Conquer the IBM i World with OpenSSH!!

Jesse Gorzinski
Business Architect
jgorzins@us.ibm.com
Twitter: @IBMJesseG

Agenda

• Why this presentation?
• Why SSH?
• How to:
  – Run commands
  – Access the filesystem & editing files
  – Do file transfers
  – Running simple SQL
  – Running CL commands
  – Looking at active jobs
  – Accessing a git repository
  – Running Access Client Solutions
  – SSH tunneling
Why this presentation?

1. Scenarios with limited ports accessible

2. Learn about all the stuff you can do with OpenSSH!

Why SSH?

• Secure

• Simple

• Industry standard
Getting started…

- On IBM i, need either:
  - 5733-SC1 installed (start by running "STRTCPSVR *SSHD")
  - "openssh" installed in RPM form [http://ibm.biz/ibmi-rpms](http://ibm.biz/ibmi-rpms) (start by running ‘sshd’)

- On Mac/Linux/AIX:
  - Probably already around. Invoke "ssh" from a terminal

- Windows:
  - Linux Subsystem for Windows
  - PuTTY
  - Cygwin with openssh (Jesse’s preferred)
Key-based authentication

- Like typing passwords?
- If yes:
  - You’re good to go!
- If not:
  1. Generate an SSH key pair, with the ssh-keygen command
  2. Use ssh-copy-id to copy the key to the server for you

Run commands (Tips)

- Run bash!
- Can also use “DEFAULT” as the user. Everyone will default to bash!
  Be the favorite sys admin!!!!
Run Commands

Today, I’m covering a few of my favorite tips.

DISCLAIMER: these examples assume you have the new open source environment installed: [http://ibm.biz/ibmi-rpms](http://ibm.biz/ibmi-rpms)
- Also, assumes you have some cool packages, like:
  - coreutils-gnu (ls, grep, etc)
  - grep-gnu
  - bash
  - git
  - less
- Just run: `yum install coreutils-gnu grep-gnu bash git less`

Run Commands (Tips)

Why bash?
- Tab completion
- Up arrow to retrieve commands
- `<ctrl>`+r to search past history
- Well-known programming language
- Well-known shell

```
(reverse-i-search)`echo': echo "the cat is brown" | grep cat
```
Run Commands (tips)

• Add good things to $HOME/.bash_profile
  (use $HOME/.profile if not using bash)

```bash
PATH=/QOpenSys/pkgs/bin:$PATH
export PATH
```

```
bash-4.4$ which python3
/QOpenSys/pkgs/bin/python3
-bash-4.4$ python3 --version
Python 3.6.5
```

Run Commands (tips)

• Add good things to $HOME/.bash_profile
  (use $HOME/.profile if not using bash)

```bash
PAGER=/QOpenSys/pkgs/bin/less
export PAGER
```

```
bash-4.4$ git diff
diff --git a/examplesinsert_and_select.js b/examples/insert_and_select.js
index 9dcfda3..53eb334 100644
--- a/examples/insert_and_select.js
+++ b/examples/insert_and_select.js
@@ -1,4 +1,4 @@
- var dba = require("idb-pconnector");
+ var dba = require("..\lib\idb-pconnector");
   async function runInsertAndSelect()
     try {
       var dbStmt = new dba.Connection().connect().getStatement();
- bash-4.4$ 
```

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Run Commands (tips)

- Add good things to $HOME/.bash_profile
  (use $HOME/.profile if not using bash)

```
alias grep='/QOpenSys/pkgs/bin/grep --color=auto'
```

```
-bash-4.4$ echo "the cat is brown" | grep cat
the cat is brown
```

Run Commands (tips)

- Add good things to $HOME/.bash_profile
  (use $HOME/.profile if not using bash)

```
alias ls='/QOpenSys/pkgs/bin/ls --color=auto -F'
```

```
Makefile.in
RPMS/
ReinhardtEdmund.png
videos/
KUMENG_RPMS/
a.c
a.out*
acsbundle.jar
benchmark.py*
benchmark.py.save
benchmark.py.save.1*
benchmark.py.save.2*
getexe.c
getexe.c.save
getexe.c.save.1
healthcenter-3.0.3.tgz
idbtest/
jed-0.99-19/
jed-0.99-19.tar
jenkins.war
junk/
junk5/
junk7/
jwttest/
```

```
nodestash/
odo/
orion_log*
orion_log.1208.txt
```

```
package-lock.json
php-7.2.4/
php-7.2.4.tar
pool/
python_sandbox/
rocksdb-5.12.2/
rpmbuild/
```
Run Commands (tips)

. Bash-it project to collect Bash scripts/customizations: https://github.com/Bash-it/bash-it

2017-04-21 14:49:27 kadler in ~/projects/python-examples
± |bottle-example ✓| → touch new_file

2017-04-21 14:49:34 kadler in ~/projects/python-examples
± |bottle-example ?:1 X| → git add new_file

2017-04-21 14:49:50 kadler in ~/projects/python-examples
± |bottle-example S:1 X| → git commit -m 'dummy commit'
[bottle-example 8ca2a43] dummy commit
1 file changed, 0 insertions(+), 0 deletions(-)
create mode 100644 new_file

2017-04-21 14:49:56 kadler in ~/projects/python-examples
± |bottle-example ↑1 ✓| →

Run Commands (tips)

- Chain commands together for more complex tasks.
  
- **A; B**
  - Run A and then B, regardless of success of A

- **A && B**
  - Run B if A succeeded

- **A || B**
  - Run B if A failed

- **A &**
  - Run A in the background
Run Commands (tips)

# Use Perl as sed -i replacement
perl -p -i -e 's/bad/good/g' myfile

# Change CRLF (Windows) line endings to LF (Unix)
perl -p -i -e 's/\015\012/\n/g' myfile

# print lines between START and END to stdout
perl -ne 'print if /^START$/ .. /^END$/' myfile

More Perl one-liners:
http://www.math.harvard.edu/computing/perl/oneliners.txt

Access the filesystem & edit files

- Mac/Linux: sshfs

Article: bit.ly/mcpress-edit-ifs-files

File ssh_connections.sh:

```bash
basedir="/Users/aaronbarte
sshfsname="remote_appl"
remotedir="/home/aaron/git"
mkdir $basedir$sshfsname
umount -f $basedir$sshfsname
sshfs -o volname=$sshfsname -o allow_other,defer_permissions,IdentityFile=/ssh/id_rsa
aaron@ibmi1:$remotedir $basedir$sshfsname
```
Access the filesystem & edit files

- WinSCP
  - Windows-only utility
  - Uses SSH to connect to the system (STRTCPSVR *SSHD)
    - Can use password- or key-based auth

Access the filesystem & edit files

- WinSCP
  - Allows you to use your editor of choice
  - Supports drag-and-drop of files, double-click to edit, transfer files to a different system, and much more
Do File Transfers

- Three popular commands:
  - sftp
    - Included with OpenSSH
    - Like FTP, allows for interactive commands
  - scp (secure copy)
    - Included with OpenSSH
    - Designed to transfer a single file or directory
  - rsync (remote sync)
    - Separate install
    - Most powerful & robust

Do File Transfers: sftp

- sftp user@hostname
Do File Transfers: scp

[-l limit] [-o ssh_option] [-P port] [-S program]
[[user@]host1:]file1 ... [[user@]host2:]file2

Common-looking example:
scp -r directory user@hostname:/target/directory

Do File Transfers: rsync

- Fast and versatile remote (and local) copying tool
- By default only transfers files whose modification times or sizes differ
- Uses a novel method to transfer only file deltas to speed up transfer
- Can be used to sync local directories or between a local and remote
- Can also be used as a remote transfer utility, i.e. replace ftp or scp
- NOTE: To transfer remotely, you must have rsync installed on both systems
- https://rsync.samba.org/
- http://ibm.biz/ibmi-rpms
Do File Transfers: rsync

• rsync is a powerful and somewhat complicated tool
• Lots of switches and options:
  -r, recurse in to subdirectories
  -l, copy symlinks as symlinks
  -t, preserve modification times
  -g and -o, preserve group and user ownership
  -P, show progress while transferring
• Usually best to use -a (archive), equivalent to -rlptgoD
• Use --exclude to exclude files from the sync
• May want to use --delete if you want to remove deleted files on the destination
• Use -n, --dry-run to see what rsync would do without actually doing it
Do File Transfers: rsync

# create full backup from src to dst
$ rsync -a --delete src/ dst_full

# create Monday's incremental backup
$ rsync -a --delete --link-dest=dst_full src/ dst_mon

# create Tuesday's incremental backup
$ rsync -a --delete --link-dest=dst_full src/ dst_tue

Do File Transfers: rsync

$ find dst_full dst_mon dst_tue -type f
dst_full/myfile
dst_mon/myfile
dst_tue/myfile

ls -l dst_full/* dst_mon/* dst_tue/*
-rw-r--r-- 3 kadler 0 0 Apr 26 13:27 dst_full/myfile
-rw-r--r-- 3 kadler 0 0 Apr 26 13:27 dst_mon/myfile
-rw-r--r-- 3 kadler 0 0 Apr 26 13:27 dst_tue/myfile
Running Simple SQL

- "db2" command available in QSH
- Let’s run it from an SSH terminal!

-bash-4.4$ db2 "select * from QIWS.QCUSTCDT"

-bash-4.4$ db2 "select * from QIWS.QCUSTCDT"
bash: /usr/bin/db2: The file access permissions do not allow the specified action.

- Oops!!!
Running Simple SQL

- qsh, like many shells, supports `-c`. Handy for qsh-only utilities
  - `qsh -c 'db2 "select * from QIWS.QCUSTCDT"'`

```
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<th>INIT</th>
<th>STREET</th>
<th>CITY</th>
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</tbody>
</table>
```

Running Simple SQL

- IBM i Access Client Solutions
  - Load file acsbundle.jar. Use the "CLDOWNLOAD" plugin:
    ```
    java -jar acsbundle.jar /plugin=cldownload /sql="select * from QIWS.QCUSTCDT" /system=localhost /display
    ```
    - (can also download to file using "/FILE" instead of "/display")

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Running CL Commands

- Use the PASE “system” utility
  - `system dspsyssts`

Look at Active Jobs

- Method 1: PASE ‘ps’ command (common invocation is ‘ps aux’ or ‘ps -Af’)
Look at Active Jobs

• Method 2: QSH ‘ps’ command, allows you to see job name via ‘-o’ (common invocation is ‘ps aux’ or ‘ps -Af’)

```
qsh -c "'/usr/bin/ps -Af -o jobid,PID,jobname,user"
```

Look at Active Jobs

• Method 3: system WRKACTJOB
Look at Active Jobs

- Method 4: SQL!!
  
  ```bash
  qsh -c 'db2 "select JOB_NAME, AUTHORIZATION_NAME, ELAPSED_TOTAL_DISK_IO_COUNT, ELAPSED_CPU_PERCENTAGE from TABLE(QSYS2.ACTIVE_JOB_INFO()) X""'
  ```


Access a git repository

- SSH is the preferred way to access a remotely-hosted git repository!
  
  ```bash
git clone <user>@<hostname>:/<path>
  ```

- Any SSH-supported authentication mechanism works
Run IBM i Access Client Solutions

- Access Client Solutions runs wherever there is Java!
- Yes, even with a GUI! PASE natively supports X11 windowing system (same as used by Linux)
- Server-side configuration (1 time) by editing sshd_config:
  - SC1: /QOpenSys/QIBM/UserData/SC1/OpenSSH/etc/sshd_config
  - RPM: /QOpenSys/etc/ssh/sshd_config

```
AllowAgentForwarding yes
AllowTcpForwarding yes
X11Forwarding yes
X11DisplayOffset 10
X11UseLocalhost yes
```

Run IBM i Access Client Solutions (Mac/Linux)

- Now, from Mac or Linux, you just need `-Y`
  
  ```
  ssh -Y username@hostname
  ```

- Launch ACS with the `java` command
  
  ```
  java -Xmx1g -jar acsbundle.jar
  ```
Run IBM i Access Client Solutions (Windows)

- Install Cygwin with the following packages:
  - openbox
  - gnome-terminal
  - xterm
  - openssh
  - xorg-x11-fonts-Type1
  - xorg-x11-fonts-misc
  - gnome-desktop
  - kde-runtime
  - konsole
Launch OpenBox

- Start menu will have a few options in “Cygwin/X”
  - Openbox
  - GNOME-Openbox
  - KDE-Openbox
Right-click, Terminals, pick your favorite

1. Right-click the Terminals application.
2. Select your preferred terminal emulator.

Example:

```
$ ssh -Y jgorzins@lp13ut28.rch.stglabs.ibm.com
jgorzins@lp13ut28.rch.stglabs.ibm.com's password:
-bash-4.4$ java -Xmx1g -jar acsbundle.jar
```
SSH Tunneling

- You can “tunnel” communications through an SSH tunnel

Visualization SSH Tunneling

SSH Tunneling

• You can “tunnel” communications through an SSH tunnel

```bash
ssh -L 800:tg_host:8000 user@system
```

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SSH tunneling

• Great for when:
  – Need to encrypt data, but application is not encryption-aware
  – Need a port open that firewall won’t allow

• Rarely useful (?)
• Not a good long-term solution
## For More Information:

### Some Links You Need

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<th>Twitter</th>
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### Blogs

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<td>IBM Systems Magazine You and i (Steve Will)</td>
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<td><a href="http://ibmsystemsmag.com/blogs/i-can/">http://ibmsystemsmag.com/blogs/i-can/</a></td>
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