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# Using Usability Scenarios in the Redesign of the MERBoard Architecture

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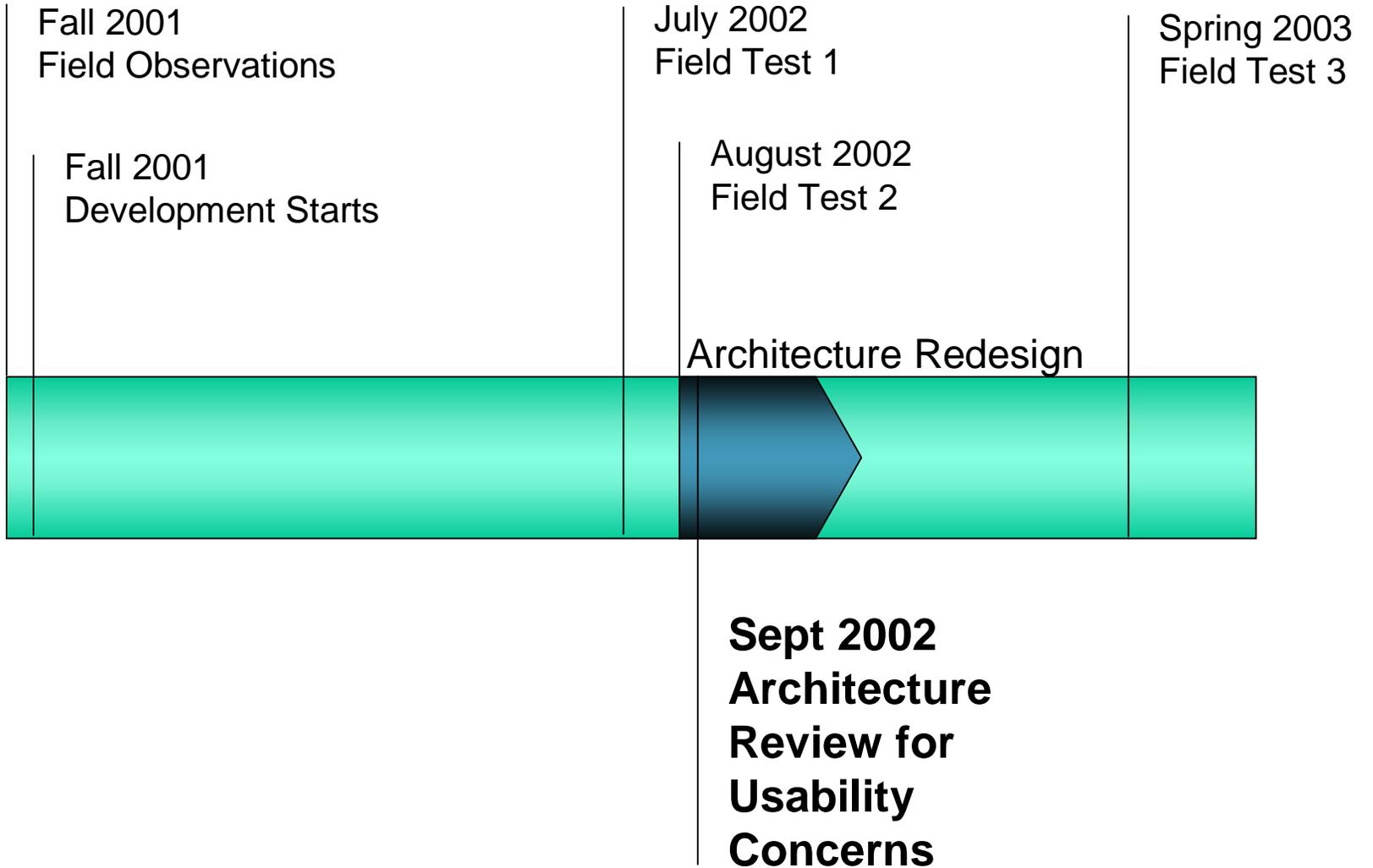
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Carnegie Mellon University

and the MERBoard team at NASA Ames



# Development timeline of MERBoard





# Developers' stated goals of the architecture redesign

- Initial design's priority was to deliver a working system to the two field trials, produced a “monolithic” system
- Initial design worked, and received excellent response at the two field trials
- For future trials and deployment, ***extendibility, performance, reliability*** all driving changes in architecture



# Our involvement in the architecture redesign

- Researchers articulated an additional attribute value of interest for architecture redesign: ***Usability***
- Usability had always been stated as a goal for the project as a whole, but not at the architecture level
- Researchers brought:
  - General, architecturally-sensitive usability scenarios
  - benefits to the user
  - sample architecture pattern
  - software tactics



# Architecturally-sensitive Usability Scenarios

1. Aggregating data
2. Aggregating commands
3. Canceling commands
4. Using applications concurrently
5. Checking for correctness
6. Maintaining device independence
7. Evaluating the system
8. Recovering from failure
9. Retrieving forgotten passwords
10. Providing good help
11. Reusing information
12. Supporting international use
13. Leveraging human knowledge
14. Modifying interfaces
15. Supporting multiple activity
16. Navigating within a single view
17. Observing system state
18. Working at the user's pace
19. Predicting task duration
20. Supporting comprehensive searching
21. Supporting undo
22. Working in an unfamiliar context
23. Verifying resources
24. Operating consistently across views
25. Making views accessible
26. Supporting visualization
27. Supporting personalization



# Our questions going into this project

- Would usability & architecture as the main discussion point fly?
  - We have contributed to several real-world projects (in small ways), but had surreptitiously brought usability concerns in through scenarios
  - What process would be effective?
- Would general scenarios generated by considering single-user-at-a-desktop apply to wall-size collaborative workspace?
- Would our architecture design suggestions contribute?
- Would we find any other scenarios specific to collaboration?



# What we did

- Overview of the old architecture, entire design & development team + researchers, ~4 hours
- 3 hour meeting of entire team to get overview of USE research + apply scenarios to the project
- Front-end developer read TR + tutorial notes, 4 days elapsed time over a weekend
- Telecon with Front-end developer to review scenarios, get reaction to TR, ~1 hour
- Telecon with Front-end developer to review proposed new architecture, ~1 hour



Question: Would usability & architecture as the main discussion point fly?

Yes

- Entire design & development team willing and actively participated in 3-hour review of scenarios
  - Included participation from designers & ethnographers who were silent during the architecture presentation
- Front-end developer (FED) did “homework” and telecons for 2 additional hours



Question: Would general scenarios generated by considering single-user-at-a-desktop apply to wall-size collaborative workspace?

Yes!

- Design & development team found 25 of 28 scenarios to be applicable to their project
- 17 of the 25 applicable scenarios needed to be solved by the next field trial; 8 were for the longer term
- Could give concrete examples of these scenarios for their users, often through direct observation in the field trials



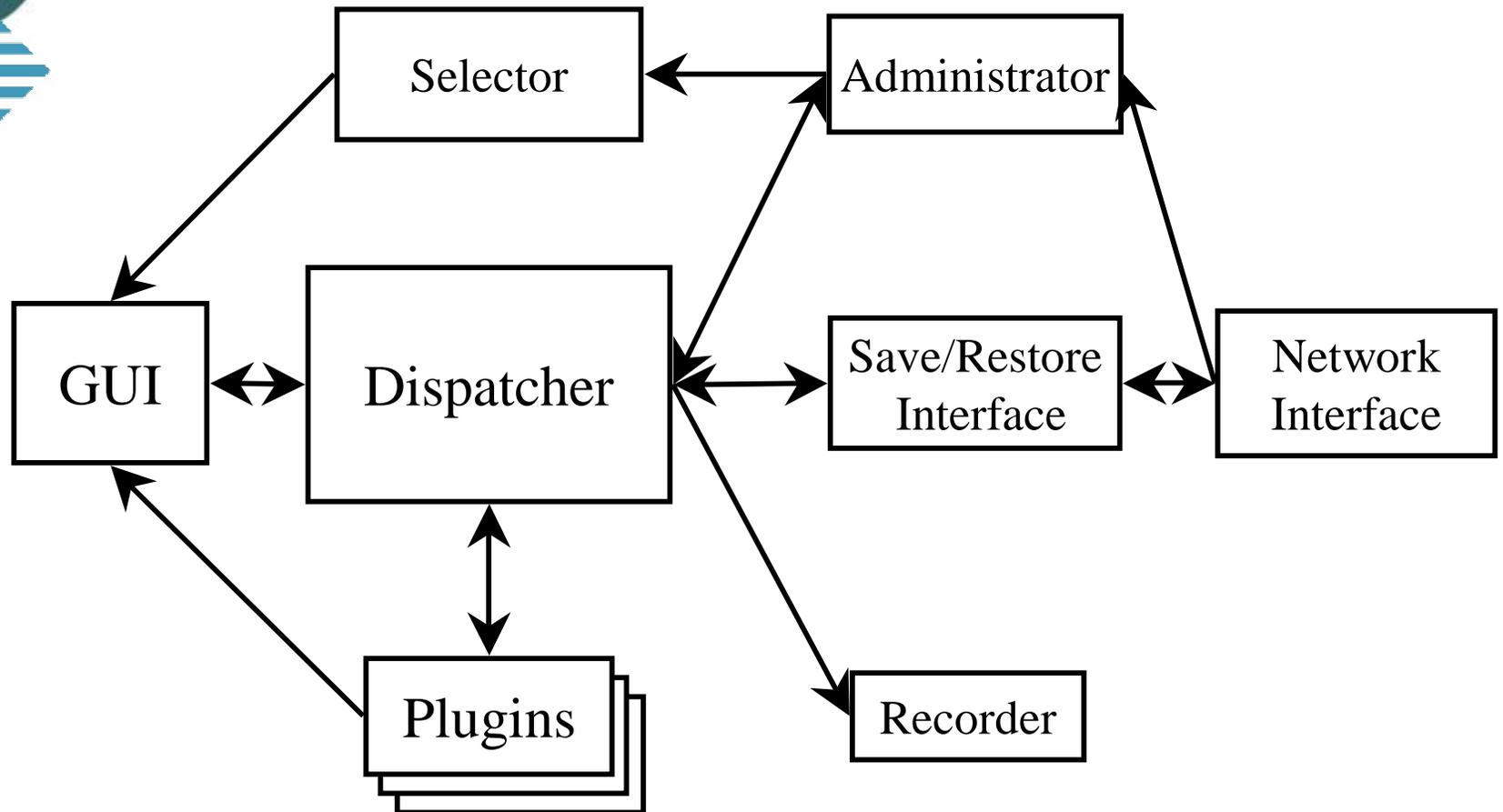
## Question: Would our architecture design suggestions contribute?

Yes!

- Proposed new architecture was designed before/after reading the USE documents
  - Analysis about this design is ongoing, content analysis of first audiotaped telecon will reveal some sources of design decisions
  - Difference from previous architecture would be interesting, but not at liberty to discuss at this point
- Majority of architecture components were modified during the 1-hour review (see next two slides)

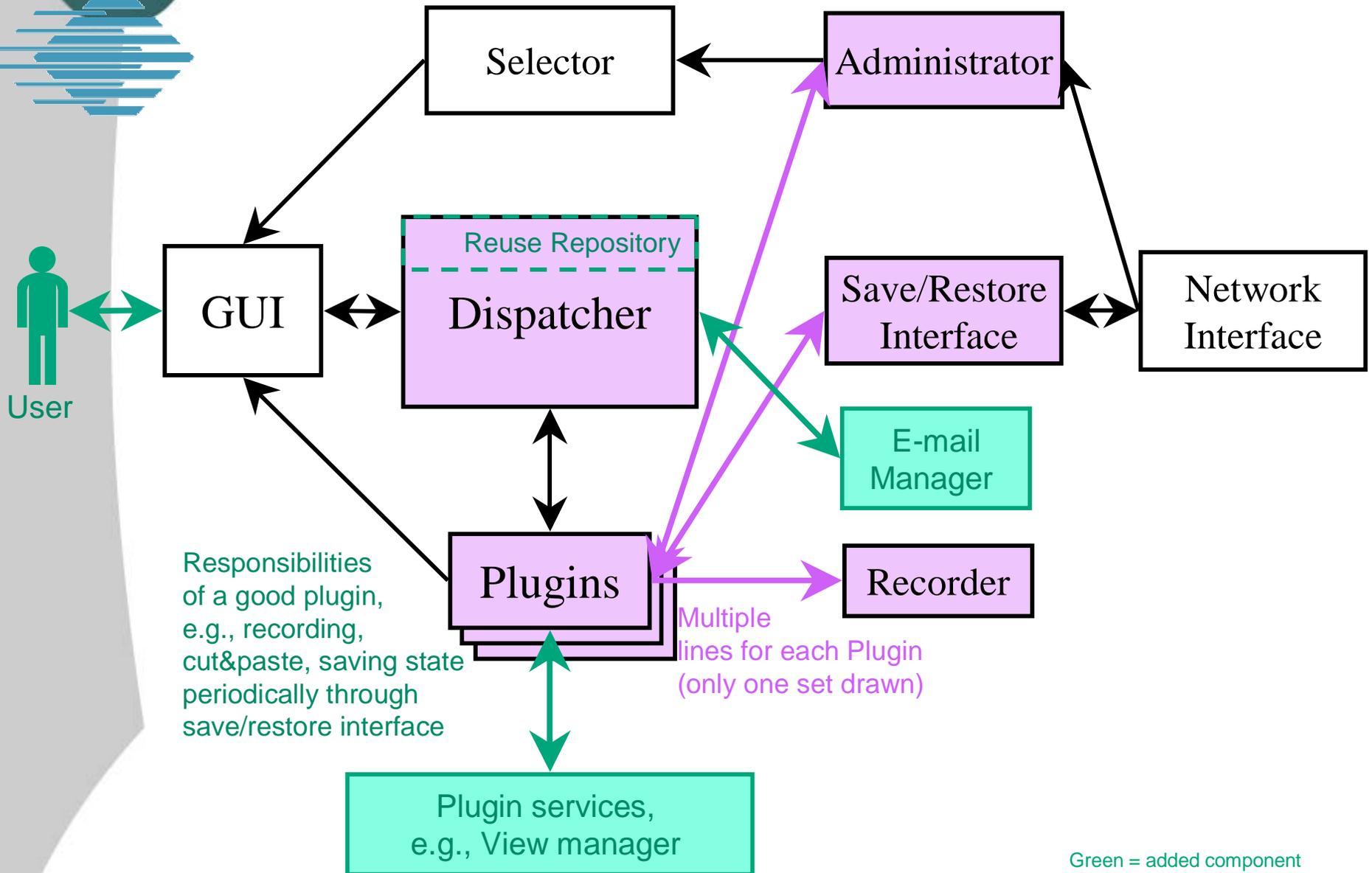


## Proposed new architecture design





# Revised architecture design after FED's discussions with USE group



Responsibilities of a good plugin, e.g., recording, cut&paste, saving state periodically through save/restore interface

Multiple lines for each Plugin (only one set drawn)

Green = added component  
Purple = modified component

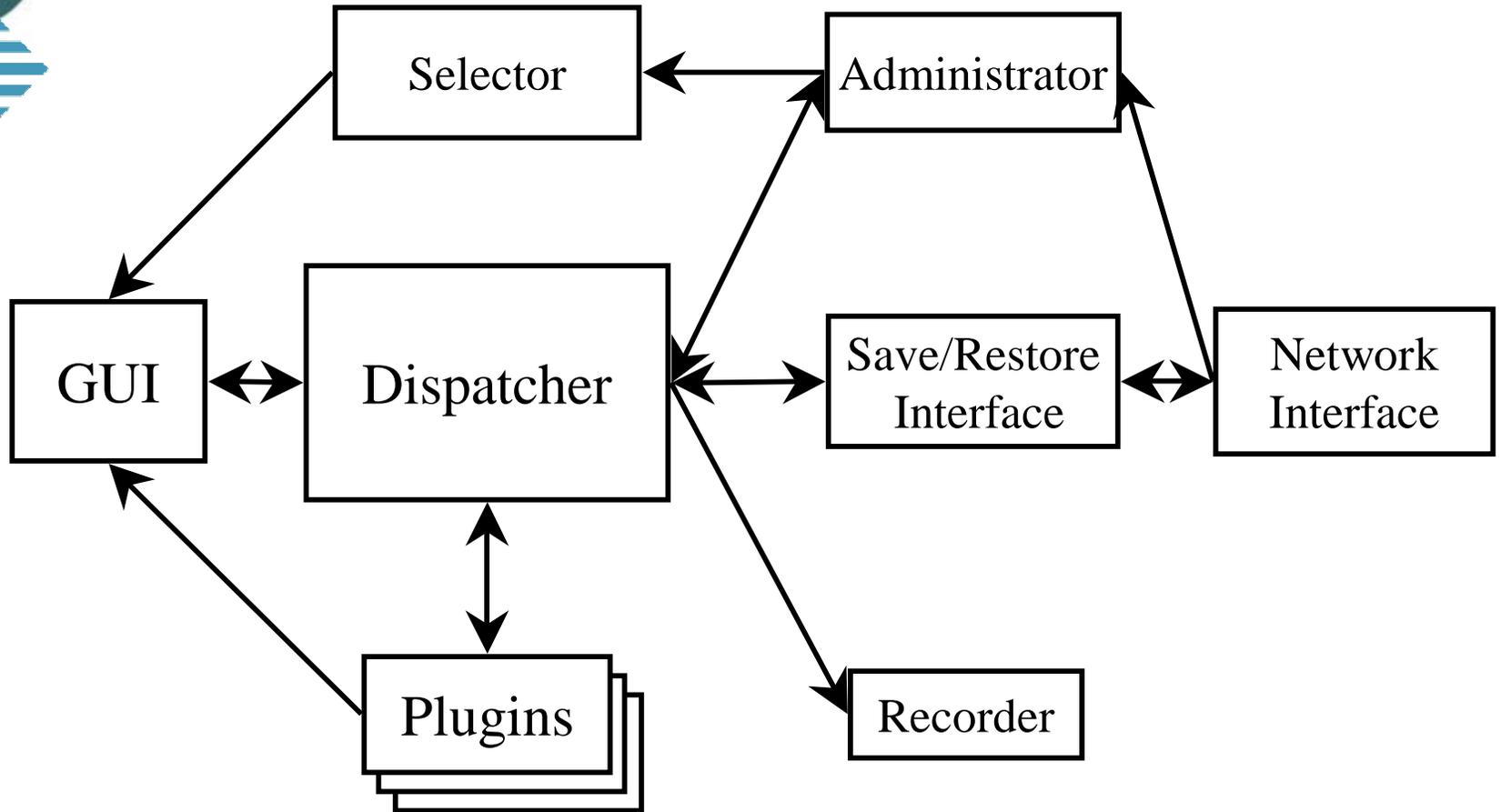


# How did these changes come from the usability scenarios?

- Still doing content analysis of design review conversation, but some preliminary points are:
  - 47% words uttered by Front-End Developer
    - Not a lecture by architecture expert
    - Not “seeded design” dominated by domain expert
    - Seemingly a collaboration of co-designers (content analysis will have to tell us more)
  - Changes in the diagram could be traced to discussions of scenarios

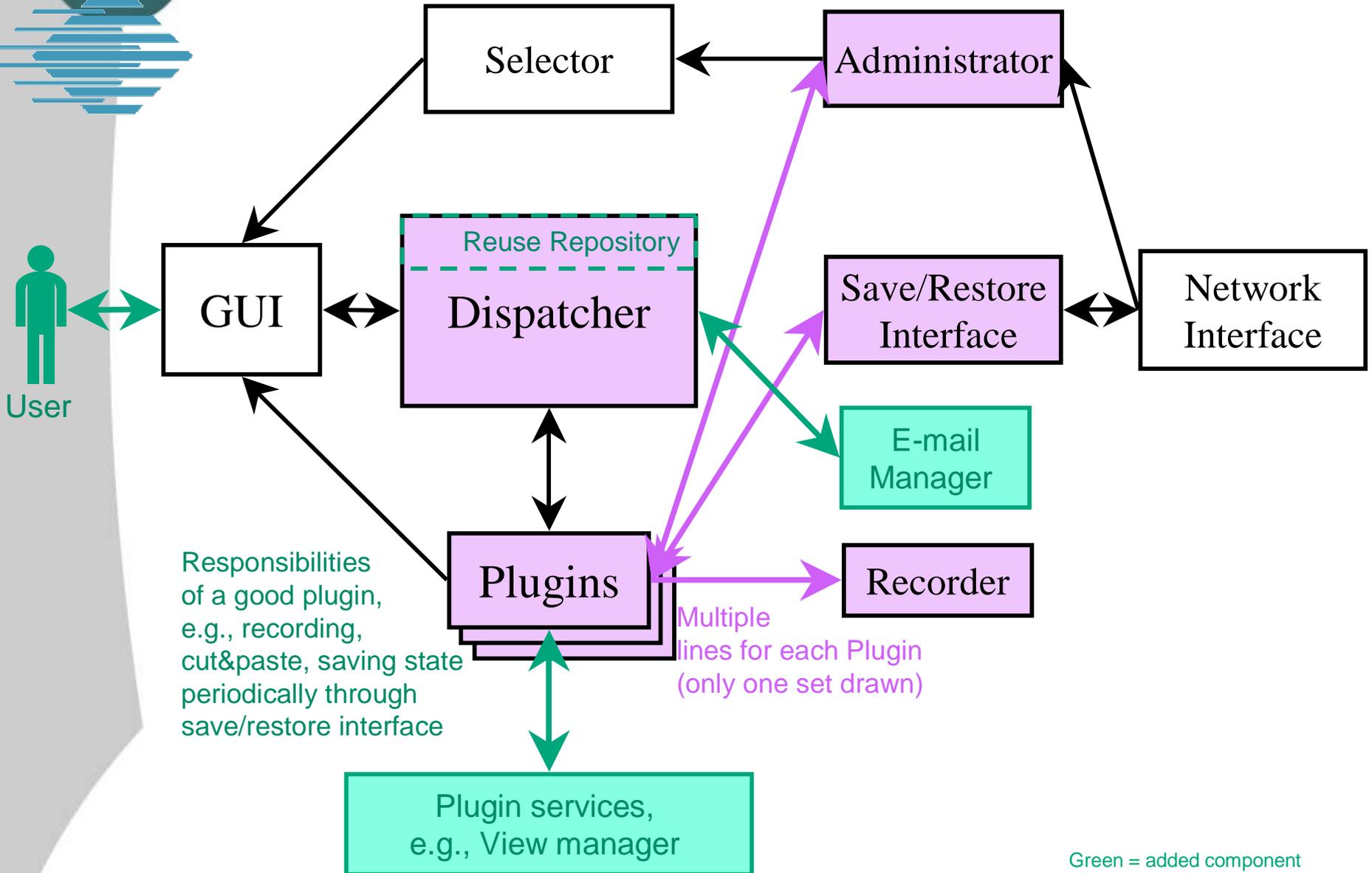


# Reminder of the Proposed new architecture design



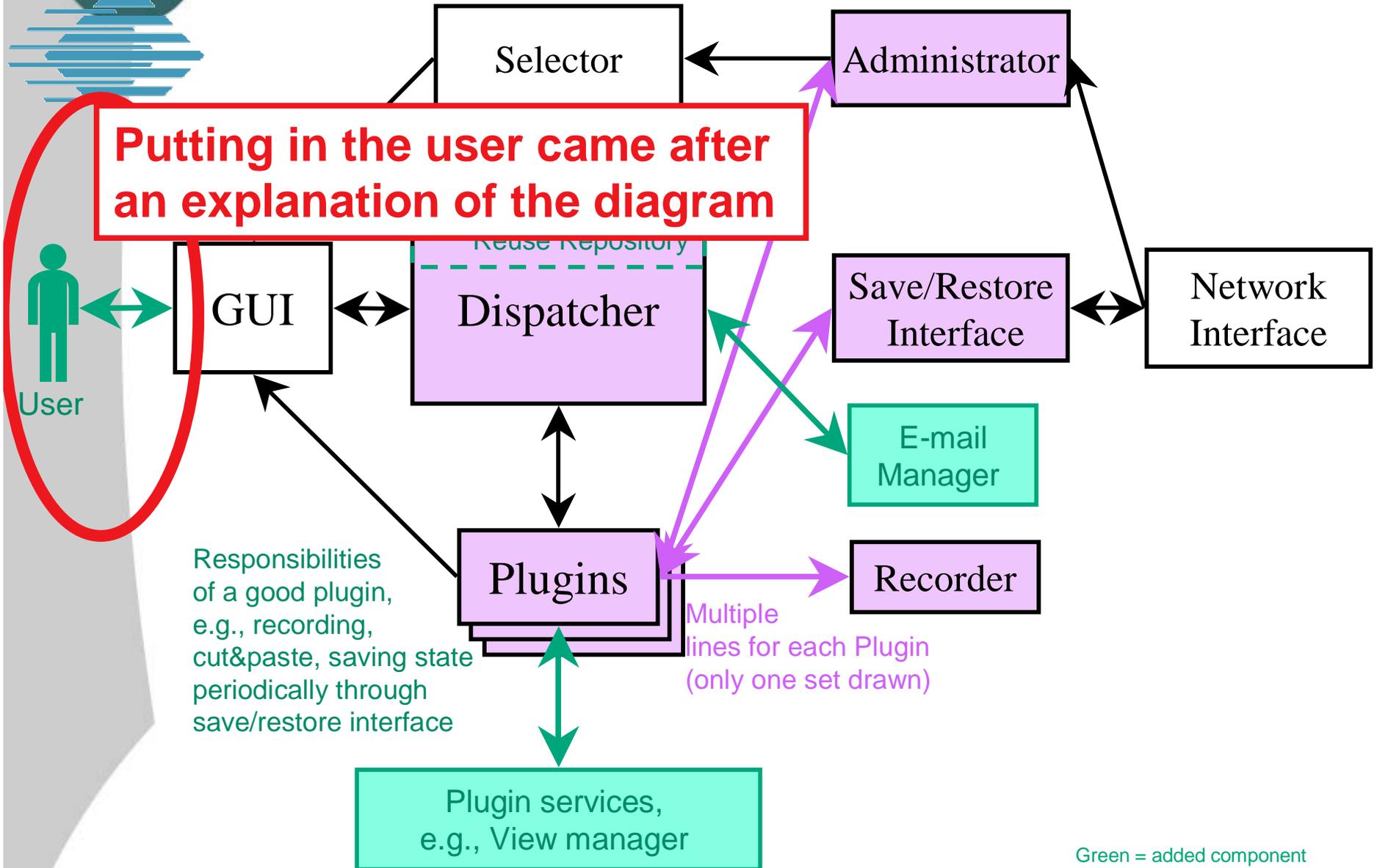


# Reminder of the Revised architecture design



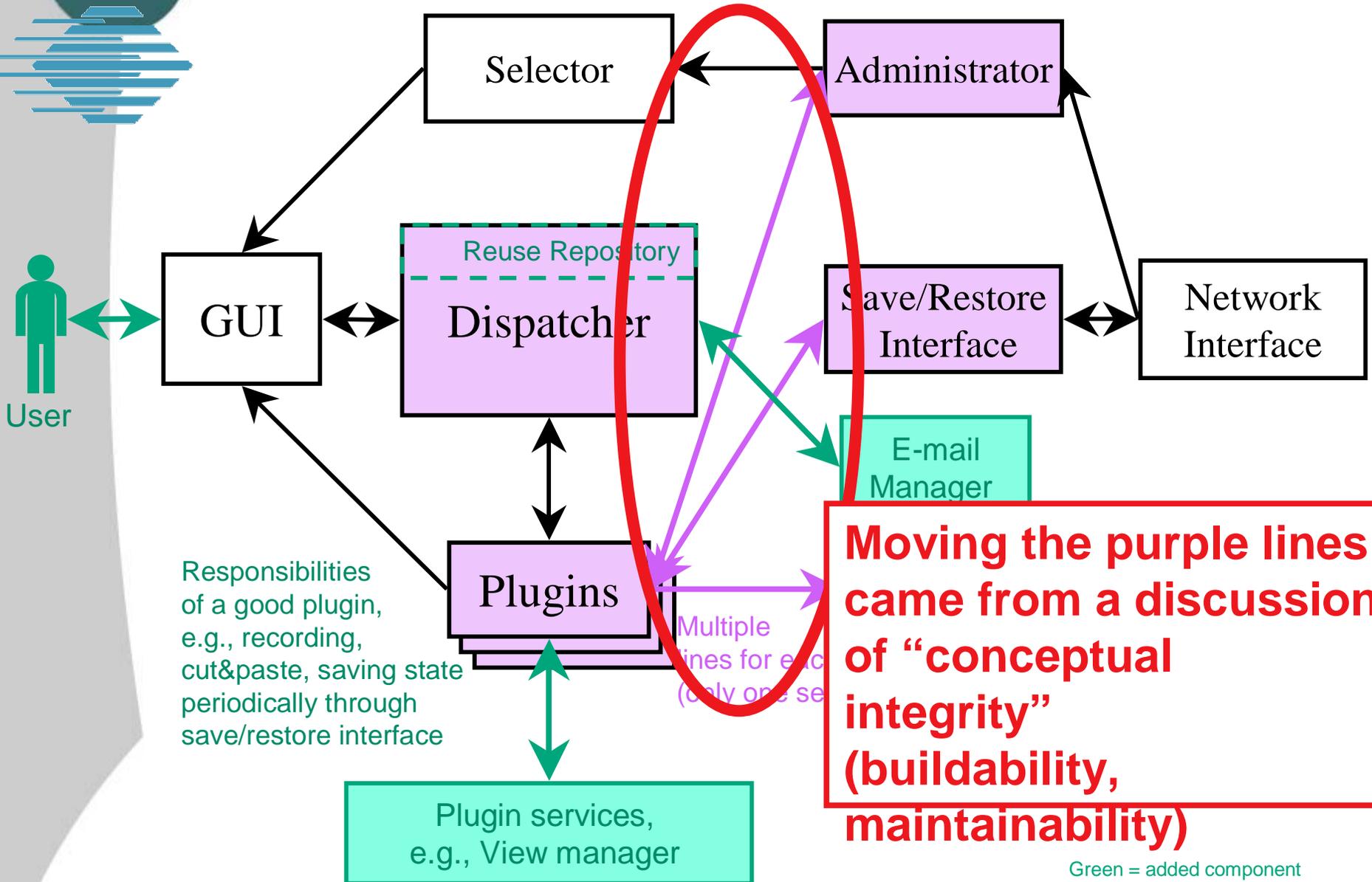


# Where the new architecture design came from in the discussion (1)





# Where the new architecture design came from in the discussion (2)



Responsibilities of a good plugin, e.g., recording, cut&paste, saving state periodically through save/restore interface

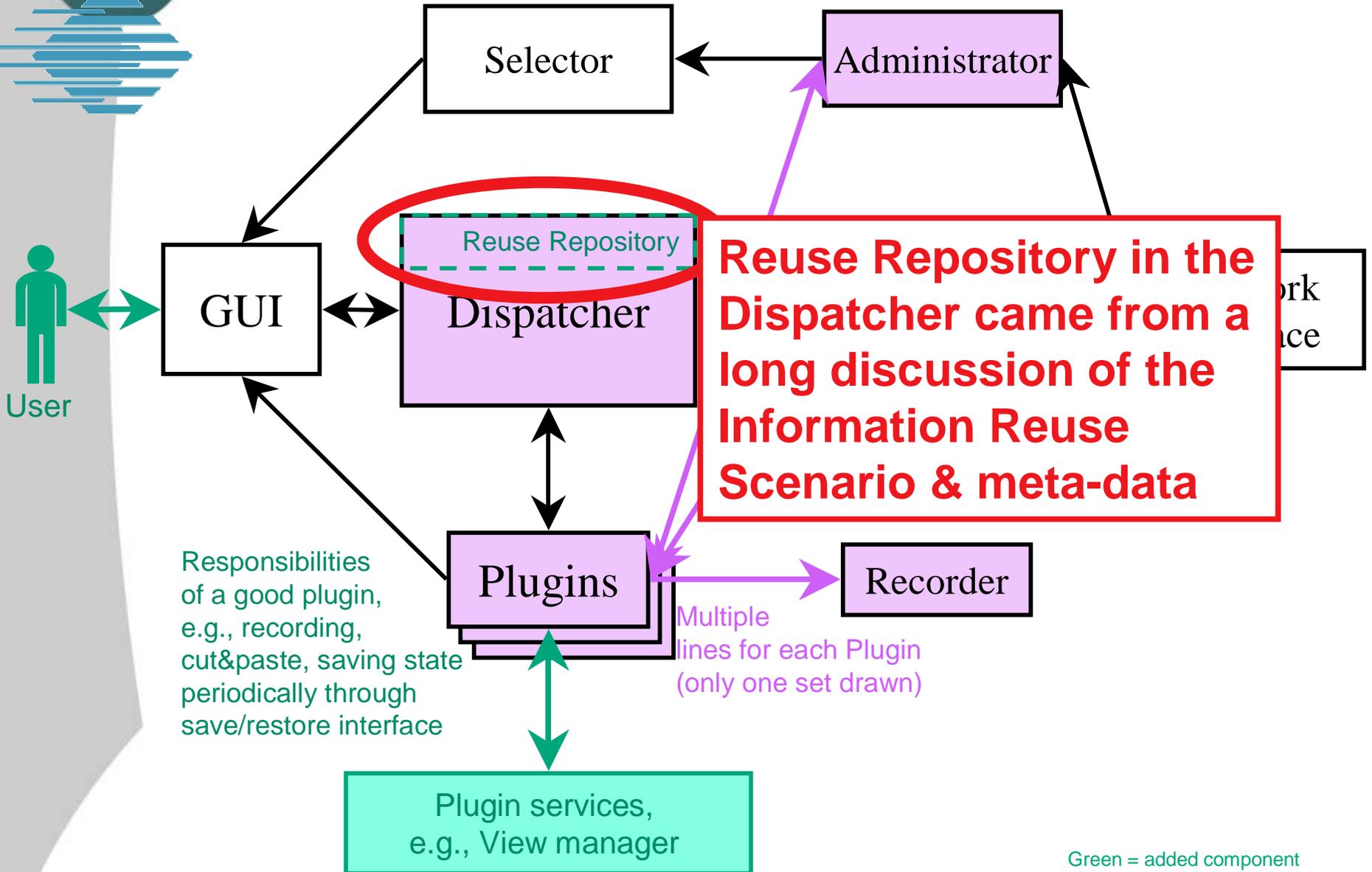
Multiple lines for each (only one selected)

**Moving the purple lines came from a discussion of "conceptual integrity" (buildability, maintainability)**

Green = added component  
Purple = modified component



# Where the new architecture design came from in the discussion (3)



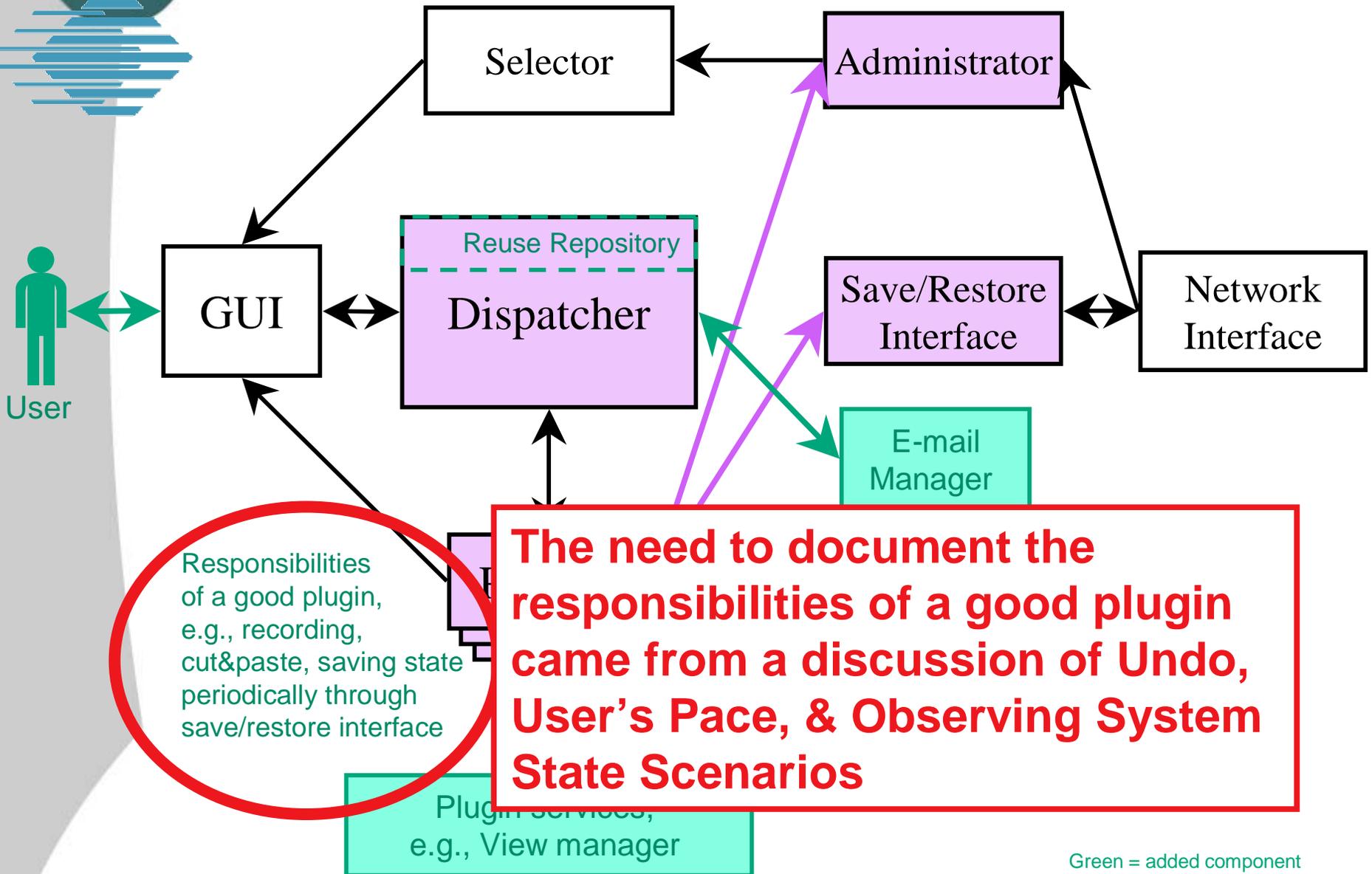
Responsibilities of a good plugin, e.g., recording, cut&paste, saving state periodically through save/restore interface

Multiple lines for each Plugin (only one set drawn)

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# Where the new architecture design came from in the discussion (4)

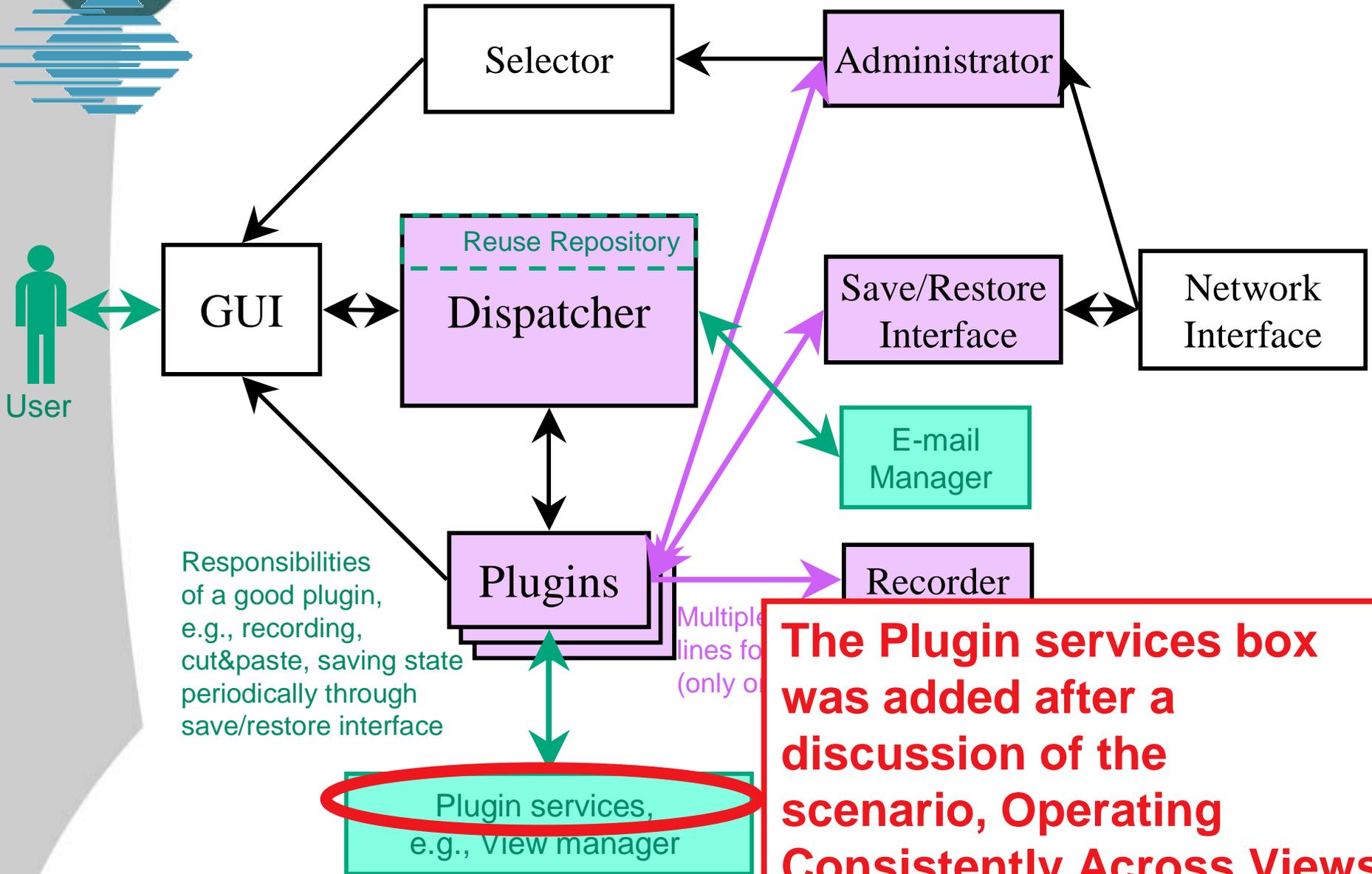


Responsibilities of a good plugin, e.g., recording, cut&paste, saving state periodically through save/restore interface

**The need to document the responsibilities of a good plugin came from a discussion of Undo, User's Pace, & Observing System State Scenarios**



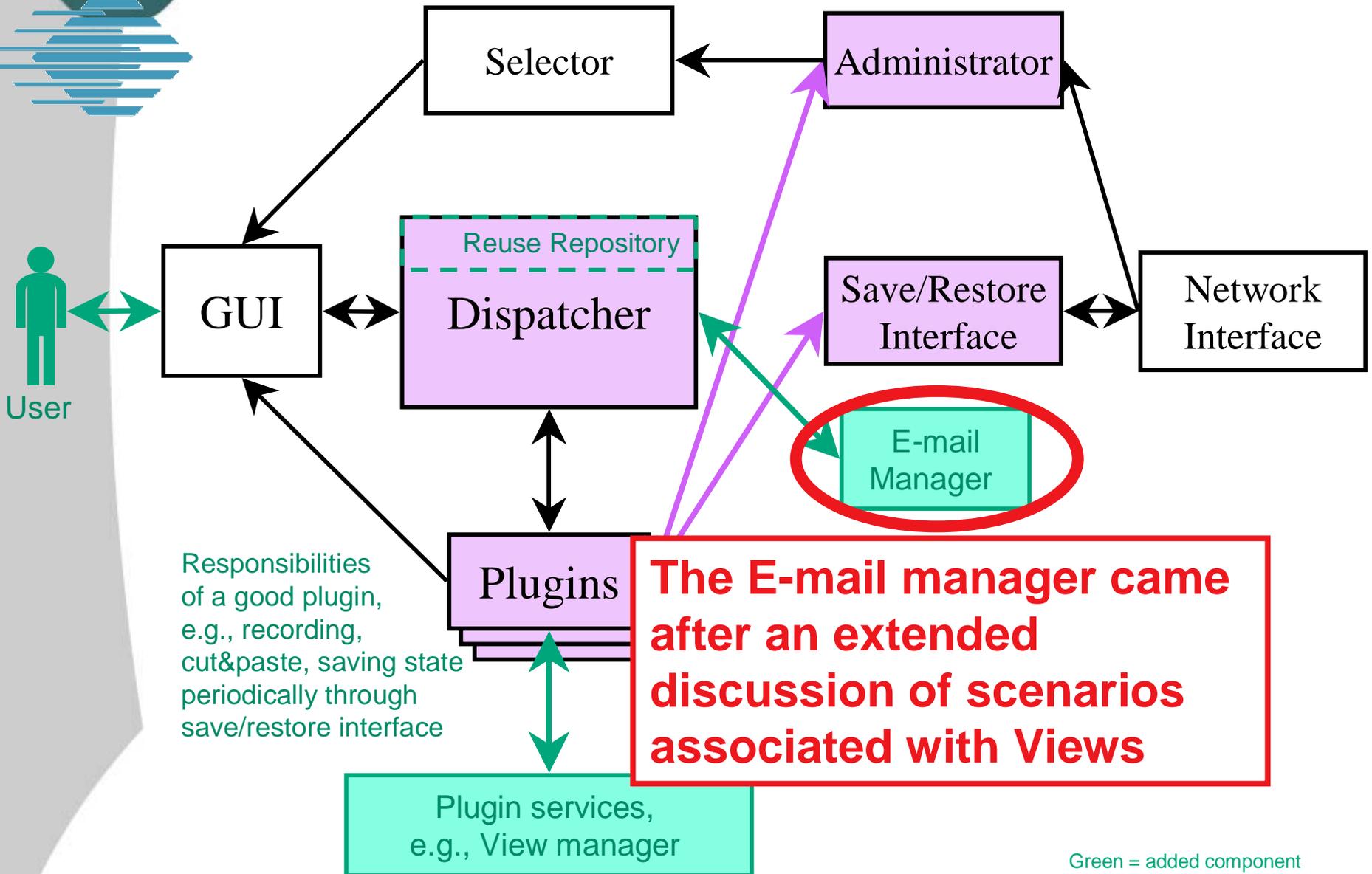
# Where the new architecture design came from in the discussion (5)



**The Plugin services box was added after a discussion of the scenario, Operating Consistently Across Views**



# Where the new architecture design came from in the discussion (6)



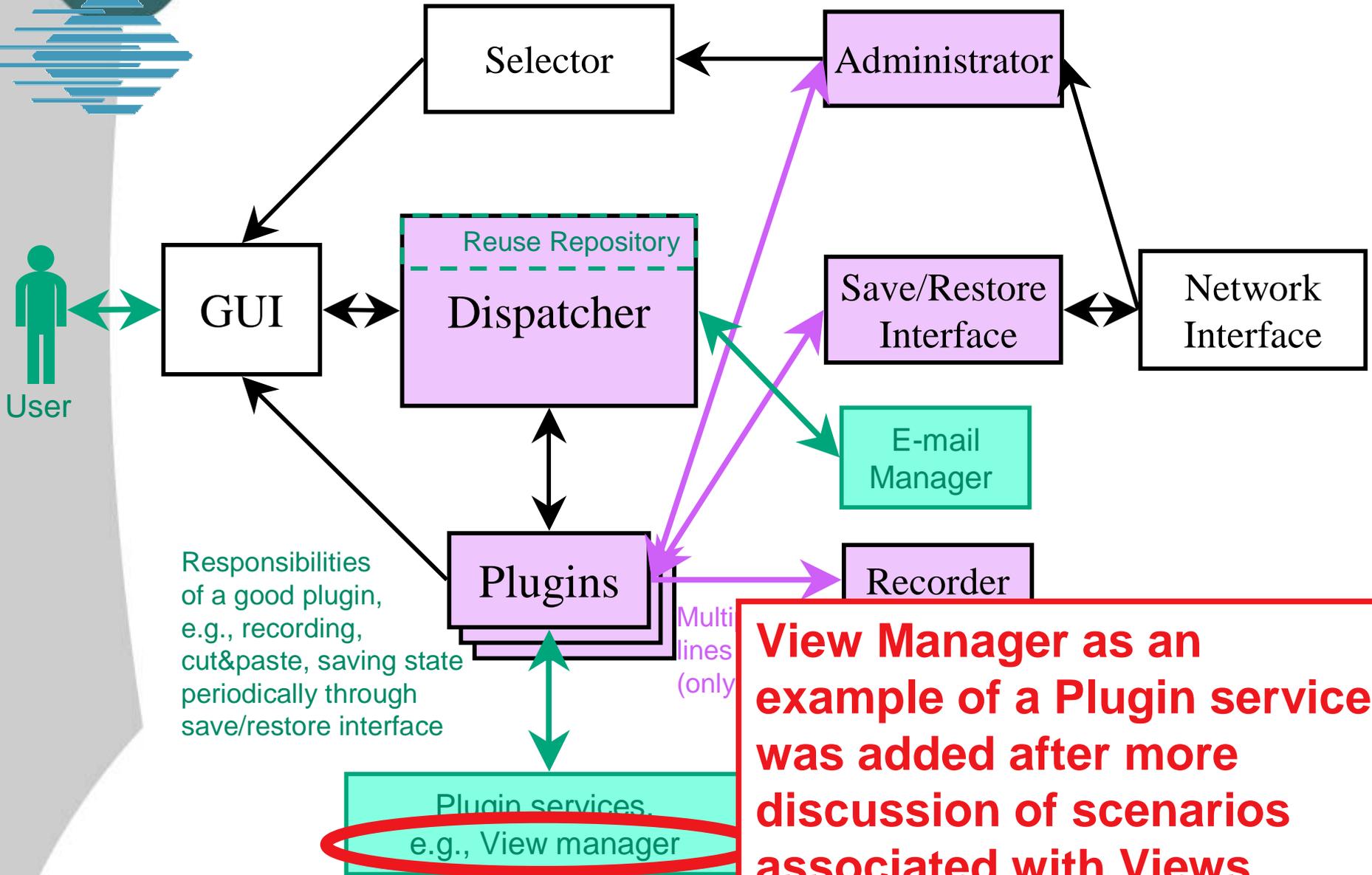
Responsibilities of a good plugin, e.g., recording, cut&paste, saving state periodically through save/restore interface

**The E-mail manager came after an extended discussion of scenarios associated with Views**

Green = added component  
Purple = modified component



# Where the new architecture design came from in the discussion (7)





Question: Would we find any other scenarios specific to collaboration?

Not yet

- None jumped out
- Analysis of field trial continuing and may produce scenarios



*“Nice to keep the list [of scenarios] next to me, so when I’m making a design decision I won’t forget anything”*

*- Front End Developer, Sept 2002*



# Summary of our work

- Scenarios were well received by the developers, readily understood how they fit (or didn't) to their system
- Scenarios *DID* apply to collaborative workspace
  - We don't know if there will be collaborative-specific scenarios yet
- Scenarios *HAD* an impact on the architecture redesign
- Process did not seem too onerous

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Questions?