

Alexandria University - Faculty of Engineering
Electrical Engineering Department

Summer Research Project - 2015

Weekly Report Num. 2

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Research Fields:

databases, android/web development and machine learning.

Research Goals:

Developing an intelligent application for efficient database management.

Development of a front-end (android/web app) and back-end prototype, and the design of a database to store various data with a large set of attributes.

Capability of applying intelligent data management techniques on the stored data.

Week-2 plan

- apply mysql naming conventions over database, tables, columns and keys.
- edit and optimize the relational database design.
- add table composite keys.
- add foreign key constraints across database tables (**Referential Integrity Rule**) .
- implement the server side scripting of establishing database connections.
- implement the server side scripting of querying database tables.

Week-2 approach

1. Editing Attribute (column) Data Types

int

for client id (primary and foreign keys).

The unsigned range is 0 to 4294967295.

mediumint

for quantity attributes, store id (primary and foreign keys), vendor id, product id and promotion id.

The unsigned range is 0 to 16777215.

tinyint

for boolean attributes, db_info id (primary and foreign keys) and items quantity in a promotion.

The unsigned range is 0 to 255.

2. Database

1. apply mysql naming conventions over database, tables, columns and keys.
2. edit and optimize the relational database design.

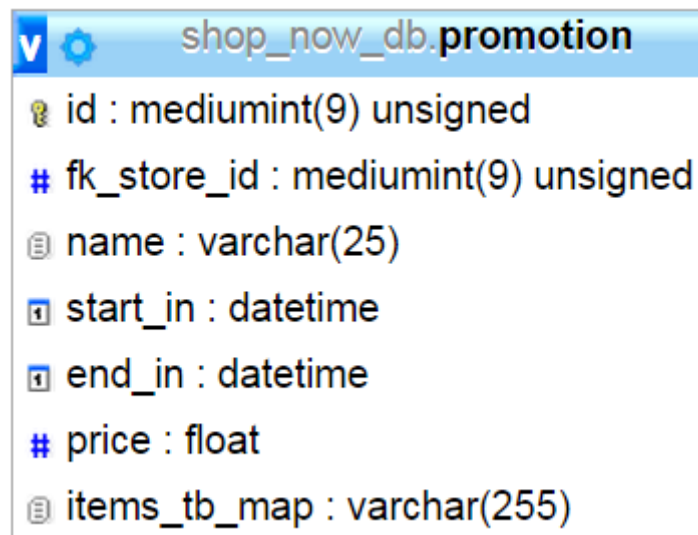


Figure 1 promotion table diagram

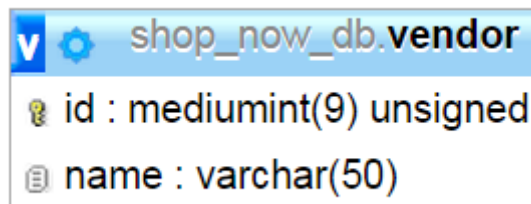


Figure 2 vendor table diagram

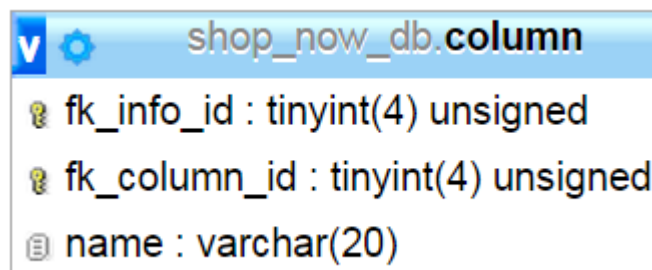


Figure 3 column table diagram

shop_now_db.client	
	id : int(11) unsigned
	name : varchar(50)
	email : varchar(50)
	password : varchar(50)
	mobile : varchar(50)
	telephone : varchar(50)
	address : varchar(255)
	notify_rate : varchar(4)
	pref_map : varchar(255)

Figure 4 client table diagram


shop_now_db.feature_computer	
#	id : tinyint(4)
	value : varchar(20)

Figure 5 feature table diagram



shop_now_db.stock_computer	
	fk_store_id : mediumint(9) unsigned
	fk_item_id : mediumint(9) unsigned
#	quantity : mediumint(9) unsigned
#	unit_price : float

Figure 6 stock table (computer category) diagram

shop_now_db.vendor_item	
fk_vendor_id	: mediumint(9) unsigned
fk_item_id	: mediumint(9) unsigned
fk_info_id	: tinyint(4) unsigned

Figure 7 vendor item mapping table diagram

shop_now_db.item_watch_list	
fk_client_id	: int(11) unsigned
fk_item_id	: mediumint(9) unsigned
fk_info_id	: tinyint(4) unsigned
available	: tinyint(1) unsigned
name	: varchar(20)

Figure 8 item watch list table diagram

shop_now_db.bought_together	
fk_item1_id	: mediumint(9) unsigned
fk_info1_id	: tinyint(4) unsigned
fk_item2_id	: mediumint(9) unsigned
fk_info2_id	: tinyint(4) unsigned

Figure 9 items bought together table diagram




shop_now_db.promotion_computer	
	fk_promotion_id : mediumint(9) unsigned
	fk_item_id : mediumint(9) unsigned
	quantity : tinyint(4) unsigned

Figure 10 promotion table (computer category) diagram

shop_now_db.store	
	id : mediumint(9) unsigned
	store_name : varchar(50)
	branch_name : varchar(50)
	email : varchar(50)
	mobile : varchar(50)
	telephone : varchar(50)
	address : varchar(255)
	map_lat : float
	map_lng : float
	map_zoom : float
	items_tb_map : varchar(255)

Figure 11 store table diagram

shop_now_db.promotion_watch_list	
🔑	fk_client_id : int(11) unsigned
🔑	fk_item_id : mediumint(9) unsigned
🔑	fk_info_id : tinyint(4) unsigned
#	available : tinyint(1)
📄	name : varchar(20)

Figure 12 promotion watch list table diagram

shop_now_db.db_info	
🔑	id : tinyint(4) unsigned
📄	available_types : varchar(255)
📄	sub_category_name : varchar(20)
📄	category_name : varchar(20)
📄	item_tb_name : varchar(20)
📄	stock_tb_name : varchar(20)
📄	promotion_tb_name : varchar(20)
📄	feature_tb_name : varchar(20)
#	items_count : mediumint(9) unsigned
#	promotions_count : mediumint(9) unsigned

Figure 13 database information table diagram

shop_now_db.item_computer	
id	mediumint(9) unsigned
name	varchar(50)
type	varchar(255)
brand	varchar(25)
battery_type	varchar(20)
display_resolution	varchar(11)
storage_capacity	varchar(10)
depth	varchar(10)
width	varchar(10)
processor	varchar(20)
card_reader_integrated	varchar(20)
wireless_lan_type	varchar(20)
video_adapter	varchar(20)
microphone_line_in_jack	varchar(20)
memory_card_slot	varchar(20)
integrated_camera	varchar(20)
processor_manufacturer	varchar(25)
memory_size	varchar(10)
cpu_speed	varchar(10)
weight	varchar(10)
battery_technology	varchar(20)
webcam	varchar(20)
image_quality	varchar(10)
built_in_microphone	varchar(255)
screen_size	varchar(10)
hdmi_inputs	varchar(20)
usb_ports	varchar(20)
bluetooth_version	varchar(20)
bluetooth	varchar(20)
color	varchar(10)
battery_life	varchar(10)
operating_system	varchar(20)
height	varchar(10)
hard_disk_capacity	varchar(10)

Figure 14 item table (computer category) diagram

shop_now_db.promotion	
id	mediumint(9) unsigned
fk_store_id	mediumint(9) unsigned
name	varchar(25)
start_in	datetime
end_in	datetime
price	float
items_tb_map	varchar(255)

shop_now_db.feature_computer	
id	tinyint(4)
value	varchar(20)

shop_now_db.stock_computer	
fk_store_id	mediumint(9) unsigned
fk_item_id	mediumint(9) unsigned
quantity	mediumint(9) unsigned
unit_price	float

shop_now_db.column	
fk_info_id	tinyint(4) unsigned
fk_column_id	tinyint(4) unsigned
name	varchar(20)

shop_now_db.vendor_item	
fk_vendor_id	mediumint(9) unsigned
fk_item_id	mediumint(9) unsigned
fk_info_id	tinyint(4) unsigned

shop_now_db.vendor	
id	mediumint(9) unsigned
name	varchar(50)

shop_now_db.item_computer	
id	mediumint(9) unsigned
name	varchar(50)
type	varchar(255)
brand	varchar(25)
battery_type	varchar(20)
display_resolution	varchar(11)
storage_capacity	varchar(10)
depth	varchar(10)
width	varchar(10)
processor	varchar(20)
card_reader_integrated	varchar(20)
wireless_lan_type	varchar(20)
video_adapter	varchar(20)
microphone_line_in_jack	varchar(20)
memory_card_slot	varchar(20)
integrated_camera	varchar(20)
processor_manufacturer	varchar(25)
memory_size	varchar(10)
cpu_speed	varchar(10)
weight	varchar(10)
battery_technology	varchar(20)
webcam	varchar(20)
image_quality	varchar(10)
built_in_microphone	varchar(255)
screen_size	varchar(10)
hdmi_inputs	varchar(20)
usb_ports	varchar(20)
bluetooth_version	varchar(20)
bluetooth	varchar(20)
color	varchar(10)
battery_life	varchar(10)
operating_system	varchar(20)
height	varchar(10)
hard_disk_capacity	varchar(10)

shop_now_db.promotion_computer	
fk_promotion_id	mediumint(9) unsigned
fk_item_id	mediumint(9) unsigned
quantity	tinyint(4) unsigned

shop_now_db.promotion_watch_list	
fk_client_id	int(11) unsigned
fk_item_id	mediumint(9) unsigned
fk_info_id	tinyint(4) unsigned
available	tinyint(1)
name	varchar(20)

shop_now_db.item_watch_list	
fk_client_id	int(11) unsigned
fk_item_id	mediumint(9) unsigned
fk_info_id	tinyint(4) unsigned
available	tinyint(1) unsigned
name	varchar(20)

shop_now_db.db_info	
id	tinyint(4) unsigned
available_types	varchar(255)
sub_category_name	varchar(20)
category_name	varchar(20)
item_tb_name	varchar(20)
stock_tb_name	varchar(20)
promotion_tb_name	varchar(20)
feature_tb_name	varchar(20)
items_count	mediumint(9) unsigned
promotions_count	mediumint(9) unsigned

shop_now_db.bought_together	
fk_item1_id	mediumint(9) unsigned
fk_info1_id	tinyint(4) unsigned
fk_item2_id	mediumint(9) unsigned
fk_info2_id	tinyint(4) unsigned

shop_now_db.client	
id	int(11) unsigned
name	varchar(50)
email	varchar(50)
password	varchar(50)
mobile	varchar(50)
telephone	varchar(50)
address	varchar(255)
notify_rate	varchar(4)
pref_map	varchar(255)

shop_now_db.store	
id	mediumint(9) unsigned
store_name	varchar(50)
branch_name	varchar(50)
email	varchar(50)
mobile	varchar(50)
telephone	varchar(50)
address	varchar(255)
map_lat	float
map_lng	float
map_zoom	float
items_tb_map	varchar(255)

Figure 15 database tables diagram

3. add table compsite keys.

4. add foreign key constarints across database tables (Referential Integrity Rule) .

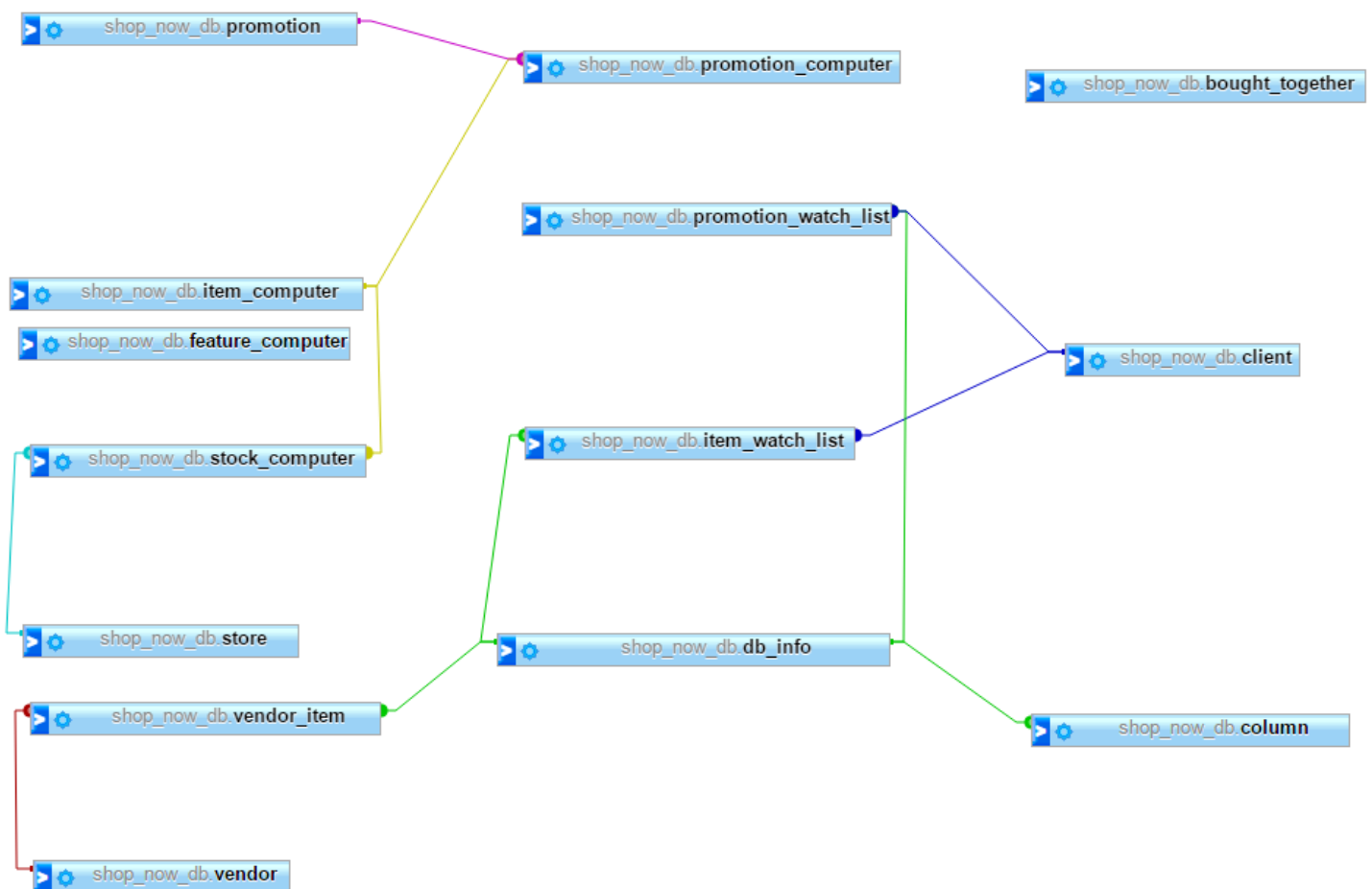


Figure 16 databse ERD (Entitiy Relation diagram).

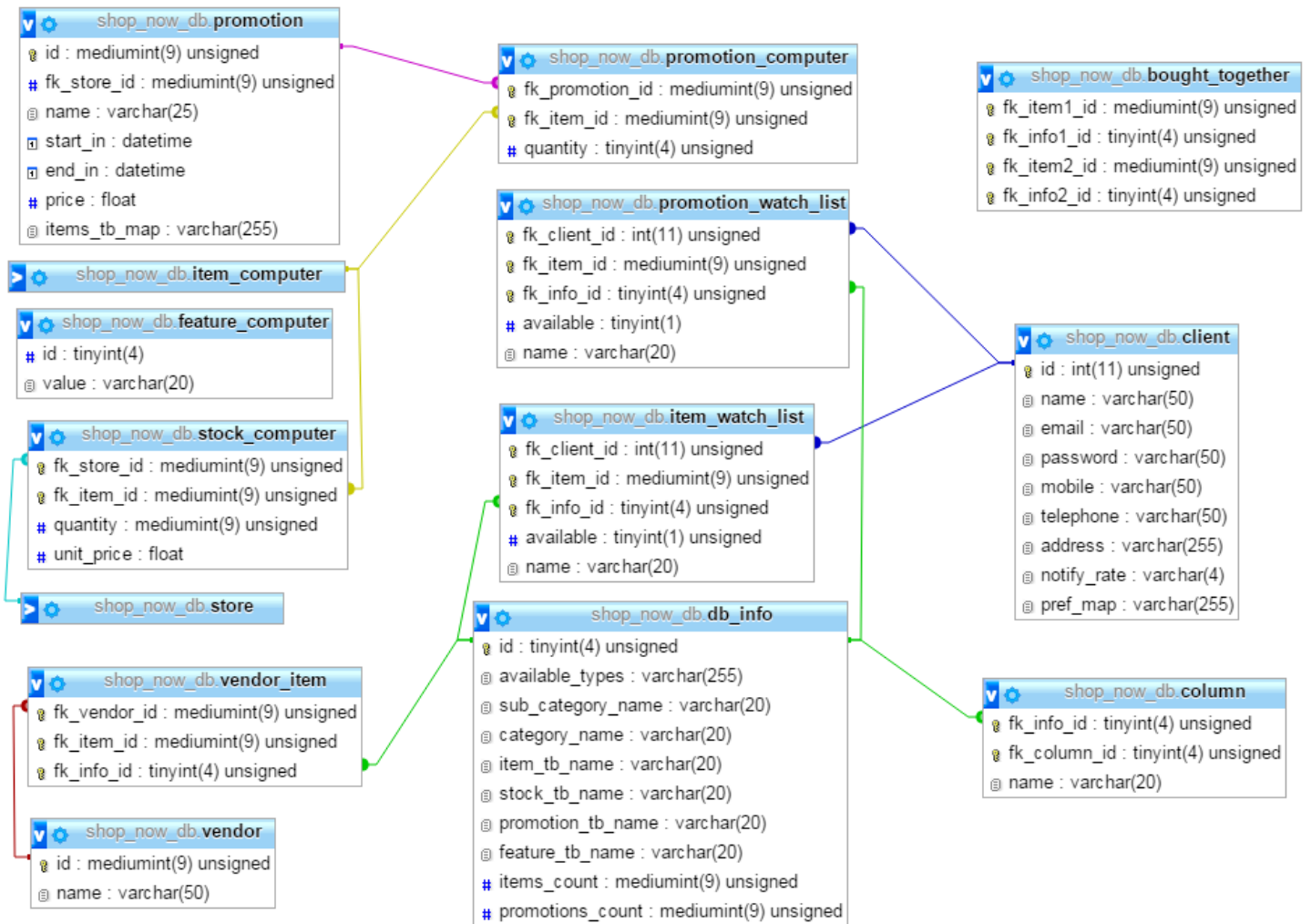


Figure 17 database ERD (Entity Relation diagram) with expanded keys.

3. Implementing the relational database design using mysql

```
--  
-- Table structure for table `client`  
--  
  
CREATE TABLE IF NOT EXISTS `client` (  
  `id` int(11) unsigned NOT NULL AUTO_INCREMENT,  
  `name` varchar(50) NOT NULL,  
  `email` varchar(50) NOT NULL,  
  `password` varchar(50) NOT NULL,  
  `mobile` varchar(50) NOT NULL,  
  `telephone` varchar(50) NOT NULL,  
  `address` varchar(255) NOT NULL,  
  `notify_rate` varchar(4) NOT NULL,  
  `pref_map` varchar(255) NOT NULL,  
  PRIMARY KEY (`id`)  
) ENGINE=InnoDB DEFAULT CHARSET=utf8 AUTO_INCREMENT=1 ;  
  
--  
-- Table structure for table `column`  
--  
  
CREATE TABLE IF NOT EXISTS `column` (  
  `fk_info_id` tinyint(4) unsigned NOT NULL,  
  `fk_column_id` tinyint(4) unsigned NOT NULL,  
  `name` varchar(20) NOT NULL,  
  PRIMARY KEY (`fk_info_id`, `fk_column_id`)  
) ENGINE=InnoDB DEFAULT CHARSET=utf8;
```

```
--
-- Table structure for table `db_info`
--

CREATE TABLE IF NOT EXISTS `db_info` (
  `id` tinyint(4) unsigned NOT NULL AUTO_INCREMENT,
  `available_types` varchar(255) NOT NULL,
  `sub_category_name` varchar(20) NOT NULL,
  `category_name` varchar(20) NOT NULL,
  `item_tb_name` varchar(20) NOT NULL,
  `stock_tb_name` varchar(20) NOT NULL,
  `promotion_tb_name` varchar(20) NOT NULL,
  `feature_tb_name` varchar(20) NOT NULL,
  `items_count` mediumint(9) unsigned NOT NULL,
  `promotions_count` mediumint(9) unsigned NOT NULL,
  PRIMARY KEY (`id`)
) ENGINE=InnoDB DEFAULT CHARSET=utf8 AUTO_INCREMENT=17 ;

--
-- Table structure for table `feature_audio`
--

CREATE TABLE IF NOT EXISTS `feature_audio` (
  `id` tinyint(4) NOT NULL,
  `value` varchar(20) NOT NULL,
  KEY `id` (`id`)
) ENGINE=InnoDB DEFAULT CHARSET=utf8;

--
-- Table structure for table `item_audio`
--

CREATE TABLE IF NOT EXISTS `item_audio` (
  `id` mediumint(9) unsigned NOT NULL AUTO_INCREMENT,
  `name` varchar(50) NOT NULL,
  `type` varchar(255) NOT NULL,
  PRIMARY KEY (`id`)
) ENGINE=InnoDB DEFAULT CHARSET=utf8 AUTO_INCREMENT=1 ;
```

```
CREATE TABLE IF NOT EXISTS `item_computer` (  
  `id` mediumint(9) unsigned NOT NULL AUTO_INCREMENT,  
  `name` varchar(50) NOT NULL,  
  `type` varchar(255) NOT NULL,  
  `brand` varchar(25) NOT NULL,  
  `battery_type` varchar(20) NOT NULL,  
  `display_resolution` varchar(11) NOT NULL,  
  `storage_capacity` varchar(10) NOT NULL,  
  `depth` varchar(10) NOT NULL,  
  `width` varchar(10) NOT NULL,  
  `processor` varchar(20) NOT NULL,  
  `card_reader_integrated` varchar(20) NOT NULL,  
  `wireless_lan_type` varchar(20) NOT NULL,  
  `video_adapter` varchar(20) NOT NULL,  
  `microphone_line_in_jack` varchar(20) NOT NULL,  
  `memory_card_slot` varchar(20) NOT NULL,  
  `integrated_camera` varchar(20) NOT NULL,  
  `processor_manufacturer` varchar(25) NOT NULL,  
  `memory_size` varchar(10) NOT NULL,  
  `cpu_speed` varchar(10) NOT NULL,  
  `weight` varchar(10) NOT NULL,  
  `battery_technology` varchar(20) NOT NULL,  
  `webcam` varchar(20) NOT NULL,  
  `image_quality` varchar(10) NOT NULL,  
  `built_in_microphone` varchar(255) NOT NULL,  
  `screen_size` varchar(10) NOT NULL,  
  `hdm_i_inputs` varchar(20) NOT NULL,  
  `usb_ports` varchar(20) NOT NULL,  
  `bluetooth_version` varchar(20) NOT NULL,  
  `bluetooth` varchar(20) NOT NULL,  
  `color` varchar(10) NOT NULL,  
  `battery_life` varchar(10) NOT NULL,  
  `operating_system` varchar(20) NOT NULL,  
  `height` varchar(10) NOT NULL,  
  `hard_disk_capacity` varchar(10) NOT NULL,  
  PRIMARY KEY (`id`)  
) ENGINE=InnoDB DEFAULT CHARSET=utf8 AUTO_INCREMENT=1 ;
```

```
--
-- Table structure for table `item_mobile`
--

CREATE TABLE IF NOT EXISTS `item_mobile` (
  `id` mediumint(9) unsigned NOT NULL AUTO_INCREMENT,
  `name` varchar(50) NOT NULL,
  `type` varchar(255) NOT NULL,
  `brand` varchar(25) NOT NULL,
  `memory_size` varchar(10) NOT NULL,
  `storage_capacity` varchar(10) NOT NULL,
  `depth` varchar(10) NOT NULL,
  `width` varchar(10) NOT NULL,
  `processor` varchar(25) NOT NULL,
  `processor_type` varchar(10) NOT NULL,
  `processor_speed` varchar(10) NOT NULL,
  `fm_radio` tinyint(1) NOT NULL,
  `logo` varchar(10) NOT NULL,
  `multi_sim_card` tinyint(1) NOT NULL,
  `wifi` varchar(10) NOT NULL,
  `front_camera` varchar(10) NOT NULL,
  `back_camera` varchar(10) NOT NULL,
  `weight` varchar(10) NOT NULL,
  `image_quality` varchar(10) NOT NULL,
  `screen_size` varchar(10) NOT NULL,
  `screen_resolution` varchar(11) NOT NULL,
  `bluetooth_version` varchar(10) NOT NULL,
  `bluetooth` tinyint(1) NOT NULL,
  `edge` tinyint(1) NOT NULL,
  `color` varchar(10) NOT NULL,
  `battery_technology` varchar(20) NOT NULL,
  `height` varchar(10) NOT NULL,
  `operating_system` varchar(20) NOT NULL,
  `operating_system_version` varchar(10) NOT NULL,
  PRIMARY KEY (`id`)
) ENGINE=InnoDB DEFAULT CHARSET=utf8 AUTO_INCREMENT=1 ;
```



```
--
-- Table structure for table `item_watch_list`
--

CREATE TABLE IF NOT EXISTS `item_watch_list` (
  `fk_client_id` int(11) unsigned NOT NULL,
  `fk_item_id` mediumint(9) unsigned NOT NULL,
  `fk_info_id` tinyint(4) unsigned NOT NULL,
  `available` tinyint(1) unsigned NOT NULL DEFAULT '0',
  `name` varchar(20) NOT NULL,
  PRIMARY KEY (`fk_client_id`,`fk_item_id`,`fk_info_id`),
  KEY `fk_info_id` (`fk_info_id`)
) ENGINE=InnoDB DEFAULT CHARSET=utf8;

CREATE TABLE IF NOT EXISTS `bought_together` (
  `fk_item1_id` mediumint(9) unsigned NOT NULL,
  `fk_info1_id` tinyint(4) unsigned NOT NULL,
  `fk_item2_id` mediumint(9) unsigned NOT NULL,
  `fk_info2_id` tinyint(4) unsigned NOT NULL,
  PRIMARY KEY (`fk_item1_id`,`fk_info1_id`,`fk_item2_id`,`fk_info2_id`)
) ENGINE=InnoDB DEFAULT CHARSET=utf8;

--
-- Table structure for table `promotion`
--

CREATE TABLE IF NOT EXISTS `promotion` (
  `id` mediumint(9) unsigned NOT NULL AUTO_INCREMENT,
  `fk_store_id` mediumint(9) unsigned NOT NULL,
  `name` varchar(25) NOT NULL,
  `start_in` datetime NOT NULL,
  `end_in` datetime NOT NULL,
  `price` float NOT NULL,
  `items_tb_map` varchar(255) NOT NULL,
  PRIMARY KEY (`id`),
  KEY `fk_store_id` (`fk_store_id`)
) ENGINE=InnoDB DEFAULT CHARSET=utf8 AUTO_INCREMENT=1 ;
```

```

--
-- Table structure for table `promotion_audio`
--

CREATE TABLE IF NOT EXISTS `promotion_audio` (
  `fk_promotion_id` mediumint(9) unsigned NOT NULL,
  `fk_item_id` mediumint(9) unsigned NOT NULL,
  `quantity` tinyint(4) unsigned NOT NULL,
  PRIMARY KEY (`fk_promotion_id`,`fk_item_id`),
  KEY `fk_item_id` (`fk_item_id`)
) ENGINE=InnoDB DEFAULT CHARSET=utf8;

--
-- Table structure for table `promotion_watch_list`
--

CREATE TABLE IF NOT EXISTS `promotion_watch_list` (
  `fk_client_id` int(11) unsigned NOT NULL,
  `fk_item_id` mediumint(9) unsigned NOT NULL,
  `fk_info_id` tinyint(4) unsigned NOT NULL,
  `available` tinyint(1) NOT NULL DEFAULT '0',
  `name` varchar(20) NOT NULL,
  PRIMARY KEY (`fk_client_id`,`fk_item_id`,`fk_info_id`),
  KEY `fk_info_id` (`fk_info_id`)
) ENGINE=InnoDB DEFAULT CHARSET=utf8;

--
-- Table structure for table `stock_audio`
--

CREATE TABLE IF NOT EXISTS `stock_audio` (
  `fk_store_id` mediumint(9) unsigned NOT NULL,
  `fk_item_id` mediumint(9) unsigned NOT NULL,
  `quantity` mediumint(9) unsigned NOT NULL,
  `unit_price` float NOT NULL,
  PRIMARY KEY (`fk_store_id`,`fk_item_id`),
  KEY `fk_item_id` (`fk_item_id`)
) ENGINE=InnoDB DEFAULT CHARSET=utf8;

```

```
--
-- Table structure for table `store`
--

CREATE TABLE IF NOT EXISTS `store` (
  `id` mediumint(9) unsigned NOT NULL AUTO_INCREMENT,
  `store_name` varchar(50) NOT NULL,
  `branch_name` varchar(50) NOT NULL,
  `email` varchar(50) NOT NULL,
  `mobile` varchar(50) NOT NULL,
  `telephone` varchar(50) NOT NULL,
  `address` varchar(255) NOT NULL,
  `map_lat` float NOT NULL DEFAULT '0',
  `map_lng` float NOT NULL DEFAULT '0',
  `map_zoom` float NOT NULL DEFAULT '0',
  `items_tb_map` varchar(255) NOT NULL,
  PRIMARY KEY (`id`)
) ENGINE=InnoDB DEFAULT CHARSET=utf8 AUTO_INCREMENT=1 ;

--
-- Table structure for table `vendor`
--

CREATE TABLE IF NOT EXISTS `vendor` (
  `id` mediumint(9) unsigned NOT NULL AUTO_INCREMENT,
  `name` varchar(50) NOT NULL,
  PRIMARY KEY (`id`)
) ENGINE=InnoDB DEFAULT CHARSET=utf8 AUTO_INCREMENT=1 ;

--
-- Table structure for table `vendor_item`
--

CREATE TABLE IF NOT EXISTS `vendor_item` (
  `fk_vendor_id` mediumint(9) unsigned NOT NULL,
  `fk_item_id` mediumint(9) unsigned NOT NULL,
  `fk_info_id` tinyint(4) unsigned NOT NULL,
  PRIMARY KEY (`fk_vendor_id`,`fk_item_id`,`fk_info_id`),
  KEY `fk_info_id` (`fk_info_id`)
) ENGINE=InnoDB DEFAULT CHARSET=utf8;
```

4. Implementing the server side scripting of querying database tables.

A DB php class was crated in order to be used as a database connection wrapper. DB is responsable for establishing database connections and performing select, insert and custom queries.