

# Piskomil Mobile - Project report

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## ***Overview***

Piskomil mobile is a J2ME application that can be used for retrieving very precise information about rain conditions at given places in the area of Czech Republic. It uses two independent data sources:

1. "**Medard**" **numerical weather forecast server** (<http://www.medard-online.cz/index.php>, site also in English). This server uses advanced numerical model to predict amount of rain at a given location and time.
2. data computed by **Radar department of Czech Hydrometeorological Institute** (<http://www.chmi.cz/meteo/rad/eindex.html>, site in English). This server provides information about actual rain conditions in Czech republic by computing it from radar waves reflection data.

Information from these sources is retrieved and then shown in easy-to-understand charts (one chart for a given location).

## ***Motivation & Design decisions***

Piskomil mobile application is intended to be used by czech rock climbers. It is designed based on these observations:

1. Most of climbing regions in Czech are sandstone rocks. Sandstone is very soft material which can be easily destroyed by climbing it. If it's wet by rain, it becomes even less solid. In most regions climbers are not allowed to climb up to 48 hours after rain (so that the rock can become dry). Thus, knowing the weather conditions is very important for czech climbers. Next, climbers are interested in future weather conditions as well as in past ones (up to 48 hours to the past).
2. Climbers need to know as much details about rain conditions as they can. They want to know how much it has been raining, for how long, etc. This help when deciding whether rocks are really dry inside and makes climbing more safe (holds can break if rock is wet inside, and that can be very dangerous). This is the reason why Piskomil Mobile supplies information in form of bar charts on hourly basis.
3. Climbers don't care about global rain conditions in the whole czech republic. They need location-specific weather forecast for couple of places they want to climb at (there are let's say 20 climbing regions in Czech). GPS coordinates of climbing regions are well-known, so Piskomil Mobile gives weather information based on GPS coordinates.
4. Climbers want to have access to weather forecast directly from the climbing places, without having access to PC. That's why they need mobile application.

5. Every climber likes different climbing regions, so he wants to make his own list of climbing regions that should be displayed in reports.

## ***System functions***

Piskomil mobile is able to:

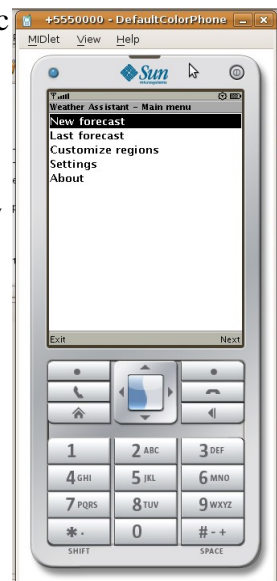
- Add, Edit, Delete location definitions (locations are called "climbing regions"). Locations are saved to RecordStore to be persistent.
- Show generated weather reports for selected input data (with user-friendly interface to achieve that).
- Download data (using HTTP) from Medard online and CHMI radar department servers. Data are downloaded in form of pictures (.gif). These pictures are then analyzed, proper pixel positions are calculated according to requested GPS coordinates and information about rain conditions at given time and location are retrieved from them.

## ***User interface***

### **Main menu**

Main menu appears after launching midlet and it navigates user through the basic actions he can perform. These are:

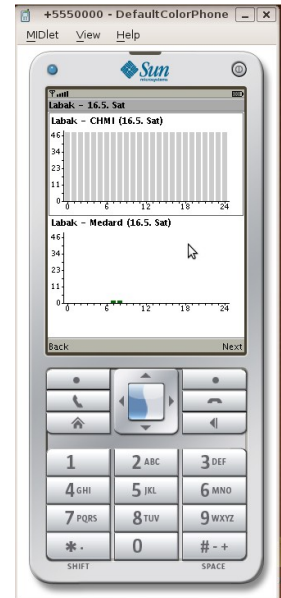
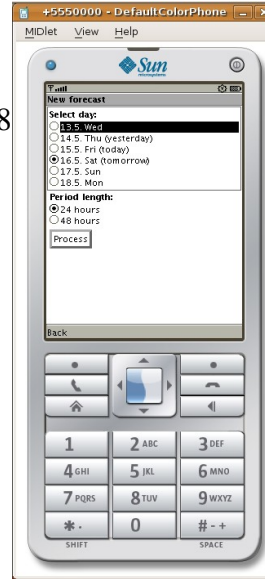
- „New forecast“ - lets user download new weather forecast data from HTTP, analyse them and view results
- „Last forecast“ - allow user to see last charts that were generated by „new forecast“ selection.
- „Customize regions“ - shows list of regions and allows user to customize their properties.
- „Setting“ - some application level settings
- „About“ - shows basic information about application version and author.



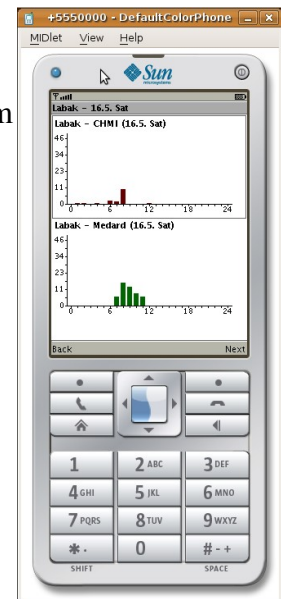
## Generating new forecast

New forecast can be generated by selecting this option in main menu. Action progresses in these steps:

1. User selects day for which he wants to see weather forecast and interval length (last 24 or 48 hours). Then user hits the „Progress“ button.
2. Application starts downloading data needed for generating charts. Progress is shown on display in form „x/50 snapshots retrieved“. After downloading all the data they are analyzed and charts are generated based on this data.
3. Resulting charts are shown on display. For each climbing region, one screen of two charts is generated and user can page between the regions by selecting the action „Next“. For 48-hour intervals, two screens are generated for each climbing region (one for each day).



Charts legenda: colored bars in charts show rain amount at given time in tenths of mm/h. Gray bar covering all the height of the charts signalizes that data are not available at this time. This situation is shown on the picture where data from CHMI were not available (CHMI radar department measures only the actual rain conditions, it does not do any forecasts – so data are available only for the past).

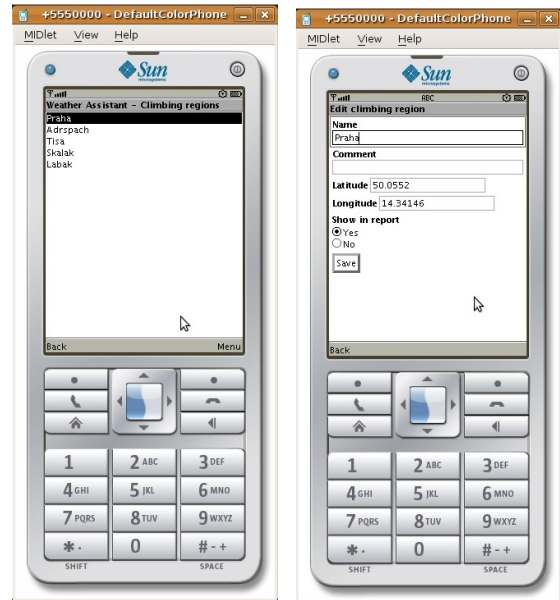


## Customizing regions

User can customize list of regions by selecting this option in the main menu. After this, a list of climbing regions appears. By selecting a command in menu, climbing region can be added or deleted. By selecting a climbing region, its detail form appears and properties of climbing region can be set.

Climbing region has these properties:

- Name – name which will appear in charts
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- Comment – place for note about climbing region
- GPS coordinates – GPS latitude and longitude in decimal degrees.
- Show in charts option – climbing regions can be selected as disabled and then they will be not shown in charts. This feature can be used when climber is interested in only a few certain places (and then he deactivates other places temporarily).



## Settings

At this time only setting „Use mock data“ is available. This option was introduced to allow users that don't have internet connection to be able see how application works without downloading any real data from internet (I used this option to test application on my mobile phone on which I pay a lot of money for transmitted data).

## Problems solved

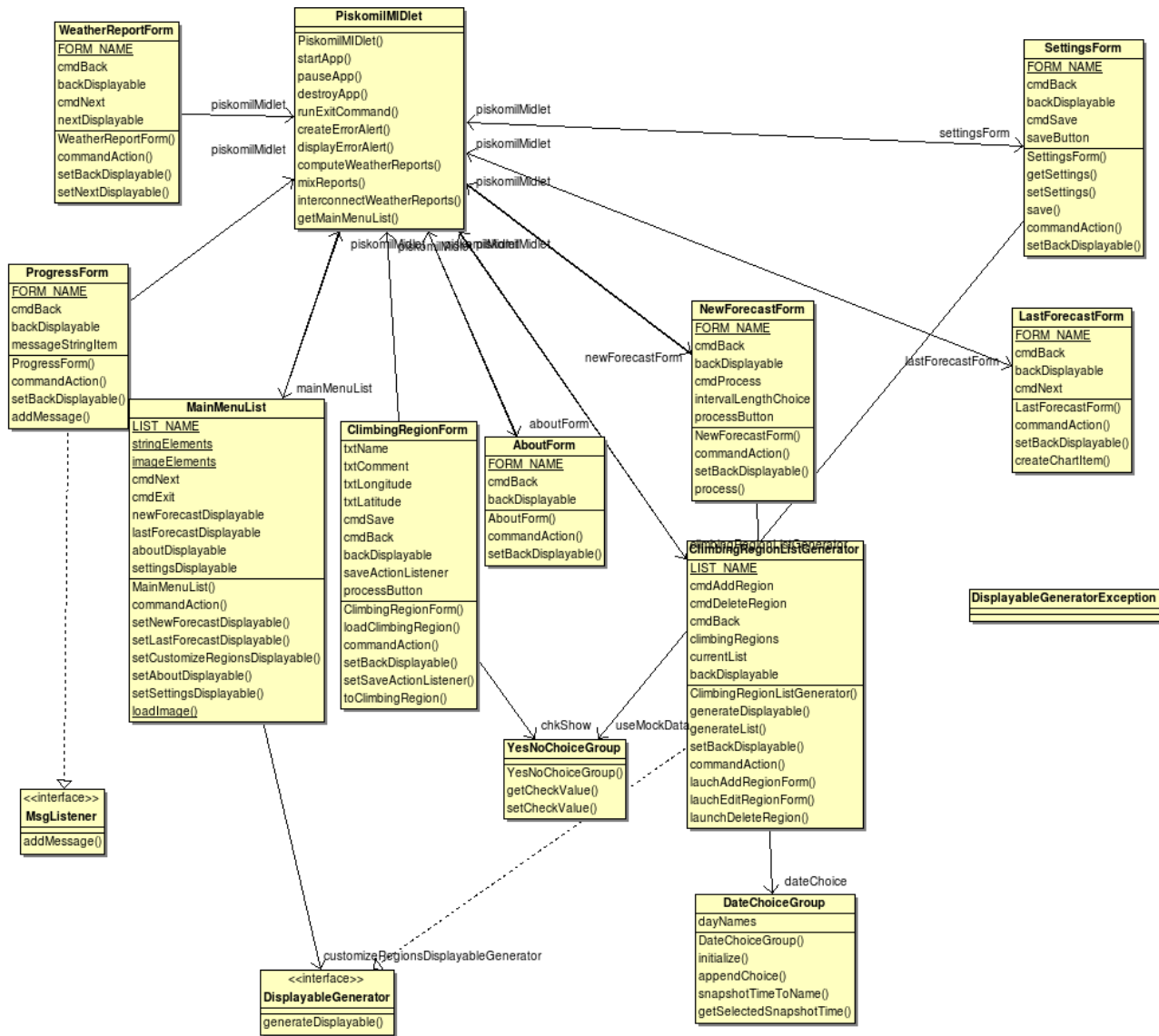
All downloaded images (50 or 100 small images for one report) does not fit into phone's memory together - which conflicted with the original workflow in application's core (desktop version of the same application first downloads are images and then analyses them). I introduced a new layer of clever proxies, that analyze images as soon as possible, cache the needed results (which are pretty small) for later use and let JRE garbage-collect the images themselves immediately. That solved the problem without a need to rewrite substantial part of application's core.

J2ME does not support some advanced math functions I needed (to transform GPS coordinates to pixel positions). I used implementations that I found on web (package Math).

J2ME does not support generics. I had to downgrade code for analyzing pictures (which I wrote before, for a desktop version of the same application) to use collections from Java 1.4.



## 2. Piskomil UI Class Diagram



### Third-party code

When implementing Piskomil mobile, I reused this code (downloaded from internet):

- Implementation of missing Math.\* functions.
- J2ME Component for displaying charts.