Air Force Installation & Mission Support Center

AI in Civil Engineer Business Processes

On behalf of Gerald J. O'Brien
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San Antonio, TX
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Classification

The classification of this brief is UNCLASSIFIED and the discussion can go up to UNCLASSIFIED

We Have a Problem

We are

Under Manned

Under Funded

Managing Increasingly Aged Infrastructure

How then do we improve scope, schedule and cost in Built Infrastructure while also managing potential manpower cuts, a plus up of sustainment funding while preparing for AFFORGEN?

Answer:
Bolster our already robust Planning, Programming, Budgeting, and Execution (PPBE) tools with Artificial Intelligence Capability

We Have a Problem

- 48% of projects for DoD in the last decade have experienced cost overruns[1]
- >$500B in cost overruns[2]
- These issues occur at the expense of:
  - Overtasked contracting and construction personnel
  - Altered budgets
  - Impact the ability to award future projects

1-2 Source: Dicks, E., Molenaar, K. R., and Gibson, G. E. (2017). "Scope Definition of Air Force Design and Construction Projects." *Journal of Management in Engineering*, American Society of Civil Engineers (ASCE), 33(5).

MANTECH™
ALWAYS ADVANCING

AI-Driven Cost Estimation for Enhanced Mission Readiness

27 October 2025

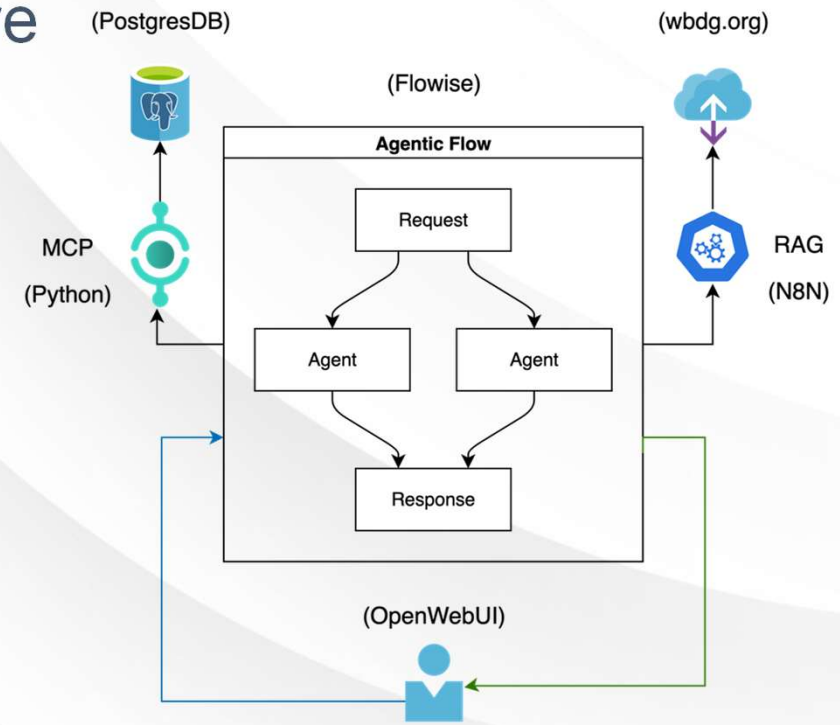
Our Approach: Agentic AI Architecture

Chat-based Interface: Provides a conversational user experience.

Agentic Multi-Agent Flow: Employs a multi-agent framework to handle complex requests, where agents collaborate to achieve a final response.

Dynamic Tool Use via Model Context Protocol (MCP): A custom MCP server enables agents to interact with a Postgres database for data retrieval and manipulation.

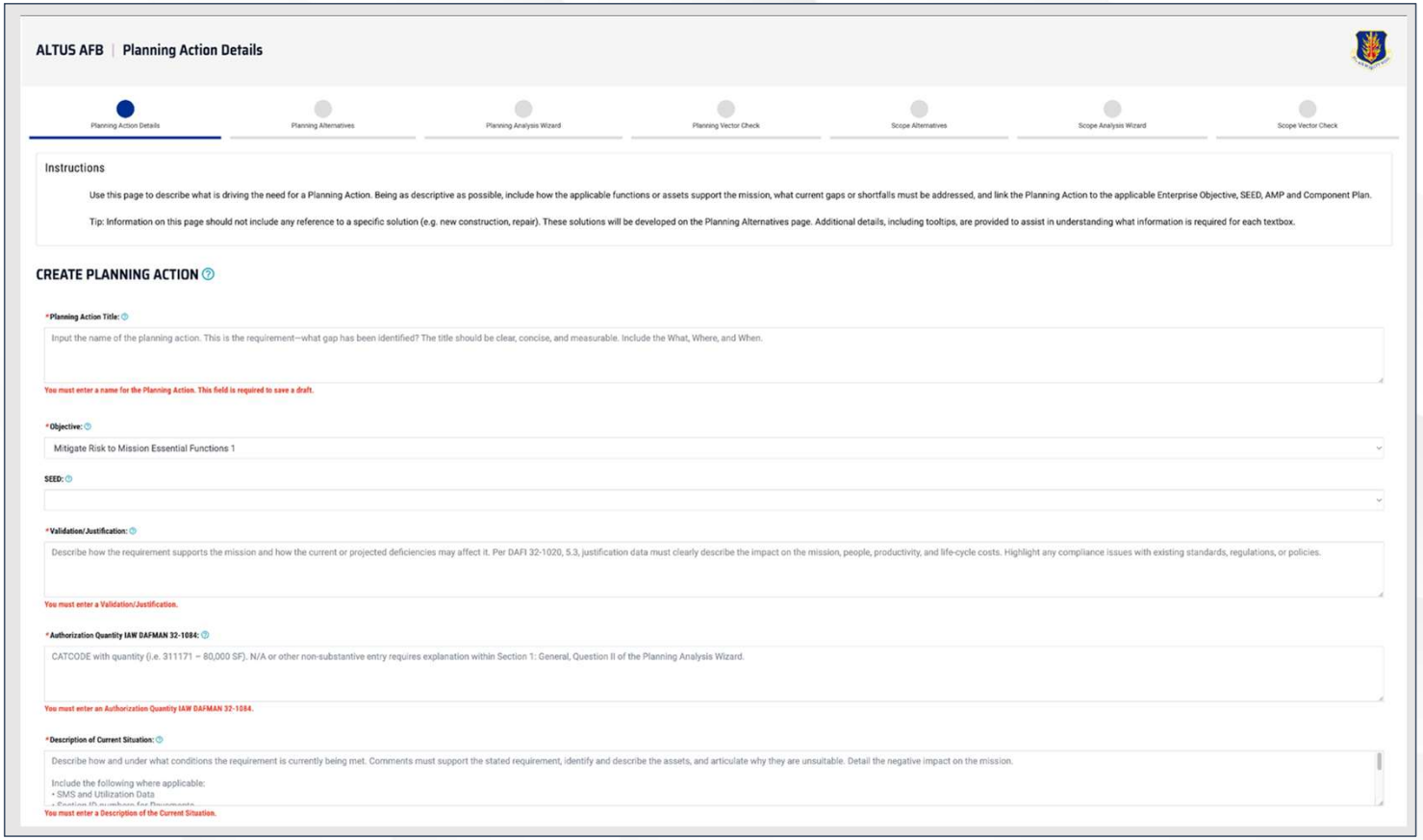
Retrieval-Augmented Generation (RAG) for External Data: A custom tool using RAG allows agents to access and integrate information from publicly available web assets.



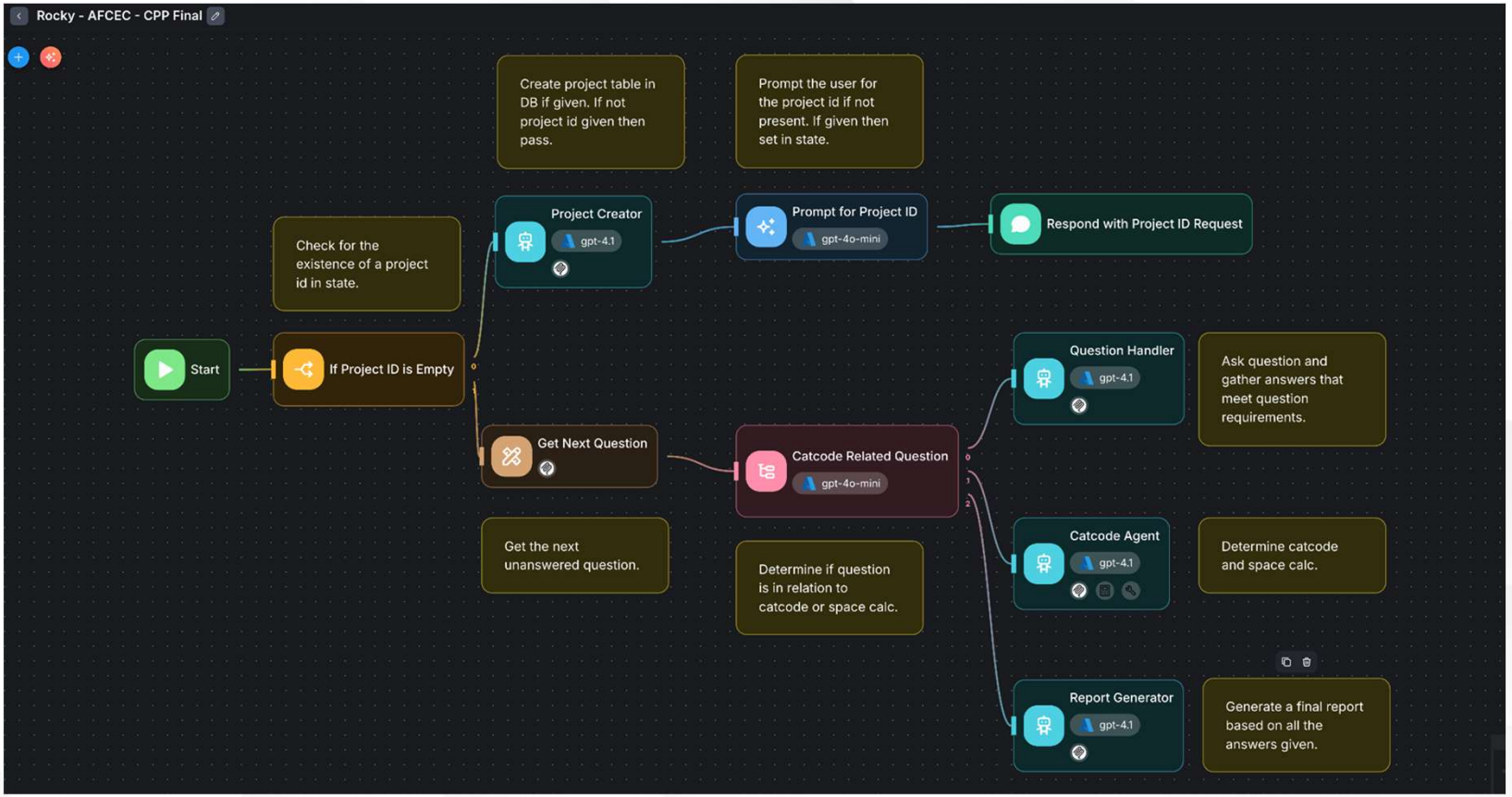
Technology Agnostic Approach

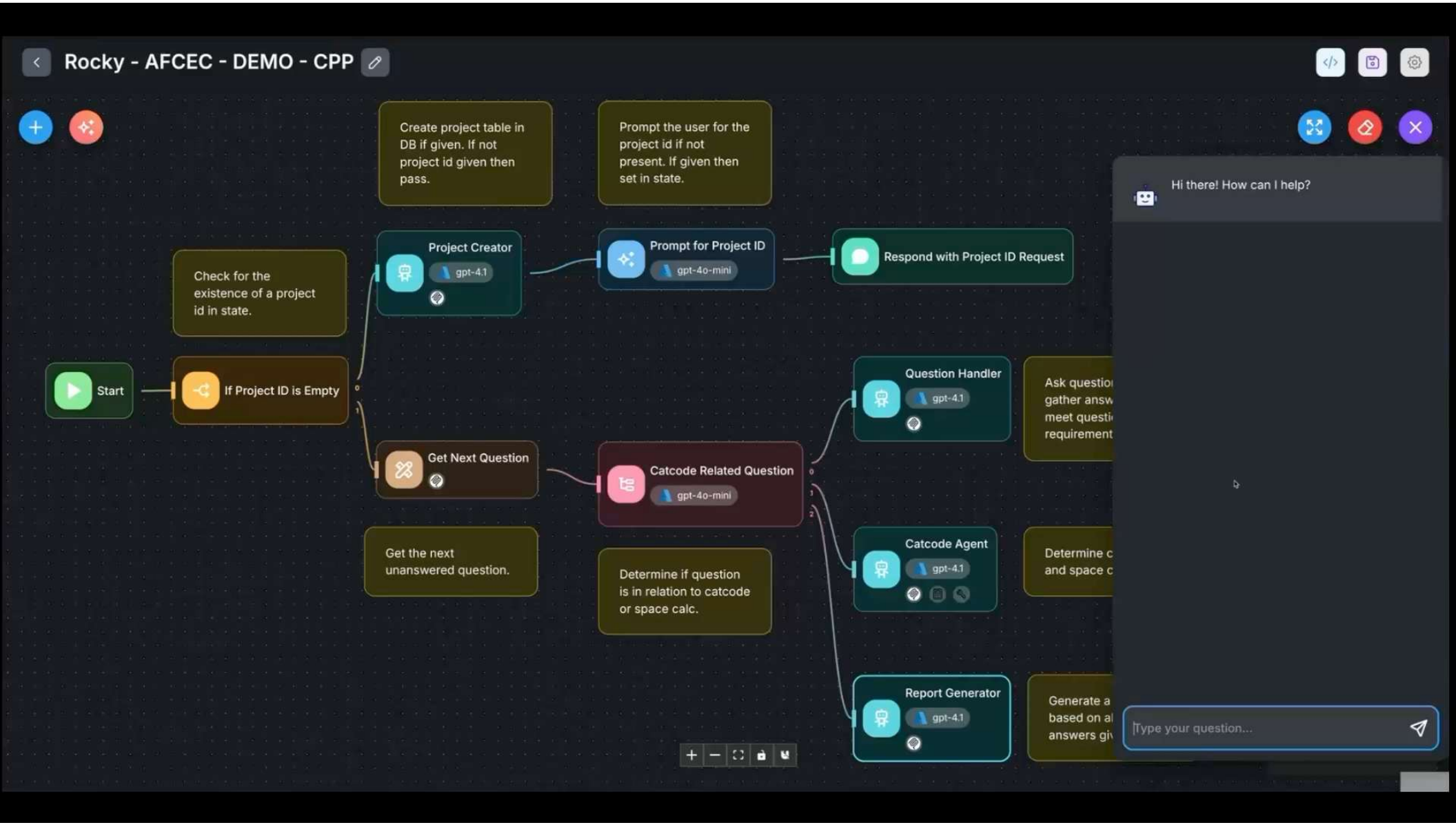
- ✓ Flexibility
- ✓ Scalability
- ✓ Interoperability

A.I. Assisted CPP - Planning Action Details

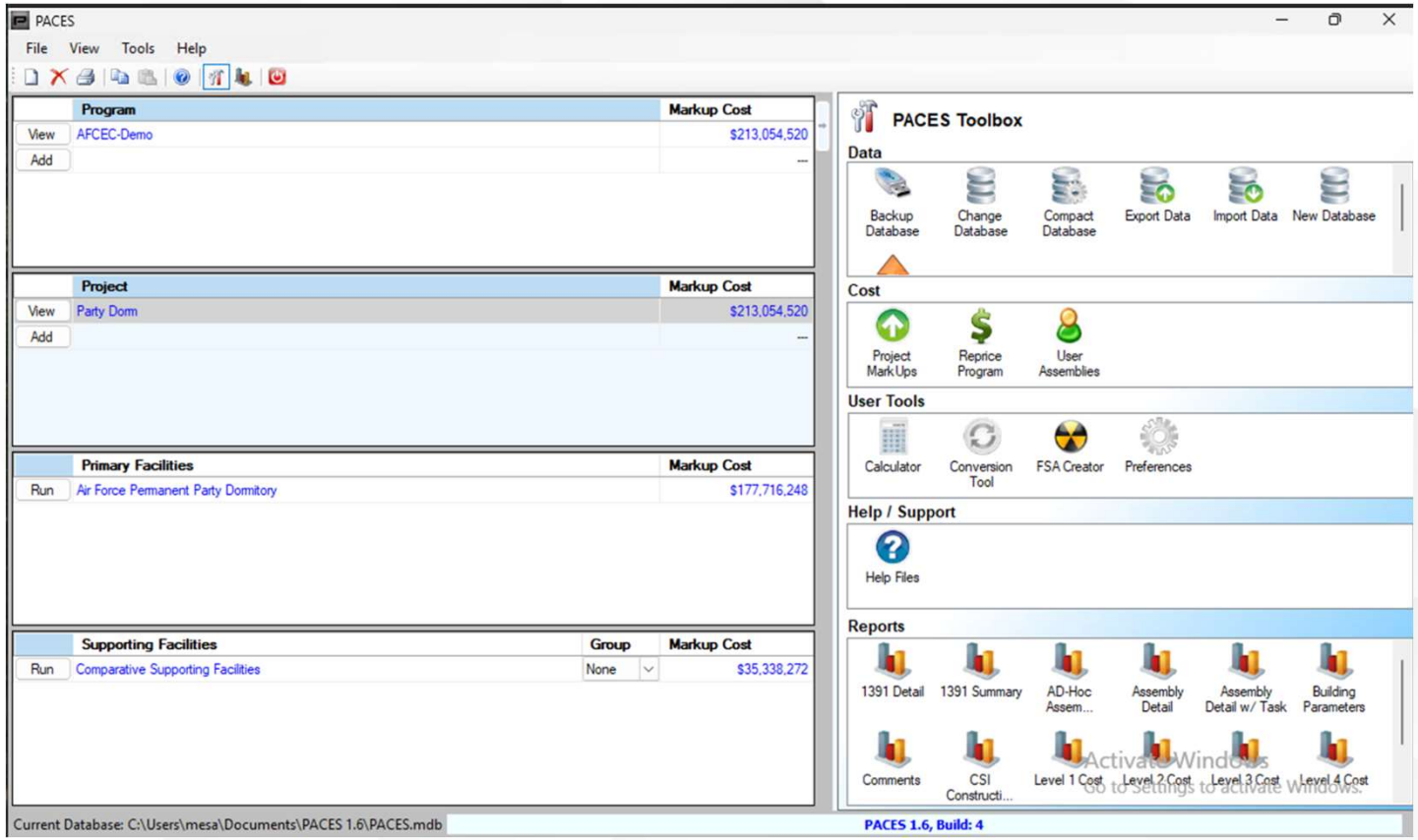


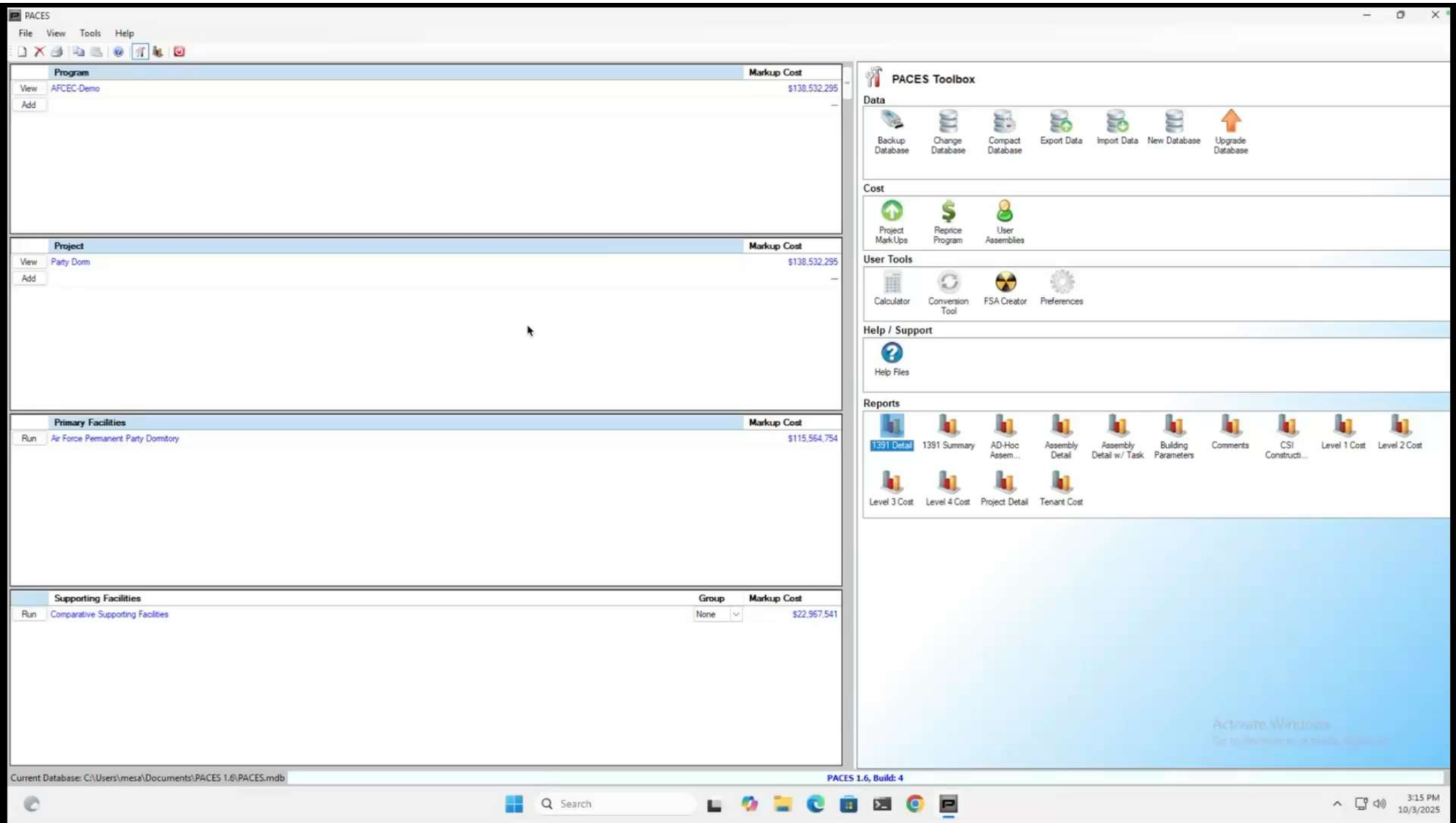
A.I. Assisted CPP - Agentic Flow




Rocky - AFCEC - DEMO - CPP
Create project table in DB if given. If not project id given then pass.
Prompt the user for the project id if not present. If given then set in state.
Check for the existence of a project id in state.
Project Creator
gpt-4.1
Prompt for Project ID
gpt-4o-mini
Respond with Project ID Request
Start
If Project ID is Empty
Get Next Question
Get the next unanswered question.
Catcode Related Question
gpt-4o-mini
Determine if question is in relation to catcode or space calc.
Question Handler
gpt-4.1
Catcode Agent
gpt-4.1
Report Generator
gpt-4.1
Hi there! How can I help?
Type your question...

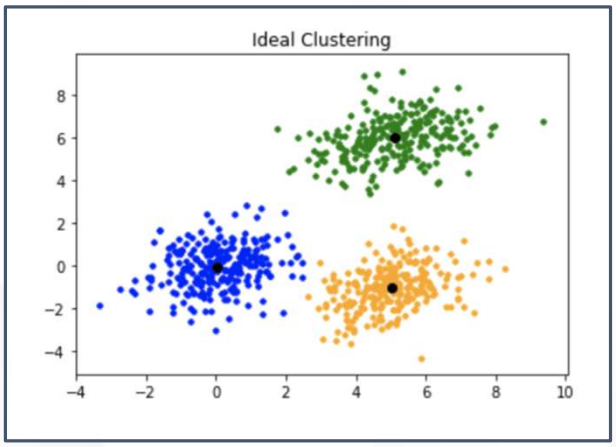
A.I. Assisted Cost Estimate - PACES




PACES
File View Tools Help
Program Markup Cost
View AFCEC-Demo $138,532,295
Add
Project Markup Cost
View Party Dorm $138,532,295
Add
Primary Facilities Markup Cost
Run Air Force Permanent Party Dormitory $115,564,754
Supporting Facilities Group Markup Cost
Run Comparative Supporting Facilities None $22,967,541
PACES Toolbox
Data
Backup Database
Change Database
Compact Database
Export Data
Import Data
New Database
Upgrade Database
Cost
Project Mark Ups
Reprice Program
User Assemblies
User Tools
Calculator
Conversion Tool
FSA Creator
Preferences
Help / Support
Help Files
Reports
1391 Detail
1391 Summary
AD-Hoc Assem...
Assembly Detail
Assembly Detail w/ Task
Building Parameters
Comments
CSI Constructi...
Level 1 Cost
Level 2 Cost
Level 3 Cost
Level 4 Cost
Project Detail
Tenant Cost
Current Database: C:\Users\mesa\Documents\PACES 1.6\PACES.mdb
PACES 1.6, Build: 4
Search
3:15 PM
10/3/2025

Technical Deep Dive: Models, Tools and Rationale

K-Means Algorithm



SBERT Model

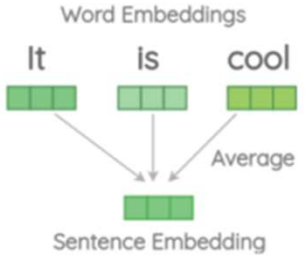
- counting-based: "The cat is in the hat"

  Does not take semantics into account at all

the	cat	is	in	hat
2	1	1	1	1

- Averaging word embeddings:

  Sentences tend to "bundle up" in the same area of the vector space



AI-Driven Predictability: Key to Faster Decisions and Mission Readiness

Summary of AI-Driven Predictability:

- **Improved Speed:** Streamlines requirements gathering and execution, saving hours to days on initial tasks (e.g., CATCODE Determination: 15 to 90 minutes saved; Space Authorization: 10 minutes to 4 hours saved per project).
- **Enhanced Accuracy & Data Fidelity:** Direct, data-driven validation (via PACES Aid and Clustering) and real-time data access ensure better cost estimates from inception, maintaining high-quality data throughout the planning process.
- **The Strategic Impact:** AI-driven predictability is the key to accelerating the planning process, directly improving infrastructure readiness, and strengthening the mission.

Next Steps:

- Advance the solution to a fuller prototype focusing on integration within the Air Force environment.

Questions / Final Discussion

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Your Success is Our Mission!