Syncables: A Framework to Support Seamless Data Migration Across Multiple Platforms

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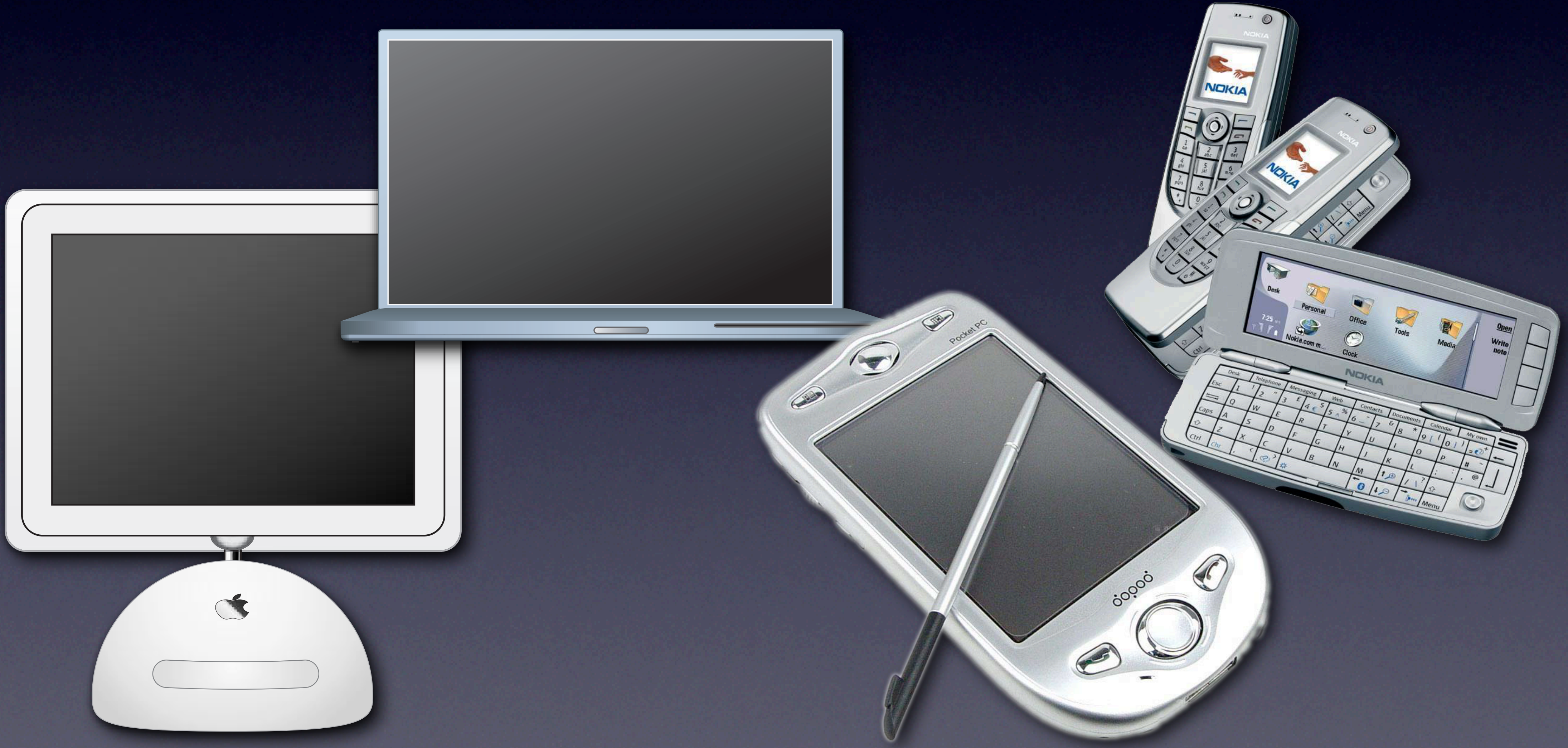
Outline

- Problems with Portable Information Devices
  - Information fragmentation
  - Inadequate support for task migration
- Description of our Syncables framework
- How the framework enables solving some of these problems

Problems with Multiple Portable Information Devices

Information is Fragmented

Across Devices



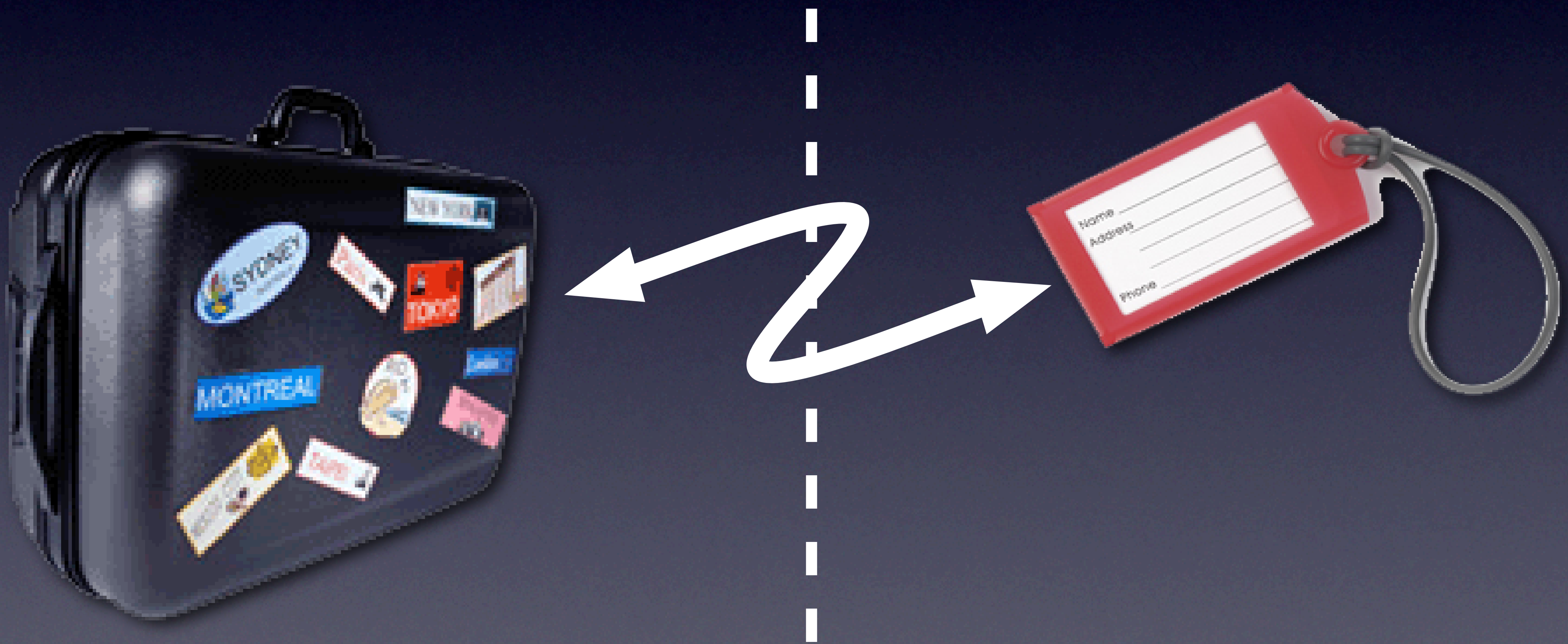
Information is Fragmented

Across Document types

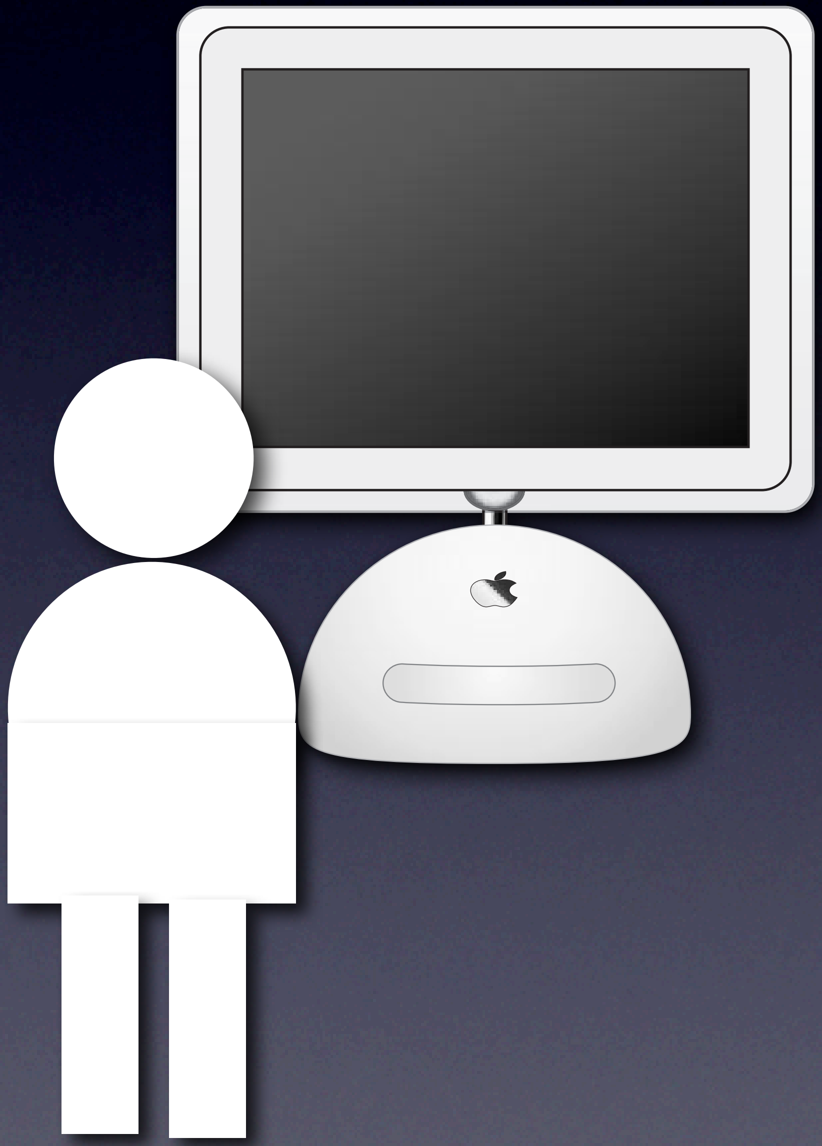
* Make Hotel Bookings
* Confirm Travel
Arrangements with Adam
* Pack bags

Information is Fragmented

Metadata is not preserved

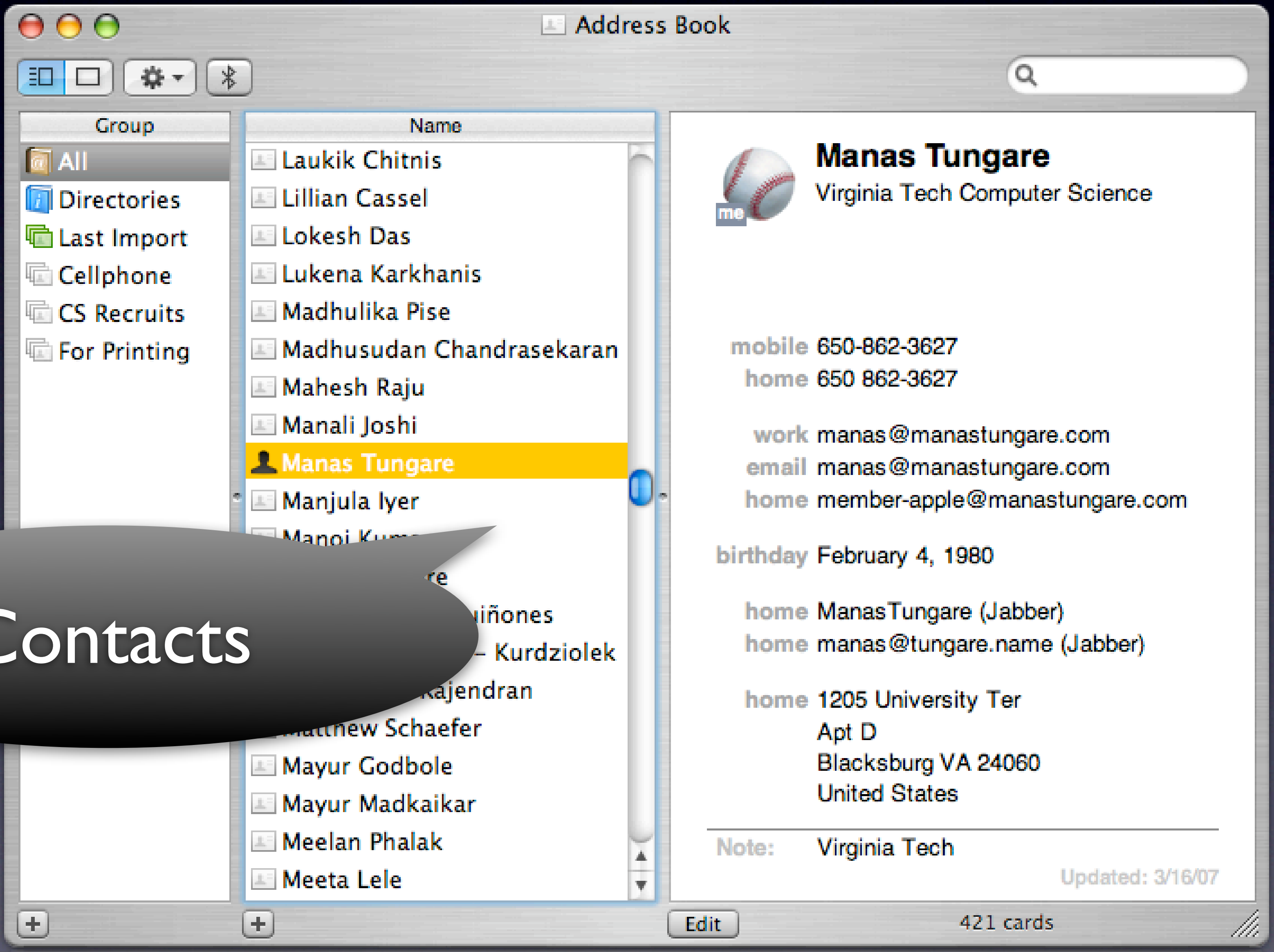


No support for task migration



No support for task migration

Not all data is in files



Laukik Chitnis
Lillian Cassel
Lokesh Das
Lukena Karkhanis
Madhulika Pise
Madhusudan Chandrasekaran
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Manali Joshi
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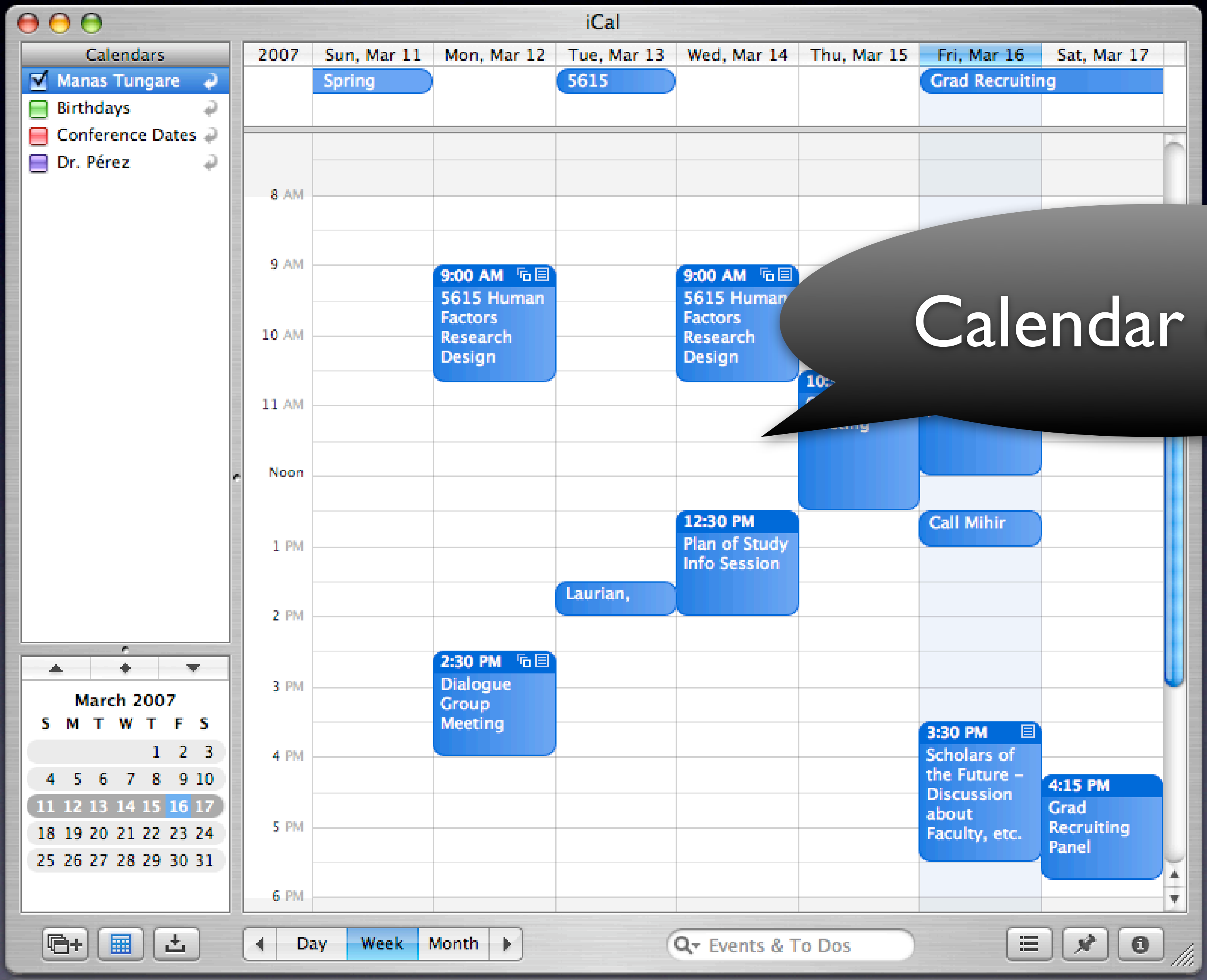
Contacts

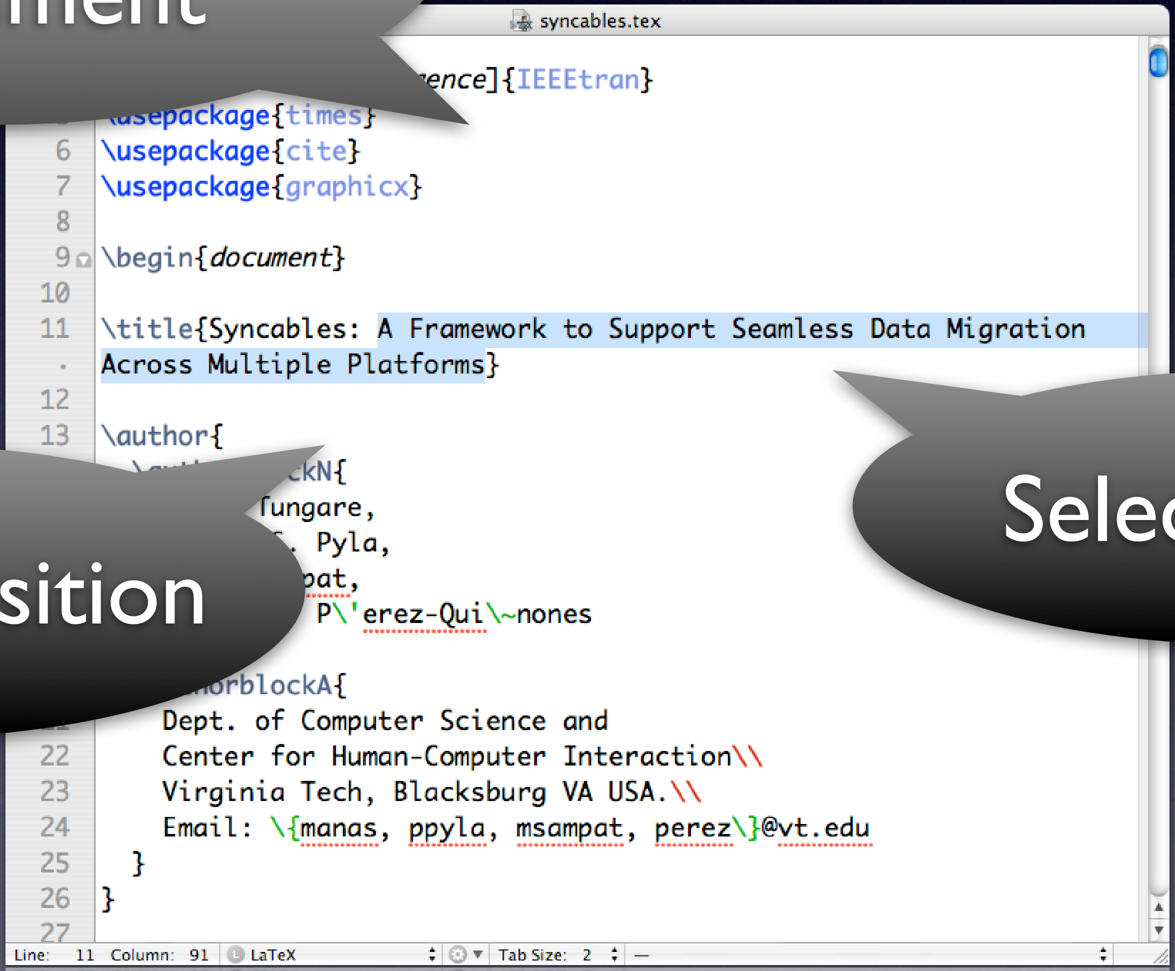
Not all data is in files



Calendar events

Not all data is in files

Name of opened document



```
ence]{IEEEtran}
\usepackage{times}
\usepackage{cite}
\usepackage{graphicx}

\begin{document}

\title{Syncables: A Framework to Support Seamless Data Migration
Across Multiple Platforms}

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  }
}
```

Line: 11 Column: 91 LaTeX Tab Size: 2

Selected text

Cursor position

The Syncables Framework

Syncable objects

- Not necessarily files
  - Files are just a sub-type
- Components
  - `Name`
  - `InputStream`
  - `OutputStream`
- Extensible, defined by applications

Features

- Information clusters
  - Devices that talk freely
- Support for collections
- Objects identified uniquely across devices

Naming scheme

sync:// cluster-id / collection / type / path / object-name

- URI – Uniform Resource Identifier
- Some parts defined by framework
- Other parts defined by application
- sync:// protocol handler

Naming scheme

sync:// cluster-id / collection / type / path / object-name

- Cluster of devices
- Devices that talk freely
- Identified by a GUID
- One device can belong to many clusters

Naming scheme

sync:// cluster-id / collection / type / path / object-name

- User-defined project-based collections
- Emails, bookmarks, files, events, contacts can belong to the same collection
- Reduces information fragmentation

Naming scheme

sync:// cluster-id / collection / type / path / object-name

- Object type: one of file, email, bookmark, event, contact, etc.
- Each type is defined by a Syncable class
- Version Tracker keeps track of objects

Naming scheme

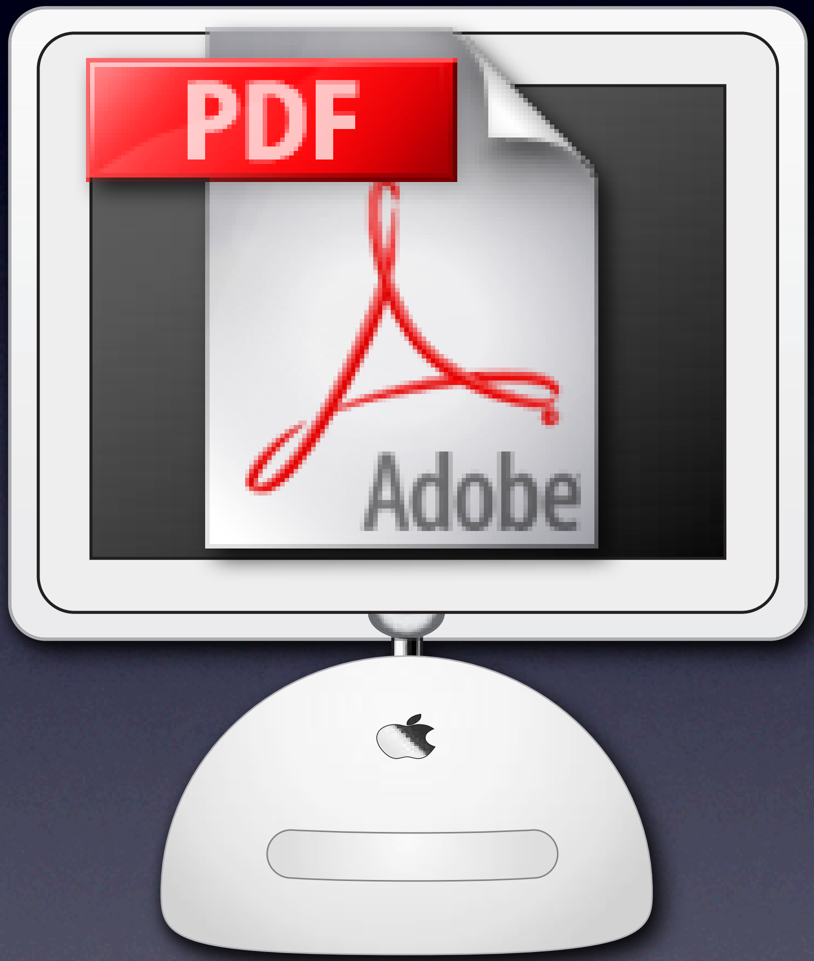
sync:// cluster-id / collection / type / path / object-name

- Rest of the path defined by a specific implementation of a subclass of the Syncable class
- Framework doesn’t care about semantics
- Can be arbitrarily deep

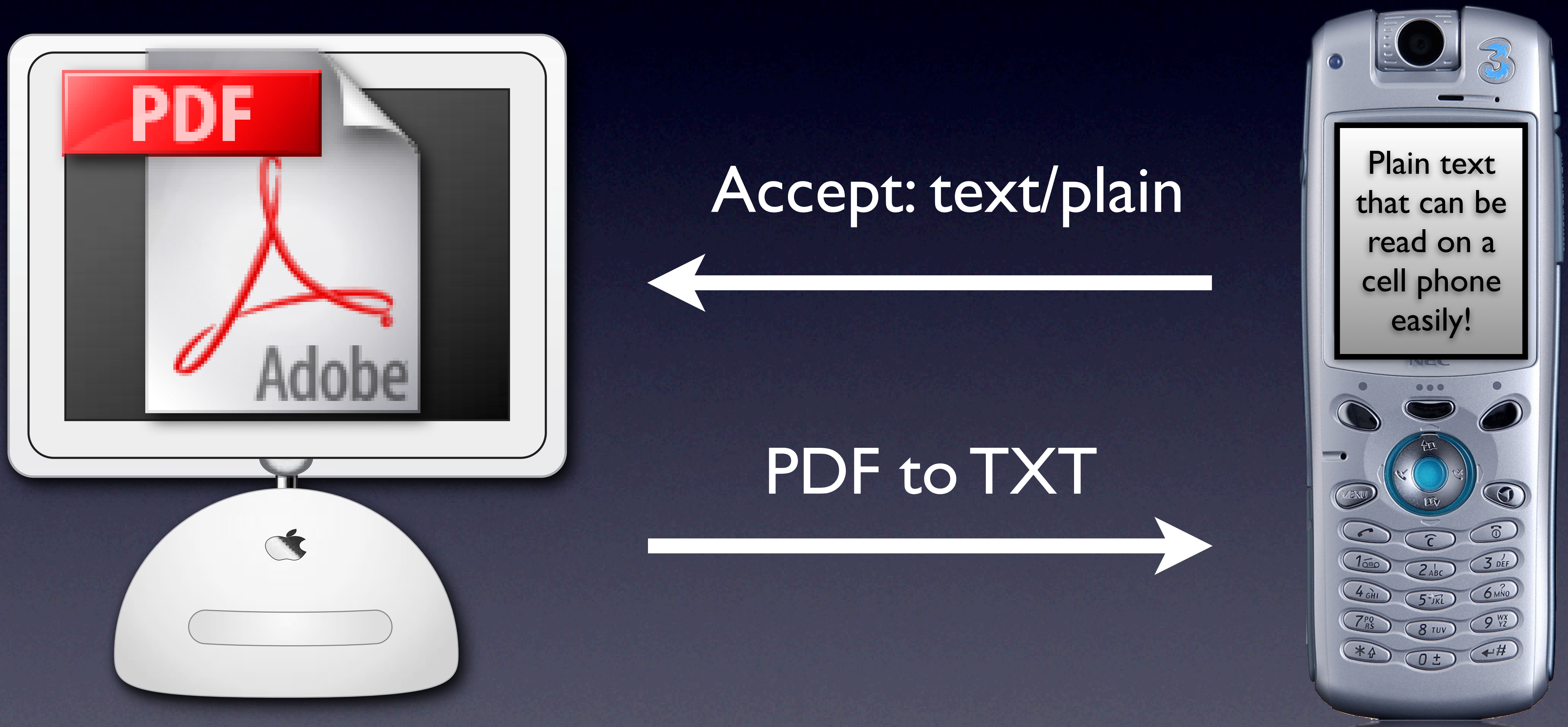
Examples

- sync://cluster-id/IEEE-Portable/File/Research/Papers/Syncables.tex
- sync://cluster-id/IEEE-Portable/Email/Perez/Draft/3
- sync://cluster-id/IEEE-Portable/Calendar/2006/09/01/Meeting-With-Manuel
- sync://cluster-id/IEEE-Portable/Note/Phone/Reminders

Transcoding



Transcoding



Accept: text/plain

PDF to TXT

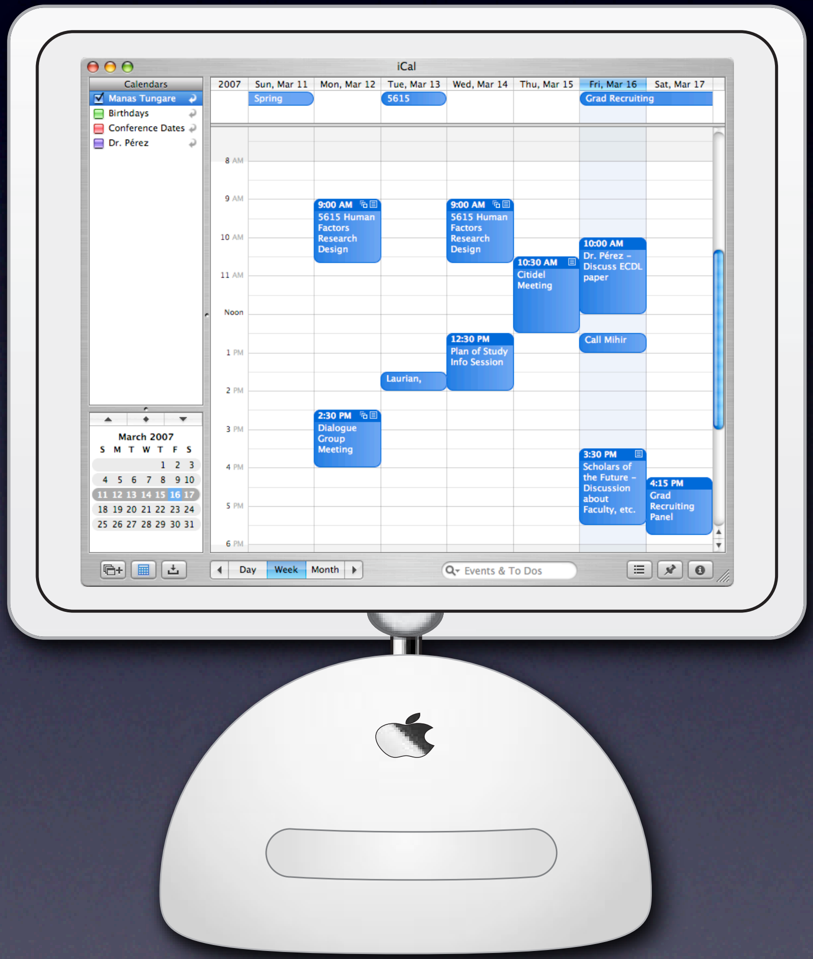
Plain text that can be read on a cell phone easily!

Filtering

iCal
Calendars
☑ Manas Tungare
Birthdays
Conference Dates
Dr. Pérez
March 2007
2007
Sun, Mar 11
Mon, Mar 12
Tue, Mar 13
Wed, Mar 14
Thu, Mar 15
Fri, Mar 16
Sat, Mar 17
Spring
5615
Grad Recruiting
9:00 AM 5615 Human Factors Research Design
9:00 AM 5615 Human Factors Research Design
10:30 AM Citidel Meeting
10:00 AM Dr. Pérez – Discuss ECDL paper
12:30 PM Plan of Study Info Session
Call Mihir
Laurian,
2:30 PM Dialogue Group Meeting
3:30 PM Scholars of the Future – Discussion about Faculty, etc.
4:15 PM Grad Recruiting Panel
Day
Week
Month
Events & To Dos

NEC
3

Filtering



iCal

Calendars
☑ Manas Tungare
Birthdays
Conference Dates
Dr. Pérez

2007 | Sun, Mar 11 | Mon, Mar 12 | Tue, Mar 13 | Wed, Mar 14 | Thu, Mar 15 | Fri, Mar 16 | Sat, Mar 17

Spring
5615
Grad Recruiting

9:00 AM 5615 Human Factors Research Design
9:00 AM 5615 Human Factors Research Design
10:30 AM Citidel Meeting
10:00 AM Dr. Pérez – Discuss ECDL paper
12:30 PM Plan of Study Info Session
Call Mihir
Laurian,
2:30 PM Dialogue Group Meeting
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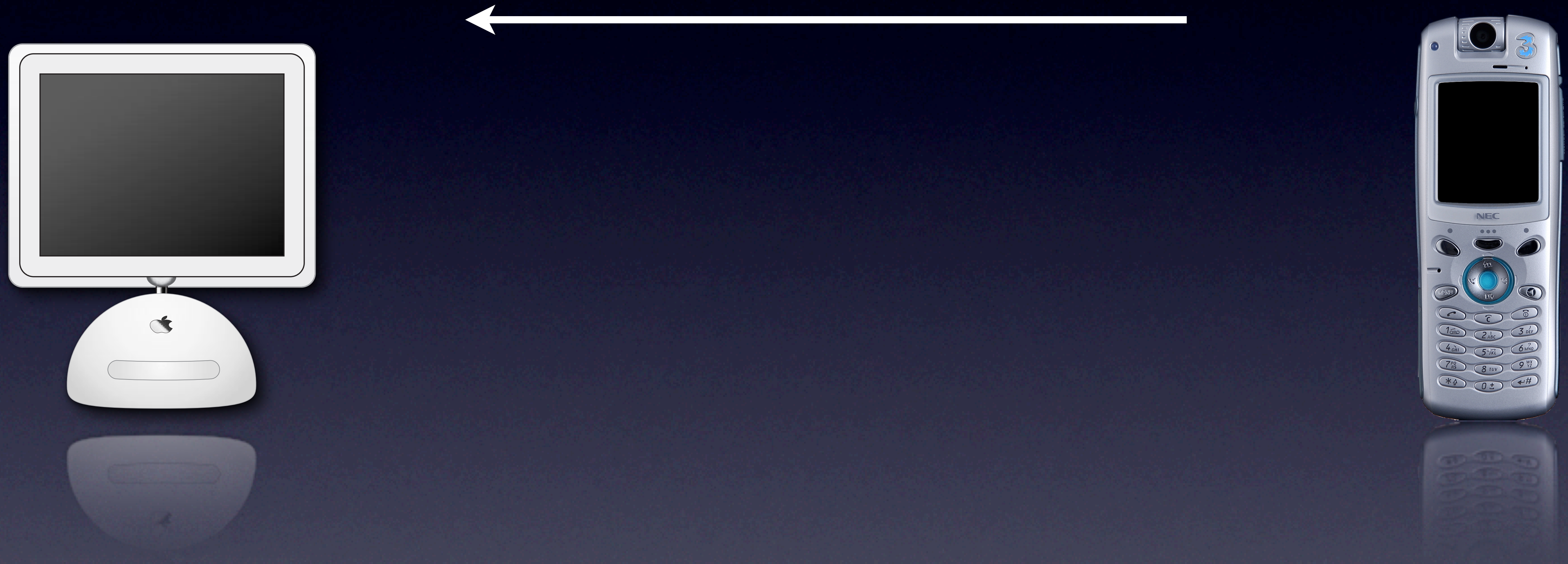
Where
date = today

Today's
Events

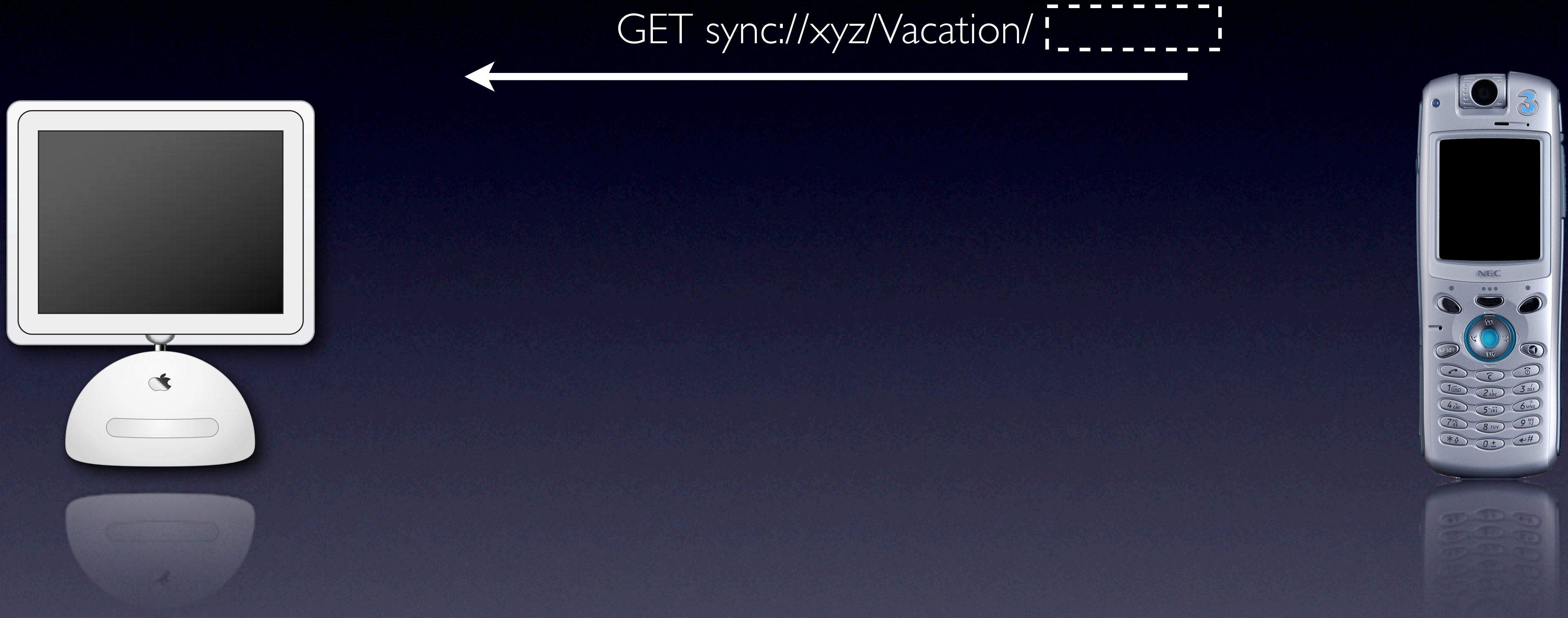
How it works

How it works



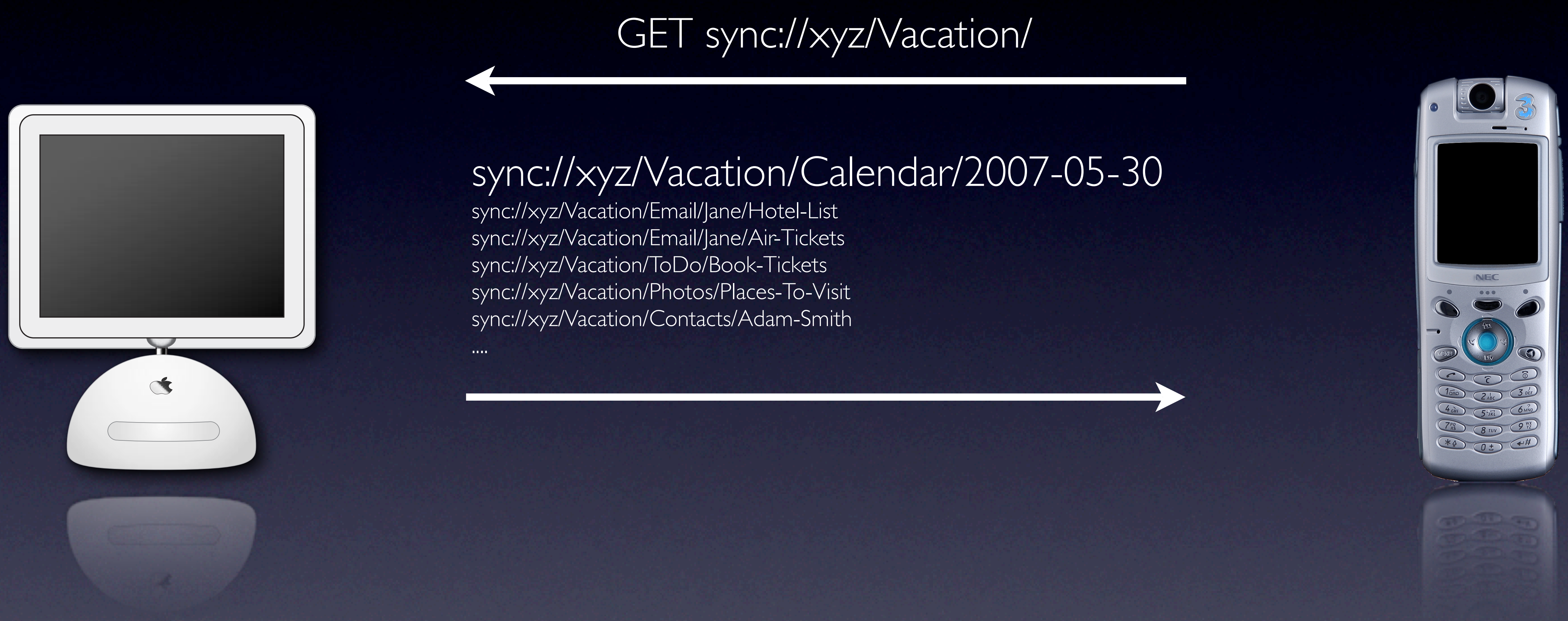
GET sync://xyz/Vacation/

How it works



GET sync://xyz/Vacation/

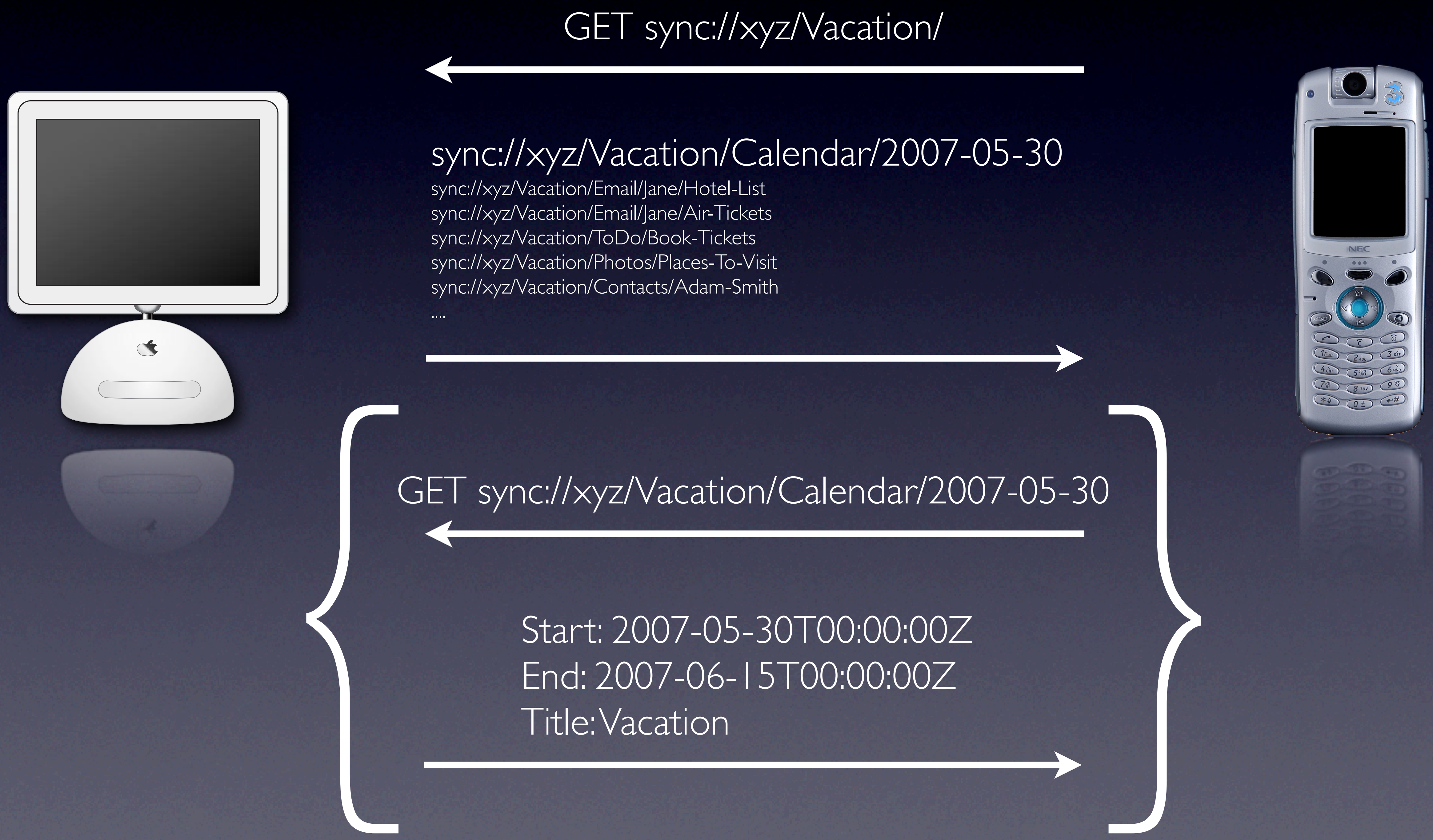
How it works



GET sync://xyz/Vacation/

sync://xyz/Vacation/Calendar/2007-05-30
sync://xyz/Vacation/Email/Jane/Hotel-List
sync://xyz/Vacation/Email/Jane/Air-Tickets
sync://xyz/Vacation/ToDo/Book-Tickets
sync://xyz/Vacation/Photos/Places-To-Visit
sync://xyz/Vacation/Contacts/Adam-Smith
....

How it works



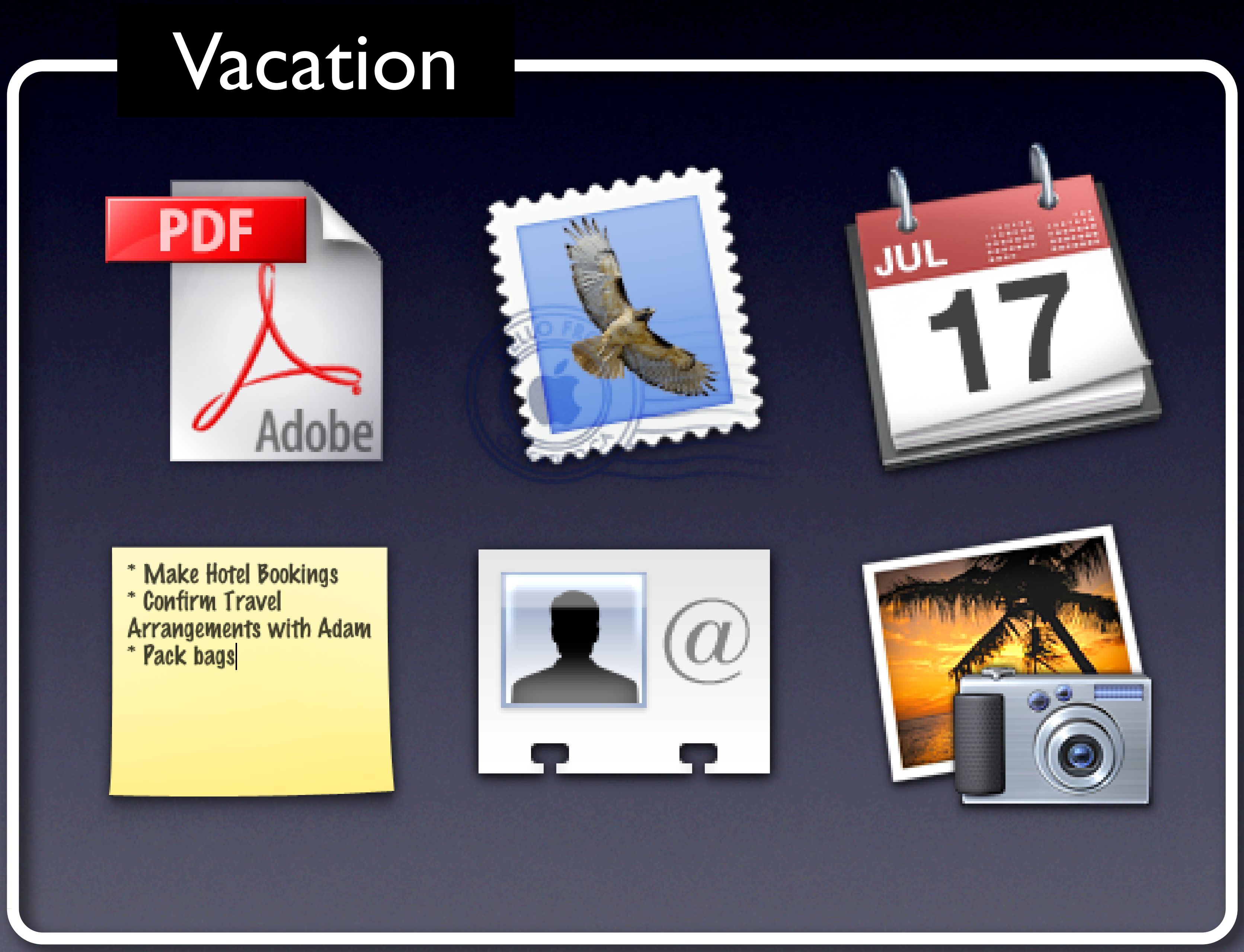
GET sync://xyz/Vacation/

sync://xyz/Vacation/Calendar/2007-05-30
sync://xyz/Vacation/Email/Jane/Hotel-List
sync://xyz/Vacation/Email/Jane/Air-Tickets
sync://xyz/Vacation/ToDo/Book-Tickets
sync://xyz/Vacation/Photos/Places-To-Visit
sync://xyz/Vacation/Contacts/Adam-Smith
....

GET sync://xyz/Vacation/Calendar/2007-05-30

Start: 2007-05-30T00:00:00Z
End: 2007-06-15T00:00:00Z
Title:Vacation

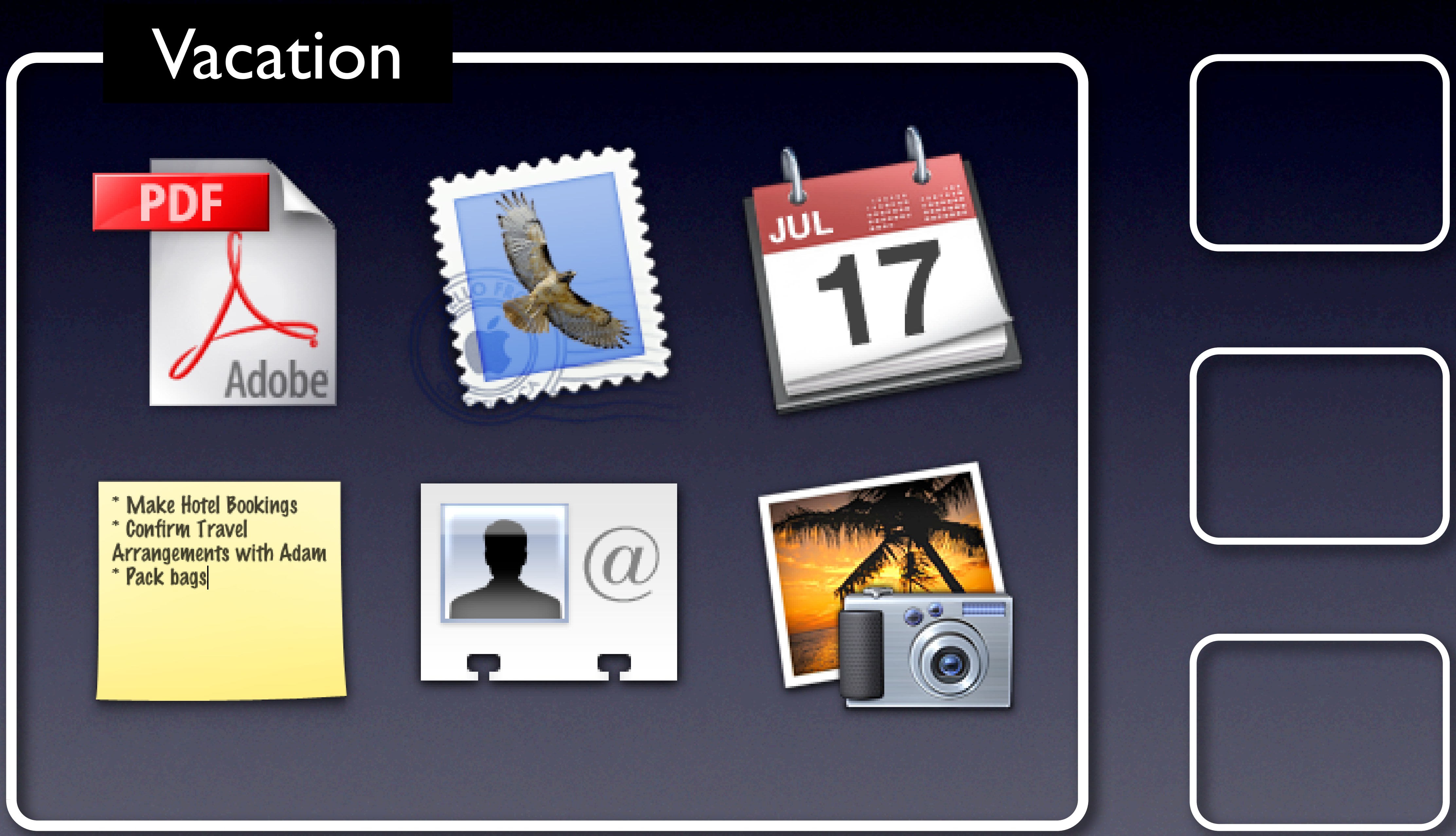
Grouped by Collection



Vacation

* Make Hotel Bookings
* Confirm Travel Arrangements with Adam
* Pack bags

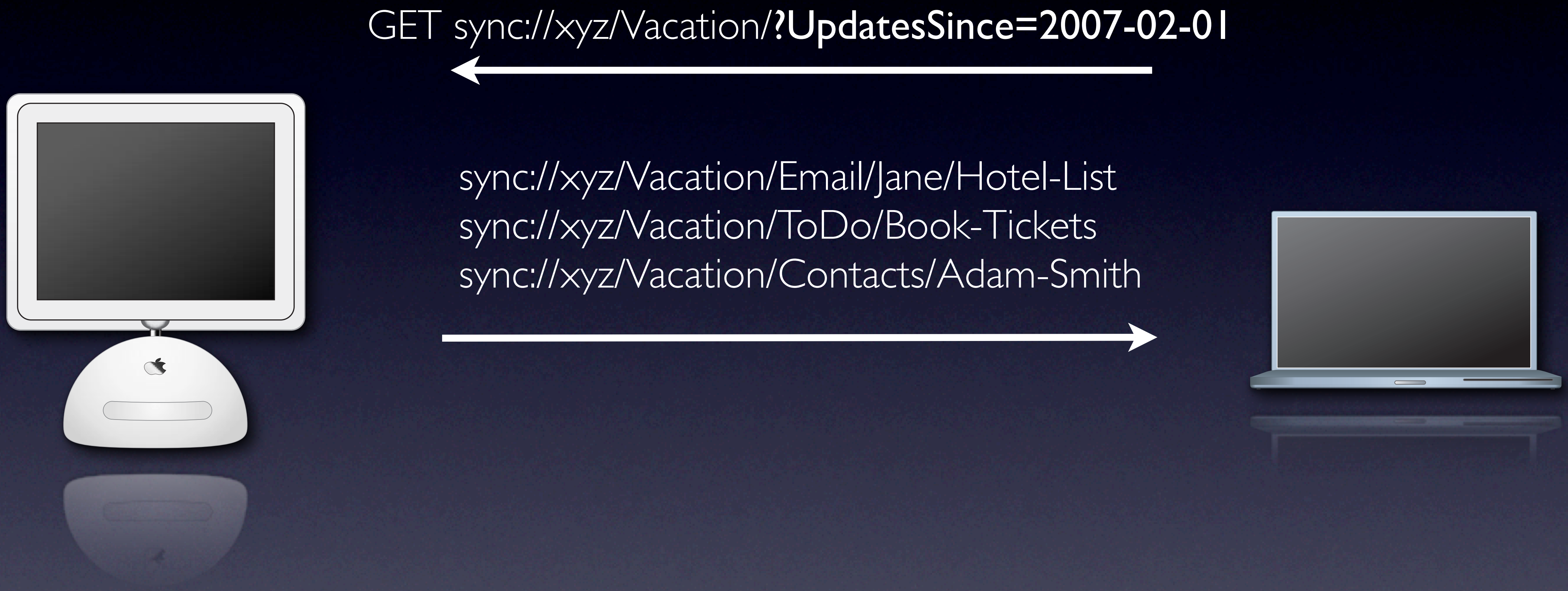
Grouped by Collection



* Make Hotel Bookings
* Confirm Travel Arrangements with Adam
* Pack bags

Versioning

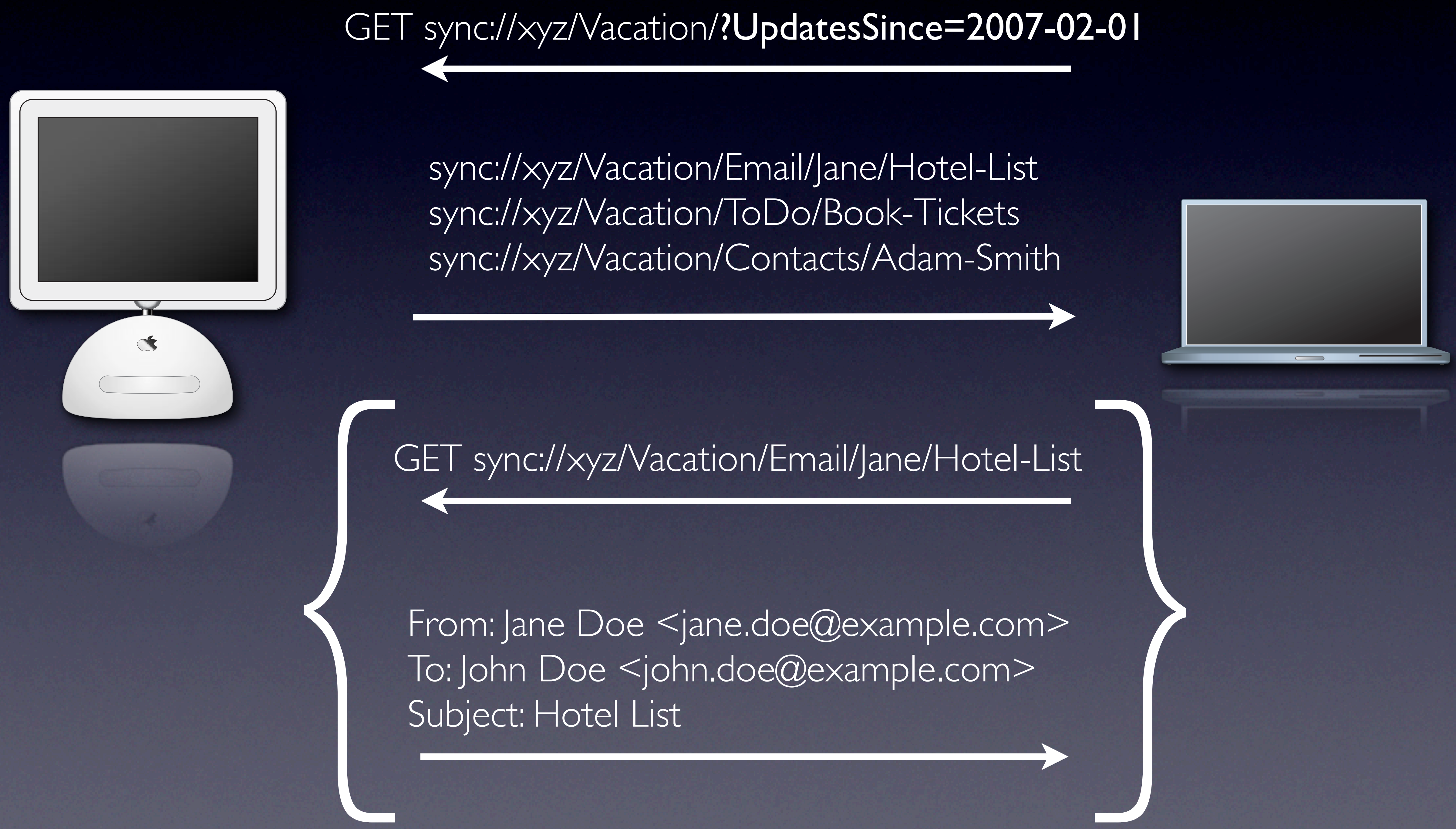
Versioning



GET sync://xyz/Vacation/**?UpdatesSince=2007-02-01**

sync://xyz/Vacation/Email/Jane/Hotel-List
sync://xyz/Vacation/ToDo/Book-Tickets
sync://xyz/Vacation/Contacts/Adam-Smith

Versioning



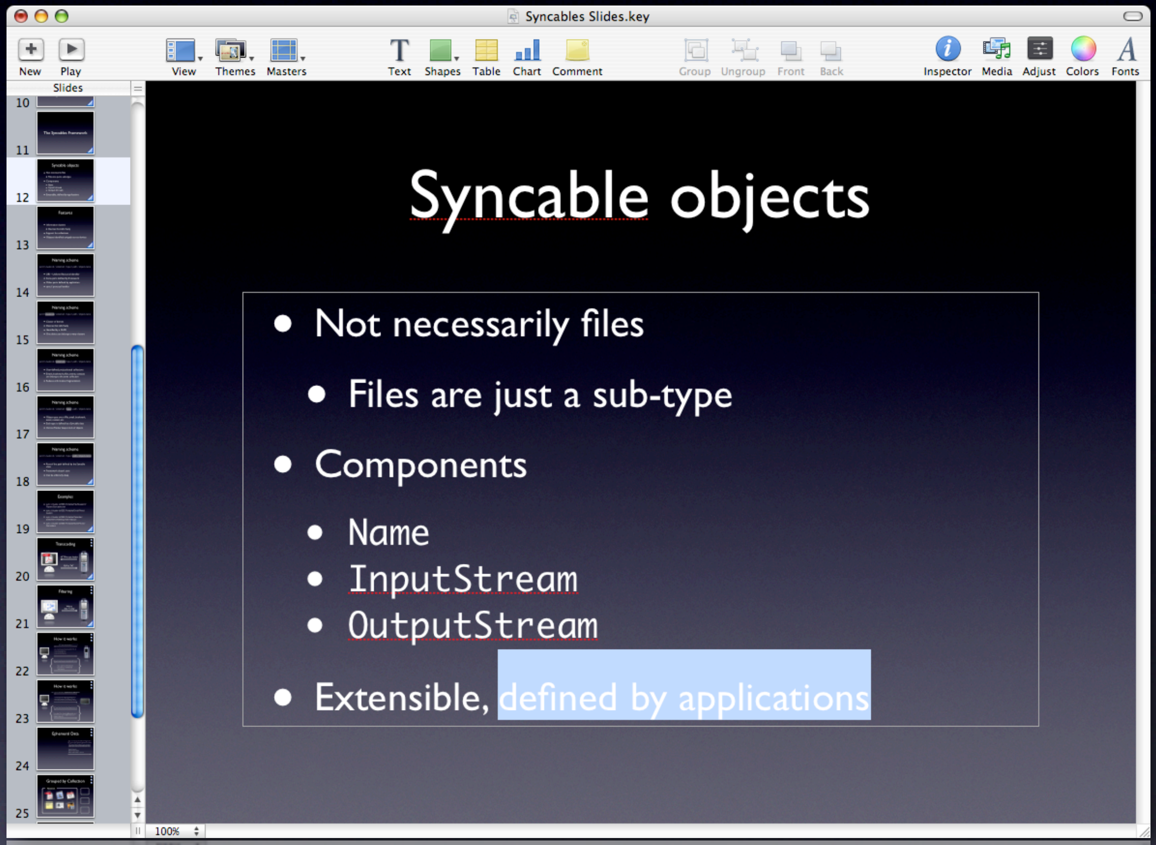
GET sync://xyz/Vacation/**?UpdatesSince=2007-02-01**

sync://xyz/Vacation/Email/Jane/Hotel-List
sync://xyz/Vacation/ToDo/Book-Tickets
sync://xyz/Vacation/Contacts/Adam-Smith

GET sync://xyz/Vacation/Email/Jane/Hotel-List

From: Jane Doe <jane.doe@example.com>
To: John Doe <john.doe@example.com>
Subject: Hotel List

Ephemeral Data



Syncable objects

- Not necessarily files
  - Files are just a sub-type
- Components
  - Name
  - InputStream
  - OutputStream
- Extensible, defined by applications

Request:

GET sync://xyz/Context/Active-Application
GET sync://xyz/Context/Opened-Document
GET sync://xyz/Context/Cursor-Location
GET sync://xyz/Context/Selected-Text

Response:

Apple Keynote
~/IEEE Portable Slides.key
Slide=12,Paragraph=3,Line=1
"defined by application"

Summary of Features

- On-demand migration of data across platforms
- Support for data other than files, especially context information
- Transcoding and filtering
- Possibilities for collaboration and group sharing

Problems solved

- Information fragmentation
  - Since information is grouped by collection
- Eliminates the need to synchronize manually
- Format independence: transcoding, filtering
- Paving the way for seamless task migration

Future work

- Use rsync
- Peer-to-peer data migration
  - No master required
- Evaluation in the field
- Work towards migrating tasks

Questions

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