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*iOS App Product Design*



# Summary

Tennis Time is for tennis players that schedule tennis contract time. It allows the captain to create a weekly schedule for a collection of players, will keep track of who is playing each week and assist in finding substitutes.

## Market

<http://www.tennisindustry.org> indicates there are 14000 facilities that offer programming on 90000 courts. There are 5 million frequent players (21+ times a year) and 330K USTA league players. If there were 10 captains per court during a season, the universe in the US for this app is about 1M. 200K likely own iphones (5% US Population own but # skewed higher because these are adults with money). Seeking to attract 10% for downloads would yield 20K.

Freemium: can make schedule but can’t view outside of app or share schedule.

Pay $4.99: can save as PDF, print, share.

20% conversion = 4K \* 5 = $20K.

Alternatively: allow all players to play if they download the app and share and charge everyone

Alternatively: market to the tennis club in revenue share through tennis supplier. Or they brand.

## Background

Contract tennis time is typically on a weekly basis. There are a least 4 or more tennis players assigned to the contract time (doubles requires 4 players and you typically have extras players so everyone is not scheduled every week). A typical breakdown would be a 33-week season, 6 players assigned. Each player is on for 2/3s of the weeks (22) and off 1/3 (11). This can be more complicated is some of the players choose to play less than full time (e.g. 7 members: 5 full time (22 slots each), 2 part time (11 slots each)). This affects how much they pay as well.

There is usually one captain for the group whose responsibilities include: creating the schedule, notifying players of changes, managing the money (collecting and paying the tennis facility), finding substitutes.

## Scheduling

There are a number of factors that need to be considered when creating a tennis schedule:

**Number of Slots.** Doubles requires 4 slots per week. Singles requires 2.

**Number of Players**. Doubles requires four players every week. Therefor, you need at least 4 players or there will be available slots that always need filling. Typically you need more than the number of slots to handle weeks where certain players can’t make it.

**Court Blackout Dates.** Even though the tennis is scheduled weekly there may be weeks when the facility is closed for holidays and other reasons.

**Player Blackout Dates.** There will be times when a certain player knows ahead of time (before schedule creation) that they can’t make it due to other commitments. The player can’t be scheduled for the weeks they know they are now available. If there are too many player blackout dates, it may not be possible to create a schedule without available slots. Large blocks of black-out time (player in Florida for Feb and Mar) should probably be entered as individual blackout dates.

**Player White-In Dates.** Opposite of blackout dates. These are dates the players are requesting to play within the schedule. The schedule can tolerate a certain amount of forced dates.

**Weighting.** As mentioned, some players may opt-in for more weeks than others (full time vs part time). This needs to be factored properly into the schedule.

**Distribution.** It is common that players would like a schedule that has the most diversity in it. This means that over the course of the season, they would like to be able to play with as many combinations of players as possible. It may be desirable to have an uneven distribution as well. For example, player A may always want to play on the same days as Player D, or conversely may not wish to be on the same court as Player C. In actuality, this is unlikely since they are usually friends playing.

**Ancillary scheduling**. In addition to scheduling time, we may want to schedule additional activities like who brings the balls, beer, food.

**Special Event Scheduling**. There may be certain dates that are worth calling out (awards dinner night). While these are ancillary to player schedules, they may need to be identified on the schedule.

*Due to the complexities of scheduling, it may make sense to have a generic rules-based scheduling scheme.*

**Changes.** It may be necessary to change a schedule once it has been generated. This will affect some of the players. Changes should be minimized to limit chaos with the players.

## Finances

There are a number of factors to consider when determining finances:

**Court Time**. The most common pricing is based on an hourly rate for the court time. This needs to be multiplied by the number of hours for contract time, typically 1.5 hours.

**Seasonal Fixed Expenses.** Some facilities require that an annual membership be paid in addition to the court time. It may be that they only require 4 memberships even though the group has 6 members. Seasonal expenses should be entered once and then distributed based on the player’s weighting. i.e. part time members should not have to pay the same percentage of fixed court expenses as the full time members. This could include a “captain’s fee” for the aggravation of running the group.

Court time can be considered a seasonal fixed expense.

**Weekly Fixed Expenses**. Usually balls, maybe other consumables. This should be split amongst the players that are playing in any particular week.

Captains would like to know who has paid and who hasn’t. Players need to know how much they need to pay, when and where it is due.

## Actors

These are the people that interact with the application:

**Tennis Captain (TC)**. Organizes schedule and manages finances.

**Contract Player (CP)**. TC is probably also a CP.

**Substitute Player (SP).** SPs are fill-ins and are not part of the contract time or finances. They may be available for last minute changes. It is useful to have these contacts handy.

**Useful Contacts (UC).** Not part of scheduling but a useful contact to have available to all CPs. Can include tennis facility, emergency numbers, spouse/work numbers, restaurants, bars, caterers, etc.

# User Stories

This section describes the primary user stories for the application. These stories capture what the actors need to be able to do.

|  |  |
| --- | --- |
| No | Stories |
|  | TC can download the app from the app store |
|  | TC can create a new schedule |
|  | TC can add CPs from his contact list to schedule |
|  | TC can customize each CP preferences as needed |
|  | TC can customize the schedule based on blackouts, time, start/end weeks |
|  | TC can generate a new schedule. |
|  | TC can modify CP and schedule preferences from current date |
|  | TC can rebalance a schedule for all dates in the future |
|  | App can notify all CPs of changes via text messages and emails |
|  | TC can configure all financial information and calculate $ splits between parties based on weighting. |
|  | Schedule generation should perform financial calculations. |
|  | Need to generate a nice printable schedule that can be emailed out to all CPs |
|  | Only the TC needs to have the app |
|  | Can other players see or change the app? |
|  | TC can select SPs from contact list |
|  | TC can add auxiliary contacts from contact list. |
|  | Printed schedules should have all contacts including SPs and auxiliary info |
|  | Schedule should show: who is scheduled, who is not, who is blacked out. |
|  | Should we allow the schedule to change once it has been generated? Yes but not for substitutions. |
|  | Should we allow other players to change master schedule. NO, just TC. |
|  | TC can organize impromptu matches. Will send out text msgs all points bulletin to tennis players in list. and email to contacts to see if they are available? |

## Screens

### Home screen

If (court time defined)

Jump to Court Time Schedule screen

Else

If (first time running this)

Tutorial mode on. Press the + sign to create a new schedule

### List of Court Times (needed? Who has more than one?)

* List of contract times (in case player has more than one).
* + to add one
* swipe delete/confirm
* touch to edit.
* If no court time exist, immediately go to court time edit (add)

### Court Time Edit

* Start date
* End Date (shows number of weeks)
* Start time, end time (show scheduled court time)
* table of blackout dates (add blackout date button)
  + table entries swipe delete
  + Date selector
* Table of contract players with name and slide bar with max availability available, minimum available.
  + + takes to contact list (only care about members in this list, no subs)
* Table of non-paying substitutes (SPs)

### Court Time Schedule Table list showing all dates and who is on it

* Header with court time and place (6:30 Thursday @ Radnor)
* Table row for each week. Each row has at least 4 players horizontally. Each player has round photo if available first name and last initial underneath. 4 scheduled players active followed by the the other players greyed out if they are not scheduled and circle/line over if they are blocked out. Substitute players can be selected.
* Weeks in the past can’t be changed.
* Selecting scheduled player will ask: block this week out or cancel.
* Selecting a blocked out player will ask (make player available?)
* Can we select
* Count Time Configuration
* Email schedule – sends PDF to everyone.
* Should we allow the schedule to lock? Is that redundant with editing and saving. Generating a schedule is a big thing: set up black out dates, weighing then make a schedule with parameters (random, cyclical distribution – not sure id options are presented). Attempts made to rebalance schedule if can’t create one (or fill in holes). Need to identify problems with weeks (highlight in red – say how many weeks have problems).
* Reset schedule – keeps all setup information but removes all blackouts. (are you sure?)
* Recalulate Schedule (from beginning, from current date forward).
* Saving changes schedule prompts to email schedule to all participants.
* Edit schedule
  + Can only edit dates in the future
  + Select active player – find substitute/blackout/cancel
    - Blackout date. Will show who is available for swaping and dates to swap. Can be a list of all future swap dates.
      * Dialog box has scrollable list + swap/cancel. Swap disabled until one is selected.
    - Selecting player and time.
  + If changes are accepted and the results generate the need to recalculate the schedule, schedule is recalculated. If can resolve, need to identify this the best way possible. If not, need to flag in the schedule where we are short. E.g. 6 players but 3 are blackedout for that week will create a hole.
  + Each slot is either:
    - Assigned – shows picture of person
    - Reassigned with slot with active player
    - Reassigned with substiture player
    - Not assigned but player is responsible for finding a substiture. That is. Player has been assigned, now is blacked out and we can’t swap. Needs to be flagged and first l. guest should be in the slot since this person has removed

### Contact list – list TC, CPs, SPs and other (facilities)

### Contact Settings (includes blackouts, weighting)

JSON format sample format

{

“contacts” :{

“player” :{

“firstName”:”Bob”,

“lastName”:”Slob”,

“number”:”212 555-1234”,

“email”:”bobtheslob@sloppy.net”, “imageData”:”..”

}

}

}

## Algorithms

### Storage and retrieval of schedules

We’ll keep everything the app needs in one JSON file in the app root directory. This file will contain a section on contacts and a section on schedules.

Contacts contain the database of people and places but do not contain schedule or match information. The contacts in this list are referenced by index by the matches and contracts. If a contact is deleted from the database, it will affect any match that references it.

Schedules are either contract schedules that describe a series of matches or a single match setup as impromptu. These schedules references the contacts.

**Player creation**. Players are created through the contacts screen. When creating a player, he is added to the end of the list and can be used from there on in match schedules

### Importing, merging and exporting a schedule

Schedules can be shared between people (pro version). An individual schedule (match or contract schedule) can be distributed. In order to avoid player propagation, when a schedule is shared only the contacts referenced by the schedule is included.

When a schedule (limited contacts and schedule) is read in, it needs to be merged with the existing schedule and contact database.

**merging contacts**. New contacts are added at the end of the list and a new index is created. If the contact matches (first and last name) an existing contact then the last modified date is compared. If the new contact has been modified more recently, its information overwrites the old. We also keep track of the old index so we can replace the contact references in the incoming schedules with the index in the current database.

**Merging schedules**. If the schedule matches an existing schedule (place, date, time) than the one with the latest update is used. (ask to replace) reading in requires realignment with the new contact indices.

**Exporting Schedules.** When sending out a schedule, we need to send out the contact info as well. We only send the contacts we need to send. This means we reindex the players in the schedules to match the limited schedule.

### Deleting a contact

**Player deletion**. Deleting a player from a single match just pulls him from the match. Players can block out particular weeks in a contract schedule. This does not delete the player. Players can be deleted from a contract series. Use will be asked if the player should move to alternate status or removed from the schedule. Either way, this will cause a ripple effect through the schedule. For each week they are scheduled, they need to be replaced with unassigned and the week is flagged with an error. Rebuilding a schedule is required. Once the schedule has begun however, the player cannot be deleted. He can be blocked out on a week by week basis however. You can’t delete players from the contact list if there are matches that reference him. We just don’t permit it.

### Finding possible substitutes

Once a contract is built, it may be desirable to swap dates with another player. This can be done without rebuilding the schedule or remonetizing it if a suitable substitute can be found.

Given a contract, a week and a player – find then next n potential substitutes. You can’t find a substitute for weeks in the past. A potential substitute is a week that is:

* After today (not after the sub week because it could be a prior week.
* A week in which the player is NOT scheduled.
* A week in which the player is NOT blocked.
* A week in which a potential substitute IS schedule. A potential substitute is one who:
  + Is NOT blocked for this week
  + Is NOT scheduled for this week (available)

Each player has a different number of weeks they are paying for (e.g. half time vs full time). We need to know what each player has ahead of time before scheduling. This is kept in PlayerCount array.

For each available time slot (e.g. available week in contract year), build an array consisting of players that still have available time left to schedule and who are not blacked out for this week. Scramble the array and take the first four guys. Decrement the use count of the selected guys by one so we don’t over schedule them.

nSlots = # of contract time slots to fill

nPlayers = number of players

needed = 4; // 2 for singles

PlayerCount[nPlayers] = array of available slots for each player;

ContractTime[nSlots][needed];

BlackoutList[nSlots][nPlayers];

for each timeslot {

// create array of potential guys

int curcount = 0;

for (i=0; i< nPlayers; i++) {

if (!PlayerCount[i]) continue; // guy is done

if (BlackoutList[imeslot][i]) continue; // blacked out

array[curcount++] = i; // guy is potential

}

if(curcount < needed) error(“ran out of guys”);

shuffle(array, curcount); // mix up potential

// take the first 4 guys

for (i=0; i < needed; i++) {

ContractTime[timeslot][i] = array[i];

PlayerCount[array[i]]--; // one less week for this guy

}

}

### Blackout (clear) Week

Blackout times for holidays. e.g. we have tennis every thursday from sept to may except Thanksgiving. Requires schedule to be recalculated.

### Blackout (clear) player, week

Blackout a player from a particular week (e.g. vacation). Requires recalculation of the schedule from today until end of year. If the player is scheduled for this slot, requires finding a substitute from one of the available players. If we can’t find a substitute, need to flag as shorthanded.

If we are freeing him up, look for shorthanded lists in the future and see if we can plug him in.

### Determining the min and max # weeks based off min/max slidebar

### Balancing the schedule so it has best chance of success

### Keeping track of finances.