Problem Statements and Requirements of Real-Virtual Agent Protocol (RVP): Communication Protocol for Embodied Intelligence in Physical- Digital Continuum

draft-zhang-rvp-problem-statement-00

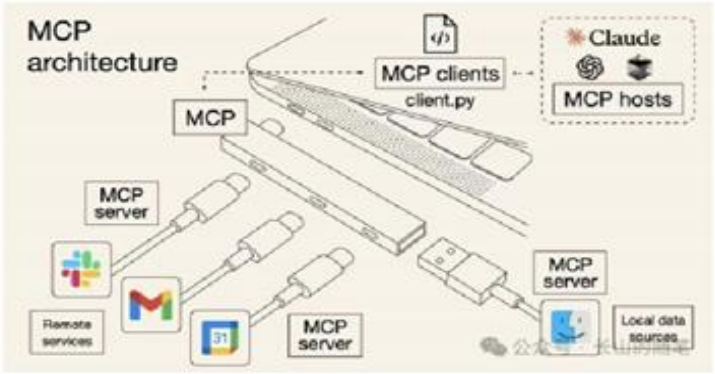
Yunfei Zhang, China Telecom, HotRFC

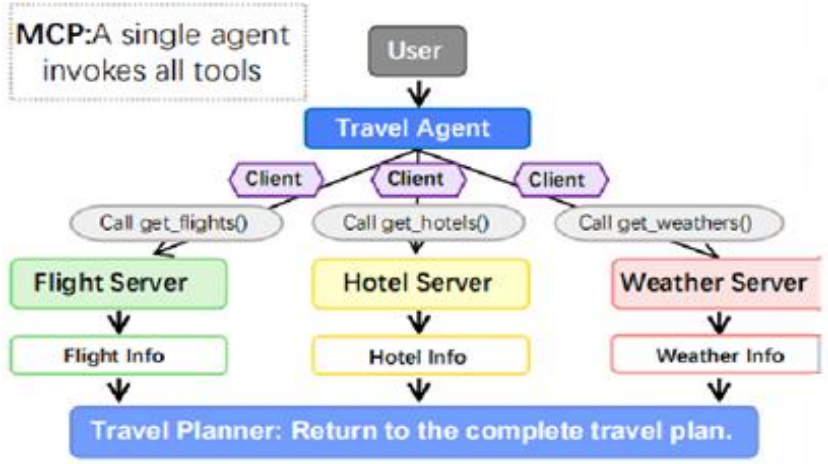
Real-Virtual Agent Protocol (RVP) Overview

- Unifies physical and digital agents communication, supporting hierachical/non peer-to-peer, hetergeneous and partially centralized communication and coordination between physical entities (robots, IoT devices, manufacturing systems and agents) and digital agents (AI systems, models, software agents,virtual twins)
- Achieves real-time physical data loop for online learning
- Forming embodied intelligence networks
- Three key points
  - Unified composite identity management
  - Physical/social/production relations graph-based coordination
  - Physical constraint integration

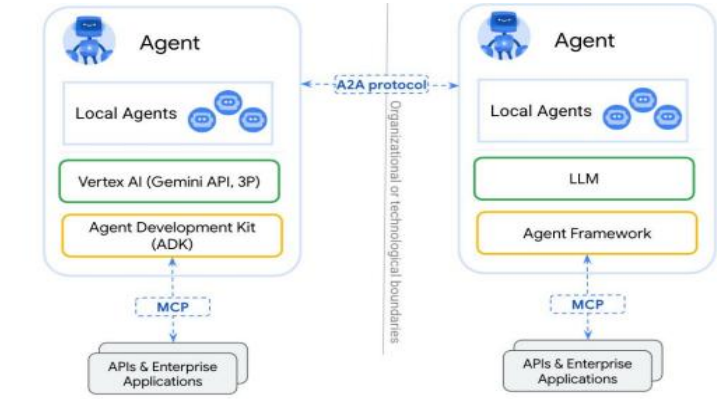
MCP and A2A are gaining much attention

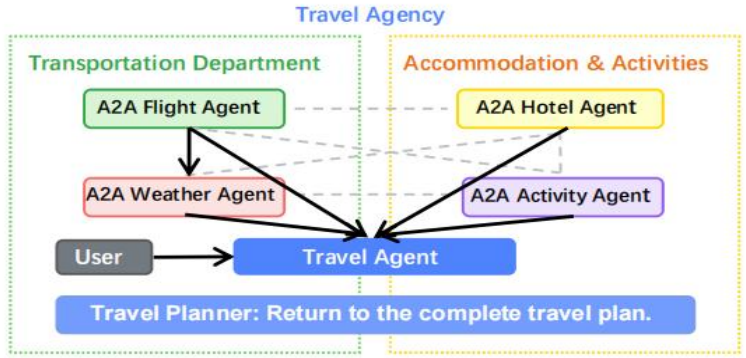
MCP: Interface bw agents and tools/resources to avoid the ecological fragments





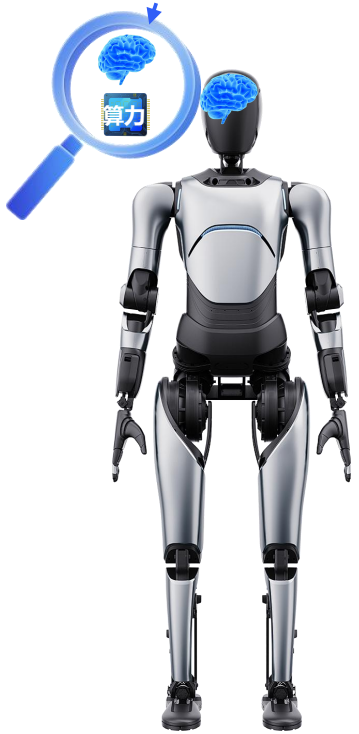
A2A: Protocol bw agents to form multi-agents collabration





MCP, A2A and RVP link the physical world and digital world for EIN

AI agent



Embodied Intelligence

Digital agent

RVP

Multi-modal Interactive enhancement
Action planning
Simulation/Prediction
Robot Agent
Online Learning
Multi-agent Coordniation
Proactive Safety Protection
Agent Platform
Robot Model
DeepSeek Model

KG
Path planning
Device management
Sweeper Agent
Multi-modal sensing
Joint emergency response
Data-driven optimization
Agent Platform
Environment Saitationn model
Tongyi Model

Policy Evolution
Service Recommendation
Vehicle-Cloud Interaction
AD Agent
OTA
Computing Scheduling
V2X Sensing
Dify
CVIS platform
AD end-to-end model

Super-resolution Sensing
Scheduling
Edge decision
Streetlight Agent
Event Early Warning
Device Managment
Data Service
Agent Platform
Municipal Service Model

RVP/A2A

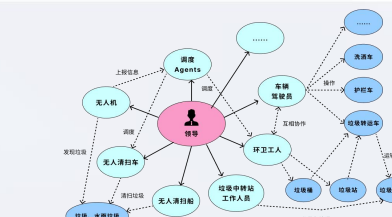
MCP

Pysical agent

Three Unique Features

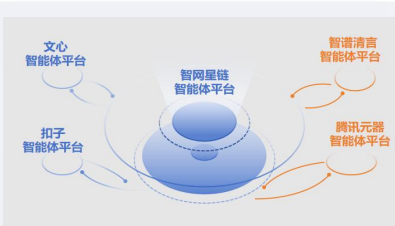
Real-Virtual Mapping and Convergence

Different forms of agents



Physical-Social-Production Relations

Different roles types, and levels of agents



Cross domain and hetergenenous communication

Different interface and framework of agents

Problems in Current Protocols

- Identity Fragmentation Across Domains
- Lack of Physical/Social Relations Mapping among agents
- Lack of Physical Constraint Reflection
- Lack of Efficient Registration and Effective Discovery Mechanisms for Agents
- Lack of Real-time Data Input to the Embodied Large Model for Training

- Requirements are for open discussions to consolidate.
- Protocol Integration Stategy:

RVP is designed as a meta-protocol that does not replace existing protocols (such as A2A, MCP, IoT protocols) but inherits, extends,or enhances them,

RVP Use Cases

- Flexible Production Line Coordination in Manufacturing
- Disaster Rescue Human-Robot Collaborative Environments
- Autonomous Driving Systems in Smart City
  - Multi-Vehicles(Agents) Collaborative Delivery fleet
  - Vehicle-to-Everything (V2X) Intersection Management

Looking for collaborators for moving forard RVP protocol.

You can reach me at hishigh@sina.com

Thanks