WiSe 25/26

Project Advanced Media Technologies: „Middleware for GenAI“

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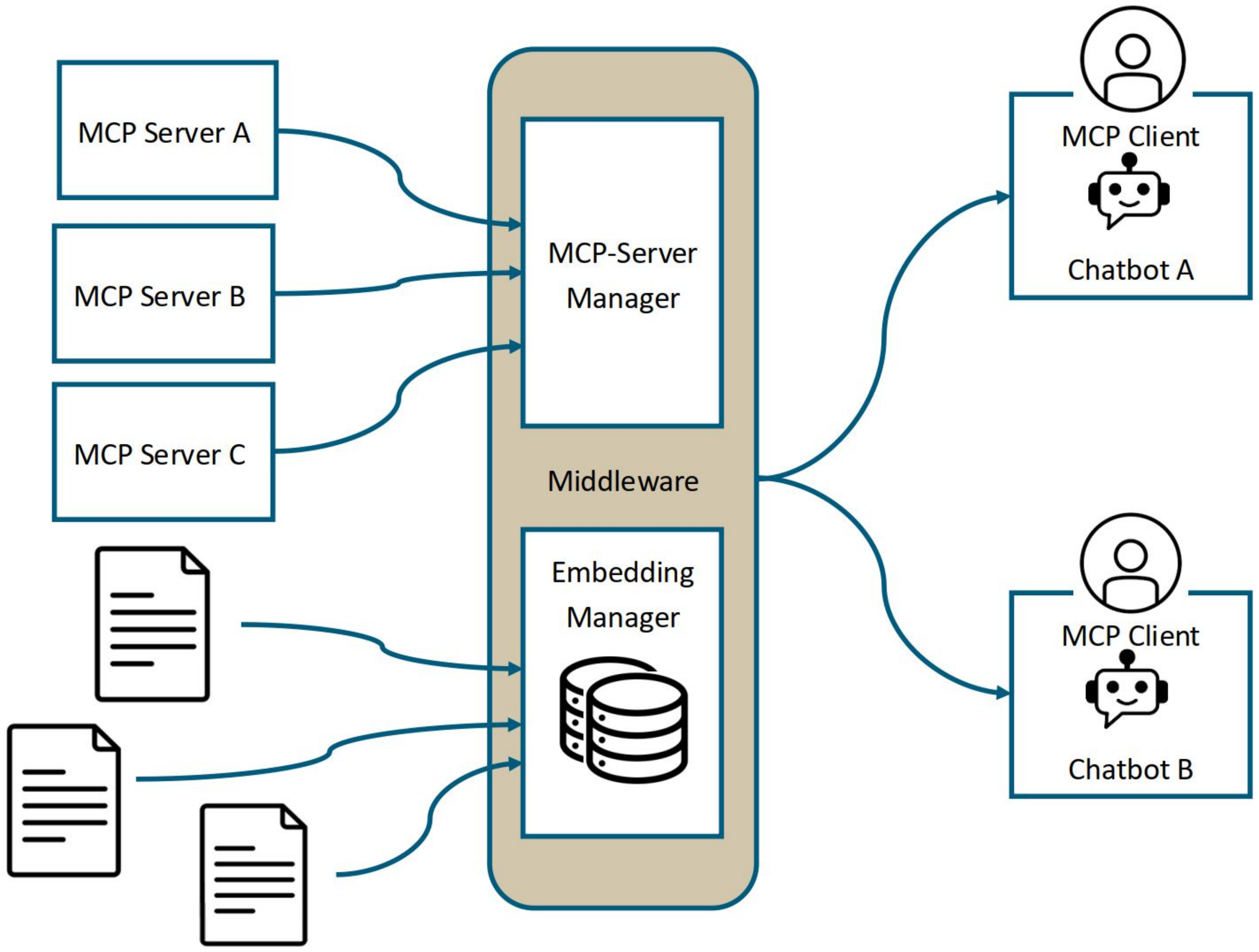
Problem Statement: State-Of-The-Art GenAI Systems

- **Problems with orchestration of GenAI systems:**
  - Fragmented components
  - Repeated custom integrations (MCP server registration / DB access)
  - <u>Policy control:</u> mostly single-user workflows

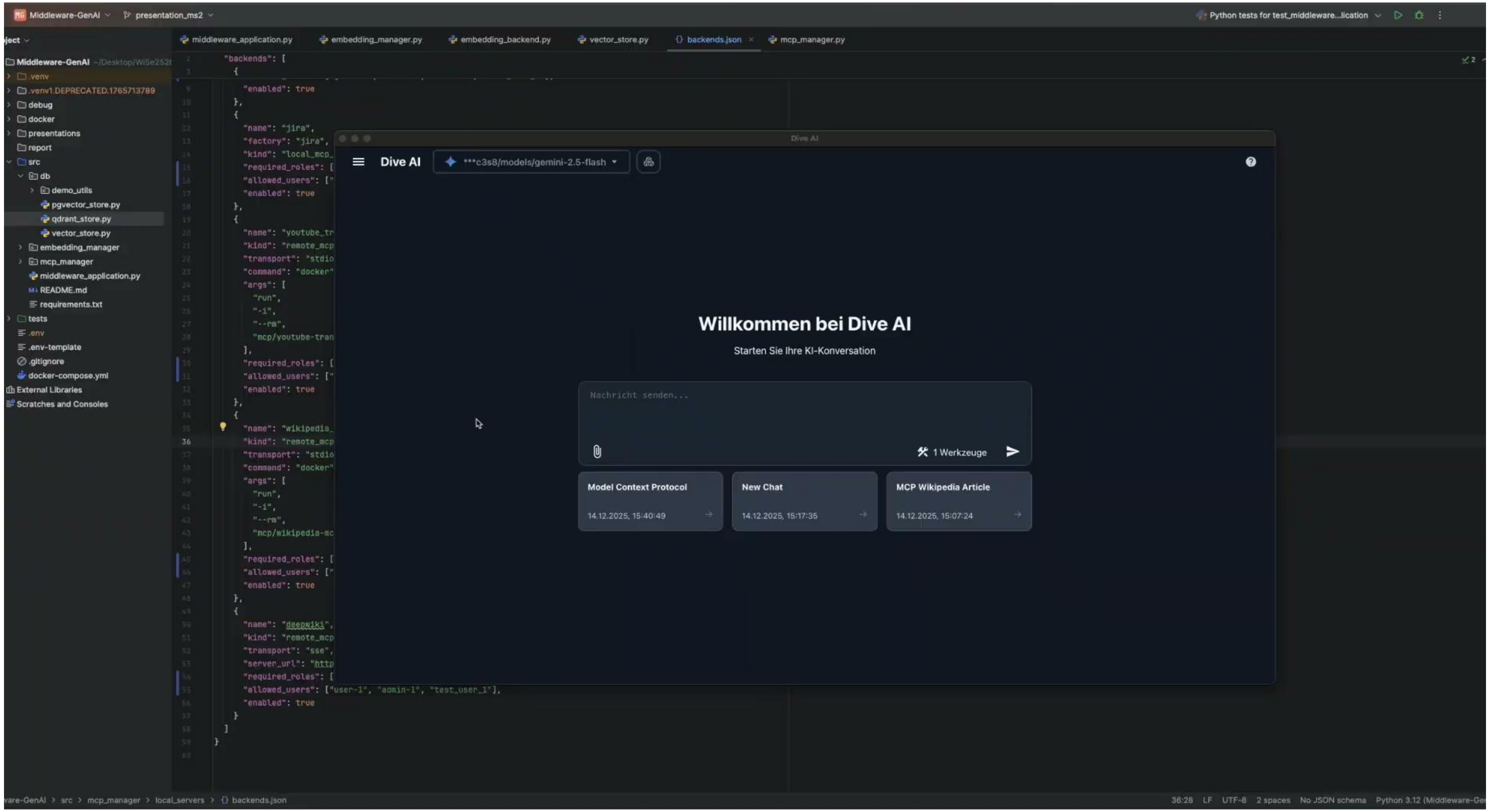
- **Problem statement:** Low reusability of existing GenAI applications <u>due to individual orchestration</u> of:
  - MCP host/server registration
  - Embedding pipelines
  - Database access
  - Policy control mechanisms

Proposed Solution: Middleware Concept



- <u>Eliminates need </u>for **MCP-Clients** to implement:
  - Authorization control
  - MCP host
  - Embedding pipelines
  - Database access/registration

Demo: Current Implementation



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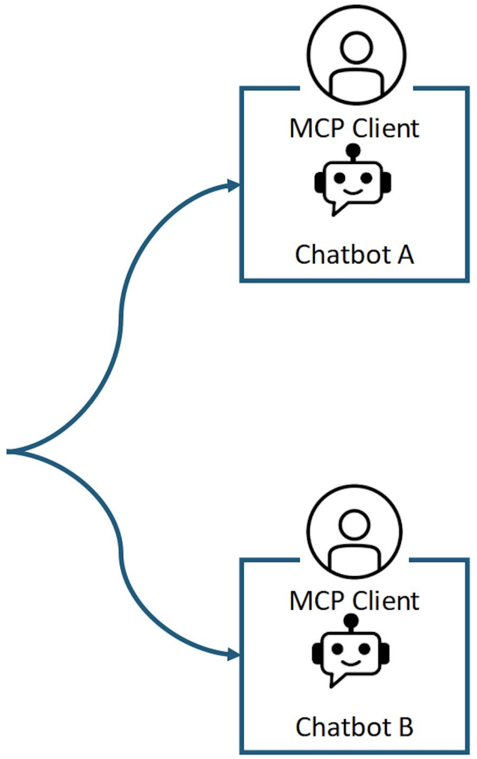
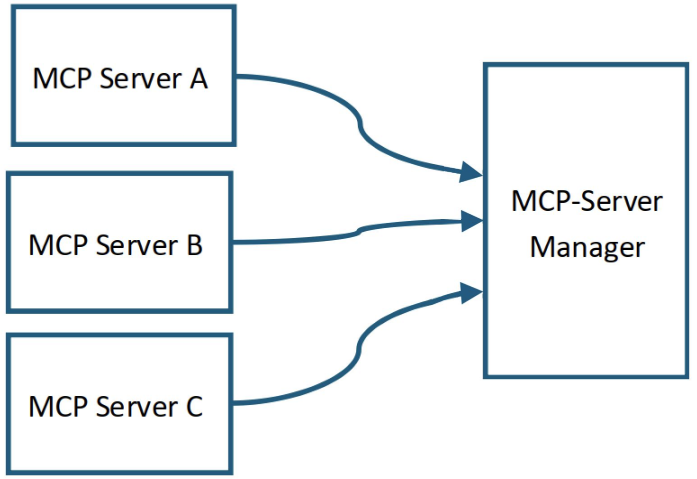
Middleware Concept: Requirements

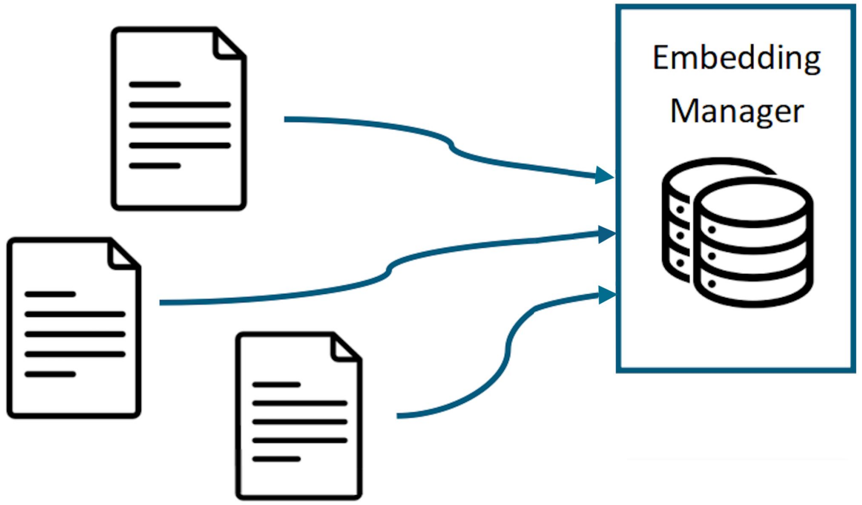
- **MCP-Clients** *(LLM chatbots)*
  - <u>Receive prompts</u> through user interface ✅
  - Pass to middleware and <u>await response</u> ✅
  - Answer based on retrieved information ✅
- **Middleware**
  - Authorize user and parse prompt 🟨
  - Communicate with MCP-Server manager/Embedding manager ✅
  - Return information back to MCP-Client ✅



Middleware Concept: Requirements

- **MCP-Server Manager**
  - Manage internal MCP-Server registry ✅
  - Route prompts to relevant servers *(capability-based)*✅
  - Register new servers through admin user only 🟥
- **Embedding Manager**
  - Embed prompts based on pipeline registry 🟥
  - Upload data through admin user only 🟨
  - Registers/Manages different vector databases 🟥
  - Performs database session control *(user-based)* ✅





Next Steps: Routing

- **Embedding router:** pick pipeline by
  - Modality
  - Corpus
  - Fast vs quality
  - User entitlements

- **Database router:**
  - map requests to backend + tenant/corpus collection; optionally query multiple DBs

- **Industry patterns:**
  - **Embeddings:** rule-based routing first, “smart routing” later
  - **DBs:** per-tenant indexes or federated retrieval with merge/rerank.

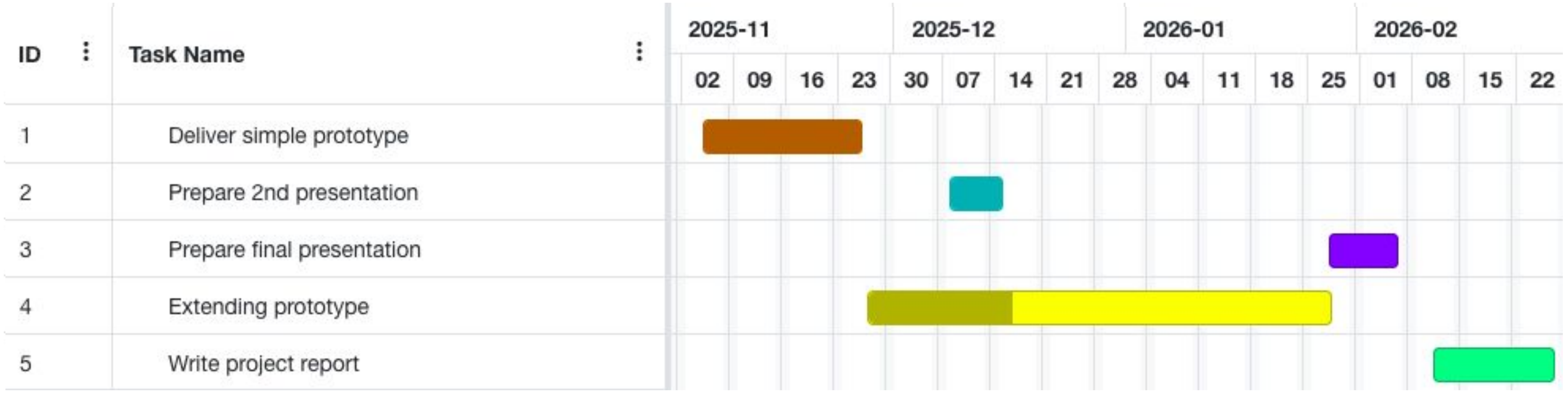
Next Steps: Authentication / UI

- **Auth upgrade:**
  - move from “user-id-in-query” to token-based identity (API key/JWT)

- **UI question:**
  - Dive works for demo
  - But real login likely needs a minimal admin/user UI or gateway

- **Open questions:**
  - Dynamic MCP discovery
  - Tool visibility (no enumeration)
  - Multi-user concurrency

Project Schedule



ID	Task Name
1	Deliver simple prototype
2	Prepare 2nd presentation
3	Prepare final presentation
4	Extending prototype
5	Write project report

Thanks for your attention!

Any questions or feedback?