

3: Building the MIT Mobile Web



MIT Mobile Project Team
Albert Chow, Sonya Huang, Eric Kim, and Brian Patt



Agenda

- Introduction
- Designing the MIT Mobile Web
- Building the MIT Mobile Web
- Technical architecture
- Browser detection
- Content generator
- Sample modules
- Q&A

Designing the MIT Mobile Web



The mobile web?



Designing for the mobile context



Designing for the mobile context

- Physical constraints
 - Small, dense screens
 - Limited input and feedback
- Technical constraints
 - Data is still relatively slow and expensive
 - Limited security and personalization
 - Wide variety of physical form factors
 - Screens: from 128x160 up to 480x640 pixels
 - Input: touchscreen, numeric keypad, full QWERTY keypad
 - Data speed: 3G “high-speed”, low-speed (dialup-class)
 - Limited web browsers with very wide range of capabilities and standards compliance

Device and browser differences



Nokia N70



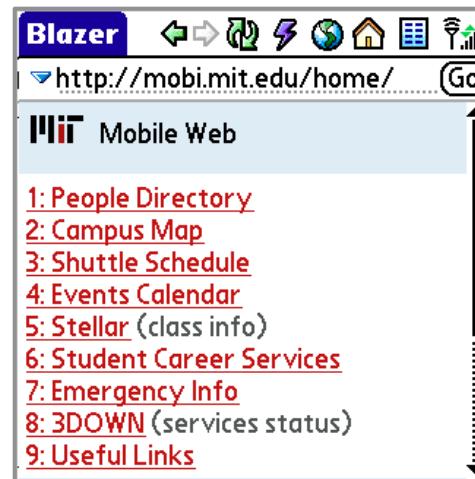
Sony Ericsson K750i



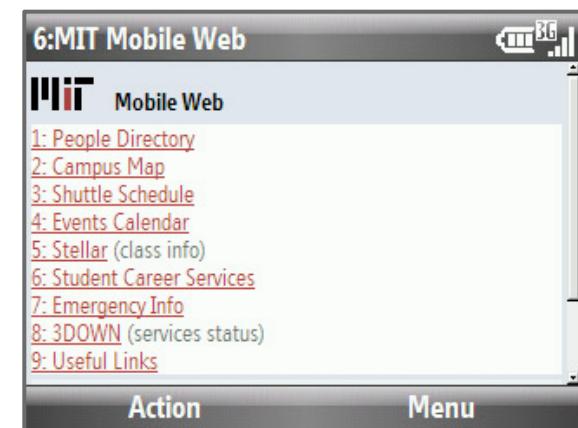
Motorola RAZR v3i



BlackBerry 8830



Palm Treo 755p



Motorola Q9h (Windows Mobile)

Device and browser differences



Designing for the mobile context

- Attention considerations
 - Seconds vs. minutes
 - Sovereign vs. transient tasks
 - *In situ* activities
- Mobile = new opportunity
 - Reach your community where they are most of the day
 - Meet low-level needs in an unexpectedly useful and fun way

Early design decisions at MIT

- Carefully curated content and functionality
- Narrow and shallow structure
- Simple navigation with as many accelerators as possible
 - Consistent global navigation
 - Consistent application-level navigation
 - Accesskeys
- Segmentation and adaptation

Segmentation and adaptation

- Impossible to design for every device
- Didn't want lowest-common-denominator experience
- Solution: device segmentation

Feature phones



Flip, bar, slider phones with relatively basic browsers and smaller screens

Smartphones



BlackBerry, Windows Mobile, PalmOS

iPhone/iPod touch



Segmentation and adaptation

Same content & functionality across device classes

Different presentation and navigation for each device class

MIT People Directory

name: Chris P Lee
dept: Materials Science and Engineering
home: [617-555-1234](#)
email: crispy@mit.edu
office: [N42-220](#)

[< Back to search results](#)

[People Directory Help](#)

0: [MIT Mobile Web Home](#)
1: [People Directory Home](#)

MIT People Directory

Search Details ?

name: Chris P Lee

dept: Materials Science and Engineering

home: 617-555-1234

email: crispy@mit.edu

office: N42-220

IST Information Services & Technology

Key differences between “buckets”

- Level of:
 - Rich, semantic structure (HTML)
 - Style (CSS)
 - Interactivity (Javascript)
- Amount of content shown per page (pagination)
- Image sizes
- Location, organization and presentation of navigation

General design principles

- Feature phone and smartphone: converged on a simple, robust, text-centric design optimized for keypad navigation
- iPhone and iPod touch: take advantage of unique capabilities of the touch-driven platform
- Minimize distance to user goals
- Be great where we can
- Don't suck anywhere

iPhone-specific design features

- Best standards compliance – things work the way they're supposed to
- Support for advanced CSS, including absolute positioning, layering, rounded corners, PNGs, transparency
- Full-screen mode
- Asynchronous data loading
- Layout re-flowing on device orientation change
- Apple's guides, HIG, code samples

iPhone-specific design features

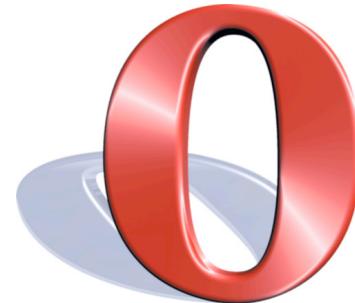


iPhone-specific design features



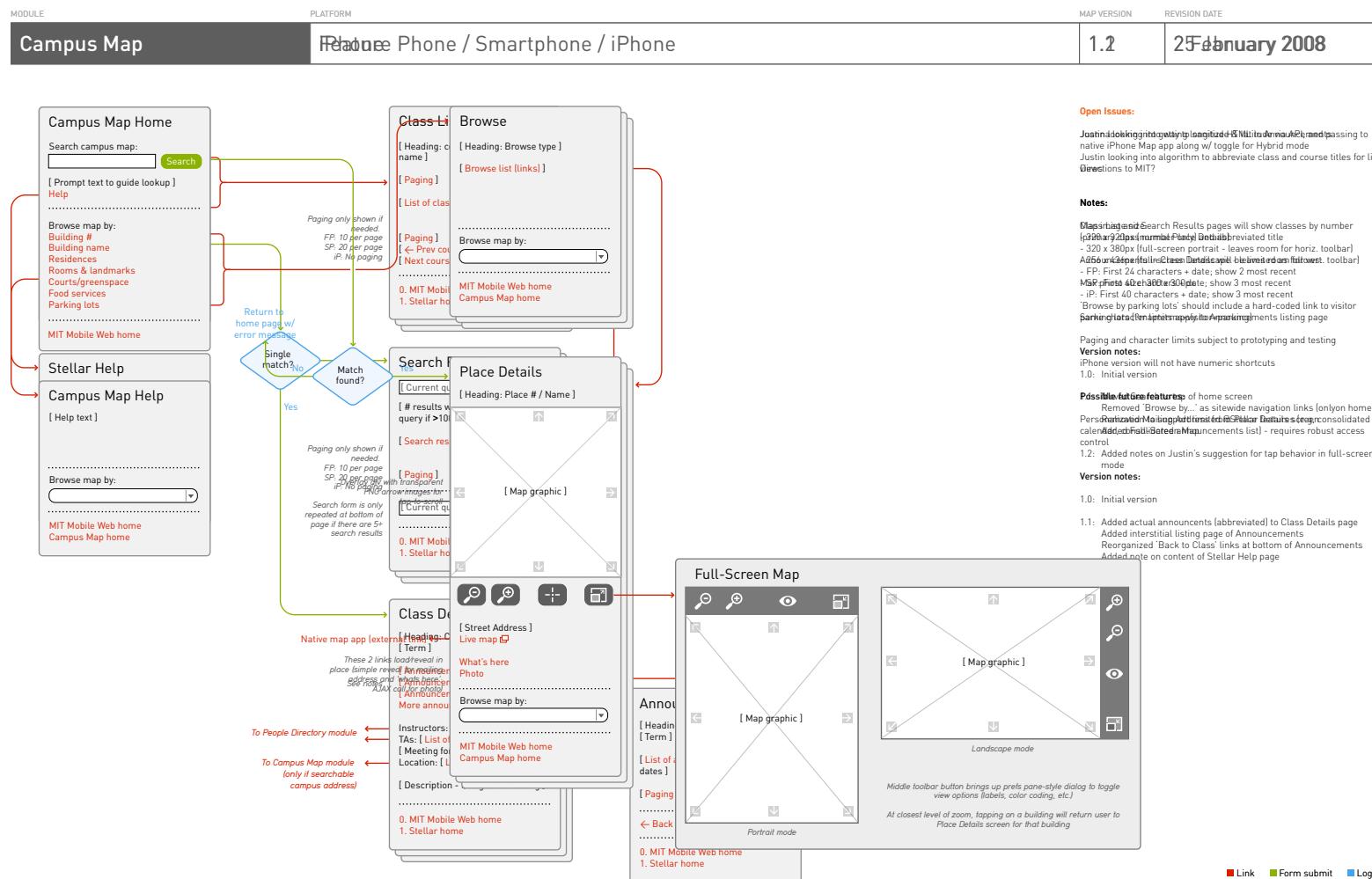
Segmentation and adaptation

- Challenge: Devices are always changing, previous category lines blurring and shifting
- Future: segment by browser capability, not hardware category
- Better exploit strengths of emerging advanced devices and platforms



Design process

1. User-experience (UX) mapping



Design process

1. User-experience (UX) mapping
2. Visual design and prototyping
3. Initial implementation
4. Usability testing
5. Remaining implementation and testing
6. Ongoing design and development

Conclusion

- Mobile web provides real-world daily utility for the college and university community
- Comes with unique and constantly evolving challenges
- Strategies for success:
 - Design for the mobile context
 - Segment target devices and adapt content, navigation and functionality
 - Test and refine
 - Continue to track, re-think, re-design and re-test your site as the mobile market evolves

Further reading

- *Mobile Web Design*: <http://mobilewebbook.com/>
- dotMobi Mobile Web Developer's Guide: <http://dev.mobi>
- Global Authoring Practices for the Mobile Web:
<http://www.passani.it/gap>
- WURFL: <http://wurfl.sourceforge.net>
- Device Atlas: <http://deviceatlas.com>
- Device Anywhere: <http://deviceanywhere.com>
- Apple iPhone web and application guidelines (free Apple Developer Connection account required):
<http://developer.apple.com/documentation/AppleApplications/Reference/SafariWebContent>
<http://developer.apple.com/webapps>

Building the MIT Mobile Web



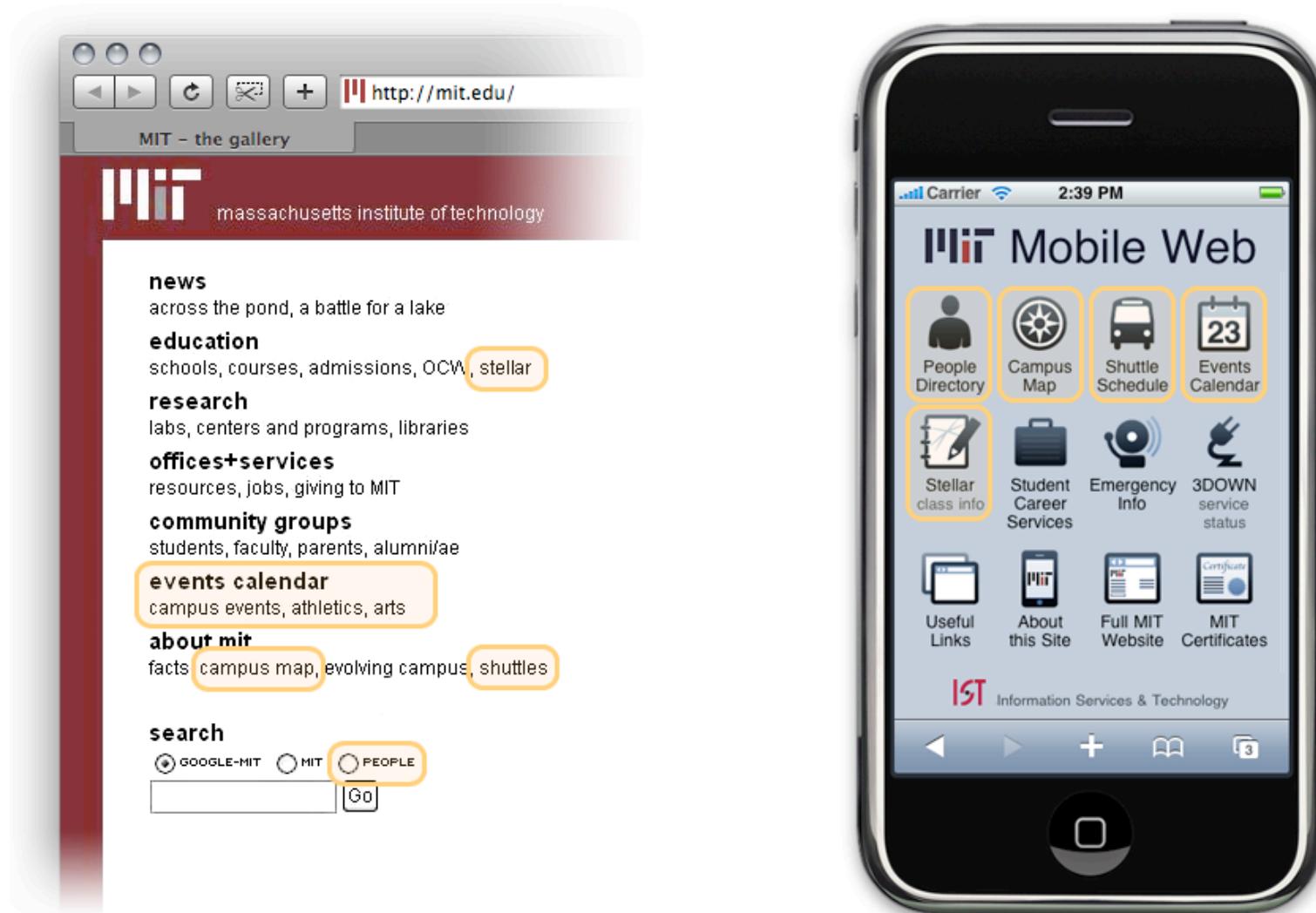
Building the MIT Mobile Web

How to start building a mobile web site:

1. Select modules
2. Find data sources
3. Select devices to support
4. Set up server

...or use the MIT Mobile Web, which will be open sourced

MIT Mobile Web modules



Criteria for module selection

- What's most useful on the go
- Most readily available data sources
- Avoided “screen scraping”
 - Takes more development time
 - Not robust

System architecture



Browser Detection

iPhone

Smartphone

Feature Phone

Other

Content Generator

People
Directory

Campus
Map

Shuttle
Schedule

Events
Calendar

Stellar

Student
Careers

Emergency
Info

3Down

MIT
LDAP
Server

MIT
IMS
Server

NextBus

MIT
Events
Server

MIT
Stellar
Server

Careers
Office

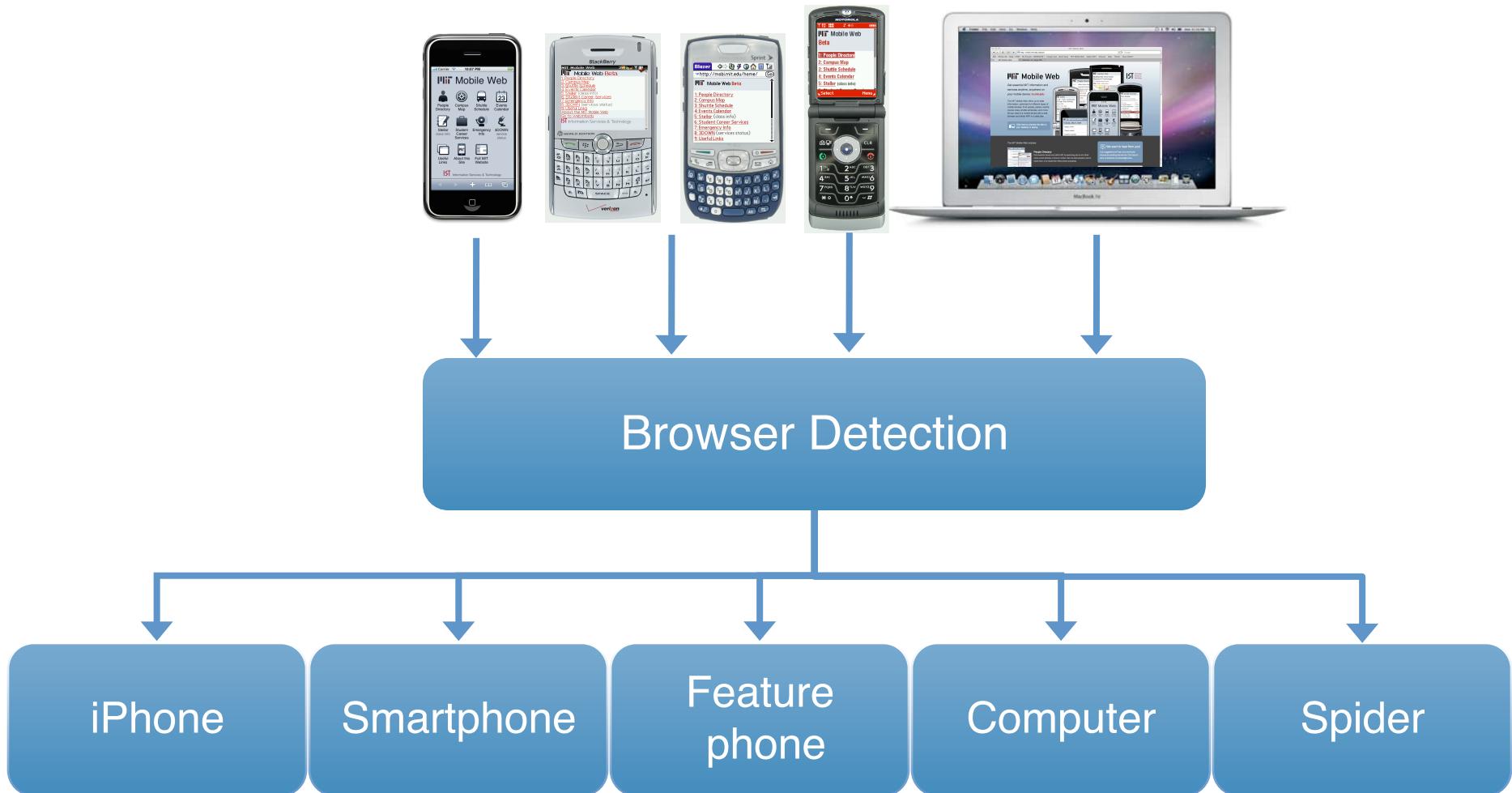
Emergency
.mit.edu

3Down
.mit.edu

System configuration

- Hardware (Virtual Server):
 - CPU: Intel Xeon 3GHz
 - Memory allocation: 2 GB
 - Storage: 15 GB
 - VMWare
- Software:
 - Operating system: Red Hat Enterprise Linux 4
 - Web server: Apache 2.0.52
 - PHP 5.2.5, MySQL 5.0.18, Python 2.4.4

Browser detection



WURFL

Wireless Universal Resource File (WURFL)

- Open source data source
- Attempts to catalog all mobile devices
- Initial goals:
 - Determine screen size
 - Determine phone features
- Current implementation:
 - Distinguishes phones from computers
 - Updated database of User-Agent strings
 - Keywords to pick smart phones (iPhone, iPod, BlackBerry, ...)

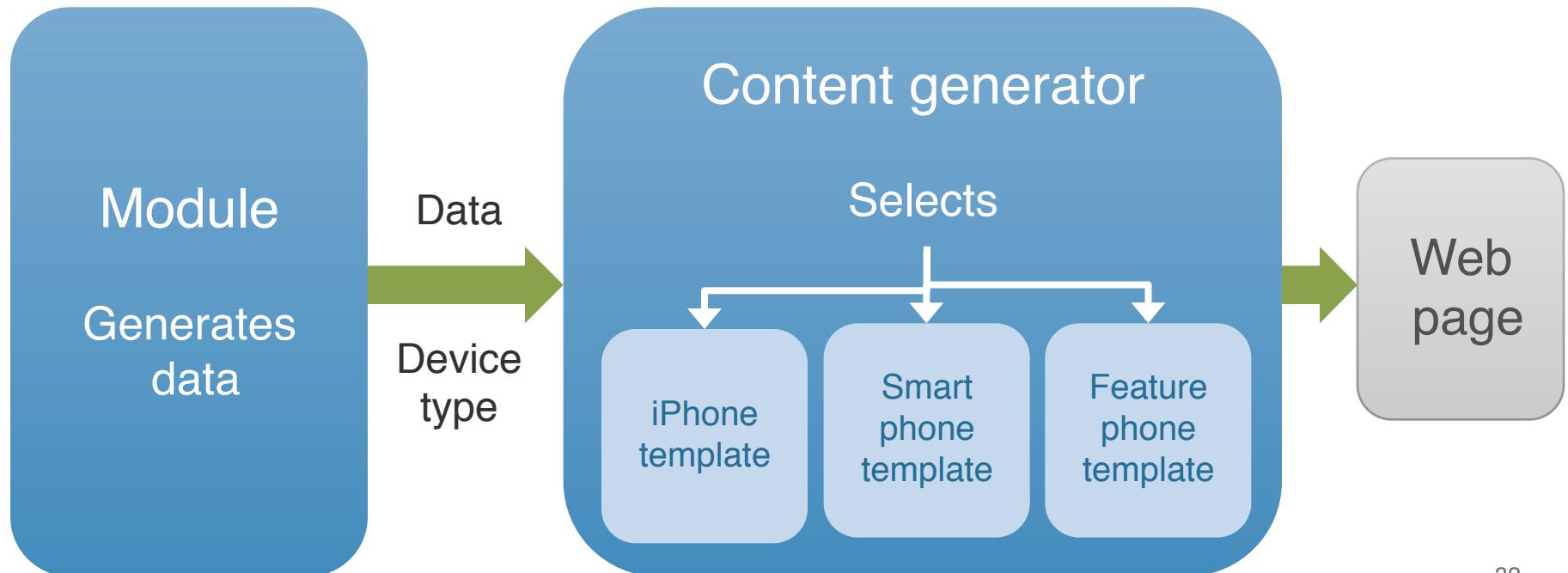
User agent strings

Complicated and non-standardized

- iPhone:
Mozilla/5.0 (iPhone; U; CPU like Mac OS X; en)
AppleWebKit/420+(KHTML, like Gecko) Version/3.0
Mobile/1A538a Safari/419.3
- BlackBerry:
BlackBerry8130/4.3.0 Profile/MIDP-2.0 Configuration/
CLDC-1.1 VendorID/105
- Search for closest match

Content generator

- Three different HTML templates – one for each “bucket” of devices
- Each HTML template includes its own CSS (style sheets) and images



People Directory



MIT – people directory

http://web.mit.edu/bin/cgicso?options=general&query=andrew+yu

MIT – people directory

home news education research offices+services community events about map search

people directory

MIT

name/email reverse lookup (7 digits) lastname sounds like search

There was 1 match to your request.

name: Yu, Andrew J.
email: andrewyu@mit.edu
phone: (617) 324-8985
Fax: (617) 253-8665
address: N42-250I
department: Information Services & Technology
title: Mobile Devices Platform Project Ma

Student data loaded as of Oct 7, Staff data loaded as of Oct 7

about the online people directory
[how to update](#) | [emergency services](#)

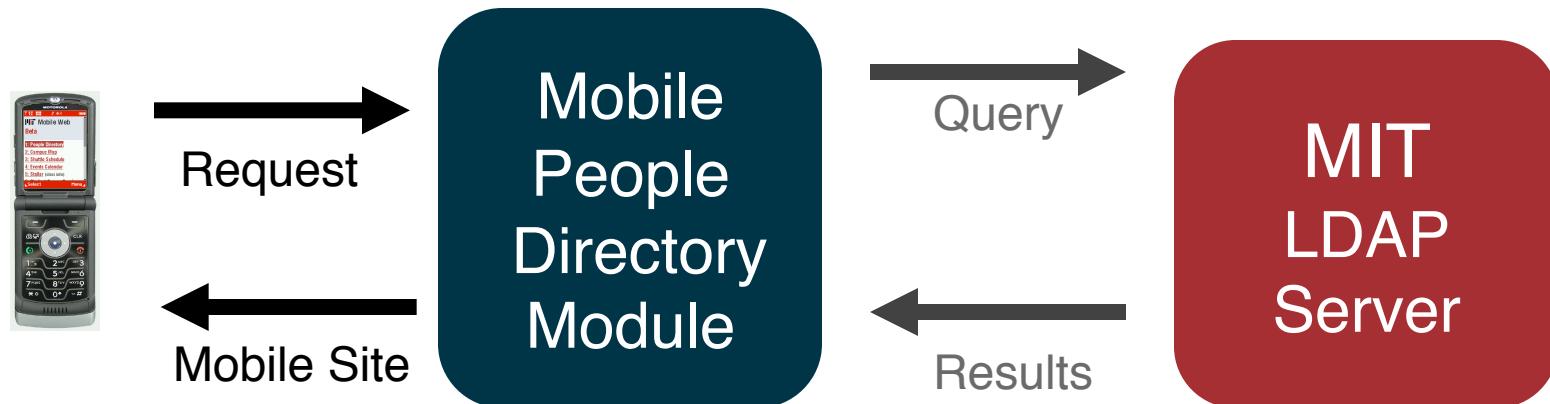
search format

first name last name	example
last name	wilson
username	wilson



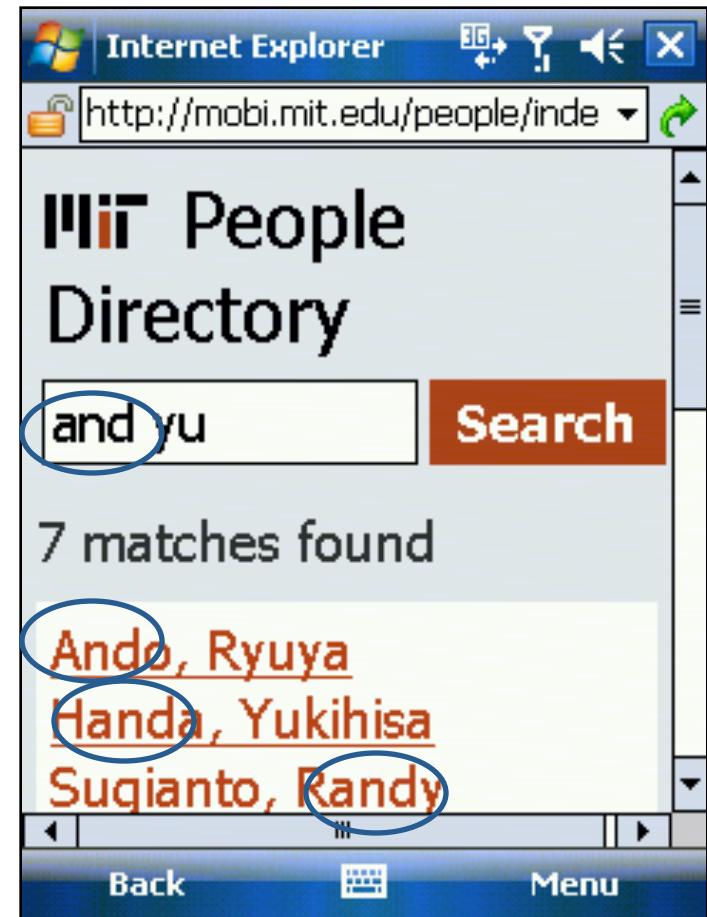
People Directory mobile backend

- LDAP (Lightweight Directory Access Protocol)
 - Uses standard query language
 - Widely used
 - PHP has a built in interface



Optimized for mobile experience

- Difficult/slow to type on mobile devices
- Optimize search results:
 - Single letter = first initial of first or last name
 - Default sub string search
 - Exact email matches at the top



3DOWN

- Status of major services at MIT, such as internet, email, and telephone
- Backend: RSS (Rich Site Summary) Feed
 - Contains title and content
 - Widely used, such as Wordpress and New York Times

The screenshot shows a mobile-style web page titled "MIT 3DOWN". At the top right, there are icons for signal strength, battery level, and the time "12:52P". Below the title, the page header "MIT 3DOWN" is displayed again. The main content area contains several sections: "General Services" (status: "The problem with techtime should now be resolved. (10/1 16:44)"), "Network Services" (status: "All services are operating normally. (8/19 22:34)"), "Email Services" (status: "Sun, Sep 21st: WebMail preferences have been restored. Reminder: MIT staff wi... more (9/21 16:04)"), and "Telephone Service" (status: "All services are operating normally. (8/24 8:52P)"). At the bottom, there are navigation links "Options" and "Back".

RSS good for mobile devices

- RSS is list oriented
- Phones are good at displaying lists
- Easy to reformat content for mobile devices

```
<ttl>5</ttl>      <item>
  <title>
    General Services
  </title>
  <link>http://3down.mit.edu/</link>
  <description><![CDATA[
    The problem with techtime should now be resolved.
  ]]>
  </description>
  <pubDate>Wed, 1 Oct 2008 16:44:13 EDT</pubDate>
```

Mit 3DOWN

This page shows the status of services available to the MIT community.

General Services

The problem with techtime should now be resolved. (10/1 16:44)

Stellar – web version

8.033 Class Home

<http://stellar.mit.edu/S/course/8/fa08/8.033/>

RSS Google

8.033 Relativity

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

LOGIN

- [Class Home](#)
- [General Info](#)
- [Calendar](#)
- [Schedule](#)
- [Important Web Sites](#)
- [Handouts](#)
- [Problem Sets](#)
- [Quizzes](#)
- [Materials](#)
- [Relativistic](#)
- [Procrastination](#)
- [Gradebook](#)
- [Class List](#)
- [Staff List](#)
- [Feedback](#)
- [Forum](#)
- [Search](#)

Sections

- [8.033 R01](#)
- [8.033 R02](#)
- [8.033 R03](#)

[STELLAR HELP](#)

[RSS FEED](#)

8.033 Relativity

Course : » Course 8 : » Fall 2008 : » 8.033 : »Homepage

Fall 2008

image restricted to class participants

Albert Einstein, 1947

Lecturer: Enectali Figueroa-Feliciano

Recitation Instructor: Peter H Fisher, Nguyen Thanh Son

Lecture: TR11-12.30 (6-120)

Information:

[OCW archive available](#)

Announcements

Modifications to PS4 and PS5

Problem set 4: in problem 8, part b will be counted as optional. The solution to this question requires an integration that I didn't think of at the beginning.
 Problem set 5: optional problem 10 and 11 were removed. We will have these variation problems later.

Announced on 04 October 2008 7:54 p.m. by Son Nguyen

More Minkowski Spacetime Diagrams

I've put up a zip file in the "Handouts" section of the website with more Spacetime diagrams at different boosts, in addition to the one posted by Prof. Fisher earlier. Enjoy!

Announced on 29 September 2008 6:59 p.m. by Enectali Figueroa-Feliciano

Correction to Problem set 4

On figure 1, the y-axis should read $(\lambda - \lambda_0)/\lambda_0$. Thanks Scott Vasquez for pointing this out.
 Also, a clarification has been made to question b) of Problem 5: "this" means "both beams exhibit the same wavelength"

Announced on 29 September 2008 12:38 a.m. by Son Nguyen

Mikowski Graph Paper

Several of you have asked for Mikowski Graph Paper. I have made one for you for beta=3/5 and gamma=5/4. For

Stellar – mobile version

8.033 Class Home

<http://stellar.mit.edu/S/course/8/fa08/8.033/>

8.033 Relativity
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

8.033 Relativity

Fall 2008
image restricted to class participants
Albert Einstein, 1947

Lecturer: Enectali Figueroa-Feliciano
Recitation Instructor: Peter H Fisher, Nguyen Thanh Son
Lecture: TR11-12.30 (6-120)
Information:
[OCW archive available](#)

Announcements

Modifications to PS4 and PS5:
Problem set 4: in problem 8, part b will be counted as optional. The s... [more](#)
(10/4 19:54)

More Minkowski Spacetime Diagrams
I've put up a zip file in the "Handouts" section of the website with more addition to the one posted by Prof. Fisher earlier. Enjoy!
Announced on 29 September 2008 6:59 p.m. by Son Nguyen

Correction to Problem set 4
On figure 1, the y-axis should read $(\lambda - \lambda_0)/\lambda_0$. Thanks Scott Vasquez for pointing this out.
Also, a clarification has been made to question b) of Problem 5: "this" means "both beams exhibit the same wavelength"
Announced on 29 September 2008 12:38 a.m. by Son Nguyen

Mikowski Graph Paper
Several of you have asked for Mikowski Graph Paper. I have made one for you for beta=3/5 and gamma=5/4. For

AT&T 3:57 PM

Search Detail ?

8.033: Relativity

Fall 2008 | [Stellar site](#)

News Info Staff

Modifications to PS4 and PS5:
Problem set 4: in problem 8, part b will be counted as optional. The solution t... [more](#)
(10/4 19:54)

More Minkowski Spacetime Diagrams
I've put up a zip file in the "Handouts" section of the website with more addition to the one posted by Prof. Fisher earlier. Enjoy!
[more](#) (9/29 18:59)

Correction to Problem set 4: On

Stellar backend

- Stellar uses several different data sources
- Aggregate into a custom XML (eXtensible Markup Language) feed
 - Course guide is an XML feed
 - One RSS per class for course announcements
 - Not given access to protected information
- Why use XML?
 - Easy to inspect
 - Easy to expand to any text based data
 - Widely used for internet applications

Campus Maps – web version

MIT – campus map home

<http://whereis.mit.edu/map-jpg?mapterms=W20&mapsearch=go>

MIT – campus map home search

massachusetts institute of technology

MIT campus map

map home about the map print version directions to MIT

Building W20 (Stratton Student Center)

locate:
 building by number
 building by name
 residences
 selected rooms
 streets/landmarks
 courts/green areas
 food services
 parking lots
 wireless

search on map: go

zoom: [-] [+] clear selection other views: full campus aerial mapquest

Building W20 (Stratton Student Center)
 street address: 84 Massachusetts Avenue

mailing address:
 Building W20
 77 Massachusetts Avenue
 Cambridge, MA 02139-4307

[floor plans](#) (MIT access only: Adobe Acrobat Reader required)
 0 1 2 3 4 5 6 6M

here you will find:
 Anna's Taqueria
 Art Association, Student


 view from south side

Campus Maps – backend

Web Map Services (WMS)

- Generates a map
- Based on picture size, frame size, and map elements to display
- Parameters passed via URL
- Widely used standard
- Requires a two step process:
 - Request frame
 - Request picture

Campus Maps – backend

- Example: Map of W20 (Student Center)
- Parameters :

?request=getmap&version=1.1.1&

image size width=220&height=160&

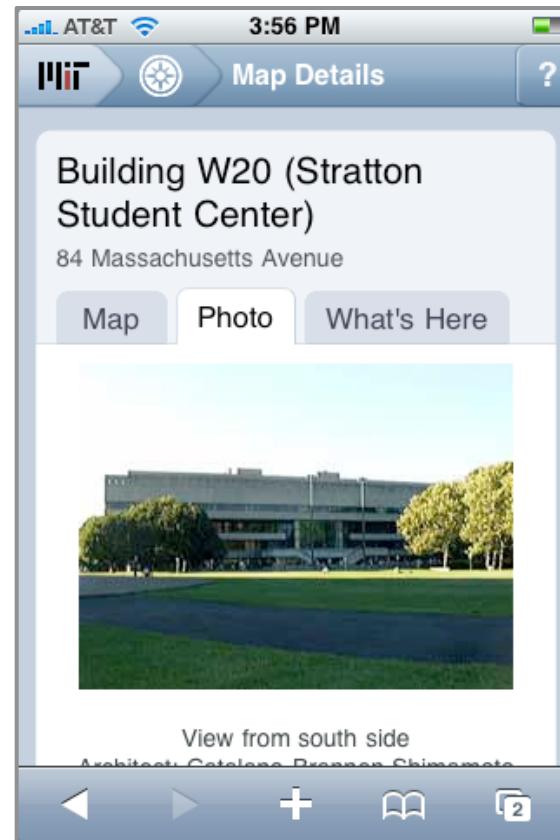
building selectvalues=W20&

frame bbox=708882,495087,709896,495825&

map elements to layers=Greenspace,Roads,Parking,

display Buildings

Campus Map – mobile version



Shuttle Schedules

- Created a data file of the published bus schedule
- Stored in MySQL database

Boston Daytime

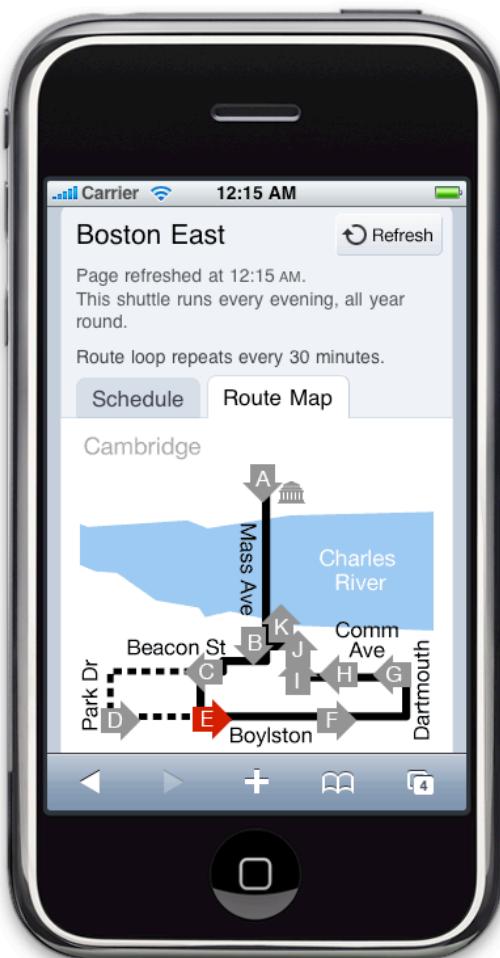
RUNS SEPTEMBER THROUGH MAY

1	84 Mass. Ave.	8:07	8:27	8:47	9:07	9:27	9:47	10:07	10:27	10:47	11:07	11:27	11:47
2	Mass. Ave./Beacon	8:09	8:29	8:49	9:09	9:29	9:49	10:09	10:29	10:49	11:09	11:29	11:49
3	487 Comm. Ave. (PSK)	8:10	8:30	8:50	9:10	9:30	9:50	10:10	10:30	10:50	11:10	11:30	11:50
4	64 Bay State (TXI)	8:11	8:31	8:51	9:11	9:31	9:51	10:11	10:31	10:51	11:11	11:31	11:51
5	478 Comm. Ave.	8:14	8:34	8:54	9:14	9:34	9:54	10:14	10:34	10:54	11:14	11:34	11:54
6	450 Beacon St.	8:19	8:39	8:59	9:19	9:39	9:59	10:19	10:39	10:59	11:19	11:39	11:59
7	77 Mass. Ave.												

```
$schedule
  ->route("Boston Daytime", "boston")
  ->summary("Runs weekdays 8AM-6PM, Sep-May")
  ->except_holidays()
  ->perHour(3)
  ->stops(
    st("84 Mass. Ave." , "mass84_d", "boston" , '07'),
    st("Mass. Ave. / Beacon" , "massbeac", "cambridge" , '09'),
    st("487 Comm. Ave. (PSK)" , "comm487" , "cambridge" , '10'),
    st("64 Bay State (TXI)" , "bays64" , "cambridge" , '11'),
    st("478 Comm. Ave." , "comm478" , "cambridge" , '14'),
    st("450 Beacon St." , "beac450" , "cambridge" , '19'),
    st("77 Mass. Ave." , "mass77" , "cambridge" , '23'))
  ->addHours("Mon-Fri", hours("8-17"));
```

Shuttle Schedules

- Route maps hand-drawn for different screen sizes



Summary of MIT Mobile Web

- Module selection:
 1. Usefulness (e.g., People Directory, shuttle, etc.)
 2. Easy to integrate data sources = less interface code
 - Open data standards (e.g., LDAP, RSS, and XML)
- Device optimization / selection:
 - UI optimized for three categories (“buckets”)
 - iPhone, smartphone, and feature phone
- Optimized mobile experience
 - Only display essential information (device dependent)
 - Code to reduce the amount of input needed

Q&A



Thank you!

Design:

Eric J. Kim

eric@chemicalcreative.com

Development:

Albert Chow, Sonya Huang, and Brian Patt

MangoText

mangotext@mit.edu