

IBM i

FormaServe

ROYAL NAVY

Open-Source on IBM i

IBM CHAMPION

Andy Youens
FormaServe Systems

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Andy Youens

FormaServe

IBM CHAMPION

- IBM i Consultant/Instructor at FormaServe for over 31 years
- Over 40 years IT experience working with S/34, S/36, AS400, iSeries & IBM i
- Specialties IBM i, RPG, PHP, SQL, DB2 & Node.js
- Instructor & an article writer specialising in programming on the IBM i
- IBM Champion 2021 & Member of IBM ISV Advisory Council
- Prior to IT, Andy is proud to have served 10 years in the Royal Navy



ROYAL NAVY

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Agenda




- Open-Source Introduction
- Open-Source Tools
- GIT & GitHub
- NPM
- Node.JS & Express Framework
- Develop a CRUD Application
- Misc. Bumph







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Administration





Enjoy!

-  This is a workshop & expect you to participate
-  Breaks every hour for 10 minutes
-  Hope you have IBM i access
-  Links will be placed in chat window
-  Interrupt me any time
-  [Examples on GitHub](#)


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No Recording!





- This workshop is not being recorded; all individual components of this workshop are available on our website
- <https://learning.formaserve.co.uk/>


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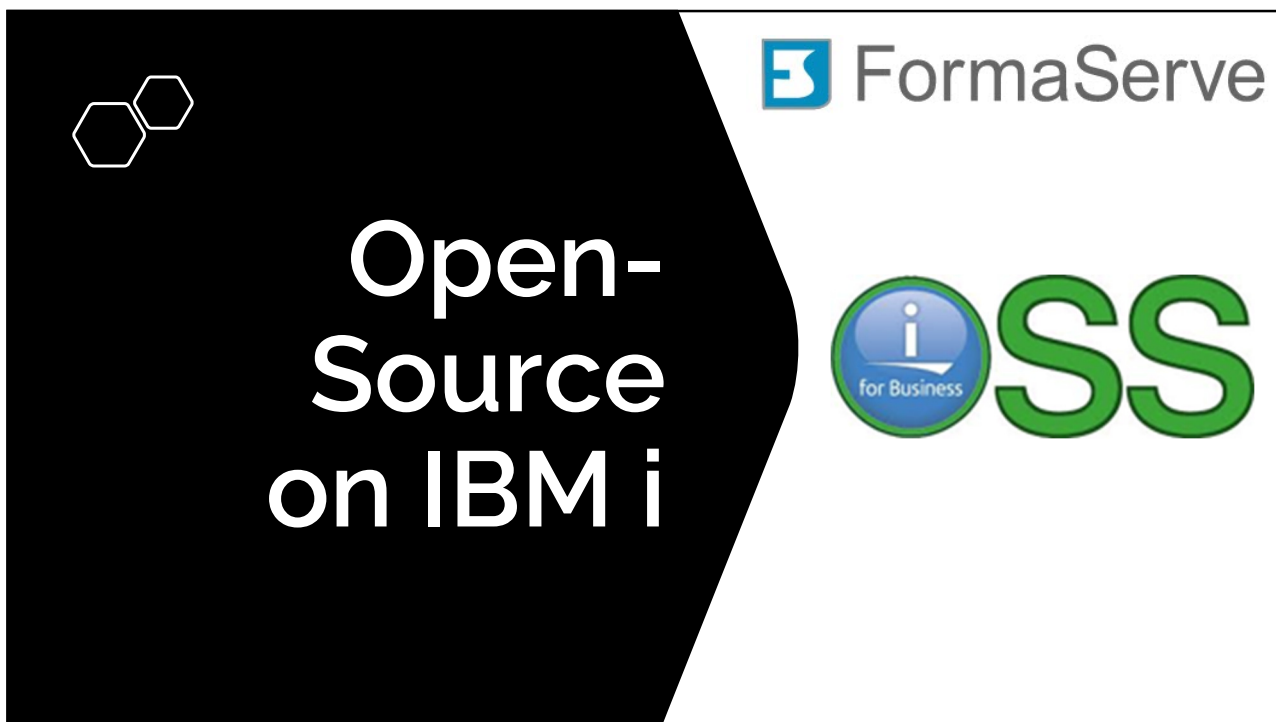
Examples



- Full examples of all the material in this workshop can be found on GitHub
- <https://github.com/AndyYouens/User-Groups>
- This is a private repo
- For access to this material contact Andy@formaserve.co.uk
- <https://learning.formaserve.co.uk/>

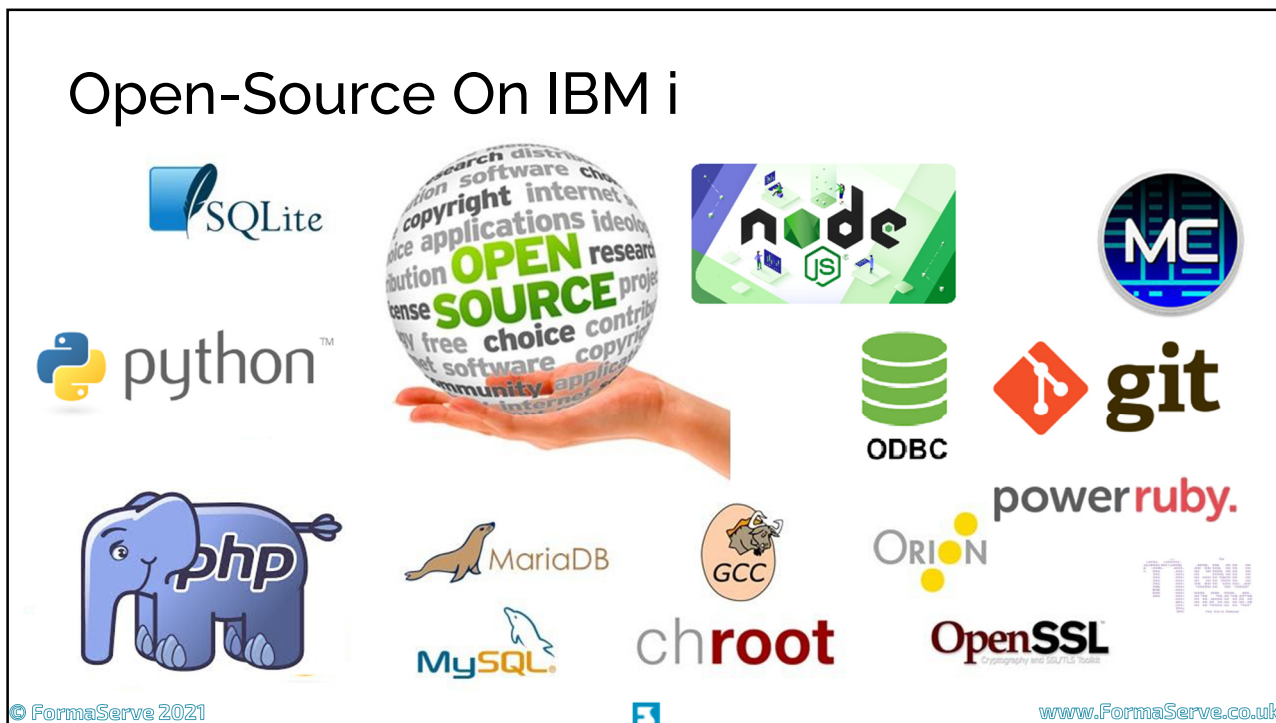
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The banner features a black background on the left with two white hexagons in the top left corner. The text "Open-Source on IBM i" is written in large white font. On the right, the FormaServe logo is at the top, and the "iOSS for Business" logo is below it.

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The collage is titled "Open-Source On IBM i" and features a central image of a hand holding a globe with "OPEN SOURCE" text. Surrounding the globe are logos for various open-source technologies: SQLite, python, php, MariaDB, MySQL, chroot, node.js, ODBC, git, power ruby, ORION, OpenSSL, ME, and GNU nano. The bottom left has "© FormaServe 2021" and the bottom right has "www.FormaServe.co.uk".

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Open-Source Management

- IBM had a lot of pressure to make available *'Open-Source on the IBM i'*
- We already had
 - Apache HTTP Server
 - PASE - 1998
 - Zend Server & PHP - 2006
- In 2015 IBM made available Open-Source software as a licensed program – **5733OPS**
- Initially these were all empty slots
- These slots could then be filled by PTFs




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Open-Source Placeholders

Display Installed Licensed Programs

Licensed Program	Installed Status	Description
5733OPS	*INSTALLED	Nginx
5733OPS	*INSTALLED	IBM i Open Source Solutions Option 12
5733OPS	*INSTALLED	IBM i Open Source Solutions Option 13
5733OPS	*INSTALLED	IBM i Open Source Solutions Option 14
5733OPS	*INSTALLED	IBM i Open Source Solutions Option 15
5770QU1	*COMPATIBLE	IBM Query for i
5733SC1	*INSTALLED	IBM Portable Utilities for i
5733SC1	*INSTALLED	OpenSSH, OpenSSL, zlib
5770ST1	*COMPATIBLE	DB2 Query Mgr and SQL DevKit
5770TC1	*COMPATIBLE	IBM TCP/IP Connectivity Utilities for i
5770TS1	*COMPATIBLE	IBM Transform Services for i
5770TS1	*COMPATIBLE	Transforms - AFP to PDF Transform
5770UME	*COMPATIBLE	IBM Universal Manageability Enablement for i

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Open-Source Management

- 5733OPS populated by group PTFs
- No updates since 2017
- **No future updates!**

Last Updated Nov 2017

Work with PTF Groups

Type options, press Enter

1=Order 4=Delete 5=Display 6=Print 8=Disp
 9=Display related PTF groups 10=Display PTF a

Opt	PTF Group	Level	Status
—	SF99875	14	Installed
—	SF99730	18025	Installed
—	SF99729	57	Installed
—	SF99728	28	Installed
—	SF99727	4	Installed
—	SF99725	8	Installed
—	SF99722	14	Installed
—	SF99703	10	Installed
—	SF99225	6	Installed

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What about 5733OPS?

- The 5733OPS licensed program is now longer required!
- Depreciated by IBM
- End of Life 2015
- Anyone tried/brave enough to remove it?
- Do your Open-Source applications still work?

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Something Needed to be Done!

🟡 Catch 22!

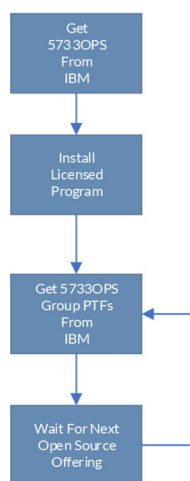
- You had to know the name of 5733OPS options to get them – they are blank!
- The PTF delivery route is confusing to non-IBM i people – the people IBM is trying to attract to the server!



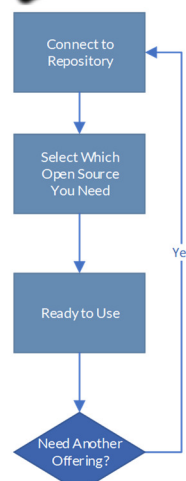
Software Flow



2015 - 2017



NEW!



Open-Source Dependencies



- One of the problems IBM encountered with OSS was with **dependencies & updates**
- For example, Node.js might have a dependency on OpenSSL, so this would need to be included on install
- So IBM moved over to the Linux world way
- They use a utility called the **Red Hat Package Manager** to install software packages - **RPM**
- This is the route IBM now takes to supply IBM i Open-Source software



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RPM Repositories



- IBM has created a RPM repository for Open-Source packages
- RPM packages are stored in a repositories – aka repo
- They are not AIX/Unix RPMs
 - They are IBM i RPMs shipping IBM i software
 - Compiled for & are known to run on IBM i
 - **Built on IBM i for IBM i**



IBM i

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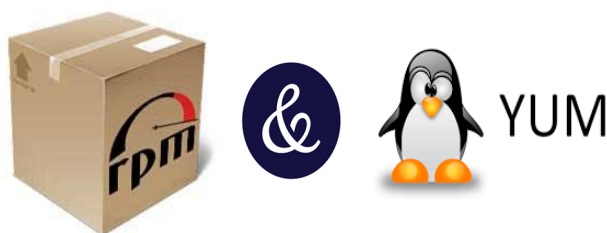


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Yum – What is it?

- **Yellow Dog Updater Modified!**
- Yum is an automatic updater & package installer/remover
- It automatically handles dependencies
- Yum has a plugin interface for adding simple features
- Yum works with software repositories – it uses RPM!
- **A licensed program & PTF process in one!**



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Yum

- Runs in **PASE**
- Interfaces
 - 5250 → **Call QP2Term**
 - Remote Shells
 - Windows 10 SSH Client
 - Chrome SSH Plugin
 - Putty
 - Git Bash
 - OpenSSH



```

19/09/2018          FormaServe Systems Ltd          15:07:17
                    IBM i Power 7 Servers

User ID . . . . . █
Password . . . . .

      .ad8888ba      88
      d8x      "a8b      88
      d8      88
      88      ,adPPYbba,      88      ,adPPYbba,      M888MMM      ,adPPYbba,      ,adPPYbba,
      88      88888      xx      `Y8      88      xx      `Y8      88      a8P      _..88      xx      `Y8
      Y8,      88      ,adPPPP88      88      ,adPPPP88      88      8PPxxxxxx      ,adPPPP88
      Y8a,      ,a88      88,      ,88      88,      ,88      88,      bb,      ,aa      88,      ,88
      `xY88888Pn      `x8bbdPaY8      88      `a8bbdPaY8      ,a888      `aYbbd8a      `a8bbdPY8

Subsystem . . . . . QINTER          Display . . . . . QPADEV0003
Partition . . . . . GALATEA          Server . . . . . Neptune
Operating System . . . . . IBM i 7.3          www.FormaServe.co.uk
    
```

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Yum Example

```

Windows PowerShell x OpenSSH SSH client x OpenSSH SSH client x + v
andy@GALATEA /Aug $ yum repolist
repo id                               repo name
ibm                                    ibm
repos.zend.com_ibmiphp_ppc64          added from: http://repos.zend.com/ibmiphp/ppc64
repolist: 983
andy@GALATEA /Aug $
    
```



Yum Example

```

Windows PowerShell x OpenSSH SSH client x OpenSSH SSH client x + v
andy@GALATEA /Aug $ yum list installed
Installed Packages
bash.ppc64                               4.4-7 @ibm
ca-certificates.noarch                  2_git20170807.10b2785-2 @ibm
ca-certificates-mozilla.noarch          2019.2.32-0 @ibm
coreutils-gnu.ppc64                      8.25-5 @ibm
coreutils-pase-dummy.ppc64              7.2-0 @ibm
createrepo.noarch                       0.10.4-4 @ibm
cronie.ppc64                             1.5.5-4 @ibm
cronie-anacron.ppc64                    1.5.5-4 @ibm
curl.ppc64                               7.70.0-3 @ibm
db.ppc64                                 4.8.30-0 installed
db2util.ppc64                           1.0.11-1 @ibm
file-magic.ppc64                         5.32-4 @ibm/$releasever
findutils.ppc64                         4.6.0-4 @ibm
gcc-aix.fat                             6.3.0-25 @ibm
gcc-cplusplus-aix.fat                   6.3.0-25 @ibm
gcc-cpp-aix.fat                         6.3.0-25 @ibm
git.ppc64                               2.26.2-3 @ibm
gmp-aix.fat                             5.1.3-13 @ibm
grep-gnu.ppc64                          3.0-2 @ibm
groff.ppc64                             1.22.4-0 @ibm
gzip.ppc64                              1.8-3 @ibm
ibm-iaccess.ppc64                       1.1.0.13-0 @/ibm-iaccess-1.1.0
ibmip2.ppc64_ibmip2_ibmip2              2.1.3-1
    
```



Yum Commands



- **yum list installed** - list installed packages
- **yum list available** - list available packages
- **yum list updates** - list available updates to packages
- **yum help** – help text
- **yum install <package>** - install a package
- **yum search <package>** - search for a package
- **yum erase <package>** - remove a package
- **yum repolist** – what rep'o's am I using?



Yum Crib Sheet

https://access.redhat.com/sites/default/files/attachments/rh_yum_cheatsheet_1214_jcs_print-1.pdf

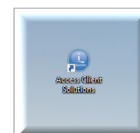
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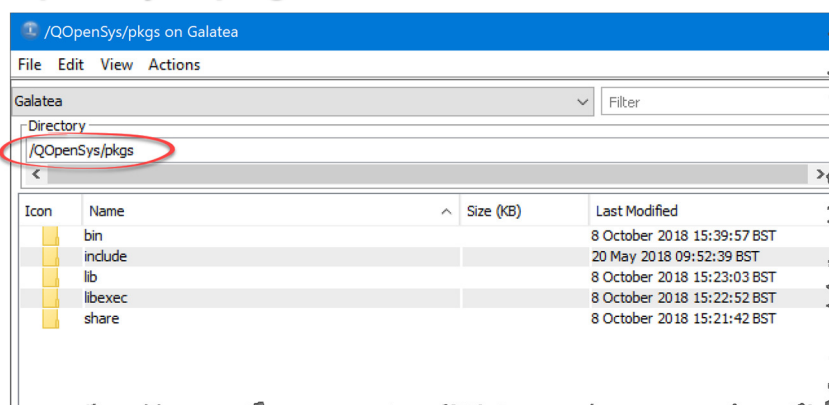
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Using These Resources



- RPM packages are downloaded to the IFS directory
 - **/QOpenSys/pkg**s



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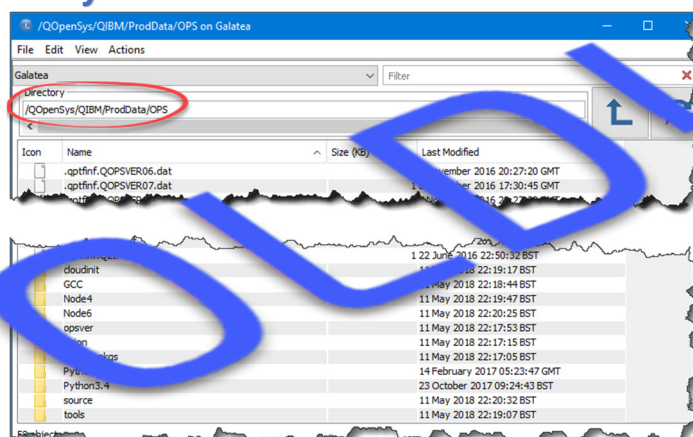


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Lic Pgm/PTF Location

- Original location
 - **/QOpenSys/QIBM/ProdData/OPS**



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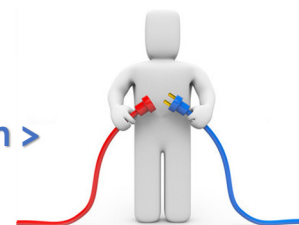
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RPM Repositories Offline

- Install for Offline Repositories
 - Download **bootstrap.sh** & **bootstrap.tar.z**
 - FTP to the IFS in the /tmp directory
 - From QShell run


```
QSH CMD('touch -C 819 /tmp/bootstrap.log;
/QOpenSys/usr/bin/ksh /tmp/bootstrap.sh >
/tmp/bootstrap.log 2>&1')
```



Full Details at

<https://ibmi-oss-docs.readthedocs.io/en/latest/yum/README.html>


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Access for Client Solutions

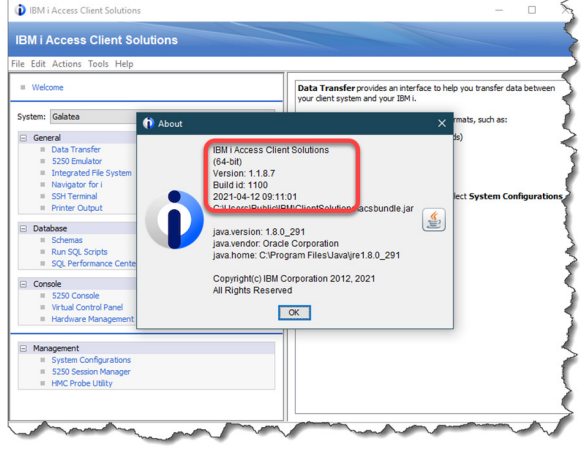



Majority of packages run on 7.1

Version 1.1.8.7 – April 2021

IBM i OS 7.2 & later


Preferred way to manage OSS



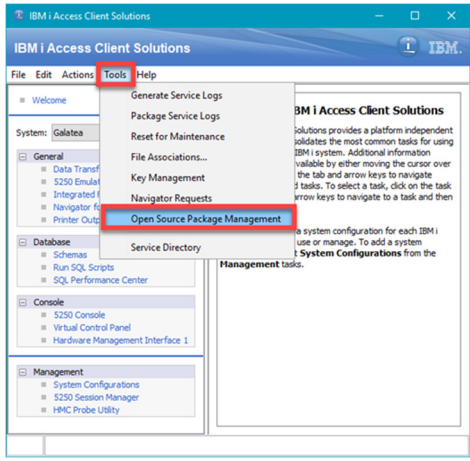
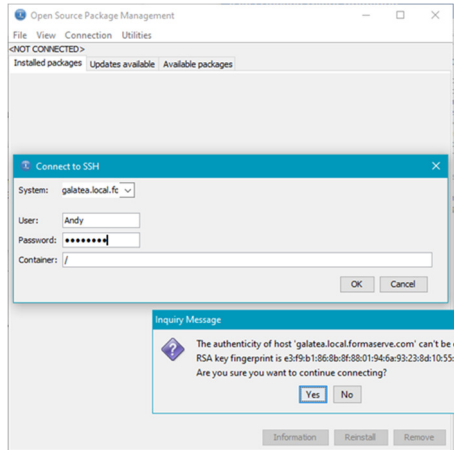
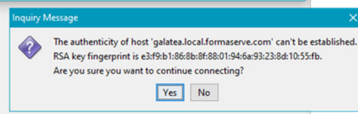
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Access for Client Solutions



Tools → Open-Source Package Management

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ACS Uses Yum!

Behind the Scenes!



```

Package Installation
Setting up Install Process
Resolving Dependencies
--> Running transaction check
--> Package curl.ppc64 0:7.76.0-3 will be updated
--> Package curl.ppc64 0:7.76.1-1 will be an update
--> Processing Dependency: libcurl4 = 7.76.1-1 for package: curl-7.76.1-1.ppc64
--> Running transaction check
--> Package libcurl4.ppc64 0:7.76.0-3 will be updated
--> Package libcurl4.ppc64 0:7.76.1-1 will be an update
--> Processing Dependency: libz/0qopensys/pkg5/lib/libbrotli1dec.so.1(shr_64.o)(ppc64) for package: libcurl4-7.76.1-1.ppc64
--> Processing Dependency: libz/0qopensys/pkg5/lib/libbrotli1common.so.1(shr_64.o)(ppc64) for package: libcurl4-7.76.1-1.ppc64
--> Running transaction check
--> Package libbrotli1dec.ppc64 0:1.0.9-1 will be installed
--> Processing Dependency: libz/0qopensys/pkg5/lib/libbrotli1common.so.1(shr_64.o)(ppc64) for package: libbrotli1dec1-1.0.9-1.ppc64
--> Package libbrotli1common.ppc64 0:2.3.0-2 will be installed
--> Running transaction check
--> Package libbrotli1common.ppc64 0:1.0.9-1 will be installed
--> Finished Dependency Resolution

Dependencies Resolved

-----
Package Arch Version Repository Size
-----
Updating:
curl ppc64 7.76.1-1 fba 121 k
Installing for dependencies:
libbrotli1common ppc64 1.0.9-1 fba 69 k
libbrotli1dec1 ppc64 1.0.9-1 fba 34 k
libbrotli1common.ppc64 0:2.3.0-2 fba 266 k
Updating for dependencies:
libcurl4 ppc64 7.76.1-1 fba 432 k
-----

Transaction Summary
-----
Install 3 Packages
Upgrade 2 Packages
Total download size: 922 k
Is this ok [y/N]:
    
```



YUM

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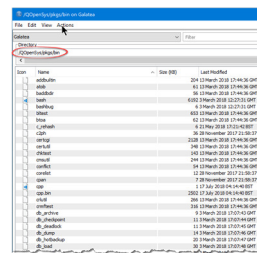
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Using Packages

- To use any package ensure the /bin directory is in your path
 - /QOpenSys/pkg5/bin



PROFILE

- Change your profile script to set the path (.profile)
- PATH=/QOpenSys/pkg5/bin:\$PATH**

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```

/*****
/* Automate OSS Package Updates
/*
/* Andy Youens
/*
/* © 1990 - 2020 FormaServe Systems Ltd
/*
/* Publish in PowerLine in March 2019
/*
/* Article can be found at
/* https://powerline.eu/open-source-updates
/*
*****/
Start: Pgm
Dcl      &Date      *Char      6
Dcl      &Mbr       *Char      10
Dcl      &IFSDir    *Char      256 Value( '/oss/Logs/' )
Dcl      &Time      *Char      6
Dcl      &FullName  *Char      256
Dcl      &PDFName   *Char      640

Dcl      &MsgId     *Char      7
Dcl      &MsgDta    *Char      256
Dcl      &MsgF      *Char      10
Dcl      &MsgLib    *Char      10
Dcl      &ErrorSw   *Lgl

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MonMsg   Cpf0000 Exec(Goto Error)

RtvSysVal QDate &Date
RtvSysVal QTime &Time

/* Create naming convention for logging
ChgVar   &Mbr ('Log_' || &Date )
ChgVar   &FullName ('/QSYS.LIB/POWERWIRE.LIB/OSS_LOG.FILE/' || &Mbr |< '.MBR')

/* Create Audit Log
CrtPfl  File(PowerWire/OSS_log) RcdLen(512) TEXT('OSS Audit Log ') MaxMbrs(*Nomax)
MonMsg  (Cpf5813 Cpf7392) /* Already exists - dont care! */

/* Remove previous log

```

CL to Update Packages

- Can be scheduled to fit with existing fix management
- Can be tailored to fit your requirements
- Produces PDF of packages updated for auditing
- On our [GitHub](#) – Sign up!

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Shells On IBM i






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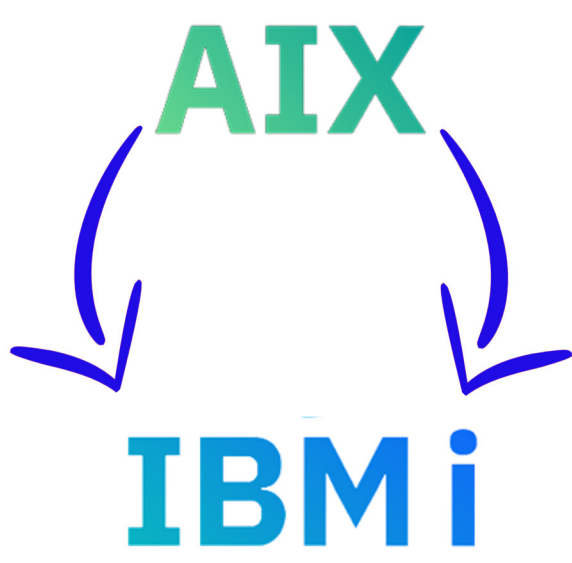
What are shells?

- What are shells, why should I use them?
- If you still use green screen for your shell access, take a look at all the benefits you can gain by moving away from 5250 shell access
- Its well worth the learning curve of using these shells
- They will be your friend - honest guv!

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What is Pase?

- **P**ortable
- **A**pplication
- **S**olutions
- **E**nvironment



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A PASE Interface

- **QCMD** – IBM i Interface
- **PASE** – Shell Interface

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PASE Shell Types

- **Korn**  Green Screen Access
- **Bourne**  SSH access
- **C**

DATED!



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PASE Shell Types – What then?

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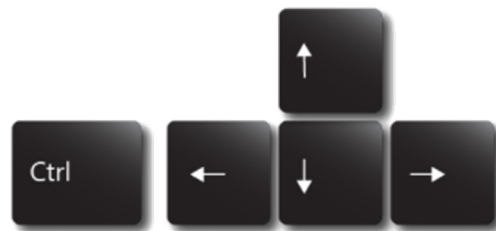
Bash Benefits

- History
- Autocomplete
- Own Startup Script
- Customise
- And lots, lots more
- ...

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BASH History

- Use **Arrow** keys for history
- Stores, by default, **500** commands
- Environment variable stores size **HISTSIZE**
- Stored in **bash_history** file in home directory
- **Ctrl-R** to search history



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BASH AutoComplete



Use the **TAB** shortcut to autocomplete

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BASH Profile - .bashrc in ~ directory

```

SSH FS - galatea > home > andy > .bashrc
1  #-----
2  # Personal Aliases
3  #-----
4  alias rm='rm -i'
5  alias cp='cp -i'
6  alias mv='mv -i'
7  alias l='ls -aLF'
8  alias la='ls -A'
9  alias lc='ls -CF'
10
11 # what git branch we on?
12 parse_git_branch() {
13     git branch 2> /dev/null | sed -e '/^[^*]/d' -e 's/* \(.*\)/(\1)/'
14 }
15
16 # show git branch on prompt
17 export PS1="\u@h \[\e[32m\]\w \[\e[91m\]\$(parse_git_branch)\[\e[00m\]$ "
18
19 # export PS1="My prompt $ > "
20
21

```

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Changing a Users Shell

```

C:\Learning\i00s02 Open Source Top Tips\Shell SPs.sql - Run SQL Scripts - Galatea(Galatea)
File Edit Search View Connection Run Explain Monitor Tools Help
1  -- Set users shell for PASE environment
2
3  -- Current user to BASH
4  CALL QSYS2.SET_PASE_SHELL_INFO('*CURRENT', '/QOpenSys/pkgs/bin/bash');
5
6  -- Set James & Angus shell to KORN
7  CALL QSYS2.SET_PASE_SHELL_INFO('JRIDDLE', '');
8  CALL QSYS2.SET_PASE_SHELL_INFO('ANGUS', '/QOpenSys/pkgs/bin/ksh');
9
10 -- Set everyone to BASH
11 CALL QSYS2.SET_PASE_SHELL_INFO('*DEFAULT', '/QOpenSys/pkgs/bin/bash');
12
13 -- set Andy to use the BASH shell
14 CALL QSYS2.SET_PASE_SHELL_INFO('ANDY', '/QOpenSys/pkgs/bin/bash');
15
16 -- set Andy to use the bsh
17 CALL QSYS2.SET_PASE_SHELL_INFO('ANDY', '/QOpenSys/pkgs/bin/sh');
18
19 -- set Andy to use the default
20 CALL QSYS2.SET_PASE_SHELL_INFO('ANDY', '');
21

```

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Who is using what shell?



```

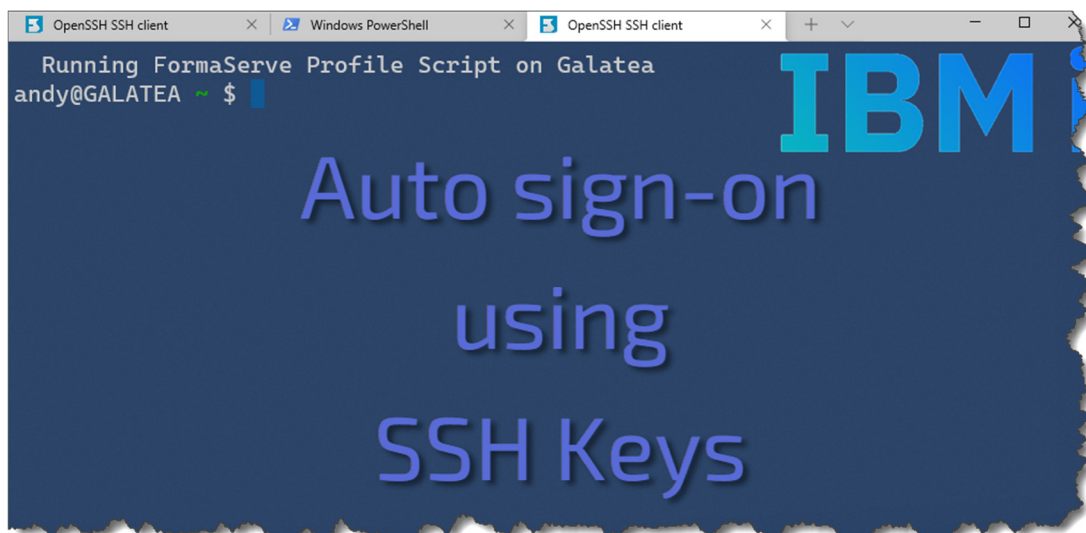
21
22 -- what shells are being used by users
23 Select Authorization_Name As User,
24       Pase_Shell_Path As Shell
25 From Qsys2.User_Info
26 Order By User;
27
28
    
```

USER	SHELL
ANDY	-
ANDYYOUENS	-
ANGUS	/QOpenSys/pkgs/bin/ksh
ARE	-
CENTRAL	-
F_CONTACT	-
F_MTD	/QOpenSys/pkgs/bin/bash
F_MTD_DEV	-
F_MTD_X	-
F_USER	-
FORMASERVE	-
FRED	-

QSSHD	-
QSYS	/QOpenSys/pkgs/bin/bash
QSYSOPR	-
QTCM	-
QTCM	-



SSH Keys



How Does it Work?

- We have a pair of keys, a private key & a public key
- Each key pair is unique, the two keys work together
- If you have the private key, you can prove you have it without showing what it is
- It's like proving you know a password without having to show someone the password



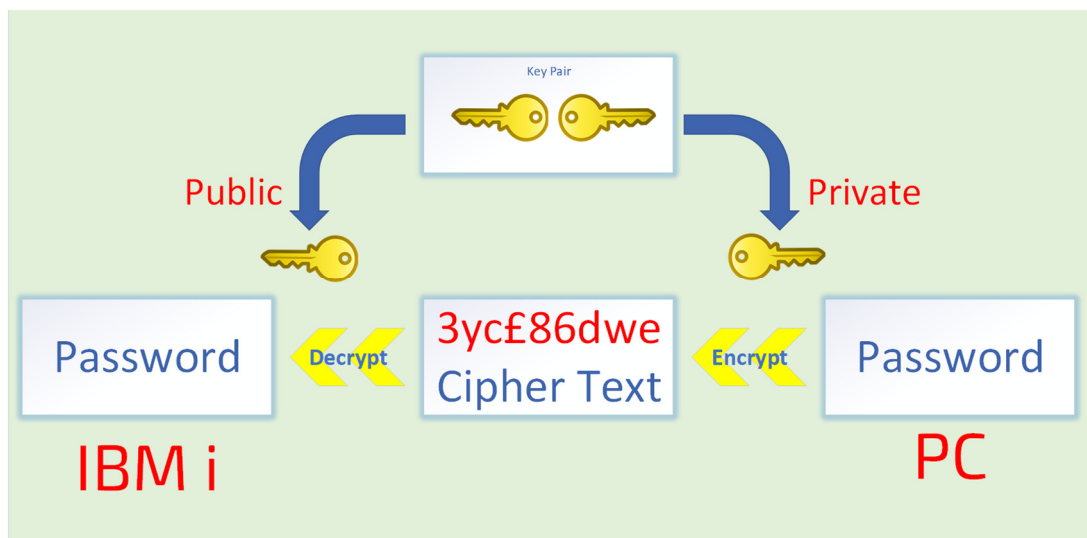
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Key Authentication



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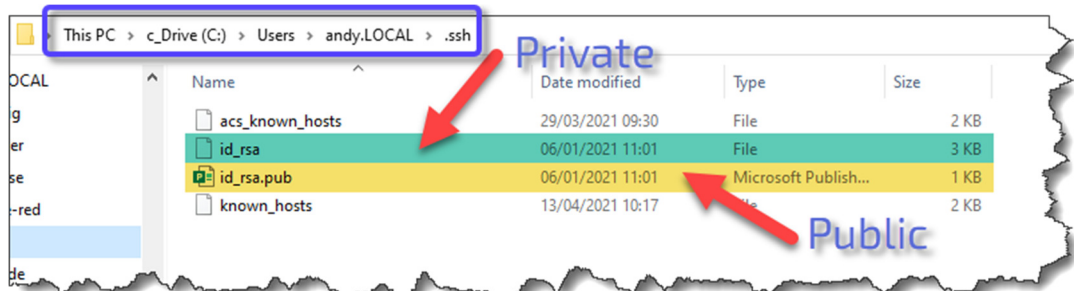


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Generating Keys - Use ssh-keygen

- We can use
 - OpenSSL feature of Windows
 - Git for Windows
 - Putty



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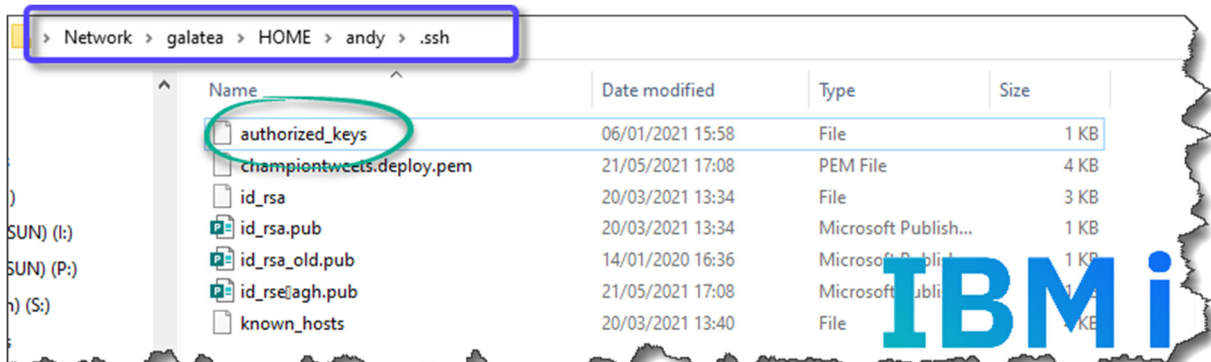


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Send Public Key to IBM i

- Home .ssh Directory





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Not Working?


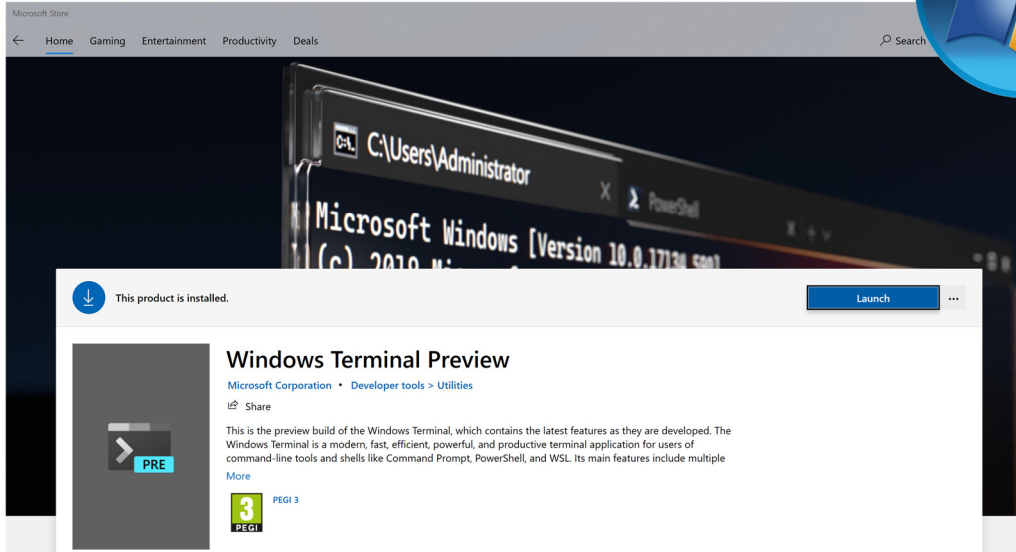




- **Home Directory**
 - Are you the owner? - ls -ld /home/Andy/
 - **chown andy /home/andy**
 - Check permissions on home directory - drwxr-sr-x
 - **chmod 755 /home/andy/**
- **.ssh Directory**
 - Are you the owner of the .ssh directory? - ls -ld /home/Andy/.ssh
 - **chown andy /home/andy/.ssh**
 - Check authority for -rw - drwx-S--3
 - **chmod 700 /home/andy/.ssh/**
- **Authorized_keys**
 - Check authority for -rw
 - **chmod 600 /home/andy/.ssh/authorized_keys**

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Windows Terminal

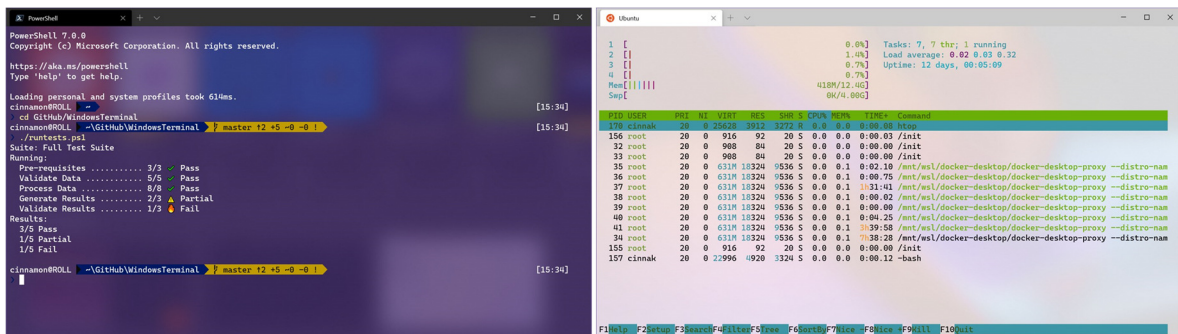



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Windows Terminal

- Launched 2019
- Open-Source
- Includes **Cascadia Code**
- Uses programming ligatures
- Repo at <https://github.com/Microsoft/Terminal>



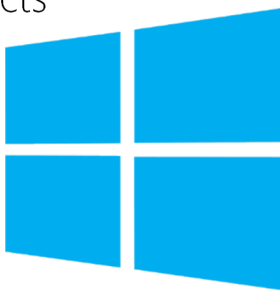
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Features

- UTF8 & UTF16 (inc emojis)
- Colour transparency effects
- Background images
- Themes
- Full screen mode
- Split panes
- Mouse input
- Customizable key binding



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Settings

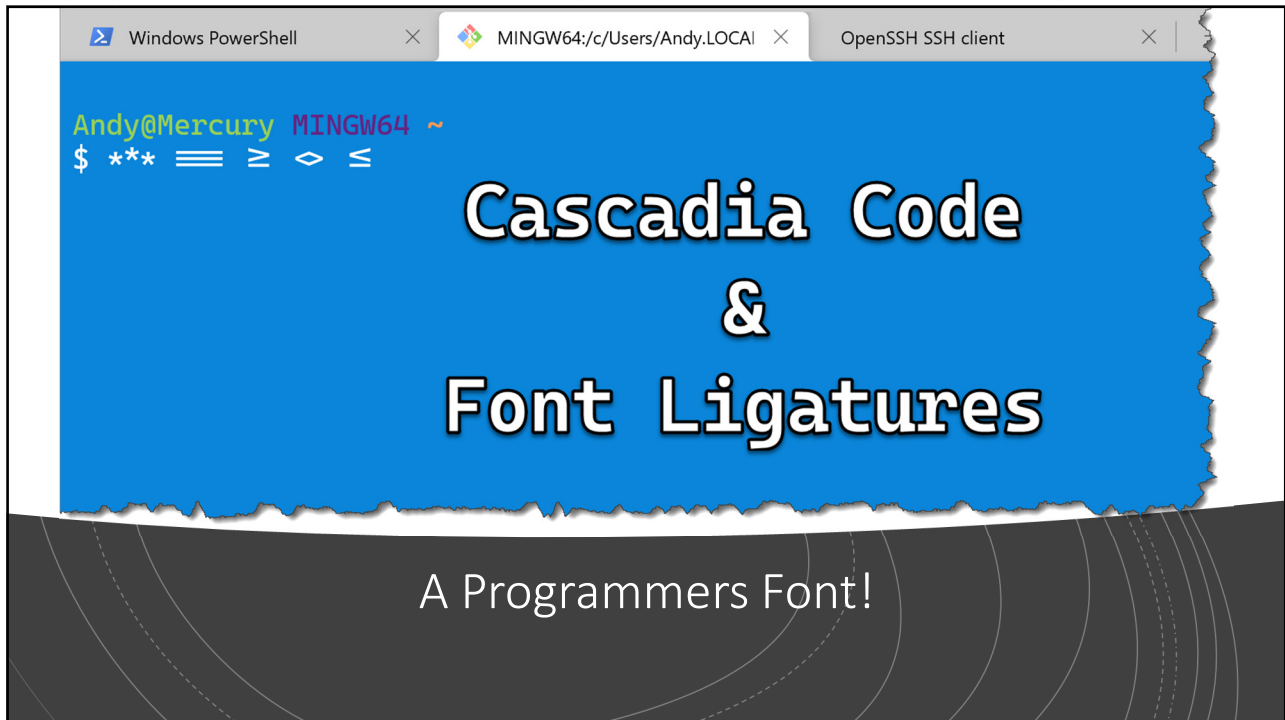
- Settings offer a great deal of control over each shell's appearance
- Different profiles for
 - PowerShell
 - Command Prompt
 - Azure connections
 - Ubuntu terminal (WSL)
 - SSH connections
- All fully customisable



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Node.js Editors

- NetBeans
- Eclipse RDi *
- Visual Studio *
- Visual Studio Code
- Notepad ++
- 5250 EDTF

*** Chargeable**





- Others
 - Sublime Text
 - Cloud 9
 - WebStorm
 - Komodo
 - Koding
 - Etc. Etc


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VS Code

- Need to edit files in the IFS?
- Only one choice!
- Plugins Make VS Code!
- Its Open-Source!
- Free!

<https://code.visualstudio.com/download>



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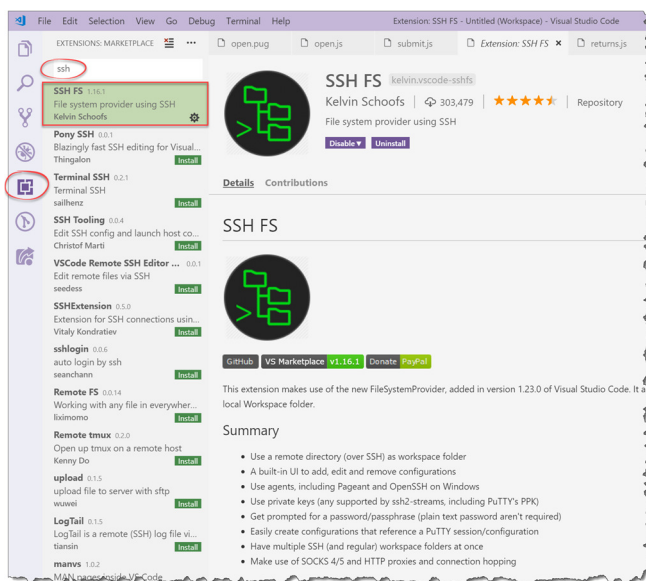


VS Code Extensions

- Increase the power of VS Code through Extensions
- Out of the-box features are just the start
- Lets you add languages, debuggers & tools to your installation to support your development workflow

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IBM i Connection



Use Code extension
SSH FS



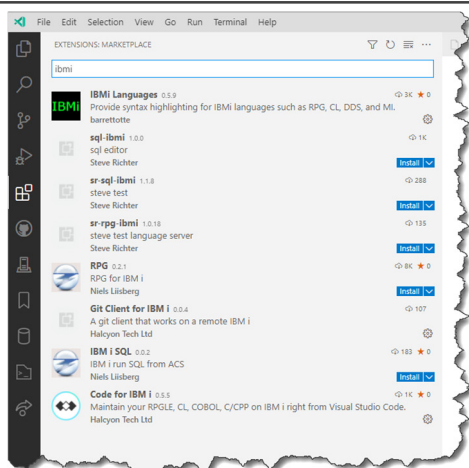
Ensure ***SSHD**
server running

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IBM i Extensions



Visual Studio Code

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Git Source Control

A severely complicated version of 'Save As'

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Git Source Control



- Time travel your source with Git
- Thinks of its data more like a series of snapshots of a miniature filesystem
- Takes a picture of what all your files look like at that moment & stores a reference to that snapshot
- If files have not changed, Git doesn't store the file again, just a link to the previous identical file it has already stored
- Thinks about its data more like a stream of snapshots

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Git Advantages

- **Resilience**
 - No one repository has more data than any other
- **Speed**
 - Very fast operations compared to other source control
- **Space**
 - Compression is done across repository not just per file
 - Minimizes local size as well as push/pull data transfers
- **Simplicity**
 - Object model is very simple
- **Large user base**
 - Has robust tools



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Git is Different!




- Not a server
- Runs thro' SSH
- Distributed – developers work on their own copy
- It stores all info in .git directory – Hidden!
- Very fast!
- Not just for source!
- **Not great with large binary files – our videos – no chance!**

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Some GIT Disadvantages

- **Definite learning curve**
 - Especially for those used to centralised systems
 - Can sometimes seem overwhelming to learn
- Documentation mostly through manual pages, but improving all the time
- Terminology unfamiliar with existing SCMs
- Learn the basics first!



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A Git Repository

Repository

Staged

Committed

Untracked


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Git on IBM i

7 Most Useful Commands

Description	Command	Example
Initialise Git	git init	git init
Clone an existing repository	git clone	git clone https://github.com/AndyYouens/GitTest.git
Mark for staging	git add	git add .
Commit	git commit	git commit -m "changes for v1_2"
Go back to previous commit	git reset	git reset --hard xt4jb
Log	git log	git log --pretty=oneline
Status	git status	git status

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- Used to exclude files from GIT
- In the root directory
- Must be named .gitignore

.gitignore file




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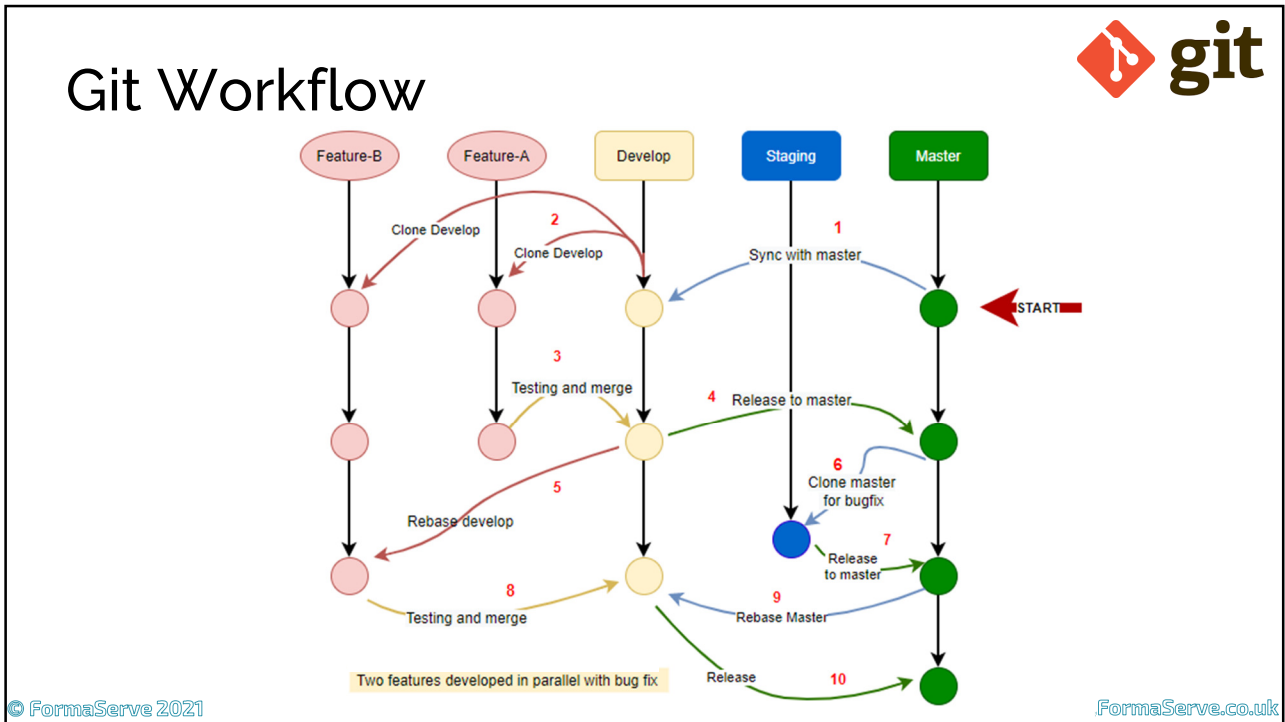


Git Workflow - Branches

- **Frictionless Context Switching**
 - Create a branch to try out an idea, commit a few times, switch back to where you branched from
- **Role-Based Code lines**
 - Have a branch that always contains only what goes to production, another that you merge work into for testing & others for day to day work
- **Feature Based Workflow**
 - Create new branches for each new feature you're working on so you can seamlessly switch back & forth between them
- **Disposable Experimentation**
 - Create a branch to experiment in, realise it's not going to work, just delete it




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Node Package Manager

- The World's largest software registry
- The registry contains over 1.5 million code packages
- Open-Source developers use NPM to share software
- Many organisations use NPM to manage private development
- Free to use – No Logins, No Passwords!
- Installed with Node.JS



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Package.json

- A manifest for your project
- A central repository of configuration for tools
- Where NPM stores the names & versions of the packages it installs

```

"author": "FormaServe Systems Ltd (https://www.formaserve.co.uk)",
"version": "2.0.0",
"private": true,
"scripts": {
  "start": "node ./bin/www"
},
"dependencies": {
  "cookie-session": "^1.3.3",
  "dateformat": "^3.0.3",
  "debug": "~2.6.9",
  "express": "~4.16.0",
  "express-oauth-server": "^2.0.0",
  "format-currency": "^1.0.0",
  "http-errors": "~1.6.2",
  "idb-connector": "^1.1.9",
  "idb-pconnector": "^1.0.4",
  "moment": "^2.24.0",
  "nodemon": "^1.18.11",
  "pug": "^2.0.3",
  "session": "^0.1.0",
  "sha1": "^1.1.1",
  "simple-oauth2": "^1.0.2",
  "superagent": "^5.0.2",
  "winston": "^3.2.1",
  "winston-daily-rotate-file": "^3.8.0"
}

```

NPM – Semantic Versioning



- Also known, as SEMVER
- Semver uses three part version number like 3.9.2
- Major, minor & patch numbers

3	.	9	.	2
<i>major</i>		<i>minor</i>		<i>patch</i>

NPM Versioning

- 3 digits – 1st = Major Release, 2nd = Minor Release & 3rd = Patch Release

Symbols	Description
~	if you write ~0.13.0, you want to only update patch releases: 0.13.1 is ok, but 0.14.0 is not!
^	if you write ^0.13.0, you want to update patch & minor releases: 0.13.1, 0.14.0 & so on ...
*	if you write *, that means you accept all updates, including major version upgrades
>	You accept any version higher than the one you specify
>=	You accept any version equal to or higher than the one you specify
<=	You accept any version equal or lower to the one you specify
<	You accept any version lower to the one you specify

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NPM Versioning - Examples

- f_Training** will take any patch updates
- f_MTD** will take any minor & patch updates
- f_FTP** will take any updates!

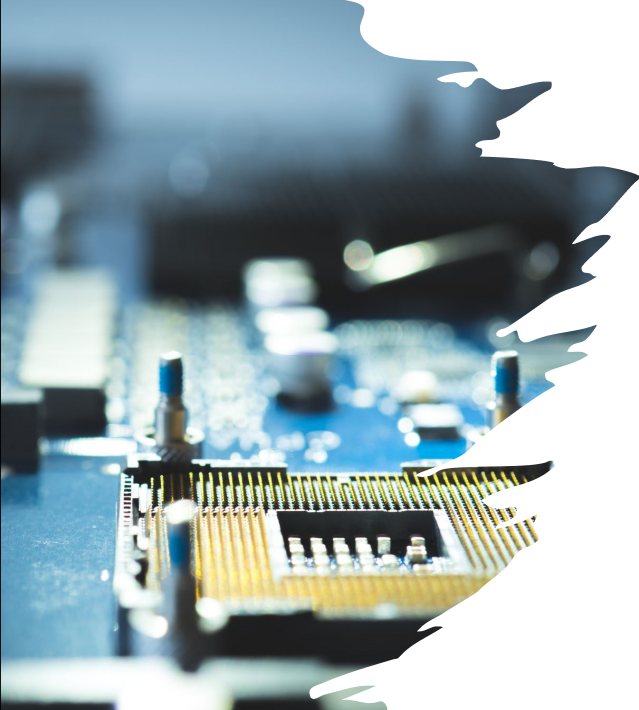
```
"dependencies": {
  "f_Training": "^1.0.0",
  "f_MTD": "~2.2.0",
  "f_FTP": "*3.0.0"
},
```

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NPM CLI Commands

- NPM Init
- NPM Help Install
- NPM List
- NPM List --depth 1
- NPM List -depth 0 -long
- NPM i -g
- NPM uninstall lodash
- NPM u -g




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NPM Init

- Used to set up a new/existing NPM project
 - `npm init`
 - `npm init -y (no prompts)`

```
{
  "name": "iug",
  "version": "1.0.0",
  "description": "",
  "main": "index.js",
  "scripts": {
    "test": "echo \"Error: no test specified\" && exit 1"
  },
  "author": "FormaServe",
  "license": "MIT"
}
```



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Our Weather Application

The terminal window shows the following commands and output:

```

andy@GALATEA /powerwire/weather (master)$ npm run debug
> fweather@1.0.0 debug
> DEBUG=weather:* nodemon -L ./bin/www

[nodemon] 2.0.4
[nodemon] to restart at any time, enter `rs`
[nodemon] watching path(s): *.*
[nodemon] watching extensions: js,mjs,json
[nodemon] starting node ./bin/www
weather:app → Into the app.js +0ms
weather:server Into our weather app! +225ms
*** Starting Weather App ***
Host: galatea.local.formaserve.com
Running on Port: 4000
weather:server Listening on port 4000 +7ms
  
```

The browser window shows the 'FormaServe - f_Weather' application. It includes a text input field labeled 'Enter a City', a 'Get Weather' button, and a message: 'Weather is Clouds, (overcast clouds) - 16.64 degrees in London!'.

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Twitter Analysis

The terminal window shows the following commands and output:

```

}
}
andy@GALATEA /powerwire/champion (master)$ npm start
> champion@1.0.0 start
> DEBUG=champion:* nodemon -L ./bin/www

[nodemon] 2.0.7
[nodemon] to restart at any time, enter `rs`
[nodemon] watching path(s): *.*
[nodemon] watching extensions: js,mjs,json
[nodemon] starting node ./bin/www
champion:server Listening on port 3061 +0ms
champion:index → Into index.js GET +0ms
champion:index Sunday is 24 +17ms
champion:index Saturday is 48 +1ms
champion:index Monday is 133 +0ms
champion:index Thursday is 153 +0ms
champion:index Tuesday is 183 +0ms
champion:index Friday is 189 +0ms
champion:index Wednesday is 204 +0ms
champion:index Datastring: 133, 183, 204, 153, 189, 48, 24
GET / 200 1756.454 ms - 2431
  
```

The browser window shows the 'IBM Champion Tweets Analysis' application. It features a bar chart titled 'Number of Tweets' for each day of the week. The data is as follows:


Day	Number of Tweets
Monday	133
Tuesday	183
Wednesday	204
Thursday	153
Friday	189
Saturday	48
Sunday	24

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IBM i

Open-Source Databases





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Alternatives to DB2

- Open-Source Databases



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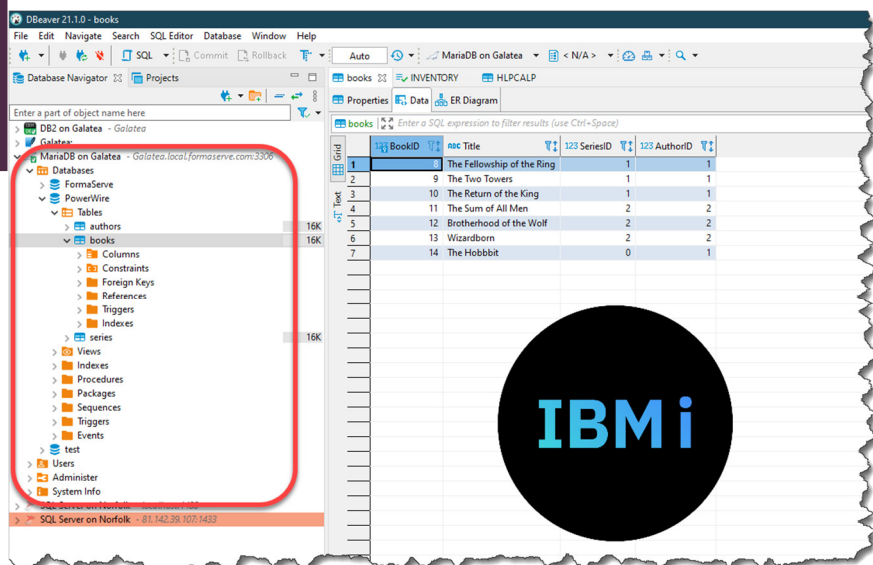
What is MariaDB?

- MariaDB is a replacement for MySQL
- It is Open-Source & developed by the MySQL developers
- One of the most popular database servers in the world
- It is fast, scalable & robust
- Is a community developed version of MySQL



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Let me show you my Beaver!



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Need more details on MariaDB?

- Excellent article!
 - <https://powerwire.eu/hello-maria>



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What is SQLite?



- A RDMS system contained in a C programming library
- Not a client/server database engine
- It is embedded into the end program
- Most used database engine in the world
- Reads & writes directly to ordinary disk files

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What is SQLite?

● Excellent article!

● <https://powerwire.eu/sqlite-what-is-that>



SQLite Example

IBM Champion Tweets Analysis

From: 2 April 2021 To: 12 May 2021

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
133	183	204	153	189	48	24



Node Database Example

The screenshot shows an IBM i Intranet Signon interface. On the left, there is a signon form with fields for 'Your IBM i User' and 'Your Password', and a 'Sign in' button. On the right, there is an 'Employee Database' table with columns for Employee ID, Surname, First Name, and Department. A modal form titled 'Add Employee' is overlaid on the table, containing input fields for First Name, Surname, and Department, along with 'Close' and 'Confirm Add' buttons. A red box highlights the 'Add Employee' button in the top right corner of the table.

Employee ID	Surname	First Name	Department
317	Allchin	Emily	PHO
			IT
			MAK
			IT
			HR
			HR
			SAL
			SAL
			MAK
			MAK
			MAK
			HR


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Node Database Example - Functionality

- Uses SSL to connect
- Signs onto IBMi
- Uses cookies to store signon stuff
- Accesses Employee table
- Lists all employees
- Allows updates, deletes & inserts

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IBM Champion
2021

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<https://learning.formaserve.co.uk>

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Anything Else ?



-  +44 (0)330 010958
-  Andy@formaserve.co.uk
-  www.formaserve.co.uk
-  @FormaServe & @AndyYouens

Thank You!

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