



calo *stardust*



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Project Overview

SRI sponsored project:

Cognitive Agent that Learns and Organizes (CALO)

AI-powered application that adapts to user's behavior

Target users: “overburdened knowledge workers”

Project Goals

Obtain data-driven understanding of users and their needs

Research novel uses for the system

Design an improved model of interaction while still leveraging existing CALO technologies

Deliver an interactive prototype

Design Constraints

The AI learns and changes over time

The system requires training to be effective

The system needs to show that it's learning

Design Constraints

The AI's current capabilities should be leveraged

The AI's limitations must be taken into account

CALO should be useful to DARPA managers, yet extendable to executives in general

Our Process

Background and user research

Literature review, contextual design

Ideation and design

Personae, use case analysis, concept validation, paper prototypes, implemented prototypes

Evaluative user testing

Think aloud user studies, heuristic evaluation

Contextual Inquiries

CALO developers

To gain better understanding of the existing CALO system

Executives

To determine the needs of our target users

Administrative assistants

To find out how assistants work with their executives

Key Findings

Applications are overloaded

Using the AI to extract information

Current collaborative technology is disruptive

Interruption management

Key Findings

Users often have to wait for others

Pending tasks

Too many interruptions?

Capturing loose items

Findings

Training CALO IRIS is disruptive to user's workflow

Low cost ways to enable users to train CALO

Information is decentralized

Gathering information into one place

Prioritization is difficult

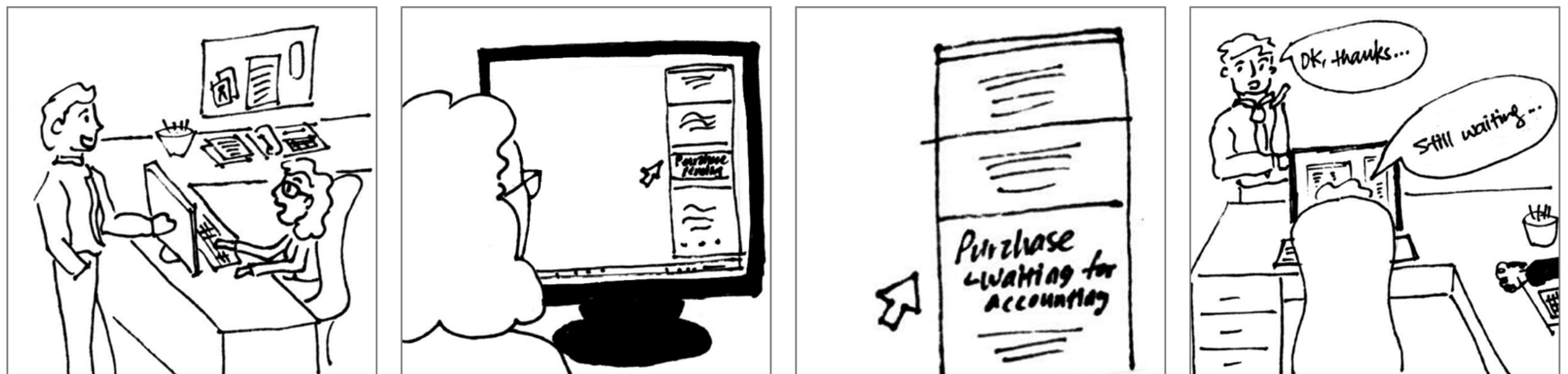
AI automated prioritization

Concept Validation

We asked users:

Do you have a need to see certain information at all times?

Would you be willing to put more effort into teaching the system to guarantee that it doesn't make a particular mistake again?



Ideation

Design guiding principles:

Some information must always be visible on screen

Some information is only necessary by request

The user should have ubiquitous control

Training should not interrupt the user's work flow

Made five independent designs, synthesized, and critiqued

Think Alouds

Paper prototype

On non-target users

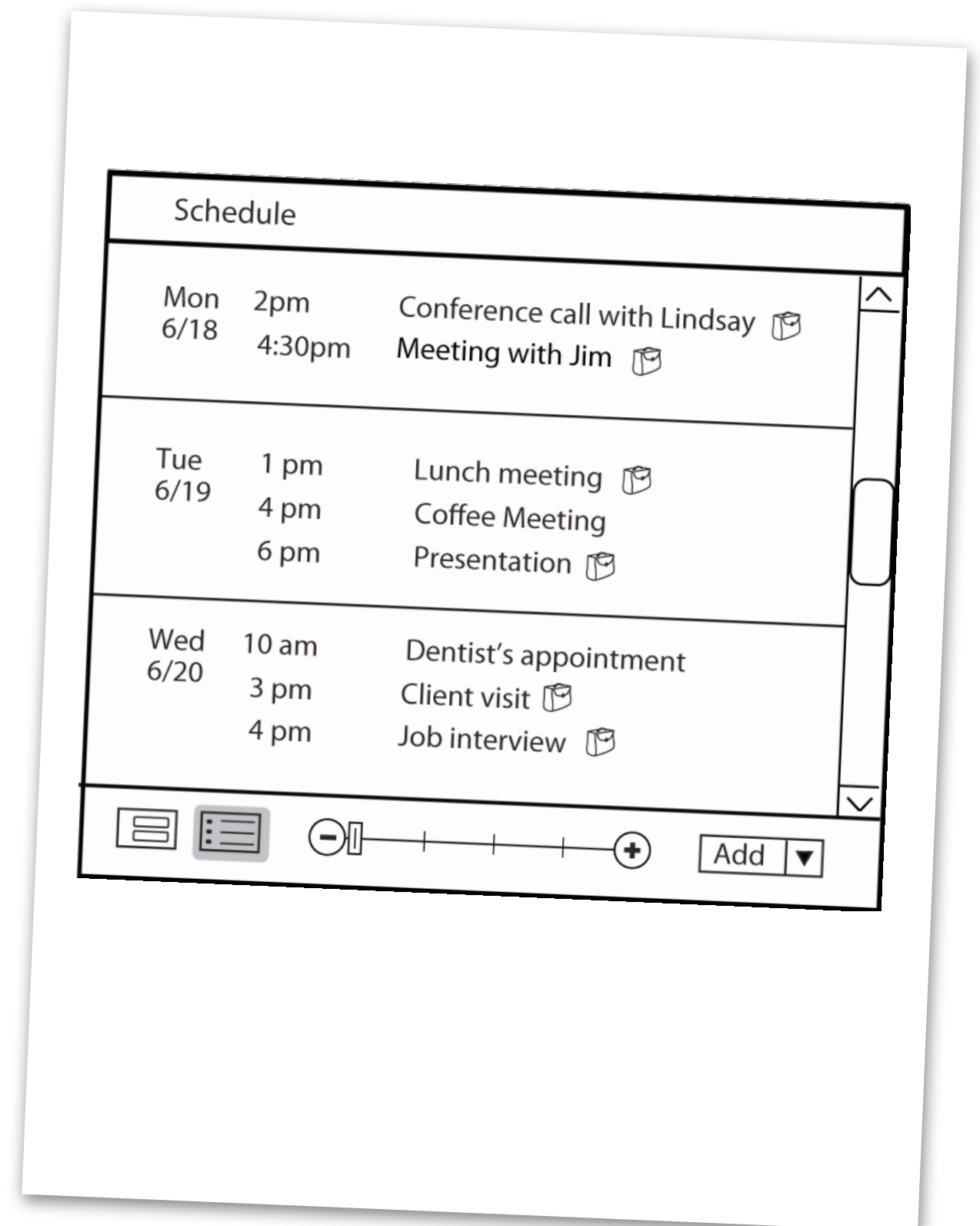
High-level usability

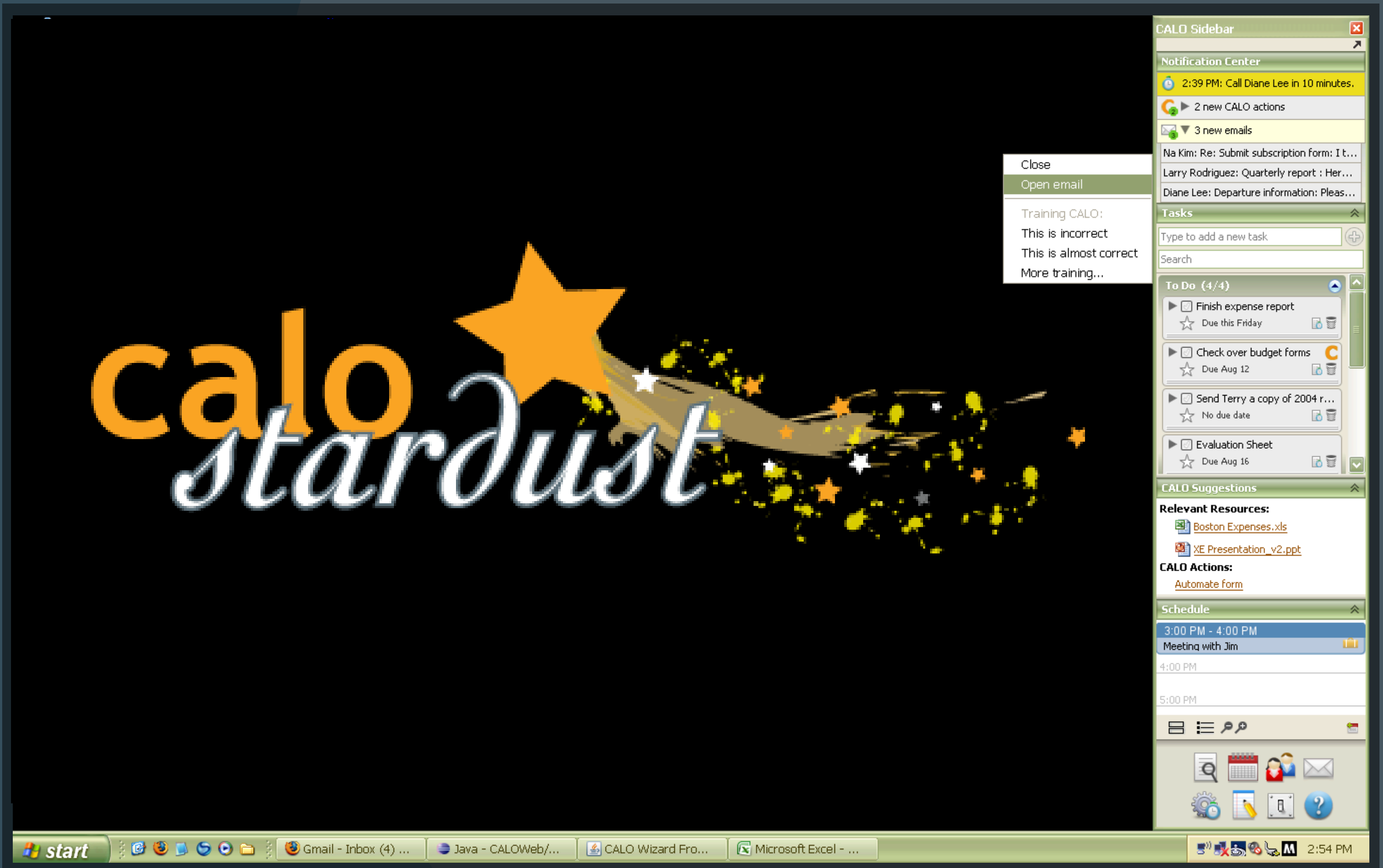
Wizard of Oz prototype

On both non-target and target users

Fine grained usability details

Model of interaction





Benefits of a sidebar

Information can be visible at all times

Easy access to different sources of information

Doesn't get covered by other windows

Doesn't constrain the variety of interactions

Interaction Challenges

Lack of space in the sidebar

- Use icons

- Make non-essential information available upon request

Taking up screen real estate

- Allow users to choose what to see at all times

AI system acts autonomously, users need to be aware

- Animations

- Notifications

- Context

Training Challenges

AI needs to be trained to be effective; users don't have time to train explicitly

Create different levels of training to accommodate the user's and the system's needs

Leverage existing user actions for implicit training

Make explicit training ubiquitous and "just out of sight"

Task pane

A prioritized task manager

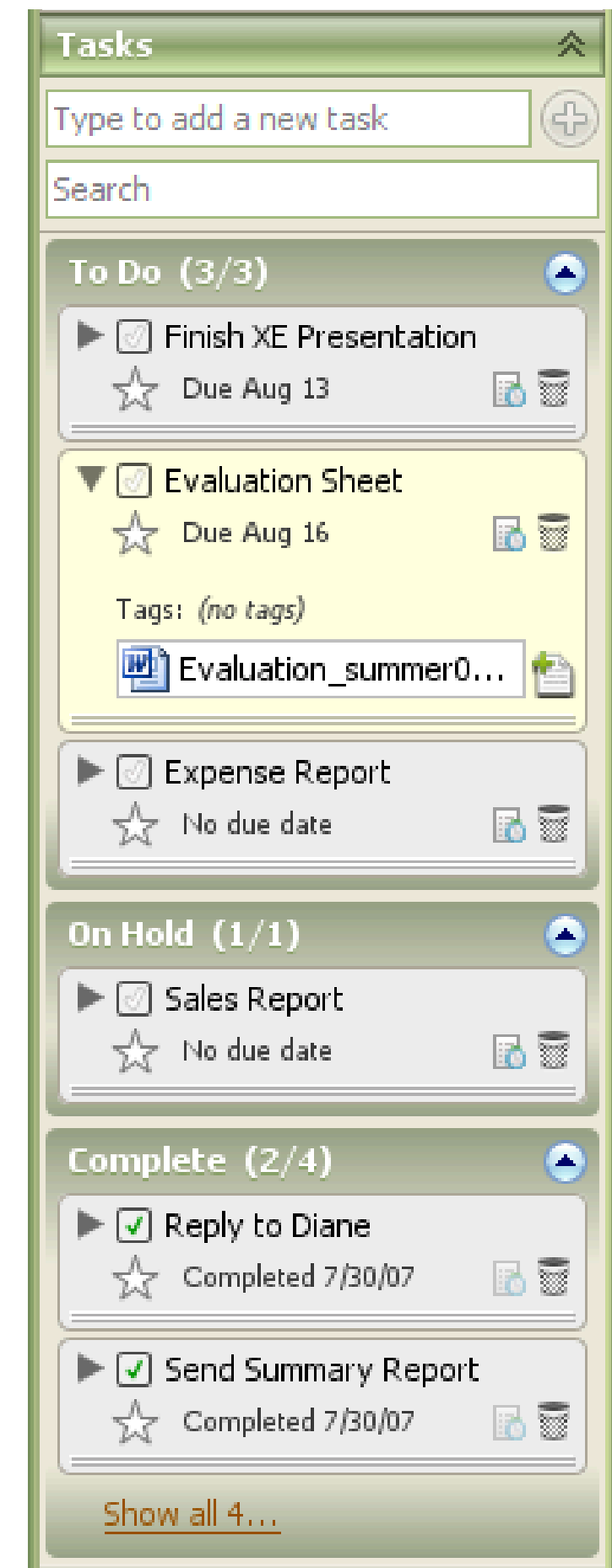
Target users have too many tasks, so it takes too much time to figure out what they need to do right now

AI dynamically adds and adjusts the tasks

Priority is not just dictated by due dates

Automatically helps users to capture and prioritize tasks

Differentiates user-added and system-added tasks



Task pane

A prioritized task manager

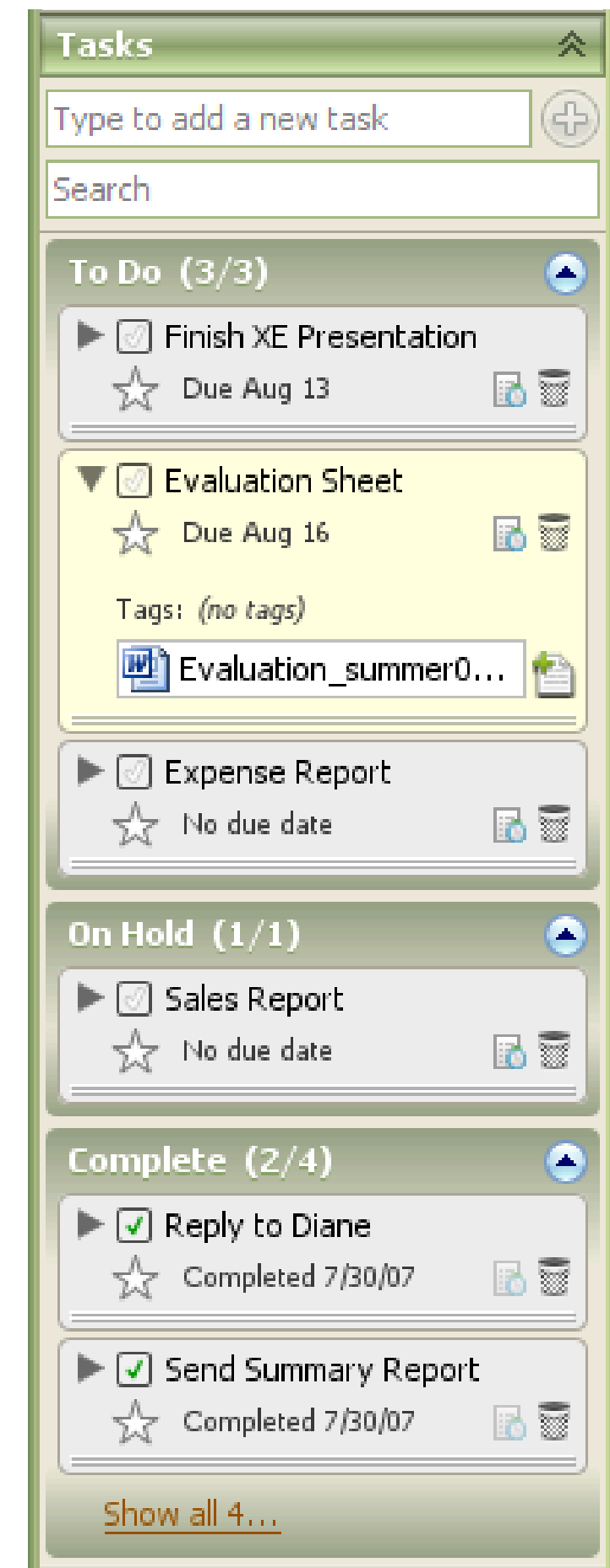
Three groups of tasks: To Do, On Hold, and Complete

Users usually have separate piles for active and pending tasks

Allows users full editability (add, delete, grouping, etc.)

Users expressed reservation about automatic prioritization

Allow users full control of their tasks



Task pane

A prioritized task manager

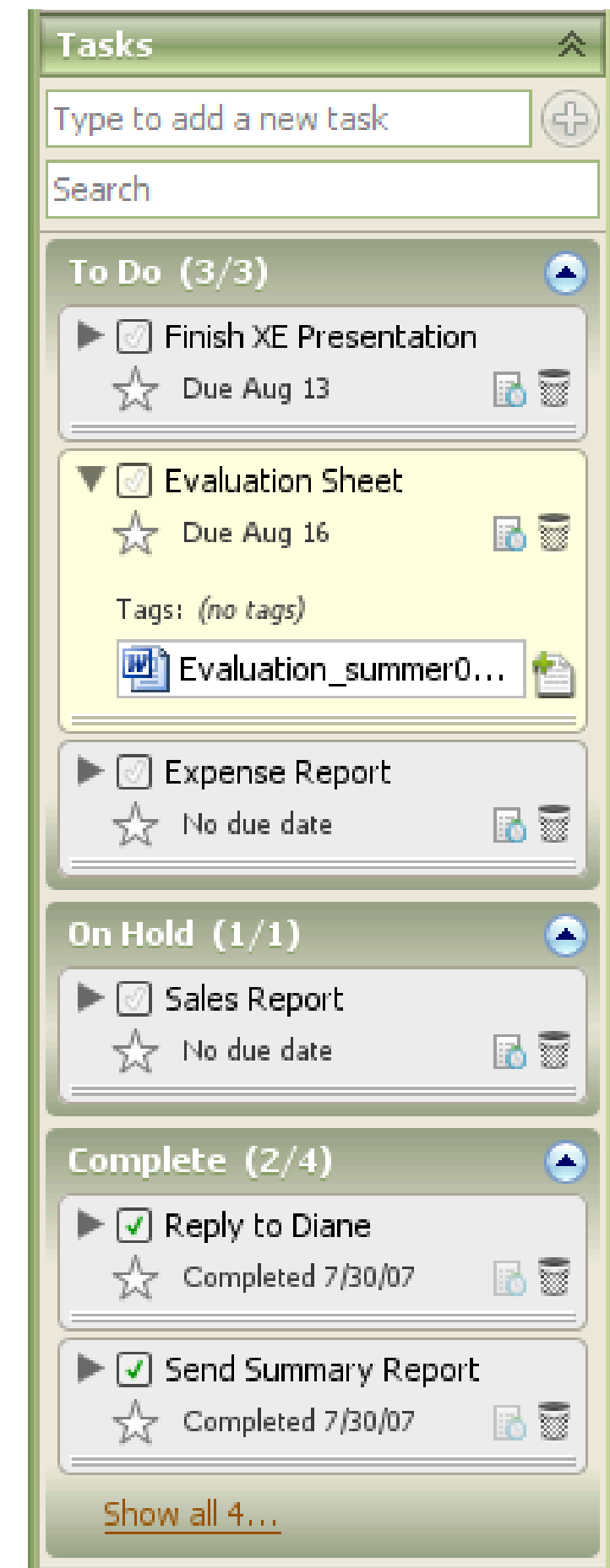
Enables users to search and filter their tasks

AI can change task order, making tasks hard to find

Attaches associated resources to tasks

The tasks that users need to do usually involve working with files, emails, etc.

AI can associate relevant resources with tasks as well



Notification center

A space to keep users informed

Three types of notifications

Reminders

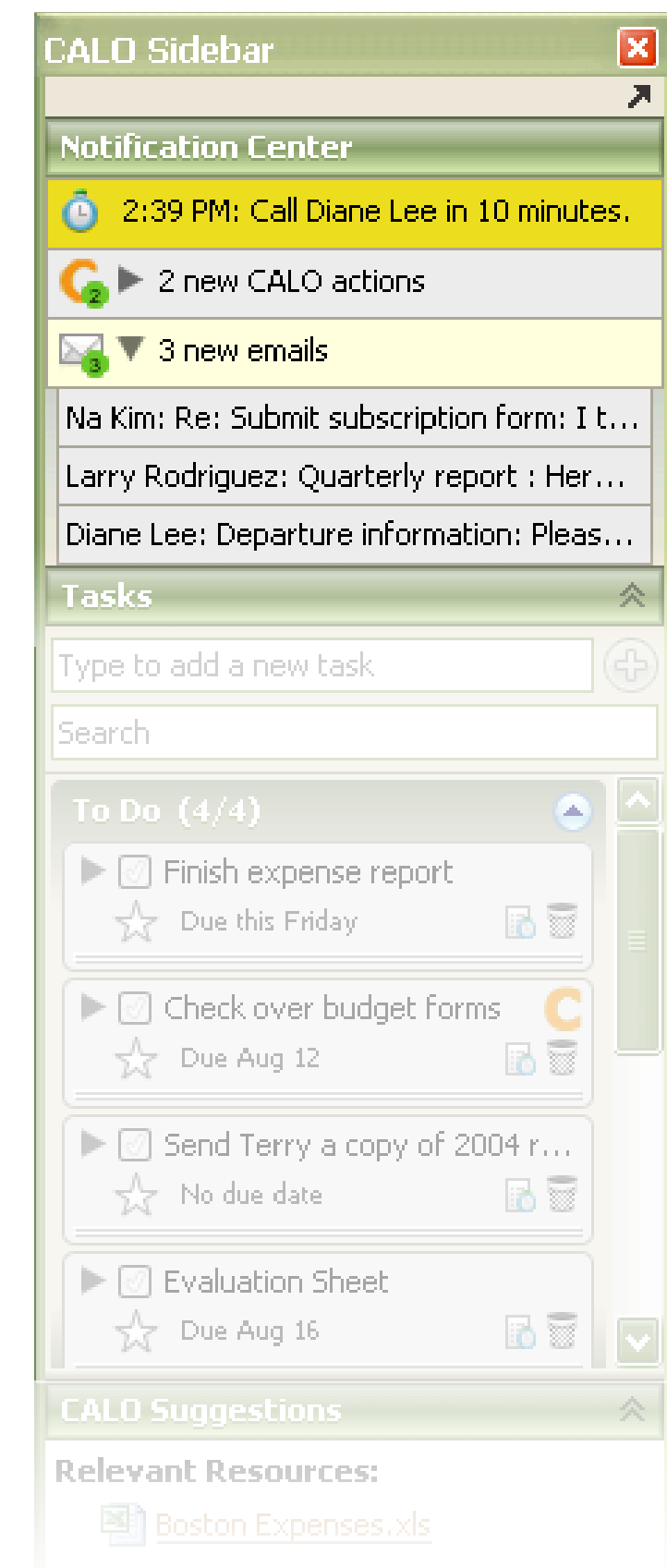
Observed during CIs

Verified in concept validation

Important emails

Research shows much information comes from email

Encourages user to look at emails so CALO can process them



Notification center

A space to keep users informed

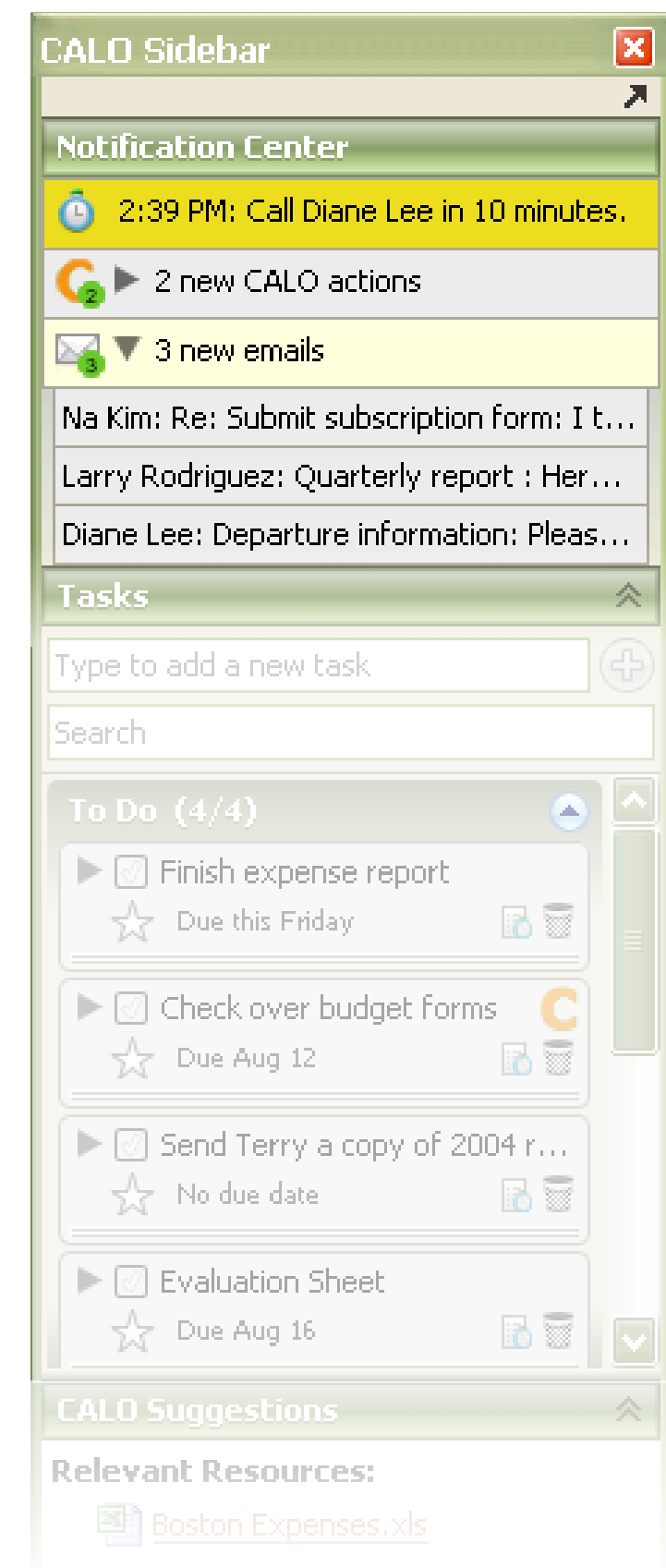
CALO actions

Keep user aware of important
AI activities

Two levels of priority: urgent and extremely urgent

Notification center serves to
ensure some information is
always visible

Extremely urgent
notifications are time-
sensitive



Notification center

A space to keep users informed

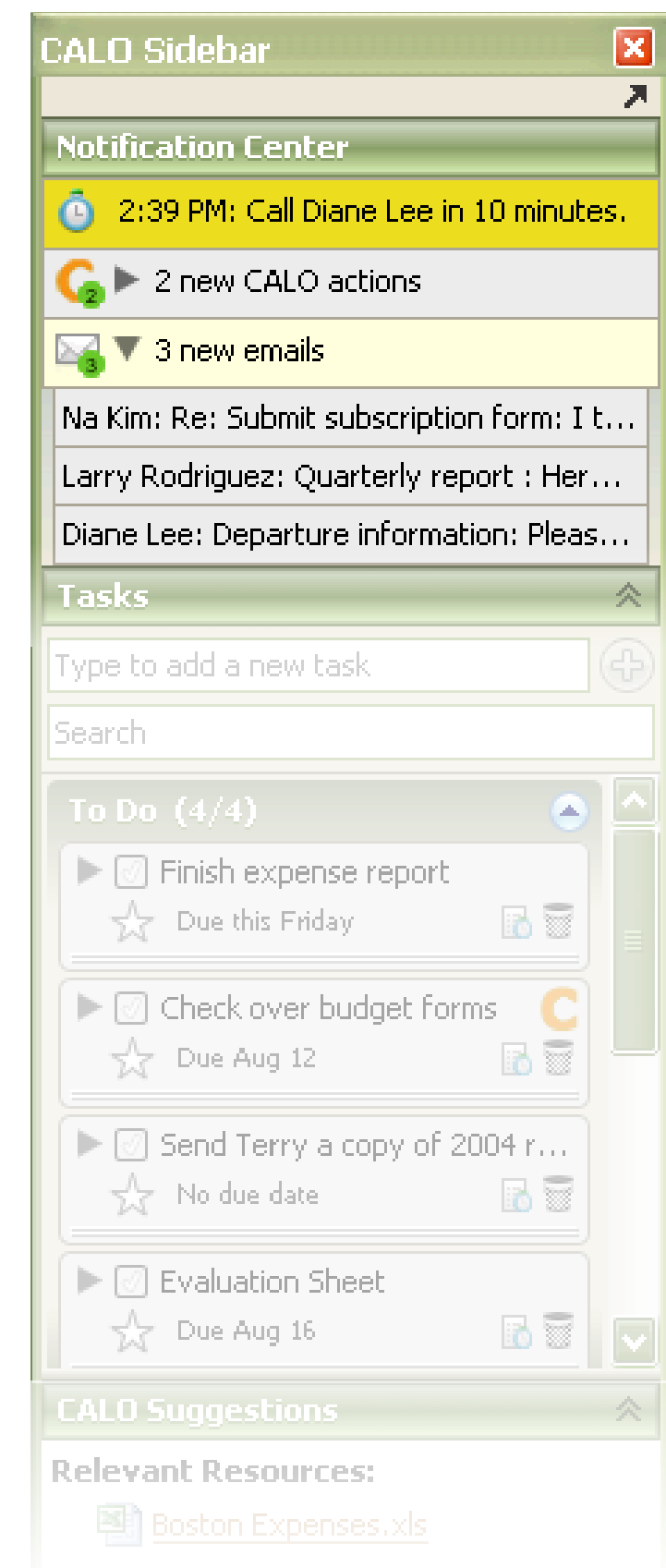
Urgent notifications coalesce together

Prevents the sidebar from changing abruptly

Visually separates out extremely urgent notifications

Click-through

Ties the sidebar more strongly to the user's workflow



CALO Suggestions

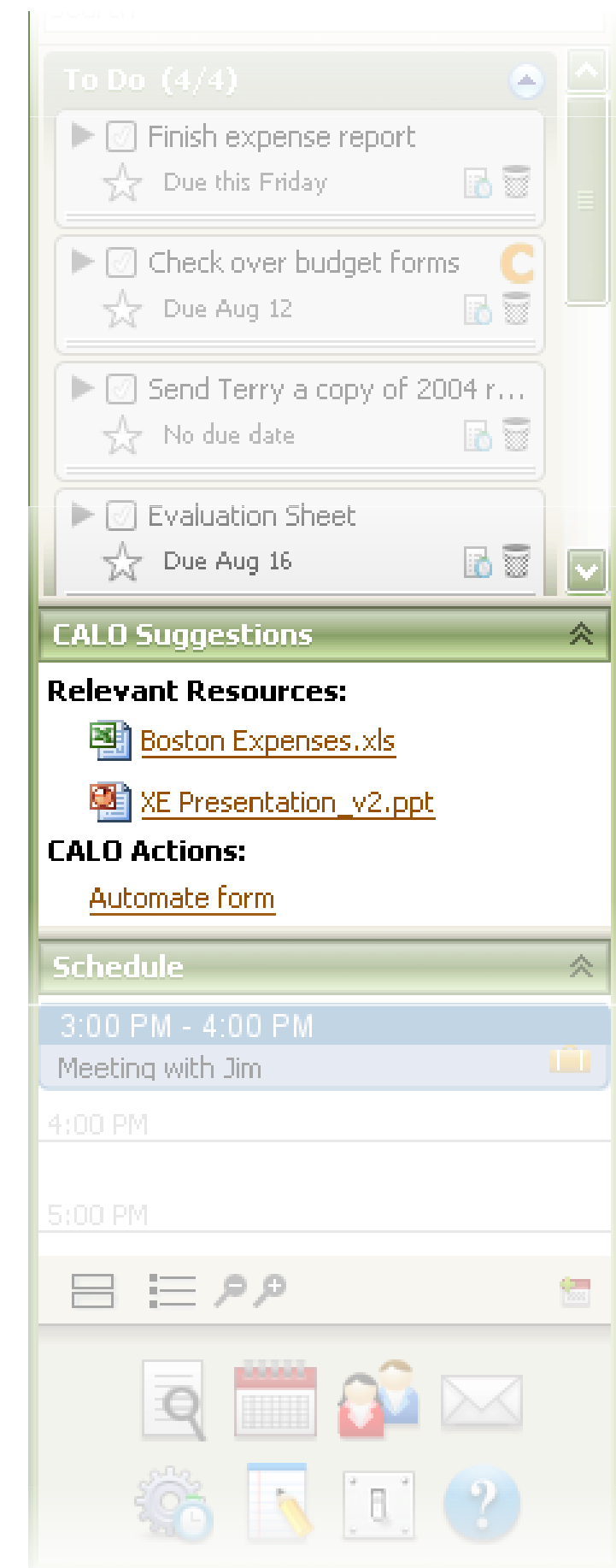
A place where CALO can suggest relevant resources and actions

Relevant to the user's currently focused window

CALO can initiate interaction with the user

Not all AI capabilities relate to tasks and notifications

CALO can demonstrate that its learning benefits the user



Schedule

A view of the day to help users manage their time

Today's schedule should be visible at a glance

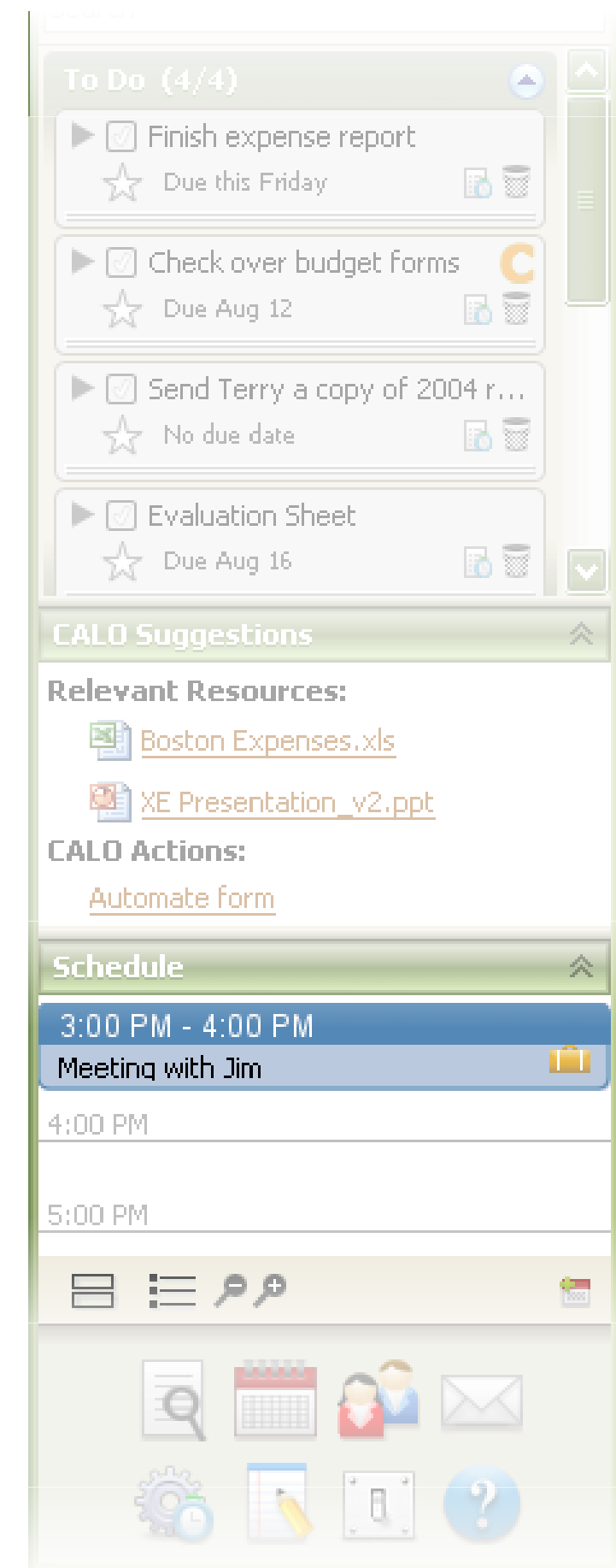
Common use of calendars is to orient user in time

Schedule view not for long-term scheduling

Calendar applications better equipped to serve this need

“Now” is always visible

Need to see now to orient yourself



Schedule

A view of the day to help users manage their time

Schedule moves as day progresses

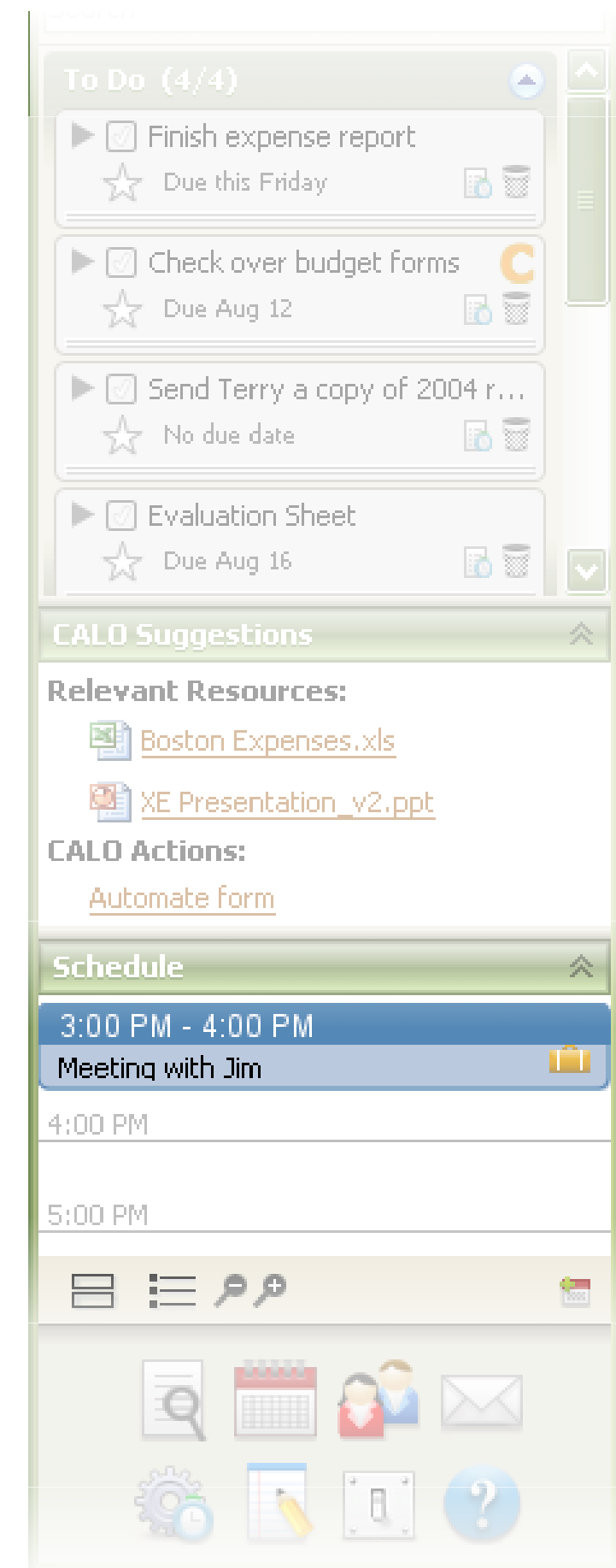
Users can see events and meetings as they approach

Block vs. agenda view

Block view shows duration, only shows today

Agenda view allows user to orient within an entire week

Can move between by zooming in and out



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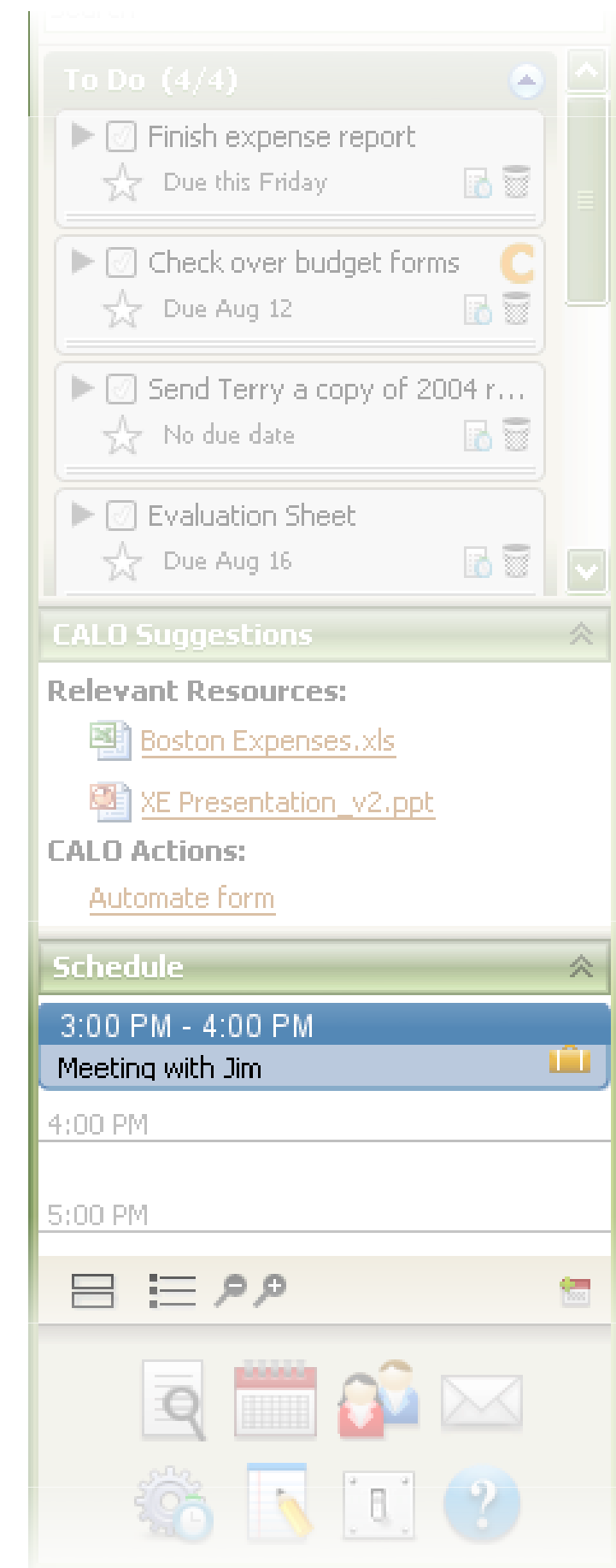
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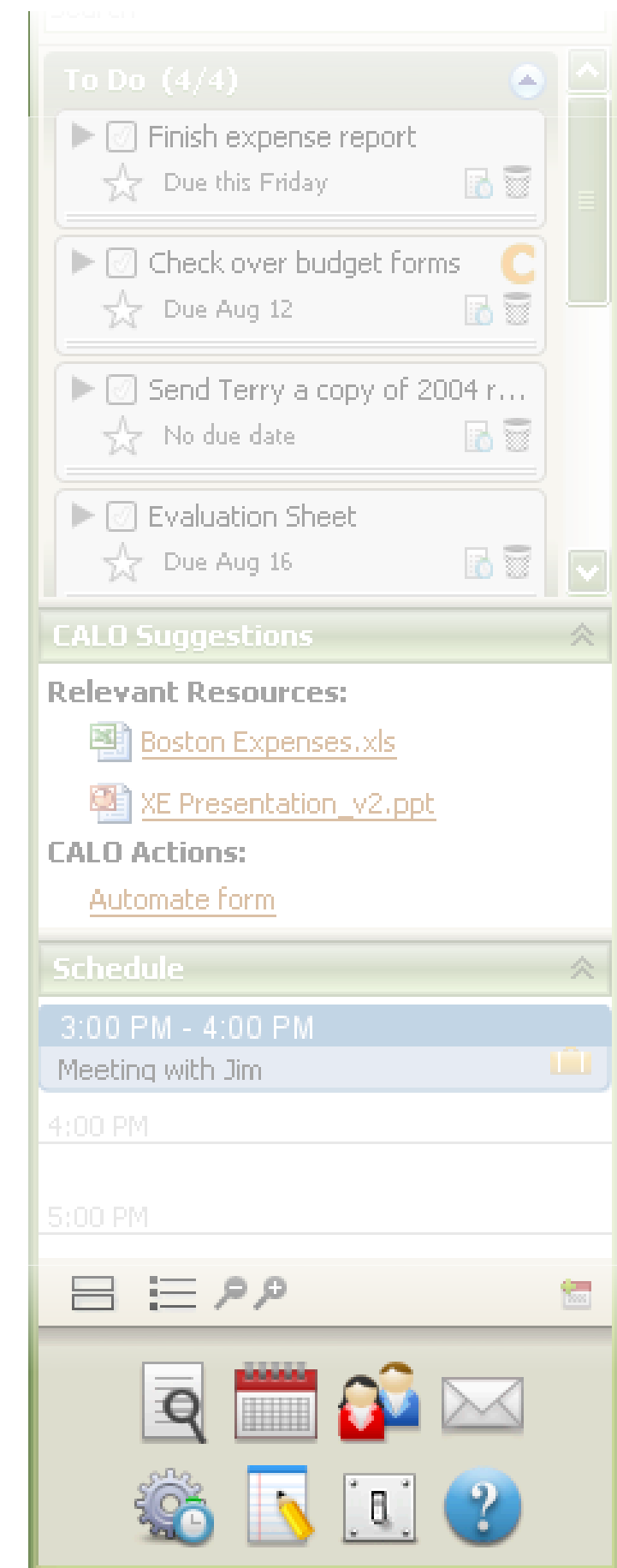
Icon well

Quick access to CALO components and applications

Some components do not belong on the sidebar

Other methods of accessing these lack persistence

Icon well simplifies transition between sidebar and rest of the user's work space



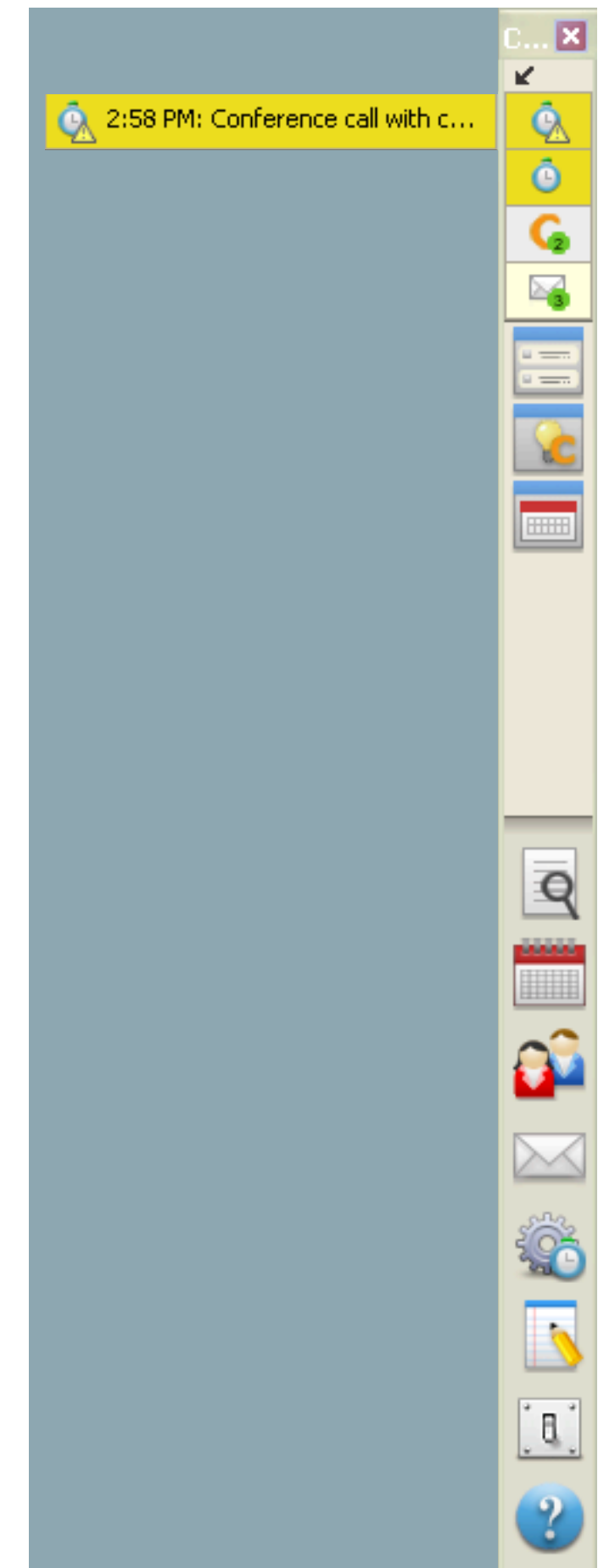
Mini-bar

Quick access to CALO components and applications

Users need the ability to reclaim screen real estate

Notifications still need to be always visible

The mini-bar provides a minimal interface while still showing notifications



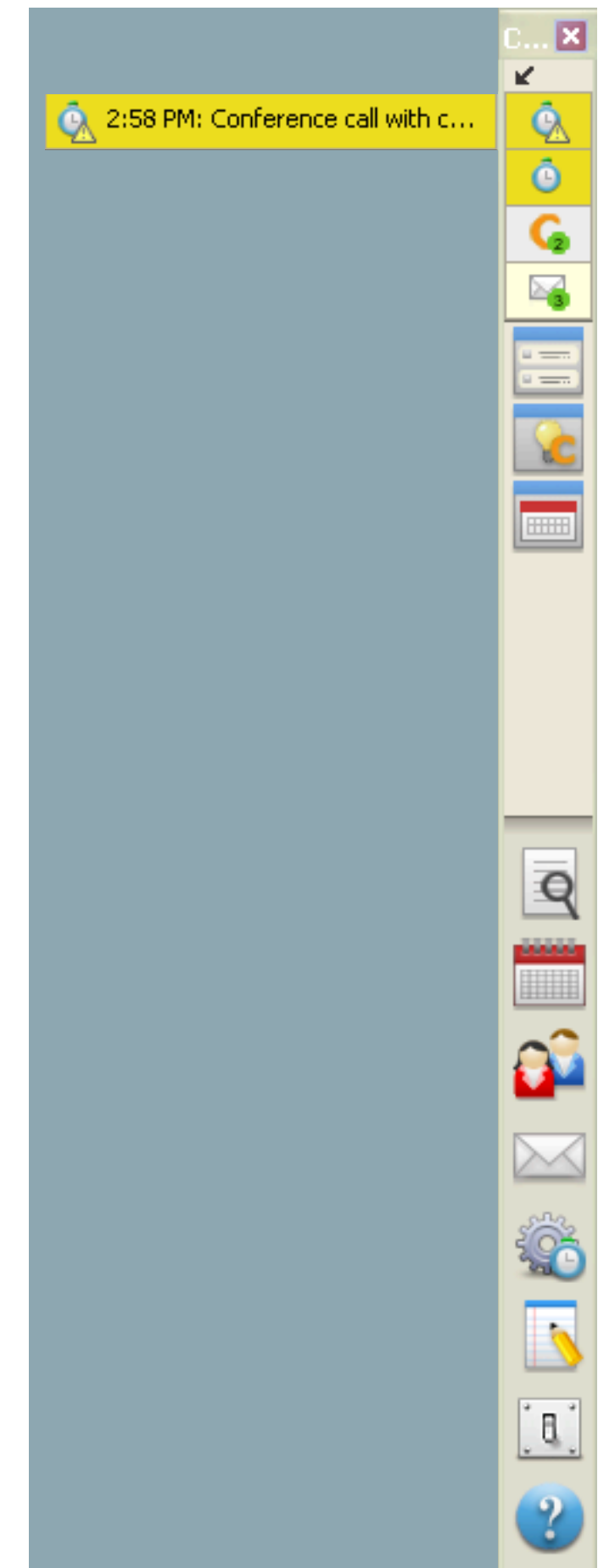
Mini-bar

Quick access to CALO components and applications

“Growl” effect for extremely urgent notifications

Only icons shown to minimize mini-bar width

Icons are badged to show urgency or coalescing



Packs

Dynamically generated resources in a searchable window

Generated from events, tasks, people, etc.

CIs showed users need resources in many contexts

Highly resonated with users in concept validation

Update dynamically as CALO's knowledge evolves

Can be saved as folders of shortcuts

Concept validation showed that users would be uncomfortable manipulating their actual files

Can be filtered, sorted, etc.

Task viewer

A window for managing and editing tasks

Sidebar is intended for doing tasks, not managing them

Users expressed the desire in concept validation to have full control over task management

Detailed editing of tasks is more difficult in restricted space

Provides rich, extensive searching, sorting, and filtering

Users need to sift through a large number of tasks

Video Demonstration

Video Goes Here!

Future Work

Automated Skill Transfer

Could transfer knowledge of shared organizational knowledge bases

Could ask other CALOs for specialized knowledge, like executives ask others' assistants today

Collaboration

CALO could coordinate meetings, delegate or share tasks

CALO Mobile

Would make CALO into a portable system

Could be docked to a computer as an “external” sidebar

Thank you!



Thank you!

