Package 'mcptools'

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Title Model Context Protocol Servers and Clients

Version 0.2.0

Description Implements the Model Context Protocol (MCP). Users can start 'R'-based servers, serving functions as tools for large language models to call before responding to the user in MCP-compatible apps like 'Claude Desktop' and 'Claude Code', with options to run those tools inside of interactive 'R' sessions. On the other end, when 'R' is the client via the 'ellmer' package, users can register tools from third-party MCP servers to integrate additional context into chats.

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URL https://github.com/posit-dev/mcptools, https://posit-dev.github.io/mcptools/

BugReports https://github.com/posit-dev/mcptools/issues

Depends R (>= 4.1.0)

Imports cli, ellmer (>= 0.3.0), httpuv, httr2, jsonlite, nanonext (>= 1.6.0), processx, promises, rlang

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`client` *R as a client: Define ellmer tools from MCP servers*

Description

These functions implement R as an MCP *client*, so that ellmer chats can register functionality from third-party MCP servers such as those listed here: https://github.com/modelcontextprotocol/servers.

`mcp_tools()` fetches tools from MCP servers configured in the mcptools server config file and converts them to a list of tools compatible with the `$set_tools()` method of ellmer::Chat objects.

Usage

```
mcp_tools(config = NULL)
```

Arguments

`config`	A single string indicating the path to the mcptools MCP servers configuration file. If one is not supplied, mcptools will look for one at the file path configured with the option `.mcptools_config`, falling back to `file.path("~", ".config", "mcptools", "config.json")`.

Value

- `mcp_tools()` returns a list of ellmer tools that can be passed directly to the `$set_tools()` method of an ellmer::Chat object. If the file at `config` doesn't exist, an error.

Configuration

mcptools uses the same .json configuration file format as Claude Desktop; most MCP servers will define example .json to configure the server with Claude Desktop in their README files. By default, mcptools will look to `file.path("~", ".config", "mcptools", "config.json")`; you can edit that file with `file.edit(file.path("~", ".config", "mcptools", "config.json"))`.

The mcptools config file should be valid .json with an entry `mcpServers`. That entry should contain named elements, each with at least a `command` and `args` entry.

For example, to configure `mcp_tools()` with GitHub's official MCP Server https://github.com/github/github-mcp-server, you could write the following in that file:

```
{
  "mcpServers": {
    "github": {
      "command": "docker",
      "args": [
        "run",
        "-i",
        "--rm",
        "-e",
        "GITHUB_PERSONAL_ACCESS_TOKEN",
        "ghcr.io/github/github-mcp-server"
      ],
      "env": {
        "GITHUB_PERSONAL_ACCESS_TOKEN": "<add_your_github_pat_here>"
      }
    }
  }
}
```

Connecting to remote (http) servers

`mcp_tools()`, which supports using R as an MCP *client* via ellmer, only implements the local (stdio) protocol. However, some MCP *servers* only implement the http protocol.

In that case, we recommend using mcp-remote, a local (stdio) MCP server that supports connecting to remote (http) servers using the stdio protocol, with fully-featured authentication. In other words, `mcp-remote` converts remote MCP servers to mcptools-compatible local ones.

To connect to remote (http) MCP servers when using ellmer as a client, use the command `npx` with the args `mcp-remote` and the URL provided by the remote server. For example, you might write:

```
{
  "mcpServers": {
    "remote-example": {
      "command": "npx",
      "args": [
        "mcp-remote",
        "https://remote.mcp.server/sse"
      ]
    }
  }
}
```

mcp-remote's homepage has many examples for various authentication schemes.

See Also

This function implements R as an MCP *client*. To use R as an MCP *server*, i.e. to provide apps like Claude Desktop or Claude Code with access to R-based tools, see `mcp_server()`.

Examples

```
# setup
config_file <- tempfile(fileext = "json")
file.create(config_file)

# usually, `config` would be a persistent, user-level
# configuration file for a set of MCP server
mcp_tools(config = config_file)

# teardown
file.remove(config_file)
```

---

server *R as a server: Configure R-based tools with LLM-enabled apps*

Description

`mcp_server()` implements a model context protocol server with arbitrary R functions as its tools. Optionally, calling `mcp_session()` in an interactive R session allows those tools to execute inside of that session.

Usage

```
mcp_server(
  tools = NULL,
  ...,
  type = c("stdio", "http"),
  host = "127.0.0.1",
  port = as.integer(Sys.getenv("MCPTOOLS_PORT", "8080")),
  session_tools = TRUE
)

mcp_session()
```

Arguments

`tools`	Optional collection of tools to expose. Supply either a list of objects created by `ellmer::tool()` or a path to an `.R` file that, when sourced, yields such a list. Defaults to `NULL`, which serves only the built-in session tools when `session_tools` is `TRUE`. Note that **tools are associated with the** `mcp_server()` rather than with `mcp_session()`s; to determine what tools are available in a session, set the `tools` argument to `mcp_server()`.
`...`	Reserved for future use; currently ignored.
`type`	Transport type: `"stdio"` for standard input/output (default), or `"http"` for HTTP-based transport.

host	Host to bind to when using HTTP transport. Defaults to "127.0.0.1" (localhost) for security. Ignored for stdio transport.
port	Port to bind to when using HTTP transport. Defaults to the value of the MCPTOOLS_PORT environment variable, or 8080 if not set. Ignored for stdio transport.
session_tools	Logical value whether to include the built-in session tools (list_r_sessions, select_r_session) that work with mcp_session(). Defaults to TRUE. Note that the tools to interface with sessions are still first routed through the mcp_server().

Value

mcp_server() and mcp_session() are both called primarily for their side-effects.

- mcp_server() blocks the R process it's called in indefinitely and isn't intended for interactive use.
- mcp_session() makes the interactive R session it's called in available to MCP servers. It returns invisibly the **nanonext** socket used for communicating with the server. Call close() on the socket to stop the session.

Configuration

Local server (default, via stdio):

mcp_server() can be configured with MCP clients via the Rscript command. For example, to use with Claude Desktop, paste the following in your Claude Desktop configuration (on macOS, at file.edit("~/Library/Application Support/Claude/claude_desktop_config.json")):

```
{
  "mcpServers": {
    "r-mcptools": {
      "command": "Rscript",
      "args": ["-e", "mcptools::mcp_server()"]
    }
  }
}
```

Or, to use with Claude Code, you might type in a terminal:

```
claude mcp add -s "user" r-mcptools Rscript -e "mcptools::mcp_server()"
```

Remote server (via http):

To run an HTTP server instead, use type = "http":

```
# Start HTTP server on default port (8080)
mcp_server(type = "http")

# Or specify custom host and port
mcp_server(type = "http", host = "127.0.0.1", port = 9000)
```

The server will listen for HTTP POST requests containing JSON-RPC messages.

mcp_server() is not intended for interactive use.

The server interfaces with the MCP client. If you'd like tools to have access to variables inside of an interactive R session, call `mcp_session()` to make your R session available to the server. Place a call to `mcptools::mcp_session()` in your `.Rprofile`, perhaps with `usethis::edit_r_profile()`, to make every interactive R session you start available to the server.

On Windows, you may need to configure the full path to the Rscript executable. Examples for Claude Code on WSL and Claude Desktop on Windows are shown at https://github.com/posit-dev/mcptools/issues/41#issuecomment-3036617046.

See Also

- The "R as an MCP server" vignette at `vignette("server", package = "mcptools")` delves into further detail on setup and customization.
- These functions implement R as an MCP *server*. To use R as an MCP *client*, i.e. to configure tools from third-party MCP servers with ellmer chats, see `mcp_tools()`.

Examples

```
# should only be run non-interactively, and will block the current R process
# once called.
if (identical(Sys.getenv("MCPTOOLS_CAN_BLOCK_PROCESS"), "true")) {
# to start a server with a tool to draw numbers from a random normal:
library(ellmer)

tool_rnorm <- tool(
  rnorm,
  "Draw numbers from a random normal distribution",
  n = type_integer("The number of observations. Must be a positive integer."),
  mean = type_number("The mean value of the distribution."),
 sd = type_number("The standard deviation of the distribution. Must be a non-negative number.")
)

mcp_server(tools = list(tool_rnorm))

# can also supply a file path as `tools`
readLines(system.file("example-ellmer-tools.R", package = "mcptools"))

mcp_server(tools = system.file("example-ellmer-tools.R", package = "mcptools"))
}

if (interactive()) {
  mcp_session()
}
```

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