Integrating the IBM i and Cloud Storage

JAMES HOOPES
HOOPES@HOTMAIL.COM

Who Am I?

James Hoopes (hoopes@hotmail.com)

Senior Systems Engineer – Pacific Sunwear of California (11 years)

33 years on the System/38, AS/400, IBM i

I've been an operator, network engineer, programmer, and systems engineer

Former senior technical editor at News/400 and Midrange Computing

The Most Important Question: Why Do You Care About This?

- Rule 1: If your company is going to survive and thrive, your IT department needs to be agile. If you're going to keep your job, you need to be agile. Your competitors are becoming agile. Your company's future and your future as an IT professional depend on your ability to rapidly react to business requirements.

Agile

Traditional

What Does a Lack of Agility Look Like?

Example: The Old Model of Adding Disk Space

1. Determine requirements and write requirements document
2. Get quote from business partner(s)
3. Review quotes for accuracy
4. Get approval from executives or board for costs
5. Get legal approval for an SOW
6. Sign contracts
7. Wait for vendor to ship hardware
8. Schedule installation
9. Get approval from change control board
10. Install and configure…

That's weeks into months.

What Does Agility Look Like?

Example: Using a Cloud Partner to Provide Extra Disk Space

1. Use Disk Space.

That's seconds into minutes.

Options

1. Use IBM's Cloud Storage Solutions for i (5733ICC)

Provides access to IBM's Softlayer and Amazon Web Services storage. Integrates with BRMS.

2. Write Your Own Solution

Different language options include Python, Ruby, or even RPG.

IBM's Cloud Storage Solutions for i

- Licensed program available from IBM, 5733ICC.
- Version 1.1, works with 7.1 or higher. Version 1.2 requires 7.2 or higher.
- Released October of 2016.
- Support, documentation, PTFs, and upgrades available through usual IBM channels.

IBM's Cloud Storage Solutions for i

- Prices I found were $2,400 for a single partition or $5,000 for unlimited partitions on a system. Version 1.2 is changing licensing. Customers who bought unlimited converted to 4 licenses at V1.2.
- Supports IBM's Softlayer storage, Amazon Web Services' S3 storage, or you can use FTP to transfer to another IBM i system/partition.
- Integrates with BRMS, once certain prerequisite PTFs are installed.

Cloud Storage Background

- I'm going to focus on AWS S3. The differences between using AWS and Softlayer are largely minor differences in terminology.
- AWS S3 (Simple Storage Service) is a object storage system.
- It's a highly reliable storage environment. AWS advertises eleven 9's of durability. AWS automatically replicates data between multiple data centers.

Cloud Storage Background

- You get charged for the storage, for data transfer, and for operations against the data
- AWS has three categories of S3 storage: Standard, Infrequent Access, and Glacier. Prices decrease as you say you'll access the data less often. For Glacier, you give up access speed. Standard retrieval can take 3 to 5 hours. Expedited retrieval is available as well.

Cloud Storage Background: Costs

I used AWS' cost calculator to estimate the cost of storing 500GB in S3 standard storage for 1 month.

Standard Storage:		
Storage:	500	GB
PUT/COPY/POST/LIST Requests:	5000	Requests
GET and Other Requests:	1000	Requests

Data Transfer:		
Inter-Region Data Transfer Out:	0	GB/Month
Data Transfer Out:	100	GB/Month
Data Transfer In:	500	GB/Month
Data Transfer Out to CloudFront:	0	GB/Month

https://calculator.s3.amazonaws.com/index.html

Cloud Storage Background: Costs

I used AWS' cost calculator to estimate the cost of storing 500GB in standard storage for a month.

Service Type	Components	Region	Component Price	Service Price
Amazon S3 Service (US-West-2)				$11.54
	Standard Storage:	US-West-2 (Oregon)	$11.50	
	Standard Put/List Requests:	US-West-2 (Oregon)	$0.03	
	Standard Other Requests:	US-West-2 (Oregon)	$0.01	
AWS Data Transfer In				$0
	US-West-2 (Oregon) Region:	Global	$0	
AWS Data Transfer Out				$8.91
	US-West-2 (Oregon) Region:	Global	$8.91	
AWS Support (Basic)				$0
	Support for all AWS services:		$0	
		Total Monthly Payment:		**$20.45**

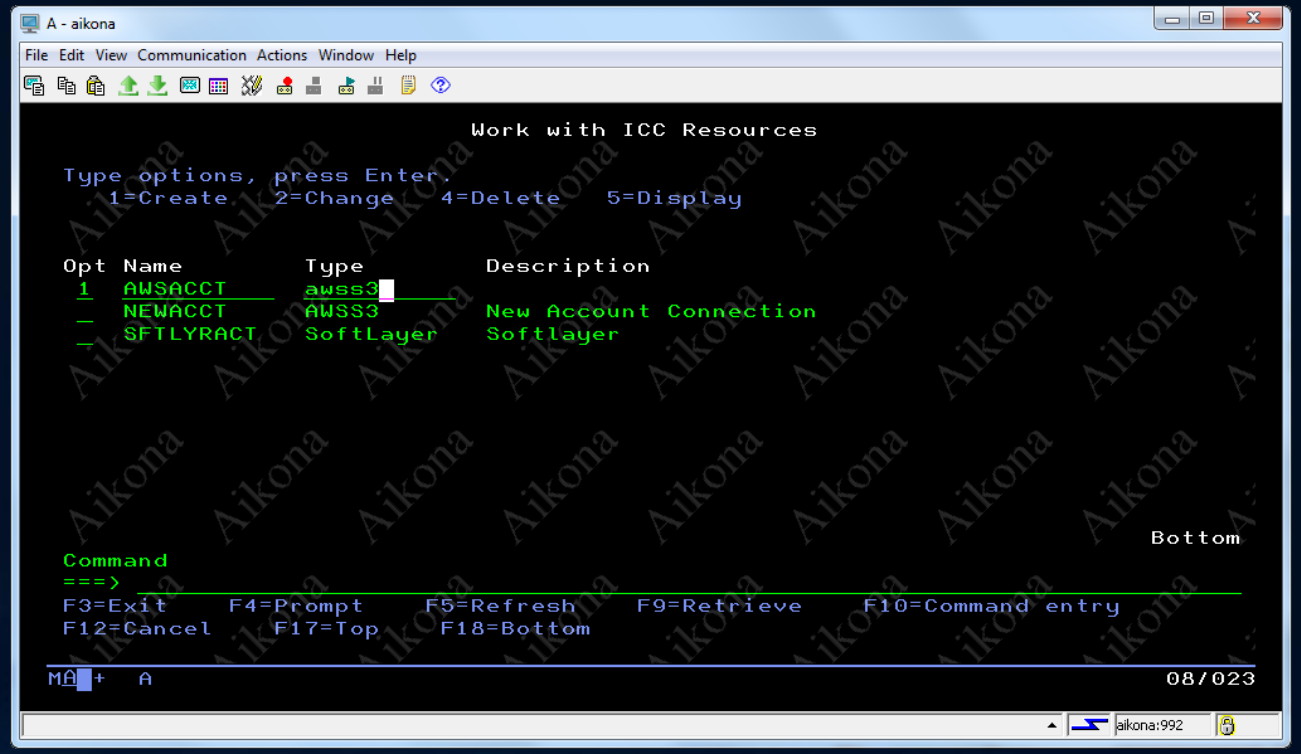
https://calculator.s3.amazonaws.com/index.html

Installing IBM Cloud Storage Solutions for i

- Download the image from IBM's Entitled Software Support (It's pretty small.)
- RSTLICPGM for 5733ICC
- Install latest PTFs (varies by operating system version and language.)
- AWS support won't work until you install the latest PTFs.
- Libraries are QICC and QUSRICC, but commands are installed into QSYS.
- By default, jobs run through QICCSBS subsystem.

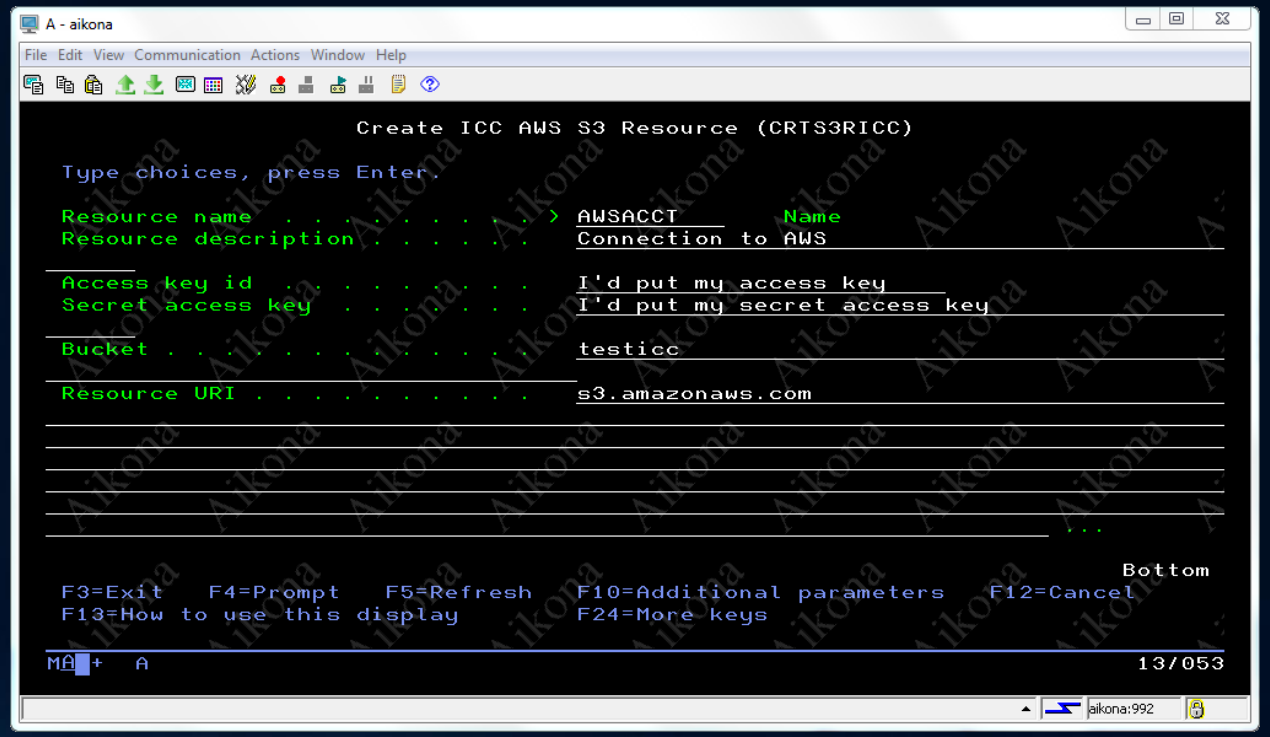
Configuring Cloud Storage Solutions for i

- Starting point is the WRKCFGICC command. From there you can create and manage connections to Softlayer or AWS.



Configuring Cloud Storage Solutions for i

- Creating a new AWS connection. You need your access key and secret key from IAM (Identity and Access Management) in AWS. When you create access keys, that's the only time you can see the secret key. Protect your secret key. Rotate them frequently.



Copy a File to AWS, Delete It, then Copy It Back

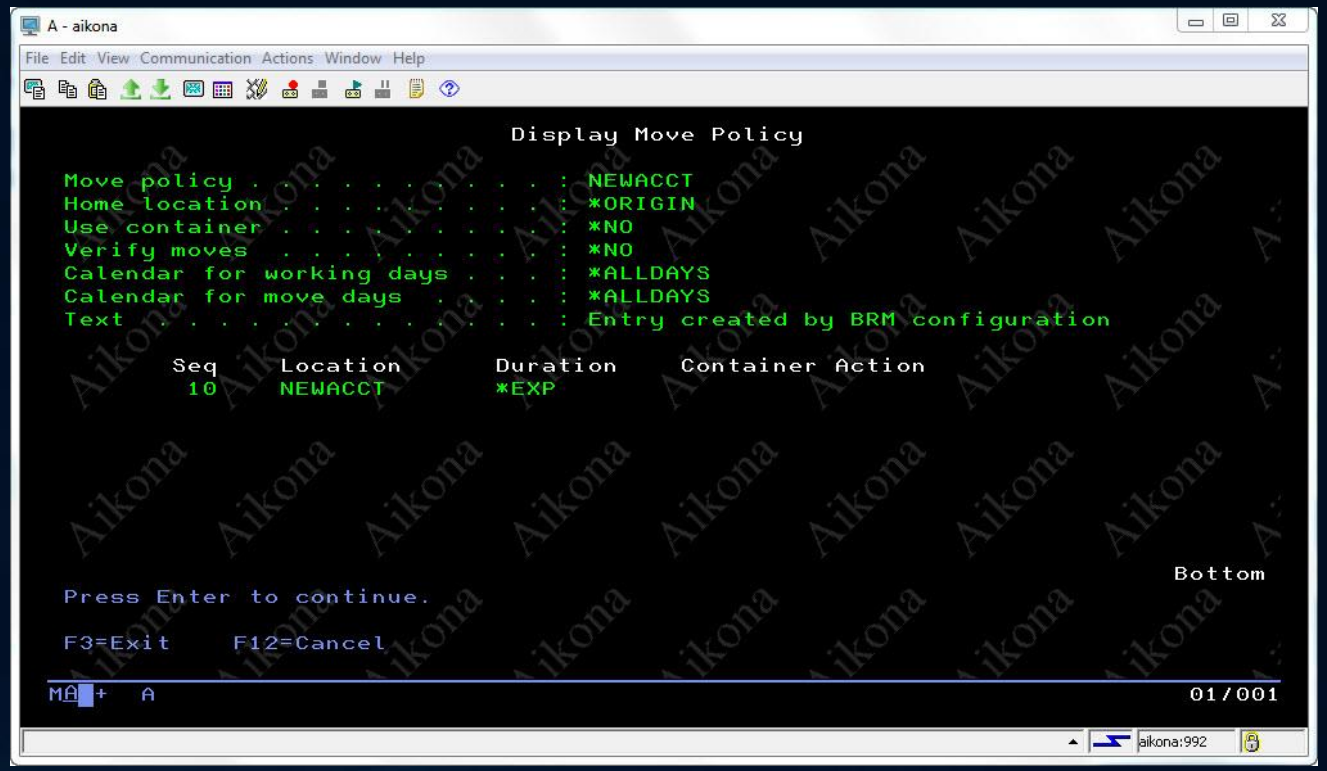
Video

Cloud Storage Solutions for i
BRMS Integration

- If you have the correct PTFs in place, Cloud Storage Solution for i integrates directly with BRMS.
- When you create an account in Cloud Storage Solutions, it will create that name as a location and move policy in BRMS.
- So for virtual tapes, you'll be able to move them to AWS, Softlayer, or another IBM i automatically when the BRMS move process is run.

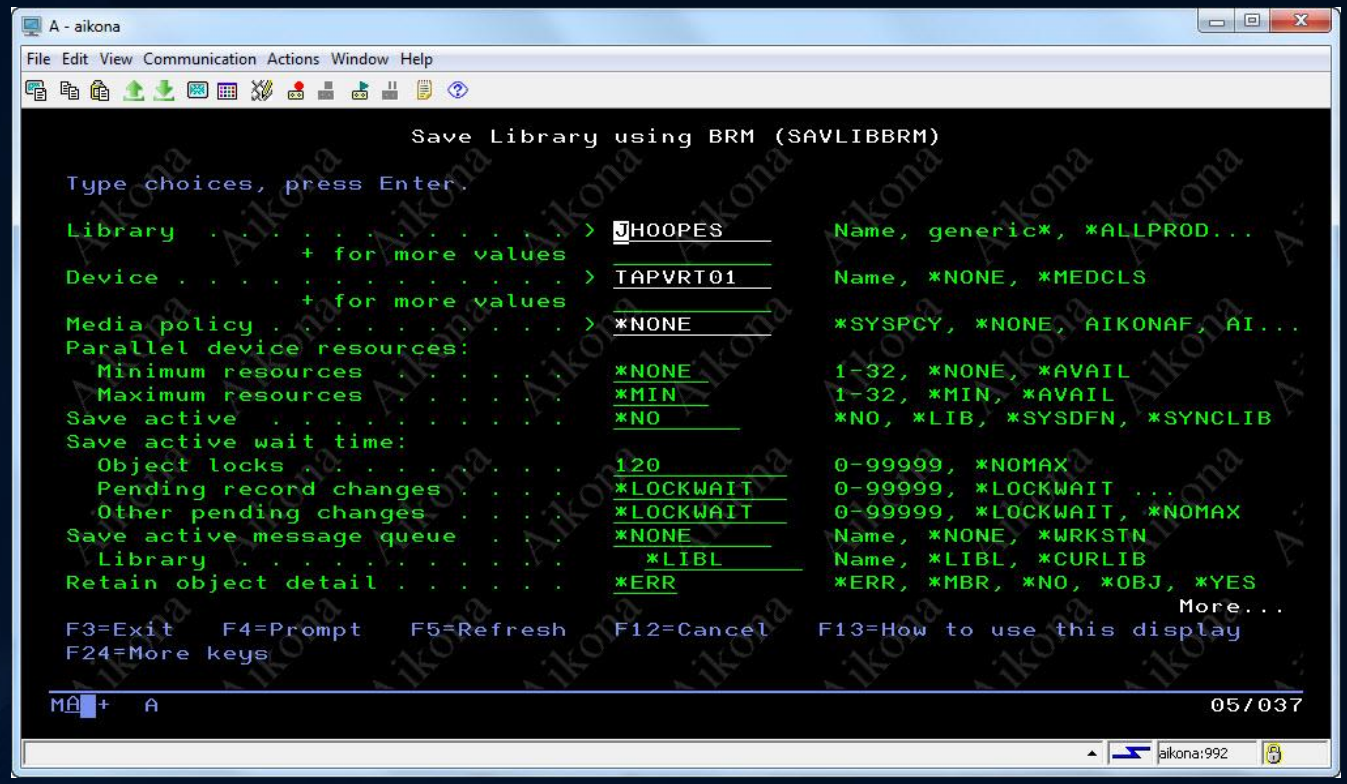
Cloud Storage Solutions for i
BRMS Integration

- Move policy in BRMS related to AWS account:



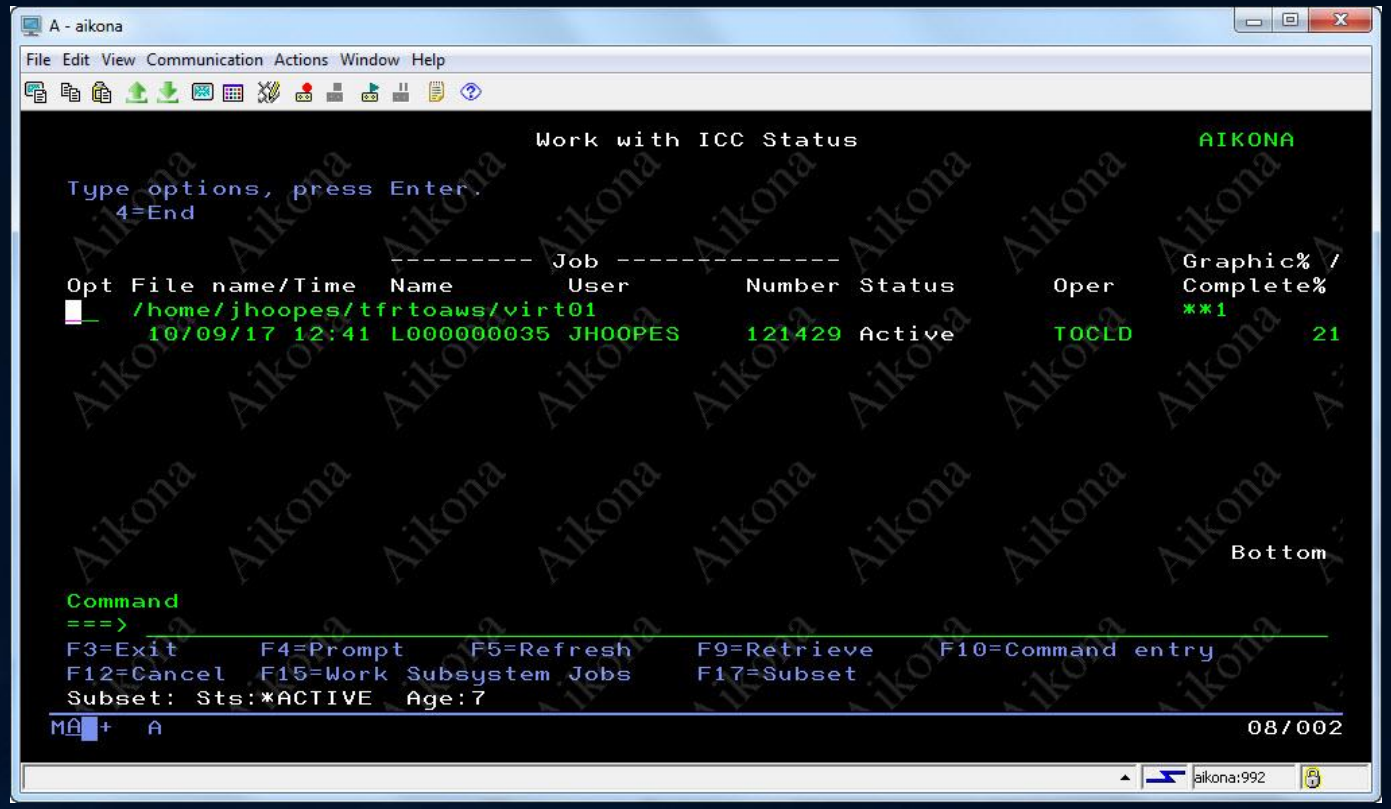
Cloud Storage Solutions for i BRMS Integration

- Saving a library to virtual tape using BRMS:



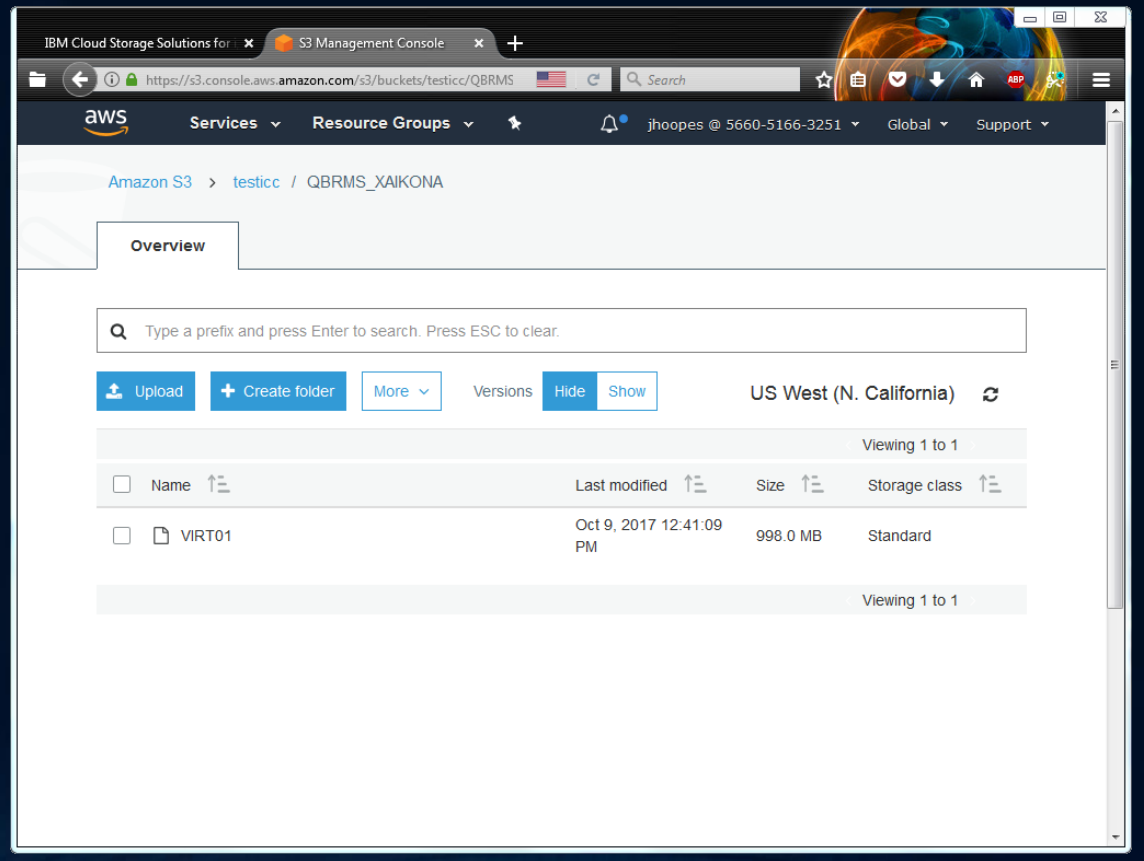
Cloud Storage Solutions for i
BRMS Integration

- Media movement to AWS location automatically kicks off transfer of virtual tape to AWS:



Cloud Storage Solutions for i BRMS Integration

- Virtual tape is now stored in S3 on AWS:



Cloud Storage Solutions for i BRMS Integration—What Won't it Do?

- It doesn't really do bare metal restore.
- Not practical for large systems and files. The transfer speed, of course, is dependent on your Internet connectivity speed.
- It could be used to reduce your RPO (Recovery Point Objective.)

Cloud Storage Solutions for i Summary

- Two pieces, one provides the ability to transfer IFS files to and from cloud providers or another IBM i system or partition. CPYTOCLD CPYFRMCLD
- The BRMS integration is another piece that can automatically transfer virtual tapes to a cloud provider or another IBM i.
- Licensed program is 5733ICC, Cloud Storage Solutions for i.
- Current version is 1.1, which runs on 7.1 or higher. Version 1.2 coming.
- Supports AWS, Softlayer, and another IBM i partition through FTP. More cloud providers probably in the works.

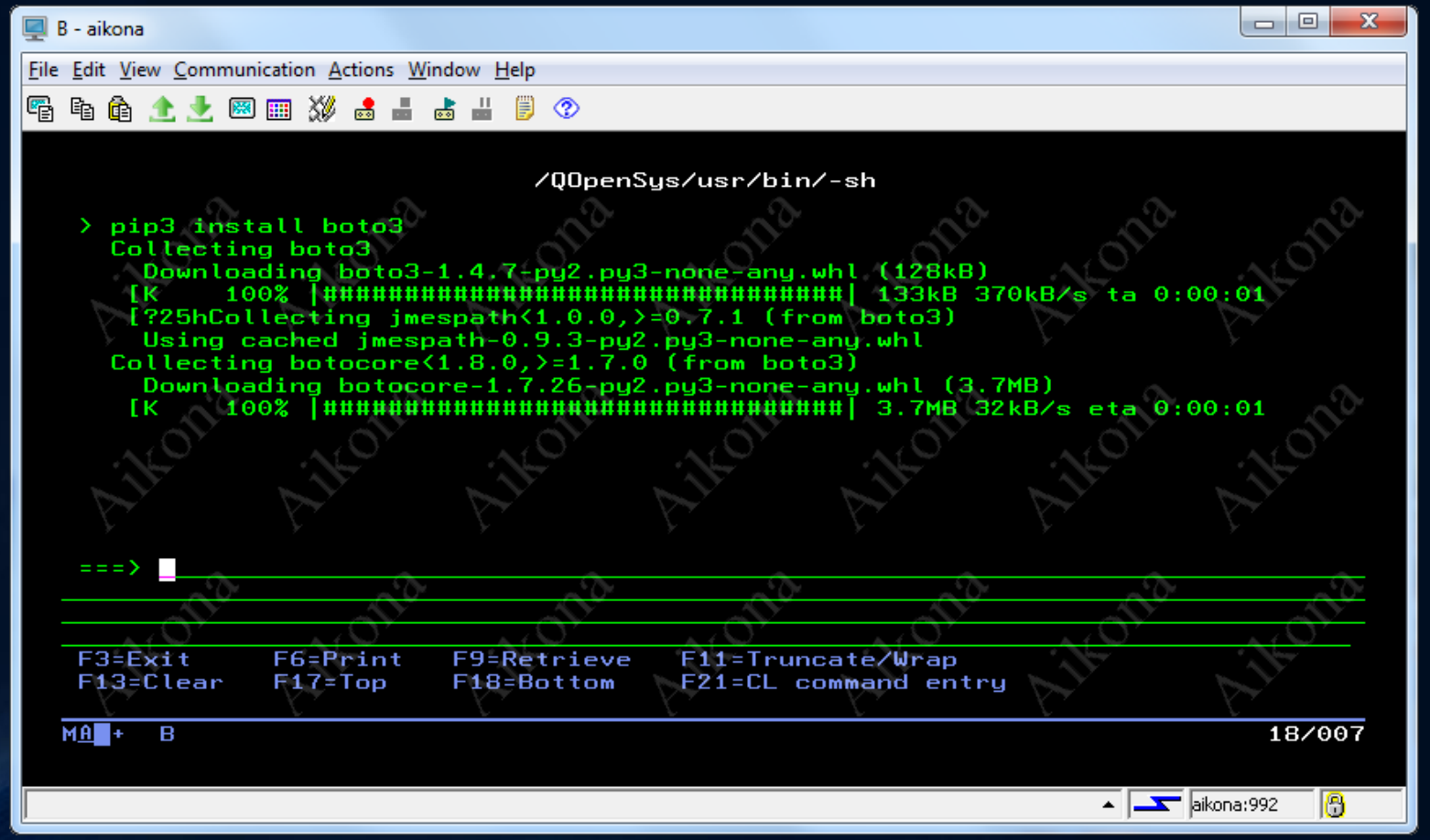
Cloud Storage Solutions for i Summary

- New version 1.2 coming out, probably at end of the month. The new version supports encryption and compression. That may help the transfer performance question. (Version 1.2 requires 7.2 of the OS.)
- Has a 70-day free trial. Cost is $2,400 per partition.

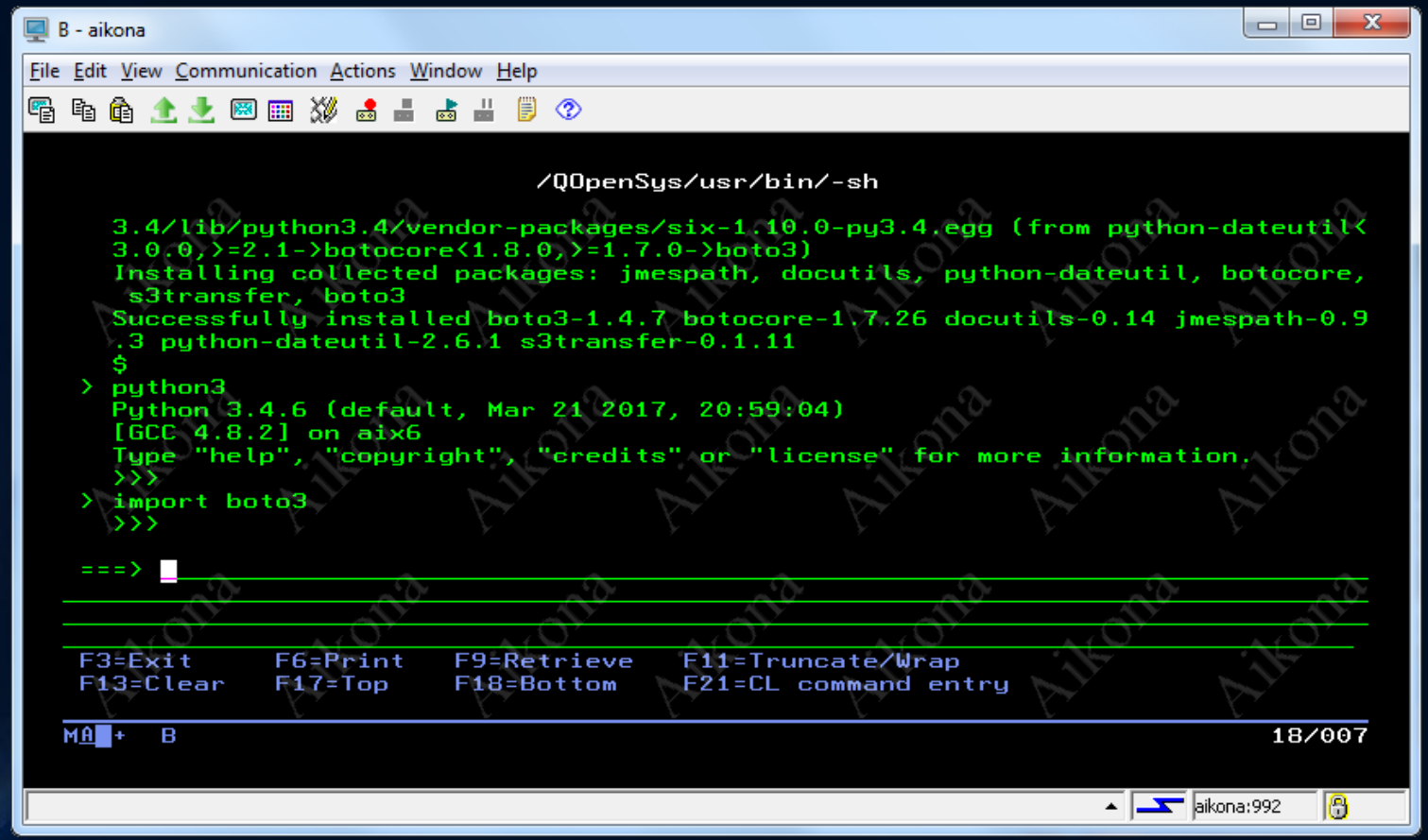
You Can Do Much of This Yourself

- AWS APIs are available to the IBM i through Python.
- Python is available free as part of 5733OPS.
  Python 3 is Option 2
  Python 2 is Option 4
- Once you have Python, you can install the AWS APIs.
- The AWS APIs are called Boto, so to install the AWS APIs for Python 3, you'd run the pip application and install boto3

Installing Boto3



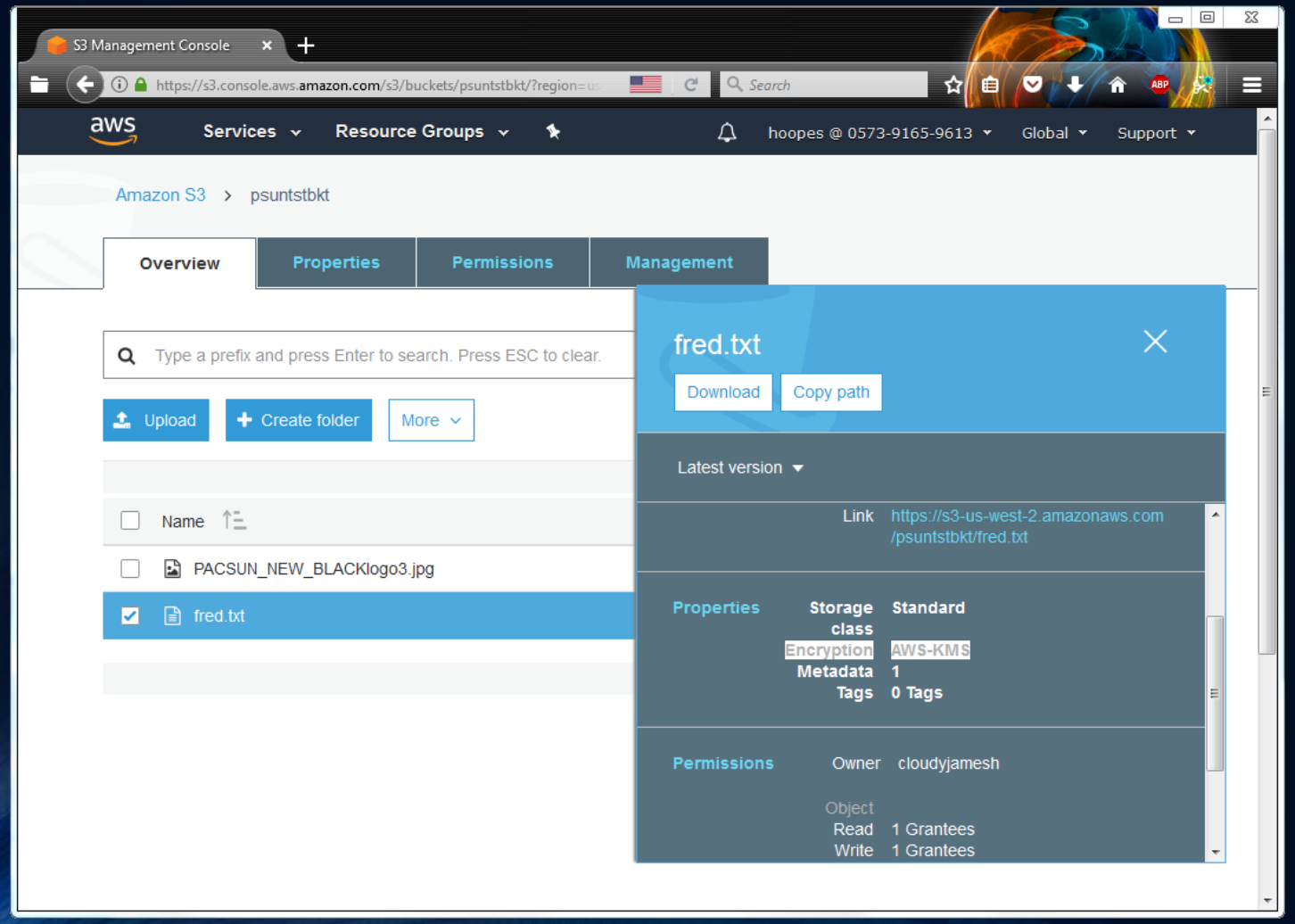
Installing Boto3



Use Python to Copy All Files in a Directory to AWS, Delete Them, Then Copy Them Back

Video

The Result of the Transfer



The Code to Upload Files to AWS S3

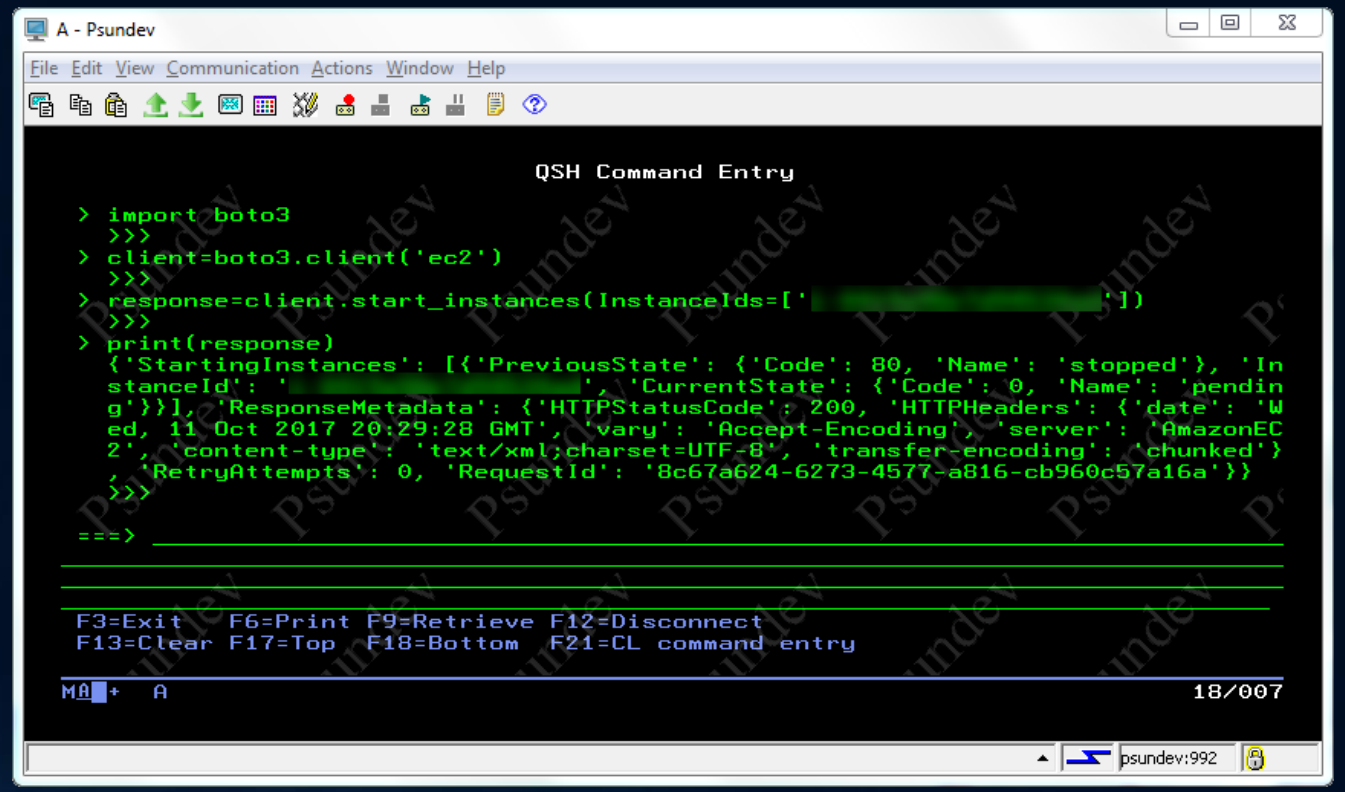
```
import os
import boto3
from botocore.client import Config

s3 = boto3.client('s3', config=Config(signature_version='s3v4'))

path='/home/jhoopes/toaws'
files=os.listdir(path)

if (len(files)>0):
    for file in files:
        pathandfile=path+'/'+file
        data=open(pathandfile, 'rb')
        s3.put_object(Body=open ( pathandfile , 'rb' ), Bucket='psuntstbkt', Key=file, ServerSideEncryption='aws:kms'
        os.remove(pathandfile)
        print('File: '+file+' sent to AWS.')
else:
    print('No files to send.')
```

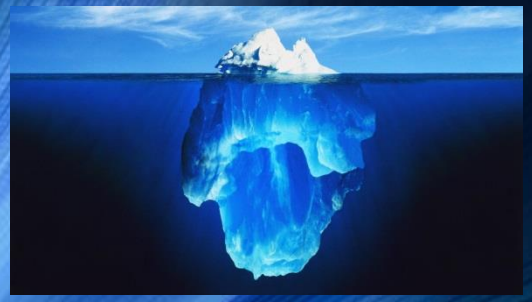
The Code to Download Files from AWS S3

```
import os
import boto3
from botocore.client import Config

s3 = boto3.client('s3', config=Config(signature_version='s3v4'))

path='/home/jhoopes/fromaws'

fileName=input('Enter a file to retrieve:')

if (len(fileName)>0):
    try:
        s3.head_object(Bucket='psuntstbkt', Key=fileName)
        response = s3.get_object(Bucket='psuntstbkt', Key=fileName, )
        fp = open(path + '/' + fileName, 'wb')
        fp.write(response['Body'].read())
        fp.close()
        print('File: ' + fileName + ' retrieved from AWS.')
    except:
        print('File: '+fileName+' not found on AWS.')
else:
    print('No file retrieved.')
```

You Can Do Much of This Yourself

The key point in the code that you've seen is that the S3 integration, or storing files in the cloud, is just the starting point. The API opens all of the AWS services to your IBM i. Here's starting an EC2 instance from Python.





More Information

- Cloud Storage Solutions for i: https://www.ibm.com/support/knowledgecenter/en/ssw_ibm_i_71/icc/topics/iccuoverview.htm
- AWS: https://aws.amazon.com/

- Softlayer: http://www.softlayer.com/

- Open Source Technologies for i: https://www.ibm.com/developerworks/community/wikis/home?lang=en#!/wiki/IBM%20i%20Technology%20Updates/page/Open%20Source%20Technologies

More Information

- Python
  https://www.python.org/

- AWS SDK for Python (Boto)
  https://aws.amazon.com/sdk-for-python/

Questions?