November 2020

Broker Protocol For Automated Event Scheduling By Virtual Assistant

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ABSTRACT

When planning an event, people often need to coordinate and negotiate with other parties to determine a time slot that is suitable for all parties. Figuring out and confirming the most suitable arrangements can involve substantial communication overhead, thus making the process slow and tedious, especially when several parties are involved. Further, such an approach can be invasive because it can require visibility into the calendars of all parties involved. This disclosure describes techniques that enable automated communication and coordination among virtual assistants to schedule an appointment involving multiple parties. User-permitted information such as the user's calendar, routines and preferences, etc. can be accessed by the virtual assistant to implement a broker protocol to determine a time for the appointment that works for the multiple parties.

KEYWORDS

- Event scheduling
- Automated scheduling
- Scheduling constraint
- Broker protocol
- Multiparty event
- Virtual assistant

BACKGROUND

When planning an engagement, people often need to coordinate and negotiate with other parties to determine a workable arrangement. For example, organizing a barbecue with friends requires a person to ask all those on the invitee list for workable days and time for the event and

to manually find a slot that satisfies the constraints of these multiple parties. Another example is finding an available slot in one's calendar for scheduling a doctor's appointment based on scheduling requirements driven by external factors, e.g., the need to fast for several hours prior to the appointment. Figuring out and confirming the most suitable arrangements with a manual approach can involve substantial communication overhead, thus making the process slow and tedious, especially when several parties are involved.

In addition to manual inquiries, people can use features of calendaring systems when scheduling such events with multiple parties. For instance, people can look up someone's availability via a calendar shared by the person. Such an approach can be invasive since it requires that appropriate access controls be set up to provide visibility into the calendars of all parties involved. Moreover, people's calendars may be incomplete, out-of-date, or incompatible, which affects the extent to which the information in the calendars can be considered reliable. As a result, some amount of manual work may still be required despite having access to calendars. Further, the burden involved in any of these strategies worsens considerably with an increase in the number of people involved in the event.

DESCRIPTION

This disclosure describes techniques that enable user-permitted automated communication and coordination among virtual assistants to schedule an appointment involving multiple parties. In essence, with user permission, the virtual assistant of each person involved in a planned event acts as that person's broker, using a broker protocol without the need for explicit user involvement to negotiate a slot workable for all parties. The protocol is strictly limited to using only the minimum user-permitted information needed for scheduling purposes. As such,

the simplicity of the operation avoids the need for users to be burdened with the negotiation effort without the need to reveal information in their calendars to other people.

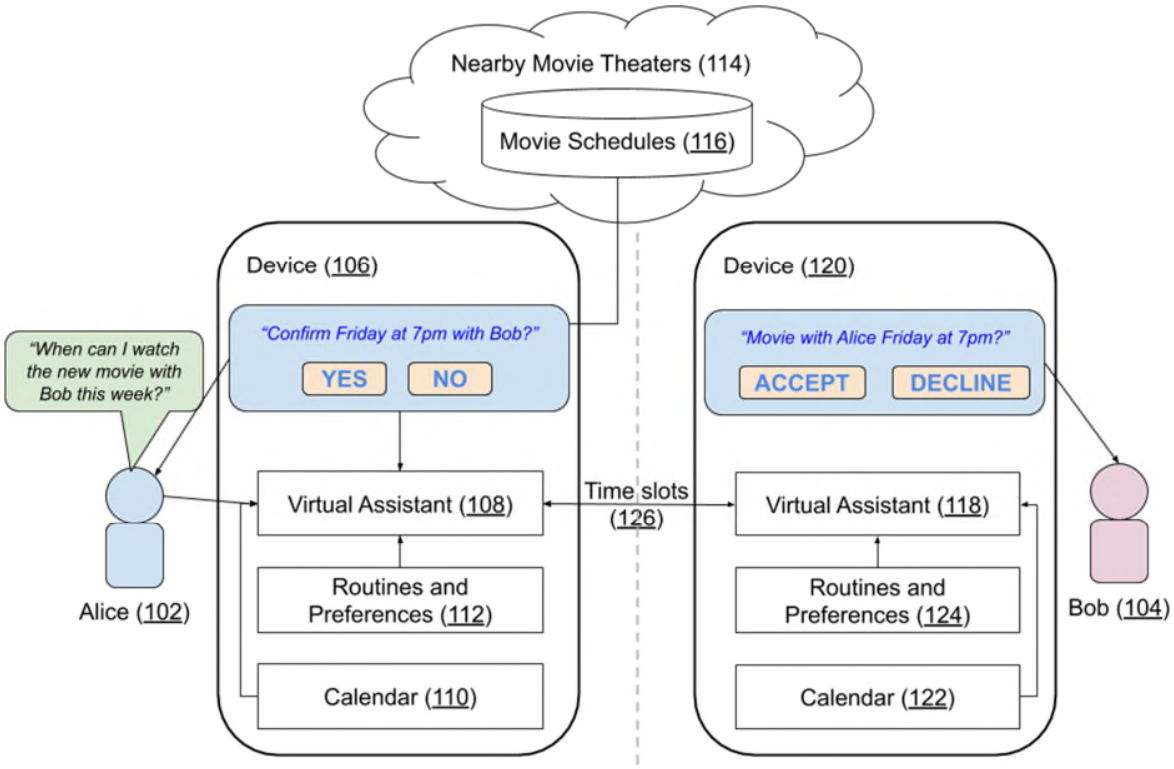

Fig. 1: Virtual assistants using a broker protocol to determine a workable appointment slot

Fig. 1 shows an operational implementation of the techniques described in this disclosure. The user Alice (102) wishes to watch a newly released movie with her friend Bob (104) in the coming week. Alice instructs the virtual assistant (108) on her device (106) to find a movie screening time that is mutually workable for herself and Bob. Alice's virtual assistant generates a list of candidate time slots (126) based on retrieving permitted information from Alice's calendar (110), her routines and preferences (112) as inferred from her previous interactions with the assistant, and movie schedules (116) at nearby movie theaters (114).

A broker protocol is used to present the list of slots and corresponding theater locations to Bob's virtual assistant (118) on his device (120). With Bob's permission, Bob's virtual assistant

determines the most suitable slot from the received list by accessing permitted information from Bob's calendar (122) and his typical routines and preferences (124) as inferred from his previous interactions with the assistant. Alice is then asked if the slot negotiated among the assistants is acceptable for proposing to Bob. If Alice confirms, the slot is proposed to Bob. If Bob accepts, the appointment is added to the respective calendars.

Implementation of the techniques described above can involve any number of parties as necessary. Specifically, with user permission, the broker protocol facilitates automated negotiation for event scheduling based on various constraints, such as time, location, costs, user preferences, etc. If the users permit, the protocol can additionally take into account event characteristics and dependencies, such as reservations, purchases, transportation, etc.

If the users permit, the determination of available slots can employ information regarding routines and locations not explicitly present in the calendar, but inferred based on previous user interactions. For example, a user may not have calendar entries for routinely recurring events, such as a team lunch each Tuesday. Alternatively, or in addition, existing calendar entries can be used to determine suitability of slots immediately preceding or following the entry. For example, a user may be too tired following a scheduled workout session and may prefer not to book any social engagements in the evening hours following the workout.

Employing the broker protocol as described herein limits information sharing among parties only to the specifics needed for the scheduling task at hand. Moreover, with user permission, the protocol permits automated negotiation at the backend, further limiting the information about any user shown that may be shown to other parties to only the final results or inquiries. The limited information exposure makes the described protocol suitable for use in

scheduling scenarios that involve potentially untrusted third parties, such as companies, unfamiliar individuals, etc.

Using a broker protocol via virtual assistants overcomes the issues of calendar and assistant compatibility, thus making the operation independent of the specifics of each user's virtual assistant and/or calendar programs.

Implementation of the described techniques simplifies complex multiparty scheduling negotiations to a single request to a virtual assistant, thus significantly enhancing the user experience (UX) of event scheduling. The interfaces that employ the protocol can be packaged to be machine readable in the form of an application programming interface (API), thus enabling its use within third party applications and services. For example, the API can enable communication between multiple different virtual assistant applications (e.g., which is the case when different users make use of such different applications) to negotiate the scheduling of the event. Additionally, the protocol can support human readable interfaces, such as text, email, etc., which can enable the involvement of human assistants in the scheduling negotiations, if needed. Further, the broker protocol underlying the operation can be made open to permit interoperation and extension.

If the users permit, the techniques described in this disclosure can be implemented in a manner that allows the virtual assistants to perform additional actions necessary for the event after all parties have agreed on a slot. For example, a virtual assistant can purchase tickets for a movie event, reserve a table for a dinner engagement, etc.

The techniques can be further extended by the implementation of functionality that allows a user to survey various options connected to scheduling desired activities. For instance, a user can inquire about restaurants with available seats within a 10-minute walking distance,

recommendation for an evening movie, list of friends who might be available to get together for coffee on an upcoming trip, suggestions for presents for a family member's birthday, etc.

Further to the descriptions above, a user may be provided with controls allowing the user to make an election as to both if and when systems, programs or features described herein may enable collection of user information (e.g., information about a user's social network, social actions or activities, calendar appointments, routines, profession, a user's preferences, or a user's current location), and if the user is sent content or communications from a server. In addition, certain data may be treated in one or more ways before it is stored or used, so that personally identifiable information is removed. For example, a user's identity may be treated so that no personally identifiable information can be determined for the user, or a user's geographic location may be generalized where location information is obtained (such as to a city, ZIP code, or state level), so that a particular location of a user cannot be determined. Thus, the user may have control over what information is collected about the user, how that information is used, and what information is provided to the user.

CONCLUSION

This disclosure describes techniques that enable automated communication and coordination among virtual assistants to schedule an appointment involving multiple parties. User-permitted information such as the user's calendar, routines and preferences, etc. can be accessed by the virtual assistant to implement a broker protocol to determine a time for the appointment that works for the multiple parties. If the users permit, the protocol can additionally consider event characteristics and dependencies, such as reservations, purchases, transportation, etc. Employing the broker protocol limits information sharing among parties only to the specifics needed for the scheduling task at hand. Implementation of the described techniques simplifies

complex multi-party scheduling negotiations to a single request to a virtual assistant, thus significantly enhancing the user experience (UX) of event scheduling.