SpaceSQ Topological Distributed Object Generation Protocol (TDOG-Protocol)

White Paper: The Laws of Materialization in Spatial Computing

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Classification: Core Infrastructure / Physics Engine **Core Logic:** Hidden Deployment -> Intent Parsing -> Cross-Domain Printing -> Occupancy Verification

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1. Definition: The End of Logistics, The Beginning of Genesis

In the SpaceSQ universe, the concept of "moving furniture" is deprecated. All devices, furniture, and decorations are fundamentally data streams instantiated into matter.

1.1 The TDOG Array TDOG (Topological Distributed Object Generator) is not a standalone device placed *in* a room. It is a micro-distributed manufacturing array embedded within the structural gaps of the SSSU (Standard Space Storage Unit)—specifically in the ceiling plenums and wall joints.

- **Invisibility:** The hardware is invisible to the user. It requires no floor space and no dedicated power outlets.
- **Input: NBT (Narrative Blockchain Token)** assets + Blueprint Code.
- **Output:** Physical Matter (via Atomic Reassembly) or Virtual Projection (via High-Density Light Fields), depending on the Domain type (PHY vs. VIR).

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2. Materialization Laws: Cross-Border Generation

TDOG is not constrained by the 2.0m x 2.0m boundary of a single SSSU. It operates on a topological mesh level, allowing for **Cross-Domain Cooperative Printing**.

2.1 Horizontal Spanning When a blueprint (e.g., a 4-meter Conference Table) exceeds the dimensions of a single SSSU, the system automatically activates the TDOG arrays of adjacent SSSUs.

- **Protocol:** Neighboring nodes synchronize their print heads to materialize the object as a single, seamless entity across the boundary line.

2.2 Vertical Penetration For vertical structures (e.g., Spiral Staircases, Data Columns) that exceed the standard 2.4m height:

- **Protocol:** The TDOG requests a "Penetration Permit" from the upper-layer container. Once granted, the "floor slab" logic is temporarily dissolved to allow continuous material generation through the Z-axis.

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3. Spatial Safety & The H-S Ratio

To prevent "Spatial Suffocation"—where excessive decoration renders a space uninhabitable for humans—TDOG enforces the **H-S Occupancy Verification** before any print job begins.

3.1 Zoning Standards

- **Silicon Zone (High Density):** For server rooms or storage vaults. TDOG allows up to **100%** volumetric occupancy.
- **Carbon Zone (Human Habitation):** For living rooms, bedrooms, and offices. TDOG enforces a mandatory **Dynamic Free Volume (DFV)**.

3.2 The 60% Red Line

- **Rule:** In a Carbon Zone, solid objects generated by TDOG must not occupy more than **40%** of the total SSSU volume. **60%** must remain empty for carbon-based respiration and movement.
- **Trigger:** If a user attempts to print a solid block that violates this ratio, the kernel will reject the command with the error: ERR_CARBON_SUFFOCATION_RISK.

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4. Interaction Paradigm: The Isometric God View

Since instantiated objects are three-dimensional and cross-boundary, the traditional 2D floor plan is obsolete. SpaceSQ mandates the **2.5D Isometric Projection** as the standard engineering view.

4.1 The Interface

- **Perspective:** 45-degree Orthographic Projection.
- **Workflow:**
  1. **Select Topology:** Highlight one or multiple SSSU grids.
  2. **Load Blueprint:** Choose from the Catalog, AI Dream Forge, or External Import.
  3. **Burn NBT:** Confirm the energy cost.
  4. **Materialize:** The interface renders a "Photon Construction" animation as the object solidifies.