# iOS
# Introduction

# iOS

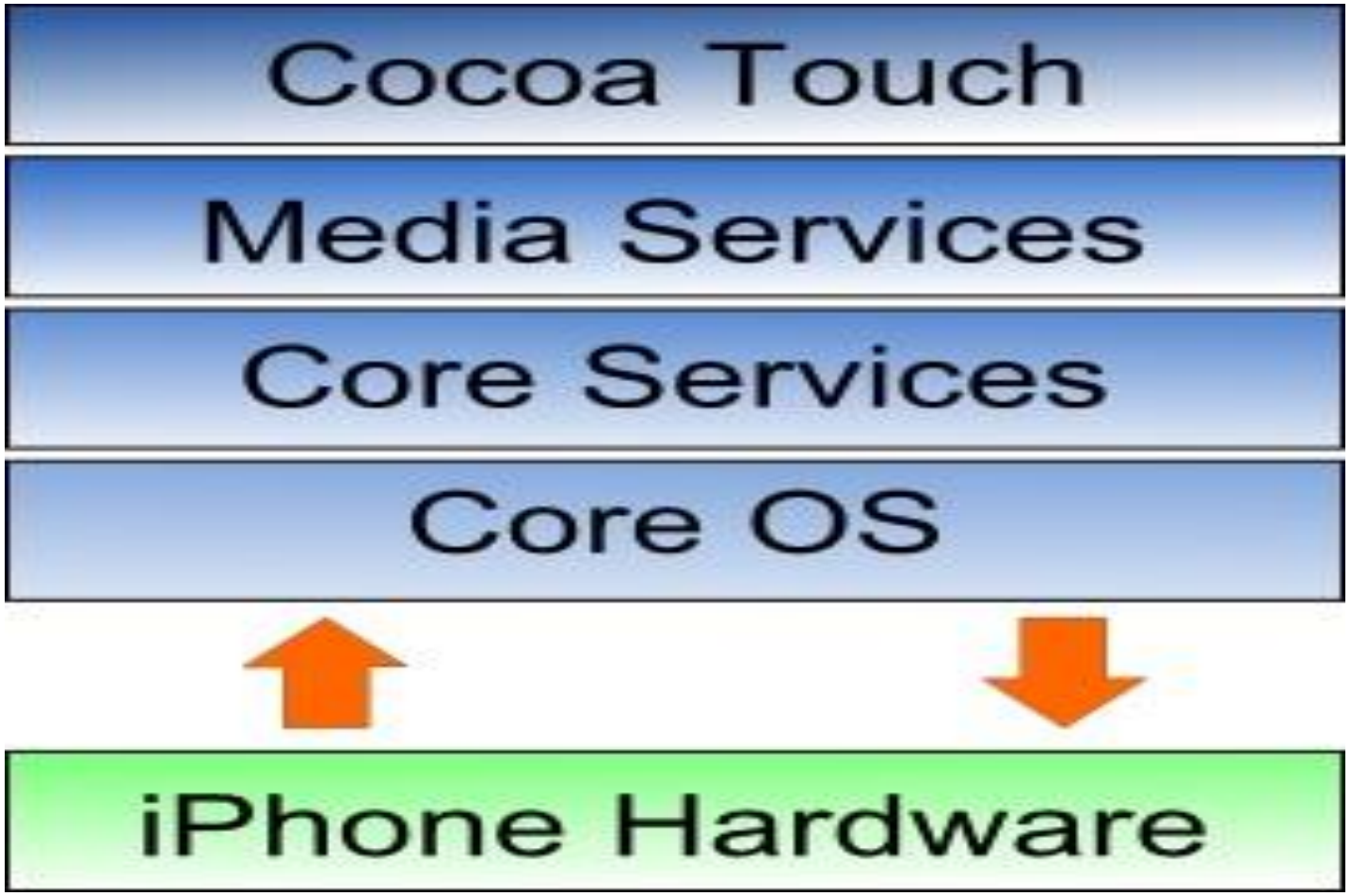
- iOS is a mobile operating system
- It runs on iPhone, iPad and iPod touch and Apple TV devices.
- iOS is developed and maintained by Apple Inc.
- It is based on Unix-like kernel.
- It can run only on apple devices (hardware).
- It is formally known as iPhone OS.

# History

- iPhone OS was first unveiled in Jan 2007 at the Macworld Conference and Expo
- Released June 2007
- In June 2010 licensed the trademark iOS (From Cisco IOS)
- Now goes all the way up to iOS 5 (released last month)
- Originally did not allow third party applications but after Feb 2008 this changed
  - With either 30% profit to apple, or free with membership fee

# iOS highlights

# Layered Architecture of iOS



# iOS Layers

**Kernel and Device Drivers:**

- This is the lowest layer of iOS which mainly includes the kernel and device drivers.
- The kernel environment is built on top of Mach 3.0 (a microkernel which replaces the kernel in the BSD version of Unix)
- It provides high-performance networking facilities and support for multiple, integrated file systems.

**Core OS Layer**

- The Core OS layer consist of technologies and frameworks which provide low-level services related to low-level hardware and networks.
- These services are based on facilities in the Kernel and Device Drivers layer.

**Core Services Layer**

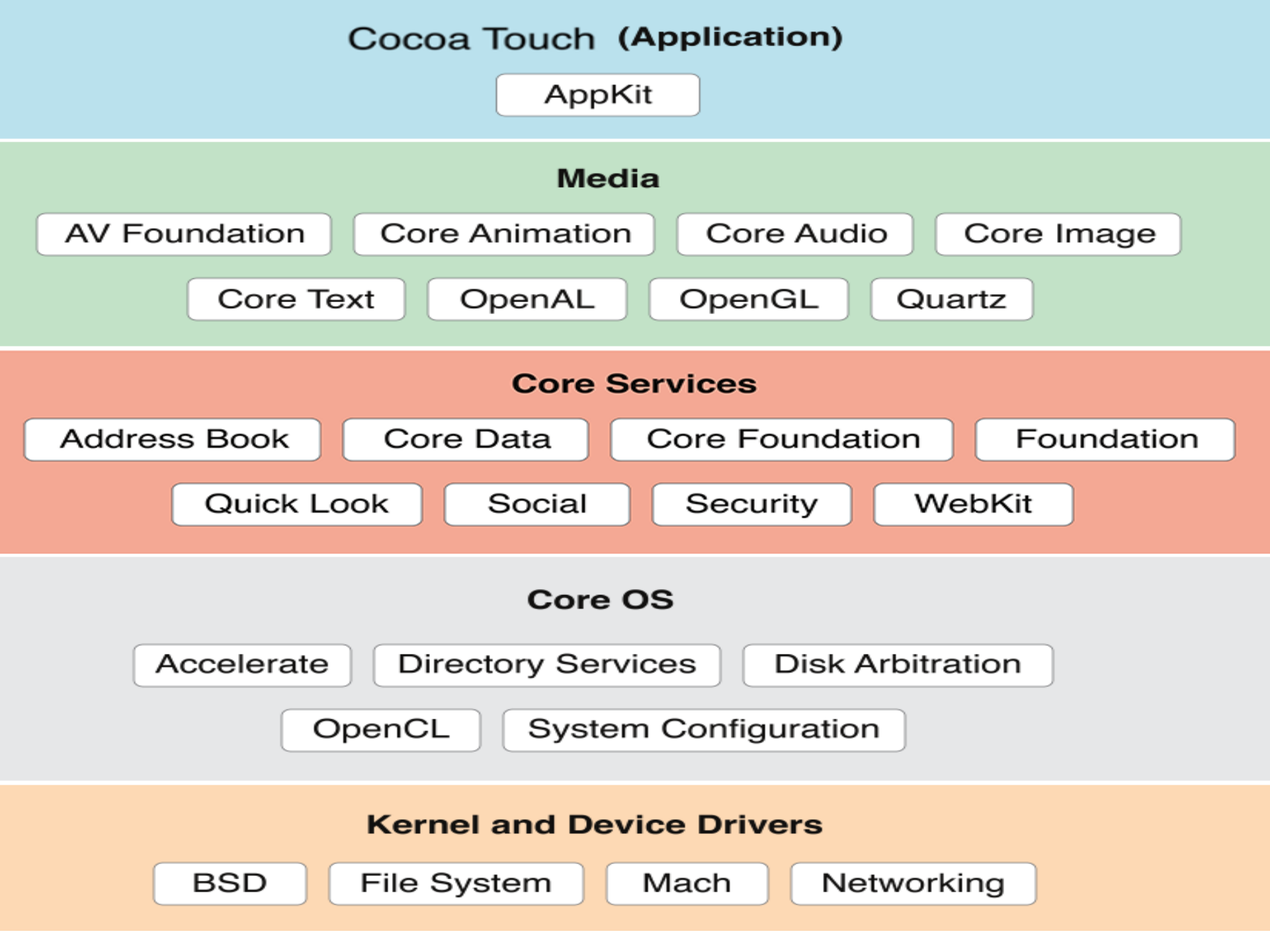
- The Core Services layer consist of core services like Address book, Security, Social and foundation which provide essential features to apps. It gives access to fundamental resources needed for app.

**Media Layer**

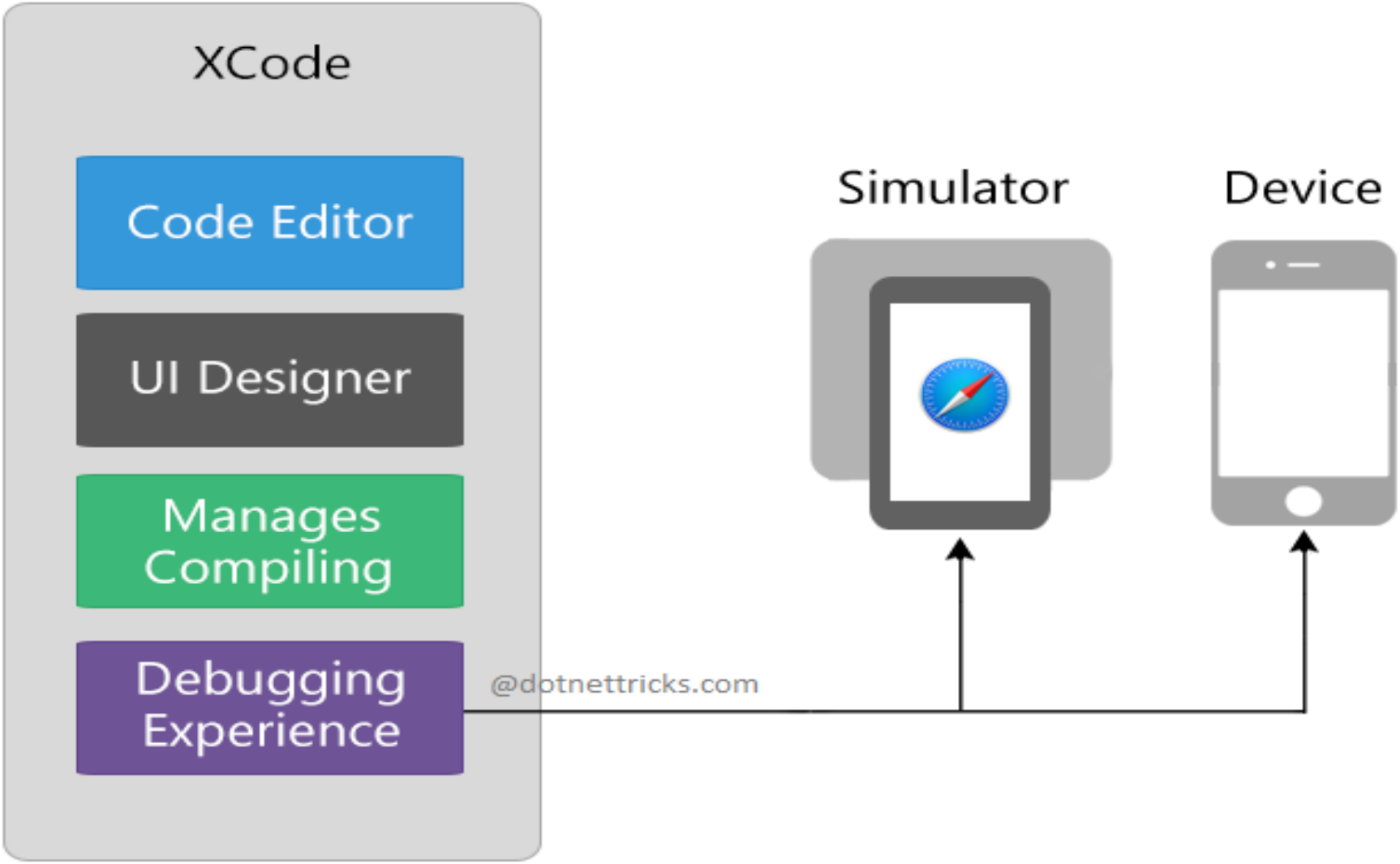
- The Media layer help you to incorporate 2D and 3D graphics, animations, image effects, and professional-grade audio and video functionalities into your mobile app.

**Cocoa Touch Layer**

- The Cocoa Touch layer is primarily responsible for the appearance of apps. It provides access to main system functions like Contacts, Camera, touch input, shares with other apps, push notifications etc


Cocoa Touch (Application)
AppKit
Media
AV Foundation
Core Animation
Core Audio
Core Image
Core Text
OpenAL
OpenGL
Quartz
Core Services
Address Book
Core Data
Core Foundation
Foundation
Quick Look
Social
Security
WebKit
Core OS
Accelerate
Directory Services
Disk Arbitration
OpenCL
System Configuration
Kernel and Device Drivers
BSD
File System
Mach
Networking

# iOS Application Development



# iOS: Advantages and disadvantages

+ Highest revenue for mobile OS
+ Little fragmentation (just iPhone and iPad)
+ Runs on high-end devices
+ Big developer community and excellent support
+ Many open-source libraries available
- Strictly controlled by Apple
- Development only possible in Mac OS
- Objective C is the main programming language

# Technology

Application development in **Objective C** – a language that adds Smalltalk-style messaging to C


Development done in **Xcode** on **Mac OS** devices
Debugging and running on phone done also in **Xcode**

# Development

# Programming Language

- Android OS: Java
- iOS: Objective C

# Objective C

Objective-C is an object oriented language

Flexible because almost everything is done at runtime:

- Dynamic Binding
- Dynamic Typing
- Dynamic Linking

It is used for both iOS and Mac OS development

Source files: **.m**, header files: **.h**

# Memory allocation

Objects are created dynamically using **alloc** keyword

Objects are automatically deallocated in latest Objective-C through **automatic reference counting (ARC)**

**ARC** keeps an internal count of how many times an Object is 'needed'

System makes sure that objects that are needed are **not deleted**, and when an object is not needed it is **deleted**

# Development Platform

- Android OS:
  - open platform, allowing the use of 3rd party tools
  - Key to OS success
  - can reach core components. More like PC swr
- iOS:
  - Restrictive guidelines
  - Fixed set of tools, nothing outside, nothing deep

# Multitasking Abilities

- Android OS:
  - Very versatile → dynamic
  - Highly fragmented → challenging
    - In USA: **80** Android models *vs*. **9** iOS models
  - Poor battery performance
  - Best notification system (e.g. emails)
- iOS:
  - Stable and exclusive platform
  - Fixed set of tools, with clear potential and boundaries → easier

# Security

- Android OS:
  - Access control, isolation, web security
  - Encryption
  - Permission-based access control:
    - Static list in manifest
    - User presented with list at installation time
  - Wild West app marketplace.
    - Nearly any app is allowed to market
    - Android-specific malware

# Security

- iOS:
  - Access control, isolation, web security
  - Encryption
  - Permission-based access control:
    - Dialog box at run time.
  - Geolocation
  - Auto Erase

# Security

Table 1

## Resisting attack types

| Resistance to: | Apple iOS | Google Android |
|---|---|---|
| Web-based attacks |  |  |
| Malware attacks |  |  |
| Social Engineering attacks |  |  |
| Resource Abuse/ Service attacks |  |  |
| Data Loss (Malicious and Unintentional) |  |  |
| Data Integrity attacks |  |  |

Table 2

## Security feature implementation

| Security Pillar | Apple iOS | Google Android |
|---|---|---|
| Access Control |  |  |
| Application Provenance |  |  |
| Encryption |  |  |
| Isolation |  |  |
| Permission-based Access Control |  |  |

**Semantic**

# OS Upgrades

- Android OS:
  - Millions of phones under contract cannot be updated
  - 0.4% run the latest version
- iOS:
  - Apple disallows old devices to update →permanently vulnerable to easy attacks
  - ~90% run one of the two latest versions

# Publishing

# App Approval

- Android OS:
  - Very quick!
- iOS:
  - Days.. and days.. and days..
  - Many restrictions

# Payments and Availability

- Android OS:
  - Developer pays $25 one time
  - Developer earns 70% of revenue
  - Several Stores: Google Play, Amazon…
  - Paid apps available in 132 countries
  - No screenshots of apps, only short descriptions

# Payments and Availability

- iOS:
  - Developer pays $99 annually
  - Developers earns 70% of revenue
  - App Store only
  - Paid apps available in 155 countries
  - 5 screenshots and description

# Which is Better?

| | |
|---|---|
| OS Mkt Share |  |
| # of Apps |  |
| Revenue |  |
| Developer Interest |  |
| Easiness of PL |  |
| Platform |  |
| Multitasking |  |
| Security |  |
| OS Upgrades |  |
| App Approval |  |
| Payments & Avail. |  |

# Sources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