

Academy Agents for Numerical Weather Prediction

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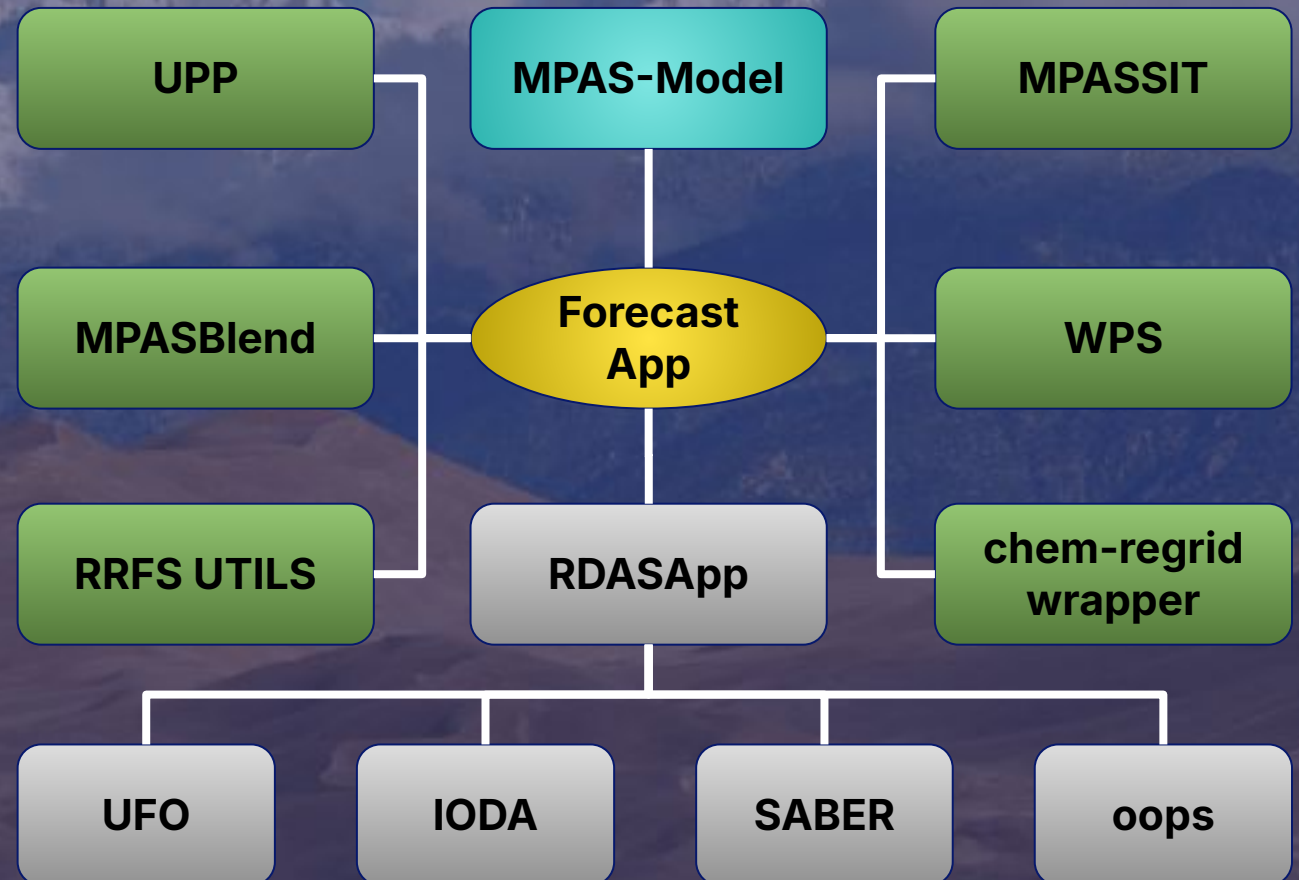


University of Colorado **Boulder**



What We Started With

- **Complex nested Structure**
 - Diverse component ownership
- **1000s of lines of config / scripts**
 - XML / YAML
 - Bash
 - Poor reuse across apps
- **Legacy Automation**
 - Static workflow behavior
 - Confined to one computer



A Lofty Aspiration

1000s of lines of XML / YAML / Bash + Legacy Automation



"Run a 10 day MPAS forecast for 3km CONUS with 3 hourly output"

Example: MPAS Mesh Agent

YAML → Mesh

```
mesh:  
  name: CONUS_15km  
  resolution: 15km  
  regional:  
    project_hexes:  
      extent_x_km: 5403.0  
      extent_y_km: 3183.0  
      center_lat: 38.5  
      center_lon: -97.5  
      rotation_degrees: 0.0
```

**Remote Python
Method Call**

**Academy
MPAS
Mesh Agent**

**Downloads the tools
Builds & installs the tools
Runs the tools to create the mesh**

Example: MPAS Mesh Agent

English → Mesh

mesh:
prompt: "Generate a 15km
MPAS mesh that covers CONUS."

mesh:
prompt: "Generate a 15km
elliptical MPAS mesh that
covers Tornado Alley."

mesh: "Generate a 15km
polygonal mesh that covers
Italy."

Remote Python
Method Call

**Academy
MPAS
Mesh Agent**

Call LLM / lookup geo data

Create YAML mesh config

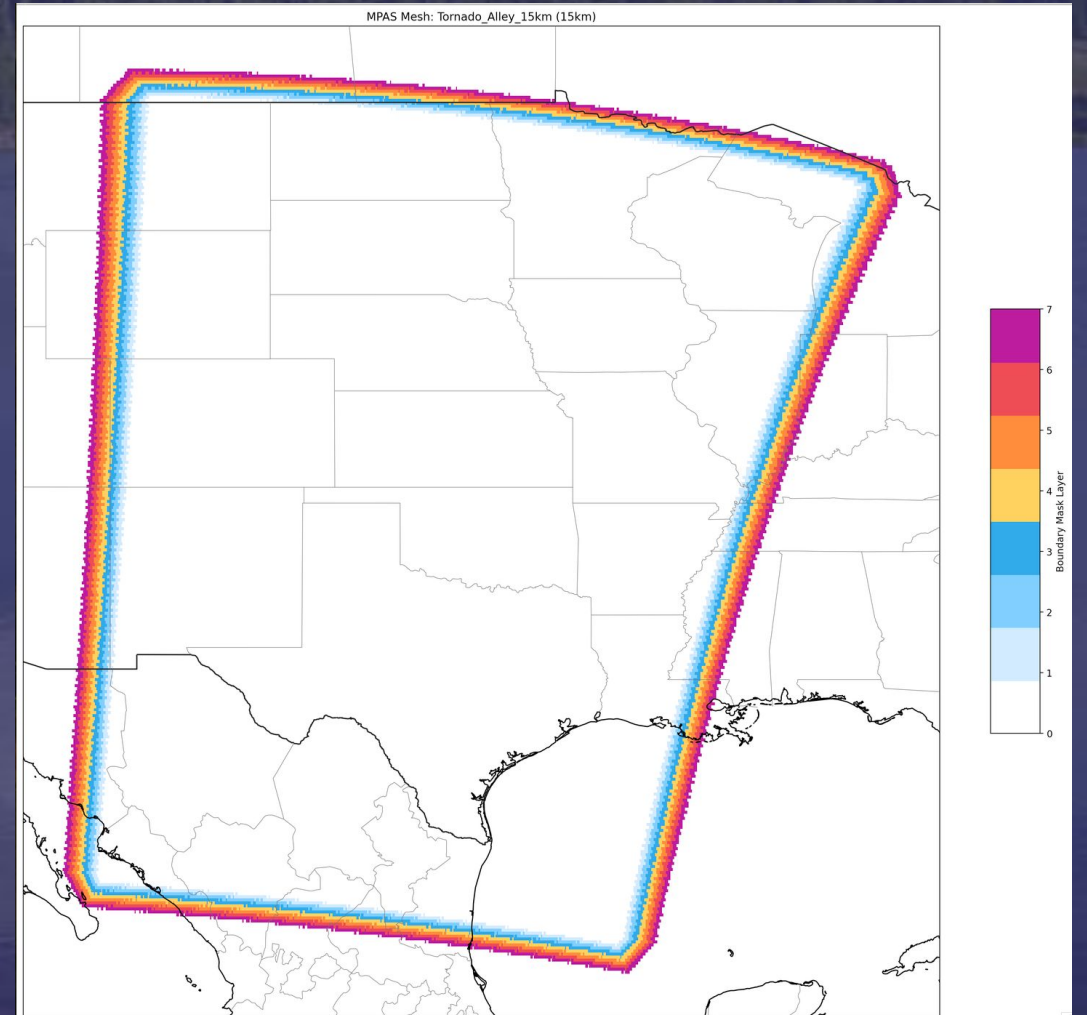
Downloads the tools

Builds & installs the tools

Runs the tools to create the mesh

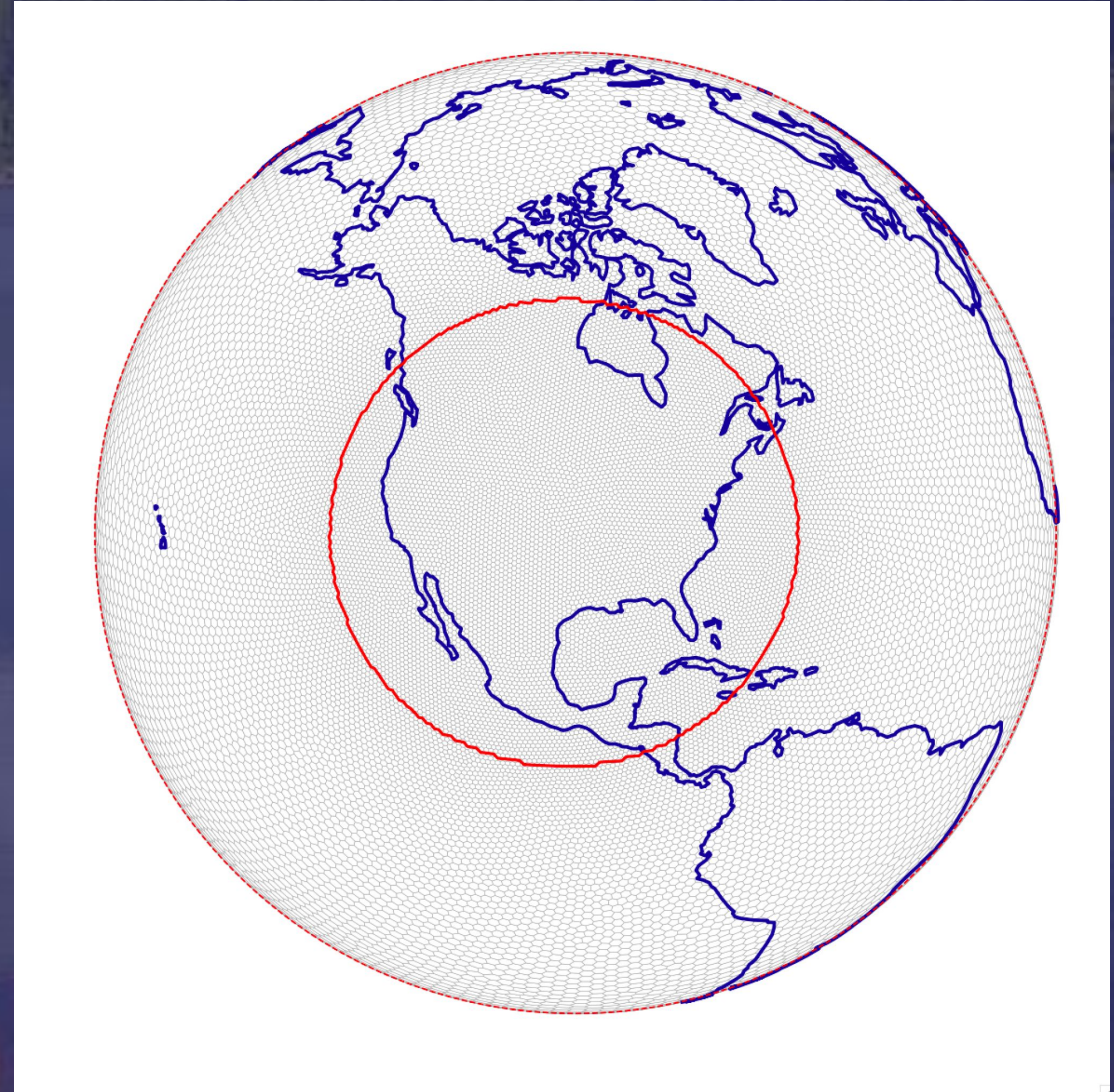
Example: MPAS Mesh Agent

"Generate a 15km MPAS mesh that covers Tornado Alley."

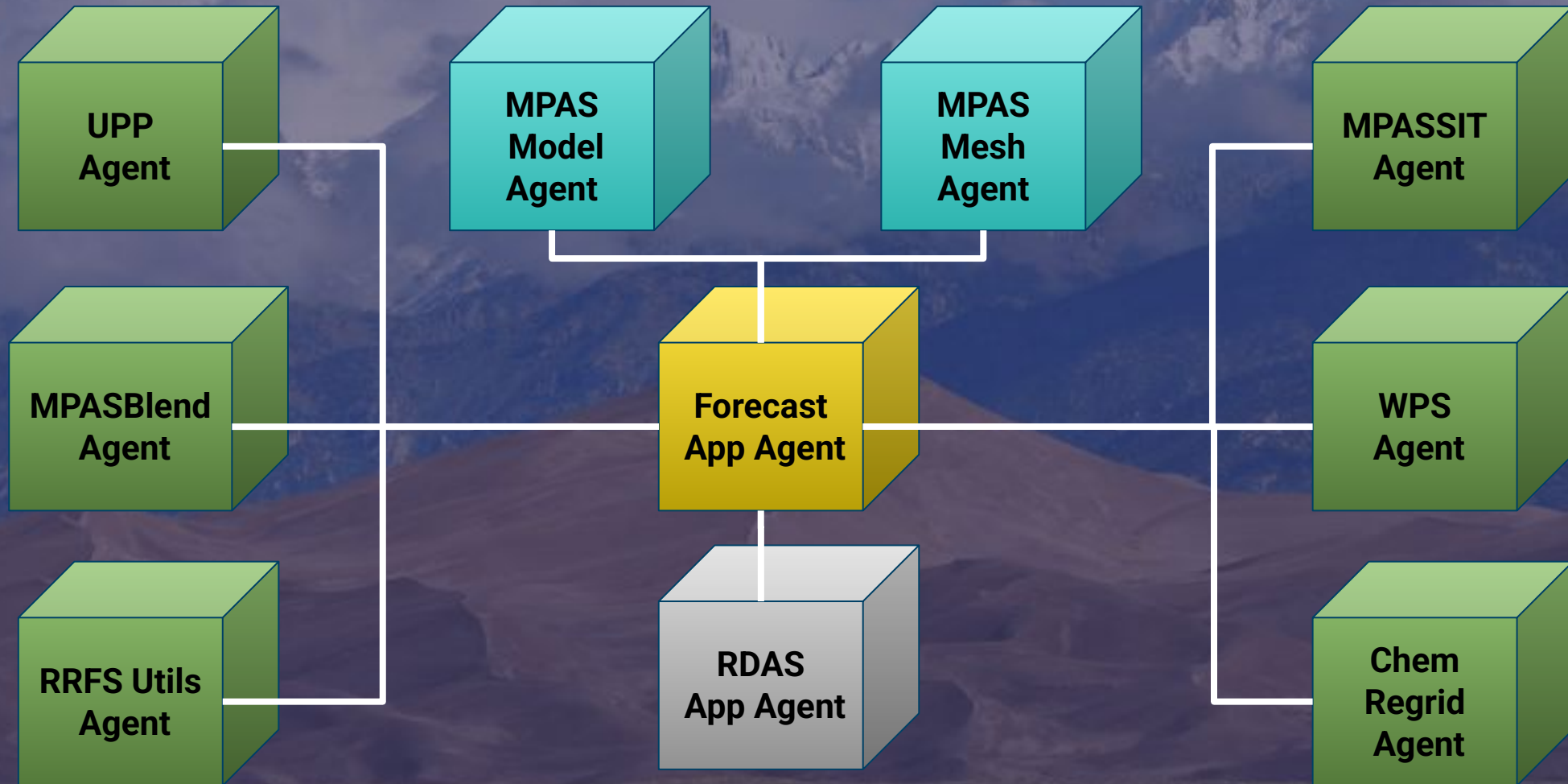


Example: MPAS Mesh Agent

"Generate a 240km global MPAS mesh with a 60km circular refinement that covers CONUS"

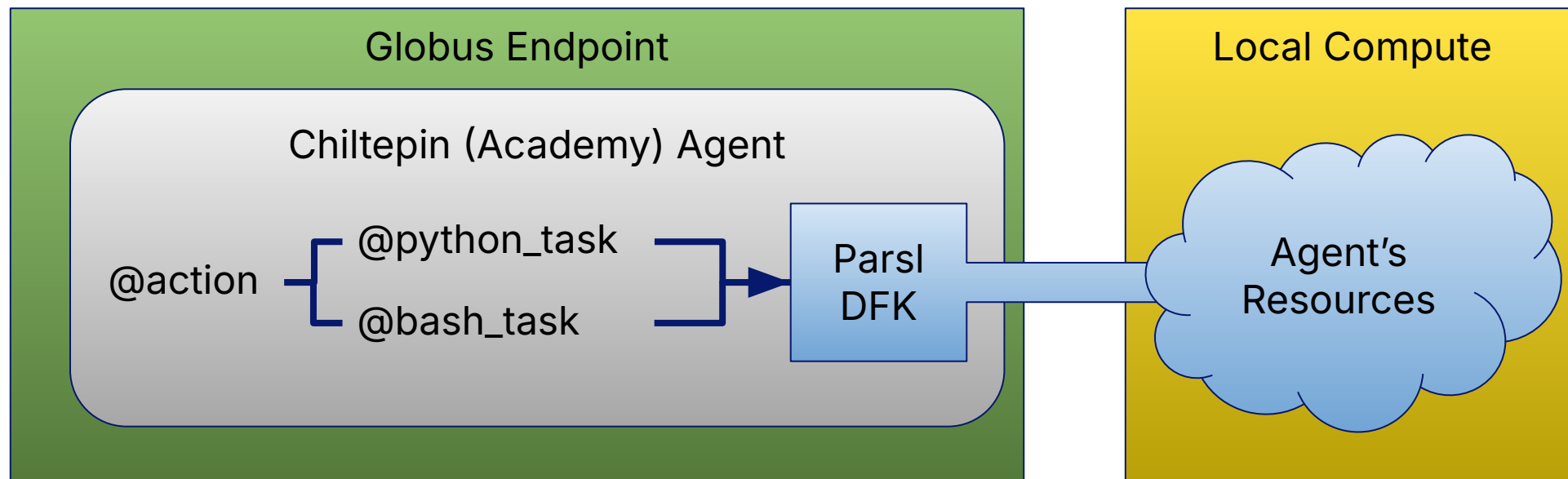


Bash → Configurable Remote Agents



Academy + Globus + Parsl

HPC / Cloud / Laptop



Chiltepin Agent Secret Sauce

Serializable Behavior

```
class WeatherModelBehavior:  
  
    @chiltepin_action  
    async def ...  
  
    @chiltepin_loop  
    async def ..  
  
    @bash_task  
    def ...  
  
    # Tasks may access self  
  
    @python_task  
    def ...
```

Deployable Agent

```
@chiltepin_agent  
class WeatherModelAgent(WeatherModelBehavior):  
    pass
```

Academy Agent (not serializable!)

Actions
Forwarded
To Behavior

Domain Behavior
(serializable)

ParslApp methods

Questions