The Meeting Scheduler System - Problem Statement

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The preliminary description hereafter is deliberately intended to be sketchy and unprecise. Acquisition, formalization and validation processes are needed to complete it and lift the many shadow areas.

A number of features of the Meeting Scheduler system were inspired from various experiences in organizing meetings (faculty meetings, ESPRIT project meetings, Program Committee meetings, etc.).

Scheduling Meetings: Domain Theory

Meetings are typically arranged in the following way. A *meeting initiator* asks all potential meeting attendees for the following information based on their personal agenda:

- a set of dates on which they cannot attend the meeting (hereafter referred as *exclusion set*);
- a set of dates on which they would prefer the meeting to take place (hereafter referred as *preference set*).

A meeting date is defined by a pair (calendar date, time period). The exclusion and preference sets are contained in some time interval prescribed by the meeting initiator (hereafter referred as date range).

The initiator also asks active participants to provide any special equipment requirements on the meeting location (e.g., overhead-projector, workstation, network connection, telephones, etc.). He/she may also ask important participants to state preferences about the meeting location.

The proposed meeting date should belong to the stated date range and to none of the exclusion sets; furthermore it should ideally belong to as many preference sets as possible. A *date conflict* occurs when no such date can be found. A conflict is strong when no date can be found within the date range and outside all exclusion sets; it is weak when dates can be found within the date range and outside all exclusion sets, but no date can be found at the intersection of all preference sets. Conflicts can be resolved in several ways:

- the initiator extends the date range;
- some participants remove some dates from their exclusion set;
- some participants withdraw from the meeting;
- some participants add some new dates to their preference set.

A meeting room must be available at the selected meeting date. It should meet the equipment requirements; furthermore it should ideally belong to one of the locations preferred by as many important participants as possible. A new round of negotiation may be required when no such room can be found.

The meeting initiator can be one of the participants or some representative (e.g., a secretary).

System Requirements

The purpose of the meeting scheduler system is to support the organization of meetings - that is, to determine, for each meeting request, a meeting date and location so that most of the intended participants will effectively participate. The meeting date and location should thus be as convenient as possible to all participants. Information about the meeting should also be made available as early as possible to all potential participants. The intended system should considerably reduce the amount of overhead usually incurred in organizing meetings where potential attendees are distributed over many different places. On another hand, the system should reflect as closely as possible the way meetings are typically managed (see the domain theory above).

The system should assist users in the following activities.

- Plan meetings under the constraints expressed by participants (see domain theory).
- Replan a meeting dynamically to support as much flexibility as possible. On one hand, participants should be allowed to modify their exlusion set, preference set and/or preferred location before a meeting date/location is proposed. On the other hand, it should be possible to take some external constraints into account after a date and location have been proposed - e.g., due to the need to accommodate a more important meeting. The original meeting date or location may then need to be changed; sometimes the meeting may even be cancelled. In all cases some bound on replanning should be set up.
- Support conflict resolution according to resolution policies stated by the client.
- Manage all the interactions among participants required during the organization of the meeting, for instance, to communicate requests, to get replies even from participants not reacting promptly, to support the negotiation and conflict resolution processes, to make participants aware of what's going on during the planning process, to keep participants informed about schedules and their changes, to make them confident about the reliability of the communications, etc.

The amount of interaction among participants (e.g., number and length of messages, amount of negotiation required) should be kept as small as possible.

The meeting scheduler system must in general handle several meeting requests in parallel. Meeting requests can be competing by overlapping in time or space. Concurrency must thus be managed.

The following aspects should also be taken into account.

- The system should accomodate decentralized requests; any authorized user should be able to request a meeting independently of his whereabouts.
- Physical constraints should not be broken - e.g., a person may not be at two different places at the same time, a meeting room may not be allocated to more than one meeting at the same time, etc.
- The system should provide an appropriate level of performance, for example:
  + the elapsed time between the submission of a meeting request and the determination of the corresponding meeting date/location should be as small as possible;
  + the elapsed time between the determination of a meeting date/location and the communication of this information to all participants concerned should be as small as possible;
  + a lower bound should be fixed between the time at which the meeting date is determined and the time at which the meeting is actually taking place.
- Privacy rules should be enforced; a non-privileged participant should not be aware of constraints stated by other participants.
- The system should be usable by non-experts.
- The system should be customizable to professional as well as private meetings. These two modes of use are characterized by different restrictions on the time periods that may be allocated (e.g., meetings during office hours, private activities during leisure time).

- The system should be flexible enough to accommodate evolving data - e.g., the sets of concerned participants may be varying, the address at which a participant can be reached may be varying, etc.
- The system should be easily extendable to accommodate the following typical variations:
  + handling of explicit priorities among dates in preference sets;
  + handling of explicit dependencies between meeting date and meeting location;
  + participation through delegation - a participant may ask another person to represent him/her at the meeting;
  + partial attendance - a participant can only attend part of the meeting;
  + variations in date formats, address formats, interface language, etc.
  + partial reuse in other contexts - e.g., to help establish course schedules.

Extending the System with Additional Knowledge for Conflict Resolution

Knowledge about participant status and about priorities among users and meetings should help in determining a "best" way to resolve a conflict. Even when there is no conflict, the participant status may be useful in determining a "best" meeting date and location.

The following notions should be incorporated in the proposed extension. They capture the hierarchical importance of participants, the importance for a participant to attend a particular meeting relatively to other participants or to other meetings, and the ease with which a participant can make a particular date interval free. These various notions should be used in the conflict resolution process.

Participant Status. The participant status captures the hierarchical importance of a participant with respect to others independently of any specific meeting he is expected to participate in. This attribute might be used, e.g., to determine a "best" compromise on date and location whenever several ones are possible. The participant status is typically determined by some superuser. For instance, in the context of scheduling faculty meetings the departement head would have a higher status than normal professors. The latter would have a higher status than student representatives.

Participant Importance. The participant importance captures the importance for a specific person to attend a particular meeting *relatively to other participants*. Participant importances are typically determined by the meeting initiator. For instance, the meeting chairman and secretary must be present; they have the highest participant importance. In a project meeting where specific tasks are discussed, the task leaders would have a higher importance than normal project members and a lower importance than the meeting chair, the task speakers or the project reviewers.

Meeting Significance. The meeting significance represents the importance for a specific person to attend a particular meeting *relatively to other meetings or meeting requests*. Meeting significances are typically determined by the participants concerned. For instance, participants to a specific task in a research project would assign a greater significance to a project meeting where their task will be discussed. This information must be kept confidential.

Participant Flexibility. The participant flexibility is intended to indicate how easily a user can make a particular date interval free to allow meetings to be scheduled within that interval. Dates in exclusion sets and/or preference sets can thus be weighted accordingly. The participant flexibility is typically determined by the participants concerned. For instance, professors cannot move lecture periods easily; their participant flexibility for the corresponding date intervals should be low. A date interval which is not in the exclusion set of a participant should have a high flexibility for that participant. This information must be kept confidential.

Using Knowledge about Status and Priorities. The following tactics illustrate some typical uses of the various kinds of priorities suggested above.

- Best meeting dates and locations should be determined by considering participants with higher participant *status* first.
- If no date can be found to organize a meeting, the Meeting Scheduler system could propose a person having low participant *importance* to withdraw from the meeting.
- If no date can be found to organize a meeting, the Meeting Scheduler system could propose a participant to cancel (or to withdraw from) another meeting having a lower meeting *significance*.
- A meeting date within some exclusion set (or outside some preference set) coud be considered if the corresponding participant has a high *flexibility* for it.