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**REMEDICATION OF SERVER CONNECTIVITY ISSUE BY USING OUT OF BAND
CAPABILITIES IN AUTOMATION**

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TECHNICAL FIELD

[0001] The present subject matter relates to the field of automation technology, more particularly providing a failsafe solution to the automation process.

BACKGROUND

[0002] Automation is the creation and application of technologies to produce and deliver services with minimal human intervention. Automation can execute huge number of hosts, claiming huge workload savings. Once the company/industry is used to the automation process, the manpower is not adapted anymore to fallback to manual execution, therefore failure in automation process leads to huge failure in operation.

[0003] One of the major issues in the automation failure is connectivity. If there is a loss of connection between the automation control plane and the endpoints, it becomes impossible to check the status, change or delete the configurations or states of the endpoints to control the operation. The connectivity loss is a single point of failure in the automation process where there is no other workaround than to manually fix it. In conventional systems the operator must physically visit the datacentre to plug a console and fix the connectivity issue. Therefore, the conventional systems leads to halt of operations, which causes huge loss.

BRIEF DESCRIPTION OF THE DRAWINGS

[0004] The accompanying drawings, which are incorporated in and constitute a part of this disclosure, illustrate exemplary embodiments and, together with the description, serve to explain the disclosed principles. In the figures, the left-most digit(s) of a reference number identifies the figure in which the reference number first appears. The same numbers are used throughout the figures to references like features and components. Some embodiments of device or system and/or methods in accordance with embodiments of the present subject matter are now described, by way of example only, and with reference to the accompanying figures, in which:

[0005] **Fig. 1** illustrates a flowchart for remediation of server connectivity issues by using out of band capabilities in automation, in accordance with some embodiments of the present disclosure.

[0006] **Fig. 2** illustrates a block diagram of a system containing network devices, physical servers and virtual machines connected to automation control plane, in accordance with some embodiments of the present disclosure.

[0007] **Fig. 3** illustrates a block diagram of an automation system explaining the process of remediation of server connectivity issue by using out-of-band capabilities and executing the remediation script.

[0008] The figures depict embodiments of the disclosure for purposes of illustration only. One skilled in the art will readily recognize from the following description that alternative embodiments of the structures and methods illustrated herein may be employed without departing from the principles of the disclosure described herein.

DESCRIPTION OF THE DISCLOSURE

[0009] The present disclosure provides a solution to enable a failsafe feature in the automation process, reducing the need for intervention of a human system administrator. Further pushing the automation and self-remediation is achieved by using the out of band feature that is present in every hardware and virtual hardware for troubleshooting purpose.

[0010] The present disclosure discloses a solution method that allows the automation control plane to go through the out of band to fix the issue in case of connectivity loss in between the automation control plane and endpoints and also manages the connectivity check with same. During the connectivity check, the automation tool will test all use cases to confirm full connectivity, and if the connectivity between the automation tool and endpoints fails, the automation process will trigger the remediation by contacting the out-of-band interface through API and will launch the remediation action (Execute the remediation script) using the backend/backup access.

[0011] While the disclosure is susceptible to various modifications and alternative forms, specific embodiment thereof has been shown by way of example in the drawings and will be described in detail below. It should be understood, however that it is not intended to limit the disclosure to the particular forms disclosed, but on the contrary, the disclosure is to cover all modifications, equivalents, and alternative falling within the spirit and the scope of the disclosure.

[0012] The terms “comprises”, “comprising”, or any other variations thereof, are intended to cover a non-exclusive inclusion, such that a setup, device or method that comprises a list of components or steps does not include only those components or steps but may include other components or steps not expressly listed or inherent to such setup or device or method. In other words, one or more elements in a device or system or apparatus preceded by “comprises... a” does not, without more constraints, preclude the existence of other elements or additional elements in the device or system or apparatus.

[0013] The terms "an embodiment", "embodiment", "embodiments", "the embodiment", "the various embodiments", "one or more embodiments", "some embodiments", and "one embodiment" mean "one or more (but not all) embodiments of the invention(s)" unless expressly specified otherwise.

[0014] The terms "including", "comprising", “having” and variations thereof mean "including but not limited to", unless expressly specified otherwise.

[0015] In an embodiment, the proposed system invokes a dynamic method of using an out of band capability that exists in any automation tool for fixing the connectivity issue in an automation process. Control panel will trigger a connectivity check using ping check and Domain Name System (DNS) status check and analyses at which point the connectivity is failing and will also find out the cause of the connectivity loss. The cause for connectivity failure are categorized into: connection refused, connection reset by peer, no space left on the device, invalid/incorrect password, authentication failed, name or service not known, no route to host, connection timeout. After identifying the reason for connectivity loss, the automation control plane will connect to the secure vault to get the root password of the servers, where the vault returns the server credentials. The automation control plane with the help of out of band will connect to the server using the server credentials to retrieve and execute the remediation script that is tailored and written specifically to fix the component that is failing. Upon execution of the remediation script the automation control plane will trigger a connectivity check again to confirm the restoration of connectivity between the automation control plane and the endpoints as illustrated in FIG. 3. If the connectivity is not confirmed, the remediation process i.e., checking the connectivity through ping check and DNS check and executing of remediation script is repeated using the out of band until the connection is successfully established.

[0016] The FIG. 2 illustrates the schematic block diagram for Automation process, wherein the automation comprises one or more components such as automation control plane, operating systems, network devices, physical servers, virtual machines and components required for connectivity purpose.

[0017] The FIG. 3 illustrates schematic representation of remediation of connectivity in automation process, the schematic block diagram comprises an automation control plane, operating system, network devices, physical servers, virtual machines and an out of band capability. In normal condition that being without any connectivity failure or component failure the automation control plane can reach to operating system in one or more manners i.e., through Application Programming Interface (API), Secure Shell (SSH) and Windows Remote Management (WinRM). The automation requires one or more components in operating system such as performance tool, authorization, library/binaries and privilege, if one of the components is missing or not operating as intended the connection is broken.

[0018] The cross marks in the FIG. 3 represent failure i.e., the cross mark on the SSH represents failure of connection between automation control plane and the operating system whereas the second cross mark inside the operating system represents operation failure of the operating system caused due to connection failure. The automation control plane in association with the out of band connects to the secure vault server and extracts the remediation script for fixing the failure. After extracting the remediation script is executed, the execution of the remediation script restores the components to normal working order with the help of the out of band port/cord or virtual console present in the components.

[0019] In an embodiment, each endpoint is associated with a remediation script. When the endpoint which is causing the failure is detected, and based on the category, the appropriate script is selected for execution. After executing the script, the connectivity is restored, therefore resuming the operations without manual intervention. The proposed solution acts as a virtual console which can be executed automatically. Further, the virtual console is executed repeatedly at regular intervals or upon detecting events to detect all endpoints which cause failure and rectify all errors.

[0020] The remediation script disclosed below addresses the following points in the automation system, fixing the connectivity issue in the automation process.

- 1 Svcansible SSH key deployment
- 2 SSH service restart if it's down
- 3 SSSD service restart if it's down
- 4 /opt /var /tmp /home file systems utilization check and report
- 5 Correct the ssh key permission and base/home directory permission

Remediation Script:

```

#/bin/bashs
DAT=$(date +"%d-%m-%Y-%S")
UNM=$(uname -n)
UNM_WO_DNS=$(uname -n | awk -F. '{print $1}')
HTML_FRAME=/tmp/func_id_group_connect_check.out
SSH_CONF_OWNER=func_id_owner
SSH_CONF_GROUP=func_id_group
SSH_CONF_PATH=/home/func_id_owner
SSH_CONF_SSH_PATH=/home/func_id_owner/.ssh
SSH_CONF_SSH_AUTH_PATH=/home/func_id_owner/.ssh/authorized_keys
SSH_CONF_PRD_PATH="/opt/ssh_keys/authorizedkeys/%u/authorized_keys"
SSH_KEY_CONF_PRD_PATH="/opt/ssh_keys/authorizedkeys/func_id_owner/authorized_
keys"
SSH_AUTHKEY_PATH=$(grep -i "^AuthorizedKeysFile" /etc/ssh/sshd_config | awk '{print
$NF}' | awk '{ gsub ("/", "_");print }')
TMP_FS_USAGE=$(df -H /tmp | awk '{ print $5 " " $6 }' | sed '1d')
USEP_TMP=$(echo $TMP_FS_USAGE | awk '{ print $1}' | cut -d'%' -f1)
partition_tmp=$(echo $TMP_FS_USAGE | awk '{ print $2 }')

#####          ssh          Daemon          check
#####
sshd_srv_check=$(systemctl show -p ActiveState sshd | sed 's/ActiveState=//g')
if [ $sshd_srv_check == "active" ];then
    echo "Service SSHD is active and Running" 2>&1
else
    /usr/bin/systemctl start sshd
    sleep 2

```

```
ssh_start_count=1
sshd_srv_check2=$(systemctl show -p ActiveState sshd | sed 's/ActiveState=//g')
if [ $sshd_srv_check2 == "active" ];then
    echo "Service SSHD is active and Running" 2>&1
else
    until [ $ssh_start_count -eq 10 ];
    do
        sshd_srv_check3=$(systemctl show -p ActiveState sshd | sed 's/ActiveState=//g')
        if [ $sshd_srv_check3 == "active" ];then
            echo "Service SSHD is active and Running now" 2>&1
        else
            sleep 3
            ssh_start_count=`expr $ssh_start_count + 1`
        fi
    done
    echo "Unable to start SSH service. Manual intervension required, pleae login to the
server and check the sshd_config file" 2>&1
    exit 101
fi
fi
#####          File          system          check
#####
#df -H /tmp | awk '{ print $5 " " $6 }' | sed '1d' | while read output;
TMP_FS_USAGE=$(df /tmp | awk '{ print $5 " " $6 }' | sed '1d')
usep=$(echo $TMP_FS_USAGE | awk '{ print $1 }' | cut -d'%' -f1)
partition=$(echo $TMP_FS_USAGE | awk '{ print $2 }')
if [ $usep == 100 ]; then
    echo "Running out of space \"$partition $usep%\" on $(hostname) as on $(date)" >
/tmp/tmp_partition_usage.out 2>&1
    exit 103
else
    TMP_FS_USAGE_OK=0
fi
OPT_FS_USAGE=$(df /opt | awk '{ print $5 " " $6 }' | sed '1d')
```



```

usep=$(echo $OPT_FS_USAGE | awk '{ print $1}' | cut -d'%' -f1)
partition=$(echo $OPT_FS_USAGE | awk '{ print $2 }')
    if [ $usep == 100 ]; then
        echo "Running out of space \"$partition $usep%\" on $(hostname) as on $(date)" >
/tmp/fs_opt_partition_usage.out 2>&1
        exit 104
    else
        OPT_FS_USAGE_OK=0
    fi
VAR_FS_USAGE=$(df /var | awk '{ print $5 " " $6 }' | sed '1d')
usep=$(echo $VAR_FS_USAGE | awk '{ print $1}' | cut -d'%' -f1)
partition=$(echo $VAR_FS_USAGE | awk '{ print $2 }')
    if [ $usep == 100 ]; then
        echo "Running out of space \"$partition $usep%\" on $(hostname) as on $(date)" >
/tmp/var_partition_usage.out 2>&1
        exit 105
    else
        VAR_FS_USAGE_OK=0
    fi
HOME_FS_USAGE=$(df /home | awk '{ print $5 " " $6 }' | sed '1d')
usep=$(echo $HOME_FS_USAGE | awk '{ print $1}' | cut -d'%' -f1)
partition=$(echo $HOME_FS_USAGE | awk '{ print $2 }')
    if [ $usep == 100 ]; then
        echo "Running out of space \"$partition $usep%\" on $(hostname) as on $(date)" >
/tmp/fs_home_partition_usage.out 2>&1
        exit 106
    else
        HOME_FS_USAGE_OK=0
    fi
##### /opt IO error check #####
touch /opt/io_error_chk.txt 2> /tmp/io_error_chk_err.out || true
OPT_IO_ERROR=$(cat /tmp/io_error_chk_err.out | grep -i "error"| wc -l)
IO_ERR_FILENAME=/tmp/io_error_chk_err.out
if [ -f $IO_ERR_FILENAME -a -s $IO_ERR_FILENAME ];then

```

```

echo "/opt fs is in read/only mode, please restart the system" 2>&1
exit 102
fi
if [ -f /opt/io_error_chk.txt -a ! -s /opt/io_error_chk.txt ];then
echo "Flat file /opt/io_error_chk.txt exists and removing" 2>&1
rm -f /tmp/io_error_chk.txt
fi
##### /opt mount point base dir permission check
#####
OPT_FS_PERM=(stat -L -c "%a %U %G" /opt | awk '{print $1}')
if [ $(stat -L -c "%a %U %G" /opt | awk '{print $1}') != "755" ];then
    chmod 00755 /opt
    echo "/opt filesystem permission was incorrect and its been corrected" 2>&1
else
    echo "/opt fs has expected permission" 2>&1
fi

#####
#####
id      $SSH_CONF_OWNER      2>      /tmp/func_id_group_func_err      1>
/tmp/func_id_group_func.out || true
if [ -f /tmp/func_id_group_func.out -a ! -s /tmp/func_id_group_func.out ];then
#if [ $? == 0 ];then
    if [ $SSH_AUTHKEY_PATH != $SSH_CONF_PRD_PATH ];then
        if [ -d $SSH_CONF_PATH ];then
            if [ $(stat -L -c "%a %U %G" $SSH_CONF_PATH | awk '{print $1}') != "700" ];then
                chmod 700 $SSH_CONF_PATH
            elif [ $(stat -L -c "%a %U %G" $SSH_CONF_PATH | awk '{print $2}') !=
"func_id_owner" ];then
                chown func_id_owner $SSH_CONF_PATH
            elif [ $(stat -L -c "%a %U %G" $SSH_CONF_PATH | awk '{print $3}') !=
"func_id_group" ];then
                chgrp func_id_group $SSH_CONF_PATH
            fi
        fi
    fi
fi

```

```

func_id_owner_BASE_PERM=0
else
mkdir $SSH_CONF_PATH
chmod 700 $SSH_CONF_PATH
chown func_id_owner:func_id_group $SSH_CONF_PATH
fi

#####
#####

if [ -d $SSH_CONF_SSH_PATH ];then
    if [ $(stat -L -c "%a %U %G" $SSH_CONF_SSH_PATH | awk '{print $1}') != "700"
];then
        chmod 700 $SSH_CONF_SSH_PATH
        elif [ $(stat -L -c "%a %U %G" $SSH_CONF_SSH_PATH | awk '{print $2}') !=
"func_id_owner" ];then
            chown func_id_owner $SSH_CONF_SSH_PATH
            elif [ $(stat -L -c "%a %U %G" $SSH_CONF_SSH_PATH | awk '{print $3}') !=
"func_id_group" ];then
                chgrp func_id_group $SSH_CONF_SSH_PATH
            fi
        else
            mkdir $SSH_CONF_SSH_PATH
            chmod 700 $SSH_CONF_SSH_PATH
            chown func_id_owner:func_id_group $SSH_CONF_SSH_PATH
        fi

#####
#####

if [ -f $SSH_CONF_SSH_AUTH_PATH ];then
    if [ $(stat -L -c "%a %U %G" $SSH_CONF_SSH_AUTH_PATH | awk '{print $1}')
!= "600" ];then
        chmod 600 $SSH_CONF_SSH_AUTH_PATH
    fi
fi

```

```

elif [ $(stat -L -c "%a %U %G" $SSH_CONF_SSH_AUTH_PATH | awk '{print
$2}') != "func_id_owner" ];then
    chown func_id_owner $SSH_CONF_SSH_AUTH_PATH
elif [ $(stat -L -c "%a %U %G" $SSH_CONF_SSH_AUTH_PATH | awk '{print
$3}') != "func_id_group" ];then
    chgrp func_id_group $SSH_CONF_SSH_AUTH_PATH
fi
grep -wi "functional_id_ssh_key" $SSH_CONF_SSH_AUTH_PATH >/dev/null
if [ $? -eq 0 ];then
    echo "func_id_owner ssh key and it's configurations are looks good"
else
    cp -p $SSH_CONF_SSH_AUTH_PATH
$SSH_CONF_SSH_AUTH_PATH_${DAT}
    if [ $USEP_TMP -lt 100 ]; then
        wget -P /tmp -q -N
http://path_execution_server/pub/func_id_group_ssh_keys/np_tower_authorized_keys
        if [ $? -eq "0" ];then
            if [ -f /tmp/np_tower_authorized_keys ];then
                mv /tmp/np_tower_authorized_keys
/home/func_id_owner/.ssh/authorized_keys
                chmod 600 $SSH_CONF_SSH_AUTH_PATH
                chown func_id_owner:func_id_group
$SSH_CONF_SSH_AUTH_PATH
                echo "func_id_owner ssh key was missing and it's been configured"
2>&1
            fi
        else
            echo "Failed - func_id_owner nonprod ssh key download has failed" 2>&1
            exit 107
        fi
    else
        echo "Manual intervention required - /tmp file system doesn't have enough
space to configure ssh keys" 2>&1
        exit 103
    fi
fi

```

```

        fi
    fi
else
    if [ $USEP_TMP -lt 100 ]; then
        wget -P /tmp -q -N
        http://path_execution_server/pub/func_id_group_ssh_keys/np_tower_authorized_keys
        if [ $? -eq "0" ];then
            if [ -f /tmp/np_tower_authorized_keys ];then
                mv /tmp/np_tower_authorized_keys
                /home/func_id_owner/.ssh/authorized_keys
                chmod 600 $SSH_CONF_SSH_AUTH_PATH
                chown func_id_owner:func_id_group $SSH_CONF_SSH_AUTH_PATH
                echo "func_id_owner ssh key was missing and it's been configured" 2>&1
            fi
        else
            echo "Failed - func_id_owner nonprod ssh key download has failed" 2>&1
            exit 107
        fi
    else
        echo "Manual intervention required - /tmp file system doesn't have enough space
to configure ssh keys" 2>&1
        exit 103
    fi
fi

#####
#####

else
    if [ -f $SSH_KEY_CONF_PRD_PATH ];then
        elif [ $(stat -L -c "%a %U %G" $SSH_KEY_CONF_PRD_PATH | awk '{print $1}')
!= "444" ];then
            chmod 444 $SSH_KEY_CONF_PRD_PATH

```

```
elif [ $(stat -L -c "%a %U %G" $SSH_KEY_CONF_PRD_PATH | awk '{print $2}')  
!= "root" ];then  
    chown root $SSH_KEY_CONF_PRD_PATH  
    elif [ $(stat -L -c "%a %U %G" $SSH_KEY_CONF_PRD_PATH | awk '{print $3}')  
!= "root" ];then  
        chown root $SSH_KEY_CONF_PRD_PATH  
    fi  
fi  
else  
    echo "func_id_owner functional id does not exist. please contact Config Automation Team"  
2>&1  
    exit 100  
fi
```

```
#####  
#####
```

REMEDICATION OF SERVER CONNECTIVITY ISSUE BY USING OUT OF BAND CAPABILITIES IN AUTOMATION

ABSTRACT

The present disclosure relates to a method and system for remediation of server connectivity issues by using out of band capabilities through automation. Generally, when there is a loss of connectivity between the automation tool and the endpoint in an automation process there is no other way around than to manually trouble shooting the issue in the datacenter. The present invention uses out of band for fixing the connectivity issue in the automation process, wherein the automation tool uses out of band to connect to the Secure vault server to retrieve the remediation script for fixing of the connectivity issue caused due to failure of certain component which is later executed to achieve the fixing of the issue and normal working of the automation process.

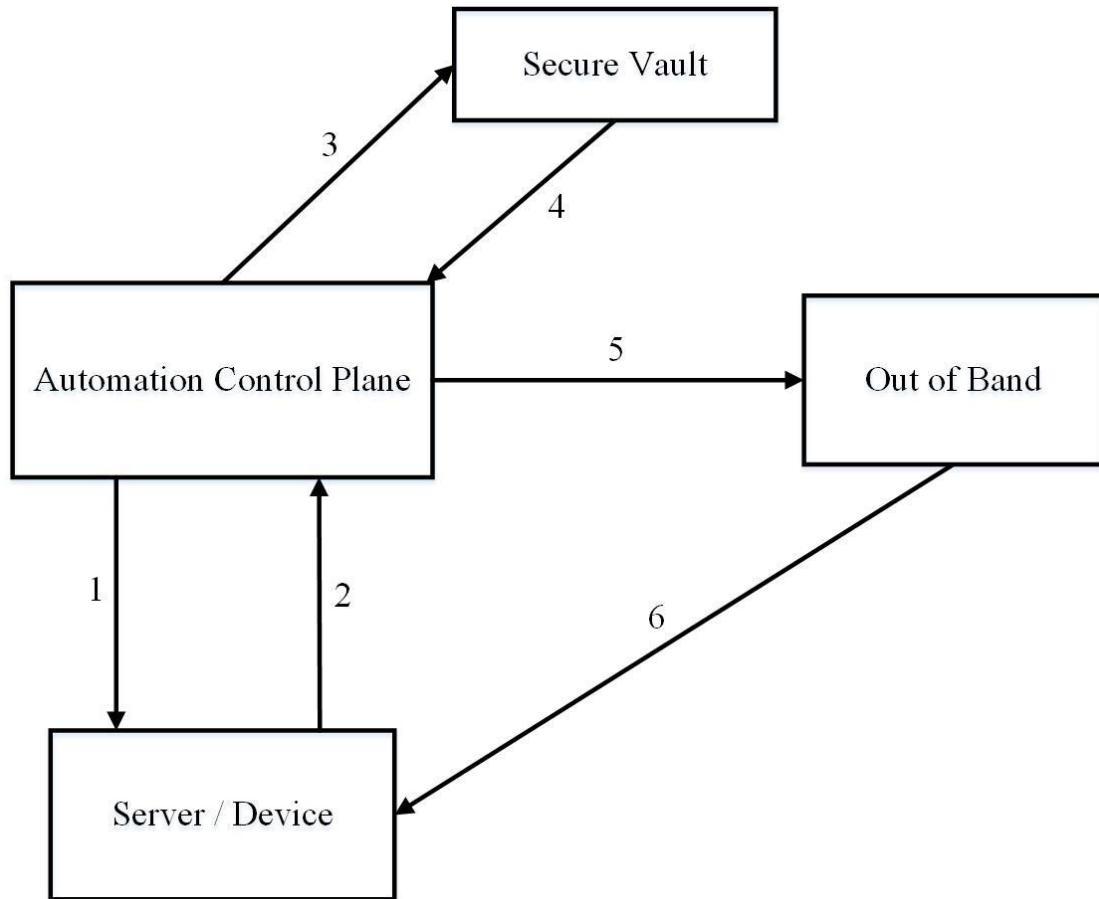


Fig. 1

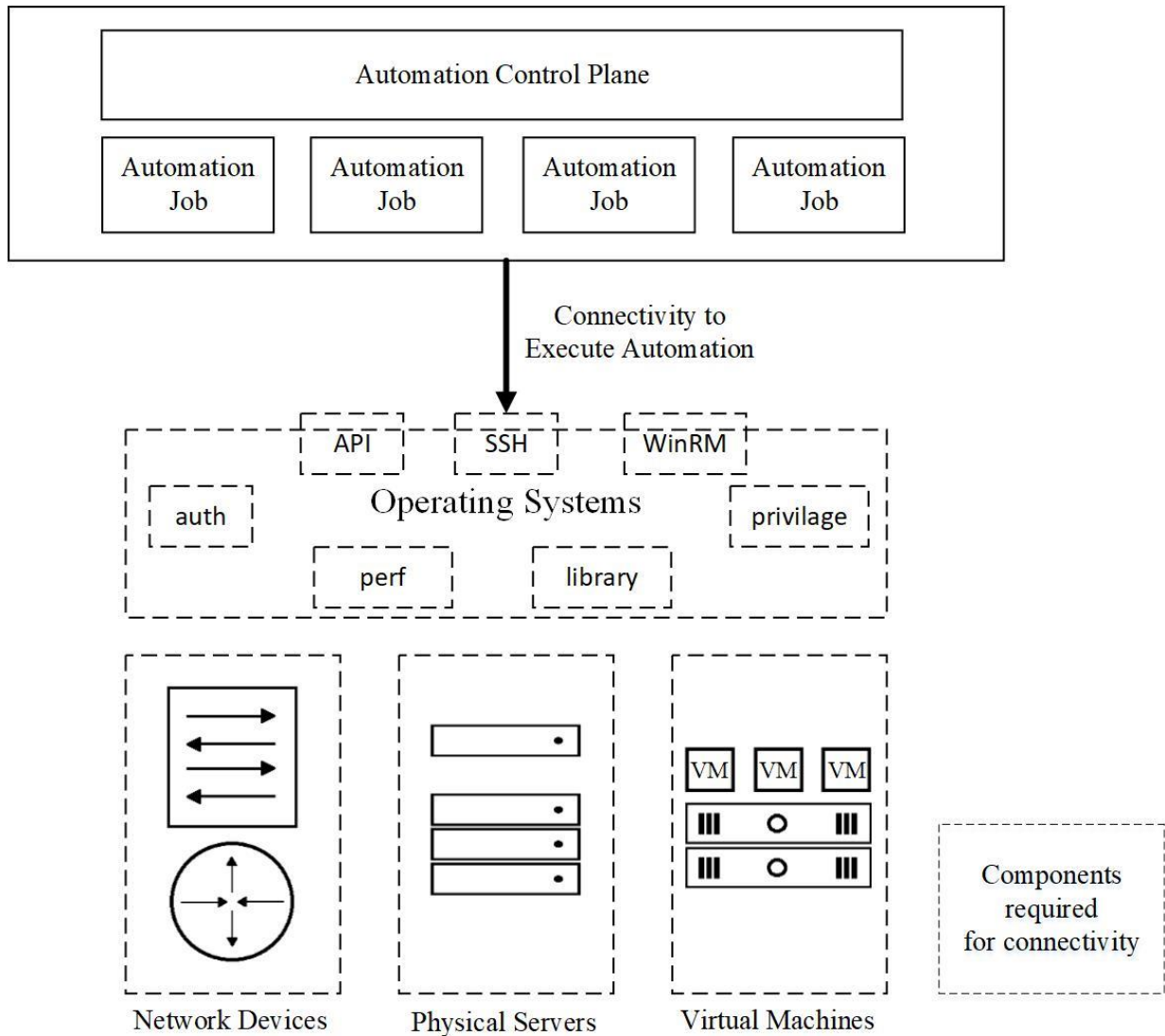


Fig. 2

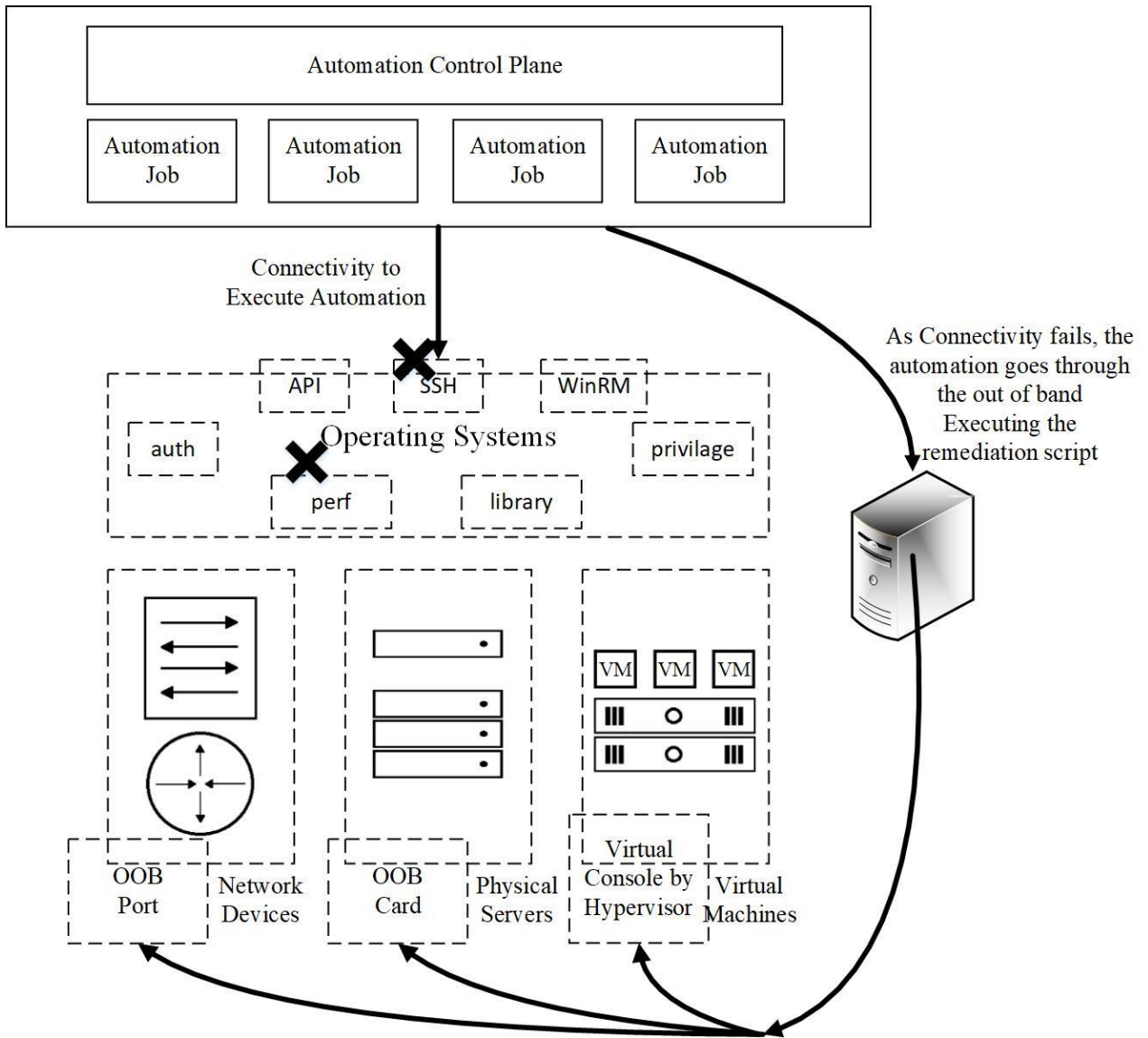


Fig. 3