

Development and operational adoption of OCAI, the Operations Companion

COMET - *Opérations et Opérateurs du futur*
30/03/2023

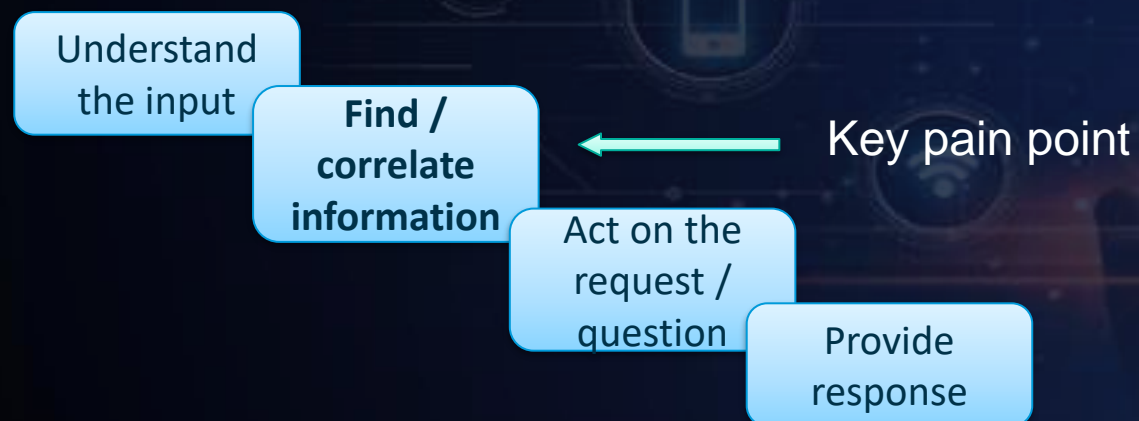
Evridiki Ntagiou, ESA/ESOC

What is it?

“An AI-powered software agent that is able to interact with a user with the use of human language and answer questions or complete tasks”

User Stories

Complex questions, analysis of multiple knowledge sources



What other similar events, touching the sub-systems XYZ occurred within this mission?

Please call the engineer on call and send them the current anomaly and associated information

What was the s/c Latitude/ Longitude and space weather condition at time of the OOL triggering?

What contingency procedure do I have to use for a certain XYZ Out Of Limit or OOL combination?

Coming to life...

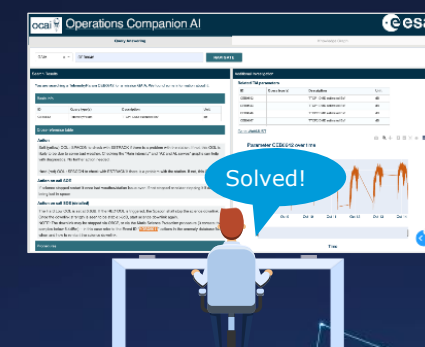
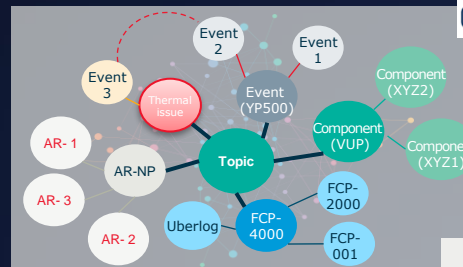
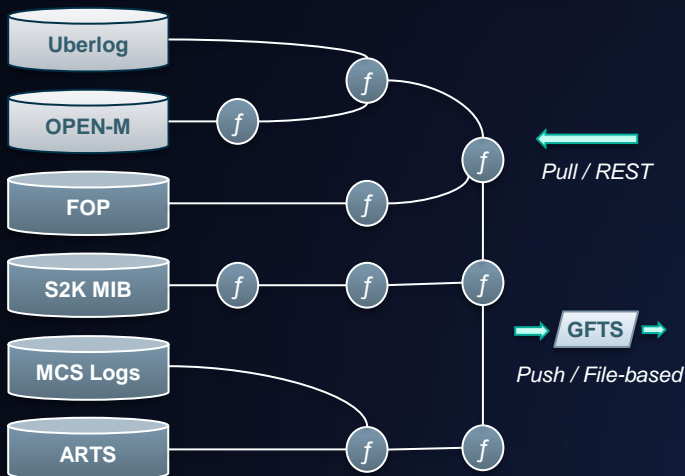


OCAI 2.0 in a nutshell

Event

Reaction / Advanced Search / Correlation

Analysis



Knowledge sources

Data ingestion and processing

Knowledge discovery

Decision making interface

Natural Language Processing (NLP)

- Tokenisation
- Stop-world removal
- Lemmatisation,
- Stemming,
- Bm25, Doc2Vec

Knowledge Engineering

- Data model based on ECSS standards
- Enrichment of the KG with:
 - Bm25
 - Doc2Vec, BERT-based model
- Nearest Neighbour navigation

A notable example...

What information do you need to determine the root cause of an anomaly on a space mission during operations?

ChatGPT

Examples

"Explain quantum computing in simple terms" →

"Got any creative ideas for a 10 year old's birthday?" →

"How do I make an HTTP request in Javascript?" →

Capabilities

Remembers what user said earlier in the conversation

Allows user to provide follow-up corrections

Trained to decline inappropriate requests

Limitations

May occasionally generate incorrect information

May occasionally produce harmful instructions or biased content

Limited knowledge of world and events after 2021

ChatGPT Mar 14 Version. Free Research Preview. Our goal is to make AI systems more natural and safe to interact with. Your feedback will help us improve.



Released Nov 2022



1 billion monthly website visitors estimated



High revenue predictions



Huge investments to the technology

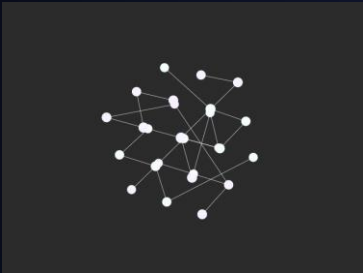
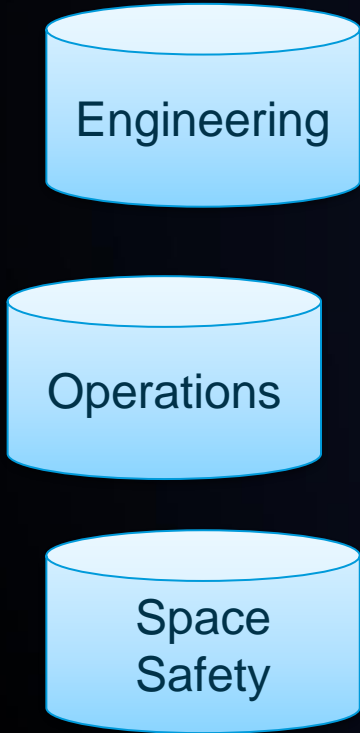
Capabilities

- Advanced search & correlation
- Explanation of terms, docs
- Write / Debug code / test cases
- Extract data in specific format

Limitations:

- Domain specific tailoring required!
- Model training 34 days, ~1k GPUs

Roadmap – Vision



User Stories



Core functionality

- Integration of Q&A prototype
- Improved AI models for similarity
- Improved conversational capabilities
- Extension to more missions

Infrastructure

- Use of Ainabler and Data Infrastructure available
- User Authentication
- Tailoring to more powerful h/w e.g. GPUs

New functionality

- Explain data, processes, documents, code, models' outputs
- Access tools, generation of code based on text description
- Training & integration of conversational tools
- Support multi-mission operations
- Advanced User Experience



Roadmap – Implementation

On-going

TDE *Intelligent Ops Assistant*

Upcoming

GSTP AI-based decision support system for Mission Ops

TDE *Launch campaign preparation and operations intelligent assistance*

Thank you!



Improve efficiency by automating tasks



Increase accessibility to OPS systems



Facilitate training processes

Contact

evridiki.ntagiou@esa.int