Digital Lifelines

"Your life is playing…are you recording?"

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1. Overview

Our project turns the mobile handset you carry with you everywhere into a recording device for your life. It enables you to capture the details of your life into recorded streams of memories that we call timelines. Consider a timeline representing every movie you've ever seen, how your blood pressure or weight has changed, every job you've ever held and every person you've ever dated. These facts are easy to record in the moment and fascinating to reflect back on later. We want to make it easy to collect the streams of information you wish to record so that they aren't lost in the haze of unreliable memory and to explore interesting correlations between these streams. To do this, our software turns your mobile handset into more than a communication and entertainment device; it becomes a life recorder.

2. Who We Are / What Our Goals Are

We are all members of the Open Source Institute[1] at Clarkson University in Potsdam, New York and are committed to open platforms and open source. As such, we are thrilled about the Open Handset Alliance and about the opportunity to develop software for the Android platform. We believe that open platforms are key to increasing user confidence in technologies that collect and store personal information.

Our full vision for this project includes research into new types of human interaction enabled by the software. Imagine the possibility of passing down your timelines to your children and grandchildren. Imagine donating anonymized timelines of health statistics for medical research. Imagine overlaying your timelines with those of your true love to see where he or she has been all your life.

3. Technical Details

The heart of our project is the ability to easily create and record data into new timelines. With our software, we include a set of example timelines including health statistics, travels, books read, jobs held, events in a baby's first year and goals. (See the Appendix for a complete list).

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1 http://docs.cosi.clarkson.edu/wiki/Guiding_Principles

However, the true power of our application is that anyone can create new timelines to represent precisely the information they want to record and nothing more.

We expect many people to create timelines based on their interests and expertise. For example, a doctor could develop timelines for patients to record their pain levels throughout the day, a bird watcher could develop timelines to record relevant details of the birds they have seen, or a climatologist could develop timelines for recording changing signs of the seasons.

3.1 XML Representation

Timelines are first expressed as a simple XML file. A simple GUI application will be implemented to allow users to create timelines without editing XML files directly.

Listing 1 contains a sample XML file for a "BlogOnTheGo" timeline. Each entry in the "BlogOnTheGo" timelime contains three fields - a title, a body and a photo. The XML file also specifies the name of the timeline as well as one or more tags to categorize the timeline.

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE TIMELINE PUBLIC "-//DLL//DTD TIMELINE 1.0//EN"
 "http://www.digitallifelines.com/dtds/1.0/timeline.dtd">
<timeline id="BlogOnTheGo" version="1.0">
  <name>BlogOnTheGo</name>

  <tag>Personal</tag>

  <field type="text">
    <id>title</id>
    <label>Title</label>
  </field>

  <field type="textarea">
    <id>body</id>
    <label>Body</label>
  </field>

  <field type="photo">
    <id>photo</id>
    <label>Photo</label>
  </field>
</timeline>
```

Listing 1, XML File For BlogOnTheGo Timeline

The BlogOnTheGo example illustrates three of the possible field types—text, textarea, and photo. We also support boolean, double, and integer fields as well as a select type. The select

type is used to specify the options in a drop-down list of choices. We also plan to add support for audio types.

By default, all timelines also contain a timestamp field and location information (i.e. longitude and latitude) as supported by the individual mobile device. These default values are recorded automatically when the user records an entry in a timeline.

Listing 2 contains the XML file for a “Baby's First Year” timeline. It contains a select type containing a list of common first events in a child's life. (Only a few of the select choices are listed here, but the entire list is in the Appendix.) The “Baby's First Year” timeline also contains a textarea field for comments and a photo field. It contains two tags—Baby and Family.

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE TIMELINE PUBLIC "-//DLL//DTD TIMELINE 1.0//EN"
 "http://www.digitallifelines.com/dtds/1.0/timeline.dtd">
<timeline id="BabysFirstYear" version="1.0">
        <name>Baby's First Year</name>

        <tag>Baby</tag>
        <tag>Family</tag>

        <field type="select">
                <id>type</id>
                <label>First</label>
                <option>First bath</option>
                <option>Turns over</option>
                <option>Grasps objects</option>
                <option>Sleeps Through Night</option>
                  .....
                <option>Says Mommy</option>
                <option>Says Daddy</option>
        </field>

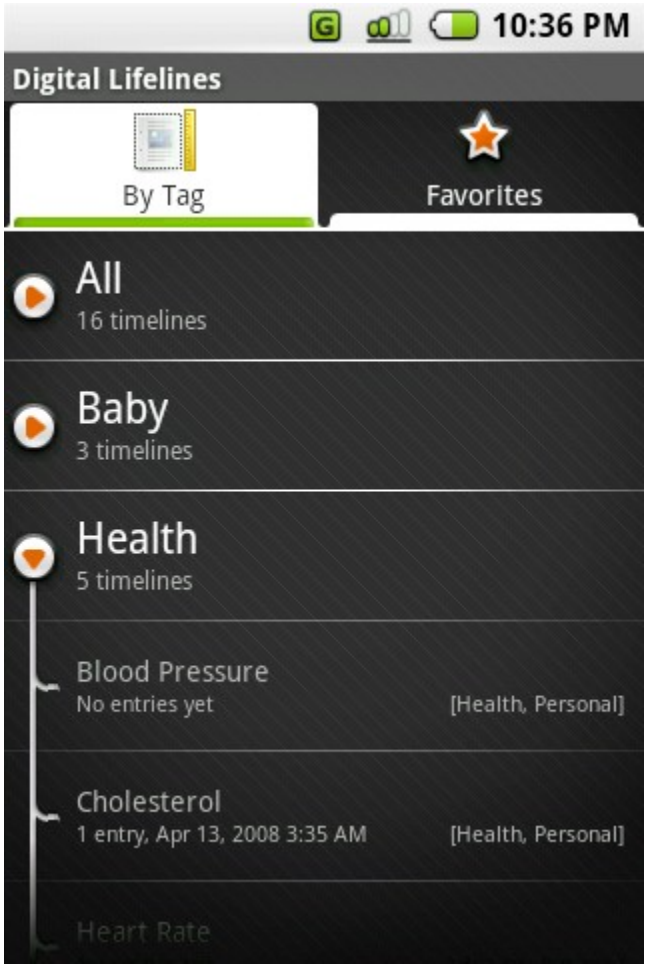
        <field type="textarea">
                <id>comments</id>
                <label>Comments</label>
        </field>

        <field type="photo">
                  <id>photo_name</id>
                  <label>Photo</label>
         </field>
</timeline>
```

Listing 2, XML File For Baby's First Year Timeline

3.2 List of Timelines

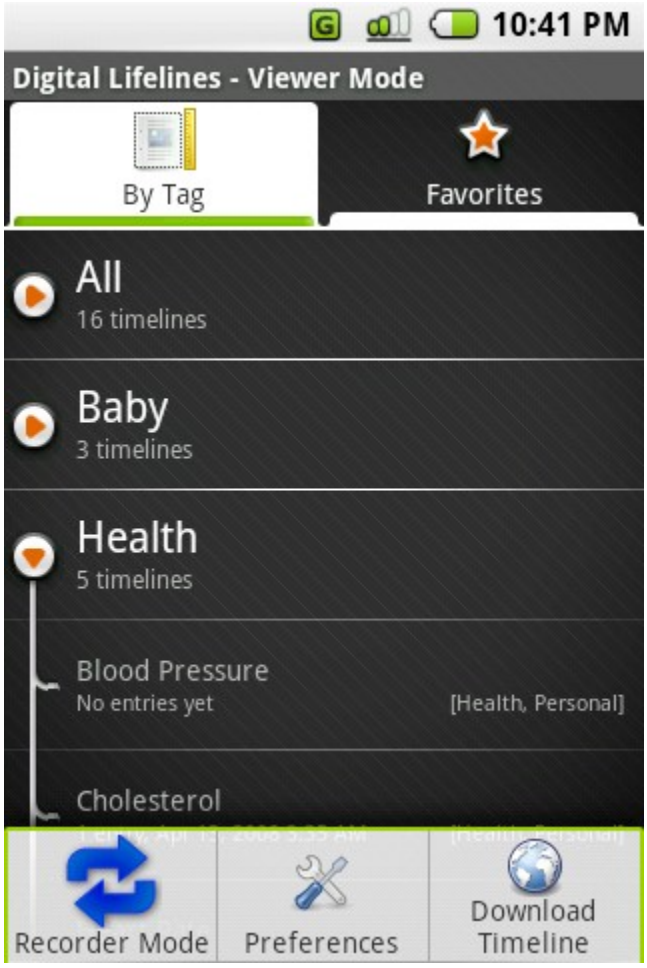
From the Android homescreen, a user chooses the Lifelines icon and a list of timelines is displayed. The "By Tag" tab contains a list of all timelines organized by tag and the "Favorites" tab contains a list of timelines that have been tagged as a favorite.



In each list, a few basic statistics about each timeline are displayed below the name including the number of entries, the timestamp of the most recent entry added, and a list of all tags applied to the timeline.

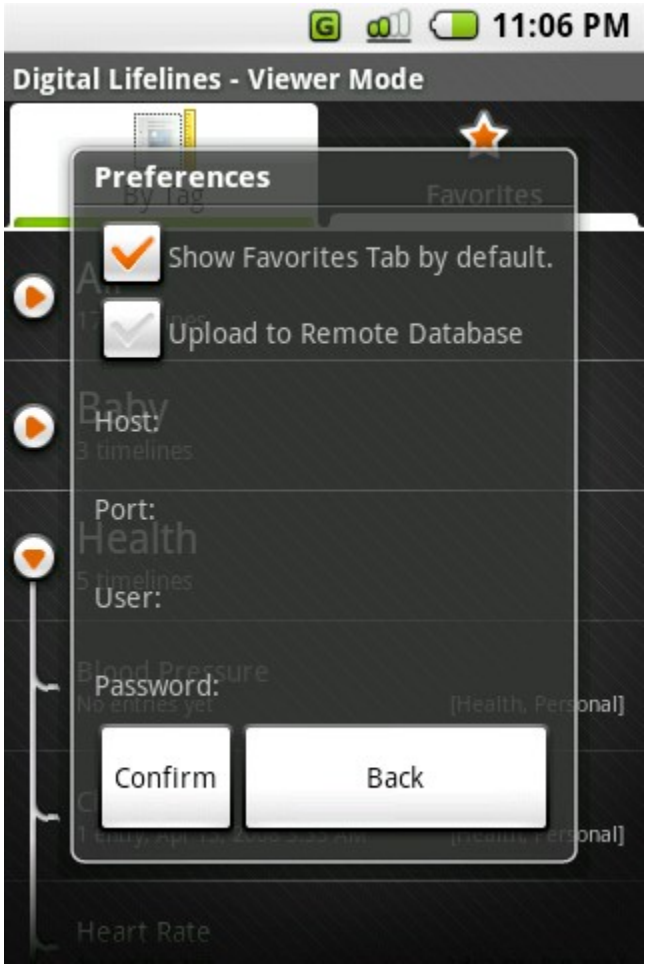
Tags are used to group together a set of related timelines. For example, our sample timelines include a set of health statistics. Each is its own timeline, but they are related through the Health tag. Favorites are implemented as a special tag that can be set by the user. In the display, if a timeline has multiple tags, it will be listed under each one.

There are three additional menu options available from the list of timelines—Recorder/Viewer Mode, Preferences, and Download Timeline.

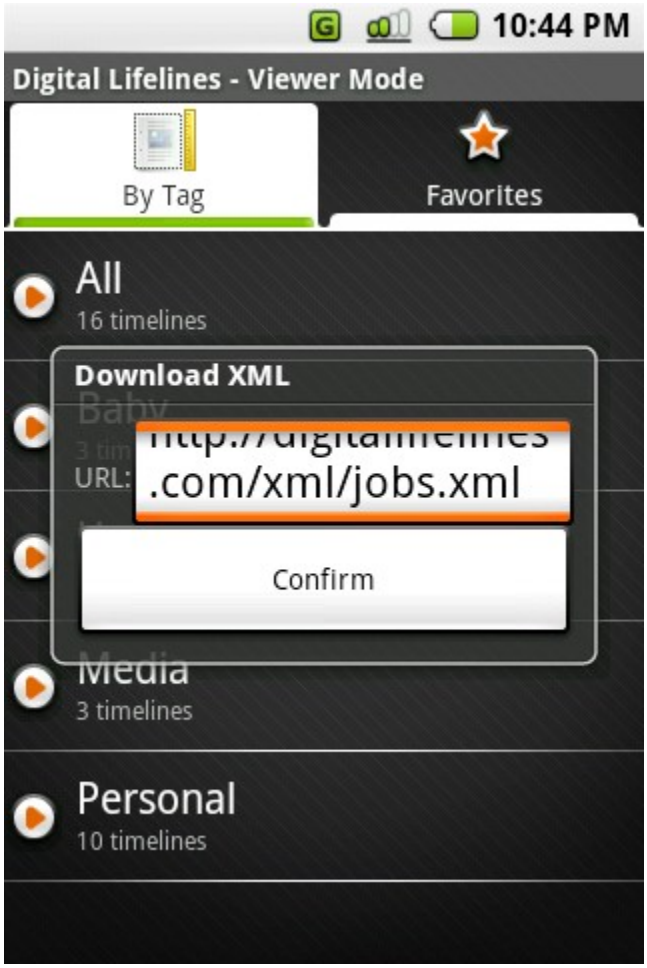


Recorder Mode/Viewer Mode - The user can switch between Recorder Mode and Viewer Mode. In Recorder Mode, when the user chooses a timeline, she is taken to the recorder screen for that timeline to create a new entry. In Viewer Mode, when the user chooses a timeline, she is taken to a list of current entries. We describe the Recorder and Viewer functions in more detail in later sections. Recorder Mode is the default and when Viewer Mode is chosen the title bar is updated to say “Digital Lifelines – Viewer Mode”.

Preferences - We also offer a preferences screen where users can set overall options for the application. Currently, the only implemented option is whether to initially display the "Favorites" or the "By Tag" tab. Our preferences screen also contains options for setting a hostname, port number, username, and password to enable logging of entries to remote databases. However, remote logging is not fully implemented, and thus not supported in this release.

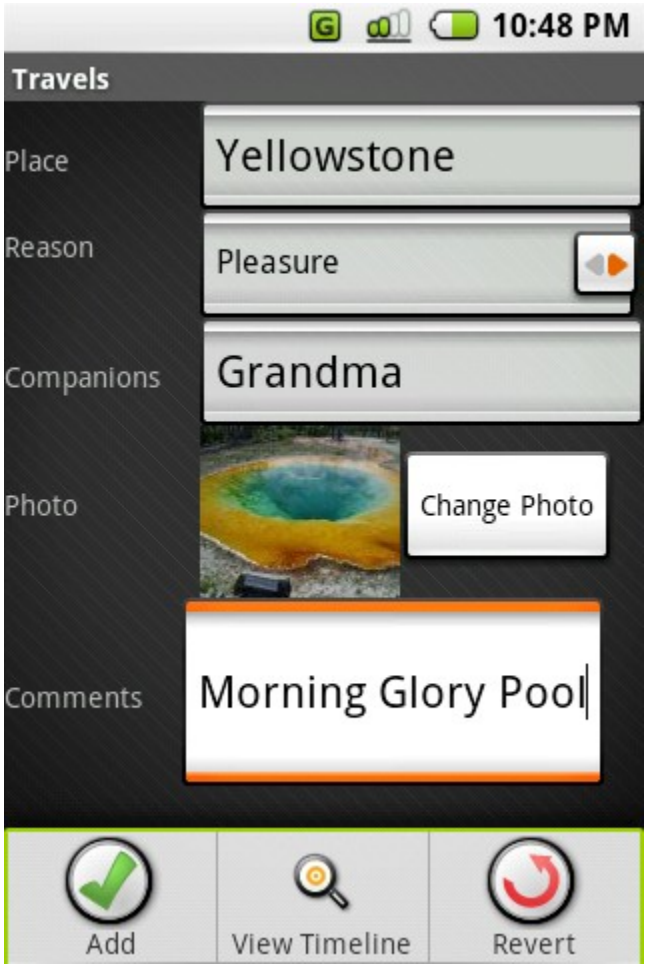


Download Timeline - The user can add new timelines to the device by downloading an XML file from the web to create a new timeline on their device. This feature enables people to easily share timelines they have created with others. To test this feature, feel free to download one of the other timelines denoted by a star in the Appendix. The newly downloaded timeline will appear in the list of timelines. An error will be reported if the file is missing or in an incorrect format.



3.3 Recorder

Like the database tables, the recorder screen is generated automatically for each timeline based on the information in the XML file. We simply arrange the GUI elements in the same order specified in the XML file and label each element with the string in the `<label>` tag. We have a standard GUI representation for each field type (TEXT, TEXTAREA, PHOTO, INTEGER, BOOLEAN, DOUBLE and SELECT).



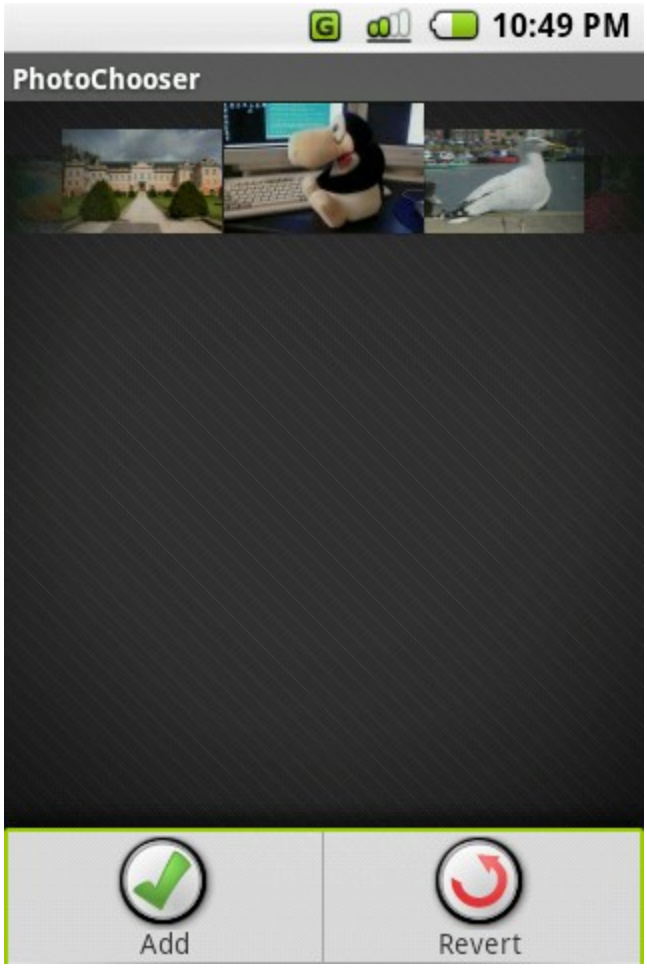
There are three menu options for a Recorder screen: “Add”, “View Timeline”, and “Revert”.

Add - Records the information entered by the user. After choosing “Add”, the user will be returned to the list of timelines. The timeline statistics (number of entries and last timestamp) will be updated to reflect the recent addition, providing the user with active feedback on the success of their action. The user can also choose not to record data by using the standard “back” button to return to the list of timelines.

View Timeline - Displays a list of current entries in this timeline. The standard “back” button can be used to return to the Recorder screen after viewing existing entries.

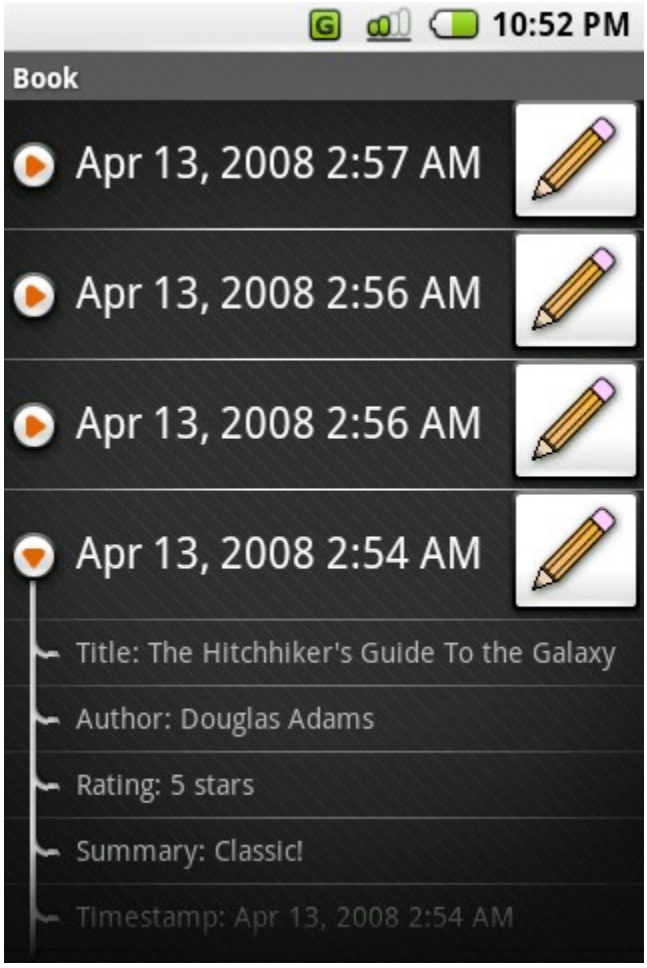
Revert - Returns to the list of timelines without adding a new entry to the timeline.

For timelines that contain a photo type, a photo chooser can be launched by choosing “Add Photo” or “Change Photo”. This brings up a gallery view of available photos. Menu options allow the user to add or change a selected photo or revert without adding a photo. For now, the only available are several included with our application. On an actual Android device with a camera, we would expect to display all available images taken by the user.



3.4 Viewer

Selecting a timeline in Viewer Mode brings up a list of entries ordered by timestamp. (The "View Timeline" menu option in the Recorder screen brings up the same list.) Each entry can be further expanded to display the value of all its fields.

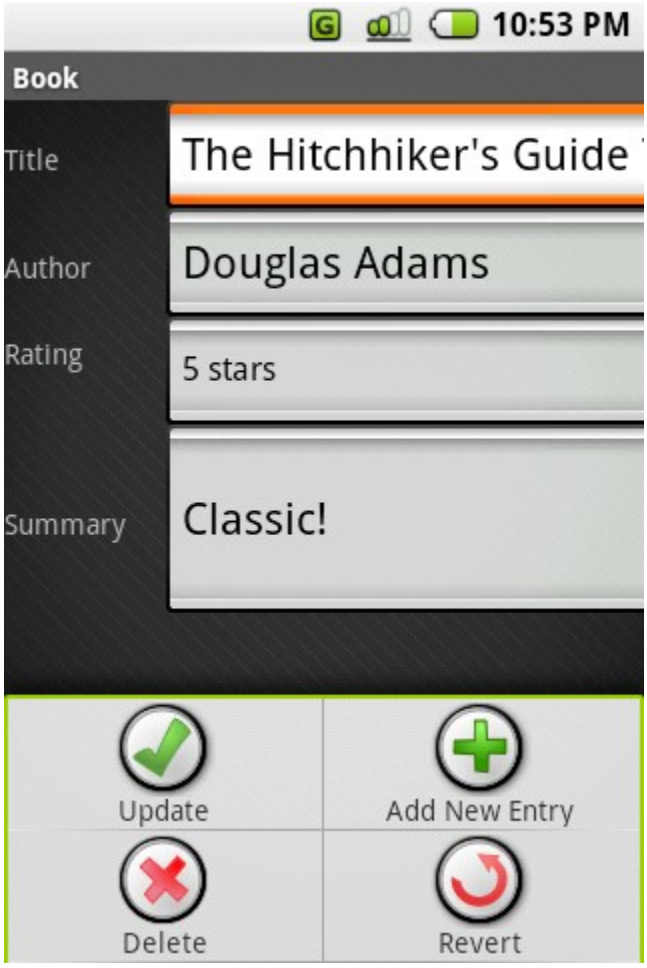


A menu option in the Viewer allows the user to toggle whether a timeline is classified as a favorite. If the timeline is not currently a favorite, the menu option will read “Add to Favorites”. If the timeline is already a favorite, the menu option will read “Remove from Favorites”.



From the Viewer, the user can also choose to edit any entry by choosing the Edit icon next to the entry. A recorder screen similar to the original recorder screen for the timeline will be displayed. The fields will be filled with the original data entered and the user can edit the content as desired.

When the user chooses the “Update” menu option, the modified data will be updated in the database. In this case, the timestamp and the original location information will not be changed. If instead he chooses the “Delete” menu option, the original entry will be removed. If he chooses the “Add As New Entry” menu option, the modified data will be added to the database with a new timestamp and location information. The “Revert” option will return to the list of entries without making any changes.



3.5 Storing Timelines In a Database

When a timeline is created, a new SQL table is created to store all entries added to the timeline. The table name is based on the `<timelineid>` tag in the XML file. Column names are chosen based on the `<id>` tag for each field of the XML file and column types are based on the field type.

Listing 3 shows the SQL statement automatically generated when the "BlogOnTheGo" XML file is loaded onto the device. It includes the three fields specified in the XML file (Title, Body and Photo). It also includes four automatically generated fields—a unique id, a timestamp, longitude and latitude.

```
CREATE TABLE BlogOnTheGo (_timelineEntry_id INTEGER PRIMARY KEY,
Title TEXT, Body TEXT, Photo TEXT, timelineEntry_timestamp
TIMESTAMP, timelineEntry_longitude DOUBLE,
timelineEntry_latitude DOUBLE);
```

Listing 3, SQL Create statement for BlogOnTheGo Table

We have several other database tables supporting our application – TimelineTypes, Tags and TimelineTags.

- **TimelineTypes -** The TimelineTypes table contains a row for each Timeline created on the device. For example, when the "BlogOnTheGo" Timeline is loaded, a row containing its name and description is added and it is assigned an unused timeline id.

- **Tags -** XML files describing a timeline contain `<tag>` attributes. In our examples, the "BlogOnTheGo" timeline contained the tag "Personal" and the "Baby's First Year" timeline contained two tags: "Baby" and "Family". These tags are used to organize and group the list of timelines on the Android device. When a timeline contains a new tag, its name will be entered in the Tags table, and it will be assigned an unused tag id.

- **TimelineTags -** The TimelineTags table is used to link tags to timelines. Each row in the table contains a timeline-id and a tag-id. For example, when the "BlogOnTheGo" timeline is created, a row would be added to TimelineTags linking the tag id for "Personal" with the timeline id for "BlogOnTheGo".

3.6 Next Steps

We have a clear list of next steps for the development of our application.

- **Remote Database Logging** - We want to add the ability to log entries to a remote database as well as to the database on the Android device. We have added elements to our preference screen to allow the user to specify remote host, port number, username and password, but logging is not currently supported. After logging to a single remote database is fully implemented, we would like to implement the ability to specify different logging instructions for each timeline. For example, this could be used to send the "BlogOnTheGo" timeline to a blogging site. More generally, communities of people using the same timeline could choose to contribute their data to a shared repository. At all times, users would have control over the data they choose to record and the data they choose to share. We would also like to give users the opportunity specify how long records remain on the Android device (e.g. remove oldest to save space, delete when sent to a remote database, save all).

- **GUI Create Timeline Feature** - We have designed, but not yet implemented, a timeline creator function for the Android device. It would prompt the user to name the timeline and then add a series of fields and tags. For each field, it would prompt the user to select the type from a drop down menu and then enter a name. For each tag, it would prompt the user to select an existing tag from a drop down menu or enter a new tag.

- **Default Timelines Based On Existing Data** - We would like to give the user the ability to treat information that is already collected, such as received calls, dialed calls, or songs played, as a timeline.

- **Field Types** - We would like to add additional field types based on the capabilities of specific devices. For example, for devices with the ability to make audio records, we would like to offer an audio field type. We would also like to warn the user if an XML file they've downloaded includes fields not supported on their device.

- **Timeline Version Management** - We would like to allow users to modify existing timelines by adding or removing fields, changing field names and adding elements to a SELECT list. Currently this requires them to create a new timeline with the new properties. We would like to support some modifications to existing timelines. This would require modification of the underlying database structure.

- **Per Entry Tagging** - We currently allow timelines to be tagged, but we would like to allow individual entries to be tagged as well.

- **Desktop Timeline Viewing and Manipulation** - We envision a sophisticated companion application designed to be used on a desktop machine. This application would support importing timelines collected on the Android device as well as timelines from other sources (e.g. emails sent/received). It would allow general search and edit functions and support graphing of timeline entries and values. A single timeline could be separated into multiple timelines based on specific search criteria. Multiple timelines could also be graphed together, compared or merged. It would support exporting of timelines including features to support modifying fields to anonymize data.

  We are especially interested in implementing a variety of timeline viewing options. For example, the viewer could graph how the value of a specific field varies over time. An alternate view could allow the user to slice through all their timelines and display the entry in each timeline with the timestamp closest to a specified date/time. This could be used to examine many aspects of one's life as of a particular date in the past (most recent job, last book read, last trip taken, height, etc.). Yet another view could display all entries recorded within a certain range of a specific geographic location. This could be used to examine entries you've made from a specific place.

Appendix List of Sample Timelines

Here is a list of the sample timelines included with our project. Several of these are available for download rather than being loaded on the device when the software is installed. These are marked with an asterisk (*) and a URL is provided.

1. Travels
   TEXT Place
   SELECT Reason {Pleasure, Business, Family, Other}
   TEXT Companions
   PHOTO Photo
   TEXTAREA Comments

2. Goals
   SELECT Category {Career, Education, Family, Social, Well-being}
   TEXTAREA Description

3. Milestones
   TEXTAREA Description

4. BlogOnTheGo
   TEXT Title
   TEXTAREA Body
   PHOTO Photo

5. *Jobs (`http://digitallifelines.com/xml/jobs.xml`)
   SELECT Type {Start, End}
   DOUBLE SALARY
   TEXT Title
   TEXT Company
   TEXTAREA Description
   TEXT ContactPerson
   TEXT PhoneNumber

6. Dreams
   TEXTAREA Description

7. Books
   TEXT Title
   TEXT Author
   SELECT Rating {1 star, 2 stars, 3 stars, 4 stars, 5 stars}
   TEXTAREA Summary

8. Music
   TEXT Title
   TEXT Artist
   TEXT Genre
   SELECT Rating {1 star, 2 stars, 3 stars, 4 stars, 5 stars}
   TEXTAREA Summary

9. Movies
   TEXT Title
   TEXT Genre
   TEXT WhereSeen
   TEXT Companions
   SELECT Rating {1 star, 2 stars, 3 stars, 4 stars, 5 stars}
   TEXTAREA Summary

10. Blood Pressure
    INTEGER Systolic
    INTEGER Diastolic

11. Cholesterol
    INTEGER Hdl
    INTEGER Ldl
    INTEGER Triglycerides

12. Height
    DOUBLE Height
    SELECT Units { Inches, Centimeters}

13. Weight
    DOUBLE Weight
    SELECT Units {Pounds, Kilograms}

14. *Blood Sugar (`http://digitallifelines.com/xml/blood_sugar.xml`)
    INTEGER BloodSugar

15. Heart Rate
    INTEGER BeatsPerMinute

16. Exercise
    TEXT Type
    DOUBLE Duration
    TEXTAREA Comment

17. *Medical Appointments (`http://digitallifelines.com/xml/medical.xml`)
    TEXT Type
    TEXT Doctor
    TEXT Place
    TEXT Reason

18. Baby's Firsts
    SELECT First { Baby's Arrival, First Bath, First Haircut, Circumcision, Cord Falls off, Visits doctor, Turns Over, Grasps Objects, Sleeps Through Night, Visits Grandparents, Uses Spoon, Eats Cereal, Discovers Hands, Discovers Feet, Laughs Out Loud, Smiles, Eats Fruit, Eats Vegetables, 1st Upper Tooth Appears, Holds Head Up, Sits Alone, Wears First Shoes, Stands Up Alone, Rolls Over, Pulls Self Up To Standing, Crawls, First Step,

Cruising, Walks Alone, Waves Goodbye, Gives Kisses, Says First Word, Says Mommy, Says Daddy, Drinks From Cup, Sucks on Thumb, Special Visitor, Special Accomplishment, Shots, First Plane Flight, Favorite Food, Favorite Toy, Nickname, Tries New Food, Favorite Song, Favorite Book, Favorite Activity, Diaper Size, Clothes Size, Special Discovery, New Tooth, First Snow, Favorite Game, Favorite Outfit, Happy, Sad, Sick, Wake Up, Goes to Bed, Nap, Talks on the phone}
TEXTAREA Comments
PHOTO Photo

19. Baby's Length
    DOUBLE Length
    SELECT Units { Inches, Centimeters}

20. Baby's Weight
    DOUBLE Weight
    SELECT Units {Pounds, Kilograms}