566 E-Guard Report

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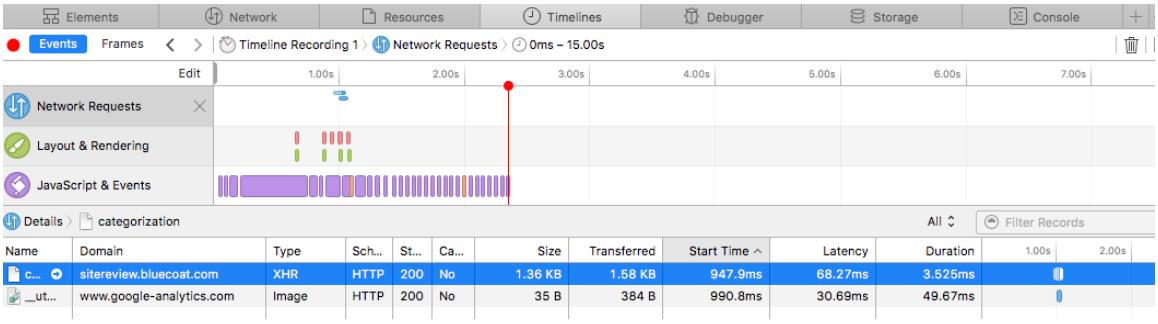
1. Related Software and Libraries

1. MAMP or XAMPP is used as Apache server and MySql DB setup. The program under *E-Guard/E-Guard-Server* is running on the Apache Server under the directory *localhost/E-Guard/E-Guard-Server.*
2. I use the Atom, MAMP, XDEBUG to debug the PHP files. MAMP PRO has the settings for XDEBUG in php.ini file, which is the easiest way to set up the XDEBUG because we could have multiple PHP versions and it is very hard to set the XDEBUG for all different versions. While MAMP has the option for you so that you don't need to worry about the XDEBUG settings.
3. *Chrome.tabs* is the main Chrome API I used to control the chrome's page. Every time user access to a new page, the extension's background.js will check if the URL is allowed.
4. Bluecoat REST API is the web service I used to get access to the Bluecoat Database to check the current URL belongs to which category.

2. Bluecoat Review for categorizing the URL

Actually, I didn't find any well-defined API so I take a look at the Timeline events from the developer tool. And I found the actual request when I search in the Bluecoat Website: http://sitereview.bluecoat.com/sitereview.jsp .



The actual request is here:

```
curl 'http://sitereview.bluecoat.com/rest/categorization' \
-XPOST \
-H 'Content-Type: application/x-www-form-urlencoded; charset=UTF-8'
\
-H 'Referer: http://sitereview.bluecoat.com/sitereview.jsp' \
-H 'Accept: */*' \
-H 'User-Agent: Mozilla/5.0 (Macintosh; Intel Mac OS X 10_12_4)
```

```
AppleWebKit/603.1.30 (KHTML, like Gecko) Version/10.1
Safari/603.1.30' \
-H 'Origin: http://sitereview.bluecoat.com' \
-H 'X-Requested-With: XMLHttpRequest' \
--data 'url=www.google.com'
```

And then I implement the custom request in my server side like this in the Server Side:

```
        $post_data = array(
             'url' => $request
        );
        $postdata = http_build_query($post_data);
        $options = array(
            'http' => array(
                'method' => 'POST',
                'header' => 'Content-type:application/x-www-form-
urlencoded',
                'content' => $postdata,
                'timeout' => 15 * 60
            )
        );
        $context = stream_context_create($options);
        // query the bluecoat to check the website category
        $result =
file_get_contents('http://sitereview.bluecoat.com/rest/categorizatio
n', false, $context);
        $jsonResult = json_decode($result, true);
```

3. Installation Steps

1. Create a DB in Phpmyadmin called e_guard. Import the *DB.sql* from the directory *{server root directory}/E-Guard/E-Guard-Database*
2. Load the extension directory: *./E-Guard/E-Guard-Client* from the Chrome Extension Page.
3. You can click the E-Guard Extension -> Options to get to the configuration page.
4. You can uninstall it by click the uninstall icon from the Chrome Extension page.

4. User Interface

a. Chrome Extension Popup Page

This is the Client side of my E-Guard chrome extension. I implemented 3 visualization pages for visualizing the time spent on visited websites, Bar Chart, Table, Chart.

There are 3 ways to view the time spent on visited websites, Today, Average and All Time. These are just the same localStorage data in Chrome extension labeled differently.

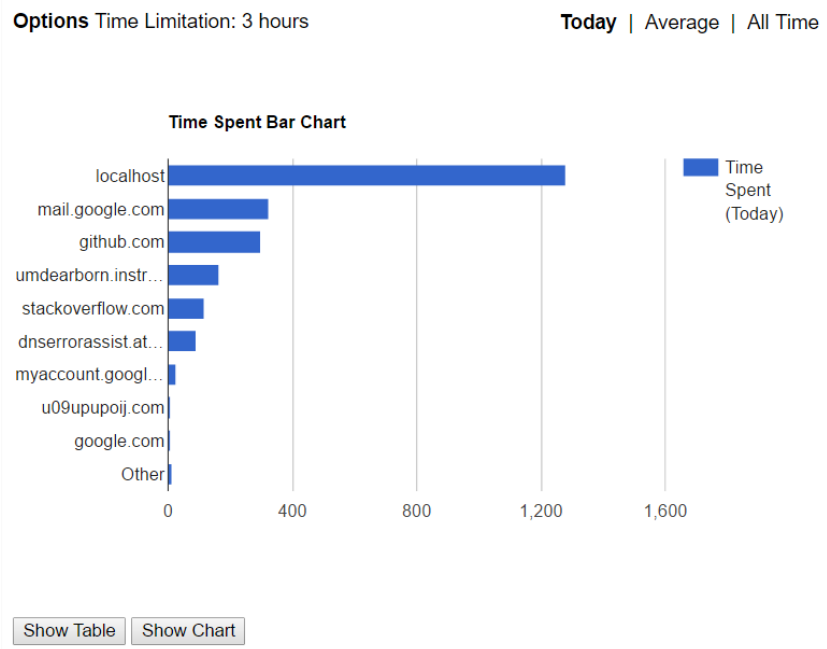


Figure 1 Bar Table

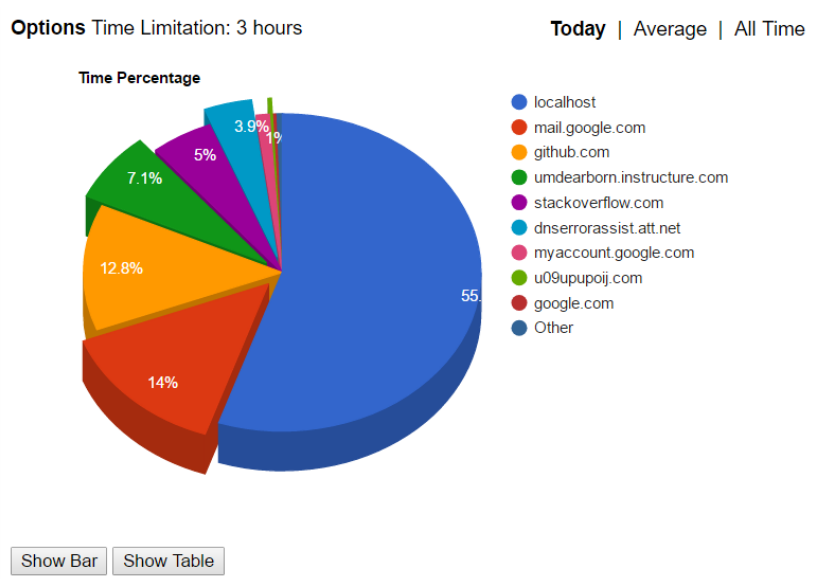


Figure 2 Chart

Options Time Limitation: 3 hours **Today** | Average | All Time

DOMAIN	TIME SPENT (TODAY)
localhost	21 minutes and 21 seconds
mail.google.com	5 minutes and 24 seconds
github.com	4 minutes and 57 seconds
umdearborn.instructure.com	2 minutes and 45 seconds
stackoverflow.com	1 minute and 57 seconds
dnserrorassist.att.net	1 minute and 30 seconds
myaccount.google.com	24 seconds
u09upupoij.com	6 seconds
google.com	6 seconds
Other	12 seconds
Total	38 minutes and 42 seconds

Show Bar Show Chart

Figure 3 Table

b. Configuration Page

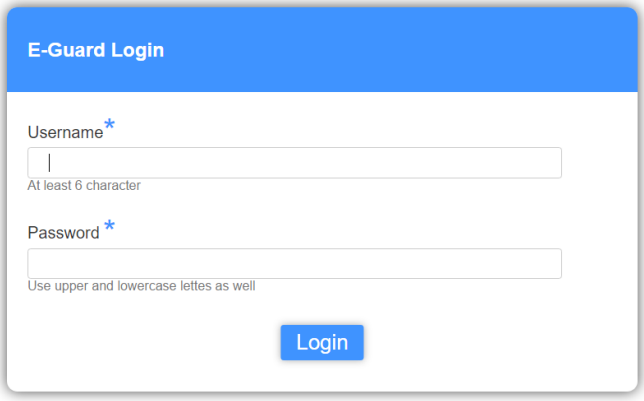


Figure 4 User Login

Right click the extension option to go to the User Login page.

The default configuration for the E-Guard User Login page is here: Username: ztlevi, Password: ztlevi. It is defined in the *DB.sql* 's table called eguard_user which is the parent user. You can modified it manually in the database. I didn't implement a website side way to do the user registration because I don't want to implement a user registration validation. But it could be done further.

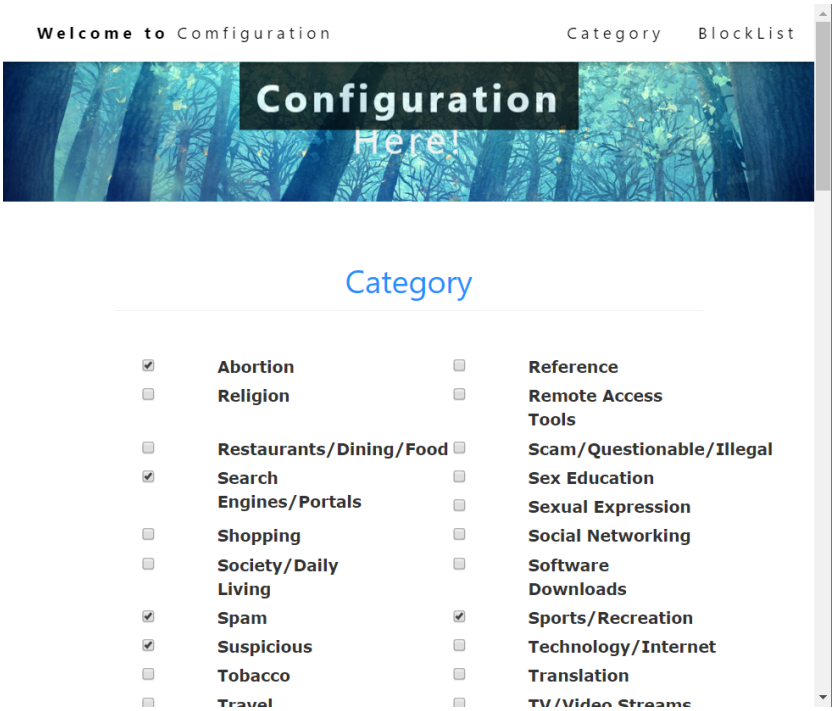


Figure 5 Pick Categories

Once logged into the Configuration Page, parent user can check the categories he/she wants to block in the Configuration Page.

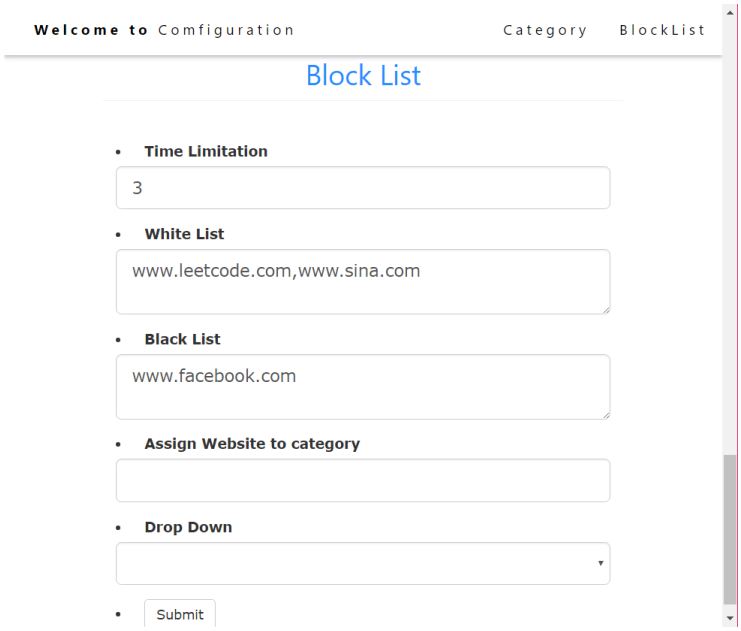


Figure 6 Block List

Parent User can also define the Time Limitation, White List, Black List in the Configuration Page. User could also assign the website to category if the website is categorized as “Uncategorized” by Bluecoat.

c. Database Structure

Table	Action	Rows	Type	Collation	Size	Overhead
block_category	Browse Structure Search Insert Empty Drop	13	InnoDB	latin1_swedish_ci	16 KiB	-
eguard_user	Browse Structure Search Insert Empty Drop	1	InnoDB	latin1_swedish_ci	16 KiB	-
timer	Browse Structure Search Insert Empty Drop	0	InnoDB	utf8_general_ci	16 KiB	-
website_black_list	Browse Structure Search Insert Empty Drop	1	InnoDB	latin1_swedish_ci	16 KiB	-
website_category	Browse Structure Search Insert Empty Drop	139	InnoDB	latin1_swedish_ci	16 KiB	-
website_white_list	Browse Structure Search Insert Empty Drop	2	InnoDB	latin1_swedish_ci	16 KiB	-
6 tables	Sum	156	InnoDB	latin1_swedish_ci	96 KiB	0 B

Figure 7 MySql

5. Class Diagrams

a. Singleton

The Singleton Design Pattern is used to implement the Timer class. Singleton Pattern makes sure the Timer only has one instance in the System. Timer is used to set the time limitation for the E-Guard. If the user exceeds the time limitation, the E-Guard will prevent the user to browser on the Chrome browser.

UML

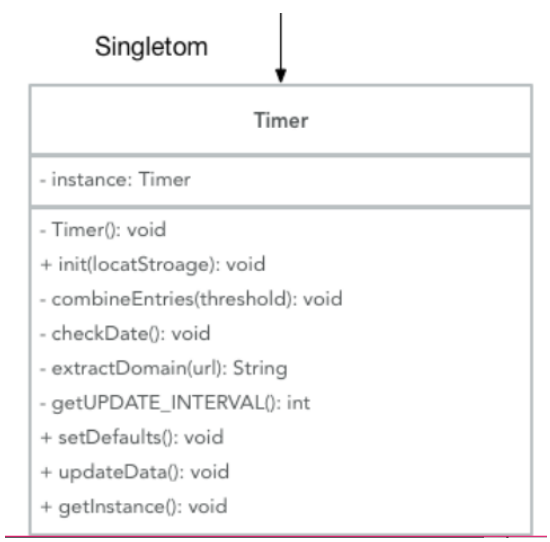


Figure 8 Singleton UML

Source Code:

```
//declare Timer CLass
var Timer = (function(){
    var instance;
    function init(localStorage){
    // Interval (in seconds) to update timer
        var UPDATE_INTERVAL = 3;
        var limitedTime = parseInt(localStorage["timeLimitation"]);
```

```
        // Add sites which are not in the top threshold sites to "other"
category
        // WARNING: Setting the threshold too low will schew the data set
        // so that it will favor sites that already have a lot of time but
        // trash the ones that are visited frequently for short periods of time
        var combineEntries = function (threshold) {
            var domains = JSON.parse(localStorage["domains"]);
            var other = JSON.parse(localStorage["other"]);
            // Don't do anything if there are less than threshold domains
            if (Object.keys(domains).length <= threshold) {
                return;
            }
            // Sort the domains by decreasing "all" time
            var data = [];
            for (var domain in domains) {
                var domain_data = JSON.parse(localStorage[domain]);
                data.push({
                    domain: domain,
                    all: domain_data.all
                });
            }
            data.sort(function (a, b) {
                return b.all - a.all;
            });
            // Delete data after top threshold and add it to other
            for (var i = threshold; i < data.length; i++) {
                other.all += data[i].all;
                var domain = data[i].domain;
                delete localStorage[domain];
                delete domains[domain];
            }
            localStorage["other"] = JSON.stringify(other);
            localStorage["domains"] = JSON.stringify(domains);
        }
       // Check to make sure data is kept for the same day
        var checkDate = function () {
            var todayStr = new Date().toLocaleDateString();
            var saved_day = localStorage["date"];
            if (saved_day !== todayStr) {
                // Reset today's data
                var domains = JSON.parse(localStorage["domains"]);
                for (var domain in domains) {
                    var domain_data = JSON.parse(localStorage[domain]);
                    domain_data.today = 0;
                    localStorage[domain] = JSON.stringify(domain_data);
                }
                // Reset total for today
                var total = JSON.parse(localStorage["total"]);
                total.today = 0;
                localStorage["total"] = JSON.stringify(total);
                // Combine entries that are not part of top 500 sites
                combineEntries(500);
                // Keep track of number of days web timer has been used
```

```
                localStorage["num_days"] = parseInt(localStorage["num_days"]) +
1;
                // Update date
                localStorage["date"] = todayStr;
            }
        }
       // Extract the domain from the url
        // e.g. http://google.com/ -> google.com
        var extractDomain = function (url) {
            var re = /:\/\/(www\.)?(.+?)\//;
            return url.match(re)[2];
        }
       var inBlacklist = function (url) {
            if (!url.match(/^http/)) {
                return true;
            }
            var blacklist = JSON.parse(localStorage["blacklist"]);
            for (var i = 0; i < blacklist.length; i++) {
                if (url.match(blacklist[i])) {
                    return true;
                }
            }
            return false;
        }
        return {
            getUPDATE_INTERVAL : function () {
                return UPDATE_INTERVAL;
            },
       //set Time limitation
            setTimer : function(time){
                limitedTime = time*60*60;

            },
           getTimer : function(){
              return limitedTime;
            },
       // Set default settings
            setDefaults : function () {
                // Set blacklist
                if (!localStorage["blacklist"]) {
                    localStorage["blacklist"] =
JSON.stringify(["example.com"]);
                }
                // Set number of days Web Timer has been used
                if (!localStorage["num_days"]) {
                    localStorage["num_days"] = 1;
                }
                // Set date
                if (!localStorage["date"]) {
                    localStorage["date"] = new Date().toLocaleDateString();
                }
                // Set domains seen before
                if (!localStorage["domains"]) {
```

```
                    localStorage["domains"] = JSON.stringify({});
                }
                // Set total time spent
                if (!localStorage["total"]) {
                    localStorage["total"] = JSON.stringify({
                        today: 0,
                        all: 0
                    });
                }
                if (!localStorage["timeLimitation"]){
                    localStorage["timeLimitation"] = 7200;
                }
                // Limit how many sites the chart shows
                if (!localStorage["chart_limit"]) {
                    localStorage["chart_limit"] = 9;
                }
                // Set "other" category
                // NOTE: other.today is not currently used
                if (!localStorage["other"]) {
                    localStorage["other"] = JSON.stringify({
                        today: 0,
                        all: 0
                    });
                }
            },
            // Update the data
            updateData : function () {
                // Only count time if system has not been idle for 30 seconds
                chrome.idle.queryState(30, function (state) {
                    if (state === "active") {
                        // Select single active tab from focused window
                        chrome.tabs.query({'lastFocusedWindow': true, 'active':
true}, function (tabs) {
                            if (tabs.length === 0) {
                                return;
                            }
                            var tab = tabs[0];
                            // Make sure 'today' is up-to-date
                            checkDate();
                            if (!inBlacklist(tab.url)) {
                                var domain = extractDomain(tab.url);
                                // Add domain to domain list if not already
present
                                var domains =
JSON.parse(localStorage["domains"]);
                                if (!(domain in domains)) {
                                    domains[domain] = 1;
                                    localStorage["domains"] =
JSON.stringify(domains);
                                }
                                var domain_data;
                                if (localStorage[domain]) {
```

```
                                    domain_data =
JSON.parse(localStorage[domain]);
                                } else {
                                    domain_data = {
                                        today: 0,
                                        all: 0
                                    };
                                }
                                domain_data.today += UPDATE_INTERVAL;
                                domain_data.all += UPDATE_INTERVAL;
                                localStorage[domain] =
JSON.stringify(domain_data);
                                // Update total time
                                var total = JSON.parse(localStorage["total"]);
                                total.today += UPDATE_INTERVAL;
                                if (total.today >
parseInt(window.localStorage["timeLimitation"])){
                                    chrome.windows.getCurrent(function(window){
                                        alert("Exceed the time limitation!
\nPlease contact the administrator to modify limited time.");
                                        chrome.windows.remove(window.id);
                                    });
                                }
                                total.all += UPDATE_INTERVAL;
                                localStorage["total"] = JSON.stringify(total);
                                // Update badge with number of minutes spent on
                                // current site
                                var num_min = Math.floor(domain_data.today /
60).toString();
                                if (num_min.length < 4) {
                                    num_min += "m";
                                }
                                chrome.browserAction.setBadgeText({
                                    text: num_min
                                });
                            } else {
                                // Clear badge
                                chrome.browserAction.setBadgeText({
                                    text: ""
                                });
                            }
                        });
                    }
                });
            }
        }
    }
    return{
    getInstance: function(localStorage) {

        if ( !instance ) {
            instance = init(localStorage);
        }
```

```
        return instance;
    }
    }
})();
```

b. Façade

Façade Design Pattern is used to help the E-Guard System to control the system overall. The Client Side (Chrome extension) communicates the Server Side (program run on the Apache server) through the Control_Facade. Both the View_HomePage (extension popup page) and the View_OptionPage (extension option page) will send request to the Control_Facade. Also the background.js of the Chrome extension talks to the Control_Facade too.

Additionally, Control_Facade controls the classes of CoR described below.

UML

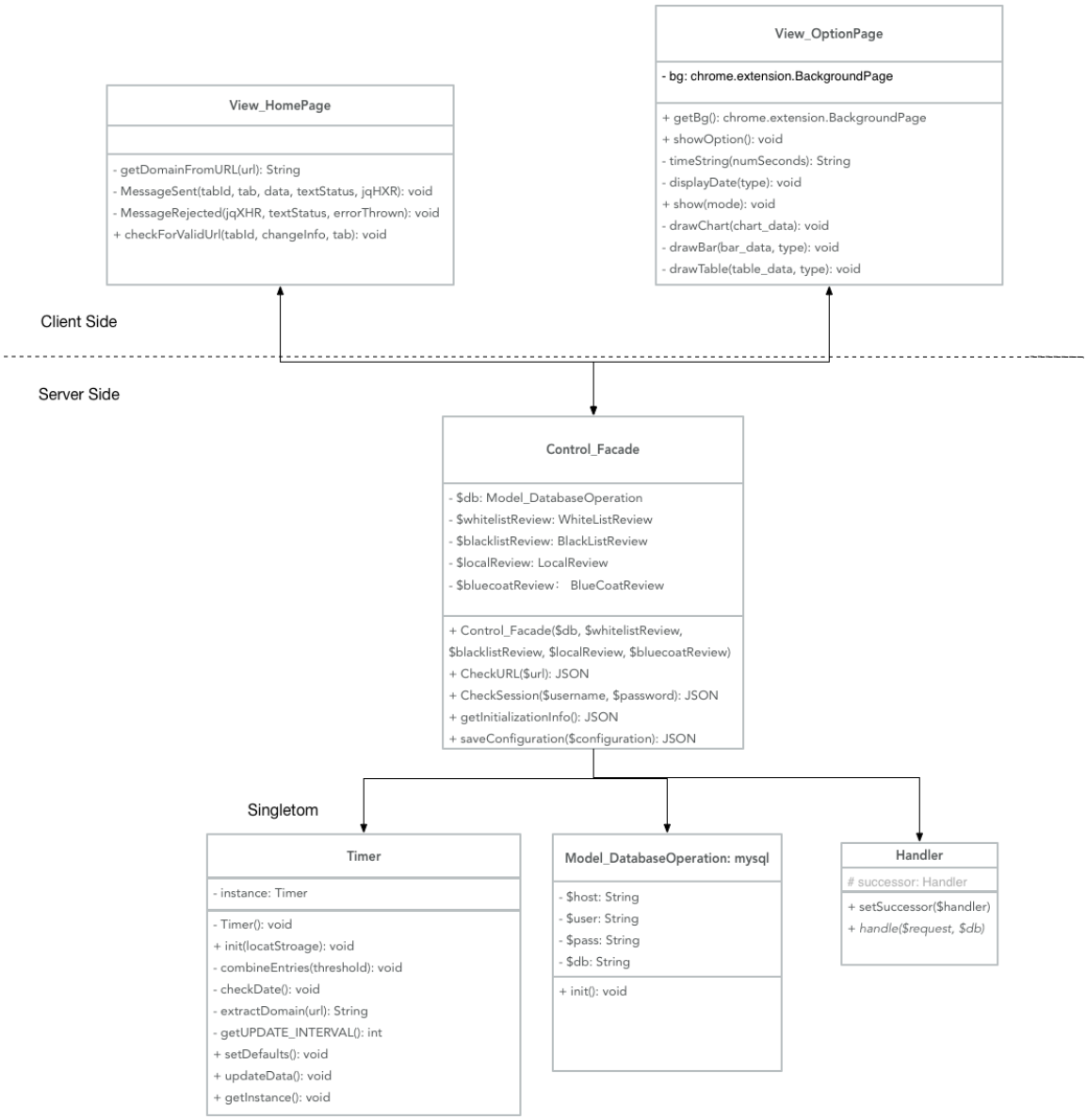


Figure 9 Control_Facade

Source Code:

```
class Control_Facade {
   private $db = null;
   private $whitelistReview = null;
   private $blacklistReview = null;
   private $localReview = null;
   private $bluecoatReview = null;

   // initialization for Control_Facade
   public function __construct(PDO $db, WhiteListReview $whitelistReview,
                               BlackListReivew $blacklistReview, LocalReview
$localReview, BlueCoatReview $bluecoatReview){
```

```
        $this->db = $db;
        $this->whitelistReview = $whitelistReview;
        $this->blacklistReview = $blacklistReview;
        $this->localReview = $localReview;
        $this->bluecoatReview = $bluecoatReview;
    }

    // set the chain of responsibilities by using setSuccessor()
    public function CheckURL($url){
        $this->whitelistReview->setSuccessor($this->blacklistReview);
        $this->blacklistReview->setSuccessor($this->localReview);
        $this->localReview->setSuccessor($this->bluecoatReview);
        $this->bluecoatReview->setSuccessor($this->localReview);
        return $this->whitelistReview->handle($url, $this->db);
    }

    // Valid the user login
    public function CheckSession($username, $password){
        $query = ("SELECT * FROM eguard_user WHERE Username = '{$username}' "
                  . "AND Password = '{$password}'");
        $result = $this->db->query($query);
        if ($result->rowCount() != 0) {
            exit(json_encode("allow"));
        }
        else{
            exit(json_encode("deny"));
        }
    }
    public function getInitalizationInfo(){
        $query_blockedCategory = ("SELECT Category FROM block_category");
        $configuration->block_category =
$this->db->query($query_blockedCategory)->fetchAll(PDO::FETCH_COLUMN, 0);
        $query_timer = ("SELECT Limitation FROM timer");
        $configuration->timer =
$this->db->query($query_timer)->fetchAll(PDO::FETCH_COLUMN, 0);
        $query_white_list = ("SELECT URL FROM website_white_list");
        $configuration->white_list =
$this->db->query($query_white_list)->fetchAll(PDO::FETCH_COLUMN, 0);
        $query_black_list = ("SELECT URL FROM website_black_list");
        $configuration->black_list =
$this->db->query($query_black_list)->fetchAll(PDO::FETCH_COLUMN, 0);
        exit(json_encode($configuration));
    }

    public function saveConfiguration($configuration){
        $blockedCategories = $configuration->blockedCategories;
        $timer = $configuration->timer;
        $whitelist = $configuration->whitelist;
        $blacklist = $configuration->blacklist;
        $website = $configuration->website;
        $category = $configuration->category;
        $query_blockedCategory = ("delete FROM block_category");
        $result = $this->db->exec($query_blockedCategory);
```

```
        for($numOfBlockedCategories = 0;
            $numOfBlockedCategories < sizeof($blockedCategories);
            $numOfBlockedCategories++)
        {
            $query_blockedCategory = "INSERT INTO block_category (`Category`)
VALUES ('{$blockedCategories[$numOfBlockedCategories]}');";
            $result = $this->db->exec($query_blockedCategory);
        };
        $query_timer = "UPDATE timer SET Limitation = $timer LIMIT 1;";
        $result = $this->db->exec($query_timer);
        preg_match_all('/.+?,/', $whitelist , $whitelist);
        $query_white_list = "DELETE FROM website_white_list";
        $result = $this->db->exec($query_white_list);
        for($numOfWhitelist = 0; $numOfWhitelist < sizeof($whitelist[0]);
$numOfWhitelist++){
            $whitelist_URL =
str_replace(array(","),"",$whitelist[0][$numOfWhitelist]);
            $query_white_list = "INSERT INTO website_white_list (`URL`) VALUES
('{$whitelist_URL}')";
            $result = $this->db->exec($query_white_list);
        }
        preg_match_all('/.+?,/', $blacklist , $blacklist);
        $query_black_list = "DELETE FROM website_black_list";
        $result = $this->db->exec($query_black_list);
        for($numOfBlacklist = 0; $numOfBlacklist < sizeof($blacklist[0]);
$numOfBlacklist++){
            $blacklist_URL =
str_replace(array(","),"",$blacklist[0][$numOfBlacklist]);
            $query_black_list = "INSERT INTO website_black_list (`URL`) VALUES
('{$blacklist_URL}')";
            $result = $this->db->exec($query_black_list);
        }
        if(!empty($website) && !empty($category)){
            $query = "DELETE FROM website_category WHERE URL = '{$website}'";
            $delete_result = $this->db->exec($query);
            $query_newWebsite = "INSERT INTO website_category
(`URL`,`Category`) VALUES ('{$website}','{$category}');";
            $result = $this->db->exec($query_newWebsite);
        }
        exit(json_encode("success!"));
    }
}
```

c. Chain of responsibility

The Handler class uses CoR design pattern. The chain responsibilities are like this: WhiteListReview -> BlackListReview -> LocalReview -> BlueCoatReview -> LocalReview.

The BlueCoatReview only requests for the category of the current URL and insert the URL and its category into the database. And later, the LocalReview will handle if the URL is valid. In the BlueCoatReview, if the URL's category is "Uncategorized", it will send the email to the parent user.

UML

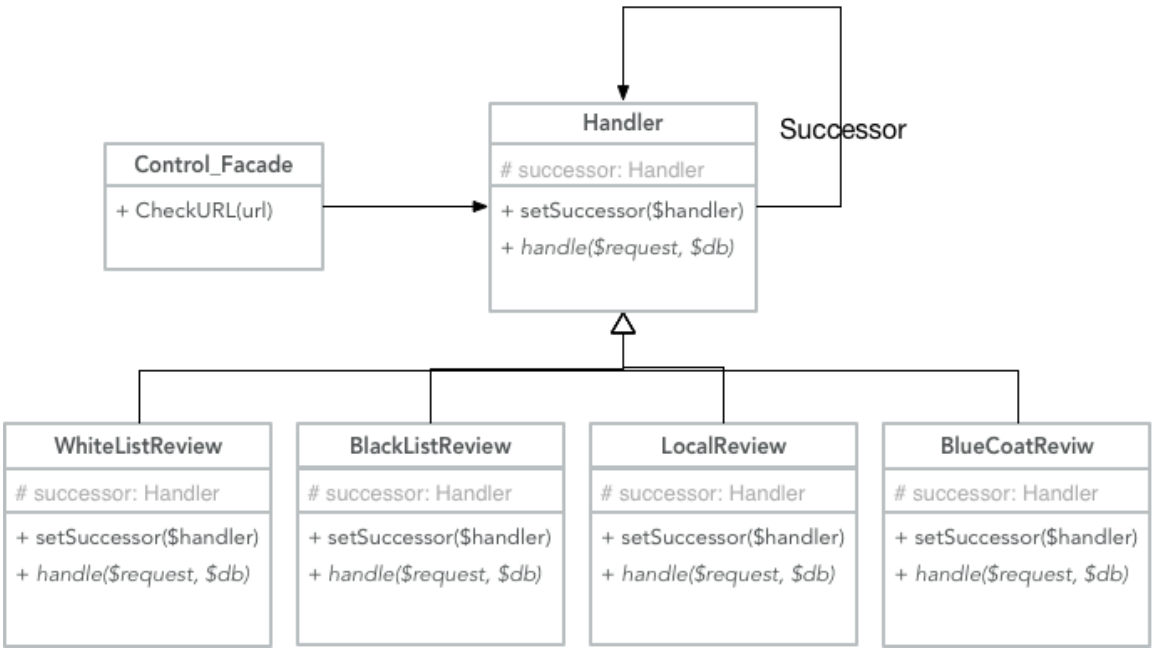


Figure 10 CoR

Source Code:

```
class Control_Facade {
    // set the chain of responsibilities by using setSuccessor()
    public function CheckURL($url){
        $this->whitelistReview->setSuccessor($this->blacklistReview);
        $this->blacklistReview->setSuccessor($this->localReview);
        $this->localReview->setSuccessor($this->bluecoatReview);
        $this->bluecoatReview->setSuccessor($this->localReview);
        return $this->whitelistReview->handle($url, $this->db);
    }
}

// chain of responsibilities
abstract class Handler{

    protected $successor = null;

    public function setSuccessor(Handler $handler){
        $this->successor = $handler;
    }

    abstract public function handle($request, PDO $db);
}

class WhiteListReview extends Handler{

    public function handle($request,PDO $db){
        $query = "SELECT URL FROM website_white_list Where URL = '{$request}'
LIMIT 10";
```

```
        $result = $db->query($query);
        if ($result->rowCount() != 0) {
            $datarow = $result->fetch();
            /* free result set */
            exit(json_encode("allow"));
        }
        else{

            $this->successor->handle($request,  $db);
        }
    }
}

class BlackListReivew extends Handler{
    public function handle($request, PDO $db){
        $query = "SELECT URL FROM website_black_list Where URL = '{$request}'
LIMIT 10";
        $result = $db->query($query);
        if ($result->rowCount() != 0) {
            $datarow = $result->fetch();
            exit(json_encode("deny"));
        }
        else{
            $this->successor->handle($request, $db);
        }
    }
}

class LocalReview extends Handler{
    public function handle($request, PDO $db){
        $query = "SELECT Category FROM website_category WHERE URL =
'{$request}' LIMIT 10";
        $result = $db->query($query);
        if ($result->rowCount() != 0){
            $datarow = $result->fetch();
            $query = "SELECT Category FROM block_category WHERE Category =
'{$datarow[Category]}'";
            $result = $db->query($query);
            if ($result->rowCount() != 0){
                exit(json_encode("deny"));
            }
            else{
                exit(json_encode("allow"));
            }
        }
        else{
            $this->successor->handle($request, $db);
        }
    }
}

class BlueCoatReview extends Handler{
    public function handle($request, PDO $db){
```

```
        $post_data = array(
            'url' => $request
        );
        $postdata = http_build_query($post_data);
        $options = array(
            'http' => array(
                'method' => 'POST',
                'header' => 'Content-type:application/x-www-form-urlencoded',
                'content' => $postdata,
                'timeout' => 15 * 60
            )
        );
        $context = stream_context_create($options);
        // query the bluecoat to check the website category
        $result =
file_get_contents('http://sitereview.bluecoat.com/rest/categorization', false,
$context);
        $jsonResult = json_decode($result, true);
        if(preg_match_all('/>.+?<\/a>/', $jsonResult['categorization'] ,
$categorization)){
            for($categorizationIndex=0; $categorizationIndex <
sizeof($categorization[0]); $categorizationIndex++){
                // trim the categorization string
                $categorization[0][$categorizationIndex] =
str_replace(array("</a>",">"),"",$categorization[0][$categorizationIndex]);
                $query = "INSERT INTO website_category (`URL`, `Category`)
VALUES ('{$request}','{$categorization[0][$categorizationIndex]}');";
                $result = $db->exec($query);
            }
            if (strcmp($categorization[0][0],"Uncategorized")==0){
                if (require './PHPMailer/PHPMailerAutoload.php')
                    echo "Seccess load PHPMailer";
                //Create a new PHPMailer instance
                $mail = new PHPMailer;
                //Tell PHPMailer to use SMTP
                $mail->isSMTP();
                //Enable SMTP debugging
                // 0 = off (for production use)
                // 1 = client messages
                // 2 = client and server messages
                $mail->SMTPDebug = 2;
                //Ask for HTML-friendly debug output
                $mail->Debugoutput = 'html';
                //Set the hostname of the mail server
                $mail->Host = 'smtp.gmail.com';
                //Set the encryption system to use - ssl (deprecated) or tls
                $mail->Port = 587;
                $mail->SMTPSecure = 'tls';
                //Whether to use SMTP authentication
                $mail->SMTPAuth = true;
                //Username to use for SMTP authentication - use full email
address for gmail
                $mail->Username = "ztlevitest@gmail.com";
```

```
                //Password to use for SMTP authentication
                $mail->Password = "helloTest";
                //Set who the message is to be sent from
                $mail->setFrom('ztlevitest@gmail.com', 'Ting Zhou');
                //Set an alternative reply-to address
                $mail->addReplyTo('ztlevitest@gmail.com', 'Ting Zhou');
                //Set who the message is to be sent to
                $mail->addAddress('ztlevtest@yahoo.com', 'Ting Zhou');
                $query = ("SELECT Username, Email FROM eguard_user");
                $result = $db->query($query);
                $user = $result->fetch();
                $mail->AddAddress("{$user['Email']}", "{$user['Username']}");
                //Set the subject line
                $mail->Subject = 'PHPMailer GMail SMTP test';
                //Read an HTML message body from an external file, convert
referenced images to embedded,
                //convert HTML into a basic plain-text alternative body
                $mail->Body = 'Hello!<br>' . $request . 'is uncategorized,
please go to E-Guard option page and assign it to one category!<br>Thanks';
                // $mail->msgHTML(file_get_contents('contents.html'),
dirname(__FILE__));
                //Replace the plain text body with one created manually
                $mail->AltBody = 'This is a plain-text message body';
                //Attach an image file
                // $mail->addAttachment('images/phpmailer_mini.png');
                //send the message, check for errors
                if (!$mail->Send()) {
                    echo "Mailer Error: " . $mail->ErrorInfo;
                } else {
                    echo "Message sent!";
                }
            }
            $this->successor->handle($request,  $db);
        }
    }
}
```