ERES PlayNAC "KERNEL" Codebase V7.4

ERES Institute for New Age Cybernetics
PlayNAC "KERNEL" Codebase V7.4 —
Human Operating System (HUOS) 4D VR/AR Environment

Building on V7.3 enhancements in ingestion, context management, observability, and the Vacationomics engine fileciteturn0file1, Version 7.4 introduces a fully integrated VR/AR module under the VERTECA framework, enabling immersive smart-city user-group experiences via the Green-Box Simulator highlighted in the dashboard design fileciteturn0file0.

🔑 Key Updates in V7.4

1. **Human Operating System (HUOS) Module**
    - New package `src/huos/` for 4D VR/AR environment services
    - Core classes: `HUOSKernel`, `SpatialSceneManager`, `UserGroupCoordinator`
    - Interfaces with PlayNACKernel command API for gesture/voice control under Mandala-VERTECA
2. **VERTECA VR/AR Integration**
    - Extend `src/nav/mandala_translator.py` for spatial gesture mapping in 3D space
    - Sample Unity/three.js demo in `examples/vr_ar/` showcasing Green-Box environment hooks
3. **Green-Box Simulator Enhancements**
    - Connect `HUOSKernel` to low-level rendering pipelines (`src/huos/render/`)
    - Add spatial audio cues and dynamic zone highlighting

4. **Smart-City User-Group Orchestration**
    - New `UserGroupSession` abstraction in `src/kernel/context_manager.py` for multi-user VR sessions
    - Supports real-time EP node linkage and GERP forecasting overlays in VR dashboards
5. **Deployment & Configuration**
    - Update Docker Compose to include `huos-service` container and WebSocket gateway in `deploy/docker-compose.yml`
    - Extend Helm chart with VR ingress rules and secrets for AR device APIs in `deploy/helm/huos/`
6. **Documentation & Diagrams**
    - Add sequence and component diagrams under `docs/architecture/huos/`
    - New Sphinx autodoc entries for `src/huos/` classes

📂 Directory Structure

```
.
├── src/
│   ├── kernel/
│   │   ├── playnac_kernel.py      # Core orchestrator updated for HUOS integration
│   │   └── context_manager.py     # Enhanced UserGroupSession support
│   ├── huos/                      # Human Operating System VR/AR module
│   │   ├── kernel.py              # HUOSKernel: lifecycle & command routing
│   │   ├── render/                # Rendering adapters (three.js, Unity)
│   │   └── spatial/               # SpatialSceneManager & zone definitions
│   ├── nav/
│   │   └── mandala_translator.py # Extended gesture-to-command mapping
│   ├── vacationomics/
│   ├── earnedpath/
│   ├── gianterp/
│   ├── bee/
│   ├── berc/
│   ├── media/
│   └── ...
├── examples/
│   └── vr_ar/                     # Green-Box VR/AR demo project
├── docs/
│   └── architecture/
│       └── huos/                  # HUOS component & sequence diagrams
├── deploy/
│   ├── docker-compose.yml         # Added huos-service & WebSocket gateway
│   └── helm/
│       ├── base/
│       └── huos/                  # HUOS-specific ingress & secrets
├── bench/
├── tests/
└── .github/
    └── workflows/
        └── ci.yml                 # CI updated for HUOS module tests
```

🚀 Getting Started

Clone & Setup

```
git clone https://github.com/ERES-Institute-for-New-Age-Cybernetics/PlayNAC-KERNEL.git
cd PlayNAC-KERNEL
python3 -m venv venv && source venv/bin/activate
pip install -r requirements.txt
```

1. **Configure**

Copy `.env.example` to `.env` and add:

```
HUOS_API_KEY=your_vr_api_key
HUOS_WS_ENDPOINT=ws://localhost:8080/huos
```

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Run Demo

```
# Start services
docker-compose up --build
# Launch kernel with HUOS support
python src/kernel/playnac_kernel.py --enable-huos
```

2. **Explore VR/AR Demo**
    - Open `examples/vr_ar/index.html` in a modern browser with WebXR support

📖 Documentation & Contribution

- **Architecture Docs**: docs/architecture/huos/
- **API Reference**: `make docs` generates Sphinx site including HUOS module
- **Testing**: `pytest --maxfail=1 --disable-warnings -q` now includes `tests/huos/`

Contributions welcome! Fork, create a feature branch `feature/v7.4-huos`, and submit a pull request.
