.oracle.com/technetwork/java/javase/downloads/jce-6-download-429243.html>

Recommended cipher suites for Java 11:

```
cipherSuites =  
TLS_ECDHE_ECDSA_WITH_AES_128_GCM_SHA256,TLS_ECDHE_ECDSA_WITH_AES_256_GCM_S  
HA384,TLS_ECDHE_ECDSA_WITH_AES_128_CBC_SHA,TLS_ECDHE_ECDSA_WITH_AES_128_CBC_  
SHA256,TLS_ECDHE_ECDSA_WITH_AES_256_CBC_SHA384,TLS_ECDHE_RSA_WITH_AES_128_GC  
M_SHA256,TLS_ECDHE_RSA_WITH_AES_256_GCM_SHA384,TLS_ECDHE_RSA_WITH_AES_128_C  
BC_SHA,TLS_ECDHE_RSA_WITH_AES_256_CBC_SHA,TLS_ECDHE_RSA_WITH_AES_128_CBC_SHA  
256,TLS_ECDHE_RSA_WITH_AES_256_CBC_SHA384,TLS_ECDHE_ECDSA_WITH_AES_256_CBC_S  
HA,TLS_DHE_RSA_WITH_AES_128_GCM_SHA256,TLS_DHE_RSA_WITH_AES_256_GCM_SHA384,
```

TLS_DHE_RSA_WITH_AES_128_CBC_SHA,TLS_DHE_RSA_WITH_AES_256_CBC_SHA,TLS_DHE_RSA_WITH_AES_128_CBC_SHA256,TLS_DHE_RSA_WITH_AES_256_CBC_SHA256

Recommended cipher suites for Java 8:

```
cipherSuites =
TLS_ECDHE_RSA_WITH_AES_128_GCM_SHA256,TLS_ECDHE_ECDSA_WITH_AES_256_GCM_SHA
384,TLS_ECDHE_ECDSA_WITH_AES_128_GCM_SHA256,TLS_RSA_WITH_AES_256_GCM_SHA384
,TLS_ECDHE_RSA_WITH_AES_256_CBC_SHA384,TLS_ECDHE_RSA_WITH_AES_128_CBC_SHA256
,TLS_ECDHE_ECDSA_WITH_AES_256_CBC_SHA384,TLS_ECDHE_ECDSA_WITH_AES_128_CBC_SH
A256,TLS_ECDHE_ECDSA_WITH_AES_128_CBC_SHA,TLS_ECDHE_RSA_WITH_AES_256_CBC_SHA
,TLS_ECDHE_RSA_WITH_AES_128_CBC_SHA,TLS_ECDHE_RSA_WITH_3DES_EDE_CBC_SHA,TLS_E
CDHE_ECDSA_WITH_3DES_EDE_CBC_SHA,TLS_RSA_WITH_AES_256_CBC_SHA256,TLS_RSA_WIT
H_AES_256_CBC_SHA,TLS_RSA_WITH_AES_128_CBC_SHA
```

Set up Let's Encrypt (letsencrypt.org) certificate:

1. Apply for the certificate from letsencrypt.org and you'll get the certificate files: cert.pem, privkey.pem, chain.pem etc in /etc/letsencrypt/live/yourDomain/.
2. openssl pkcs12 -export -in cert.pem -inkey privkey.pem -out cert_and_key.p12 -name spark -CAfile chain.pem -caname anyFriendlyName
3. Add following entries in gateway.conf:

```
keyStore=/etc/letsencrypt/live/domain/cert_and_key.p12
```

```
keyStorePassword = yourExportPasswordInStep3
```

```
ssl = true
```

```
port = 443
```

4. Restart the gateway.

Renew and update the certificate automatically:

Create a cron job to update check the certificate every day at 2:30AM (crontab -e):

```
30 2 * * * certbot renew --post-hook "sh /etc/letsencrypt/live/startme.biz/update.sh"
```

```
update.sh:
```

```
#!/bin/bash
```

```
cd /etc/letsencrypt/live/remotespark.com/
```

```
openssl pkcs12 -export -in cert.pem -inkey privkey.pem -out cert_and_key.p12 -name spark -CAfile chain.pem -caname startme -passout pass:mypassword
```

```
systemctl stop SparkGateway
```

```
systemctl start SparkGateway
```

```
exit 0
```

3.3. Remote Desktop Web Access Portal Integration

User can log in with his domain user name and password, get the RemoteApps or desktops published on the web access portal with the integration.

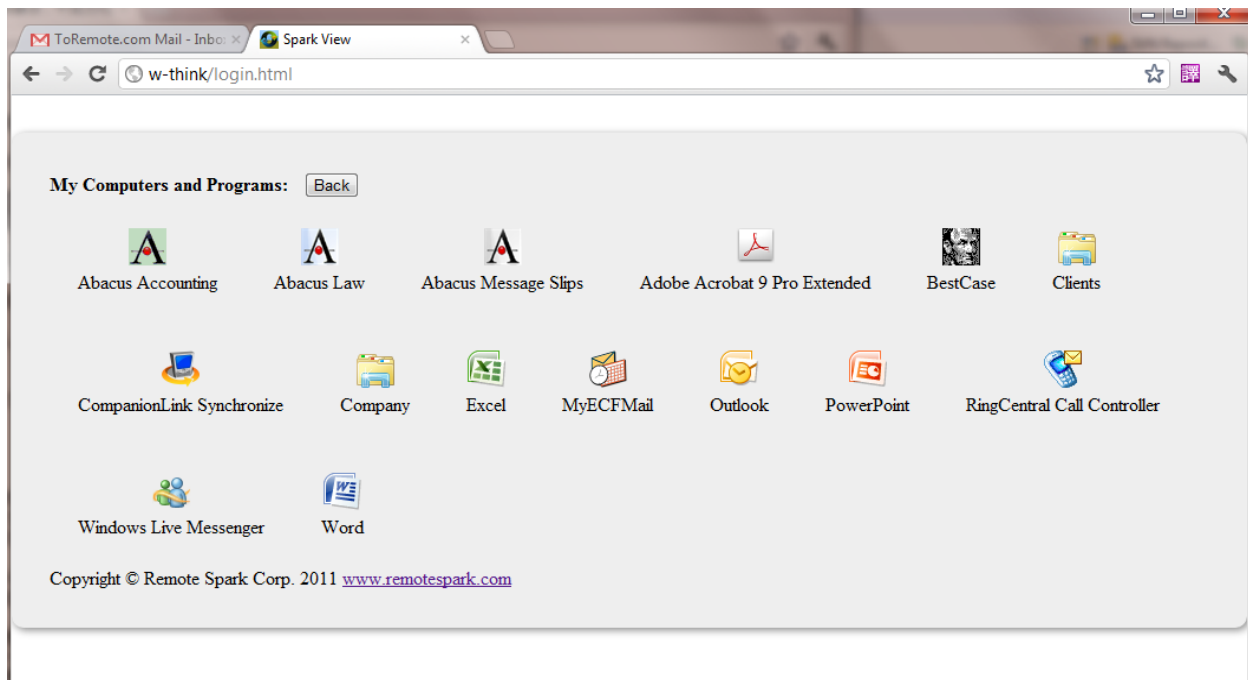
What you need:

1. RemoteApp is published and Web Access is enabled.
2. Web Access portal must be in domain.

What you should do:

1. Set up the web feed URL of your web access portal in gateway.conf. This URL is your address of your portal + /RDWeb/feed/webfeed.aspx, for example: webfeed = <https://cloud.remotespark.com/RDWeb/feed/webfeed.aspx>
2. Use login.html as the start page, set `directoryIndex = login.html;rdp.html;index.html` in gateway.conf.
3. Make sure html directory is configured in gateway.conf. Gateway will save application icons under this directory (in RDWeb subdirectory).

You don't need to set up RDP hosts or users in servers.json and users.json anymore.



3.4. RDP, VNC, SSH, TELNET hosts

You can use servers.json file to configure: RDP hosts which can be accessed; RDP options for every host. The user can get a list of the RDP hosts if this file was used.

Spark View (RDP) 4.8.8

[Spark View \(VNC\)](#) [Spark View \(SSH\)](#) [Spark View \(TELNET\)](#) [Spark View \(Remote Ass](#)

Spark Gateway: *default port is 80 if it's not specified (ip:por

General

Display

Local

Programs

Advanced

Enter the name of the remote computer. Open or drag a .rdp file No file

Computer	169.254.146.243
Port	ATPlus
User Name	WordPad
Password	Word 2010
Domain	2012
Keyboard	111
	124
	RdpServer1
	169.254.146.243
	169.254.209.86
	RDP116

☒ Open in existing window

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Here is an example:

```
{  
/* this is comment, use UTF-8 (without byte order mark) encoding for Unicode support */  
"type": "NORMALLIST",  
/*type can be WHITELIST, BLACKLIST, NORMALLIST */  
"display": true,  
/* display this list to client */
```

```

"connections": [
{
  "id": "Word",
  "displayName": "RemoteApp MS Word",
  "server": "213.180.85.124",
  "icon": "kbd.png",
  "protocols": "rdp",
  "rdp": {
    "username": "demo",
    "password": "m9ff.QWE",
    "domain": "SERVERSKY",
    "remoteProgram": "||WINWORD",
    "mapClipboard": true,
    "mapDisk": true,
    "playSound": 0,
    "mapPrinter": true
  }
}
]
}

```

This file is in JSON format, {} means an object, [] means an array. Here is a full list of RDP options you can use (All options defined in this file will override the client options):

Key	Value
port	Listening port of RDP, default is 3389
username	User name of your Windows
password	Password of the Windows user
console	Login to console session (or Admin mode).
width	Screen width of RDP session, if no value is given, client will use the width of browser window.

height	Screen height of RDP session, if no value is given, client will use the height of browser window.
color	Color depth of RDP session, default is 16.
command	Start a program on connection
directory	Directory for running "command"
mapClipboard	If enable clipboard redirection
mapDisk	If enable disk redirection
disks	<p>Redirection a disk or directory on Gateway. It's an array of DeviceInfo, example for DeviceInfo:</p> <pre>{ "dosName": "disk1", "longName": "disk1 on local", "devicePath": "/apps/test/", "actions": 7 }</pre> <p>Default value for actions is 7 = <i>ACTION_REDIRECT(1)</i> <i>ACTION_DOWNLOAD(2)</i> <i>ACTION_UPLOAD(4)</i>. Set value to 2 if you want this disk downloadable only, 1 if you only want this disk mapped to RDP host. Right now, only the first disk can be a downloadable directory.</p> <p>You can use <code>#{user}</code> and <code>#{domain}</code> variables in devicePath since 5.0.</p>
playSound	Sound options, 0: bring sound to local, 1: no sound, 2: leave sound on remote computer.
audioRecord	If enable audio record.
performanceflags	<p>Default value is 111,</p> <pre>PERF_DISABLE_WALLPAPER = 0x01; PERF_DISABLE_FULLWINDOWDRAG = 0x02; PERF_DISABLE_MENUANIMATIONS = 0x04; PERF_DISABLE_THEMING = 0x08; PERF_DISABLE_CURSOR_SHADOW = 0x20; PERF_DISABLE_CURSORSETTINGS = 0x40; PERF_ENABLE_FONT_SMOOTHING = 0x80; PERF_ENABLE_DESKTOP_COMPOSITION = 0x100;</pre> <p>111 = PERF_DISABLE_CURSOR_SHADOW PERF_DISABLE_CURSORSETTINGS PERF_DISABLE_FULLWINDOWDRAG PERF_DISABLE_MENUANIMATIONS PERF_DISABLE_THEMING PERF_DISABLE_WALLPAPER;</p>
legacyMode	If enable legacy mode, default is false. Set this true if you are using xrdp or VirtualBox RDP.
mapPrinter	If enable easy printing.
remoteProgram	Connect to a RemoteApp, always use alias name instead of program path, example: WINWORD, wordpad, or EXCEL.
remoteWorkDir	Directory for running remoteProgram.
remoteArgs	Arguments for running remoteProgram.
credSSP	If use NLA (Network Level Authentication).
sessionRecord	0: no session recording, 1: recording graphic only (no sound), 3 means recording

	graphic and sound.
keyboard	Keyboard layout
loadBalanceInfo	Load balance information
shadowing	Shadowing switch
vmid	Hyper-V VM GUID, For example: B3D5444C-2611-405A-9CA0-7AA8DA94DF0B, it's for Hyper-V console connection.
minWidth	Minimum width, some applications need a minimum resolution to work.
minHeight	Minimum height
remotefx	If enable remotefx, default is false. RemoteFX is LAN and 32 bit only.
soundPref	0: low quality sound; 1: high quality sound

You can also define IP ranges in servers.json, for example:

```
{
  "id": "range1",
  "ipRanges": [
    {"from": "192.168.0.0", "to": "192.168.0.250"},
    {"from": "192.168.56.0", "to": "192.168.56.250"}
  ]
},
```

You can also use config.html to configure servers.json. Use your browser navigate to:
<http://localhost/config.html>. For security reason, this page can be only accessed from local host.

Gateway: Password:

This page can only be accessed from local computer. Set password and remoteManage=true in gateway.conf to enable remote access.

[Start Configuration](#)

Gateway

Server

User

SymLink

Session

Server (RDP Host) Configuration (Saved in servers.json)

Add

Refresh

Type

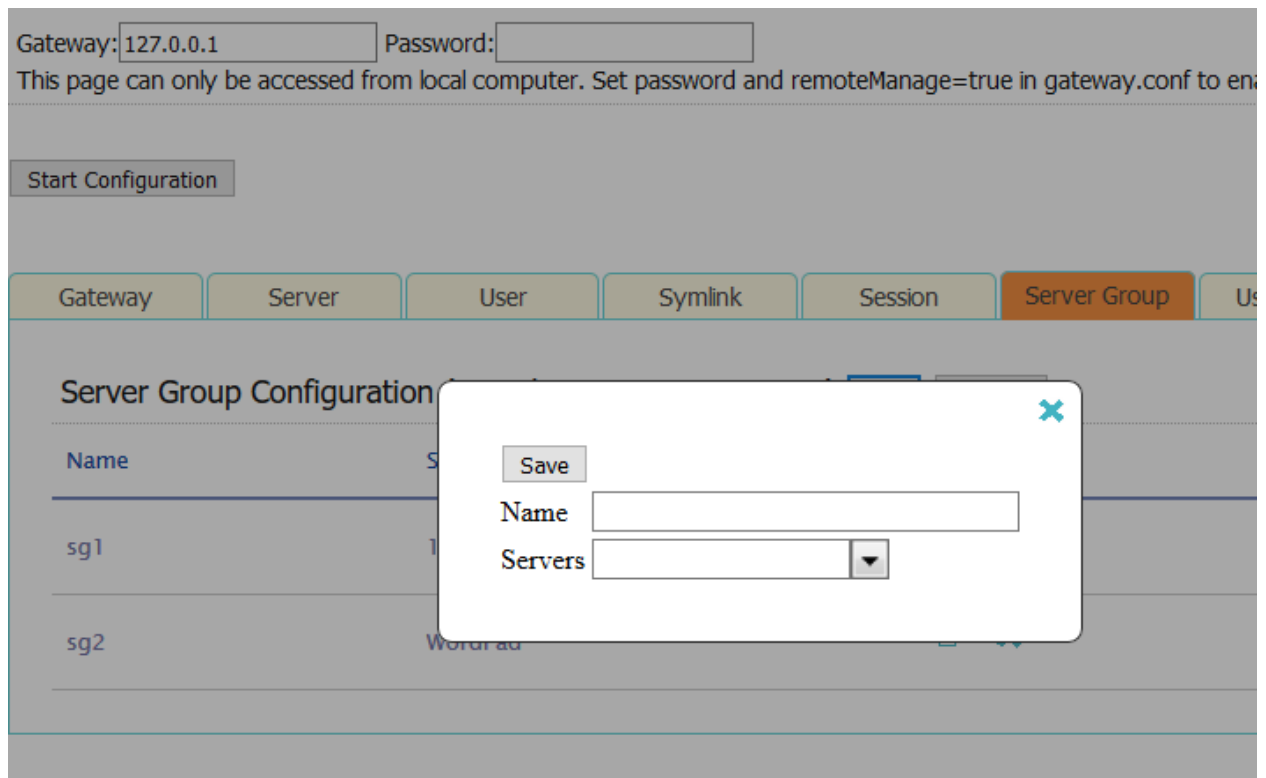
Normal List

Visible

☒

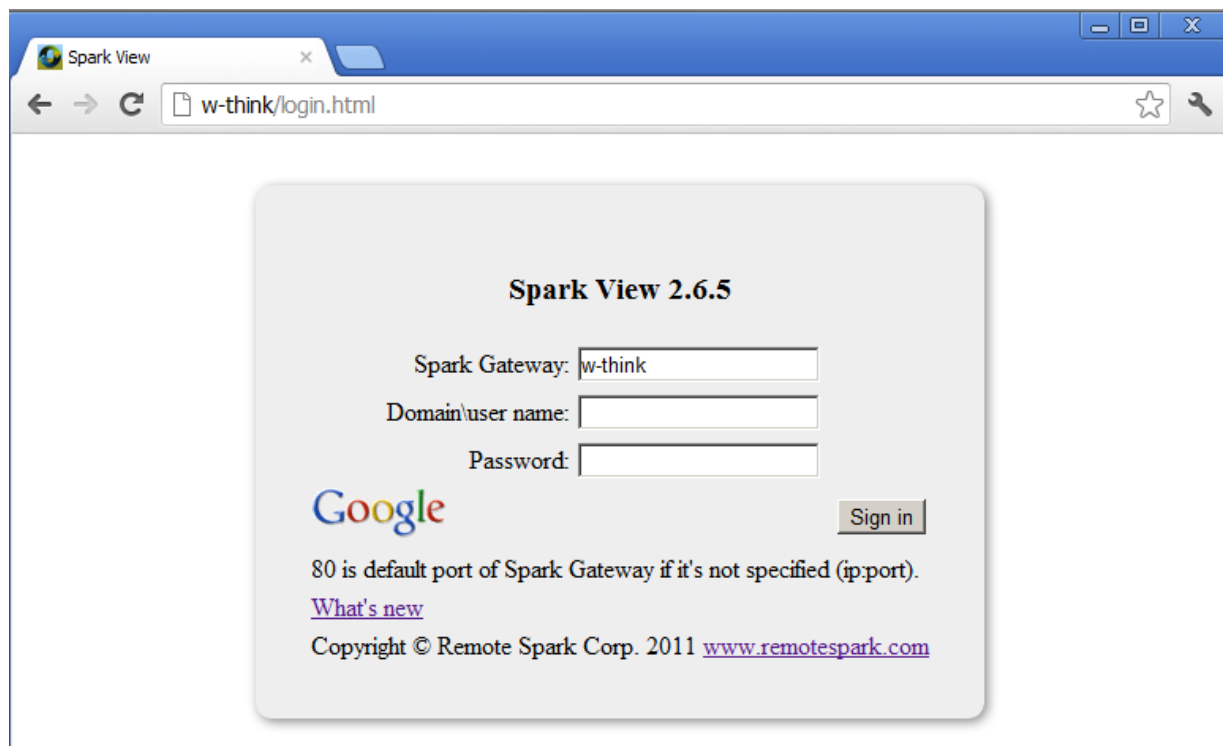
ID	Display Name	Server	RemoteApp	Start Program on Connection	Action
ATPlus	ATPlus	cloud.thinrdp.net			<div><div></div><div></div></div>
WordPad	WordPad	192.168.12.118			<div><div></div><div></div></div>
Word 2010	Word 2010	atplus.escort.fr		"%ProgramFiles%\Microsoft Office\Office14\winword.exe"	<div><div></div><div></div></div>
2012	2012 R2	192.168.8.212			<div><div></div><div></div></div>

You can also configure server groups, which is saved in serverGroups.json by default:



3.5. Users

You can use users.json file to configure: users (name and password), RDP hosts (configured in servers.json) a user can access. User will have to log in when this file was used (starting from login.html).



You can also log in with Google, Yahoo account etc with OAuth 2 integration. For OAuth integration

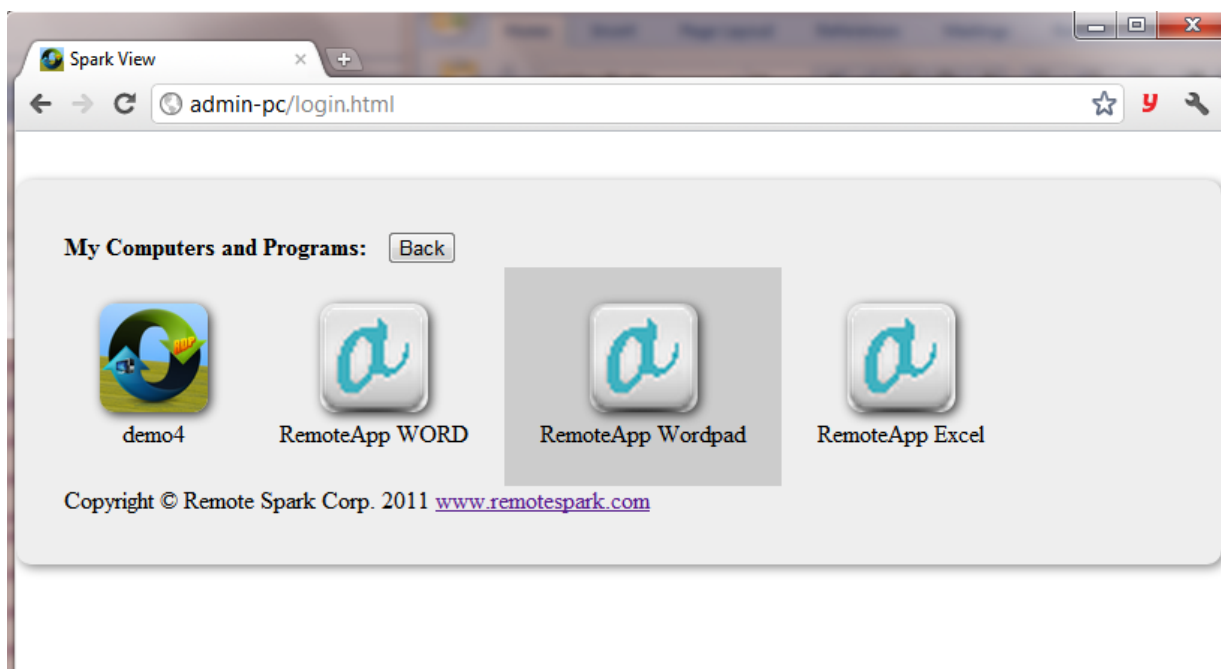
- You don't need to enter user name and password in the login.html.
- Make sure the user name in users.json is your email address (Gmail address if you are using Google Account).
- The password in users.json will be ignored, so you can give any passwords to user.

If you don't need this OAuth integration, you can remove following part from login.html:

```
<a href="/OPENID?id=Google"></a>
```

Please check Chapter 3.22 for more information about OAuth 2.

User will see a list of RDP hosts and applications they can use after logging in:



You can also use config.html to configure users.json. Use your browser navigate to:

<http://localhost/config.html>. For security reason, this page can be only accessed from local host. The user name should be your email if you are using OpenID integration (log in with Google Account etc).

← → ↻ ⓘ w-think/config.html 🔑 ☆ ABP

Gateway: Password:

This page can only be accessed from local computer. Set password and remoteManage=true in gateway.conf to enable remote access.

Gateway
Server
User
Symlink
Session

User Configuration (Saved in users.json)

Servers for imported users:

Name	Password	Servers	Domain User	Domain Server	Transfer Credential	Action
------	----------	---------	-------------	---------------	---------------------	--------

You can import users from Active Directory too. These domain users will use active directory authentication and don't need to have passwords (default is ***).

You can also configure user group, which is saved in userGroups.json by default:

Gateway: Password:

This page can only be accessed from local computer. Set password and remoteManage=true in gateway.conf to enable remote access.

Gateway
Server
User
Symlink
Session
Sever Group
User Group

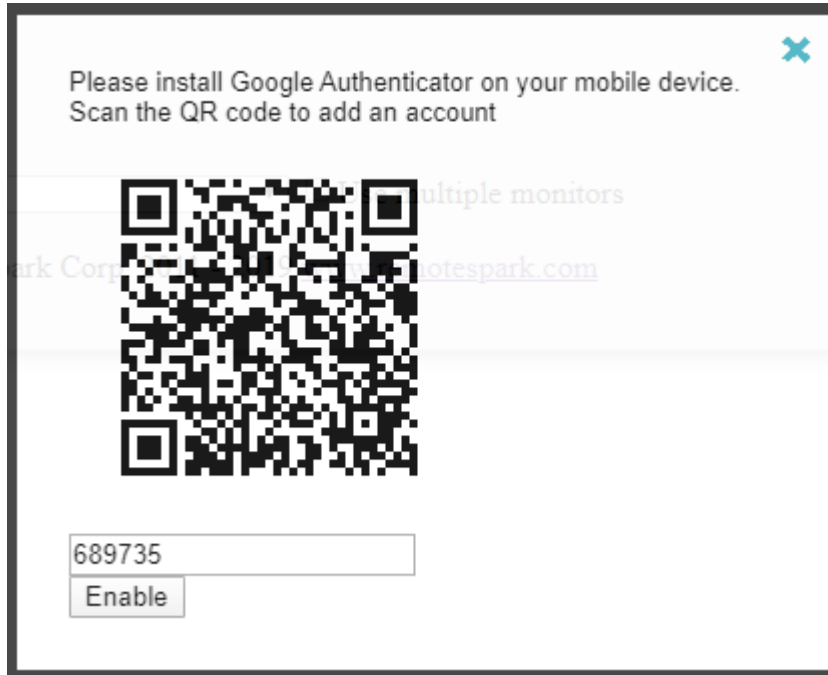
User Group Configuration ✕

Name
Users ▼
Server Groups ▼

Name	Users
ug1	use

Two-factor authentication with Google or Microsoft Authenticator:

1. Set twoFA = 1 in gateway.conf to enable it;
2. User login with login.html, add an account in the Settings:



3. Reset two factor authentication.

A: Delete the Two-factor authentication storage to reset for all users.

B: User HTTP API to reset for specific user. Please check the Integration Guide (4.1) for more details.

C: Command: `java -cp SparkGateway.jar com.toremote.gateway.tool.TwoFactor username`
(Need to stop the gateway first).

3.6. Easy Printing

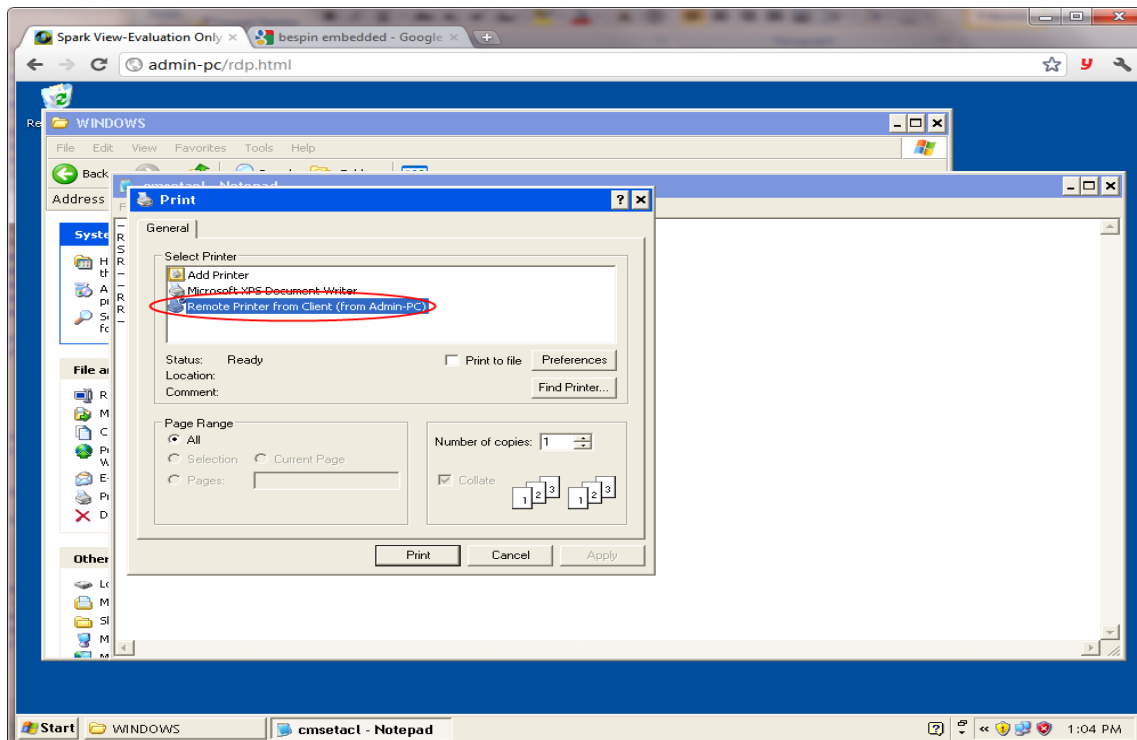
In a traditional RDP environment, you may have to install drivers for client side printers to make printer redirection work. Compared with other solutions, Spark Easy Printing has following benefits:

1. Don't need to install any drivers on RDP host.
2. Don't need to install anything on client side (MS Easy printing needs install .NET Framework 3.5).
3. RDP hosts can be any versions of Windows (MS Easy printing need to be Windows 7 and above).
4. Using separate channel (via http or https) for printing which will not affect your RDP experience.

5. Support all printers, support both PostScript, PCL, PDF and text only (Receipts, Label printer) printers, and printers can have any names. Some application can only work on PCL printers or printers with specific names.
6. Support all devices, you can print on Mac, Android, iOS too (MS and Citrix printing can be only used on PC).
7. Fewer bandwidth usages.

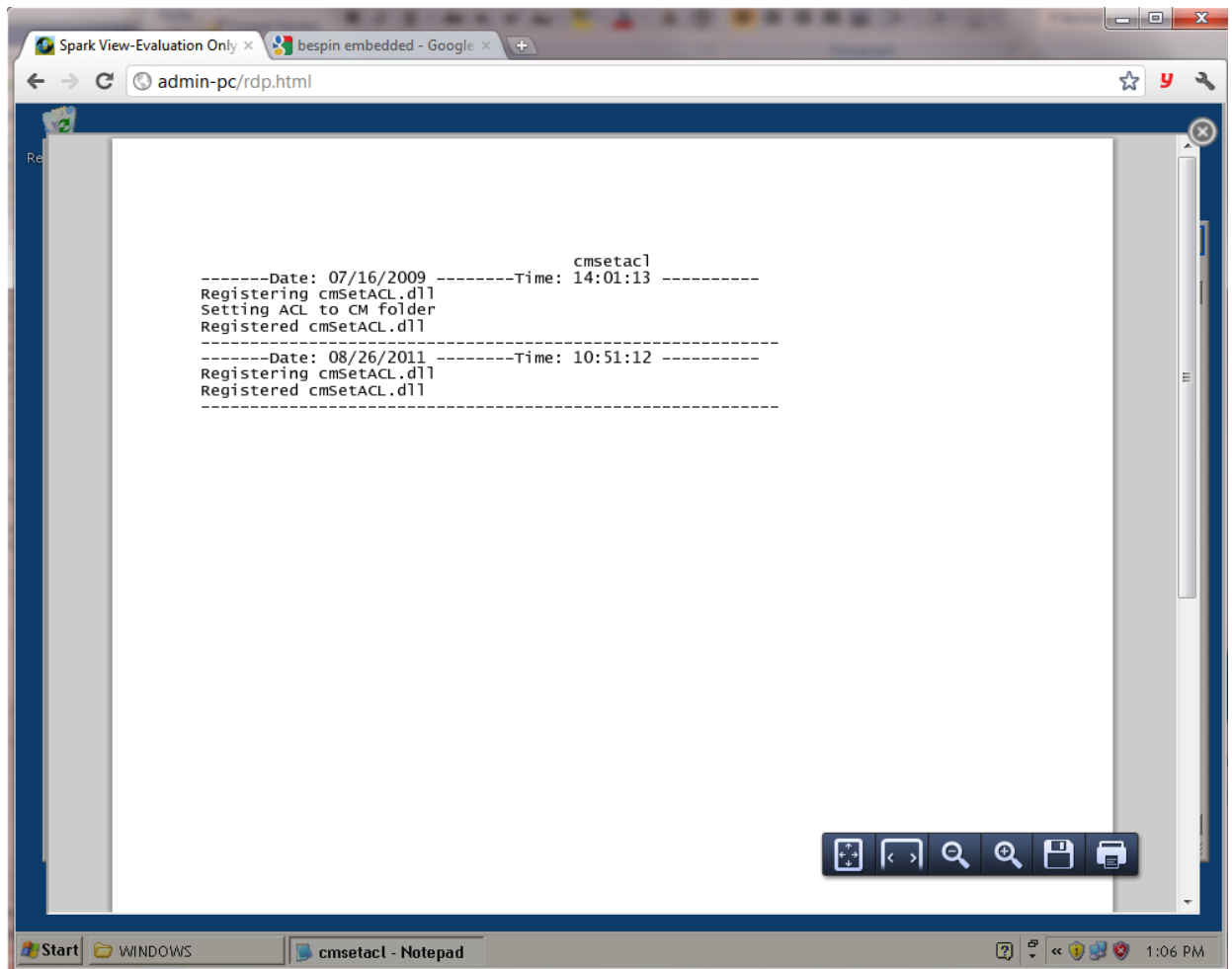
How Spark View Easy printing works:

Gateway attaches a universal PostScript printer to RDP host automatically.



- Gateway converts the printing (for PostScript and PCL printers) to PDF file when user print.
- Gateway then sends the PDF file or text (for text only printer) to user.

- User views or prints the PDF/text file in local.



To make printing works, you need to install a PostScript to PDF converter along with Gateway. Ghostscript is recommended and it works on different platforms.

Please also make sure printer redirection is enabled in RDP host.

Install a PostScript Printer (Recommended):

1. Set a PostScript to PDF converter in gateway.conf (we use [Ghostscript](http://www.ghostscript.com/download/) <http://www.ghostscript.com/download/> here):

```
converter = C:\\Program Files\\gs\\gs9.05\\bin\\gswin64c.exe
```

2. Set the arguments for converter in gateway.conf:

```
arguments = -dBATCH -dNOPAUSE -dUseCIEColor -dPDFSETTINGS=/printer -
sDEVICE=pdfwrite -q -sOutputFile=%1 %2
```

3. Set a PostScript printer driver in gateway.conf (Optional):

```
printerDriver = HP Color LaserJet 8500 PS
```

4. Set a name for the printer in gateway.conf (Optional)
printer = My Printer Name

Since version 5.7, the gateway will automatically choose the best available driver. It's not recommended to set up the printerDriver unless you have special needs.

Install a PCL printer (some applications only work on PCL printer):

1. Set a PCL to PDF converter in gateway.conf (we use ghostPCL <http://www.ghostscript.com/GhostPCL.html> here):

converter = C:\apps\ghostpcl-9.05-win32\pcl6-9.05-win32.exe

2. Set the arguments for converter in gateway.conf:

arguments = -dNOPAUSE -sDEVICE=pdfwrite -sOutputFile=%1 %2

3. Set a PCL printer driver in gateway.conf:

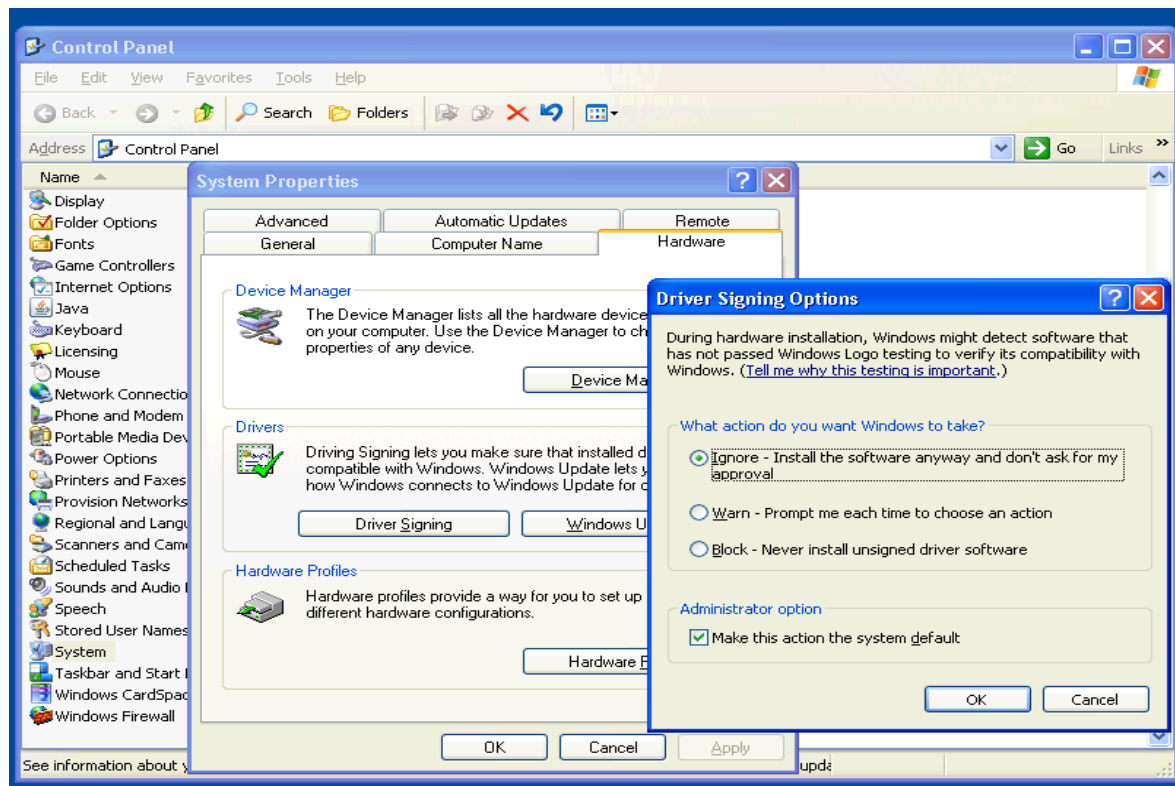
printerDriver = HP LaserJet 4100 Series PCL

4. Set a name for the printer in gateway.conf (Optional)
printer = My Printer Name

For receipts and label (text only) printers:

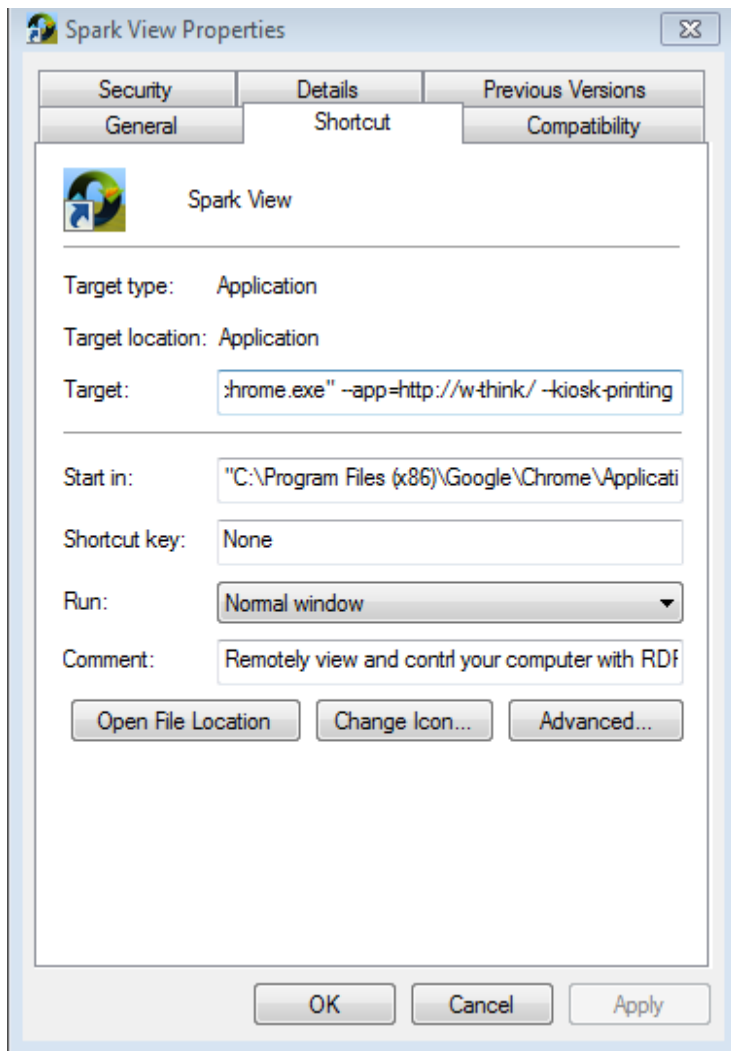
Please add "&textPrinter=on" into the websocket url.

If you got "Unsupported driver Installation" warning on Windows 2003, please change following setting:



Enable silent printing:

Chrome: "More tools" ->"Create application shortcuts", then edit the just created shortcut, add " --kiosk-printing" into the target:



Firefox: Type `about:config` at Firefox. Right click at anywhere on the page and select `New > Boolean`. Enter the preference name as `print.always_print_silent`, click OK and select "true" as the value. Restart Firefox.

3.7. RemoteApp and start a program instead of the whole desktop

There are two ways to start a program:

←

→

↻

ⓘ

w-think/

Spark View (RDP) 4.8.8

[Spark View \(VNC\)](#) [Spark View \(SSH\)](#) [Spark View \(TELNET\)](#) [Spark View \(Remote Ass](#)

Spark Gateway: *default port is 80 if it's not specified (ip:por

General

Display

Local

Programs

Advanced

Start the following program on connection:

Program path and file name

Start in following folder

RemoteApp:

Exe or file

Arguments

None

Clear

Delete

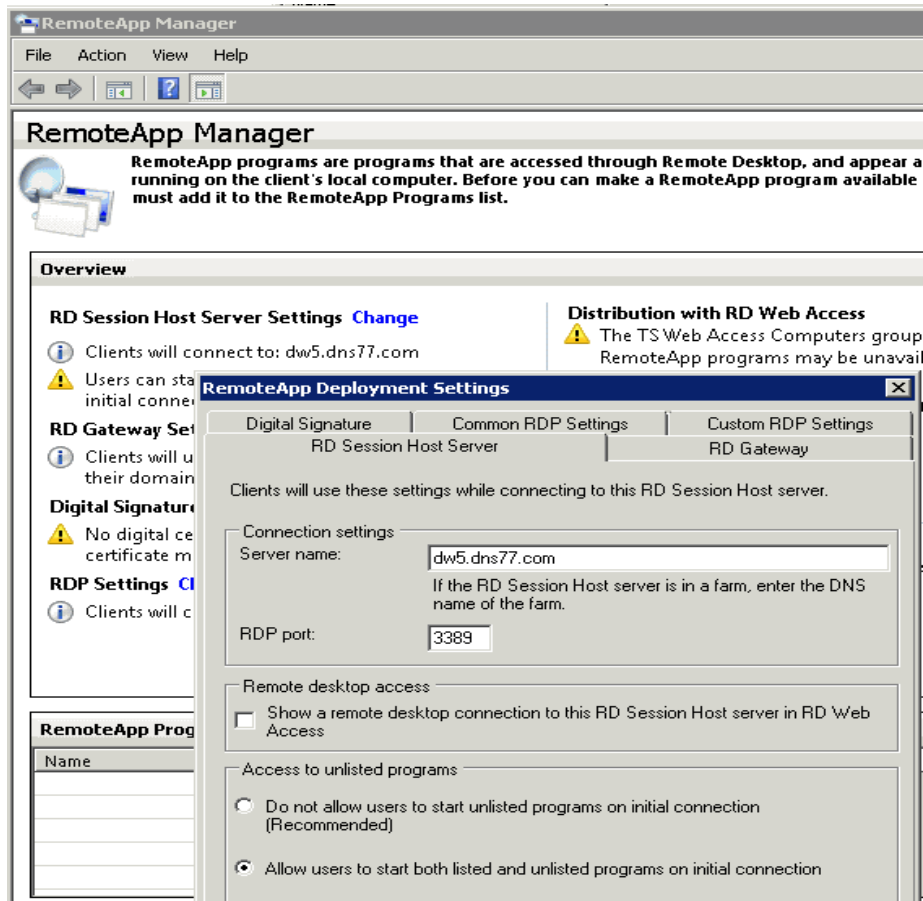
Save

Connect

Open in existing window

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Start a program on connection use a program as shell of Windows. That means you can only use one program in this session. You'll need to create 2 sessions to start 2 programs (This user will use two Spark View licenses then). To configure "Start a program on connection" in servers.json file, you need to specify "command" and "directory" options. Please make sure you allow users to start unlisted programs on Windows 2008.



If you are using Windows Server 2012 R2 you can configure this in the Collection properties sheet by using Server Manager. By default, only programs in the RemoteApp Programs list can be started when a user starts a Remote Desktop Services session. You can also use following policy or registry to do the same:

Policy path:

Windows Components\Remote Desktop Services\Remote Desktop Session Host\Connections

Scope: Machine Supported on: At least Windows Server 2008

Registry settings:

HKLM\SOFTWARE\Policies\Microsoft\Windows NT\Terminal Services\AllowUnlistedRemotePrograms.

RemoteApp was introduced in RDP 6.1. All RemoteApps running on client side can share only one session, even you are running thousands of RemoteApps. To configure RemoteApps in servers.json, you need to specify "remoteProgram", "remoteWorkDir", and "remoteArgs" options.

RemoteApp window will be automatically resized (no reconnection needed) when you resize the browser window.

Here is a example for setting up RemoteApp in servers.json:

```
{  
  "id": "RemoteAppWord",  
  "displayName": "RemoteApp WORD",  
  "server": "192.168.8.119",  
  "icon": "kbd.png",  
  "protocols": "rdp",  
  "rdp": {  
    "username": "Administrator",  
    "mapClipboard": true,  
    "password": "password",  
    "remoteProgram": "||WINWORD"  
  }  
},
```

If you are using alias name of the RemoteApp, please make sure there are || before it.

For a good user experience, it's better to start program without splash screen, also set time limit for disconnected session on RDSH:

1. Log on to the terminal server as an administrator.
2. Start the Local Group Policy Editor. To do this, click **Start**, click **Run**, type **gpedit.msc**, and then click **OK**.
3. Locate the following node:

Computer Configuration\Administrative Templates\Windows Components\Terminal Services\Terminal Server\Session Time Limits

Note: The policy settings are also located under **User Configuration\Administrative Templates\Windows Components\Terminal Services\Terminal Server\Session Time Limits**

Please check following links for more information:

http://en.wikipedia.org/wiki/Remote_Desktop_Services#RemoteApp

[http://technet.microsoft.com/en-us/library/cc753112\(v=ws.10\).aspx](http://technet.microsoft.com/en-us/library/cc753112(v=ws.10).aspx)

[http://technet.microsoft.com/en-us/library/cc730673\(WS.10\).aspx](http://technet.microsoft.com/en-us/library/cc730673(WS.10).aspx)

Configure RemoteApp RDP settings:

<http://technet.microsoft.com/en-us/library/cc733144.aspx>. For better performance, you may want to add following lines in the “Custom RDP settings” page:

disable full window drag:i:1

disable menu anims:i:1

disable themes:i:1

disable wallpaper:i:1

Please be aware not all applications can run on RemoteApp and Terminal Server/RDSH environment. You may want to choose a Virtual Machine solution instead or connecting to Hyper-V console. All applications are guaranteed to work with Hyper-V console connection, but it doesn't audio, video etc advanced RDP features.

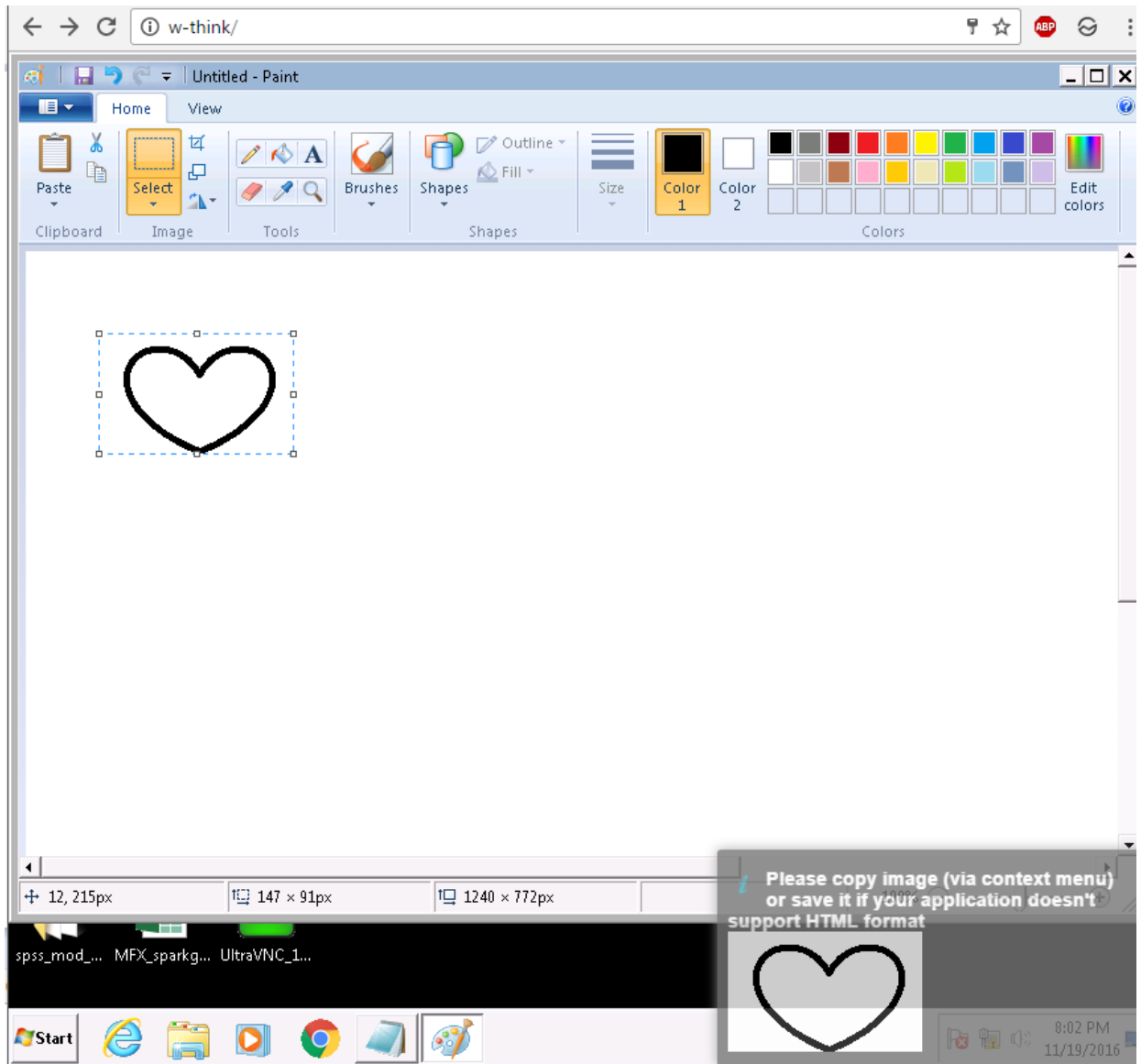
3.8. Clipboard redirection and shared clipboard

You can only copy text, image and html between local and remote because of the browser's restriction, but you can copy anything, including files, between any connected sessions (shared clipboard on gateway).

Spark View can tell you are copying from local or another session and enable shared clipboard automatically.

- Some browsers can only access local clipboard when you are doing copy/paste, so you'll have to use keyboard (Ctrl+C/V) instead of Copy/paste menu. Right click (context menu) copy is only supported on Chrome and IE. Right click paste is only supported on IE.

- You'll see a copy dialog to ask you copy the content again on browsers which doesn't support right click copy/paste.



- On Mac, you'll need to use Command key instead of Ctrl key.

3.9. Bidirectional audio redirection (RDP)

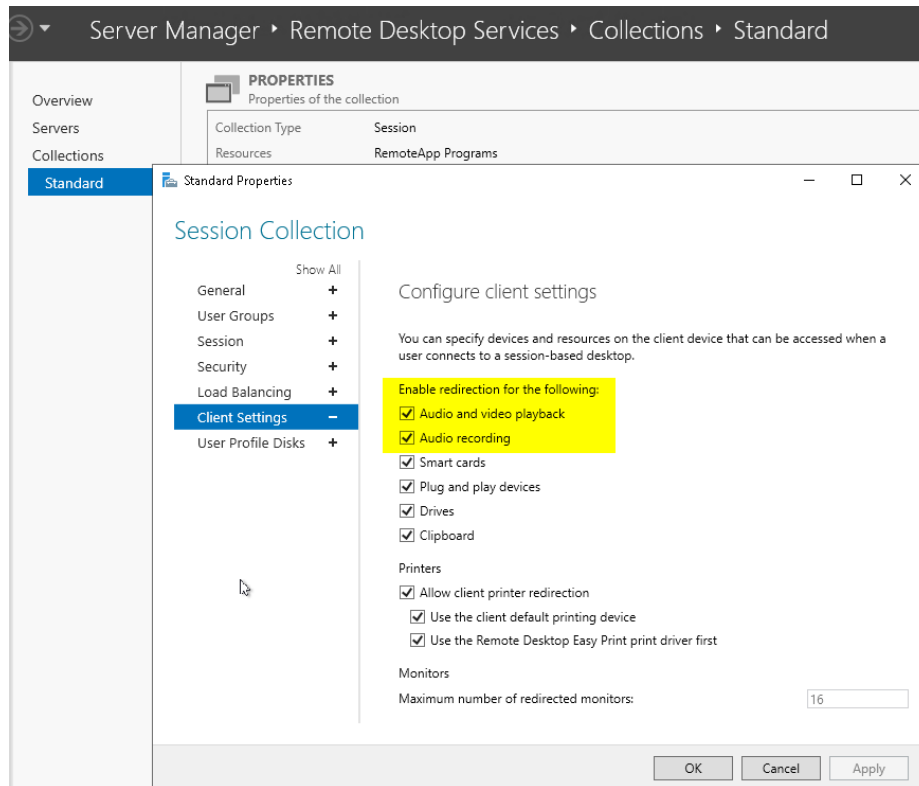
Audio redirection must be enabled in the RDP server first.

For microphone redirection, Chrome 53, Edge 12, Firefox 36, Safari 11 and secure context (HTTPS) are required.

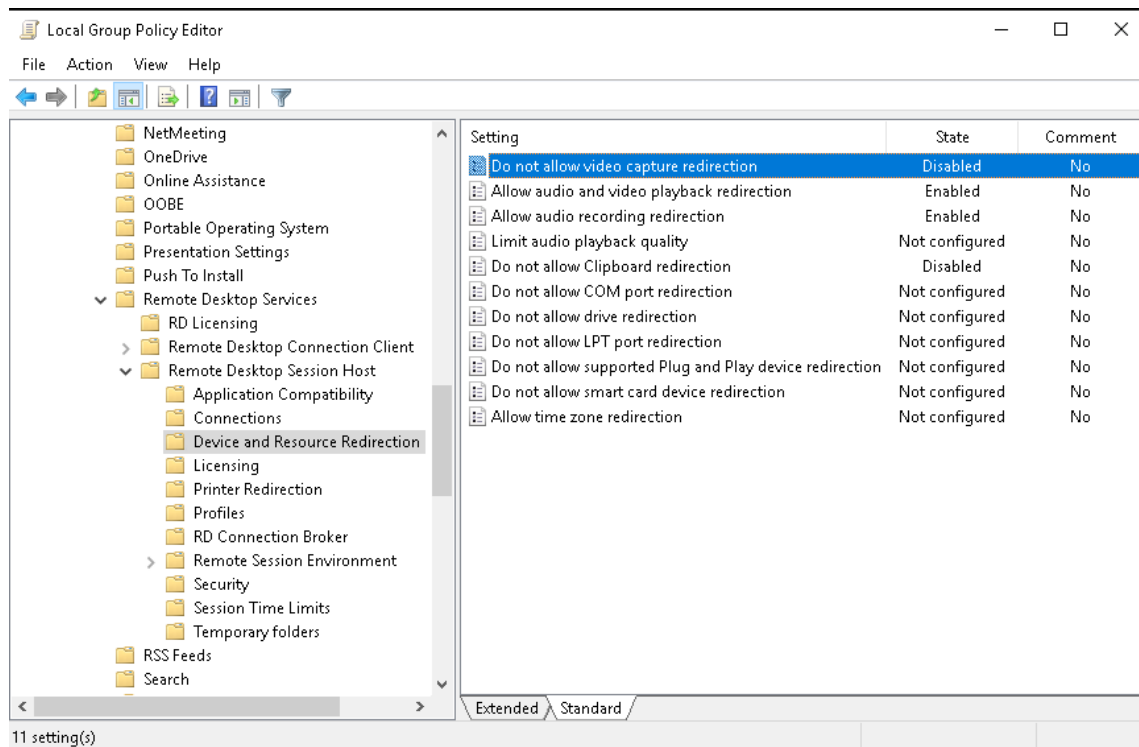
playSound=0 to bring remote sound to local.

audioRecord=on to enable microphone redirection.

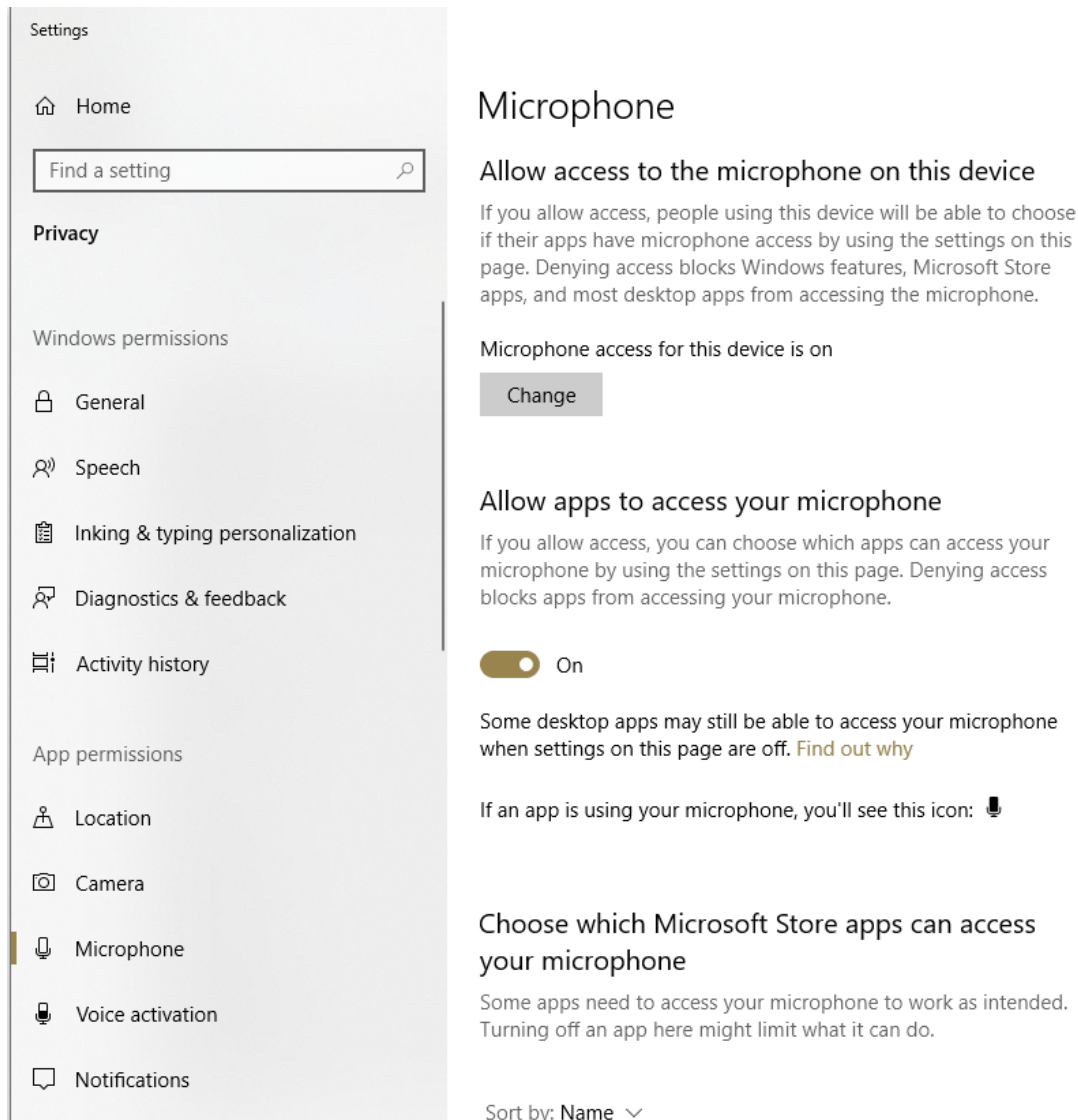
Settings for microphone in RDSH:



Group Policy:



Please also make sure you “Allow apps to access your microphone” if you are connecting to Windows 10 or 2019:



GPO Path:

Computer Configuration\Policies\Administrative Templates\Windows Components\App Privacy

GPO:

Let Windows apps access the microphone

3.10. File share (uploading and downloading)

There are two ways to implement file downloading/uploading. One is using temporary directory for every user. The temporary directory will be deleted after user session was terminated. Another is using permanent directory for each RDP host.

Temporary Directory

1. Configure a parent directory in gateway.conf: `tmpdir = C:\\apps\\share`. You can use `${user}` and `${domain}` variables in `tmpdir` since 5.0. This user directory will not be removed automatically if variables are used in `tmpdir`.
2. Make sure "Uploading/Downloading files" selected on client side.

Spark Gateway: *default port is 80 if it's not specified (ip:port)

General	Display	Local	Programs	Advanced
Time Zone (GMT-07:00) US Mountain Standard Time ▼				
Remote audio playback Play on this computer ▼ Quality Low ▼				
Remote audio recording <input type="checkbox"/>				
Choose the devices and resources that you want to use in remote session.				
Clipboard <input checked="" type="checkbox"/> Enable (Copy text, image, html between local and remote sessions) <input type="checkbox"/> Fast copy(Ctrl+C for remote copy, double Ctrl+C for copy)				
Printer <input type="checkbox"/> Enable; Name Remote Printer from Client				
<input checked="" type="checkbox"/> Uploading/Downloading files. (Drag files to your screen)				
Shared Disk Name <input type="text"/> Default is "Cloud Storage"				

Permanent Directory

1. Configure disk mapping in servers.json:

```
"mapDisk": true,
```

```
"disks": [
```

```
{
```

```
"dosName": "Storage",
```

```
"longName": "Long Display Name",
```

```
"devicePath": "/apps/test/"
```

}

],

You can use \${user} and \${domain} variables in devicePath since 5.0.

2. Make sure “Uploading/Downloading files” selected on client side.

Uploading files:

Choose files or drag files to your remote desktop (anywhere except the cloud icon) after logged in. Click

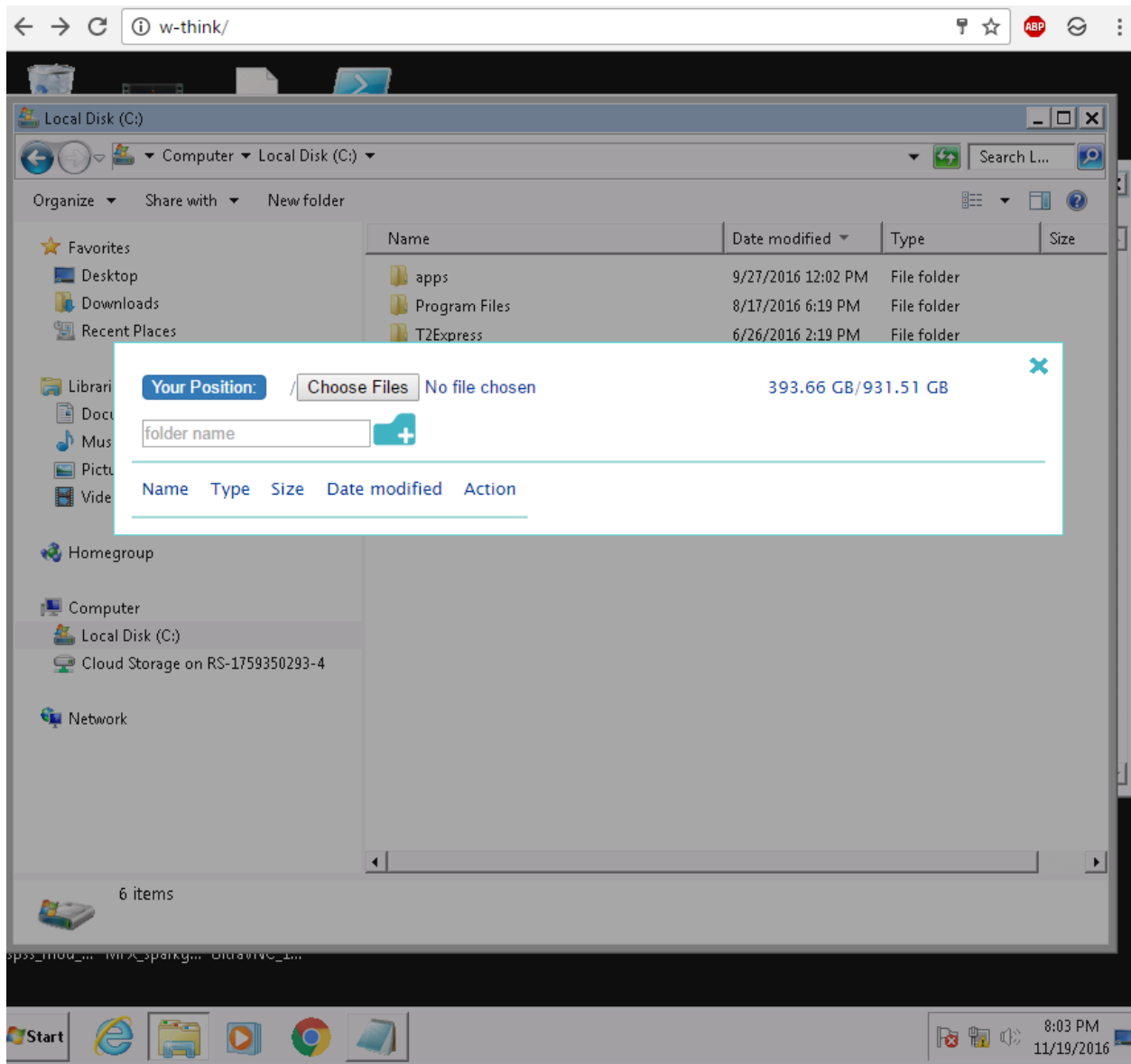
the cloud icon on the top middle of you screen to check the uploading process.



The cloud icon will disappear if you have no operation for a while, click anywhere on the screen to bring it back again.

Downloading files:

Click the cloud icon, a file browser dialog will be displayed. You can enter a folder or select a file to download. You can also drag a file to your desktop directly if you are using Chrome.



For best result, please make sure share directory is in another disk or file system.

File share will be disabled if directory is not specified in servers.json and gateway.conf.

The file which is uploading has ".uploading" filename extension. You can delete it or resume the uploading later. Uploading will be cancelled if there is no enough free space on the drive.

Drag and Drop

You can drag a local file to remote computer if the current application supports file copy and paste, e.g. File Explorer, Desktop etc. you need to set copyFile = true in gateway.conf to enable this feature.

Spark View will ask you to download the files or directories when you copy files or directories in remote computer.

3.11. Session Recording and Playback

Spark View can record your session in RDP stream format (.rdpv) and play it anywhere. This format has smallest size and best quality in the world.

You need to configure following 3 properties in gateway.conf:

```
#session recording, 1 means recording graphic only, no sound. 3 means recording
graphic and sound.
recording = 1
```

```
#parent directory for session recording
recdir = C:\\apps\\share
```

```
#warn user about recording
recwarning = true;
```

Recording, playback is also supported in VNC, SSH, TELNET sessions.

You can also record session on client side (use recording=on parameter).

Since 4.8.8, Spark View supports seamless session shadowing: no need to reconnect (to rest the client status) when user is joining. The seamless joining may take more time if network is slow. You can go back to the old way by setting resetOnJoin=true in gateway.conf

The player.html can play local recording, and playerremote.html can play a file on the gateway (server side).

Converting recording to MP4:

Download the tool:

<http://www.remotespark.com/view/converter.jar>

Convert a recording file to mp4 in command line:

```
java -jar converter.jar -s record.rdpv //convert record.rdpv to record.mp4
```

```
java -jar converter.jar -s record.rdpv -d new.mp4 //convert record.rdpv to new.mp4
```

```
java -jar converter.jar -h //help
```

Use the jar file as a library:

```
import com.toremote.record.converter.VedioConverter;
```

```
/**
 * @param sourcePath source path of a .rdpv type video file
```

```

    * @param destinationPath OPTIONAL destination path of the converted .mp4
format video file
    * @param acceleration OPTIONAL integer between 0 and 10. The acceleration of
the speed up effect
    * @param fps OPTIONAL frames per second, default is 25.
    * @param imgInterval OPTIONAL the interval in seconds of persisting snapshot
pictures, default is 10 seconds.
    * @param convertType convert type, 0: default, convert to .mp4 video only; 1:
convert to png image files only; 2: convert to both png image files and .mp4 video.
    */

```

```

VideoConverter converter = new VideoConverter(srcPath, destPath, speed, timeRational,
imgInterval, convertType);

converter.convert();

```

3.12. Session Shadowing (Join or share an active session on gateway)

Unlimited users can join/share one existed session via one click if you know the session id:

<http://www.remotespark.com/join?id=123456789&name=Admin>

The input can be controlled by all users or only one of them. User can require control from other user, or give control to other user.

Spark session shadowing has following advantages compared other solutions:

- Fully based on RDP protocol (no VNC involved), has better performance and using fewer bandwidth.
- Every joined user can see other user's mouse movements.
- Two join mode: Every one can control or only one can control at a time.
- Even sessions on Windows XP, Windows 7, xrdp can be joined too.
- Unlimited user can join one session, depends on the ability of you gateway.

RemoteApp session shadowing is also supported since 3.4.

Make sure you have following parts in your web page to make the shadowing work if you are using yourselves customized web page:

```

var info = $id("joinSelect");
if (info){
    info.onchange = function(e){
        svManager.getInstance().setJoinMode(e.target.value);
    };
}

var control = $id("requestControl");
if (control){

```

```

        control.onclick = function(e){
            svManager.getInstance().requestControl();
        };
    }

    <div id="appinfo" class="appdlg">
        
        <table>
            <tr><td align="right"><b>Connected
to:</b></td><td><span id="connectingTo"></span><br></td></tr>
            <tr><td align="right"><b>Session
id:</b></td><td><span id="numericId"></span><br></td></tr>
            <tr><td align="right"><b>Join mode:</b></td><td>
<select id="joinSelect">
                <option value="0">Every one can control</option>
                <option value="1">Only one can control</option>
            </select><br></td></tr>
            <tr><td colspan="2"><b>Join this session with following
link:</b><br><a id="joinLink" target="_blank"></a></td></tr>

            <tr><td></td><td align="right"><input type="button" id="requestControl" value="Req
uest Control" disabled="disabled" /></td></tr>
        </table>
    </div>

```

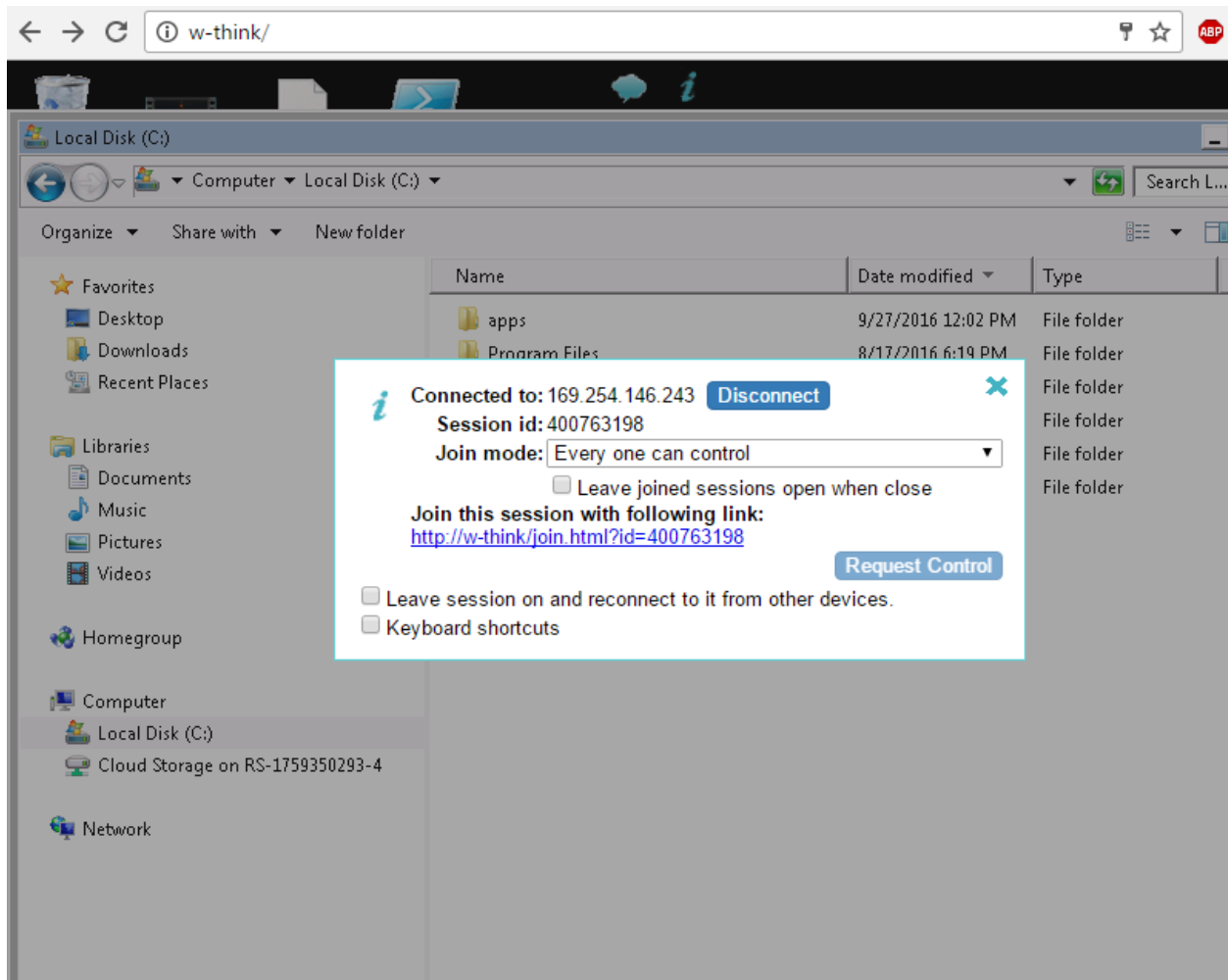
To disable session shadowing, you can:

- Set shadowing = false in gateway.conf
- Remove following part from the web page (optional):

```

<table>
    <tbody>
        <tr><td align="right"><b>Connected to:</b></td><td><span
id="connectingTo"></span><br></td></tr>
        <tr><td align="right"><b>Session id:</b></td><td><span
id="numericId"></span><br></td></tr>
    </tbody>
    <tbody id="shadowing">
        <tr><td align="right"><b>Join mode:</b></td><td>
<select id="joinSelect">
            <option value="0">Every one can control</option>
            <option value="1">Only one can control</option>
            <option value="2">Only one can control (others can move
mouse)</option>
        </select><br></td></tr>
        <tr><td colspan="2"><b>Join this session with following link:</b><br><a
id="joinLink" target="_blank"></a></td></tr>
        <tr><td></td><td align="right"><input type="button" id="requestControl"
value="Request Control" disabled="disabled" /></td></tr>
    </tbody>
</table>

```



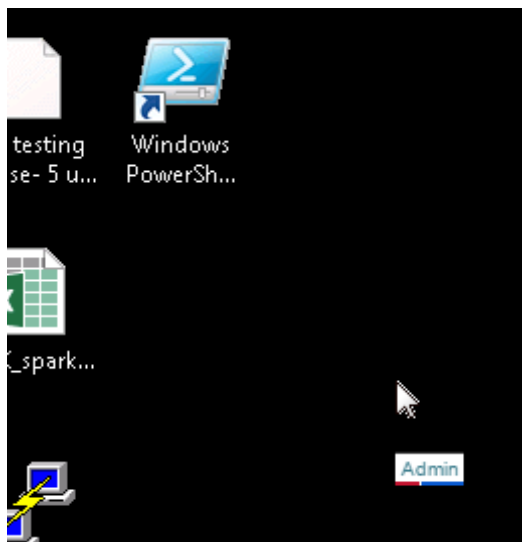
You can also join a symlink if you only know the symlink id, for example:

<http://w-think/join.html?symlink=212a155e-e951-40db-95ea-177183174fa7&gateway=w-think&connectif=true>

If connectif=true, it will start a new connection if there is no existing connection with the symlink. This only works on symlink joining and you have to enable it by adding following entry in gateway.conf:

connectif = true

If name parameter was given, the name will be displayed under the cursor:



There are two colors under the name: the first is calculated by the name, the second is calculated by the session id which makes sure every user has a unique color combination.

3.13. Native RDP shadowing (Join any active RDP sessions)

Since 6.0, Spark View can use shadow.html to shadow any active RDP sessions on the RDP server, even they are connected from another RDP client, which is same as the `mstsc.exe /v:server /shadow:x /control`.

Target RDP server requirements:

- Enable remote control: Run `gpedit.msc` -> Computer Configuration / Administrative Templates / Windows Components / Remote Desktop Services / Remote Desktop Session Host / Connections and enable the policy "Set rules for remote control of Remote Desktop Services user sessions"
- Enable File and printer sharing.

Spark View Native RDP Shadow 6.0.0

[Spark View \(RDP\)](#) [Spark View \(VNC\)](#) [Spark View \(SSH\)](#) [Spark View \(TELNET\)](#) [Spark View \(SMB/SFTP\)](#) [Spark View \(Remote Assistance\)](#)

Spark Gateway: *default port is 80 if it's not specified (ip:port).

RDP Server:

Username:

Password:

Domain:

Session ID:





Control: ☒ Allows control of the session when shadowing.









Silent: ☐ Allows shadowing without user consent. Only works when the correct policy is set on the RDP server.


3.14. Touch Interface (iOS, Android etc)

Spark View can operate on tablets and smart phone devices if you have an html5 browser available.

Following gestures are supported:

	Long press	Right click
	Flick	Scroll screen if remote desktop resolution is bigger, otherwise, drag
	Pan	Drag
	2 finger tap	Right click


	2 finger scroll	Mouse wheel
	3 finger tap	Show software keyboard (iOS only)
	3 finger pinch open	Maximize window
	3 finger pinch close	Restore window
	3 finger flick left	Previous window
	3 finger flick right	Next window
	3 finger flick down	Minimize all windows
	3 finger flick up	Restore all windows

You can also tap the keyboard icon  to activate the software keyboard. IE doesn't support 3 finger gestures and 2 finger scroll (mouse wheel).

Touchpad mode (relative mouse movement)

Touchpad mode allows you to use whole touch screen as a touch pad. You can use the finger to move the cursor and issue a click on the position of the cursor (not the position you are tapping on).

Entering text

You can see a  button after you tap anywhere on the screen. Taping on this button will activate the software keyboard and allow you entering text. Some PC keys will also be shown on the left top of your screen:



You can see more PC keys by tapping on :



Make sure your html page has following part to make PC keys work:

```
<div id="pc_key"><span>Ctrl</span><span>Alt</span><span>Del</span><span>Esc</span><span>...</span></div>
  <div id="pc_key_more">
    <span>F1</span><span>&larr;</span><span>&uarr;</span><span>&rarr;</span><span>&darr;</span><span>Start</span><span>Alt+F4</span><span>Ctrl+Alt+Del</span>
  </div>
```

You can also add any other keys by changing the pc_key div.

Recommended browsers:

Android: Chrome and Firefox.

iOS: Safari.

Playbook: Stock browser.

Windows: Chrome, Firefox, IE10 and Safari

Mac OS: Chrome, Firefox, and Safari.

Linux: Chrome and Firefox.

3.15. Touch Remoting

Touch Remoting will be enabled automatically when following conditions are met:

- RDP host is Window 8 or Windows 2012 and
- Local device has multi-touch ability and
- Minimum screen resolution of local device is 1024x768.

3.16. Hyper-V Console and Enhanced Session Mode

Compared with normal RDP connection, Hyper-V console connection has following pros and cons:

Pros:

- Don't need a network for the VM, don't need to have RDP enabled. Only need the VM GUID for connection.

- Same as a physical computer, Good for testing and some applications which cannot run under normal RDP.
- Don't require Terminal Services CALs.

Cons (if enhanced session mode is not enabled):

- Limited RDP features, no resource redirection.
- Not all resolutions can be supported; can only change the resolution in Windows.

Since Window 2012 R2, Hyper-V console supports enhanced session mode which allow your redirect local resource in Hyper-V console session. To enable enhanced session mode in Spark View, please append ";EnhancedMode=1" to the VM GUID. Please check following link for more information about enhanced session mode:

<http://technet.microsoft.com/en-us/library/dn282274.aspx>

To connect to Hyper-V console, make sure:

- Enable CredSSP (Network Level Authentication) in gateway.conf.
- The server address is the Hyper-V server address; User name, password, and domain are all for Hyper-V server, not for the VM you are connecting to. Also be aware default listening port of Hyper-V console is 2179 instead of 3389. To connect to a VM, all you need is the VM GUID.
- Install Microsoft Virtual Machine Integration Services into the VM; disable cursor shadow (important) in the VM. It's better to adjust your computer for best performance.

3.17. RDP Connection Cache/Pool

RDP session may take minutes to start (booting, login, user profile etc) which is unacceptable sometimes. RDP connection Cache/pool allows you see you desktop and RemoteApp instantly.

You can cache a connection on client side and display it when user needs it. Cache on client side is faster and recommended.

You can also cache a connection on gateway side (in a connection pool) too. It's disabled by default, to enable it, set maxCacheTime to a non-zero value in gateway.conf.

Please check example7.html (under html directory) for usage on client side.

Cache API also make integration more easier, here is what you can do with it:

- Your application send http request to the gateway to create a connection and this connection will be cached on gateway: `http://gateway/CACHE?server=hyper-vServer&port=2179&user=uu&pwd=pp&domain=dd&CACHEID=mycacheid&CACHETIMEOUT=1&CACHEPOLICY=0&DUPLICATE=off&gatewayPwd=5f4dcc3b5aa765d61d8327deb882cf99&width=800&height=600`". In this request, CACHETIMEOUT is 1 minute, CACHEPOLICY=0 means gateway will do nothing if this cache is popped out. DUPLICATE=off means there is only one cache item under one id. You'd better using UUID as CACHEID. gatewayPwd is the MD5 hash of password configured in gateway.conf, 5f4dcc3b5aa765d61d8327deb882cf99 is the MD5 hash of "password".
- On the client side, you can create an RDP connecting by: Using the JS library directly in your web page: `new svGlobal.Rdp("ws://gateway/RDP?CACHEID=mycacheid&...)` or using `rdpdirect.html`: `http://gateway/rdpdirect.html?gateway=yourgatewayaddress&CACHEID=mycacheid`

3.18. Symlink (Access link)

You can create a symlink for a RDP host (must be configured in servers.json first). After you created a RDP server in servers.json, you'll be able to access it with the server id. Symlink is more secure than server id, and it can be a temporary link (set up valid time) or a permanent link.

You can create a symlink file manual and specify this file in gateway.conf. Here is an example of symlink file:

```
{
  "symlinks": [
    {
      "id": "3645e6db-7afc-4fff-8ad9-92415aa25db0",
      "resourceId": "demo2",
      "validFrom": "2013-05-14 20:43 MDT",
      "validTime": "5d",
      "parameters": "user=uu&pwd=pp",
      "comment": "comment"
    }
  ]
}
```

The pattern for date format is "yyyy-MM-dd HH:mm z". Please check <http://docs.oracle.com/javase/7/docs/api/java/text/SimpleDateFormat.html> for more information about this format.

You can send extra parameters to the server by configuring the "parameters" property.

You need to specify the location of the symlink file in gateway.conf:

`symlink = C:\\Users\\uuu\\workspace\\data\\symlink.json`

You can also configure this using config.html:

The screenshot shows a web browser window with the address bar displaying "w-think/config.html". The page has a header with navigation tabs: Gateway, Server, User, Symlink (selected), and Session. Below the tabs, there is a "Symlink Configuration (Saved in symlink.json)" section with "Add" and "Refresh" buttons. A table lists four symlink configurations with columns for ID, Resource (Server), Password, Valid From, Valid Time, and Valid To.

ID	Resource (Server)	Password	Valid From	Valid Time	Valid To
fa691471-046d-4e22-a4c6-37987086d60d	d949e9bc-8a9f-41fb-9d5c-39041cf5bd33		2016-03-25		
212a155e-e951-40db-95ea-177183174fa7	169.254.146.243	myPassword	2016-04-01		
07aee0b4-ae5f-4129-84e1-497d7762de18	vnc		2016-04-13		
68fcfbf5-c3c2-4b6b-8c8a-00f61a2b9d70	RDP122		2016-07-15		

On the client side, you'll need to use 'symlink=symlinkId' instead of 'server=yourServer' when creating a connection:

```
var rdp = new svGlobal.Rdp('ws://gateway/RDP?symlink=symlinkId&mapClipboard=on&...').
```

You can also join a symlink:

```
var rdp = new svGlobal.Rdp('ws://gateway/JOIN?symlink=symlinkId&mapClipboard=on&connectif=on&...').
```

If connectif=on and there is no session established with that symlink, this will create a new connection instead. Make sure you set connectif = on in gateway.conf to enable this feature first.

3.19. Macro Recording

Macro recording can be used on software testing, automated jobs etc. Please add macro.js into your web page and then you can record macro:

```
var recorder = new MacroRecorder(rdp);

recorder.start();//start recording

recorder.stop();//stop recording

recorder.play(); //playback

recorder.stopPlay();//stop playing

recorder.getScript();//get playback script
```

Please check the source code of macro.js for more details.

3.20. Remote Assistance

You can provide Remote Assistance with assit.html. With Spark View's cross-platform ability, now you can provide remote assistance from anywhere, and devices:

Spark View (Remote Assistance) 4.8.8

[Spark View \(RDP\)](#) [Spark View \(VNC\)](#) [Spark View \(SSH\)](#) [Spark View \(TELNET\)](#)

Spark Gateway: *default port is 80 if it's not specified (ip:port).

1. Expert name

2. Password

3. Open or drag the invitation (.msrcIncident) file here:

No file chosen

You can connect to Windows XP, Windows 7, Windows 2008, Window 8, Windows 2012 with Spark View remote assistance. Spark View only accepts invitation file which is generated in version 1 format for now.

* Remote Assistance session cannot be joined.

* Remote Assistance is disabled by default. Please set assistance = true in gateway.conf to enable it.

3.21. RFB (VNC) protocol support

You can connect to any VNC server (Linux, Mac etc) with vnc.html. It also supports session shadowing.

← → ↻ ⓘ w-think/vnc.html

Spark View (VNC) 4.8.8

[Spark View \(RDP\)](#) [Spark View \(SSH\)](#) [Spark View \(TELNET\)](#) [Spark View \(Remote Assis:](#)

Spark Gateway: *default port is 80 if it's not specified (ip:port)

General

Advanced

Computer

Port

Password

Clear

Delete

Save

Connect

3.22. SSH and Telnet

You can connect to SSH server with [ssh.html](#), and connect to TELNET server with [telnet.html](#):

w-think/ssh.html

Spark View (SSH) 4.8.8

[Spark View \(RDP\)](#) [Spark View \(VNC\)](#) [Spark View \(TELNET\)](#) [Spark View \(Remote Assistance\)](#)

Spark Gateway: *default port is 80 if it's not specified (ip:port).

General

Advanced

Computer

Port

UserName

Password

Clear

Delete

Save

Connect

w-think/telnet.html

Spark View (TELNET) 4.8.8

[Spark View \(RDP\)](#) [Spark View \(VNC\)](#) [Spark View \(SSH\)](#) [Spark View \(Remote Assistance\)](#)

Spark Gateway: *default port is 80 if it's not specified (ip:port).

General

Advanced

Computer

Port

Clear

Delete

Save

Connect

* You can also join SSH and TELNET sessions.

* Telnet doesn't support local echo.

3.23. Smart Card Redirection

Since version 5.7, Java applet was deprecated. Smart Card redirection need a small native application (sg_agent.exe for Windows, sg_agent.zip for macOS) running on user's machine to communicate with Smart Card.

Spark View (RDP) 5.7.0

[Spark View \(VNC\)](#) [Spark View \(SSH\)](#) [Spark View \(TELNET\)](#) [Spark View \(Remote Assistance\)](#)

Spark Gateway: *default port is 80 if it's not specified (ip:port).

General	Display	Local	Programs	Advanced	Multi-Monitor
<p>Time Zone <input type="text" value="(GMT-07:00) US Mountain Standard Time"/></p> <p>Remote audio playback <input type="text" value="Play on this computer"/> Quality <input type="text" value="Low"/></p> <p>Remote audio recording <input type="checkbox"/></p> <p>Choose the devices and resources that you want to use in remote session.</p> <p>Clipboard <input checked="" type="checkbox"/> Enable (Copy text, image, html between local and remote)</p> <p>Printer <input checked="" type="checkbox"/> Enable; Name <input type="text" value="Remote Printer from Client"/> <input type="checkbox"/> Text Only (Receipt, Label print)</p> <p>Drives <input checked="" type="checkbox"/> Uploading/Downloading files. (Drag files to your screen after connected).</p> <p>Shared Drive Name: <input type="text" value="Cloud Storage"/></p> <p>Smart Card <input checked="" type="checkbox"/> Enable Smart Card</p>					



Spark Gateway Agent

Smart Card redirection needs a agent (native application) running on your computer to access the local hardware. Please:

1. [Download](#) the agent.
 2. Run the agent (Right click, select Open on macOS) and keep it running during the connection (You only need to run the agent once for multiple sessions, close it from the system tray).
- Switch back and continue (Close this dialog).

You also need to add '&smartCard=on' parameter to your websocket URL to enable smart card redirection. Use '&passwordIsPin=on' parameter if you want to transfer password as the PIN of smart card.

3.24. OAuth 2.0/Okta Integration

You need to register your application before you use OAuth 2.0 integration.

Provider	Registering Address
Google	https://developers.google.com/identity/protocols/oauth2/web-server#httprest
Windows Live Connect	https://account.live.com/developers/applications http://msdn.microsoft.com/en-us/windowslive/ff769489.aspx

Please use `http(s)://gatewayAddress/oauth2callback` for redirect URI.

You'll get client id and client secret after the registration, and set up them in the `oauth2.json` configuration file. You can specify the location of `oauth2.json` in `gateway.conf`

Example of `oauth2.json`:

```
{
  "providers" : [{
    "name" : "Google",
    "client_id" : "t2r66k1ms3hpoi3k1e2g7l2adlarau8s.apps.googleusercontent.com",
    "client_secret" : "-D-nhxWn2E97tZWWLg5IQ6Ak",
    "request_uri" : "https://accounts.google.com/o/oauth2/v2/auth",
    "redirect_uri" : "http://www.mygateway.com/oauth2callback",
    "access_token_uri" : "https://oauth2.googleapis.com/token",
    "scope": "openid email"
  },
  {
    "name" : "Live",
    "client_id" : "0000000040133",
```

```

        "client_secret" : "rq6mtaeZCwTSwqblF39Br3Z",
        "request_uri" : "https://login.live.com/oauth20_authorize.srf",
        "redirect_uri" : "http://www.mygateway.com/oauth2callback",
        "access_token_uri": "https://login.live.com/oauth20_token.srf",
        "scope": "wl.emails",
        "profile_uri": "https://apis.live.net/v5.0/me"
    }
]
}

```

Okta SSO

To enable SSO, Spark View application need to be configured as trusted application (Resource Owner Password Flow):

<https://developer.okta.com/docs/guides/implement-password/overview/>

You don't need to configure request_uri, redirect_uri , and profile_uri for Okta. Here is an example for Okta:

```

{
  "providers" :
  [
    {
      "name" : "okta",
      "client_id" : "0000000040133A31",
      "client_secret" : "p9WwBr2Pyrq6mtaeZCwTSwqblF39Br3Z",
      "access_token_uri": " https://dev-160206.okta.com/oauth2/v1/token",
      "scope": "openid email"
    }
  ]
}

```

```
}
```

Then login from http://yourGateway/login_okta.html

3.25. Active Directory, LDAP, RADIUS integration

You can authenticate your users against active directory, LDAP or RADIUS server. Please configure your users.json as followings:

For Active Directory or LDAP:

```
{
  "source":{
    "type": "AD",
    "properties": {
      "server": "192.168.12.128",
      "domain": "mydomain.com"
    }
  }
}
```

You can let gateway fetch servers from the AD. The following example will fetch all the servers from the “otherLoginWorkstations” attribute.

```
{
  "source":{
    "type": "AD",
    "properties": {
      "server": "myDomainController",
      "domain": "mydomain.com",
      "serversAttr": "otherLoginWorkstations"
    }
  }
}
```

Gateway can also change AD user password if:

1. AD has SSL enabled.
2. Export the AD certificate (Public key only) in Base-64 encoded X.509 file format.
3. Import the AD certificate to Java keystore with following commands:

cd JRE\bin (use JDK\bin instead if JRE is not found, for example, OpenJDK11).

```
keytool -importcert -alias "anyName" -keystore \lib\security\cacerts -storepass changeit -file  
"C:\Users\username\Desktop\exported.cer"
```

Please check <https://blogs.msdn.microsoft.com/microsoftservercertigerteam/2017/04/10/step-by-step-guide-to-setup-ldaps-on-windows-server/> for more details.

4. Users.json

```
{  
  "source":{  
    "type": "AD",  
    "properties": {  
      "server": "192.168.12.128:636",  
      "secProtocol": "tls",  
      "domain": "xxx"  
    }  
  }  
}
```

“tls” or “ssl” can be used for the security protocol (secProtocol).

For RADIUS:

```
{  
  "source":{  
    "type": "RADIUS",
```

```

    "properties": {
        "server": "192.168.12.128",
        "port": "1812",
        "accountingPort": "1813",
        "sharedSecret": "test123"
    }
}
}

```

The sharedSecret can be gateway wide, can also be passed from the client side. Please check the source code of login.html for more information.

You also need to configure the servers in servers.json.

4.1. Session Management

You can use config.html to check session status, terminate or join a session on the gateway:

The screenshot shows the 'w-think/config.html' web interface. At the top, there are input fields for 'Gateway: w-think' and 'Password:'. Below these is a warning: 'This page can only be accessed from local computer. Set password and remoteManage=true in gateway.conf to enable remote access.' A 'Start Configuration' button is present. The interface has tabs for 'Gateway', 'Server', 'User', 'Symlink', and 'Session', with 'Session' currently selected. Under the 'Session' tab, there is a 'Sessions' section with a 'Refresh' button and 'Total: 1'. Below this is a table with columns: Id, Server, Client IP, Browser, Start Time, NumericId, User, Domain, Join, Protocol, Symlink, Thumbnail, Port, and Action. One session is listed with Id '3a4de893-3286-4be7-a134-0bdf798bdae6', Server '169.254.146.243', Client IP '169.254.84.132', Browser 'Mozilla/5.0 (Windows NT 10.0; WOW64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/54.0.2840.99 Safari/537.36', Start Time 'Sat Nov 19 20:01:16 MST 2016', NumericId '400763198', User 'vmuser', Domain 'vmuser-PC', Protocol 'RDP', Port '3389'. Below the table, there is a 'JavaScript console command:' section with two commands: 'sparkConfig.notify('my message'); //send message to all.' and 'sparkConfig.notify('my message', [123456789, 123456788]); //send message to session 123456789 and 123456788.'

4.2. Multi-Monitor

You'll have to open a new browser window for every monitor because you can not span a full screen browser window on multi monitors.

1 Go to the "Multi-Monitor" tab, click "Open" to open a new browser window

General	Display	Local	Programs	Advanced	Multi-Monitor
---------	---------	-------	----------	----------	---------------

You need a browser window for every monitor.

1. Please open another window for another monitor
2. Repeat step 1 if you have more monitors
3. Make this window full screen (F11 or Command+Shift+F)
4. Enter your credentials and Connect

Open

Clear	Delete	Save	Connect	<input checked="" type="checkbox"/> Open in existing window
-------	--------	------	---------	-------------------------------------------------------------

2. Move the new window to the second screen and make it full screen.
3. Make the current browser window full screen and connect.

4.3. SMB2, SFTB file proxy

Spark Gateway can also act as a SMB2/SFTP file proxy. User can access their SMB share, SFTB files with file.html with the following advantages:

- No need to expose your SMB, SFTB server.
- Protected with TLS encryption.
- No need to expose RPC, pipe access with SMB.
- Easily integration file access with our HTML5 interface and library.

Spark View (File) 5.8.0

[Spark View \(RDP\)](#) [Spark View \(VNC\)](#) [Spark View \(SSH\)](#) [Spark View \(TELNET\)](#) [Spark View \(Remote Assistance\)](#)

Gateway: *default port is 80 if it's not specified (ip:port).

File Server	<input type="text" value="sparkcloud"/>
Server Type	<input checked="" type="radio"/> SMB2 <input type="radio"/> SFTP
Port	<input type="text" value="445"/>
UserName	<input type="text"/>
Password	<input type="password"/>
Domain	<input type="text"/>
SMB Share	<input type="text"/>
Directory	<input type="text"/>
<input type="button" value="Connect"/>	

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4.4. Deploy, run, test applications in the cloud

Deploy, test your application in cloud can cumbersome. You need:

- Create bastion for individual work stream or project.
- Manage a lot of bastion hosts and user account is really painful.
- Security is always a problem for those bastion hosts.

Take advantage of our Spark Gateway proxy, SSH and SFTP feature, we developed a native agent which will work with the gateway to make this a lot easier. Please check our Deploy applications in cloud with Spark Gateway:

<http://www.remotespark.com/view/DeployApplicationsInCloud.pdf>

4.5. IP Filter (iptables)

You can set up IP files for SparkGateway.

First, save you ip filters into a JSON file. Here is the format of the IP filter configuration file:

```
{  
  
  "zoneRules": {  
  
    "HTTP_API": {  
  
      "allow": true,
```

```
"ranges": [  
  {  
    "from": "192.168.12.100",  
    "to": "192.168.12.200"  
  },  
  {  
    "from": "169.254.84.132"  
  }  
]  
,  
"TCP": {  
  "allow": true,  
  "ranges": [  
    {  
      "from": "192.168.12.100",  
      "to": "192.168.12.200"  
    },  
    {  
      "from": "192.168.12.10",  
      "to": "192.168.12.20"  
    },  
    {  
      "from": "169.254.84.132"  
    }  
  ]  
}
```



```
}  
  
}  
  
}
```

Then, you need to specify the location of this file in gateway.conf:

```
iptables= C:\\workspace\\data\\iptables.json
```

There are 3 zones available in SparkGateway: “TCP” is used to control TCP connections; “HTTP_API” is used to control the HTTP API usage; “CONFIG” is used to control the config.html.

Rules for accessing config.html:

1. Always accessible from the local host.
2. Accessible from anywhere if remoteManage=true in gateay.conf and correct password is provided.
3. Accessible if remoteManage= false and source IP is allowed in iptables.

4.6. Scanner Redirection

Spark View provides two different method for scanner redirection:

1. Please use the TWAIN Virtual Data Source if your scanner has TWAIN driver and your application supports TWAIN scanner. OR
2. Please run the SparkScan.exe in RDP server to scan from a local scanner which supports TWAIN, WIA (windows) or ICA (Mac OS) scanner.

Virtual TWAIN Data Source deployment (Need to deploy it on the RDP server first):

1. Create a directory under windows\\windows\\twain_32\\, for example: RemoteSpark
2. Copy SparkDataSource.ds to this directory:

```
windows\\windows\\twain_32\\RemoteSpark\\SparkDataSource.ds
```

The name of the directory or SparkDataSource.ds can be changed.

Run "SparkScan /?" to show the help information.

5. API and plug-in

5.1.Reporting API(Query server status, Client side JavaScript API)

Include "gateway.js" in your web page:

```
var gw = new Gateway("192.168.9.118");
gw.login("password");
gw.report();// output to console
gw.report(callback);// output to callback method
gw.checkLicense(callback2); // check license status
function callback(obj) {
    if (obj.error) {
        console.log("Error on getting report:" + obj.error);
        return;
    }
    var c, cs = obj.connections;
    var len = cs.length;
    console.log("\nTotal connections:" + len);
    for ( var i = 0; i < len; i++) {
        c = cs[i];
        console.log("connection " + i + " -----");
        console.log("clientId: " + c.clientId);
        console.log("clientAgent: " + c.clientAgent);
        console.log("server: " + c.server);
        console.log("startTime: " + c.startTime);
    }
}
```

We also have Java command line tool available for same purpose. Please download it from our web site.

We also have WebSocket client available which can be used to communicate with our gateway or other WebSocket servers.

5.2.Rdp libray (Client side Javascript API)

5.2.1.Rdp parameters

Parameter	Value
gateway	String, address and listening port of the gaetway. For example: 192.168.0.8:443
server	String, address of the RDP host.
port	Integer, RDP listening port. Optional, default is 3389
user	String, user name (Windows User).
pwd	String, password for user name.
domain	String, domain name
keyboard	Integer, keyboard layout, default is 0x409 (US)

useConsole	Boolean, connecting to console session/Admin mode. Default is false.
legacyMode	Boolean, connecting to xrdp or VirtualBox RDP
width	Integer, screen width of RDP session. Default is 800
height	Integer, screen height of RDP session. Default is 600
server_bpp	Integer, color depth of RDP session. Default is 16
playSound	Integer, Default is 1: Do not play sound; 0: bring sound to local; 2: leave sound on remote computer.
startProgram	String, "shell": start a program on connection; "app": start a RemoteApp.
command	Command for "Start a program on connection (startProgram=shell)"
directory	Directory for running command (startProgram=shell)
exe	Program or file for RemoteApp (startProgram=app).
args	Arguments for RemoteApp (startProgram=app).
background	Boolean, default is false, disable background
smoothfont	Boolean, default is false, disable font smoothing.
contents	Boolean, default is false, disable full windows drag.
animation	Boolean, default is false, disable menu animations.
composition	Boolean, default is false, disable desktop composition.
styles	Boolean, default is false, disable theming.
mapClipboard	Boolean, default is false, disable clipboard redirection.
mapPrinter	Boolean, default is false, disable printer redirection.
mapDisk	Boolean, default is false, disable disk redirection.
touchpad	Boolean, default is false, touchpad mode (relative mouse movement, touch interface only).
waWidth	Work area width for RemoteApp, Default value is the screen width. You may want to change it if you display app in a iframe.
waHeight	Work area height for RemoteApp. Default value is the screen height. You may want to change it if you display app in a iframe.
printer	Printer name. You can specify multiple printer names by using "," as separator, e.g. "Printer1;Printer2". The first one will always be the default printer.
useSSL	Use WSS (WebSocket secure connection), only used by Rdp2 class.
timezone	The client time zone name. Please check the values

	you can use in rdp.html
loadBalanceInfo	Load balance information
vmid	Hyper-V VM GUID, For example: B3D5444C-2611-405A-9CA0-7AA8DA94DF0B, it's for Hyper-V console connection.
minWidth, minHeight	Minimum width and height, some applications can only work on a minimum resolution.
connectType	Connecting type: CONNECTION_TYPE_MODEM 1 Modem (56 Kbps) CONNECTION_TYPE_BROADBAND_LOW 2 Low-speed broadband (256 Kbps - 2 Mbps) CONNECTION_TYPE_SATELLITE 3 Satellite (2 Mbps - 16 Mbps with high latency) CONNECTION_TYPE_BROADBAND_HIGH 4 High-speed broadband (2 Mbps - 10 Mbps) CONNECTION_TYPE_WAN 5 WAN (10 Mbps or higher with high latency) CONNECTION_TYPE_LAN 6 LAN (10 Mbps or higher) Default value is 5.
shareClipboardId	Connections will same shareClipboardId will use shared clipboard on gateway. User can copy anything among these connections
shareClipboard	on: enabled shared clipboard, it's enabled by default if mapClipboard is on.
symlink	Id of the created symlink .
sessionRecord	0: no session recording, 1: recording grphic only (no sound), 3 means recording graphic and sound. This can only be configured in pluign
__record_name	Recording file name. This can only be configured in pluign before version 4.8.8.
recording	on: record session on client side
audioRecord	on: enable remote audio recording.
pingInterval	Seconds for ping
soundPref	0: low quality sound; 1: high quality sound
smartcard	on: enable smart card redirection
passwordIsPin	Use password as the pin of smart card
name	Show the name on the cursor on joined users
mac	Computer MAC address for Wake on LAN. Need to enable it in gateway.conf (timeoutWoL)
macIP	Network broadcast ip address for WoL.
decompressingRDP61	Enable RDP6.1 compression.
portCheckTimes, portCheckInterval	Gateway will check if the port is open before connecting. portCheckInterval: milliseconds.

copyToLocal	on: user can copy data to local from remote. It can be used to disable bi-directional copy/paste
copyToRemote	on: user can copy data to remote from local. It can be used to disable bi-directional copy/paste
copyTextOnly	on: user can only copy plain text.
textPrinter	on: redirect a text only printer (for receipts, label printers)
mapCamera	Boolean, default is false, enable webcam redirection. Enable it in RDP server with Group Policy: Computer Configuration > Administrative Templates > Windows Components > Remote Desktop Services > Remote Desktop Session Host > Device and Resource Redirection > Do not allow supported Plug and Play device redirection: Disabled
scanner	Boolean, default is false, enable scanner redirection.

5.2.2. Passing parameter via URL.

Please use “on” and “off” for Boolean value if you are using URL to pass parameters.

Connecting to desktop:

```
var parameters = "server=192.168.0.2&user=admin&pwd=" + encodeURIComponent("&=@#");
//use encodeURIComponent to escape special characters in value
var width = 800, height = 600, server_bpp = 16;
var r = new svGlobal.Rdp("http://" + gateway + "/RDP?" + parameters, width, height,
server_bpp);
r.addSurface(new svGlobal.LocalInterface());
r.run();
```

Connecting to RemoteApp in current window:

You only need to add some extra parameters:

```
parameters += encodeURIComponent("startProgram=app&exe=|EXCEL");
```

Connecting to RemoteApp in a new window:

```
var parameters = "server=192.168.0.2&user=admin&pwd=" + encodeURIComponent("&=@#");
//use encodeURIComponent to escape special characters in value
parameters += encodeURIComponent("startProgram=app&exe=|EXCEL");
var width = 800, height = 600, server_bpp = 16;
var r = svManager.getInstance(); //try use the existed session.
if (r == null){
    r = new svGlobal.Rdp(protocol + gw + "/RDP?" + s, width, height, server_bpp);
}

var rail = window.open("rail.html");
function onSurfaceReady(surface){
```

```

        r.addSurface(surface);
        r.startApp(frmConn["exe"].value, frmConn["args"].value, "");
    };
    rail.svOnSurfaceReady = onSurfaceReady;
    r.run();

```

5.2.3. Passing parameter via object or cookie

Rdp2 class can be used to replace Rdp class. You can pass a object to Rdp2:

```

var obj = {gateway: "192.168.0.2", server: "192.168.0.8", user: "user"};
var r = new svGlobal.Rdp2(obj);

```

Rdp2 class will create an object from cookies if obj is undefined. If value of the document.cookie is "gateway=192.168.0.2;server=192.168.0.8;user=user", Rdp2 will create a object automatically for connection.

5.2.4. Usage of Rdp class

Properties:

Name	Type	Description
appTimeout	int	Close the RemoteApp if no Windows found after this period, default is 800 ms.
displayMsg	Boolean	If display error or warning message, default is true
reconnectOnResize	Boolean	If reconnect when resize the browser window, default is true
reconnectTimes	Int	Automatically reconnecting time, default 0.
sessionTimeout	Int	Close the session disconnection if no RemoteApp running after this period. Default value is 3000 (3 seconds). You may want to make it longer, so user can use the current session for new RemoteApp.
windowState	Int	State of RemoteApp main window, 3: always maximized, 0: controlled by user
openLink	Boolean	Display a web link button when user copy a web link in remote computer, default is true
sessionInfo	Object	Current session information. Including following properties: sessionId, userName, domain etc.
remoteAppLogin	Boolean	If display login details when using RemoteApp, default is true

setTitle	Boolean	If allow client to change browser title, default is true, the browser title will be set as the RDP host name.
----------	---------	---------------------------------------------------------------------------------------------------------------

Methods:

Name	Description
close()	Close current RDP session.
exeAppCmd(cmd)	Execute command on current RemoteApp, cmd (Int) values: 0xF020: Minimize the window 0xF030: Maximize the window 0xF060: Close the window 0xF100: Display the window's system menu 0xF120: Restore the window
mouseDown(x, y, button)	Send mouse down to RDP host. X, y: mouse position, button: which button, same as event.button.
mouseUp(x, y, button)	Send mouse up to RDP host.
mouseMove(x, y)	Send mouse move to RDP host.
pauseSession(numericId, pause)	Pause a session output, pause: true or false. Pause all joined sessions if numericId is 0
running()	Check if connected to a RDP session.
setAudioBuffer(seconds)	Audio buffer size, default is 2.0 seconds
writeKeyCode(down, keyCode)	Send browser keyCode to RDP host. "down": Boolean
writeText(txt, interval, doneCallback)	Send Unicode to RDP host. RDP server could ignore some characters if the client is sending them too fast. Please use the optional interval and call back arguments.
writeRawInput(input)	Send raw keyboard, mouse events to RDP host. Please use onactivity event to get the raw input events.
writeKeyComb(keys, interval, doneCallback)	Write any key combinations like "Ctrl+Alt+Del". if interval > 0, every key stroke (down or up) will be sent with delay.
notify(message, sessionIDArray)	Send message to other session. sessionIDArray is optional. If sessionIDArray is not given, this will send message to all other joined and main session. If sessionIDArray is provided, it will send message to sessions with the given ID. For example: [id1, id2, id3]. The id can be the 9 digit number id or the GUID.
saveSession(info)	This will leave the session open on the gateway, so you can connect to it later from same or different device. For example: saveSession({save: true, timeout:5, id: xxxx}) will leave the session open for 5 minutes on gateway with id xxxx. You can connect to this cached session with the given id. Please check 3.14 for more information about cached session. You can also use plugin to save session. This feature will be disabled if <u>savedSessionTimeout</u> in <u>gateway.conf</u> is 0.
startPing(interval,	Start to ping the gateway when the session is idle. Interval:

noResponTime)	seconds. noResponTime: seconds, time limit for no response. onnoresponse event will be fired if this value reached, default is 0 will never fire onnoresponse event.
setJoinMode(mode)	0: Every one can control; 1: Only one can control; 2: Only one can control (others can move mouse)
setJoinCloseMode(mode)	0: close all joined sessions after initiated session is closed; 1: leave all joined sessions open even initiated session is closed.
writeClipboard(text, type)	<pre>dp.writeClipboard('Plain text');</pre> <pre>rdp.writeClipboard('<h>Header</h>', 'text/html');</pre> <pre>var reader = new FileReader(); reader.onloadend = function (e) { if (e.target.readyState == FileReader.DONE) { var imgB64 = hi5.Base64.enc(new Uint8Array(e.target.result)); rdp.writeClipboard(imgB64, 'image/png'); } }; reader.readAsArrayBuffer(blob);</pre>
sendKeyboardSynchronize(scroll, numlock, capital)	Turn off/on lock key state on remote computer.

Events:

Name	Description
onclose(expected)	Fired when RDP session is closed. Expected is true if the session is closed by user (log off) or administrators. Please be aware, the Rdp object will be released and cannot be reused after this event.
onerror(error)	Fired by an error. Use error.name, error.message to get error details.
onloggedin()	Fired when user logged in (It's not supported by xRDP and VirtualBox RDP)
beforeupload(file, path)	<p>Fired before uploading a file:</p> <p>file: File object</p> <p>path: file absolute path or name if path cannot be obtained.</p> <p>Return true if it's processed and prevent default</p>

	behavior happening.
onfileuploaded(fileName)	Fired after a file was uploaded
onuploaded()	Fired after all files were uploaded
onsessionjoin(appInfo)	<p>Fired when a new user joined the session. appInfo has following properties:</p> <p>numericId: the 9 digit id</p> <p>__ip: joined user's hone name or ip address</p> <p>name: if provided</p> <p>Return true will override the default behavior.</p>
onsessionexit(sessionInfo)	<p>Fired when a joined user existed the session.</p> <p>Return true will override the default behavior.</p>
ongivecontrol()	<p>Fired when current user can control the session.</p> <p>Return true will override the default behavior.</p>
ontakebackcontrol()	Fired when current user cannot control the session anymore.
onrequirecontrol()	Fired when another require current user to control the session.
onremoteappstart(e)	<p>Fired after a RemoteApp was started, you can get the RemoteApp id from e.id which is like:</p> <p>{1AC14E77-02E7-4E5D-B744-2EB1AE5198B7}\mspaint.exe</p>
onactivity(input)	Fired after a client activity was sent to the server (Mouse, keyboard events). Input (string) is the mouse and keyboard event. You can use writeRawInput to send them to the RDP host.
onurlredirection(URL)	Fired when an URL was copied on remote computer
ontitlechange(title)	<p>Fired when client before change the browser title.</p> <p>You can return a new title in this event. You can</p>

onsessionstart(sessionInfo)	sessionInfo is same as the sessionInfo property
onservercopy(strValue)	Fired when copying from remote to local. strValue is in "mimeType;value" format, for example: "text/plain;textCopied".
onrequestcredential(info)	Fired when wrong credential was given and credSSP is enabled on gateway). Return true will override the default behavior. Info object has following properties: domain: server's FQDN domain name nbDomain: server's NetBIOS domain name nbComputer: server's NetBIOS computer name
onprintingready(printJob)	Return true will override the default behavior. printJob has following properties: link: the PDF file link printerName: target printer name printerDriver: target printer driver name
onresolutionchange(width, height)	Fired when resolution of RDP session changes.
onnoresponse()	Need to be used with startPing(interval, missTimes)
onLockKeyState({"capsLock": capsLock, "numLock": numLock, "scrollLock": scrollLock})	

5.2.5.Extend RDP: Virtual Channel and Dynamic Virtual Channel

You can create multiple virtual channels and dynamic virtual channels on client side using JavaScript (You can only create one VC before 4.0):

```
var r = new svGlobal.Rdp(protocol + gw + "/RDP?" + s, w, h, server_bpp);
var vc = new r.VirtualChannel();//Use r.DynamicChannel to create a
dynamic virtual channel
vc.name = "CUST";
vc.process = function(buffer){
    console.log(buffer.getByte());
    console.log(buffer.getLittleEndian16());
};
```

```

vc.onopen = function(){
    var data = new Array(7);
    var rb = new RdpBuffer(data, 0, 7);
    rb.setByte(1);
    rb.setLittleEndian16(345);
    rb.setLittleEndian32(567);
    rb.markEnd();
    vc.send(rb);
};
r.addChannel(vc);

```

Virtual Channel is used to communicate with RDP host. You also need to write a plugin for the RDP host. Please check followings for more information:

[http://msdn.microsoft.com/en-us/library/aa383546\(v=vs.85\).aspx](http://msdn.microsoft.com/en-us/library/aa383546(v=vs.85).aspx)

<http://www.codeproject.com/Articles/16374/How-to-Write-a-Terminal-Services-Add-in-in-Pure-C>

5.2.6. Extend Gateway: Gateway Channel

You can create multiple gateway channels to create a communication layer between client browser and the gateway:

```

var gvc = new r.GatewayChannel();
gvc.name = "gvc";
gvc.process = function(buffer){
    console.log(buffer.getByte());
    console.log(buffer.getLittleEndian16());
};
gvc.onopen = function(){
    var data = new Array(7);
    var rb = new RdpBuffer(data, 0, 7);
    rb.setByte(3);
    rb.setLittleEndian16(45);
    rb.setLittleEndian32(678);
    rb.markEnd();
    gvc.send(rb);
};
r.addGatewayChannel(gvc);

```

On gateway side, you class must extend `com.toremote.gateway.plugin.AbstractGatewayChannel` and register it with the same name using `HandlerManager.registerChannel()`. Please check the plugin example for more information.

5.3. Plug-ins (Server side Java API)

Your plug-in must implement `com.toremote.gateway.plugin.ManagerInterface`. With the plugin, you can do authentication integration, session querying and reporting, RemoteApp management and RDP virtual channel extensions, player integration, new websocket protocol handler etc. Please download our plug-in example project for more information:

<http://www.remotespark.com/Plugin.zip>

5.4. HTTP Request API(Server side)

You can use HTTP request to create server, symlink dynamically if you don't want to write a plug-in.

Create servers on gateway:

`http://gatewayAddress/SERVER?id=serverId&displayName=Name&server=hostName&gatewayPwd=passwordInGateway.conf&...`

gatewayPwd is hexadecimal MD5 hash of the password which is configured in gateway.conf. Please check [4.2.1](#) for other parameters you can use.

Create symlink on gateway:

`http://gatewayAddress/SYMLINK?symlink=symlinkId&server=existingServerId&validTime=20m&gatewayPwd=passwordInGateway.conf&...`

You can also use "validFrom", "validTo" parameters. Please check <http://www.remotespark.com/view/doc/com/toremote/gateway/connection/SymLink.html> for more information.

To delete a server or symlink, add "&action=delete" to the URL; To update a server or symlink, add "&action=update" to the URL.

HTTP request will return status code 200 if operation succeeded, 500 if operation failed.

For more details, please check the Integration Guide:

<https://www.remotespark.com/view/IntegrationGuide.pdf>

Appendix A: shortcut keys

- CTRL+ALT+END Brings up the Windows Security dialog box.
- ALT+PAGE UP Switches between programs from left to right.
- ALT+PAGE DOWN Switches between programs from right to left.
- ALT+INSERT Cycles through the programs in the order they were started.
- ALT+HOME Displays the Start menu.
- ALT+DELETE displays the system menu.

Appendix B: browser support

Browser	Minimum Version	Comments
Mozilla Firefox	11.0	Audio redirection: 51
Google Chrome	16.0 (Desktop), 18.0 (Android)	Audio redirection: 49

Apple Safari (Desktop and iOS)	6.0	Audio redirection: 10 (recording is not supported)
Internet Explorer	10.0	Audio redirection: Flash player (recording is not supported)
Opera	12.0	Audio redirection: 43
Edge	14.0	Audio redirection: 14.0

On MacOS X, user needs to use Command Key for Ctrl-C/V.

Appendix C: EchoHandler and network check

There is an EchoHandler on the gateway which can be used to check network connectivity and latency. Please check the NetworkChecker tool in rdp.page.js. This can be used to check the network latency between browser and gateway.

Appendix D: Configuration example for Nginx

```
server {
    listen 80;

    location / {
        proxy_set_header Host $host;
        proxy_set_header X-Real-IP $remote_addr;
        proxy_set_header X-Forwarded-For $proxy_add_x_forwarded_for;
        proxy_pass http://192.168.8.2;
    }

    location ~ /LIST/RDP/VNC/LOGIN/GATEWAY/PLAY/CONF/JOIN/SSH/TELNET/ECHO {
        proxy_set_header X-Real-IP $remote_addr;
        proxy_set_header Host $host;
        proxy_set_header X-Forwarded-For $proxy_add_x_forwarded_for;
    }
}
```

```

proxy_http_version 1.1;

proxy_set_header Upgrade $http_upgrade;
proxy_set_header Connection "upgrade";

proxy_pass http://192.168.8.2;

proxy_buffering off;

tcp_nodelay on;
}
}

```

Appendix E: Configuration example for Apache Proxy

<VirtualHost *:443>

ServerName spark.gateway.com

DocumentRoot C:/Apache24/htdocs/reverseproxy

RequestHeader unset Accept-Encoding

Header Set MCOE-Gateway "spark.gateway.v1"

Header set Content-Security-Policy-Report-Only "default-src https://spark.gateway.com; \

script-src https: 'unsafe-inline'; \

style-src https: 'unsafe-inline'; \

img-src data: https://spark.gateway.com; \

connect-src wss: https://spark.gateway.com; \

report-uri https://myserver.com/csp-report-master/report.php;"

CustomLog "c:/apache24/logs/spark_access.log" common

ErrorLog "c:/apache24/logs/spark_error.log"

SSLEngine on

SSLProxyEngine On

SSLProtocol ALL -SSLv2 -SSLv3

SSLHonorCipherOrder On

SSLCipherSuite

ECDH+AESGCM:DH+AESGCM:ECDH+AES256:DH+AES256:ECDH+AES128:DH+AES:ECDH+3DES:DH+3DES:
RSA+AESGCM:RSA+AES:RSA+3DES:!aNULL:!MD5:!DSS

SSLCACertificateFile "c:/sslcerts/startcom.crt"

SSLCertificateFile "c:/sslcerts/spark.gateway.com.crt"

SSLCertificateKeyFile "c:/sslcerts/private.key"

ProxyRequests Off

ProxyPreserveHost Off

ProxyHTMLEnable On

ProxyHTMLExtended On

ProxyHTMLCharsetOut UTF-8

SetOutputFilter INFLATE;proxy-html;DEFLATE

For SPARK WebSocket

ProxyPass "/LIST" "wss://internal.spark.gateway/LIST"

ProxyPass "/RDP" "wss://internal.spark.gateway/RDP"

ProxyPass "/GATEWAY" "wss://internal.spark.gateway/GATEWAY"

ProxyPass "/CONF" "wss://internal.spark.gateway/CONF"

ProxyPass "/LOGIN" "wss://internal.spark.gateway/LOGIN"

ProxyPassReverse "/LIST" "wss://internal.spark.gateway/LIST"

ProxyPassReverse "/RDP" "wss://internal.spark.gateway/RDP"

ProxyPassReverse "/GATEWAY" "wss://internal.spark.gateway/GATEWAY"

ProxyPassReverse "/CONF" "wss://internal.spark.gateway/CONF"

ProxyPassReverse "/LOGIN" "wss://internal.spark.gateway/LOGIN"

ProxyPass / https://internal.spark.gateway/

ProxyPass / wss://internal.spark.gateway/

ProxyPassReverse / https://internal.spark.gateway/

ProxyPassReverse / wss://internal.spark.gateway/

</VirtualHost>

Must work with mod_proxy and mod_proxy_wstunnel.

Appendix F: Configuration for Juniper, Cisco, Dell etc SSL VPN

It's very easy if the VPN supports WebSocket. You just need to create a web application resource profile (bookmark) or application offloading and specify the URL of the gateway.

Make sure you update Spark View to 4.8.6 or later which improved the compatibility of SSL VPN.

You can enable HTTP Basic Authentication in Spark View for VPN SSO integration (set authorization = Basic in gateway.conf).

Spark View also supports HTTP Post integration. Please specify your URL as <http://yourGateway/CONNECT>. Please also check `html\examplePost.html` for reference.

Appendix G: SMB Path

SMB Path can also be used for recording, drive redirection etc., for example:

```
recdir = smb://domain;username:password@sparkcloud/ShareName/path
```

```
tmpdir = smb://domain;username:password@sparkcloud/ShareName/path
```

Variables can also be used in drive direction path (tmpdir):

```
tmpdir = smb://${domain};${user}:${pwd}@sparkcloud/ShareName/path
```

Appendix H: Ping

You can enable Ping on client side by setting `pingInterval` (seconds) parameter, or use `rdp.startPing(interval)`. The client will only send ping package when the session is idle.

This is helpful if there is idle timeout configuration in user's environment (routers, firewall, proxy etc). The client can also immediately notice a network disconnection.

Appendix E: TrustStore

When you RDP server or VNC server are using TLS encryption. You can allow user connect to trusted server only:

- Export the certificate from the server (Public key only). For RDP server, run "certlm.msc", Click "Remote Desktop" -> Certificates. Right click on the certificate, "All Tasks -> Export".
- Import the certificate to a trustStore: `keytool -import -file C:\cascerts\rdpserver.cer -alias rdpserver -keystore myTrustStore.jks`
- Set trustStore location and trustStorePassword in `gateway.conf`
- Restart the gateway.
- "unable to find valid certification path to requested target" message will be displayed to end user (also in the gateway log).