

Fit for Green Online Notification and Reporting System

*"Fitness Enthusiasts for a Green
Environment"*

A Senior Project
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Acknowledgments

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Introduction

Fit for Green's goal is twofold: make the United States more Fit and more Green. Fit for Green's applications and solutions focus on reducing power consumption in the home & gym, and increasing physical activity.

Motivation

I have always been passionate about technology and fitness. My passion for fitness has led me to achieve multiple (sports medicine) certifications and become a Personal Trainer and Fitness Instructor at the new Cal Poly Recreation Center. My passion for technology has led me to pursue a Computer Engineering degree. Naturally, this project was a great fit for me.

Context

America is facing multiple threats on the home front: obesity and the energy crisis.

If obesity rates continue on their current trajectory, then obesity rates for adults could reach 44% in every state and exceed 60% in 13 states. Currently Americans spend \$190 billion in medical costs every year on obesity-related problems, which equates to 21% of U.S. health care expenditures. It is estimated that obesity-related illnesses will cost citizens an additional \$500 billion in tax revenue between now and 2030. ^{1, 2, 3}

Greenhouse gas issues have the US on a path to catastrophic environmental change by 2050. Some of the effects of continued greenhouse gas emissions include a “warmer atmosphere, warmer and more acidic ocean, higher sea levels, and larger changes in precipitation patterns.” ⁴

Project Goals

The Fit for Green Online Notification and Reporting System will drive the following Fit for Green “BEGIN” directives:

- **B**uild momentum towards mainstream adoption of fitness-generated electricity
- **E**ducate users about energy conservation
- **G**ive users benefits beyond electricity generation tracking
- **I**ncrease fitness activity by providing new motivation factors
- **N**ullify environmental impact of gymnasiums

Problem

Currently no reporting tool exists for owners of the Fit for Green system. Allow the following use cases to illuminate the need for a reporting tool:

Greg is the facilities director at the University of California in Irvine California. His responsibilities include oversight of the equipment and wiring for the Fit for Green and ReRev system. Greg has requested

a daily report to help him to ensure the system is working properly. Getting this daily report will also help Greg to see what is going into the weekly report that the system provides to his managers.

Jill is the gym director at the University of California in Irvine California. Her responsibilities include showing value to the funding committee for the Fit for Green system. She wishes to see important metrics so that she can report progress that has occurred on the system. She may also ask questions about anomalies in trends that she sees.

Solution

The solution was to build an easy-to-use and easily accessible notification and reporting tool. A `web` or `cloud` application, as opposed to a desktop application, seemed to be the best answer. Therefore I chose to implement the application using `HTML`, `JavaScript`, `CSS`, `JQuery`, `PHP`, `cron`, `AJAX`, and `MySQL`.

Besides ease of use, robust error checking and security was of top priority. For instance, the notification system contains thorough form validation and allows no room for malicious attacks (i.e. `SQL` injection). In addition, implementing this project using the latest, most modern versions of all the aforementioned programming languages was also highly prioritized. For example, even though the server hosting the Notification System was running `PHP 5.2`, I made sure to use no functions that have become deprecated in `PHP 5.5` or later. I have worked extensively to "port" functionality/plugin for `JQuery 1.6.4` to the latest `JQuery 1.10.1`.

Figure 1 in the appendix shows the ER-Diagram for the Fit for Green Database. Only the relevant schema is depicted; Fit for Green's database consists of many more tables and attributes. The `reports` entity set is a table I created to fulfill the project requirements.

The interface for the Notification System is depicted in Figure 5. The options for the "Gym" drop-down menu are dynamically loaded from the database through `AJAX`.

A user has two main options for report creation using the reporting tool:

1. Generate a report for any selected day or week, and view it instantly
2. Generate a scheduled weekly or daily report, and view it via email

Option 1 is asserted when the "No" button for the "Ready to email?" part of the form is selected, and the results are displayed on the page using an `AJAX` request, as seen in [Figure 7](#).

If "Yes" is selected for the "Ready to email?" part of the form, then the query in [Figure 2](#) is executed, and the user's form options are saved in the reports table in the database. An example of the received e-mail is shown in [Figure 8](#).

Two `cron` jobs exist: one for the daily scheduled report, and one for the weekly scheduled report. Both of these are `PHP` files that query the reports table in the database, and then execute either the queries from [Figure 3](#) or [Figure 4](#).

Conclusion

This is an effective Notification & Reporting tool that gym administrators can use immediately to create and schedule reports for their individual needs.

Prior to my initial undertaking of this project, I had no experience with `JavaScript`, `JQuery`, `PHP`, `cron`, `AJAX`, or `SQL`. Now I can say I am quite comfortable with all of these languages.

My future ideas and plans for this project include:

- A Notification & Reporting System for gym *members*, and not just gym *administrators*
- Ability to generate custom queries
- A log-in form to access the Reporting System, which limits functionality of the system based on the user's permissions
- Visual graphs (for instant reports)
- Ability to view and remove previously scheduled reports
- Enhanced styling

Appendix

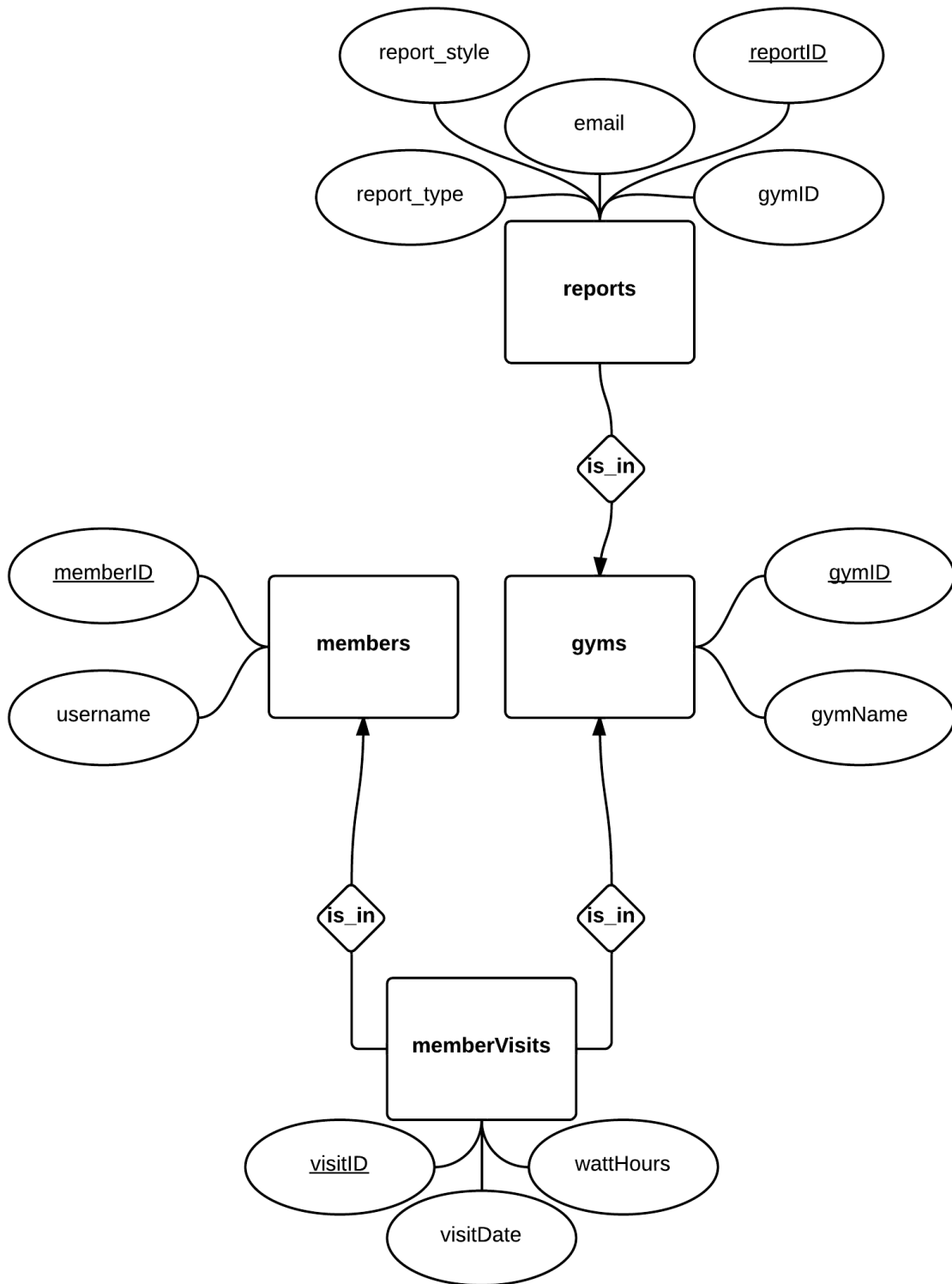


Figure 1: Pertinent tables and relevant attributes of the Fit for Green Database

```

if($readyToEmail == 'true'){
    $sQuery = <<<EOD
        INSERT INTO reports(gymID, email, report_type, report_style) VALUES (?, ?, ?, ?);
    EOD;
}

```

Figure 2: Query executed when user wishes to have the report delivered to them on a scheduled basis

```

$executeQuery = <<<EOD
    SELECT gymID, email, report_type, report_style
    FROM reports
    WHERE report_type = 'daily';
EOD;

$queries[0] = <<<EOD
    SELECT COUNT(*) AS "Number of Sessions Registering More Than 5 Watt-Hours"
    FROM memberVisits mv
    WHERE mv.wattHours > 5 AND mv.gymID = {$gym_id} AND DATE(mv.visitDate) = CURDATE();
EOD;

$queries[1] = <<<EOD
    SELECT COUNT(DISTINCT mv.memberID) AS "Number of Users That Logged In"
    FROM memberVisits mv
    WHERE mv.gymID = {$gym_id} AND DATE(mv.visitDate) = CURDATE();
EOD;

$queries[2] = <<<EOD
    SELECT FORMAT(AVG(mv.wattHours), 2) AS "Average Watt-Hours Per Session"
    FROM memberVisits mv
    WHERE mv.gymID = {$gym_id} AND DATE(mv.visitDate) = CURDATE();
EOD;

$queries[3] = <<<EOD
    SELECT FORMAT(AVG(x.WattsPerHour), 2) AS "Average Watt-Hours Generated Per Hour"
    FROM (SELECT EXTRACT(HOUR FROM mv.visitDate) AS HourOfDay,
          SUM(mv.wattHours) AS WattsPerHour
          FROM memberVisits mv
          WHERE mv.gymID = {$gym_id} AND DATE(mv.visitDate) = CURDATE()
          GROUP BY HourOfDay) x;
EOD;

$queries[4] = <<<EOD
    SELECT CONCAT(mb.username, ': ', FORMAT(x.Watts, 2)) AS
        "User With Highest Watt-Hours For a Session"
    FROM members mb,
        (SELECT MAX(mv.wattHours) AS Watts
         FROM memberVisits mv
         WHERE mv.gymID = {$gym_id} AND DATE(mv.visitDate) = CURDATE()) x
    WHERE mb.memberID = (SELECT tmp.maxMember
                        FROM (SELECT MAX(mv.wattHours), mv.memberID AS maxMember
                             FROM memberVisits mv
                             WHERE mv.gymID = {$gym_id} AND
                                 DATE(mv.visitDate) = CURDATE()) tmp);
EOD;

```

Figure 3: Queries for the Daily Report (that cron executes)


```

$executeQuery = <<<EOD
    SELECT gymID, email, report_type, report_style
    FROM reports
    WHERE report_type = weekly;
EOD;

$queries[0] = <<<EOD
    SELECT CONCAT(RPAD(DATE_FORMAT(mv.visitDate, '%W the %D'), 18, ' '), ' averaged ',
        FORMAT(AVG(mv.wattHours), 2), ' watt-hours per session.') AS "Average Watt-
        Hours Generated Each Day"
    FROM memberVisits mv
    WHERE mv.gymID = {$gym_id} AND (mv.visitDate <= CURDATE() AND
        mv.visitDate > DATE_SUB(CURDATE(), INTERVAL 1 WEEK))
    GROUP BY DATE(mv.visitDate);
EOD;

$queries[1] = <<<EOD
    SELECT CONCAT(mb.username, ': ', tmp.TotalWatts, ' watts') AS "User With Highest
        Watt-Hours For A Session This Week"
    FROM (SELECT MAX(mv.wattHours) AS TotalWatts, mv.memberID AS maxMember
        FROM memberVisits mv
        WHERE mv.gymID = {$gym_id} AND
            (mv.visitDate <= CURDATE() AND mv.visitDate > DATE_SUB(CURDATE(),
                INTERVAL 1 WEEK))) tmp,
        members mb
    WHERE mb.memberID = tmp.maxMember;
EOD;

```

Figure 4: Queries for the Weekly Report (that cron executes)

Gym ID:

Report Type:

Select Report Style:

Ready to e-mail?

Figure 5: Initial State of Form

Gym ID: 1 - UCI ARC ✓

Report Type: Weekly ✓

Selected Date:

Select Report Style: Top ✓

Ready to e-mail?

Su	Mo	Tu	We	Th	Fr	Sa
27	28	29	30	31	1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

Generate Report

Figure 6: Selecting a date for the instant report

Gym ID: ✓

Report Type: ✓

Selected Date: ✓

Select Report Style: Headers On Left Headers On Top ✓

Ready to e-mail? Yes No ✓

Here's your report:

Average Watt-Hours Generated Each Day	Saturday the 9th averaged 5.93 watt-hours per session.
	Sunday the 10th averaged 4.44 watt-hours per session.
	Monday the 11th averaged 8.24 watt-hours per session.
	Tuesday the 12th averaged 8.21 watt-hours per session.
	Wednesday the 13th averaged 5.87 watt-hours per session.
	Thursday the 14th averaged 0.17 watt-hours per session.
Friday the 15th averaged 275.47 watt-hours per session.	
User With Highest Watt-Hours For A Session This Week	NoUsrG1: 275.47 watts

Figure 7: Results of the instant report (displayed on the same page)

 **Fit For Green** <ffg.reporter@fitforgreen.com>
to me

Here is your daily Fit for Green report!

Number of Sessions Registering More Than 5 Watt-Hours	35
Number of Users That Logged In	1
Average Watt-Hours Per Session	5.87
Average Watt-Hours Generated Per Hour	34.91
User With Highest Watt-Hours For a Session	NoUsrG1: 80.55

Fit for Green Notifications

Fit for Green - Fitness enthusiasts for a Green Environment

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Figure 8: Screenshot of received email from the Notification System

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