Deconstructing iCloud Drive

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What is iCloud?



From the perspective of users, iCloud is a simple feature that automatically makes their personal content available on all their devices. To allow your app participate in this "magic," you design and implement your app somewhat differently

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When Apple Calls It Magic…



"Great magic is the result of confidence, practice, good patter, and good style."

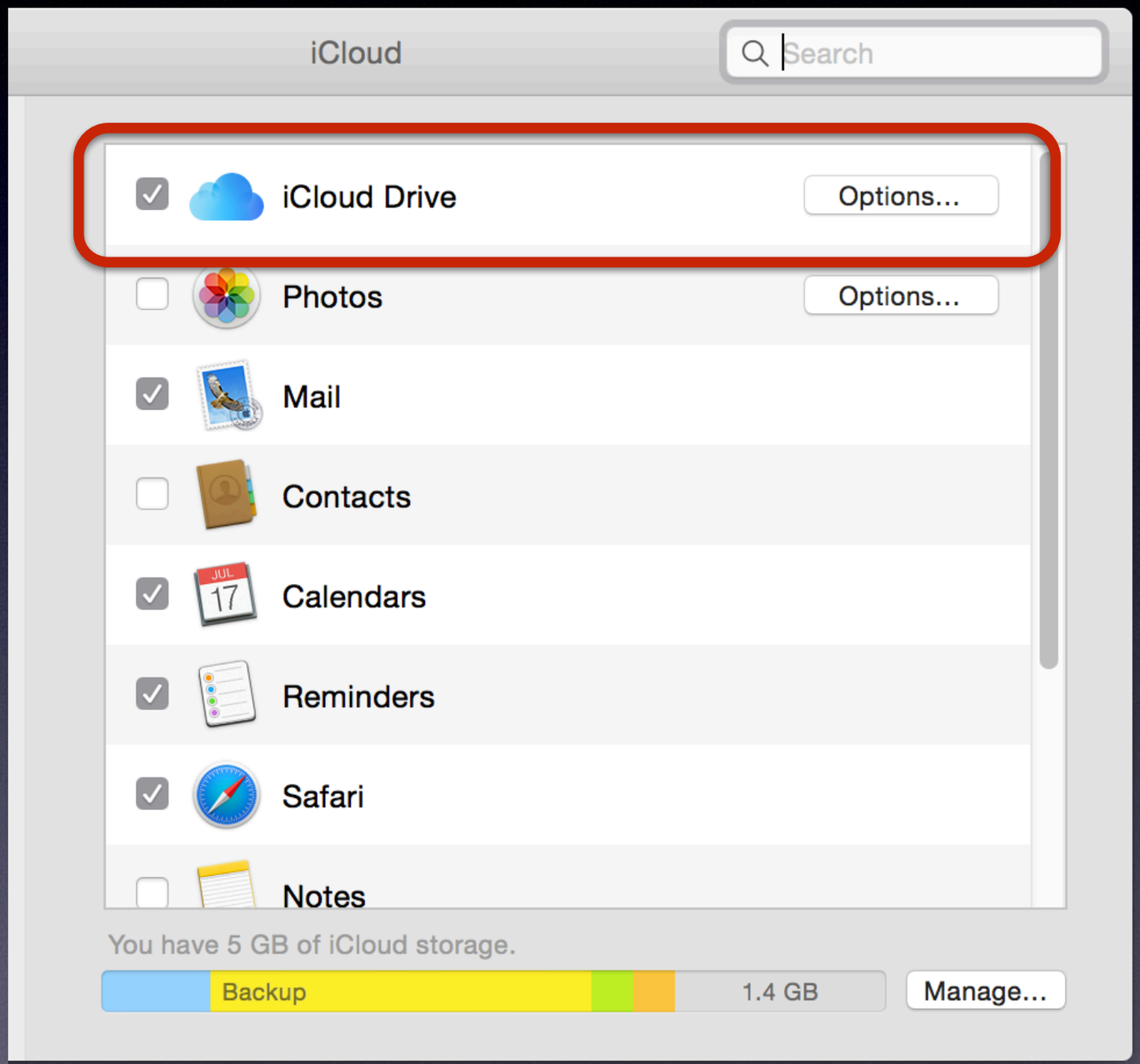
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iCloud Core Concepts

- *Lets users access their personal content on all their devices—wirelessly & automatically via Apple ID*
- *Eliminate explicit synchronization between devices*
- *Users never need to think about syncing*
- *Users can begin a workflow on one device and finish it on another*
- *Apps never interact directly with iCloud servers*



iCloud Drive



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Requirements

- iPhone, iPad, or iPod touch with iOS 8



- Mac with OS X Yosemite



- Safari 6 or later, Firefox 22 or later, or Google Chrome 28 or later







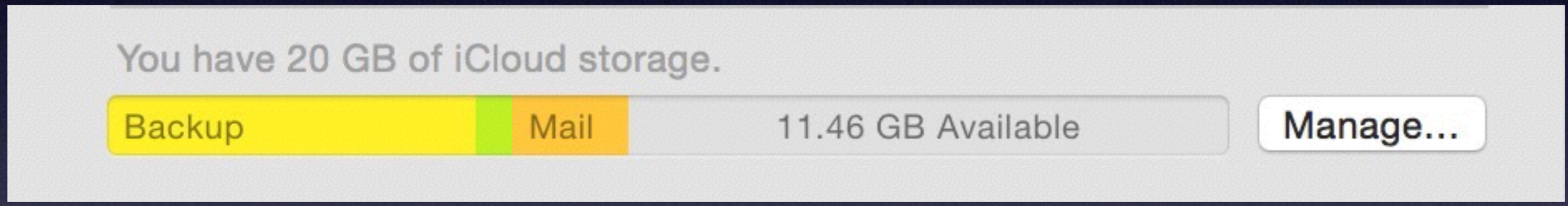
- An active Internet connection



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The Basics

File < 15GB





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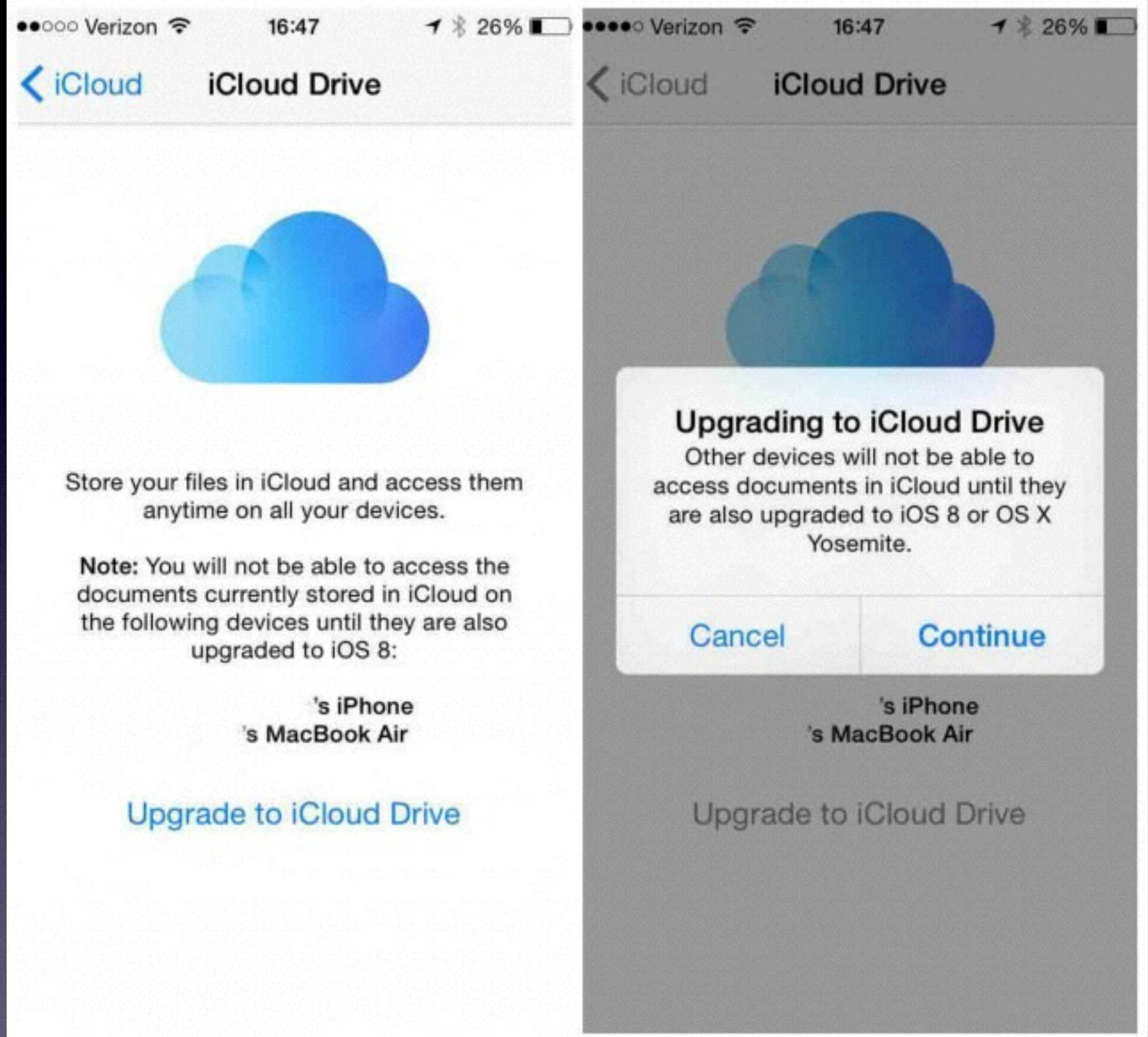
Configuration

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Setup Steps

- Meet requirements
- Upgrade to iCloud on iOS devices
- Configure iCloud system preference
- Sign into iCloud.com

https://support.apple.com/en-us/HT204025



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Let's Deconstruct iCloud

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In The Cloud

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Basic Concept

- No explicit synching
- No user interaction
- No interaction between apps and iCloud servers
- Apps autosave
- Apps manage conflicts on iOS
- System manages conflicts on OS X



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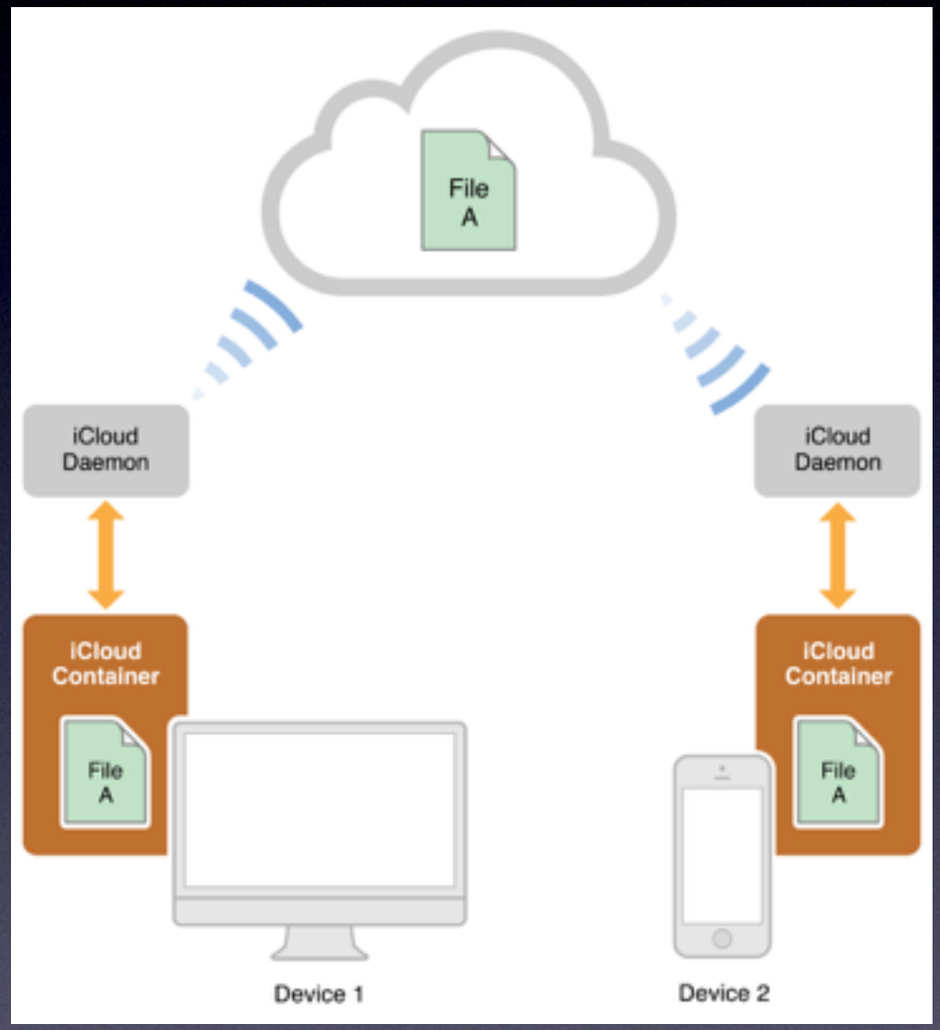
Ubiquity Containers

- *Changes automatically uploaded*
- *Peers download changes*
- *Core Data can handle either small or complex data sets*
- *Apps built with deduplication to manage multiple peers, data changes*

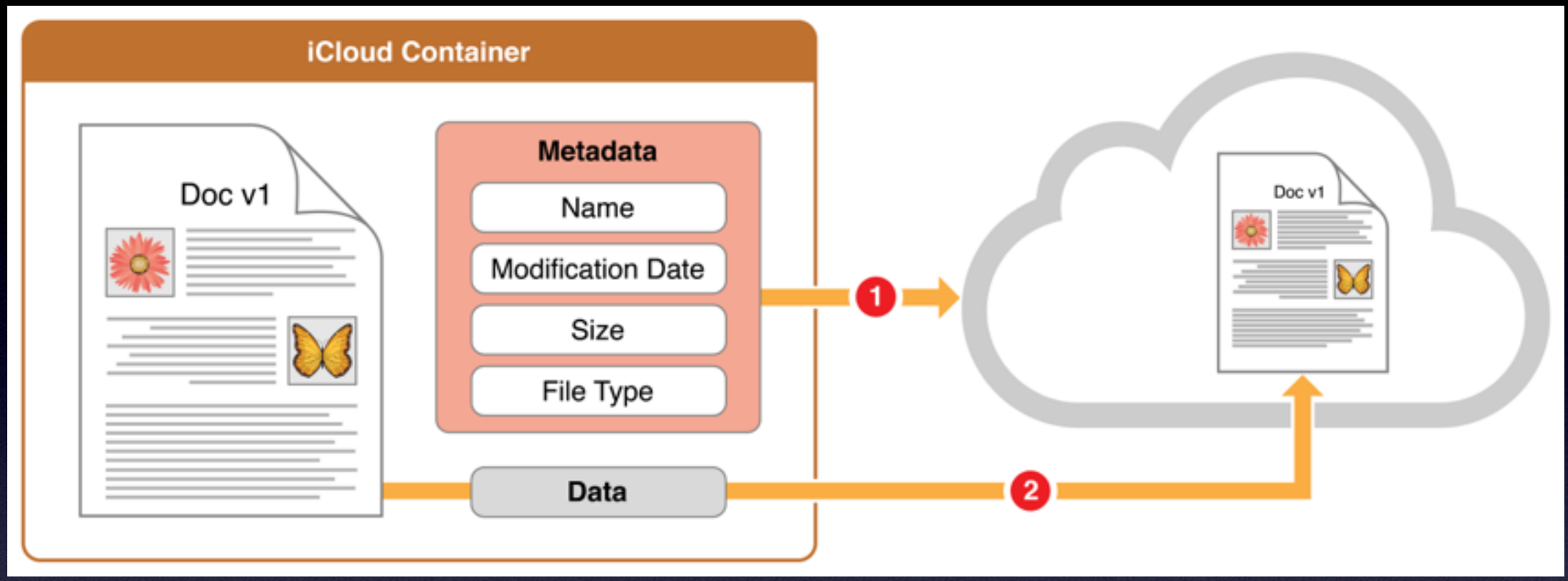
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Local Caching

- iCloud data lives on Apple's iCloud servers
- System maintains a local cache of data on each of the user's devices
- Airplane Mode: iCloud becomes inaccessible while current iCloud account remains signed in.
- User signs out of iCloud, such as by turning off Documents & Data in Settings.
- Apps designed to monitor this activity

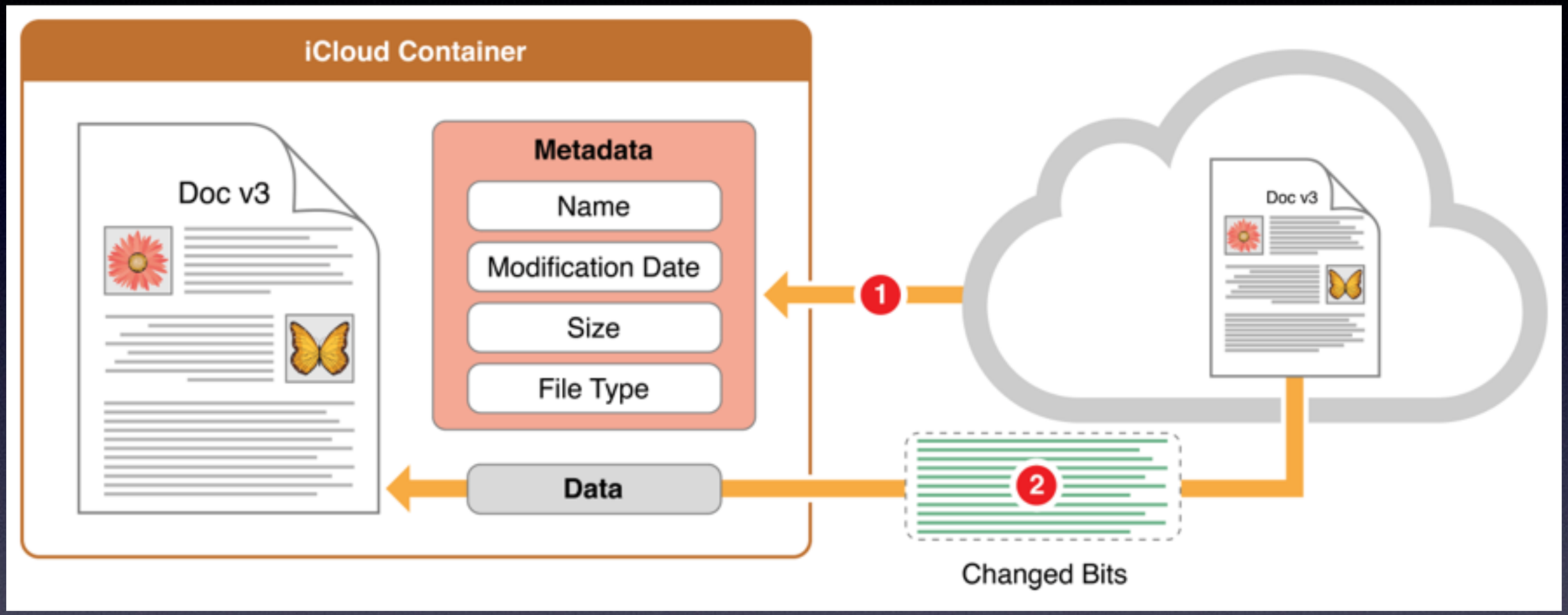


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First upload

Changes to files



- Only portions of files that change are downloaded
- iOS changes are pulled when the app is active
- OS X changes are pulled immediately

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On My Mac

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Mobile Documents — bash — 103×46

```
cd Last login: Wed Sep  2 00:30:02 on console
Mikes-MacBook-Pro:~ miked$ cd ~/library/Mobile\ Documents
Mikes-MacBook-Pro:Mobile Documents miked$ ls -la
total 16
drwxr-xr-x@ 38 miked  staff  1292 Sep  2 00:30 .
drwx------@ 48 miked  staff  1632 Sep  2 00:48 ..
-rw-r--r--@  1 miked  staff  6148 Sep  2 00:04 .DS_Store
drwxr-xr-x   3 miked  staff   102 Sep  1 21:23 2BUA8C4S2C~com~agilebits~onepassword
drwxr-xr-x   3 miked  staff   102 Sep  1 21:23 3BSFV8TV66~com~fourthpart~punchlist
drwxr-xr-x   3 miked  staff   102 Sep  1 21:23 3L68KQB4HG~com~readdle~Scanner
drwxr-xr-x   3 miked  staff   102 Sep  1 21:23 4R6749AYRE~com~pixelmatorteam~pixelmator
drwxr-xr-x   3 miked  staff   102 Sep  1 21:23 5HA97Z5P9Q~com~silverware~bizxpensetracker
drwxr-xr-x   3 miked  staff   102 Sep  1 21:23 67MBQ68QX2~com~penpower~worldcardhd
drwxr-xr-x   4 miked  staff   136 Sep  1 21:23 7PKJ6G4DXL~com~smileonmymac~PDFpen
drwxr-xr-x   3 miked  staff   102 Sep  2 00:30 7PKJ6G4DXL~com~smileonmymac~PDFpen~CloudAccess
drwxr-xr-x   3 miked  staff   102 Sep  1 21:23 7PKJ6G4DXL~com~smileonmymac~PDFpen~iOS~OCR
drwxr-xr-x   3 miked  staff   102 Sep  1 21:23 84XB754BWU~net~allaboutapps~AppBox
drwxr-xr-x   3 miked  staff   102 Sep  2 00:30 BBV3YFBS9Q~com~craigotis~iprocrastinate~mac
drwxr-xr-x   4 miked  staff   136 Sep  1 21:23 C7HPP7U8L7~com~taptaptap~CameraPlus
drwxr-xr-x   3 miked  staff   102 Sep  1 21:23 DPA6233TPQ~com~macphun~snapheal
drwxr-xr-x   3 miked  staff   102 Sep  1 21:23 F3LWYJ7GM7~com~apple~mobilegarageband
drwxr-xr-x   3 miked  staff   102 Sep  1 21:23 GG7XEEU22E~com~dataviz~DocsToGoEAS
drwxr-xr-x   3 miked  staff   102 Sep  1 21:23 JFJWWP64QD~com~goodiware~GoodReader
drwxr-xr-x   3 miked  staff   102 Sep  1 21:23 KL2F7S68N3~com~espn~ScoreCenter
drwxr-xr-x   4 miked  staff   136 Sep  1 21:23 PB4R74AA4J~com~junecloud~Deliveries
drwxr-xr-x   3 miked  staff   102 Sep  1 21:23 SXHX3674N7~com~reference~dictionary~dictionary
drwxr-xr-x   3 miked  staff   102 Sep  1 21:23 X85BAK35Y4~com~synology~DSfile
drwxr-xr-x   3 miked  staff   102 Sep  2 00:30 ZP9ZJ4EF3S~com~gingerlabs~Notability
drwxr-xr-x   3 miked  staff   102 Sep  1 21:21 com~apple~Automator
drwxr-xr-x   3 miked  staff   102 Sep  1 23:41 com~apple~CloudDocs
drwxr-xr-x  10 miked  staff   340 Sep  2 00:04 com~apple~Keynote
drwxr-xr-x  10 miked  staff   340 Sep  2 00:06 com~apple~Numbers
drwxr-xr-x  10 miked  staff   340 Sep  1 23:00 com~apple~Pages
drwxr-xr-x   3 miked  staff   102 Sep  1 21:21 com~apple~Preview
drwxr-xr-x   3 miked  staff   102 Sep  1 21:21 com~apple~QuickTimePlayerX
drwxr-xr-x   3 miked  staff   102 Sep  1 21:21 com~apple~ScriptEditor2
drwxr-xr-x   3 miked  staff   102 Sep  1 21:21 com~apple~TextEdit
drwxr-xr-x   4 miked  staff   136 Sep  1 21:24 com~apple~TextInput
drwxr-xr-x   4 miked  staff   136 Sep  1 21:24 com~apple~mail
drwxr-xr-x   4 miked  staff   136 Sep  1 21:23 com~apple~shoebox
drwxr-xr-x   4 miked  staff   136 Sep  1 21:23 com~apple~system~spotlight
drwxr-xr-x   3 miked  staff   102 Sep  1 21:23 iCloud~com~StrongLifts
Mikes-MacBook-Pro:Mobile Documents miked$
```

~/Library/ Mobile Documents

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continued



Processes

- *bird*
- *brctl*
- *ocspd*
- *ubd*
- *ubcontrol*
- *cloudd*

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Jul 31 11:04:58 Tenaya.local bird[296] <Notice>: sending 1 items to the cloud for com.apple.Keynote
Jul 31 11:05:01 Tenaya.local bird[296] <Notice>: received 3 edited items and 0 deleted items from the cloud for com.apple.Keynote
Jul 31 11:05:01 Tenaya.local bird[296] <Warning>: Bounced itemID 44E633DB-C56D-4D83-9E9E-93CF4D175CA3 from "150812-MTPro-NewYork-01-DeconstructingiCloud-Shelley-Watson.jpg" to "150812-MTPro-NewYork-01-DeconstructingiCloud-Shelley-Watson 2.jpg" because it clashes with CACD4CB3-2EA9-43E6-8149-3F1713A4507A
Jul 31 11:05:01 Tenaya.local bird[296] <Notice>: sending 1 items to the cloud for com.apple.Keynote
Jul 31 11:05:02 Tenaya.local bird[296] <Notice>: received 0 edited items and 1 deleted items from the cloud for com.apple.Keynote
Jul 31 11:05:13 Tenaya.local bird[296] <Notice>: scheduled 1 items for upload in com.apple.Keynote
Jul 31 11:05:20 Tenaya.local bird[296] <Notice>: sending 1 items to the cloud for com.apple.Keynote
Jul 31 11:05:22 Tenaya.local bird[296] <Notice>: received 1 edited items and 0 deleted items from the cloud for com.apple.Keynote
Jul 31 11:05:35 Tenaya.local bird[296] <Notice>: scheduled 1 items for upload in com.apple.Keynote
Jul 31 11:05:38 Tenaya.local bird[296] <Notice>: sending 1 items to the cloud for com.apple.Keynote
Jul 31 11:05:41 Tenaya.local bird[296] <Notice>: scheduled 1 items for upload in com.apple.Keynote
Jul 31 11:05:41 Tenaya.local bird[296] <Notice>: received 3 edited items and 0 deleted items from the cloud for com.apple.Keynote
Jul 31 11:05:41 Tenaya.local bird[296] <Warning>: Bounced itemID CACD4CB3-2EA9-43E6-8149-3F1713A4507A from "150812-MTPro-NewYork-01-DeconstructingiCloud-Shelley-Watson.jpg" to "150812-MTPro-NewYork-01-DeconstructingiCloud-Shelley-Watson 2.jpg" because it clashes with D3A071FD-8BA7-43AC-90CC-B0BC0FA49321
Jul 31 11:05:41 Tenaya.local bird[296] <Notice>: sending 1 items to the cloud for com.apple.Keynote
Jul 31 11:05:43 Tenaya.local bird[296] <Notice>: received 0 edited items and 1 deleted items from the cloud for com.apple.Keynote
Jul 31 11:05:48 Tenaya.local bird[296] <Notice>: sending 1 items to the cloud for com.apple.Keynote
Jul 31 11:05:50 Tenaya.local bird[296] <Notice>: received 1 edited items and 0 deleted items from the cloud for com.apple.Keynote
Jul 31 11:20:28 Tenaya.local bird[296] <Notice>: scheduled 1 items for upload in com.apple.Keynote
Jul 31 11:20:32 Tenaya.local bird[296] <Notice>: sending 1 items to the cloud for com.apple.Keynote



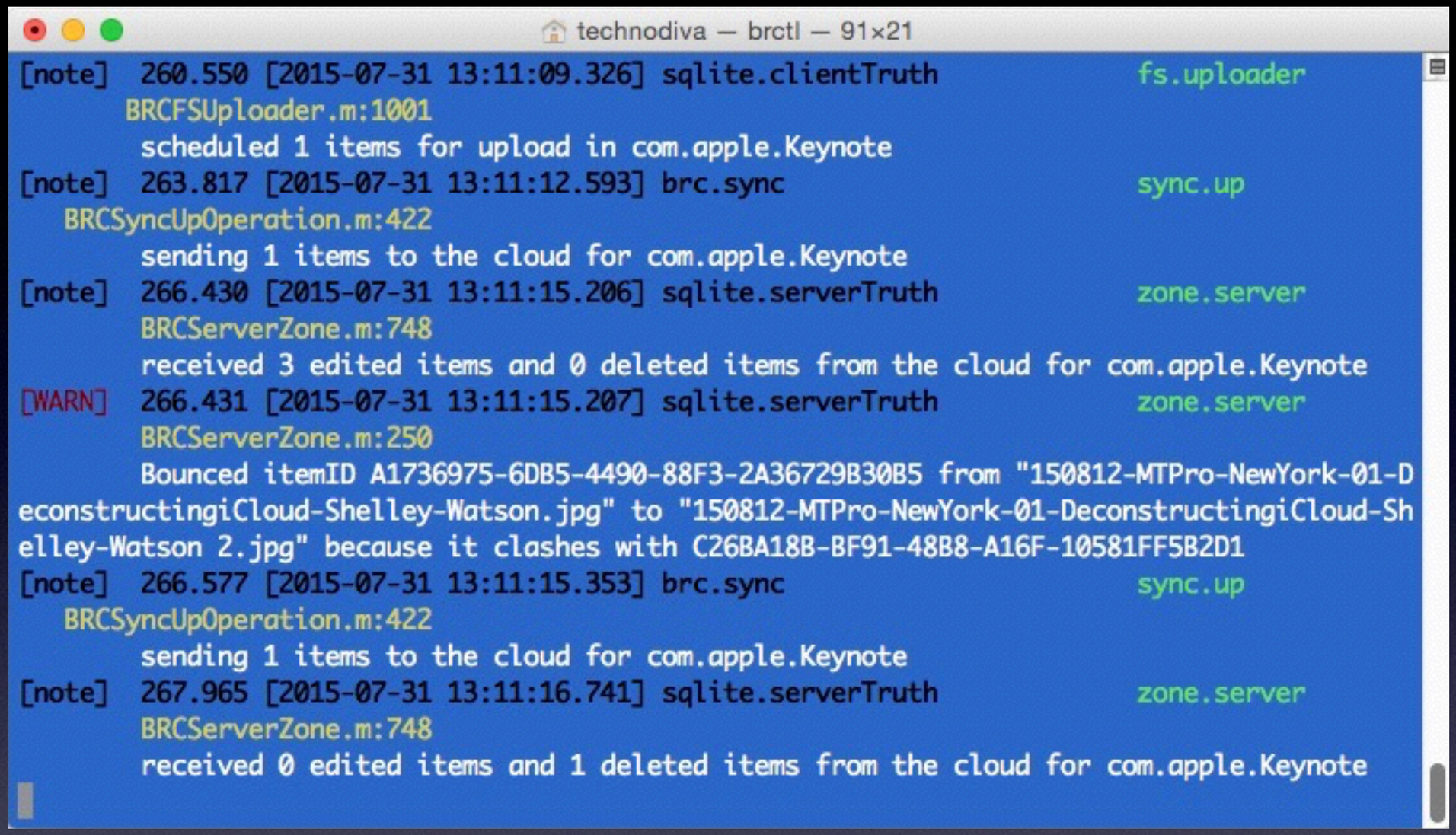
Monitor Connections

- nettop
- Little Snitch

```
[note]  10741.262 [2015-07-31 10:13:26.370] sqlite.clientTruth                fs.uploader                BRCF
        scheduled 1 items for upload in com.apple.Keynote

[note]  11087.903 [2015-07-31 10:19:13.010] cloudkit.operation.callback       sync-up.container-metadata BF
ration.m:73
        saved 1 containers metadata in the cloud
[note]  11088.274 [2015-07-31 10:19:13.382] cloudkit.operation.callback       sync-down.container-metadata
nOperation.m:191
        fetched 0 containers metadata from the cloud
```

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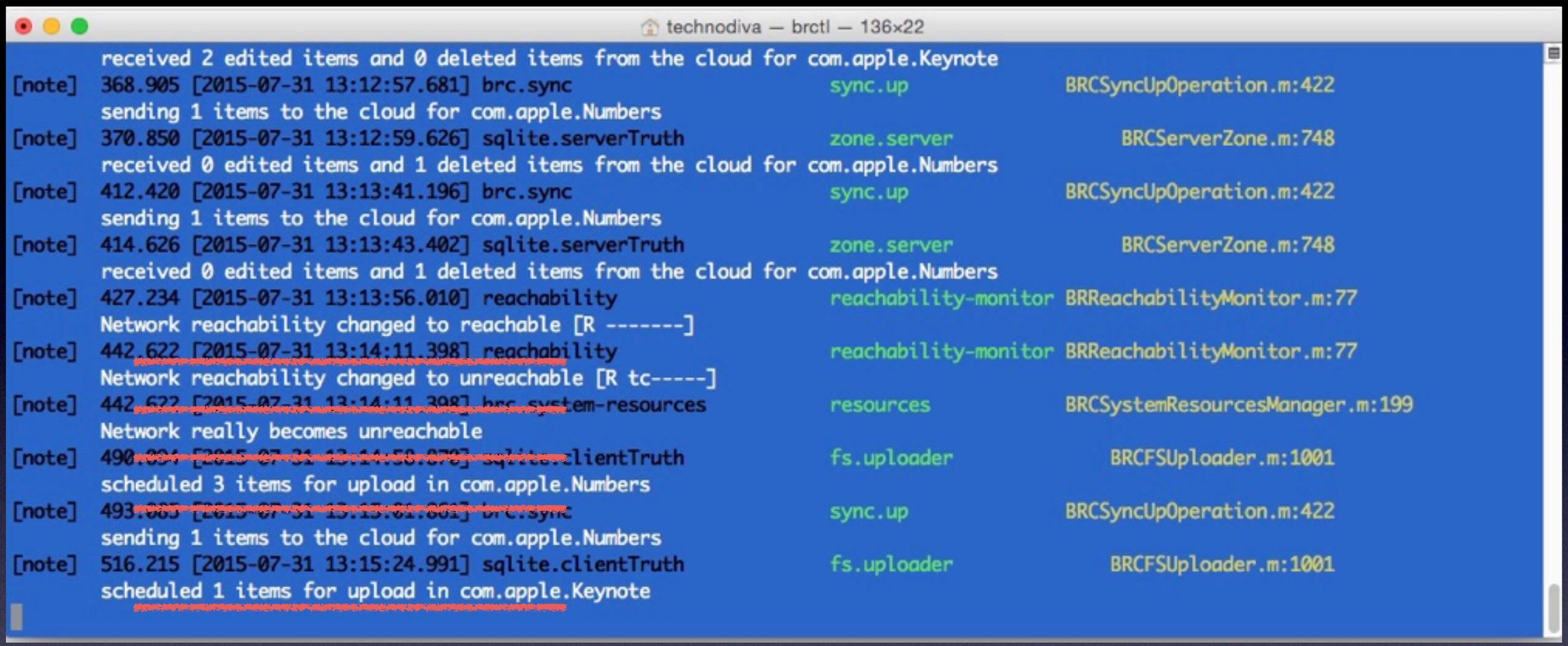
Monitor Network State

brctl log -w

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demo

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But, the Internet!

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```
        Network really becomes reachable
[note]  1063.863 [2015-07-31 13:24:32.640] reachability                reachability-monitor BRReachabilityMonitor.m:77
        Network reachability changed to reachable [R -------]
[note]  1083.048 [2015-07-31 13:24:51.824] brc.sync                    sync.up              BRCSyncUpOperation.m:422
        sending 2 items to the cloud for com.apple.Numbers
[note]  1083.051 [2015-07-31 13:24:51.827] sqlite.clientTruth          fs.uploader            BRCFSUploader.m:1001
        scheduled 2 items for upload in com.apple.Numbers
[note]  1083.144 [2015-07-31 13:24:51.920] sqlite.clientTruth          fs.uploader            BRCFSUploader.m:1001
        scheduled 1 items for upload in com.apple.Keynote
[note]  1083.148 [2015-07-31 13:24:51.924] brc.sync                    sync.up              BRCSyncUpOperation.m:422
        sending 1 items to the cloud for com.apple.Keynote
[note]  1085.892 [2015-07-31 13:24:54.668] sqlite.clientTruth          fs.uploader            BRCFSUploader.m:1001
        scheduled 1 items for upload in com.apple.Keynote
[note]  1089.037 [2015-07-31 13:24:57.814] sqlite.serverTruth          zone.server             BRCServerZone.m:748
        received 2 edited items and 0 deleted items from the cloud for com.apple.Keynote
[note]  1089.056 [2015-07-31 13:24:57.832] brc.sync                    sync.up              BRCSyncUpOperation.m:422
        sending 1 items to the cloud for com.apple.Keynote
[note]  1089.398 [2015-07-31 13:24:58.174] sqlite.serverTruth          zone.server             BRCServerZone.m:748
        received 4 edited items and 0 deleted items from the cloud for com.apple.Numbers
[note]  1089.425 [2015-07-31 13:24:58.202] brc.sync                    sync.up              BRCSyncUpOperation.m:422
        sending 1 items to the cloud for com.apple.Numbers
[note]  1090.382 [2015-07-31 13:24:59.158] sqlite.serverTruth          zone.server             BRCServerZone.m:748
        received 0 edited items and 1 deleted items from the cloud for com.apple.Keynote
[note]  1091.663 [2015-07-31 13:25:00.439] sqlite.serverTruth          zone.server             BRCServerZone.m:748
        received 2 edited items and 0 deleted items from the cloud for com.apple.Numbers
```

Praise be, it's back!

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technodiva — nettop — 133×28

	interface	state	bytes in	bytes out	rx dupe
racoon.78449			1612 B	1312 B	0 B
udp6 fe80::6e40:8ff:feb6:fc9c%en0.4500<->*.*	en0		0 B	0 B	
udp6 fe80::6e40:8ff:feb6:fc9c%en0.500<->*.*	en0		0 B	0 B	
udp4 192.168.200.38:4500<->*:*	en0		1264 B	584 B	
udp4 192.168.200.38:500<->*:*	en0		348 B	728 B	
udp6 fe80::f4c2:5fff:fe84:18b%awdl0.4500<->*.*	awdl0		0 B	0 B	
udp6 fe80::f4c2:5fff:fe84:18b%awdl0.500<->*.*	awdl0		0 B	0 B	
Messages.78456			0 B	0 B	0 B
tcp4 *:*<->*:*		Closed			
udp4 10.253.254.207:16402<->*:*	ppp0		0 B	0 B	
udp4 192.168.200.38:16402<->*:*	en0		0 B	0 B	
cloudd.78769			7058 B	4936 B	1228 B
tcp4 10.253.254.207:61866<->17.248.128.183:443	ppp0	LastAck	6036 B	2017 B	1228 B
Keynote.78778			0 B	0 B	0 B
tcp6 *.61725<->*.*		Listen			
tcp4 *:61725<->*:*		Listen			
syncdefaultsd.78835			12 KiB	1997 B	9255 B
tcp4 10.253.254.207:62148<->17.172.208.30:443	ppp0	Established	12 KiB	1997 B	9255 B
Safari.78905			111 KiB	15 KiB	0 B
tcp4 127.0.0.1:62014<->localhost:49170	lo0	Established	3433 B	1591 B	0 B
tcp4 127.0.0.1:62015<->localhost:49170	lo0	Established	57 KiB	1727 B	0 B
tcp4 127.0.0.1:62016<->localhost:49170	lo0	Established	4499 B	1389 B	0 B
com.apple.WebKi.78907			540 KiB	27 KiB	0 B
tcp4 127.0.0.1:62073<->localhost:49170	lo0	Established	276 KiB	12 KiB	0 B
tcp4 127.0.0.1:62117<->localhost:49170	lo0	Established	8379 B	1102 B	0 B
tcp4 127.0.0.1:62118<->localhost:49170	lo0	Established	75 KiB	1715 B	0 B
tcp4 127.0.0.1:62121<->localhost:49170	lo0	Established	4727 B	2077 B	0 B

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SYNC IS NOT BACKUP

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Interesting Results

- *Numbers file in Numbers folder with Numbers*
- *Excel file in Numbers folder with Excel*
- *Excel opens in root of iCloud & custom folder*
- *Numbers only sees in Numbers folder*

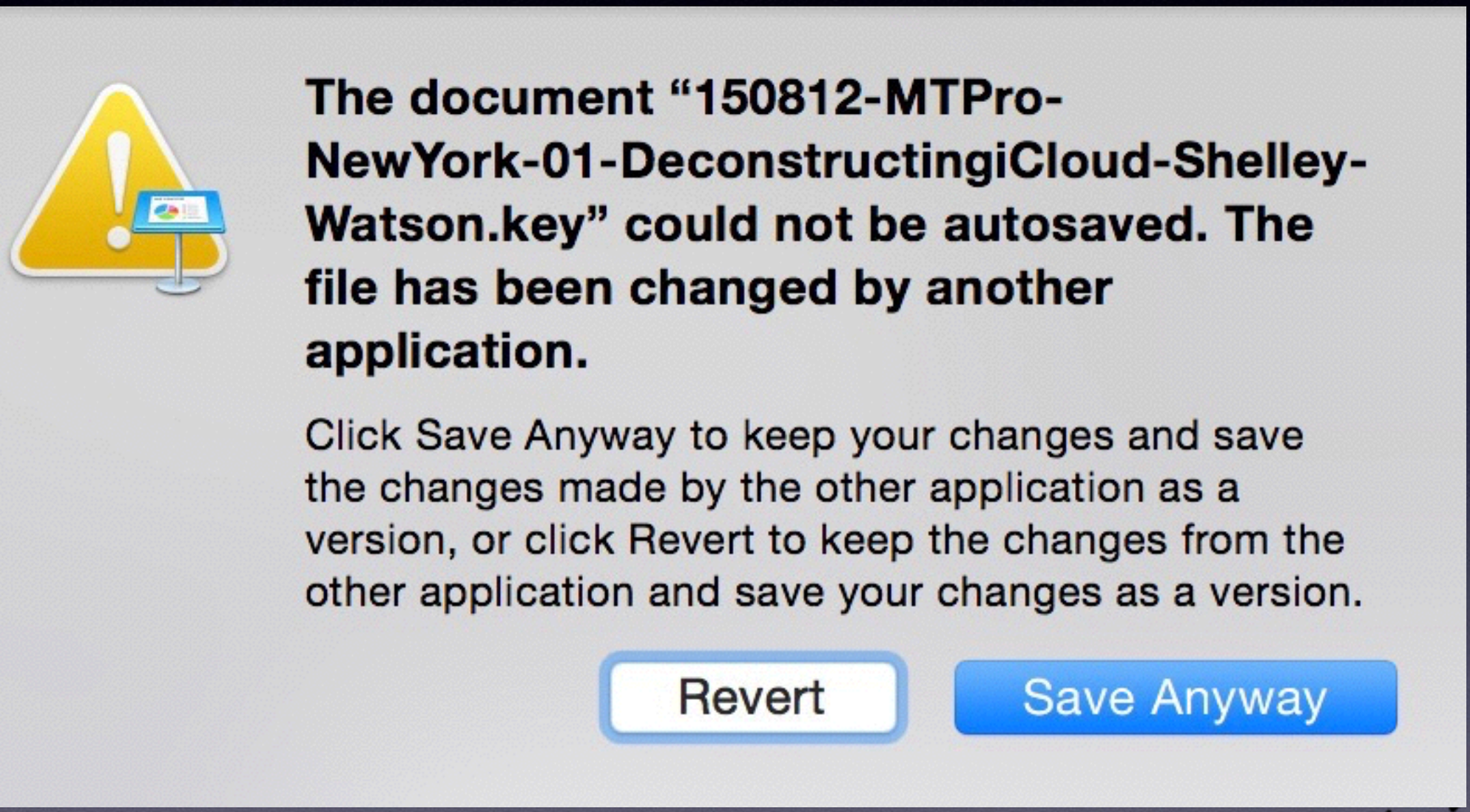
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Cloud Opener



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Conflicts



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Well-behaved apps



Provide user warnings:

- Data deletion
- Storage quota
- All devices affected

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Potential Issues

- *Explicit save vs. autosave*
- *Document conflict*
- *Over-used storage*
- *State retention vs. content changes*
- *Case sensitive file names*



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Customer issues

What device are you asking about?

Have you restarted the device?

Is your device connected to power?

Have you uninstalled and reinstalled the app?

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and more…

How's your internet connection?

Do you have multiple iCloud accounts?

Is iCloud enabled for the app/account?

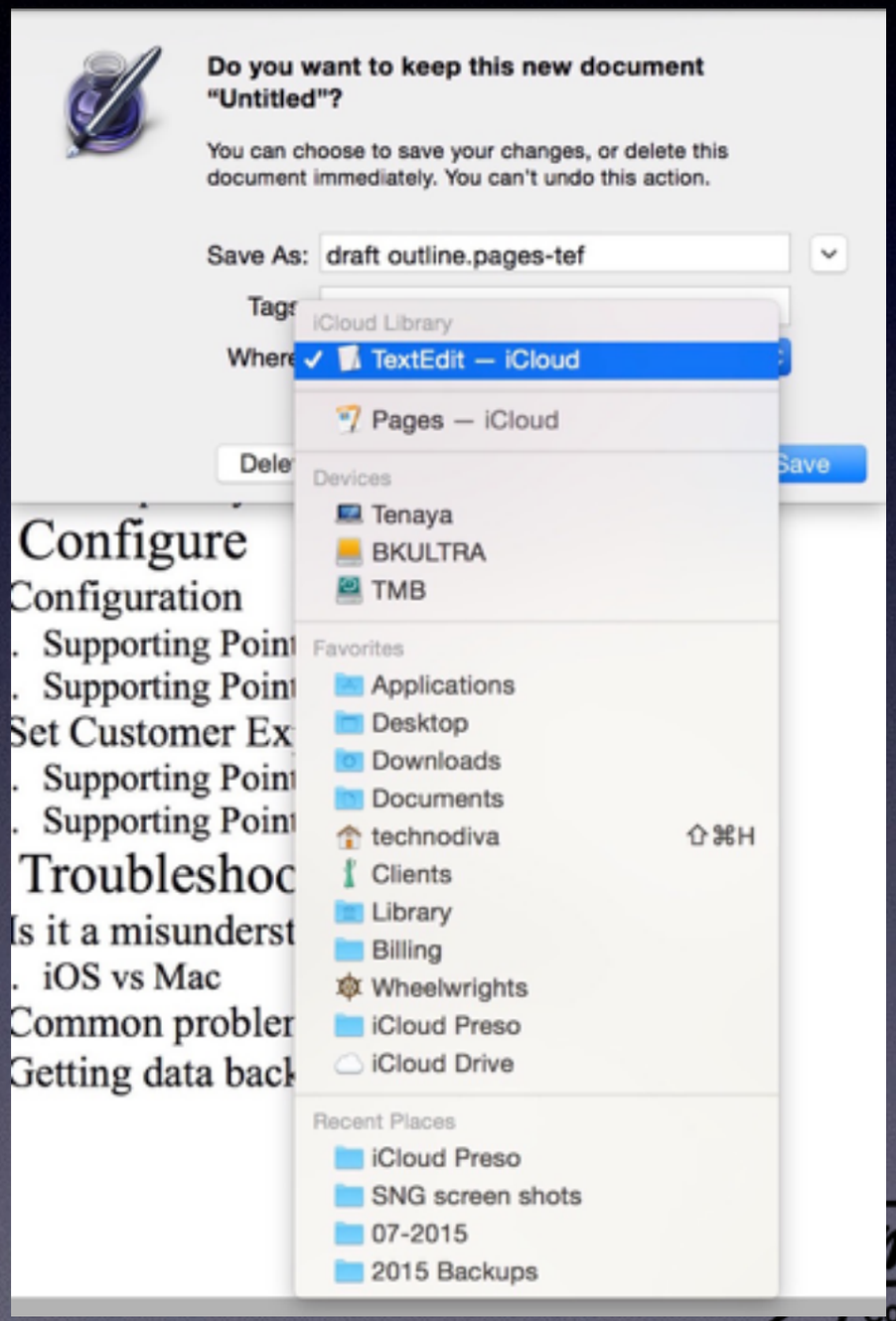
Do you allow cellular access to the app?

Is your date & time correct?

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Save & Open

- Where did you save it?
- Does the application support iCloud Drive?
- Can you save it in a different format?





What did I tell you?

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Backup









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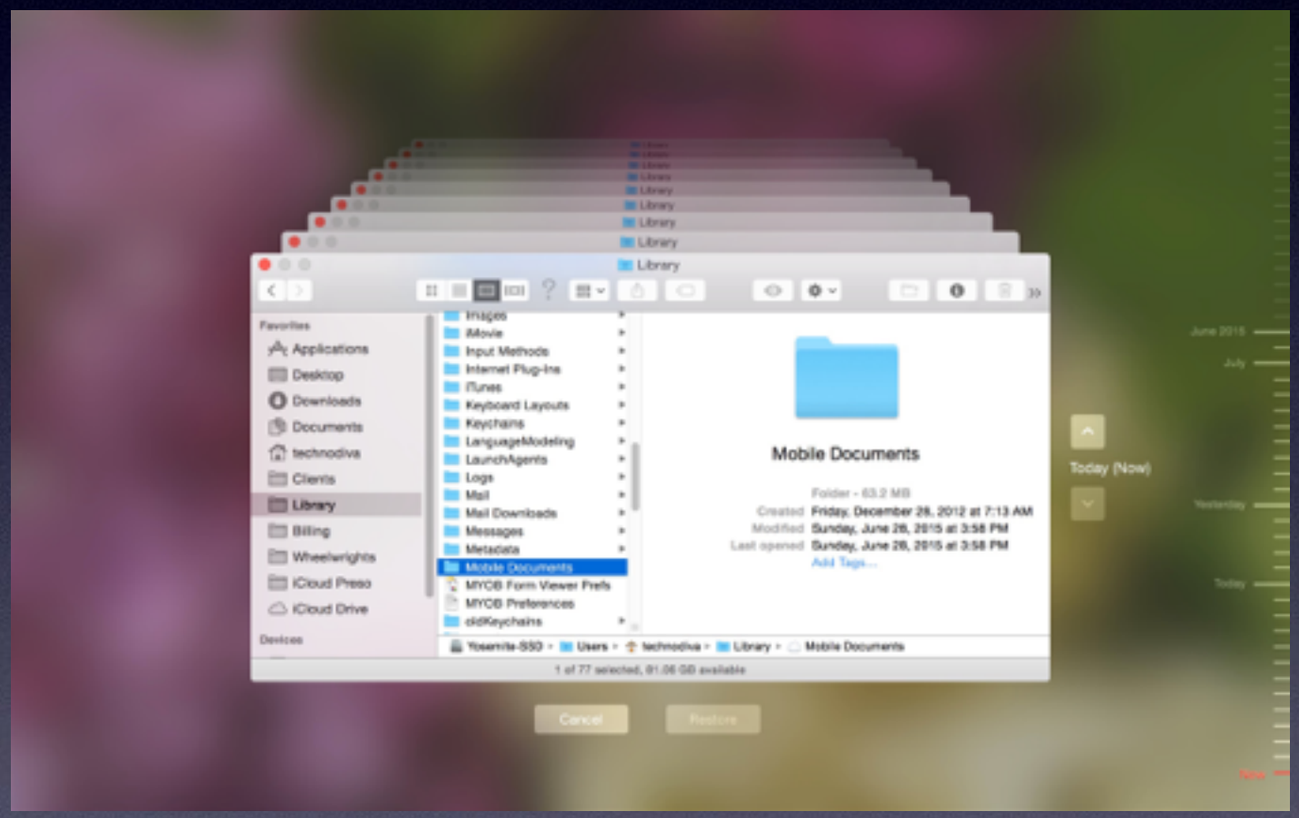
Time Machine

- Mobile Documents gets backed up but you can't inspect contents.

- Can't navigate to ~/Library unless you have it in your Sidebar, or other shortcut.

- Can navigate to iCloud Drive IF it's in the Sidebar

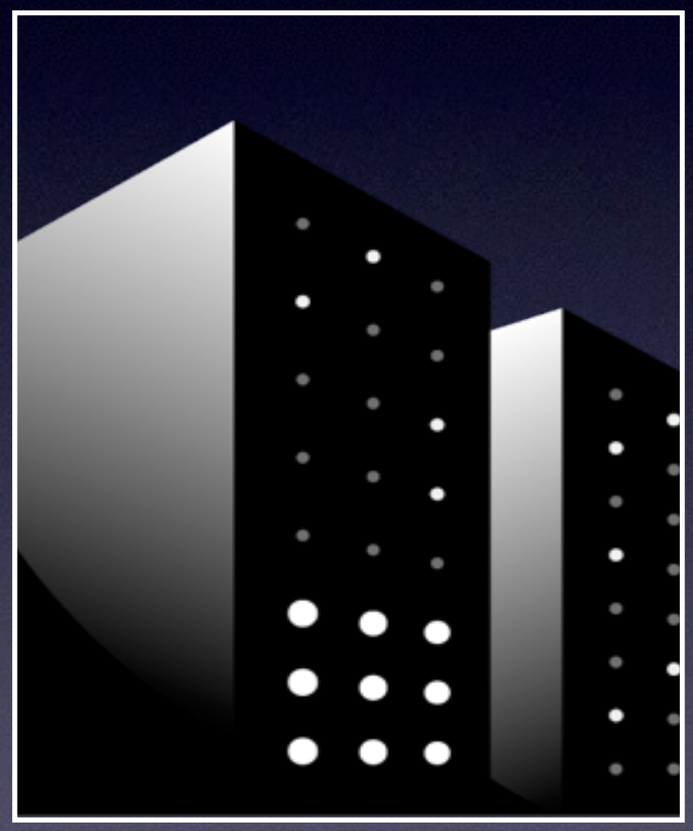
- No restore location options: replace, keep both, keep original.



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CrashPlan

- Allows restore from folders nested inside Mobile Documents
- No need for visible shortcuts
- Restored folder provides a local copy of the file
- Select your own location



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Unclouder

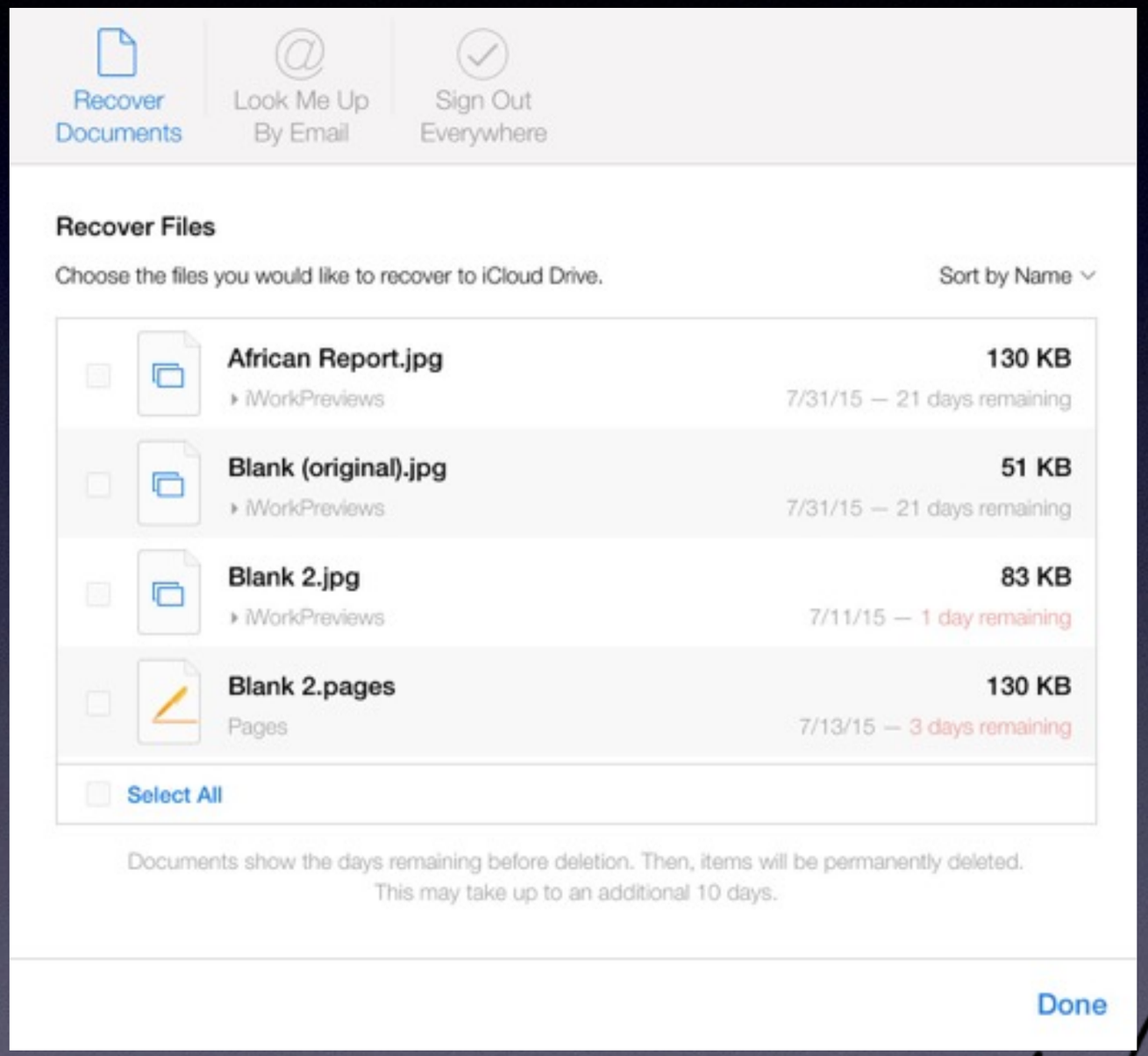
- iCloud Drive local backup
- Examine backups
- Restore selected files
- Restore deleted files



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iCloud Drive

- Download files, if they exist
- Restore deleted files within 30 days
- iCloud→Settings→Data & Security→Recover Documents



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Ecosystems



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Privacy & Security

- 128 bit encryption on the server and in transit
- iCloud Keychain uses 256 bit encryption
- iCloud.com sessions encrypted with SSL
- iCloud services use secure tokens
- Strong passwords
- Two-step verification
- Find my whatsit
- Location sharing
- iCloud Keychain
- Photos

Resources

- iCloud developer docs: https://developer.apple.com/library/ios/documentation/General/Conceptual/iCloudDesignGuide/Chapters/iCloudFundametals.html#//apple_ref/doc/uid/TP40012094-CH6-SW1
- iCloud requirements (by service): https://support.apple.com/en-us/HT204230
- Set up iCloud Drive on all your devices: https://support.apple.com/en-us/HT204025
- Ports in use by Apple https://support.apple.com/en-us/HT202944

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Resources

- *https://developer.apple.com/library/ios/documentation/General/Conceptual/iCloudDesignGuide/Chapters/Introduction.html#//apple_ref/doc/uid/TP40012094-CH1-SW1*
- *https://support.apple.com/en-ca/HT202303*
- *https://support.apple.com/en-us/*

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Resources

"Great magic is the result of confidence, practice, good patter, and good style." from falseshuffle.com (How To Be A Magician, by John Kurlak)

Manual Pages:
https://developer.apple.com/library/mac/documentation/Darwin/Reference/ManPages/

Cloud Opener:
http://www.jacks-apps.com

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Resources

Unclouder:
http://mac.eltima.com/backup-icloud.html

Privacy
https://www.washingtonpost.com/news/the-switch/wp/2014/10/30/how-one-mans-private-files-ended-up-on-apples-icloud-without-his-consent/

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