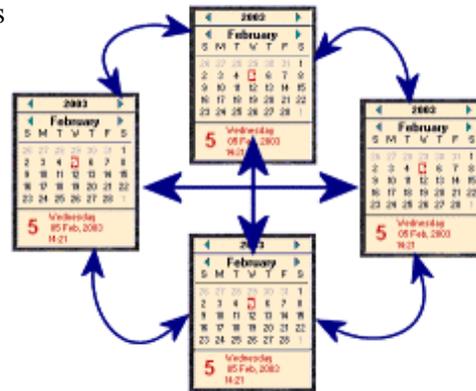


April 7, 2003

## *The Kitchen Sync Team Presents: “Roamin’ Calendar”*

A mobile instant-synchronization scheduling tool, designed for active families

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## Conceptual Design

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## Overview

Our previous memos have described our basic research and the goals of the Roamin' Calendar, or (RC), an electronic replacement for the family calendar. This product is an HCI for the modern, technically aware, family.

Today's lifestyles are becoming more complex and people are receptive to technology that helps them manage their daily lives.

Our current work focuses on the conceptual model. This document presents our conceptual modeling techniques and discusses in detail how they illustrate and define interactions, objects, and states, using views.

Specifically, this memo will present:

- Typical scenarios built from compilation of our observations
- Discussion of our OVID techniques related to the scenario
- How the scenario will play out using RC
- Review of cultural, social and technical implications
- Future plans

## Review of Important Points

What distinguishes a family calendar is that it is centralized where one can see at a glance activities occupying family time.

RC makes scheduling easier. It is:

- Portable and can be taken on the road
- Accessible by any member carrying an RC device
- Up-to-date via wireless synchronization

For our purposes, a family unit consists of two or more adults, or a family group of at least one adult and child.

The method used for tracking the family activities needs to be central and available to all family members. That's why the calendar on the wall works, but it can't be in the car with Mom and also available in the kitchen at the same time.

## The Conceptual Model

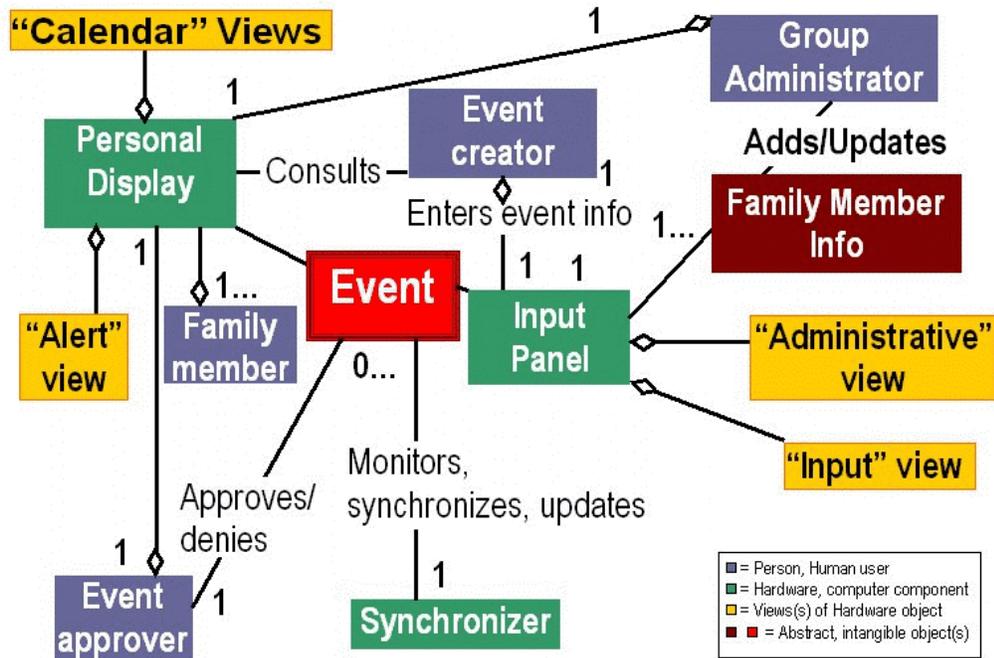
We have completed our first iteration of conceptual design, using the OVID methodology.

The set of techniques we use are defined by Richard Berry, Scott Isensee, John Mullaly, and Dave Roberts, © 1997-1998, IBM Corporation. They include the objects that users perceive, the views of these objects that enable users to interact with them, and the interactions the user has with the objects.

## Class Diagrams

Here, we introduce class diagrams to illustrate the underlying concept of Roamin' Calendar and its functionality. As you can see in figure 1, the Event is the central object in RC, and the conceptual model relies heavily on multiple views into the various RC objects.

Figure 1 - Class Diagram, Overview



## Views

Views are the visual representation of an object to a user and include everything the user needs to accomplish the task.

### Calendar Views from the Personal Display

The Personal Display module of Roamin' Calendar features a variety of "Calendar" views of scheduled events, depending on the type of event and the information relevant to that event type. The views we have identified to date are detailed below.

- **Appointment** view is intended for events having defined start/end dates, times, and durations. In addition, appointments typically have a list of expected attendees (even if that is only oneself), and may require transportation resources. Appointment view displays:
  - Date
  - Start time
  - End time

- Duration
  - Location
  - Participants
  - Resources (car, driver)
  - Recurrence(s)
- **Anniversary** view is intended for all-day events with time shown as “free” — such as birthdays, anniversaries, holidays, and so on — that do not require noting duration, participants, or resource allocation. This view serves mostly as a “reminder” of such events, and displays:
    - Date
    - Recurrence(s)
  - **Multi-day** view shows events such as conferences or vacations that span more than one day and possibly more than one location. These events do not typically require specifying a list of attendees or transportation resources. Multi-day view displays:
    - Date(s)
    - Duration
    - Recurrence(s)

## Alert Views from the Personal Display

There are conditions or situations requiring additional attention and/or input. Some of these are detailed below.

- An “**event alert**” set to alert the user before a scheduled event. This is user-configurable; users can specify whether this alert should be audio-only, visual-only, both, or neither, and they can specify how many minutes’ advance warning they prefer before being alerted of an upcoming event.
- A “**confirmation requested**” alert. Occasionally, users may deem it important to confirm that another RC user has seen a change to event details. The user making the change can request a confirmation, similar to requesting a “Read Receipt” for email. This request for confirmation then shows up on those other users’ Personal Displays.
- The “**user action required**” alert. Because RC is intended as a synchronizer but not as an arbiter, there will sometimes be schedule conflicts that Roamin’ Calendar is not able to automatically resolve and synchronize. For example, during a day in which every family member is very tightly scheduled, it may not be possible to simply reschedule an appointment without creating additional conflicts. In this case, the Personal Display of each RC family member shows the “user action required” alert, notifying them that automatic conflict resolution was not possible and that further action will be needed.
- For the designated Event Approver (only), an additional “**approval required**” alert is displayed. This alert appears when an event is added or modified by a child; the event is not considered permanently scheduled until

it has been approved. This alert notifies the approver that his/her approval is required before.

## Views from the Input Panel

The Input Panel of the Roamin' Calendar likewise features multiple views, including the standard Input View and the more specifically targeted Administrative View.

The standard **Input View** affords the input of event information as shown above in the Calendar views of the Personal Display. Additionally, Input View provides users with an opportunity to specify additional information such as the ones listed below:

- **Alert preferences** — how many minutes before an event, audio-only, visual-only, both, neither?
- **Notes** — helpful information that may not fall into one of the pre-defined categories as listed in the Calendar views of the Personal Display. For example, this might include a note that “I’ll be home after dark, please leave porch light on.”

## Administrative Views

The Administrative view is unique to the group administrator, and affords the opportunity for the administrator to add, delete, or modify family information regarding RC group members. For example, the administrator may grant a child event-entry authority that no longer requires parental approval, or may delete a family member who has gone off to college several hundred miles away, or add an extended family member that may be an integral part of daily life.

## *State Tables*

State tables show the life cycle of the object and how user actions change it from one state to another state. Our state tables use a dash when the combination is not allowed, or can't happen. “Ignore” is used when the action could conceivably be taken, but will have no effect. An example of “not allowed” happens when the event state is uncreated, and the user attempts to change it. An example of “ignore” occurs when the event is already confirmed and the user tries to confirm it again.

State tables for objects specific to the scenario transformation will be described later as part of the transformation.

## *Interactions or Task Diagrams*

**Interaction Diagrams** show the flow involved in performing a task. The vertical lines indicate which object or view is used, and arrows represent the direction of the action from one object to the next point. Objects can be humans, computer hardware, perceived objects, and views.

Interactions specific to the scenario transformation will be described later and will indicate which objects and views are required

## Transformations

### *Scenarios – Barbie and Ken*

The scenario we use for illustration is of Barbie and Ken who have decided to marry.

Barbie has been in contact with a photographer by telephone and email. She offered date and time options for a potential one-on-one meeting, based on three different calendars – Ken’s work calendar, Barbie’s school and work calendar, and a wall calendar at home.

We take up the story when the photographer emails back a date, time, and place.

1. Barbie checks her email at work and finds the photographer’s response.
2. She assumes this is an acceptable time for herself and Ken after checking her desk calendar there at work.
3. Barbie accepts the appointment via email,
4. and forwards the acceptance email to Ken so he can add it to his work calendar.
5. After sending the email to Ken, she writes the appointment onto her desk calendar.
6. Ken replies via email that although the date and time are acceptable, traffic will be heavy and he might be late. Can they make it half an hour later?
7. Barbie sends email to the photographer asking to move the time back by half an hour.
8. The photographer agrees.
9. Barbie sends email to Ken that confirms the change to the appointment.
10. Barbie then changes the appointment on her desk calendar.

At this point, Barbie still needs to remember to write this appointment on the wall calendar at home, and make sure Ken wrote it down on his work calendar.

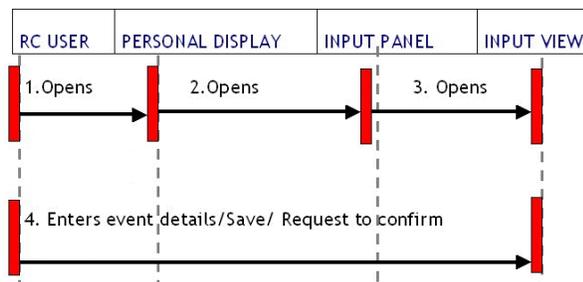
## Key Interactions – Barbie and Ken

We revisit Barbie and Ken to show key interactions and how Roamin' Calendar transforms this scenario.

1. Barbie checks her email at work and finds the photographer's response.
2. Barbie adds the photographer's interview to her Roamin' Calendar after seeing that it didn't conflict with Ken's schedule, which automatically updates Ken's RC as well. When saved, Ken's RC is updated automatically via wireless technology.
3. She asks Ken for a confirmation while entering the details of the appointment, to make sure he notices it and he hasn't had any last minute changes not yet recorded on the RC. Ken would then respond to confirm.

Figure 2 describes Barbie's view of her RC. She wants to include the photographer interview appointment.

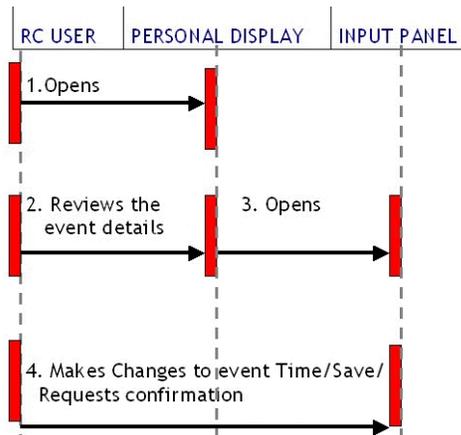
**Figure 2 – Barbie's first interaction.**



4. Ken sees the added appointment, and moves it back by half an hour (to account for heavy traffic), which automatically updates Barbie's RC.
5. Ken wants to make sure Barbie sees this change and asks for a confirmation.

Figure 3 describes Ken's view of his RC. He receives the alert that an event has been created by Barbie. He needs to alter the event time.

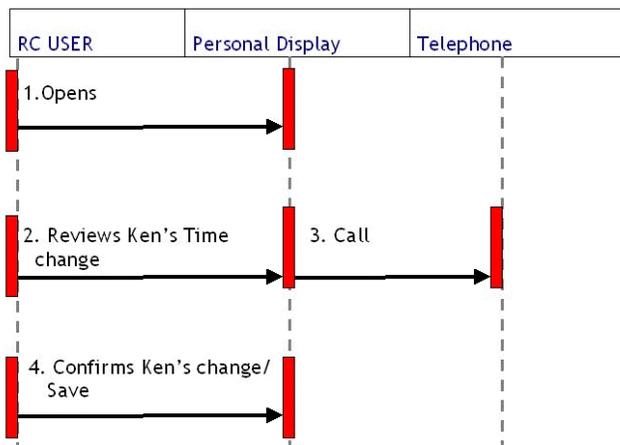
Figure 3 - Ken's interaction



6. Barbie sees the change and emails the photographer to say that she and Ken would like to move the appointment back by half an hour.
7. When the photographer agrees, Barbie confirms Ken's request

Figure 4 describes when Barbie views Ken's changes and makes the appropriate scheduling changes.

Figure 4 - Barbie's second interaction



Barbie doesn't have to write it on her desk calendar, and then remember to write it on the calendar at home as well as nag Ken to write it on his calendar.

### State Tables – Barbie and Ken

The non-human objects used in this interaction are the event, confirmation alert view, and synchronizer.

The main object in RC is the “event” or appointment from our scenario. This table shows the event in its basic states.

They are

- uncreated
- input - when the new event details are added or an existing event is changed
- scheduled – when an event is added to the family calendar

**Figure 5 - Basic state table for "event"**

	States		
Actions	Uncreated	Input	Scheduled
<b>Add</b>	Change to Input	-	-
<b>Save</b>	-	Change to scheduled	-
<b>Change</b>	-	-	Change to Input
<b>Remove</b>	-	Abandon	Change to uncreated

There are two additional states shown that are user requested:

- Needs confirmation
- Confirmed/Denied

**Figure 6 - Optional states for "event"**

	States		
Actions	Input	Needs confirmation	Confirmed/ Denied
<b>Request confirmation</b>	Change to needs confirmation	-	-
<b>Confirm</b>	-	Change to confirmed	Ignore

The confirmation required view has the basic states shown in diagram 7.

**Figure 7 - Basic states for "alert view"**

	States	
Actions	Inactive	Alert
<b>Confirmation request received</b>	Change to alert	Only one alert active at a time
<b>Confirm</b>	Ignore	Change to inactive

The synchronizer has the basic states shown in diagram 8.

Figure 8 - Basic states for "synchronizer"

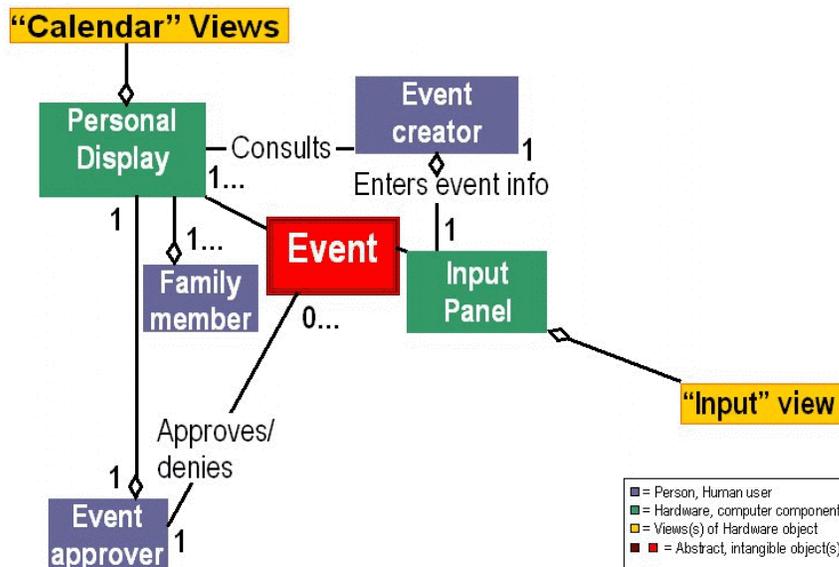
	States	
<b>Actions</b>	<b>Inactive</b>	<b>Active status</b>
<b>Change occurs to any monitored object</b>	Change to active	*processed in order of receipt
<b>Updates completed</b>	Ignore	Change to inactive

### Class Diagrams – Barbie and Ken

The class diagrams we use to illustrate the underlying concept of Roamin' Calendar and its functionality, are modeled in diagram 9. As you can see, the Event is the central object in RC, and the conceptual model relies heavily on multiple views into the various RC objects.

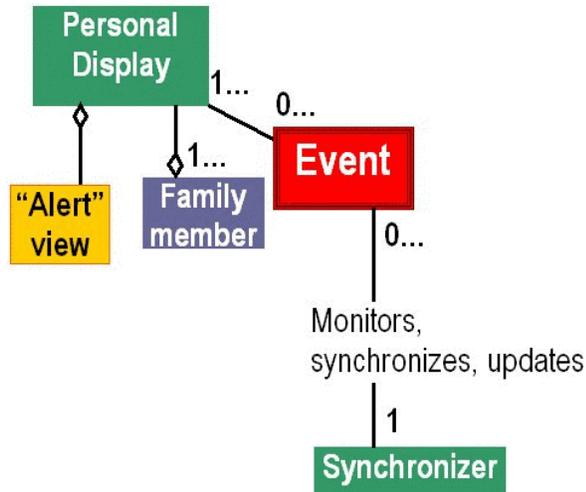
Barbie creates the Event Creator by consulting her Personal Display, (a hardware component of Roamin' Calendar that displays calendar views), for schedule conflicts. If there are no conflicts, Barbie uses the Input View of the Input Panel on the RC to enter the necessary information such as date, time, and transportation needed, to create the Event.

Figure 9 - Create an event by entering event info into input panel.



Changes to an Event’s details (date, time, location, and so on) are handled and monitored by the Synchronizer, which tracks completion of the updates.

Figure 10 - Synchronizer handles updates to RC



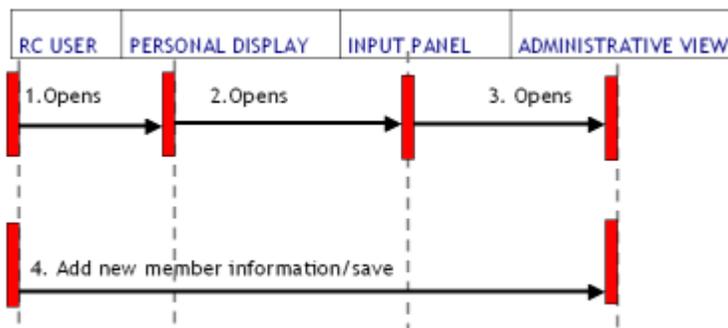
### Scenarios – Adding a New Family Member

Occasionally, the Group Administrator will need to add, delete, or modify information about individual group members. For example, suppose Barbie wants to make sure her mother is updated on all of her wedding plans and appointments, too. Barbie provides an RC unit for her mother, then uses the Administrative View of the Input Panel on her own RC to add information about her mother (shown on this diagram as an “abstract object” in maroon). After that, Barbie’s mother will see the same scheduling information on her Personal Display as Barbie and Ken do.

### Key Interactions – Adding a New Family Member

Barbie wants to add her mother into the RC system. This interaction describes how Barbie would add another user through the administrative view of family information.

Figure 11 - Barbie adds a new family member.



## State Tables – Adding a New Family Member

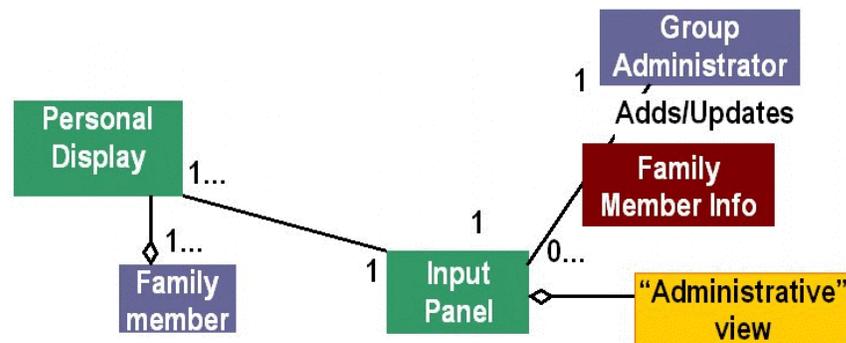
Figure 12 - Basic states for family member

Actions \ States	Inactive	Approver	Active
<b>Add</b>	Change to active	-	-
<b>Change</b>	Change to active	Change to active	-
<b>Remove</b>	-	Change to inactive	Change to inactive
<b>Make approver</b>	-	Ignore	Change to approver

## Class Diagrams – Adding a New Family Member

Occasionally, the Group Administrator will need to add, delete, or modify information about individual group members. For example, suppose Barbie wants to make sure her mother is updated on all of her wedding plans and appointments, too. Barbie provides an RC unit for her mother, then uses the Administrative View of the Input Panel on her own RC to add information about her mother (shown on this diagram as an “abstract object” in maroon). After that, Barbie’s mother will see the same scheduling information on her Personal Display as Barbie and Ken

Figure 13 - Adding a family member



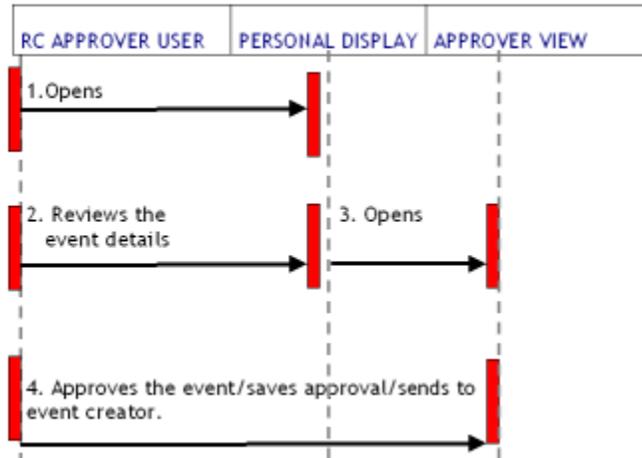
## Scenarios – The Notion of Approvals

Because Roamin’ Calendar is designed for families, it’s important that it also accommodate children’s entries. When an Event has been created and entered by a child, the Approver (usually Mom) approves or denies the event, and updates are shown in the Personal Display of each family member. This feature is intended to allow children to add events as they might on the wall calendar, but offers a way to make sure Mom sees them and approves them.

### Key Interactions – The Notion of Approvals

When an event needs approval from a parent here are the steps taken in the approval process using the event object and approval view from the alert views on the personal display.

Figure 14 - Approval process interaction



### State Tables – The Notion of Approvals

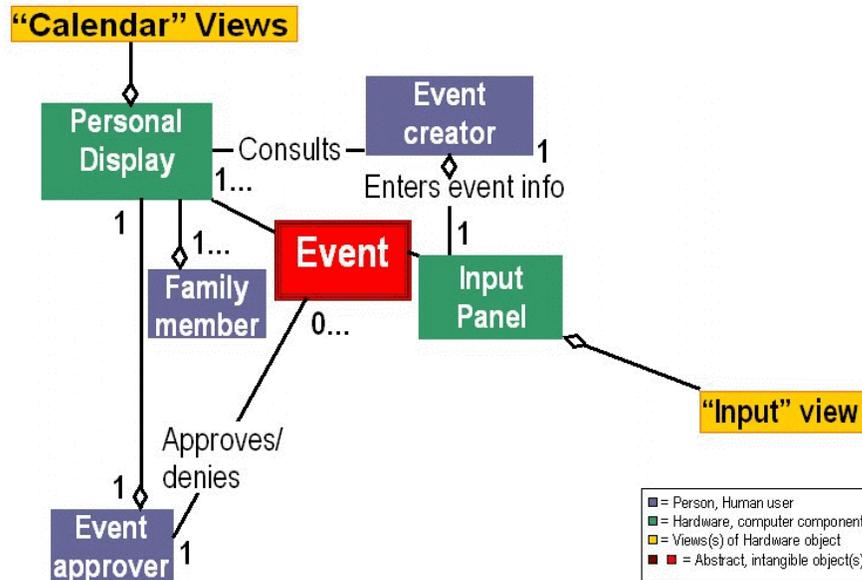
If the event creator has been set up in the family information as needing approval for adding events, the RC will automatically add the needs approval and approved states to the event object.

Figure 15 - Approval states for event

Actions	Input	Needs approval	Approved
Approval required due to status of creator	Change to needs approval	-	-
Approve	-	Change to approved	Ignore

## Class Diagrams – The Notion of Approvals

Figure 16 – Approvals



## Issues and Opportunities

### Cultural and Social Implications

Traditionally, getting children to use any scheduling system — regardless of medium or format — has been an ongoing challenge. Children can be notoriously forgetful; write it down and they forget to look at the written reminder, tell them and they'll forget ever having heard it, put it in another device and they'll forget to use it.

“Enticement” is an effective means of getting children to buy in to calendars and schedules. One method we are investigating is licensing very popular electronic games in a format compatible with Roamin' Calendar. The child can view scheduling information and the hot new game serves as the “carrot” to the “stick” of the scheduling interface.

### Cultural Opportunities

Cultural opportunities identified in previous memos continue to exist:

- Automatic electronic conflict resolution
- Children's Units

- Home Central Unit with Printer
- Vehicle Display Unit
- Transferring and updating from other devices

Many families are using calendars of some sort and have embraced cell phone technology. We believe that the right product, blending these two ideas is the potential market for the RC.

## *Considerations While Moving Forward*

### **Separate Device or Piggy Back?**

- The success of our product will depend on the public's willingness to carry and use the RC devices. Our selection of which devices to use is important.
- The 3G Motorola picture phone presents an adequate display, but the input device is still lacking even the limited methods available with a PDA. The new ideas for cell telephone devices seem to embrace inclusion of other applications. We will continue to monitor device developments.

**Figure 17 -  
Motorola T720**



### **Time Management for the Family**

- We must plan to ease RC users' migration paths from their traditional scheduling media to Roamin' Calendar. This need not necessarily be complex or even HCI-oriented, but we will need to assure users that migrating their data from the kitchen wall calendar to Roamin' Calendar will be easy and worth the effort.
- We will consider publishing white papers that discuss time management within the context of RC.

### **Wi-fi and 3G Update**

We have kept abreast of the technology required for RC. There are already proven cases of this technology in action. Strides in this direction are proceeding rapidly, fuelled by approvals of the latest IEEE 802.11 standards.

- Our product depends on existing and emerging wireless technology and devices. Similar products exist, but none are marketed to the family using this technology. The concept of group calendaring is successful, and many features can be built upon for our product.
- Telecom giants of both technologies are looking at offering their customers cost effective combinations of wi-fi and 3G. In a recent article by Adam Stone, "Is Integration Overrated?" his interview with T-Mobile includes

*"... T-Mobile absolutely intends to deliver an integrated WAN and Wi-Fi product. "We are confident that we are going to be able to offer our customers a seamless experience through combined networks," he said. In an important first step toward that goal, he noted, T-Mobile will offer customers a single-bill option by the end of the year, wherein a customer's hotspot charges would appear on that customer's regular cell phone bill."*

- From BusinessWeek Online, APRIL 1, 2002, SPECIAL REPORT: THE WIRELESS NET, Wi-Fi: It's Fast, It's Here -- and It Works:

*"Furthest along is VoiceStream Wireless. It announced in mid-March that it will integrate Wi-Fi technology (acquired when it picked up the assets of the former MobileStar Network) with its existing network to provide "seamless service" -- an Internet connection that switches automatically from Wi-Fi to 3G and back -- starting early next year. Sprint PCS is working on something similar, although it hasn't unveiled an offering. "There is no question that Wi-Fi will be complementary to 3G wireless," says Sprint spokesman Dan Wilinsky. Already, Nokia and Ericsson are working on handsets that allow seamless roaming."*

*"Indeed, Microsoft's Windows XP and Windows CE operating systems for PCs and handhelds, respectively, already come configured for Wi-Fi. And for the 2002 holiday season, Microsoft will debut its Mira mobile devices including detachable Wi-Fi flat-panel monitor. Gates & Co. promises that users will be able to remove the display from a PC and carry it around a home or office while maintaining an Internet connection and the full functionality of the computer via an on-screen keyboard."*

*"Indeed, research firm Cahners In-Stat expects sales of wireless network cards and Wi-Fi base stations to grow from \$1.9 billion in 2001 to \$5.2 billion in 2005, despite big declines in the prices of such equipment. The industry trade group, the Wireless Ethernet Compatibility Alliance (WECA), started up two years ago with six companies -- and now has close to 140. "Virtually every company that signs up for WECA has some interest in producing, selling, or deploying a product," says Sarosh Vesuna, a WECA board member."*

*"Intel has spent hundreds of millions of dollars on research and development related to Wi-Fi, says Stephen Salzman, senior director of wireless LAN marketing at the No. 1 chipmaker. He believes that Wi-Fi is the technology that will make the "extended PC" a reality and "really give people a reason to go mobile.""*

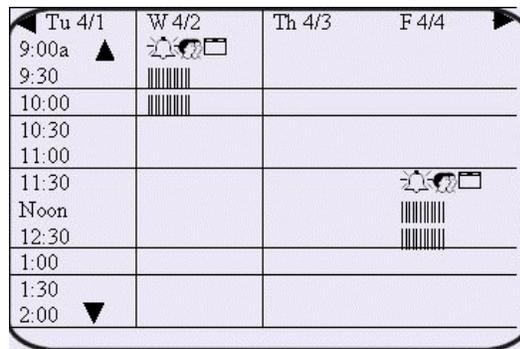
## Future Plans

The conceptual design is an iterative process. We continue to add greater levels of detail until the interactions for the UI design are insured with tight integration of information, data, and design.

## Prototype

As noted previously, the current vision for Roamin' Calendar is based on a device similar to the familiar PDA's such as the Palm, Handspring, and Pocket PC, using multiple views. This graphic shows early proof-of-concept prototypes featuring several of these views.

**Figure 18 - Prototype, 3 day calendar view**



**Figure 19 - Prototype, event view**

Activity	Study date
Start day	4/3
End day	4/3
Start time	3:30
End time	5:00
Participant	▼ Tom
Location	Sue's house
Driver/chaperone	None
Confirm request	
Approved	Tentative
Notes	Study for math test

Figure 20 - Prototype, participants dropdown from event view

Tom	✓	<input type="checkbox"/>
Mom	✓	
Dad		
Cindy	✓	
Charlie		

Figure 21 - Prototype, alert view

Activity	Study date
Time	3:30 – 5:00
Location	Sue's house
Snooze?	Okay

Figure 22 - Prototype, confirmation view

Activity	Study date
Time	3:30 – 5:00
Location	Sue's house
Note: will you drive	Okay?

Figure 23 - Prototype, approval view

Requestor	Tom	<input type="checkbox"/>
Date	4/3	
Time	3:30 – 5:00	
Location	Sue's house	
Approved	denied	<input type="checkbox"/>

Future RC versions will include additional formats of the Roamin' Calendar family of products, including a wall hung calendar model, a wearable "wristwatch" style model, and various versions designed for children.

## Implementation

We will test a low fidelity prototype with a target audience that is most likely to appreciate the technology, and that represents the broadest cross-section possible of Roamin' Calendar target demographics, transformed scenarios, and product functionality. With proof of usability and proof of concept, we will seek partners experienced in wireless modems, software development, and hardware manufacture, to assist in bringing Roamin' Calendar to market trials.

## Summary

Simultaneous synchronization of a group's schedules in a way that consolidates, coordinates, rearranges, and notifies, can be accomplished with existing and developing technologies. Giant telecom companies are adding wi-fi to 3G networks, and proven modems manufactured by Novatel Wireless insure successful data transfer with traditional full-duplex communications components.

Excerpts from BusinessWeek Online:

APRIL 1, 2002

SPECIAL REPORT: THE WIRELESS NET

Wi-Fi: It's Fast, It's Here -- and It Works

*"For Wi-Fi to really take off in homes, he thinks some kind of "killer app" will have to capture the public imagination.... That's probably true. But coming up with a killer app doesn't seem like such a tall order with Intel and Microsoft already pouring boatloads of dollars into Wi-Fi technologies and major carriers such as VoiceStream and AT&T figuring out how to make the technology work for them."*

*"To get back in the game, many wireless players are planning to incorporate Wi-Fi into their networks so they can promise customers both coverage and speed -- even if not both at the same time. The idea is that you would use a Wi-Fi LAN when one is available and migrate to the slower wide-area networks (WANs) upon which 3G is based when that's the only network available."*

The person with main responsibility for scheduling, in our observations, has some familiarity with desktop computers and cell phones. These people and their families are the target market, are good candidates for our HCI, and have expressed interest in such a tool.

We showed you how Roamin' Calendar brought Ken and Barbie an organized, easily accessible, synchronized future, and it can do the same for you and your family, too. After all, we all go roamin'. We all use a calendar. We can all use a Roamin' Calendar!

**Our observations, research, and concept design prove that RC has a well-defined market of technology aware families. RC has an exciting future helping to manage daily activities.**