

First feedback on implementing MCP server to access CDS services

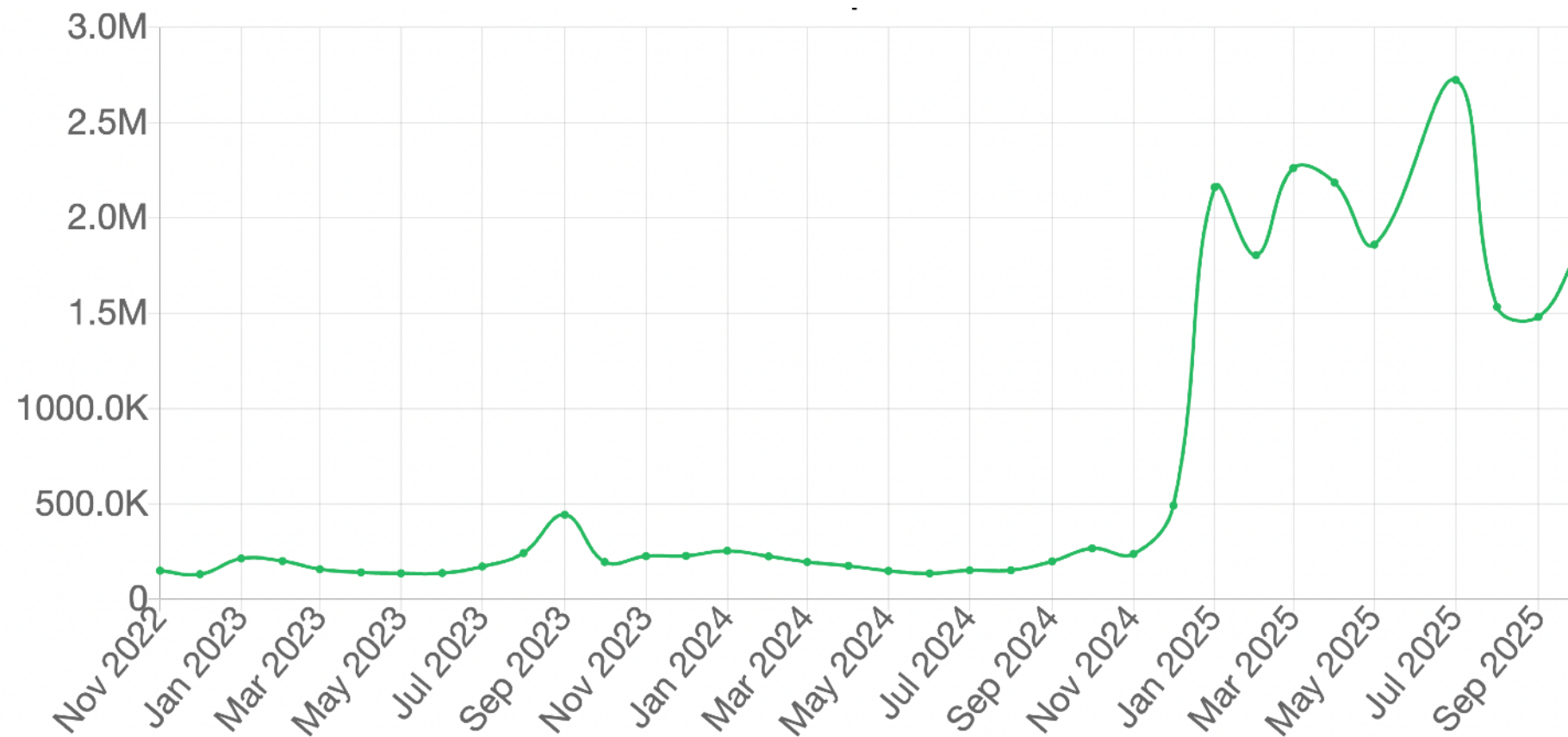


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□ What this talk is not about



- AI bots massive scraping and how to moderate it
- MCP does not solve this

□ MCP 101

- Model Context Protocol
<https://modelcontextprotocol.io/>
- Created by Anthropic
- Open-source standard to make AI and LLM actionable
 - Facilitates connection of AI applications to external systems
 - « USB to connect AI tools to external services »
 - *Examples*
 - Let LLM control your local Blender instance
 - Enable access to remote services/APIs



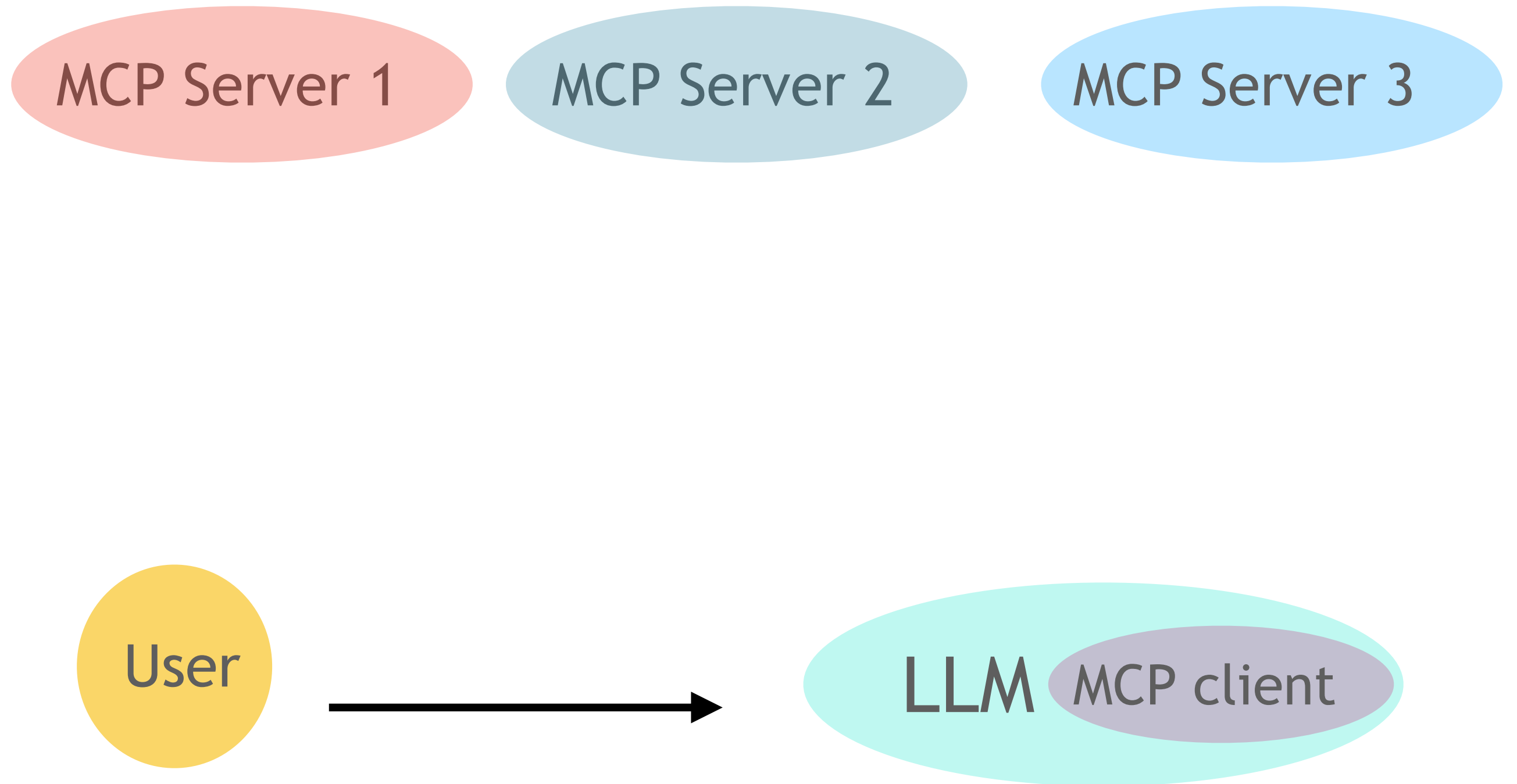
MCP Server 1

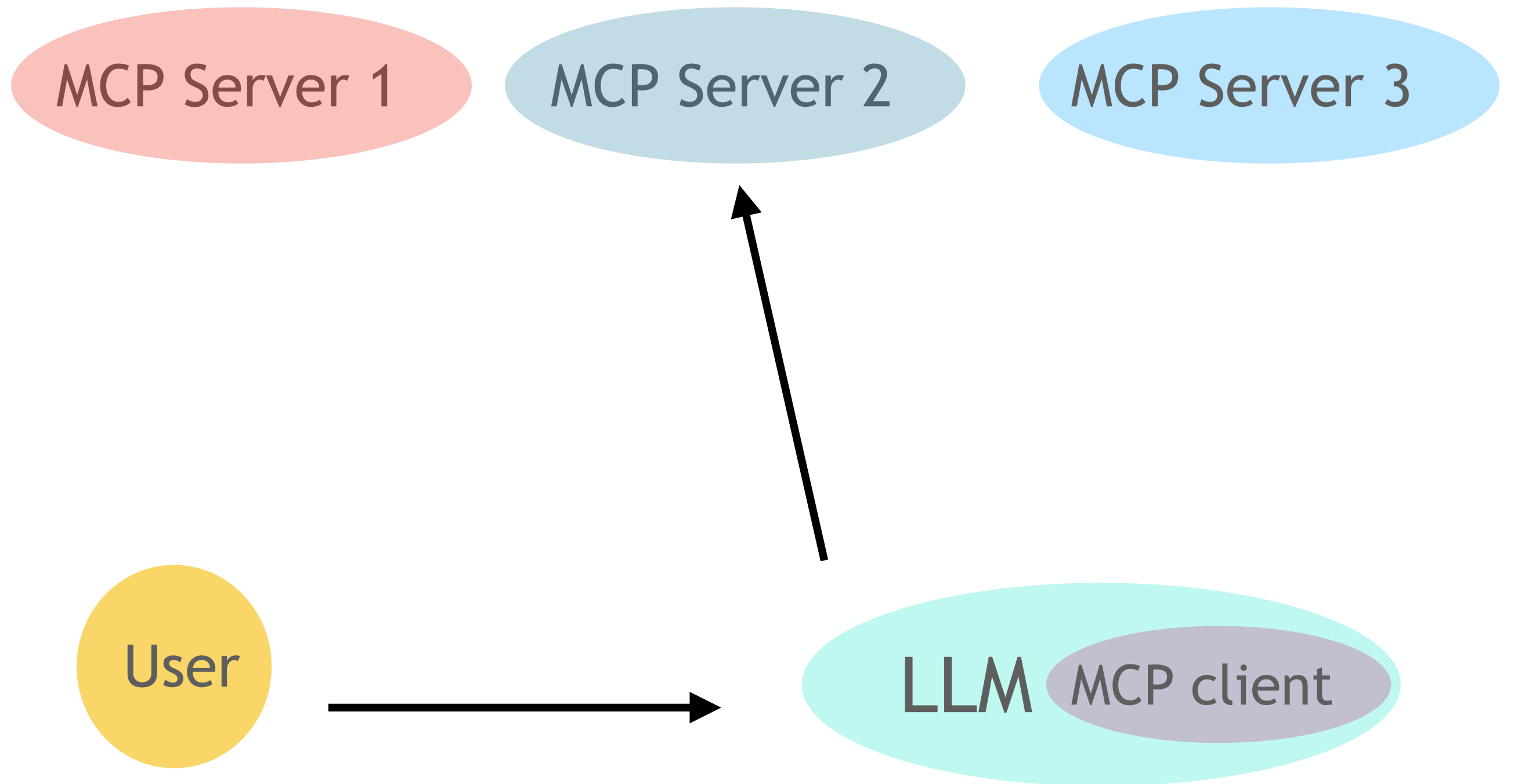
MCP Server 2

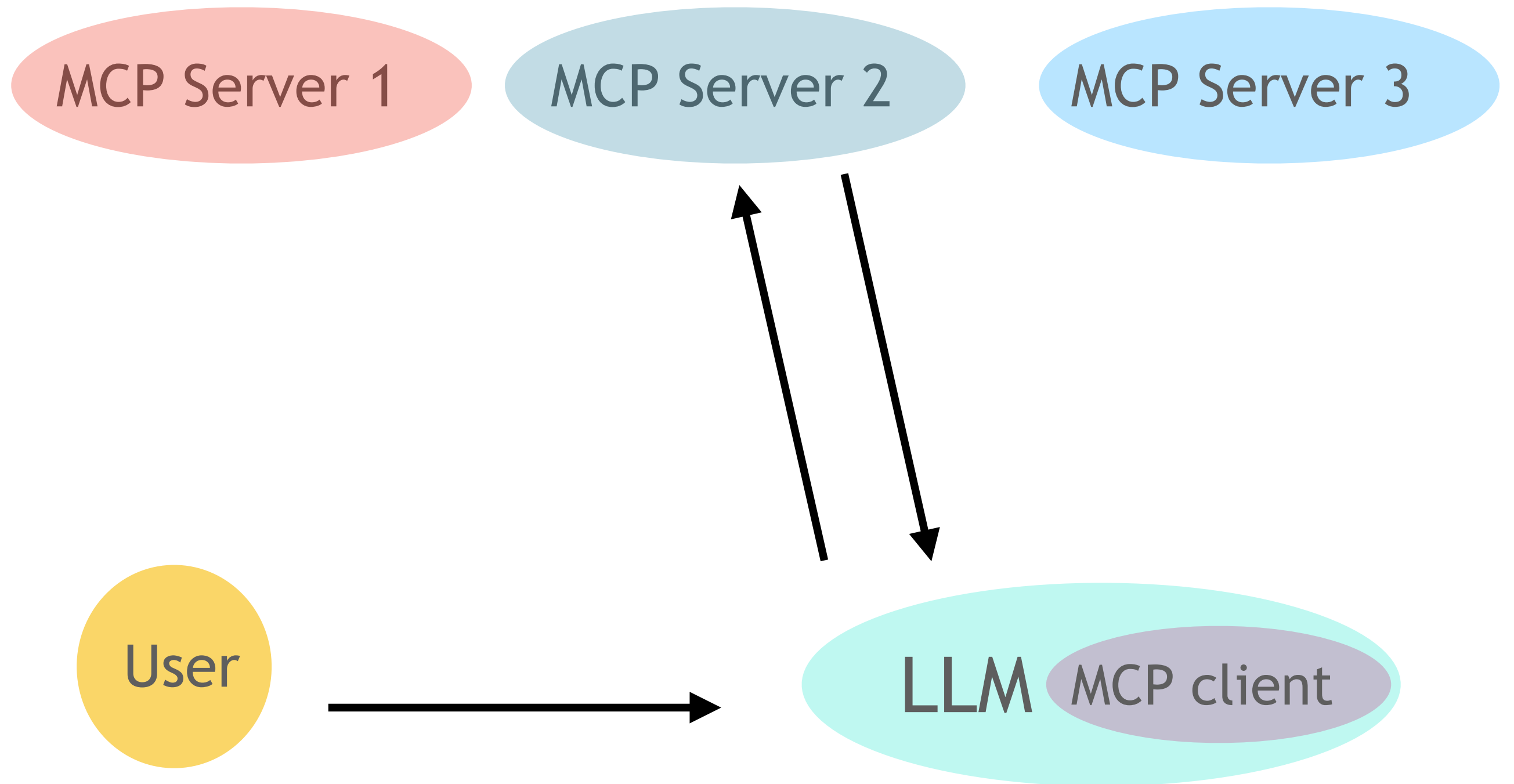
MCP Server 3

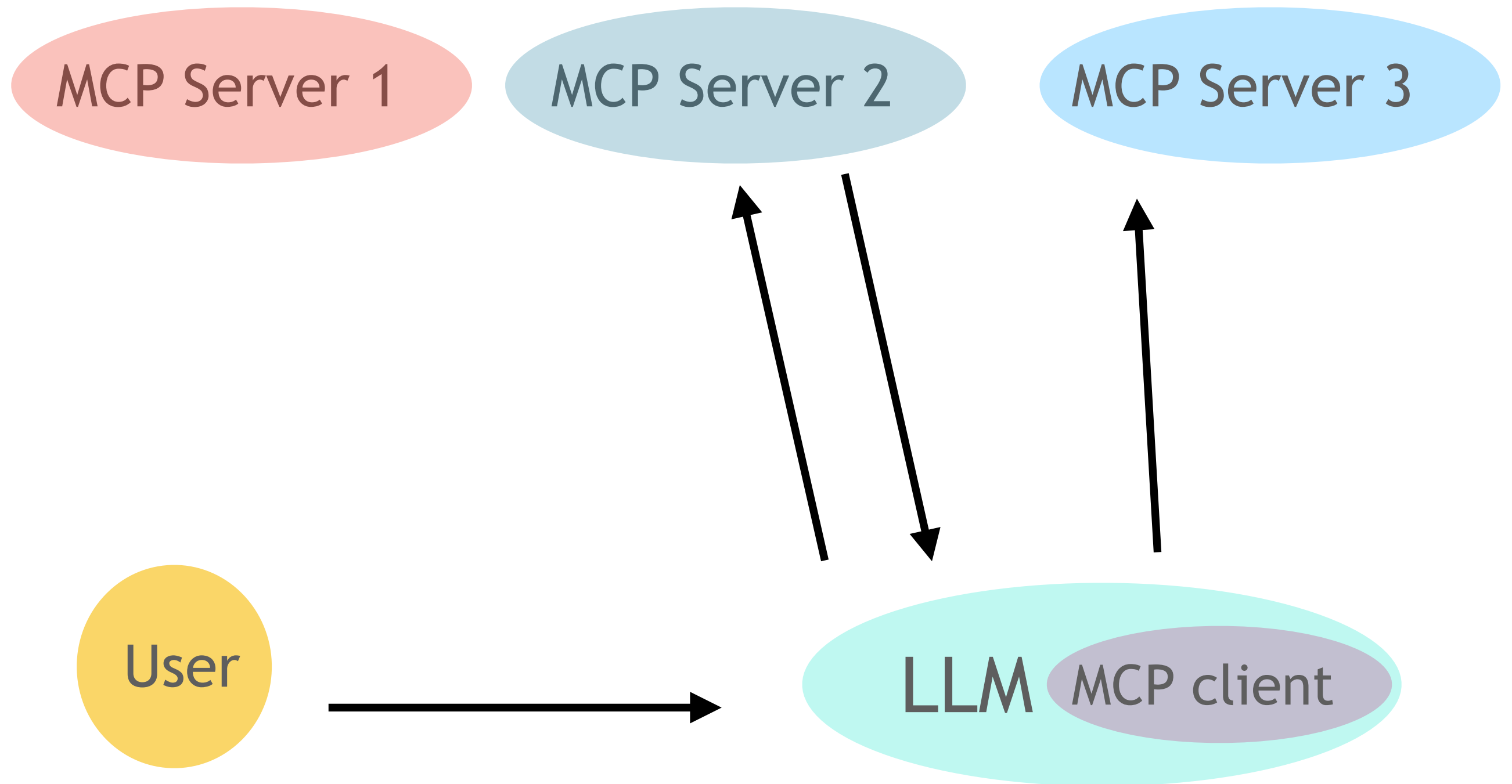
User

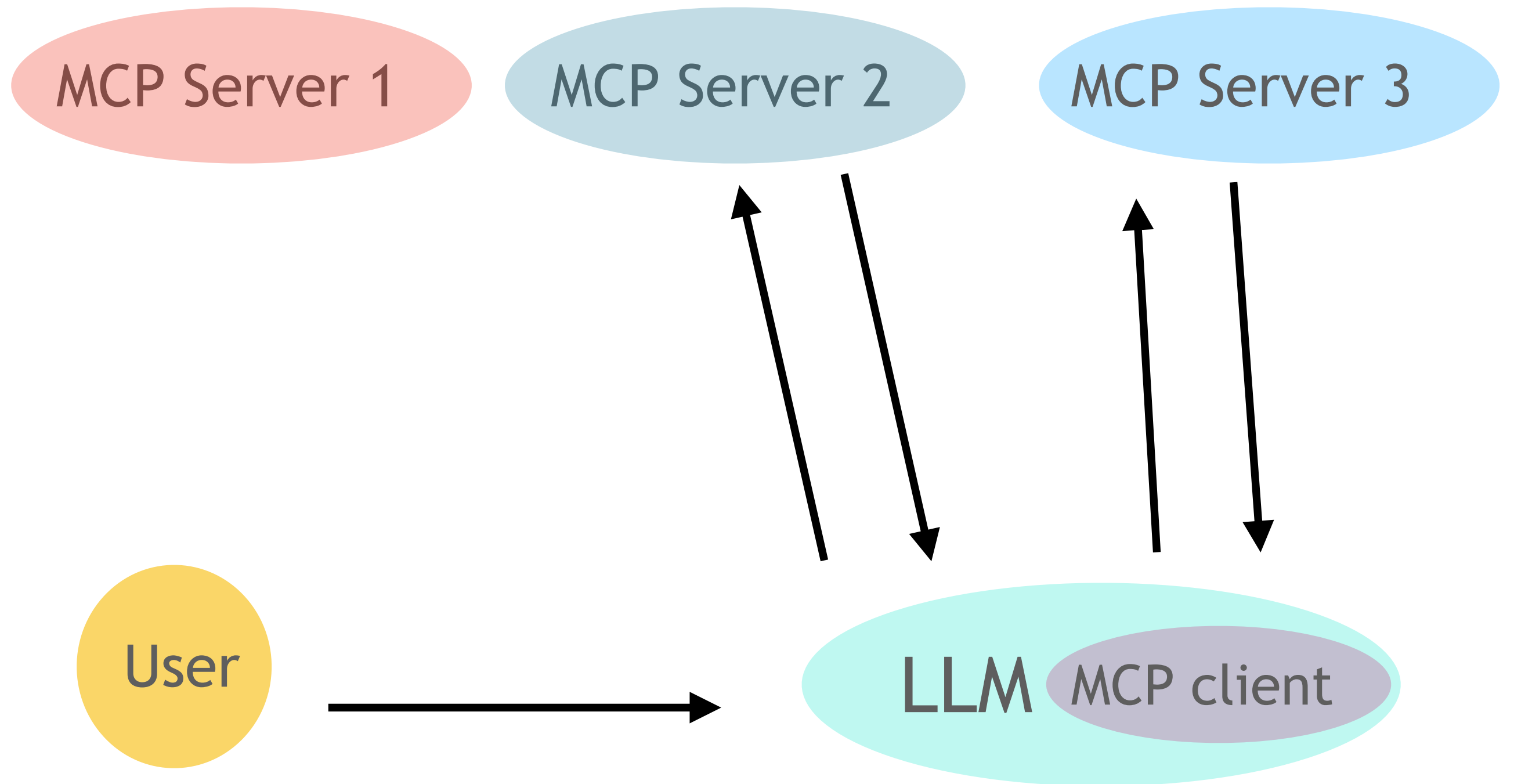
LLM MCP client

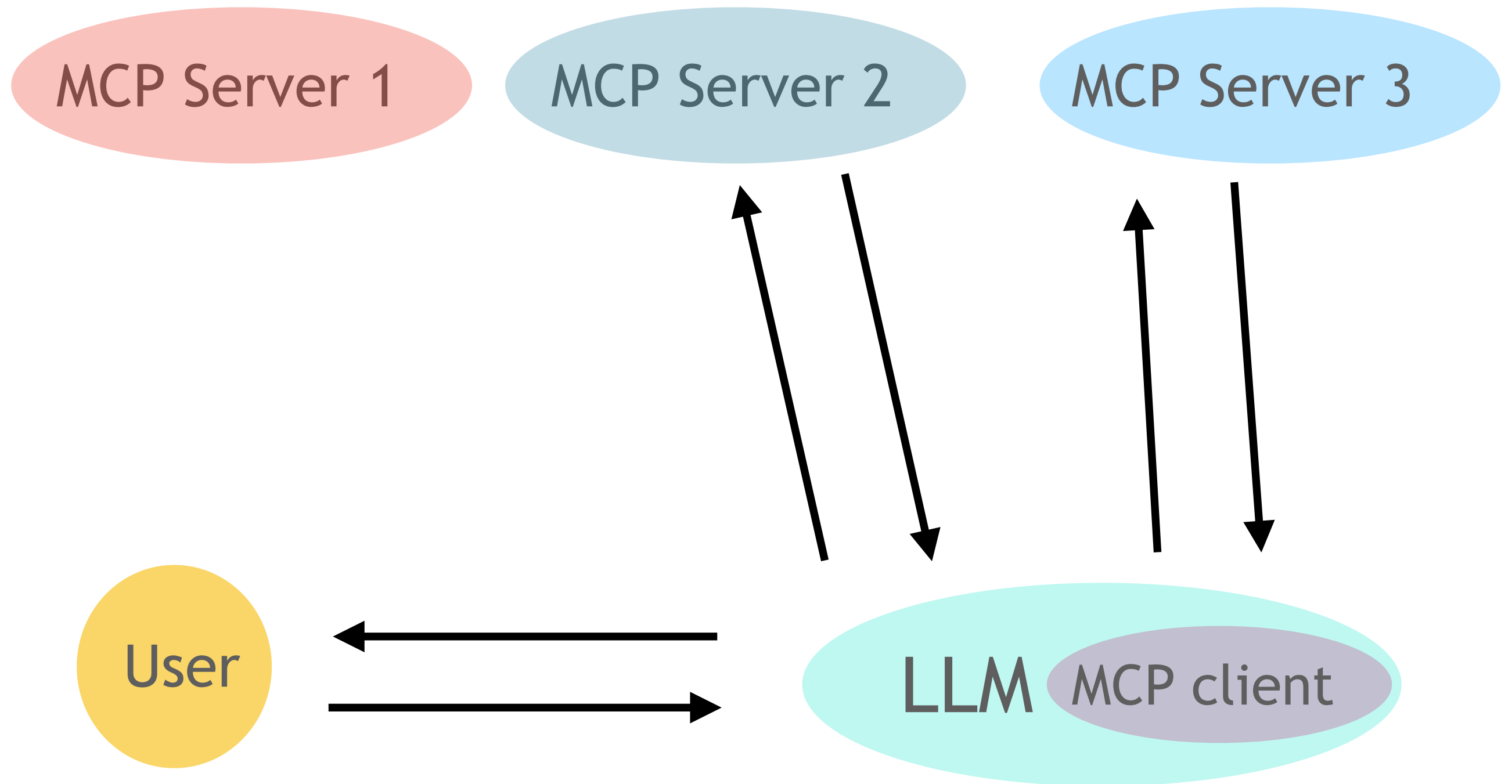












□ MCP client/server communication

- JSON-RPC
- Different phases
 - Initialization
 - Inform about server capabilities
 - Tools discovery
 - Tools execution
- See <https://modelcontextprotocol.io/docs/learn/architecture#data-layer-protocol> for details

□ MCP experimental servers at CDS

- Python package *fastmcp*
 - code example

```
def list_tools_Sesame(mcp):  
    @mcp.tool()  
    async def sesame_resolve_tool(object_name: str, resolver: str = "S") -> dict:  
        """  
        Sesame name resolver returns, from a string representing the designation  
        of an astronomical object outside the Solar System, the position of that object  
        in the sky. Available resolvers are S (Simbad, default resolver), V (Vizier), N (NED)  
  
        Examples :  
            sesame_resolve("M31")  
            sesame_resolve("M31", "N")  
  
        """  
        try:  
            return await sesame_resolve(object_name, resolver)  
        except Exception as e:  
            return {"success": False, "error": str(e)}
```

□ MCP experimental servers at CDS

- 2 experimental MCP servers
 1. Generic access to CDS services
<https://portal.cds.unistra.fr/cdslabs/mcp/cds/mcp>
 - Sesame
 - Simbad, VizieR, HiPS2FITS
 - MocServer
 2. Aladin Lite documentation
<https://portal.cds.unistra.fr/cdslabs/mcp/AL-doc/mcp>
 - MPC server created from JSDoc annotations in Aladin Lite source code

□ Demo 1

□ Demo 1

what is the spectral type of HD 891?



U CDS_MCP [Simbad Get Object](#)



It appears that the basic SIMBAD query for HD 891 did **not** return its spectral type. This information is often available in more detailed SIMBAD entries or in specialized catalogs.

Let me check for additional fields, including the spectral type, using a more detailed SIMBAD query.

U CDS_MCP [Simbad Get Object](#)



Arguments

```
fields      [
              "sp_type"
            ]
```

```
object_name "HD 891"
```



□ Demo 1

what is the spectral type of HD 891?



U CDS_MCP [Simbad Get Object](#) ✓

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Arguments

```
fields      [
              "sp_type"
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```

```
object_name "HD 891"
```



The spectral type of **HD 891** is **K2III**, indicating it is a **giant star** of spectral class K2. This means it is cooler and larger than the Sun, with an orange hue.

11:33am



□ Demo 2

The screenshot displays the ALADIN astronomical interface. The main view shows a deep-field image of the Andromeda Galaxy (M31) against a starry background. A purple crosshair is centered on the galaxy's core. The interface includes several UI elements:

- Top Left:** A dropdown menu set to "ICRS", a copy icon, and a coordinate box showing "00 42 07.37 +41 16 04.7".
- Top Right:** A "SIN" button, a full-screen icon, and a vertical stack of buttons labeled "C" and "I".
- Bottom Left:** A zoom control bar with minus and plus buttons and a scale indicator "1.000° x 31.03'".
- Bottom Right:** The "ALADIN" logo.

Left Panel (Command Console):

```
aladin.gotoObject("M31",{})
```

Moves the Aladin instance to the specified astronomical object.

Parametres :

- `targetName(string<required>)`: The name or identifier of the astronomical object to move to.
- `callbackOptions(Object<optional>)`: Optional callback options.
- `callbackOptions.success(function<optional>)`: The callback function to execute on successful navigation.
- `callbackOptions.error(function<optional>)`: The callback function to execute on error during navigation.

Code bon

Executer

Right Panel (Chat):

User :

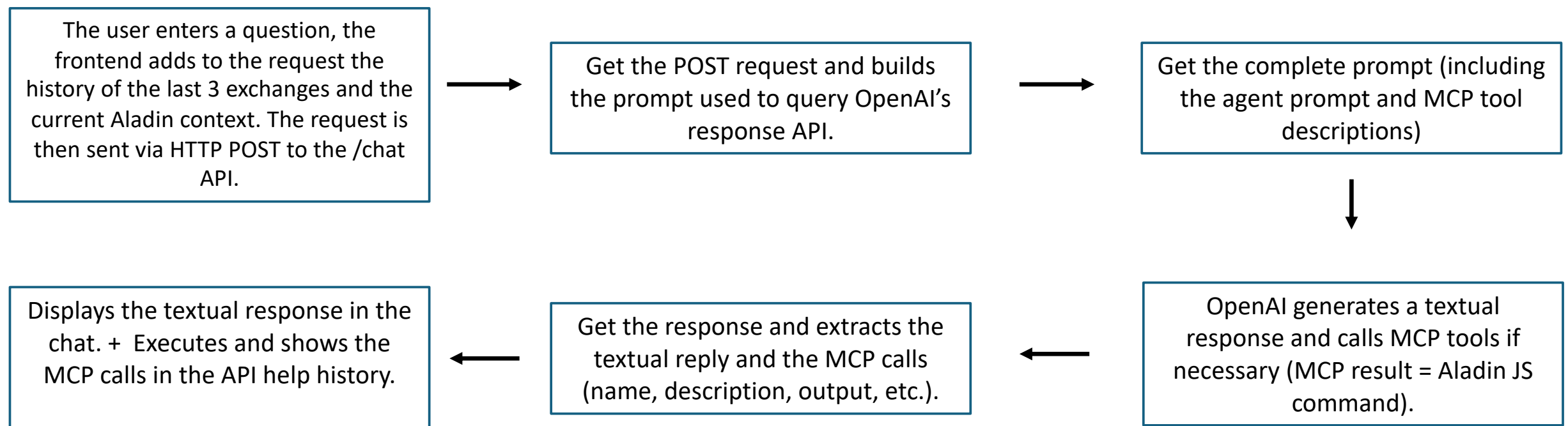
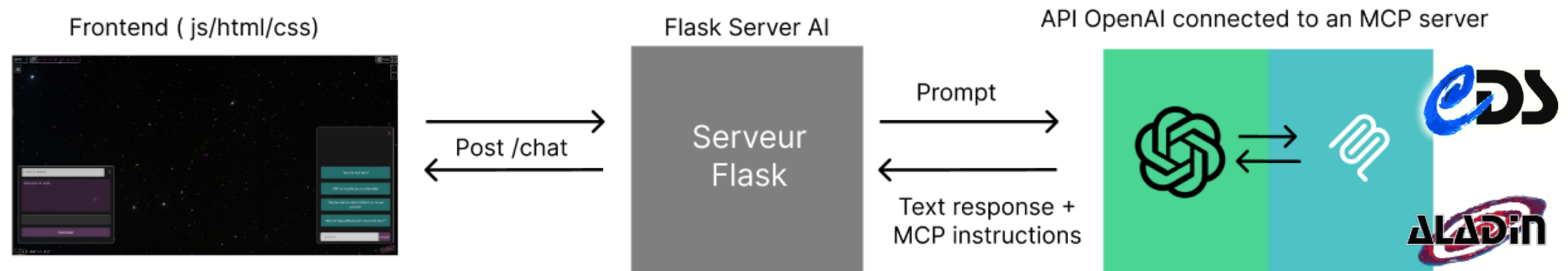
"Show me M31"

Agent :

I've navigated to M31 (Andromeda Galaxy). You can now explore its details in the Aladin view. If you need more information or have other requests, let me know!

Question Envoyer

□ Aladin Lite « chatbot » controller



The JS code returned by the MCP is never executed on the server side. It is only executed by the frontend JS, so the LLM has no awareness of whether the code worked. The LLM is still aware of the current view thanks to the context.

□ Costs

Questions	CDS MCP services enabled	gpt-4.1	gpt-4o- mini	gpt-4.1-mini	gpt-4.1- nano
<i>Show me M31</i>	All	11895 \$0.0244	12200 \$0.0019	12109 \$0.005	12109 \$0.0012
<i>Find the 3 brightest galaxies and display them on the map</i>	Sesame + simbad query	8137 \$0.0193	7994 \$0.00014	8380 \$0.0041	8302 \$0.001

□ Feedback

- Quality of result very sensitive to description provided by MCP server methods
 - The more specific the better
- MCP querying vs relying on built-in knowledge
 - *Eg:* position of <know-astro-object>
 - Nudge model through prompting is possible
- Manual fine-tuning of tools description is needed
 - Test against list of typical use cases
- Results inconsistent from one execution to another
- Problem of context size and too large results
- Chain of thoughts
 - Impressive when it combination of multiples tools work
 - Depends highly on model used

□ Feedback

1. **What is the redshift of 3C273? What is the redshift of the Virgo Cluster?**
2. **What is the parallax of Barnard's star? What is the distance of Barnard's star? What is the proper motion of Barnard's star?**
3. **What is the effective temperature of Sirius?**
4. **What are the galactic coordinates of Geminga?**
5. **Which galaxy interacts with NGC 4038?**
6. **Show me an image of the Pleiades in the K band**
7. **How many quasars are there at redshift larger than 6?**
autre formulation **How many QSOs are there at $z > 6$?**
8. **What is the redshift of galaxies members of the Virgo cluster?**
9. **Find globular clusters within 3° of M31. Find globular clusters in M31.**
10. **Query the latest Veron catalogue**
11. **What is the period of Algol? List of periods of Algol-type stars.**
12. **What is the effective temperature of T Tau? What is the effective temperature of T Tauri stars?**
13. **Find supernovae in galaxies brighter than $V=12$**
14. **How many planets orbit Kepler 20?**
15. **List of catalogues measuring surface gravity of giant stars**
16. **Get color thumbnails of Messier objects**
17. **List of galactic X-ray supernova remnants**

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□ Other related work

- StarAI (ADASS poster) - (S. Zautkin, CADDC)
<https://indico.dzastro.de/event/4/contributions/184/>
- XMM GPT (ADASS 2025 talk) - (L. Ehrlich, Telespazio/ESA)
<https://indico.dzastro.de/event/4/contributions/113/>