

OmniReality

The Future of Interactive Multidimensional Holographic Video Reality

Vision and Research Architecture by Michael Aaron Loftus



A deduplicated, chronologically ordered synthesis of the complete project: holographic light, multisensory embodiment, manipulable matter, unlimited perceivers, controllable vehicles, scientific capture, cosmic travel, hyper/super/quantum reality, Earth panoramas, social replay, epoch reconstruction, spatial advertising, and the final dimensional architecture.



Executive Thesis: From Holographic Video to OmniReality

A chronological synthesis of the complete research corpus

Vision and Research Architecture by Michael Aaron Loftus

The research began with a deceptively simple question: what would happen if a video were no longer a flat rectangle, but a world that remained anchored while the viewer moved freely through it? From that starting point, the model expanded into a mathematically indexed medium of light, time, viewpoint, matter, multisensory perception, living perceivers, controllable vehicles, scientific capture, planetary travel, quantum-informed representations, Earth panoramas, social replay, historical reconstruction, and spatial commerce.



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The name **OmniReality** is used here for the mature synthesis. It is not merely virtual reality, augmented reality, volumetric video, or holography. It is a proposed world medium in which recorded reality, reconstructed reality, simulated physics, live social presence, and creative worlds can share one coordinate architecture. Existing standards for tracked spaces and immersive media provide partial foundations, but the total architecture described here is an original synthesis of those ingredients.^{1, 2, 3}

1. Khronos Group, *The OpenXR Specification, version 1.1* (Beaverton, OR: Khronos Group, 2026.)
2. ISO/IEC, *ISO/IEC 23090-5:2026, Information technology - Coded representation of immersive media - Part 5: Visual volumetric video-based coding (V3C) and video-based point cloud compression (V-PCC)* (Geneva: ISO/IEC, 2026.)
3. ISO/IEC, *ISO/IEC 23090-12:2025, Information technology - Coded representation of immersive media - Part 12: MPEG immersive video* (Geneva: ISO/IEC, 2025.)



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This canonical edition deliberately removes duplicated equations and duplicated dimensions from earlier drafts. Historical variables are preserved, but aliases that later became components of richer objects are counted only once in the final scalar tally.



OmniReality: A World Medium Beyond the Screen



A panoramic vision of OmniReality as a world-scale medium in which people, scientific data, vehicles, and synthetic environments coexist inside a single navigable spatial framework.

I. The Foundational HVR16 State

*The historical sixteen-component formulation that started the project
Vision and Research Architecture by Michael Aaron Loftus*

The original model encoded a spatial sample, scene time, color, transparency, viewer rotation, viewer translation, zoom, and optical phase. The optical phase term was the crucial sixteenth coordinate that turned a conventional voxel-like representation into a wavefront-aware holographic state.



I. The Foundational HVR16 State

*The historical sixteen-component formulation that started the project
Vision and Research Architecture by Michael Aaron Loftus*

This vector remains historically important and useful for explaining the origin of the model. In the final OmniReality accounting, however, viewer rotation, translation, and zoom are treated as aliases of the full perceiver state rather than being counted a second time. This refactoring is the central anti-duplication rule used throughout the canonical edition.



I. The Foundational HVR16 State

Canonical equation and ITQE-style variable explanation table

$$\mathbf{h}_{16} = (x, y, z, \tau, r, g, b, \alpha, \theta_x, \theta_y, \theta_z, t, u, v, w, \phi) \tag{1}$$

Variable / Block	Meaning	Units / Domain	Role in OmniReality
x,y,z	Scene-sample position	m	Locates recorded or reconstructed content in 3D space.
τ	Master scene time	s	Synchronizes geometry, appearance, audio, and all dynamic layers.

1. Khronos Group, *The OpenXR Specification, version 1.1* (Beaverton, OR: Khronos Group, 2026.)
2. ISO/IEC, *ISO/IEC 23090-5:2026, Information technology - Coded representation of immersive media - Part 5: Visual volumetric video-based coding (V3C) and video-based point cloud compression (V-PCC)* (Geneva: ISO/IEC, 2026.)



I. The Foundational HVR16 State

Variable explanation table - continuation 2/3

Variable / Block	Meaning	Units / Domain	Role in OmniReality
r, g, b, α	Color and transparency	normalized or radiometric	Defines visible appearance and compositing.
$\theta_x, \theta_y, \theta_z$	Legacy viewer orientation	rad	Retained as historical aliases of perceiver orientation.



I. The Foundational HVR16 State

Variable explanation table - continuation 3/3

Variable / Block	Meaning	Units / Domain	Role in OmniReality
t,u,v,w	Legacy translation and zoom	m; dimensionless	Retained as historical aliases of perceiver pose and optical state.
φ	Optical phase	rad	Supports interference-aware holographic reconstruction.



II. Deduplicated World Core and Fixed Anchor

Separating shared world state from perceiver-specific state

Vision and Research Architecture by Michael Aaron Loftus

Earlier editions used a 25-scalar “core” that combined HVR16 with a nine-scalar anchored-world block. Once the perceiver model became explicit, that convention risked double-counting orientation and translational viewpoint state. The final formulation therefore separates the world into a nine-scalar photonic scene sample and a nine-scalar world-anchor block, for an 18-scalar shared core.



II. Deduplicated World Core and Fixed Anchor

Separating shared world state from perceiver-specific state

Vision and Research Architecture by Michael Aaron Loftus

This is not a loss of capability. It is a cleaner ontology: the world owns scene position, time, appearance, phase, anchor position, anchor orientation, and scale; the perceiver owns eyes, body pose, kinematics, gaze, senses, cognition, and agency.



II. Deduplicated World Core and Fixed Anchor

Canonical equation and ITQE-style variable explanation table

$$D_W = 9_{\text{photonic}} + 9_{\text{anchor}} = 18 \tag{2}$$

Variable / Block	Meaning	Units / Domain	Role in OmniReality
9_{photonic}	(x,y,z,τ,r,g,b,α,φ)	9 scalars	Shared scene-sample state.
9_{anchor}	Anchor position, orientation, scale	9 scalars	Pins the holographic world to a fixed center and frame.



II. Deduplicated World Core and Fixed Anchor

Variable explanation table - continuation 2/2

Variable / Block	Meaning	Units / Domain	Role in OmniReality
D_W	Deduplicated persistent world core	18 scalars	Used in the final runtime summation instead of the legacy 25-scalar core.



III. Wavefront Reconstruction and Eye- Specific Perspective

*A hologram must reconstruct more than color; it must reconstruct
directional optical field structure*

Vision and Research Architecture by Michael Aaron Loftus

Hyperrealistic holographic immersion depends on viewpoint-dependent reconstruction. The same world point must be transformed into the active eye or camera frame so parallax, perspective, and wavefront structure remain consistent as the perceiver moves. OpenXR's explicit concept of tracked spaces provides an important software analogue for dynamically locating views inside a world coordinate system.¹

1. Khronos Group, *The OpenXR Specification, version 1.1* (Beaverton, OR: Khronos Group, 2026.)



III. Wavefront Reconstruction and Eye- Specific Perspective

*A hologram must reconstruct more than color; it must reconstruct
directional optical field structure*

Vision and Research Architecture by Michael Aaron Loftus

In a true wavefront interpretation, amplitude and phase are coupled as a complex optical field. This is the mathematical bridge between scene geometry and interference-aware display.



III. Wavefront Reconstruction and Eye-Specific Perspective

Canonical equation and ITQE-style variable explanation table

$$\mathbf{p}_{eye} = \mathbf{R}_{eye}^T (\mathbf{p}_{world} - \mathbf{P}_{eye})$$

(3)

Variable / Block	Meaning	Units / Domain	Role in OmniReality
$\mathbf{P}_{world}$	World-space scene point	m	Represents anchored geometry.
$\mathbf{P}_{eye}$	Active eye position	m	Sets parallax origin.

1. Khronos Group, *The OpenXR Specification, version 1.1* (Beaverton, OR: Khronos Group, 2026.)



III. Wavefront Reconstruction and Eye-Specific Perspective

Variable explanation table - continuation 2/2

Variable / Block	Meaning	Units / Domain	Role in OmniReality
R_{eye}	Eye orientation matrix	SO(3)	Maps world orientation to active viewpoint.
P_{eye}	Eye-space point	m	Input to projection or wavefront reconstruction.



IV. Complex Optical Field and Intensity

Phase becomes a first-class coordinate

Vision and Research Architecture by Michael Aaron Loftus

The optical field is represented compactly by complex amplitude. The visible intensity follows from the squared magnitude, but retaining phase allows the model to preserve information that ordinary RGB video discards. This is one reason OmniReality is conceived as a richer data structure than a conventional video stream.



IV. Complex Optical Field and Intensity

Canonical equation and ITQE-style variable explanation table

$$E(\mathbf{x}, \tau) = A(\mathbf{x}, \tau)e^{i\phi(\mathbf{x}, \tau)}, \quad I = |E|^2 \tag{4}$$

Variable / Block	Meaning	Units / Domain	Role in OmniReality
E	Complex optical field	V/m or normalized	Carries amplitude and phase.
A	Field amplitude	V/m or normalized	Controls field magnitude.

2. ISO/IEC, ISO/IEC 23090-5:2026, Information technology - Coded representation of immersive media - Part 5: Visual volumetric video-based coding (V3C) and video-based point cloud compression (V-PCC) (Geneva: ISO/IEC, 2026.)

3. ISO/IEC, ISO/IEC 23090-12:2025, Information technology - Coded representation of immersive media - Part 12: MPEG immersive video (Geneva: ISO/IEC, 2025.)



IV. Complex Optical Field and Intensity

Variable explanation table - continuation 2/2

Variable / Block	Meaning	Units / Domain	Role in OmniReality
φ	Optical phase	rad	Controls interference and wavefront structure.
I	Optical intensity / irradiance	W/m ² or renderer domain	Visible energy measure derived from the field.



Wavefront-Scale Light and Quantum-Informed Sensing



A visual metaphor for wavefront reconstruction, multispectral sensing, and the transition from ordinary pixels to structured optical fields.

2. ISO/IEC, ISO/IEC 23090-5:2026, Information technology - Coded representation of immersive media - Part 5: Visual volumetric video-based coding (V3C) and video-based point cloud compression (V-PCC) (Geneva: ISO/IEC, 2026.)
3. ISO/IEC, ISO/IEC 23090-12:2025, Information technology - Coded representation of immersive media - Part 12: MPEG immersive video (Geneva: ISO/IEC, 2025.)

V. Volumetric Transport, Transparency, and Light Sources

Explicit illumination makes the world responsive rather than painted

Vision and Research Architecture by Michael Aaron Loftus

Each light source contributes position, color, transparency or gating, and directional brightness. A source therefore contributes eleven canonical scalar dimensions. This permits spotlights, projectors, suns, moons, screens, luminous objects, and moving emitters to participate in the same rendering logic.



V. Volumetric Transport, Transparency, and Light Sources

Explicit illumination makes the world responsive rather than painted

Vision and Research Architecture by Michael Aaron Loftus

The volumetric color seen along a ray is an integral of local radiance weighted by accumulated transmittance. The result is compatible with smoke, fog, translucent matter, underwater scenes, atmospheric glow, and other effects required for convincing immersion.



V. Volumetric Transport, Transparency, and Light Sources

Canonical equation and ITQE-style variable explanation table

$$C(\mathbf{r}) = \int_{s_n}^{s_f} T(s) \sigma(s) c(s) ds \tag{5}$$

Variable / Block	Meaning	Units / Domain	Role in OmniReality
T(s)	Accumulated transmittance	[0,1]	Attenuation before the sample.
σ(s)	Density / extinction	1/m	Controls opacity and scattering.

2. ISO/IEC, *ISO/IEC 23090-5:2026, Information technology - Coded representation of immersive media - Part 5: Visual volumetric video-based coding (V3C) and video-based point cloud compression (V-PCC)* (Geneva: ISO/IEC, 2026.)

3. ISO/IEC, *ISO/IEC 23090-12:2025, Information technology - Coded representation of immersive media - Part 12: MPEG immersive video* (Geneva: ISO/IEC, 2025.)



V. Volumetric Transport, Transparency, and Light Sources

Variable explanation table - continuation 2/2

Variable / Block	Meaning	Units / Domain	Role in OmniReality
c(s)	Local radiance or color	radiance / RGB	Contributes emitted or scattered color.
s	Ray coordinate	m	Parameterizes the viewing ray.



VI. Acoustic Fields and Synchronized Spatial Audio

Sound is a world-space field, not a soundtrack pasted onto the scene

Vision and Research Architecture by Michael Aaron Loftus

The auditory layer is spatial and time-indexed. Multiple sources may interfere, move, reflect, and be heard differently by different perceivers. In environments without an atmospheric pressure medium - for example exterior space - audio must instead come from interiors, communications channels, or scientifically justified sonification rather than fictional vacuum sound.



VI. Acoustic Fields and Synchronized Spatial Audio

Canonical equation and ITQE-style variable explanation table

$$p(\mathbf{x}, \tau) = \sum_{j=1}^{N_S} A_j \cos(\mathbf{k}_j \cdot \mathbf{x} - \omega_j \tau + \varphi_j) \tag{6}$$

Variable / Block	Meaning	Units / Domain	Role in OmniReality
A_j	Acoustic amplitude	Pa	Controls source pressure amplitude.
$\mathbf{k}_j$	Wave vector	rad/m	Encodes propagation direction and wavenumber.

4. International Telecommunication Union, *Report ITU-R BT.2420-6: Collection of Usage Scenarios of Advanced Immersive Sensory Media Systems* (Geneva: ITU, 2024.)



VI. Acoustic Fields and Synchronized Spatial Audio

Variable explanation table - continuation 2/2

Variable / Block	Meaning	Units / Domain	Role in OmniReality
ω_j	Angular frequency	rad/s	Sets pitch.
ϕ_j	Initial phase	rad	Sets phase offset.



VII. The Six-Channel Perceptual Interface

Five embodied senses plus a speculative cognitive-imagery channel

Vision and Research Architecture by Michael Aaron Loftus

The original visual medium was expanded to model sight, hearing, touch, smell, taste, and a sixth abstract channel for cognitive imagery. The first five channels map directly to familiar sensory modalities. The sixth is retained as a speculative interface variable for dream-like or thought-adjacent experiential content; this document does not present direct electromagnetic induction of complex thought as an established present-day capability.



VII. The Six-Channel Perceptual Interface

Five embodied senses plus a speculative cognitive-imagery channel

Vision and Research Architecture by Michael Aaron Loftus

Every sensory event can additionally be associated with a world-space or body-space target vector. That makes a sensation part of the geometry of the world: touch belongs to a location on the body, odor belongs to an air volume, sound belongs to a direction and field, and a visual event belongs to the active eye-space projection.



VII. The Six-Channel Perceptual Interface

Canonical equation and ITQE-style variable explanation table

$$\mathbf{S}_{human} = (S_V, S_A, S_T, S_O, S_G, S_C)$$

(7)

Variable / Block	Meaning	Units / Domain	Role in OmniReality
S_V	Vision	radiance / pixels / field	Conveys form, motion, color, depth, and light.
S_A	Audition	Pa / audio state	Conveys speech, ambience, and events.

4.

International Telecommunication Union, *Report ITU-R BT.2420-6: Collection of Usage Scenarios of Advanced Immersive Sensory Media Systems* (Geneva: ITU, 2024.)

5.

Apple, *visionOS* (Apple Developer, accessed August 27, 2026.)



VII. The Six-Channel Perceptual Interface

Variable explanation table - continuation 2/3

Variable / Block	Meaning	Units / Domain	Role in OmniReality
S_T	Touch	force / vibrotactile state	Conveys contact, texture, pressure, and temperature cues.
S_O	Olfaction	concentration-like state	Conveys spatial chemical context.



VII. The Six-Channel Perceptual Interface

Variable explanation table - continuation 3/3

Variable / Block	Meaning	Units / Domain	Role in OmniReality
S_G	Gustation	concentration-like state	Conveys taste-related state.
S_C	Cognitive imagery	abstract state	Speculative dream-like experiential channel.



Multisensory Embodiment and the Human Interface



The sensory interface is conceived as a synchronized field surrounding and inhabiting the perceiver, with each modality anchored to space, time, and context.

4. International Telecommunication Union, Report ITU-R BT.2420-6: Collection of Usage Scenarios of Advanced Immersive Sensory Media Systems (Geneva: ITU, 2024.)
5. Apple, visionOS (Apple Developer, accessed August 27, 2026.)

VIII. Manipulable Objects: From Watching to Doing

Recorded matter becomes independently addressable state

Vision and Research Architecture by Michael Aaron Loftus

A world becomes interactive only when selected scene elements can diverge from the prerecorded path. Each manipulable object therefore owns a transform, velocity, physical properties, contact state, forces, torques, constraints, and user-input state. Doors can hinge, drawers can slide, tools can snap into sockets, and objects can be carried away from their original recorded trajectories.



VIII. Manipulable Objects: From Watching to Doing

Canonical equation and ITQE-style variable explanation table

$$\mathbf{T}_o = T(x_o, y_o, z_o)R(q_{ox}, q_{oy}, q_{oz}, q_{ow})S(s_{ox}, s_{oy}, s_{oz}) \tag{8}$$

Variable / Block	Meaning	Units / Domain	Role in OmniReality
x_o, y_o, z_o	Object position	m	Moves object independently of the source recording.
$q_{ox..ow}$	Unit quaternion	dimensionless	Stable 3D orientation.



VIII. Manipulable Objects: From Watching to Doing

Variable explanation table - continuation 2/2

Variable / Block	Meaning	Units / Domain	Role in OmniReality
s_{ox}, s_{oy}, s_{oz}	Object scale	positive dimensionless	Supports controlled resizing.
T_o	World transform	homogeneous transform	Maps local object geometry into the world.



IX. Rigid-Body Dynamics, Contact, and Constraints

*An interactive object continues to obey a coherent physical model
after release*

Vision and Research Architecture by Michael Aaron Loftus

Force and torque evolve the state of a released or thrown object. Contacts introduce stiffness, damping, normal direction, friction, and collision response. Semantic constraints preserve the difference between a door, a drawer, a wheel, a robotic arm, and a freely floating object.



IX. Rigid-Body Dynamics, Contact, and Constraints

Canonical equation and ITQE-style variable explanation table

$$m_o \mathbf{a}_o = \mathbf{F}_{ext}, \quad \mathbf{I}_o \boldsymbol{\alpha}_o + \boldsymbol{\omega}_o \times (\mathbf{I}_o \boldsymbol{\omega}_o) = \mathbf{M}_{ext}$$

(9)

Variable / Block	Meaning	Units / Domain	Role in OmniReality
m_o	Mass	kg	Sets translational inertia.
$\mathbf{I}_o$	Inertia tensor	kg · m ²	Sets rotational inertia.

IX. Rigid-Body Dynamics, Contact, and Constraints

Variable explanation table - continuation 2/2

Variable / Block	Meaning	Units / Domain	Role in OmniReality
F_{ext}	Net external force	N	Includes user, gravity, and contacts.
M_{ext}	Net torque	N · m	Drives rotation.



X. Object-State Update and Dimensionality

Every object receives an explicit scalar budget

Vision and Research Architecture by Michael Aaron Loftus

The canonical object base contains 51 scalar components. Generalized joint coordinates add three dimensions each - coordinate, lower limit, and upper limit - while direct manipulation inputs add a variable user-input block.



X. Object-State Update and Dimensionality

Canonical equation and ITQE-style variable explanation table

$$D_{O,j} = 51 + 3d_{q,j} + d_{u,j} \tag{10}$$

Variable / Block	Meaning	Units / Domain	Role in OmniReality
51	Canonical object base	51 scalars	Pose, scale, motion, physical properties, grasp/contact, force/torque/haptics, friction auxiliaries.
d _{q,j}	Generalized joint coordinates	count	Each adds coordinate plus two limits.



X. Object-State Update and Dimensionality

Variable explanation table - continuation 2/2

Variable / Block	Meaning	Units / Domain	Role in OmniReality
$d_{u,j}$	Manipulation input dimensionality	scalar count	Controller or user inputs acting directly on object j.
$D_{O,j}$	Object dimensionality	scalar count	Total independent state of manipulable object j.



Manipulable Objects and Material Agency



A manipulable-object scene illustrates the transition from passive volumetric playback to material agency, where objects can be grasped, moved, constrained, and physically simulated.

XI. Unlimited Living Perceivers

Every being can carry its own embodied perspective

Vision and Research Architecture by Michael Aaron Loftus

The model generalizes from one default viewer to an indexed set of perceivers. A human, bird, dog, whale, fish, or other living being can inhabit the same anchored world while possessing its own body, kinematics, gaze, sensory spectrum, cognition, and agency. A bird's-eye view is therefore no longer just a camera in the sky; it is a species-conditioned embodiment.



XI. Unlimited Living Perceivers

Canonical equation and ITQE-style variable explanation table

$$\Pi = \{\Pi_i\}_{i=0}^{N_P}$$

(11)

Variable / Block	Meaning	Units / Domain	Role in OmniReality
Π_0	Default perceiver	structured object	Initial human viewpoint.
Π_i	Perceiver i	structured object	Human or nonhuman embodied perspective.

1. Khronos Group, *The OpenXR Specification, version 1.1* (Beaverton, OR: Khronos Group, 2026.)

5. Apple, *visionOS* (Apple Developer, accessed August 27, 2026.)

6. Meta Reality Labs, *Codec Avatars* (Accessed August 27, 2026.)



XI. Unlimited Living Perceivers

Variable explanation table - continuation 2/2

Variable / Block	Meaning	Units / Domain	Role in OmniReality
N_P	Additional perceivers	nonnegative integer	Allows arbitrarily many finite perceiver instances.
Π	Perceiver set	indexed collection	Collects all simultaneous or switchable viewpoints.



XII. Perceiver Dimensionality

Body, senses, cognition, and agency are counted once per being

Vision and Research Architecture by Michael Aaron Loftus

The perceiver block absorbs the legacy viewer-orientation, translation, and zoom semantics, preventing double-counting. It also introduces eye positions, velocity, acceleration, angular motion, gaze, multispectral vision, audition, olfaction, tactile body maps, cognition, agency, and species-specific sensing such as ultraviolet sensitivity, polarization sensitivity, echolocation, or magnetoreception.



XII. Perceiver Dimensionality

Canonical equation and ITQE-style variable explanation table

$$D_{\Pi,i} = 29 + (3 + d_{\Lambda,i}) + (2 + d_{H,i}) + (4 + d_{\Xi,i}) + 7N_{body,i} + d_{C,i} + d_{A,i} + d_{species,i} \tag{12}$$

Variable / Block	Meaning	Units / Domain	Role in OmniReality
29	Embodied core	29 scalars	Body pose, eye positions, kinematics, and gaze.
3+d _{Λ,i}	Vision block	scalar count	FOV/resolution plus spectral channels.

5. Apple, *visionOS* (Apple Developer, accessed August 27, 2026.)
6. Meta Reality Labs, *Codec Avatars* (Accessed August 27, 2026.)



XII. Perceiver Dimensionality

Variable explanation table - continuation 2/3

Variable / Block	Meaning	Units / Domain	Role in OmniReality
$2+d_{H,i}$	Audition block	scalar count	Hearing limits plus individualized auditory shape.
$4+d_{\Xi,i}$	Olfaction block	scalar count	Nose position, threshold, odor sensitivities.



XII. Perceiver Dimensionality

Variable explanation table - continuation 3/3

Variable / Block	Meaning	Units / Domain	Role in OmniReality
$7N_{\text{body},i}$	Tactile map	scalar count	Seven state terms per tactile zone.
$d_C+d_A+d_{\text{species}}$	Cognition, agency, species additions	scalar count	Attention, intent, locomotion, and nonhuman modalities.



Unlimited Living Perceivers and Species-Specific Perspective



Multiple living perceivers coexist inside one world, enabling the same event to be experienced from radically different bodies, scales, sensory spectra, and paths.

6. Meta Reality Labs, Codec Avatars (Accessed August 27, 2026.)

XIII. Controllable Vehicles as Specialized Interactive Objects

*Cars, boats, aircraft, and machines become enterable perspective-
bearing systems*

Vision and Research Architecture by Michael Aaron Loftus

A vehicle inherits object physics but adds controls, propulsion, energy or fuel state, occupant transforms, navigation state, and class-specific hardware. The user may enter the vehicle, assume a cockpit or driver perspective, operate controls, and travel through the world while preserving collision and environmental constraints.



XIII. Controllable Vehicles as Specialized Interactive Objects

Canonical equation and ITQE-style variable explanation table

$$D_{V,k} = 91 + 3d_{q,k} + d_{class,k} \tag{13}$$

Variable / Block	Meaning	Units / Domain	Role in OmniReality
91	Generic vehicle base	91 scalars	Object state plus 40-scalar operation extension.
$d_{q,k}$	Articulated coordinates	count	Steering, suspension, doors, joints, or mechanisms.

7. Federal Aviation Administration, *Pilot's Handbook of Aeronautical Knowledge*, FAA-H-8083-25C (Washington, DC: U.S. Department of Transportation, 2023.)

8. Federal Aviation Administration, *Airplane Flying Handbook*, FAA-H-8083-3C (Washington, DC: U.S. Department of Transportation, 2021.)



XIII. Controllable Vehicles as Specialized Interactive Objects

Variable explanation table - continuation 2/2

Variable / Block	Meaning	Units / Domain	Role in OmniReality
$d_{\text{class},k}$	Class specialization	scalar count	Wheels, rotors, propellers, surfaces, engines, landing gear.
$D_{V,k}$	Vehicle dimensionality	scalar count	Complete state of terrestrial vehicle k.



XIV. Aircraft Flight State

Aerodynamic controls and propulsion make flight genuinely flyable

Vision and Research Architecture by Michael Aaron Loftus

Aircraft require explicit control-surface, air-data, and engine state. The model therefore adds elevator, ailerons, rudder, flaps, spoilers, slats, landing gear, angle of attack, sideslip, airspeed, Mach, altitude, vertical speed, dynamic pressure, and per-engine operating channels.



XIV. Aircraft Flight State

Canonical equation and ITQE-style variable explanation table

$$D_{aircraft,k} = 109 + 3d_{q,k} + 4N_{E,k} \tag{14}$$

Variable / Block	Meaning	Units / Domain	Role in OmniReality
109	Aircraft base	109 scalars	Generic vehicle plus flight-control and air-data extensions.
$N_{E,k}$	Engine count	positive integer	Scales propulsion state.

7. Federal Aviation Administration, *Pilot's Handbook of Aeronautical Knowledge*, *FAA-H-8083-25C* (Washington, DC: U.S. Department of Transportation, 2023.)

8. Federal Aviation Administration, *Airplane Flying Handbook*, *FAA-H-8083-3C* (Washington, DC: U.S. Department of Transportation, 2021.)

9. NASA Glenn Research Center, *Four Forces on an Airplane* (Beginner's Guide to Aeronautics, accessed August 27, 2026.)



XIV. Aircraft Flight State

Variable explanation table - continuation 2/2

Variable / Block	Meaning	Units / Domain	Role in OmniReality
$4N_E$	Per-engine state	4 scalars/engine	Throttle, thrust, speed, fuel/energy flow.
$D_{\text{aircraft},k}$	Aircraft state	scalar count	Total flyable aircraft representation.



XV. Next-Generation Holographic Capture Cameras

*Capture devices must know their own geometry, optics, color, phase,
polarization, and clocks*

Vision and Research Architecture by Michael Aaron Loftus

The capture camera is itself a persistent state-bearing object. Its pose, intrinsics, lens model, focus, exposure, color calibration, wavefront calibration, spectral response, and synchronization clock are part of the scene-generation pipeline. This separation between persistent device state and recorded observation vectors is essential for rigorous dimensional accounting.



XV. Next-Generation Holographic Capture Cameras

Canonical equation and ITQE-style variable explanation table

$$D_{camera,c} = 45 + d_{spec,c} \tag{15}$$

Variable / Block	Meaning	Units / Domain	Role in OmniReality
45	Canonical camera base	45 scalars	Pose, intrinsics, lens/focus, exposure, color, wavefront/polarization, clock.
$d_{spec,c}$	Spectral response channels	scalar count	Allows RGB, multispectral, or hyperspectral capture.

2. ISO/IEC, *ISO/IEC 23090-5:2026, Information technology - Coded representation of immersive media - Part 5: Visual volumetric video-based coding (V3C) and video-based point cloud compression (V-PCC)* (Geneva: ISO/IEC, 2026.)

3. ISO/IEC, *ISO/IEC 23090-12:2025, Information technology - Coded representation of immersive media - Part 12: MPEG immersive video* (Geneva: ISO/IEC, 2025.)

4. International Telecommunication Union, *Report ITU-R BT.2420-6: Collection of Usage Scenarios of Advanced Immersive Sensory Media Systems* (Geneva: ITU, 2024.)



XV. Next-Generation Holographic Capture Cameras

Variable explanation table - continuation 2/2

Variable / Block	Meaning	Units / Domain	Role in OmniReality
$D_{\text{camera},c}$	Camera device state	scalar count	Persistent calibrated state of camera c.



Vehicle Embodiment, Flight, and Control



V. OBJECT STATE VECTOR (MANIPULABLE)

Each object j is fully interactive and physically simulated.

A flyable aircraft illustrates the fusion of vehicle control, cockpit embodiment, world anchoring, and live sensor interpretation.

7. Federal Aviation Administration, Pilot's Handbook of Aeronautical Knowledge, FAA-H-8083-25C (Washington, DC: U.S. Department of Transportation, 2023.)

9. NASA Glenn Research Center, Four Forces on an Airplane (Beginner's Guide to Aeronautics, accessed August 27, 2026.)

XVI. Recorded Optical, Audio, and Inertial Observation Vectors

The observation stream is separate from the live world state

Vision and Research Architecture by Michael Aaron Loftus

Each optical or volumetric sample contributes 26 canonical scalars: position, direction, time, RGBA, depth, amplitude, phase, wavelength, polarization, normal, motion, and confidence. Audio samples contribute nine scalars, and inertial samples contribute ten. These can number in the millions or billions and therefore must not be confused with the far smaller persistent runtime state.



XVI. Recorded Optical, Audio, and Inertial Observation Vectors

Canonical equation and ITQE-style variable explanation table

$$D_{recorded}^{classical}(\tau) = 26N_R(\tau) + 9N_S(\tau) + 10N_I(\tau) \tag{16}$$

Variable / Block	Meaning	Units / Domain	Role in OmniReality
N_R	Optical/volumetric samples	sample count	Each contributes 26 scalars.
N_S	Audio samples	sample count	Each contributes 9 scalars.

2. ISO/IEC, *ISO/IEC 23090-5:2026, Information technology - Coded representation of immersive media - Part 5: Visual volumetric video-based coding (V3C) and video-based point cloud compression (V-PCC)* (Geneva: ISO/IEC, 2026.)

3. ISO/IEC, *ISO/IEC 23090-12:2025, Information technology - Coded representation of immersive media - Part 12: MPEG immersive video* (Geneva: ISO/IEC, 2025.)

4. International Telecommunication Union, *Report ITU-R BT.2420-6: Collection of Usage Scenarios of Advanced Immersive Sensory Media Systems* (Geneva: ITU, 2024.)



XVI. Recorded Optical, Audio, and Inertial Observation Vectors

Variable explanation table - continuation 2/2

Variable / Block	Meaning	Units / Domain	Role in OmniReality
N_I	IMU samples	sample count	Each contributes 10 scalars.
D_{recorded}	Observation dimensionality	scalar observations	Data-stream burden at time τ .



XVII. Extraterrestrial Vehicles

*Rocket ships, spacecraft, satellites, stations, landers, and rovers
inherit one unified class*

Vision and Research Architecture by Michael Aaron Loftus

The extraterrestrial vehicle class generalizes the terrestrial vehicle formalism with orbital state, attitude, docking, habitat, life-support, sensor payloads, microgravity behavior, and robotic manipulation. A satellite can suppress habitat variables and reinterpret the local viewpoint as an instrument frame, while a crewed station can activate interior free-floating movement and manipulation.



XVII. Extraterrestrial Vehicles

Canonical equation and ITQE-style variable explanation table

$$D_{\Xi,k} = 142 + 3d_{q,k} + d_{class,k}$$

(17)

Variable / Block	Meaning	Units / Domain	Role in OmniReality
142	Canonical extraterrestrial vehicle base	142 scalars	Generic vehicle plus orbital, attitude, habitat, and payload extensions.
$d_{q,k}$	Articulated coordinates	count	Robotic arms, arrays, docking hardware, gimbals.

10. NASA, *International Space Station Overview; International Space Station Facts and Figures* (Accessed August 27, 2026.)

17. NASA, *Moon to Mars: Artemis* (Accessed August 27, 2026.)



XVII. Extraterrestrial Vehicles

Variable explanation table - continuation 2/2

Variable / Block	Meaning	Units / Domain	Role in OmniReality
$d_{\text{class},k}$	Class specialization	scalar count	Rocket staging, satellite instruments, rover wheels, lander gear.
$D_{\Xi,k}$	Extraterrestrial-vehicle state	scalar count	Complete state of space vehicle k.

XVIII. Astronomical Target Environments

*Planets, moons, asteroids, nebulae, galaxies, and black-hole
neighborhoods become state-bearing worlds*

Vision and Research Architecture by Michael Aaron Loftus

An extraterrestrial destination is not a painted backdrop. It has position, orientation, body geometry, gravity, atmosphere or vacuum, illumination, hazards, navigability, and optional scientific fields. Solid worlds emphasize terrain and material channels; nebulae and relativistic environments emphasize volumetric fields and physically motivated visualization.



XVIII. Astronomical Target Environments

Canonical equation and ITQE-style variable explanation table

$$D_{A,n} = 32 + d_{surface,n} + d_{field,n}$$

(18)

Variable / Block	Meaning	Units / Domain	Role in OmniReality
32	Canonical astronomical target base	32 scalars	Geometry, body, medium, illumination, hazards.
d _{surface,n}	Surface-detail augmentation	scalar count	Height, albedo, roughness, mineralogy, semantics.

16. NASA Science, *Black Hole Basics* (Accessed August 27, 2026.)
17. NASA, *Moon to Mars: Artemis* (Accessed August 27, 2026.)



XVIII. Astronomical Target Environments

Variable explanation table - continuation 2/2

Variable / Block	Meaning	Units / Domain	Role in OmniReality
$d_{\text{field},n}$	Scientific-field augmentation	scalar count	Density, temperature, plasma, lensing, radiation.
$D_{A,n}$	Target-environment dimensionality	scalar count	Local world state for destination n.



Extraterrestrial Vehicles and Universe-Scale Exploration



A space-exploration environment transforms spacecraft, scientific instruments, and extraterrestrial destinations into simultaneously navigable and interpretable state.

10. NASA, International Space Station Overview; International Space Station Facts and Figures (Accessed August 27, 2026.)

17. NASA, Moon to Mars: Artemis (Accessed August 27, 2026.)

XIX. Universe-Scale Multispectral Capture

*No single instrument captures the whole electromagnetic spectrum;
OmniReality fuses complementary observatories*

Vision and Research Architecture by Michael Aaron Loftus

The universe-scale capture model explicitly rejects the idea that one camera can record every wavelength. Hubble contributes visible, ultraviolet, and some near-infrared observation; Webb extends strongly into near- and mid-infrared; Chandra observes X-rays; Fermi observes gamma rays; and Landsat supplies multispectral Earth observation. OmniReality fuses these heterogeneous products into one navigable scientific representation. [11](#), [12](#), [13](#), [14](#), [15](#)

11. NASA Science, *About Hubble* (Accessed August 27, 2026.)

12. NASA Science, *Infrared Astronomy - James Webb Space Telescope* (Accessed August 27, 2026.)

13. NASA Science, *Chandra* (Accessed August 27, 2026.)

14. NASA Science, *Fermi Gamma-ray Space Telescope* (Accessed August 27, 2026.)

15. United States Geological Survey, *Landsat Missions* (Accessed August 27, 2026.)



XIX. Universe-Scale Multispectral Capture

Canonical equation and ITQE-style variable explanation table

$$D_{astro,s} = 31 + d_{band,s} \tag{19}$$

Variable / Block	Meaning	Units / Domain	Role in OmniReality
31	Astrophysical sample base	31 scalars	Extends 26-scalar optical sample with flux/count, band center, bandwidth/resolution, redshift/depth proxy.
d _{band,s}	Additional spectral channels	scalar count	Mission-specific bands or hyperspectral bins.

11. NASA Science, *About Hubble* (Accessed August 27, 2026.)
12. NASA Science, *Infrared Astronomy - James Webb Space Telescope* (Accessed August 27, 2026.)
13. NASA Science, *Chandra* (Accessed August 27, 2026.)
14. NASA Science, *Fermi Gamma-ray Space Telescope* (Accessed August 27, 2026.)
15. United States Geological Survey, *Landsat Missions* (Accessed August 27, 2026.)



XIX. Universe-Scale Multispectral Capture

Variable explanation table - continuation 2/2

Variable / Block	Meaning	Units / Domain	Role in OmniReality
$D_{astro,s}$	Astrophysical sample dimensionality	scalar count	Scientific sample feeding cosmic reconstruction.



Frontier Worlds, Galaxies, Nebulae, and Alien Realities



The frontier is not limited to Earth or even to literal observation. Scientific imagery, inferred fields, and creative simulation can open coherent portals into distant or entirely invented worlds.

- 11. NASA Science, About Hubble (Accessed August 27, 2026.)
- 12. NASA Science, Infrared Astronomy - James Webb Space Telescope (Accessed August 27, 2026.)
- 16. NASA Science, Black Hole Basics (Accessed August 27, 2026.)

XX. Hyper Reality

Meaning, salience, adaptation, and narrative become part of the world

Vision and Research Architecture by Michael Aaron Loftus

Hyper Reality enriches an immersive scene with explicit semantic context. Objects can carry names, relevance, warnings, memories, goals, translation, instructional overlays, or adaptive guidance. Lifelike telepresence and spatial computing interfaces motivate this layer, but OmniReality generalizes it into a world-level semantic field.^{5, 6}

5. Apple, *visionOS* (Apple Developer, accessed August 27, 2026.)

6. Meta Reality Labs, *Codec Avatars* (Accessed August 27, 2026.)



XX. Hyper Reality

Canonical equation and ITQE-style variable explanation table

$$D_{HR,h} = 40 + d_{sem,h} + d_{profile,h}$$

(20)

Variable / Block	Meaning	Units / Domain	Role in OmniReality
40	Hyper-reality canonical base	40 scalars	Context, sensing, adaptation, narrative, salience.
$d_{sem,h}$	Semantic channels	scalar count	Labels, relations, relevance, knowledge.

5.

Apple, *visionOS* (Apple Developer, accessed August 27, 2026.)

6.

Meta Reality Labs, *Codec Avatars* (Accessed August 27, 2026.)



XX. Hyper Reality

Variable explanation table - continuation 2/2

Variable / Block	Meaning	Units / Domain	Role in OmniReality
$d_{\text{profile},h}$	Profile/adaptation channels	scalar count	Optional user-specific adaptation state.
$D_{\text{HR},h}$	Hyper-reality dimensionality	scalar count	Total semantic augmentation layer.

XXI. Super Reality

Perception extends beyond native human bandwidth

Vision and Research Architecture by Michael Aaron Loftus

Super Reality represents computationally amplified perception: multispectral bands, denoising, deblurring, segmentation, predictive reconstruction, extreme zoom, temporal inference, and cross-sensor fusion. The goal is not merely to reproduce what a human eye would see, but to reveal structure that ordinary perception cannot directly access.



XXI. Super Reality

Canonical equation and ITQE-style variable explanation table

$$D_{SR,s} = 32 + d_{band,s} + d_{task,s} \tag{21}$$

Variable / Block	Meaning	Units / Domain	Role in OmniReality
32	Super-reality canonical base	32 scalars	Spectral, resolution, prediction, fusion, computational state.
$d_{band,s}$	Additional spectral channels	scalar count	Infrared, ultraviolet, remote-sensing, scientific bands.

11. NASA Science, *About Hubble* (Accessed August 27, 2026.)
12. NASA Science, *Infrared Astronomy - James Webb Space Telescope* (Accessed August 27, 2026.)
15. United States Geological Survey, *Landsat Missions* (Accessed August 27, 2026.)



XXI. Super Reality

Variable explanation table - continuation 2/2

Variable / Block	Meaning	Units / Domain	Role in OmniReality
$d_{task,s}$	Task enhancement channels	scalar count	Denoising, segmentation, reconstruction, analysis.
$D_{SR,s}$	Super-reality dimensionality	scalar count	Enhanced-perception layer.



XXII. Quantum Reality

*A tractable local quantum descriptor rather than an impossible
universal wavefunction*

Vision and Research Architecture by Michael Aaron Loftus

Quantum Reality is modeled cautiously as a reduced local state. The intent is not to claim that a complete macroscopic world can be stored as one exact universal quantum wavefunction. Instead, local basis states, density-operator degrees of freedom, uncertainties, measurements, decoherence, and explicit correlations can be represented where scientifically relevant.



XXII. Quantum Reality

Canonical equation and ITQE-style variable explanation table

$$D_{QR,q} = 17 + (b_q^2 - 1) + d_{corr,q}$$

(22)

Variable / Block	Meaning	Units / Domain	Role in OmniReality
17	Canonical non-density-matrix base	17 scalars	Local position/time, momentum expectation, uncertainties, measurement, decoherence.
b _q	Local basis size	positive integer	Finite local quantum basis.

18. National Institute of Standards and Technology, *Quantum Information Science* (Accessed August 27, 2026.)
19. United States Department of Energy, *Quantum Information Science* (Accessed August 27, 2026.)



XXII. Quantum Reality

Variable explanation table - continuation 2/2

Variable / Block	Meaning	Units / Domain	Role in OmniReality
b_q^{2-1}	Density-operator degrees of freedom	scalar count	Normalized Hermitian density operator.
$d_{corr,q}$	Correlation augmentation	scalar count	Explicit local entanglement/ correlation descriptors.



Quantum Reality and Cosmic Observation



The quantum-reality plate provides a distinct visual hinge between microscopic state description, scientific sensing, and the more speculative representational layers of OmniReality.

18. National Institute of Standards and Technology, Quantum Information Science (Accessed August 27, 2026.)

19. United States Department of Energy, Quantum Information Science (Accessed August 27, 2026.)

XXIII. OmniReality Orchestration

*The medium gains persistent memory, collaboration, trust, intent,
and governance*

Vision and Research Architecture by Michael Aaron Loftus

Once the model contains many perceivers, timelines, worlds, sensor layers, and interactive objects, a higher-order coordination layer becomes necessary. OmniReality orchestration manages shared memory, identity, synchronized presence, provenance, collaboration, translation, permissions, safety policy, and platform intent.



XXIII. OmniReality Orchestration

Canonical equation and ITQE-style variable explanation table

$$D_{OR,\lambda} = 36 + d_{collab,\lambda} + d_{policy,\lambda}$$

(23)

Variable / Block	Meaning	Units / Domain	Role in OmniReality
36	Orchestration base	36 scalars	Shared presence, memory, provenance, intent, governance.
d_{collab}	Collaboration augmentation	scalar count	Synchronization, roles, translation, group interaction.

1. Khronos Group, *The OpenXR Specification, version 1.1* (Beaverton, OR: Khronos Group, 2026.)

5. Apple, *visionOS* (Apple Developer, accessed August 27, 2026.)

6. Meta Reality Labs, *Codec Avatars* (Accessed August 27, 2026.)



XXIII. OmniReality Orchestration

Variable explanation table - continuation 2/2

Variable / Block	Meaning	Units / Domain	Role in OmniReality
d_{policy}	Governance augmentation	scalar count	Privacy, safety, access, rights, consent.
D_{OR}	Orchestration dimensionality	scalar count	Higher-order coordination layer.



XXIV. Chrono-Navigation

*Walking backward through evidence and forward through plausible or
authored branches*

Vision and Research Architecture by Michael Aaron Loftus

Chrono-navigation is intentionally distinguished from a claim of physical time travel. A user may move backward through recorded or reconstructed states and forward through forecasted, simulated, or artistically authored branches. The permitted temporal window is conditioned by the available data, the current state, and the uncertainty of reconstruction.



XXIV. Chrono-Navigation

Canonical equation and ITQE-style variable explanation table

$$D_{T,h} = 16 + d_{history,h} + d_{branch,h} \tag{24}$$

Variable / Block	Meaning	Units / Domain	Role in OmniReality
16	Canonical chrono base	16 scalars	Window, offset, direction, rate, branch selector, synchronization.
d _{history}	Historical-state augmentation	scalar count	Recorded or reconstructed prior states.

1. Khronos Group, *The OpenXR Specification, version 1.1* (Beaverton, OR: Khronos Group, 2026.)



XXIV. Chrono-Navigation

Variable explanation table - continuation 2/2

Variable / Block	Meaning	Units / Domain	Role in OmniReality
d_{branch}	Scenario branches	scalar count	Forecasted or authored future alternatives.
D_T	Chrono-navigation dimensionality	scalar count	Local temporal-navigation state.



Chrono-Navigation Through Recorded and Reconstructed Time



Chrono-navigation is imagined as a horizon of state histories and branches: evidence where the past is known, uncertainty where it is reconstructed, and explicit simulation where the future is explored.

XXV. Mutable Physics

*The same action can follow different laws on Earth, the Moon,
Mars, underwater, or inside a designed world*

Vision and Research Architecture by Michael Aaron Loftus

The physics profile makes gravity, atmospheric density, drag, friction, restitution, viscosity, thermal state, acoustic propagation, and optional fields explicit. A jump on the Moon therefore traces a different trajectory than a jump on Earth, while a spacecraft interior may transition toward microgravity. Creative environments can intentionally alter these values, but scientifically grounded destinations should preserve known physical constraints.¹⁷

17. NASA, *Moon to Mars: Artemis* (Accessed August 27, 2026.)

XXV. Mutable Physics

Canonical equation and ITQE-style variable explanation table

$$D_{\Phi,p} = 22 + d_{field,p} + d_{medium,p}$$

(25)

Variable / Block	Meaning	Units / Domain	Role in OmniReality
22	Canonical physics profile	22 scalars	Gravity vector, drag, density, friction, restitution, viscosity, thermal and acoustic terms.
d _{field,p}	Field augmentation	scalar count	Magnetic, electric, radiative, or custom fields.

17. NASA, *Moon to Mars: Artemis* (Accessed August 27, 2026.)

XXV. Mutable Physics

Variable explanation table - continuation 2/2

Variable / Block	Meaning	Units / Domain	Role in OmniReality
$d_{\text{medium},p}$	Medium augmentation	scalar count	Atmosphere, water, vacuum, plasma, custom material.
$D_{\Phi,p}$	Physics-profile dimensionality	scalar count	Editable local physical-law state.



Mutable Physics and Environment-Specific Dynamics



The physics-control environment visualizes a crucial OmniReality principle: every world should declare its active physical assumptions instead of hiding them inside the renderer.

17. NASA, Moon to Mars: Artemis (Accessed August 27, 2026.)

XXVI. Static 360° Panoramas as Holographic Entry Frames

*Existing imagery can seed a multidimensional world rather than
remain a static photograph*

Vision and Research Architecture by Michael Aaron Loftus

A panorama can serve as a starting frame for an OmniReality world. Geospatial location, camera orientation, field of view, source imagery, inferred depth, semantic segmentation, ambient context, and provenance form the entry block. Google Street View APIs illustrate the practical existence of geolocated panoramic imagery and point-of-view controls, although any real deployment must comply with the provider's licensing and usage terms.^{20, 21}

20. Google for Developers, *Street View Static API Overview* (Google Maps Platform, accessed August 27, 2026.)
21. Google for Developers, *Street View Publish API* (Google Maps Platform, accessed August 27, 2026.)



XXVI. Static 360° Panoramas as Holographic Entry Frames

Canonical equation and ITQE-style variable explanation table

$$D_{P,j} = 7 + d_{I,j} + d_{D,j} + d_{M,j} + d_{A,j} + d_{C,j}$$

(26)

Variable / Block	Meaning	Units / Domain	Role in OmniReality
7	Geospatial + orientation + FOV metadata	7 scalars	Longitude, latitude, altitude, yaw, pitch, roll, FOV.
d _I	Panorama image state	scalar/block count	Source spherical imagery or compressed representation.

20. Google for Developers, *Street View Static API Overview* (Google Maps Platform, accessed August 27, 2026.)

21. Google for Developers, *Street View Publish API* (Google Maps Platform, accessed August 27, 2026.)



XXVI. Static 360° Panoramas as Holographic Entry Frames

Variable explanation table - continuation 2/3

Variable / Block	Meaning	Units / Domain	Role in OmniReality
d_D	Depth state	scalar/block count	Estimated or captured scene depth.
d_M	Semantic masks	scalar/block count	Objects, surfaces, roads, boundaries.



XXVI. Static 360° Panoramas as Holographic Entry Frames

Variable explanation table - continuation 3/3

Variable / Block	Meaning	Units / Domain	Role in OmniReality
d_A	Ambient context	scalar/block count	Audio and environmental cues.
d_C	Capture/provenance metadata	scalar/block count	Source, time, calibration, confidence.



XXVII. Interpolated Street-Level Route Graphs

Movement between panorama anchors becomes a continuous world path

Vision and Research Architecture by Michael Aaron Loftus

A sequence of panorama anchors can be registered into a route graph. The graph supplies node poses, connections, lane or walkway geometry, topology, scene continuity, and interpolation constraints. Intermediate frames are synthesized between captured anchors rather than treated as independently photographed truth; the distinction between source imagery and inferred transition state should remain explicit.



XXVII. Interpolated Street-Level Route Graphs

Canonical equation and ITQE-style variable explanation table

$$D_{G,r} = 7N_{node,r} + d_{edge,r} + d_{lane,r} + d_{topology,r}$$

(27)

Variable / Block	Meaning	Units / Domain	Role in OmniReality
$N_{node,r}$	Panorama nodes	count	Each node contributes a seven-scalar pose/FOV anchor.
$d_{edge,r}$	Connection state	scalar count	Connectivity and traversal constraints.

20. Google for Developers, *Street View Static API Overview* (Google Maps Platform, accessed August 27, 2026.)

21. Google for Developers, *Street View Publish API* (Google Maps Platform, accessed August 27, 2026.)



XXVII. Interpolated Street-Level Route Graphs

Variable explanation table - continuation 2/2

Variable / Block	Meaning	Units / Domain	Role in OmniReality
$d_{\text{lane},r}$	Road/walkway geometry	scalar count	Drivable or walkable boundaries.
$d_{\text{topology},r}$	Route topology	scalar count	Turns, intersections, branching, continuity.



Earth Panoramas, Street-Level Navigation, and Vehicle Travel



Earth-scale route reconstruction converts static panoramic anchors into a continuous environment that a perceiver can walk, drive, or fly through while the world remains geospatially registered.

20. Google for Developers, Street View Static API Overview (Google Maps Platform, accessed August 27, 2026.)

21. Google for Developers, Street View Publish API (Google Maps Platform, accessed August 27, 2026.)

XXVIII. Earth Atlas: Seven Mile Beach, Redwoods, Kīlauea, and the Amazon

Beautiful real places become object-rich experiential worlds

Vision and Research Architecture by Michael Aaron Loftus

Seven Mile Beach demonstrates shoreline reconstruction: water, sand, palms, rocks, coral, boats, surf, wind, and tropical light can be lifted into separate objects and fields.²² The Colonel Armstrong Tree provides an old-growth redwood focal object in Armstrong Redwoods State Natural Reserve near Guerneville, California.²³

22. Visit Cayman Islands, *Seven Mile Beach* (Official Tourism Site, accessed August 27, 2026.)

23. California State Parks, *Armstrong Redwoods State Natural Reserve* (Accessed August 27, 2026.)



XXVIII. Earth Atlas: Seven Mile Beach, Redwoods, Kīlauea, and the Amazon

Beautiful real places become object-rich experiential worlds

Vision and Research Architecture by Michael Aaron Loftus

Kīlauea demonstrates the transition from static panorama to dynamic geologic event: crater geometry can remain anchored while thermal, lava, plume, and hazard fields evolve in time.^{24, 25} The Amazon demonstrates ecological object lifting, where flowers, frogs, birds, vines, leaves, insects, streams, humidity, and sound become structured components of an immersive trail.²⁶

24. National Park Service, *Eruption Viewing - Hawai'i Volcanoes National Park* (Accessed August 27, 2026.)

25. U.S. Geological Survey, *Kīlauea Webcams* (Accessed August 27, 2026.)

26. NASA Earth Observatory, *Indigenous Communities Protect the Amazon* (Accessed August 27, 2026.)



Ancient Redwood Forest Immersion



The redwood environment emphasizes scale, age, texture, ecology, and reverence: a monumental living object inside a navigable forest rather than a flat scenic image.

23. California State Parks, Armstrong Redwoods State Natural Reserve (Accessed August 27, 2026.)

Amazon Rainforest Ecological Object Lifting



The Amazon environment illustrates dense ecological object lifting - plants, animals, water, terrain, humidity, and layered canopy all become separate yet interdependent state.

XXIX. Great Barrier Reef and Aurora Borealis Immersion

*OmniReality extends below the ocean surface and into atmospheric
spectacle*

Vision and Research Architecture by Michael Aaron Loftus

The Great Barrier Reef application treats coral colonies, tropical fish, turtles, rays, water clarity, refraction, caustic light, and diver embodiment as linked object and field classes.²⁷ The Iceland aurora experience combines snow and ice, a futuristic ice-hotel environment, adaptive LED ambience, auroral motion, and the wider night sky.^{28, 29}

27. Great Barrier Reef Marine Park Authority, *About Us; Animals* (Accessed August 27, 2026.)

28. NASA Science, *Auroras; What Is an Aurora?* (Accessed August 27, 2026.)

29. Visit Iceland, *The Northern Lights in Iceland* (Official Travel Guide of Iceland, accessed August 27, 2026.)



XXIX. Great Barrier Reef and Aurora Borealis Immersion

*OmniReality extends below the ocean surface and into atmospheric
spectacle*

Vision and Research Architecture by Michael Aaron Loftus

These examples reveal why the medium is more than tourism. A reef can be a scientific habitat, a classroom, a conservation story, a diving experience, or a shared social world; an auroral night can simultaneously teach atmospheric physics and become an artistic environment.



Great Barrier Reef Scuba Immersion



A scuba-diving perspective converts the reef into an explorable volumetric ecology, with coral, fish, light shafts, and water properties represented as distinct but coupled components.

27. Great Barrier Reef Marine Park Authority, About Us; Animals (Accessed August 27, 2026.)

Iceland Aurora Borealis and Ice-Hotel Immersion



The aurora experience blends a dynamic atmospheric phenomenon with architecture, snow, LED ambience, and celestial depth, demonstrating how science and beauty can coexist inside one world.

28. NASA Science, Auroras; What Is an Aurora? (Accessed August 27, 2026.)

29. Visit Iceland, The Northern Lights in Iceland (Official Travel Guide of Iceland, accessed August 27, 2026.)

XXX. Social Replay of Entertainment, Sports, and Parties

A recorded event becomes a place that people can re-enter together

Vision and Research Architecture by Michael Aaron Loftus

OmniReality can transform sufficiently captured concerts, sporting events, festivals, and parties into navigable social replay spaces. A user may return to courtside, field-level, stage-left, aerial, or crowd viewpoints, bookmark a moment, invite friends into the same replay, and share an exact perspective state. Rights-cleared talent or celebrity representations could support moderated conversation, but likeness, voice, publicity, consent, and archival rights must be explicit platform-level constraints rather than afterthoughts.^{1, 6}

1. Khronos Group, *The OpenXR Specification, version 1.1* (Beaverton, OR: Khronos Group, 2026.)
6. Meta Reality Labs, *Codec Avatars* (Accessed August 27, 2026.)



XXX. Social Replay of Entertainment, Sports, and Parties

Canonical equation and ITQE-style variable explanation table

$$D_{E,e} = 12 + d_{venue,e} + d_{media,e} + d_{rights,e} + d_{crowd,e} \tag{28}$$

Variable / Block	Meaning	Units / Domain	Role in OmniReality
12	Canonical event-replay base	12 scalars	Event ID/time window, anchor, playback and synchronization state.
d _{venue}	Venue geometry	scalar count	Seats, stages, fields, access regions.

1. Khronos Group, *The OpenXR Specification, version 1.1* (Beaverton, OR: Khronos Group, 2026.)
6. Meta Reality Labs, *Codec Avatars* (Accessed August 27, 2026.)



XXX. Social Replay of Entertainment, Sports, and Parties

Variable explanation table - continuation 2/3

Variable / Block	Meaning	Units / Domain	Role in OmniReality
d_{media}	Replay media linkage	scalar count	Captured optical/audio streams and timecodes.
d_{rights}	Rights/consent state	scalar count	Likeness, voice, archival, territorial permissions.



XXX. Social Replay of Entertainment, Sports, and Parties

Variable explanation table - continuation 3/3

Variable / Block	Meaning	Units / Domain	Role in OmniReality
d_{crowd}	Crowd-state augmentation	scalar count	Optional recorded or synthesized audience state.

XXXI. Social Presence and Shareable Positional Perspective

*The link to a moment includes where you were, when you were
there, and how you were looking*

Vision and Research Architecture by Michael Aaron Loftus

A social-share state should be compact enough to transmit yet rich enough to reconstruct a viewpoint. It may include world identifier, event or world time, perceiver position, orientation, active embodiment, selected sensory mode, access permissions, and room or party state. This lets a friend open a link directly into the same reef dive, Amazon trail, concert replay, or historical reconstruction.



XXXI. Social Presence and Shareable Positional Perspective

Canonical equation and ITQE-style variable explanation table

$$D_{Soc,s} = 10 + d_{graph,s} + d_{perm,s} + d_{share,s} \tag{29}$$

Variable / Block	Meaning	Units / Domain	Role in OmniReality
10	Canonical social base	10 scalars	World/time/viewpoint/room core.
d _{graph}	Social graph state	scalar count	Participants, groups, relationships.

1. Khronos Group, *The OpenXR Specification, version 1.1* (Beaverton, OR: Khronos Group, 2026.)



XXXI. Social Presence and Shareable Positional Perspective

Variable explanation table - continuation 2/2

Variable / Block	Meaning	Units / Domain	Role in OmniReality
d_{perm}	Permission state	scalar count	Visibility, moderation, privacy, access.
d_{share}	Share-state augmentation	scalar count	Link metadata, bookmarks, annotations, embeds.



Social Replay of Concerts and Live Entertainment



A concert replay is presented not as a video clip, but as a social memory-space that can be re-entered from multiple positions and shared with other perceivers.

1. Khronos Group, The OpenXR Specification, version 1.1 (Beaverton, OR: Khronos Group, 2026.)
6. Meta Reality Labs, Codec Avatars (Accessed August 27, 2026.)

XXXII. Epoch Reconstruction

*Triassic, Jurassic, Neanderthal, and culturally formative human
worlds*

Vision and Research Architecture by Michael Aaron Loftus

Time travel to deep history must be explicitly reconstructed rather than falsely presented as recorded fact. The Triassic and Jurassic can be synthesized from paleontological and geological evidence, with uncertainty displayed as part of the interface.^{30, 31} Neanderthal environments can draw from the Smithsonian Human Origins record to support anthropology, survival, and comparative-cognition learning.³²

30. National Park Service, *Triassic Period - 251.9 to 201.3 MYA* (U.S. Department of the Interior, accessed August 27, 2026.)

31. National Park Service, *Jurassic Dinosaurs* (U.S. Department of the Interior, accessed August 27, 2026.)

32. Smithsonian Institution, Human Origins Program, *Homo neanderthalensis* (Accessed August 27, 2026.)



XXXII. Epoch Reconstruction

*Triassic, Jurassic, Neanderthal, and culturally formative human
worlds*

Vision and Research Architecture by Michael Aaron Loftus

The same architecture can create respectful teaching environments representing Jesus Christ or other religious and philosophical teachers. Such worlds should clearly distinguish primary textual traditions, historical evidence, scholarly reconstruction, devotional interpretation, and artistic invention. The value is not pretending to possess a camera from antiquity; the value is making uncertainty visible while allowing learners to inhabit questions that are otherwise abstract.



XXXII. Epoch Reconstruction

Canonical equation and ITQE-style variable explanation table

$$D_{Epoch,h} = 14 + d_{prov,h} + d_{uncert,h} + d_{climate,h} + d_{bio,h} \tag{30}$$

Variable / Block	Meaning	Units / Domain	Role in OmniReality
14	Canonical epoch base	14 scalars	Era interval, geography, anchor, temporal controls, confidence.
d _{prov}	Provenance state	scalar count	Sources and evidence chains.

30. National Park Service, *Triassic Period - 251.9 to 201.3 MYA* (U.S. Department of the Interior, accessed August 27, 2026.)
31. National Park Service, *Jurassic Dinosaurs* (U.S. Department of the Interior, accessed August 27, 2026.)
32. Smithsonian Institution, Human Origins Program, *Homo neanderthalensis* (Accessed August 27, 2026.)



XXXII. Epoch Reconstruction

Variable explanation table - continuation 2/3

Variable / Block	Meaning	Units / Domain	Role in OmniReality
d_{uncert}	Uncertainty state	scalar count	Alternative reconstructions and confidence.
d_{climate}	Environmental reconstruction	scalar count	Climate, atmosphere, seasonality.



XXXII. Epoch Reconstruction

Variable explanation table - continuation 3/3

Variable / Block	Meaning	Units / Domain	Role in OmniReality
d_{bio}	Biological/ecological state	scalar count	Species, populations, interactions.



Epoch Travel: Living Among Dinosaurs



The prehistoric portal is framed as evidence-informed reconstruction: immersive enough to inspire wonder, yet honest about the distinction between scientific inference and direct recording.

30. National Park Service, Triassic Period - 251.9 to 201.3 MYA (U.S. Department of the Interior, accessed August 27, 2026.)

31. National Park Service, Jurassic Dinosaurs (U.S. Department of the Interior, accessed August 27, 2026.)

Historical and Moral-Teaching Worlds



Historical and moral-teaching worlds are positioned as transparent interpretive environments, not perfect recordings of the past.

XXXIII. OmniReality Ads

*Spatial advertising becomes an object in the world rather than a
rectangle around content*

Vision and Research Architecture by Michael Aaron Loftus

OmniReality Ads are proposed as world-anchored, viewpoint-aware advertising units. They may appear as roadside billboards while driving reconstructed routes, sponsored objects inside resorts or museums, shoppable product placements in replay spaces, destination portals, interactive coupons, virtual showrooms, or contextual services keyed to geography, activity, time of day, language, or explicit user preferences.



XXXIII. OmniReality Ads

*Spatial advertising becomes an object in the world rather than a
rectangle around content*

Vision and Research Architecture by Michael Aaron Loftus

The advertising model should preserve an unambiguous distinction between source reality and sponsored insertion. Every ad unit should therefore carry creative state, targeting state, attribution state, and compliance or disclosure state.



XXXIII. OmniReality Ads

Canonical equation and ITQE-style variable explanation table

$$D_{Ad,a} = 20 + d_{creative,a} + d_{target,a} + d_{attr,a} + d_{compliance,a} \tag{31}$$

Variable / Block	Meaning	Units / Domain	Role in OmniReality
20	Canonical ad-unit base	20 scalars	Anchor, timing, visibility, interaction, campaign core.
d _{creative}	Creative payload	scalar count	Video, model, audio, animation, copy.

20. Google for Developers, *Street View Static API Overview* (Google Maps Platform, accessed August 27, 2026.)
21. Google for Developers, *Street View Publish API* (Google Maps Platform, accessed August 27, 2026.)



XXXIII. OmniReality Ads

Variable explanation table - continuation 2/3

Variable / Block	Meaning	Units / Domain	Role in OmniReality
d_{target}	Context/targeting state	scalar count	Location, world, route, activity, language.
d_{attr}	Attribution state	scalar count	Impression, engagement, conversion linkage.



XXXIII. OmniReality Ads

Variable explanation table - continuation 3/3

Variable / Block	Meaning	Units / Domain	Role in OmniReality
$d_{\text{compliance}}$	Disclosure/ compliance state	scalar count	Sponsorship labels, permissions, regional policy.



OmniReality Ads in Navigable Road Worlds



A future roadway environment shows how ads could become geospatial objects in a navigable world while remaining explicitly distinguishable from the source scene.

20. Google for Developers, Street View Static API Overview (Google Maps Platform, accessed August 27, 2026.)

21. Google for Developers, Street View Publish API (Google Maps Platform, accessed August 27, 2026.)

XXXIV. Real-Estate and Hospitality Holographic Commerce

Room-by-room 360° capture becomes a spatial sales environment

Vision and Research Architecture by Michael Aaron Loftus

Realtors, developers, hotels, and property owners can upload room-by-room panoramas that are registered into a pose graph, reconstructed into room geometry, and enriched with semantic objects such as kitchens, windows, views, fixtures, floor plans, measurements, furniture, renovation options, availability, pricing, financing, and lead-capture actions.



XXXIV. Real-Estate and Hospitality Holographic Commerce

Room-by-room 360° capture becomes a spatial sales environment

Vision and Research Architecture by Michael Aaron Loftus

No new structural class is counted for real estate because the application reuses the panorama entry frame, route graph, reconstruction seed, object, advertising, and orchestration classes. This is a deliberate example of the anti-duplication principle: an application should compose existing primitives before the model invents another class.



Real-Estate Holographic Commerce



A luxury property tour demonstrates a commercial use of the same core primitives: panorama registration, object lifting, room-to-room navigation, overlays, and optional spatial advertising.

XXXV. Proprietary Commercialization Vision

From research architecture to a licensable world platform

Vision and Research Architecture by Michael Aaron Loftus

The project positions the innovative synthesis of multidimensional holographic video inversion, OmniReality orchestration, temporal navigation, social co-presence, spatial advertising, and the integrated computational architecture described in this report as proprietary intellectual property owned by Web Development Corporation d/b/a Web Development, Inc.



XXXV. Proprietary Commercialization Vision

From research architecture to a licensable world platform

Vision and Research Architecture by Michael Aaron Loftus

Commercial pathways include enterprise licensing, venue replay subscriptions, property-tour processing and hosting, approved capture APIs, world analytics, premium scientific and historical content packs, tourism deployments, and internationally exportable OmniReality Ads. The deeper opportunity is not one product category but a platform on which many future industries can build.



Global Commercialization and Collaborative Deployment



The global innovation hub symbolizes the commercialization horizon: a shared infrastructure for licensing, research collaboration, world creation, education, tourism, media, and international deployment.

XXXVI. Final Structured- Class Count

*Twenty-two persistent runtime classes plus five observation-vector
classes*

Vision and Research Architecture by Michael Aaron Loftus

The final count includes only structurally distinct blocks. Real-estate tours, reef dives, Amazon hikes, celebrity replay, and similar experiences are applications composed from the same primitives and therefore are not counted again as new classes. This avoids the inflation that occurred in earlier drafts when application names were sometimes treated as additional dimensions.



XXXVI. Final Structured- Class Count

*Twenty-two persistent runtime classes plus five observation-vector
classes*

Vision and Research Architecture by Michael Aaron Loftus

The final canonical architecture contains **22 persistent structured runtime classes** and **5 recorded observation-vector classes**, for **27 unique structured class types**.



XXXVI. Final Structured-Class Count

Canonical equation and ITQE-style variable explanation table

$$C_{state}^{\Omega} = 22, \quad C_{obs}^{\Omega} = 5, \quad C_{total}^{\Omega} = 27 \tag{32}$$

Variable / Block	Meaning	Units / Domain	Role in OmniReality
22	Persistent runtime classes	count	World, light, object, terrestrial vehicle, extraterrestrial vehicle, perceiver, astronomical target, camera, microphone, HR, SR, QR, OR, chrono, physics, panorama, route graph, reconstruction seed, event replay, social state, epoch, ad unit.
5	Observation-vector classes	count	Optical/volumetric, astrophysical, audio, IMU, quantum-sensor.

XXXVI. Final Structured-Class Count

Variable explanation table - continuation 2/2

Variable / Block	Meaning	Units / Domain	Role in OmniReality
27	Combined structured class types	count	Final unique class count after deduplication.

XXXVII. Final Entity Count

The number of instantiated entities scales with the world

Vision and Research Architecture by Michael Aaron Loftus

A small room may contain one perceiver and a few objects; a city-scale or universe-scale world may contain millions of objects, many perceivers, multiple routes, event layers, ads, sensors, and scientific targets. The entity count is therefore parametric rather than a universal constant.



XXXVII. Final Entity Count

Canonical equation and ITQE-style variable explanation table

$$\begin{aligned} N_{entities}^{\Omega} &= 2 + N_L + N_O + N_V + N_{\Xi} + N_P + N_C + N_M + N_A + N_{HR} + N_{SR} + N_{QR} + N_{OR} + N_T + N_{\Phi} + N_P^{360} + N_G + N_{\rho} + \\ &N_E + N_{Soc} + N_{Epoch} + N_{Ad} \end{aligned}$$

(33)

Variable / Block	Meaning	Units / Domain	Role in OmniReality
2	Anchored world + default perceiver	fixed count	Always present in a live OmniReality session.
N _L ...N _A	Physical, perceiver, capture, destination entities	counts	Previously defined world constituents.



XXXVII. Final Entity Count

Variable explanation table - continuation 2/3

Variable / Block	Meaning	Units / Domain	Role in OmniReality
$N_{HR} \cdots N_{\Phi}$	Representational/ orchestration/time/physics layers	counts	Active higher-order layers.
N_P^{360}, N_G, N_{ρ}	Panorama, route, reconstruction entities	counts	Earth and imported- scene infrastructure.



XXXVII. Final Entity Count

Variable explanation table - continuation 3/3

Variable / Block	Meaning	Units / Domain	Role in OmniReality
$N_E, N_{Soc}, N_{Epoch}, N_{Ad}$	Event, social, epoch, advertising entities	counts	New final-expansion structures.



XXXVIII. Final Runtime Dimensionality

*The mathematically correct total is a summation, not a single
frozen integer*

Vision and Research Architecture by Michael Aaron Loftus

Because objects, perceivers, cameras, worlds, routes, and layers are indexed and variable in size, the total scalar dimensionality of OmniReality is not one finite universal number. The correct total is the sum of the scalar dimensions of every instantiated block. The final equation below is the canonical answer to the project's dimension-counting question.



XXXVIII. Final Runtime Dimensionality

*The mathematically correct total is a summation, not a single
frozen integer*

Vision and Research Architecture by Michael Aaron Loftus

The shared world contributes 18 scalars after deduplication. The default perceiver is counted only inside the perceiver sum, which eliminates the legacy double-counting of viewer orientation and translation. Every other term contributes exactly once.



XXXVIII. Final Runtime Dimensionality

Canonical equation and ITQE-style variable explanation table

$$\begin{aligned}
 D_{runtime}^{\Omega} = & 18 + 11N_L + \sum D_{O,j} + \sum D_{V,k} + \sum D_{\Xi,m} + \sum_{i=0}^{N_P} D_{\Pi,i} \\
 & + \sum D_{camera,c} + \sum D_{microphone,q} + \sum D_{A,n} + \sum D_{HR,h} + \sum D_{SR,s} + \sum D_{QR,q} \\
 & + \sum D_{OR,\lambda} + \sum D_{T,h} + \sum D_{\Phi,p} + \sum D_{P,j} + \sum D_{G,r} + \sum D_{\rho,z} \\
 & + \sum D_{E,e} + \sum D_{Soc,s} + \sum D_{Epoch,h} + \sum D_{Ad,a}.
 \end{aligned} \tag{34}$$

Variable / Block	Meaning	Units / Domain	Role in OmniReality
18	Deduplicated world core	18 scalars	Photonic scene sample + anchored world frame.
$11N_L$	Light-source state	11 scalars/light	Position, RGBA-like emission, directional brightness.



XXXVIII. Final Runtime Dimensionality

Variable explanation table - continuation 2/3

Variable / Block	Meaning	Units / Domain	Role in OmniReality
$\Sigma D_{\text{physical}}$	Objects and vehicles	scalar sum	Manipulable, terrestrial, extraterrestrial.
$\Sigma D_{\text{perception}}$	Perceivers and sensors	scalar sum	Living perceivers, cameras, microphones.



XXXVIII. Final Runtime Dimensionality

Variable explanation table - continuation 3/3

Variable / Block	Meaning	Units / Domain	Role in OmniReality
ΣD_{layers}	HR/SR/QR/OR/time/physics	scalar sum	Higher-order representational and control layers.
$\Sigma D_{\text{worldbuild}}$	Panorama/route/reconstruction/event/social/epoch/ad	scalar sum	Imported worlds and final expansion structures.



XXXIX. Final Recorded- Data Dimensionality

Observation vectors remain separate from persistent runtime state

Vision and Research Architecture by Michael Aaron Loftus

The final observation stream retains five unique sample classes. Panoramas, concert recordings, and property captures are composed from these underlying optical, audio, inertial, astrophysical, or quantum-informed samples rather than being counted as wholly new observation-vector classes.



XXXIX. Final Recorded-Data Dimensionality

Canonical equation and ITQE-style variable explanation table

$$D_{recorded}^{\Omega}(\tau) = 26N_R + (31 + \bar{d}_{band})N_U + 9N_S + 10N_I + (14 + \bar{d}_{spec})N_Q \tag{35}$$

Variable / Block	Meaning	Units / Domain	Role in OmniReality
$26N_R$	Optical/volumetric observations	scalar observations	Base visual/holographic samples.
$(31 + \bar{d}_{band})N_U$	Astrophysical observations	scalar observations	Multispectral scientific samples.

18. National Institute of Standards and Technology, *Quantum Information Science* (Accessed August 27, 2026.)
19. United States Department of Energy, *Quantum Information Science* (Accessed August 27, 2026.)



XXXIX. Final Recorded-Data Dimensionality

Variable explanation table - continuation 2/3

Variable / Block	Meaning	Units / Domain	Role in OmniReality
$9N_S$	Audio observations	scalar observations	Localized acoustic samples.
$10N_I$	IMU observations	scalar observations	Acceleration, angular velocity, magnetic field, time.

XXXIX. Final Recorded-Data Dimensionality

Variable explanation table - continuation 3/3

Variable / Block	Meaning	Units / Domain	Role in OmniReality
$(14+ \ar d_{\text{spec}})^{N_Q}$	Quantum-sensor observations	scalar observations	Quantum or quantum-informed scientific samples.



Unique Structured-Class Taxonomy

Every persistent runtime class appears once

The taxonomy below is the authoritative class list used by the final dimensional summation. Each persistent runtime class appears once.

Class	Canonical Dimension	Purpose
World core	$D_W=18$	Photonic scene sample + anchor; legacy viewer aliases removed from count.
Light source	11 per light	Position, emitted RGBA-like state, directional brightness.
Manipulable object	$51+3d_q+d_u$	Independent pose, physics, contacts, constraints, haptics.
Terrestrial vehicle	$91+3d_q+d_{class}$	Controllable vehicle specialization.



Unique Structured-Class Taxonomy

Every persistent runtime class appears once

Class	Canonical Dimension	Purpose
Extraterrestrial vehicle	$142 + 3d_q + d_{\text{class}}$	Orbital/habitat/payload specialization.
Perceiver	$D_{\Pi,i}$	Body, kinematics, gaze, senses, cognition, agency, species.
Astronomical target	$32 + d_{\text{surface}} + d_{\text{field}}$	Planetary/cosmic destination state.
Camera	$45 + d_{\text{spec}}$	Capture-device calibration and timing.



Unique Structured-Class Taxonomy

Every persistent runtime class appears once

Class	Canonical Dimension	Purpose
Microphone	$10+d_{\text{resp}}$	Spatial microphone configuration.
Hyper Reality	$40+d_{\text{sem}}+d_{\text{profile}}$	Semantic/adaptive layer.
Super Reality	$32+d_{\text{band}}+d_{\text{task}}$	Perception enhancement layer.
Quantum Reality	$17+(b^{2-1})+d_{\text{corr}}$	Reduced local quantum descriptor.



Unique Structured-Class Taxonomy

Every persistent runtime class appears once

Class	Canonical Dimension	Purpose
OmniReality orchestration	$36 + d_{\text{collab}} + d_{\text{policy}}$	Memory, provenance, collaboration, governance.
Chrono-navigation	$16 + d_{\text{history}} + d_{\text{branch}}$	Historical and simulated temporal traversal.
Physics profile	$22 + d_{\text{field}} + d_{\text{medium}}$	Explicit local physical-law state.
Panorama entry	$7 + d_I + d_D + d_M + d_A + d_C$	360° source, pose, depth, masks, ambient, provenance.



Unique Structured-Class Taxonomy

Every persistent runtime class appears once

Class	Canonical Dimension	Purpose
Route graph	$7N_{\text{node}} + d_{\text{edge}} + d_{\text{lane}} + d_{\text{topology}}$	Continuous terrestrial traversal graph.
Reconstruction seed	$d_{\text{geo}} + d_{\text{sem}} + d_{\text{mat}} + d_{\text{dyn}} + d_{\text{conf}}$	Generated scene geometry/ semantics/materials/dynamics/ confidence.
Event replay	$12 + d_{\text{venue}} + d_{\text{media}} + d_{\text{rights}} + d_{\text{crowd}}$	Past entertainment and social event state.
Social presence/ share	$10 + d_{\text{graph}} + d_{\text{perm}} + d_{\text{share}}$	Co-presence, viewpoint sharing, permissions.



Unique Structured-Class Taxonomy

Every persistent runtime class appears once

Class	Canonical Dimension	Purpose
Epoch reconstruction	$14 + d_{\text{prov}} + d_{\text{uncert}} + d_{\text{climate}} + d_{\text{bio}}$	Evidence-informed historical/prehistorical world layer.
Spatial ad unit	$20 + d_{\text{creative}} + d_{\text{target}} + d_{\text{attr}} + d_{\text{compliance}}$	World-anchored advertising and attribution.



Unique Variable Glossary

No variable is intentionally duplicated across the appendix

Variable	Meaning	Units / Domain	Role
x,y,z	Scene-space position	m	Coordinates of a scene sample.
τ	Master scene time	s	Synchronizes all dynamic state.
r,g,b	Color channels	normalized/radiometric	Visible color state.



Unique Variable Glossary

No variable is intentionally duplicated across the appendix

Variable	Meaning	Units / Domain	Role
α	Opacity/transmittance	[0,1]	Compositing and transparency.
φ	Optical phase	rad	Wavefront reconstruction.
x_0,y_0,z_0	World anchor position	m	Fixed world center.



Unique Variable Glossary

No variable is intentionally duplicated across the appendix

Variable	Meaning	Units / Domain	Role
ψ_x, ψ_y, ψ_z	World anchor orientation	rad	Fixed world rotation.
s_x, s_y, s_z	World scale	dimensionless	Anchored scene scale.
$^xL_j, ^yL_j, ^zL_j$	Light position	m	Locates light source j.



Unique Variable Glossary

No variable is intentionally duplicated across the appendix

Variable	Meaning	Units / Domain	Role
$r_{L,j}, g_{L,j}, b_{L,j}, \alpha_{L,j}$	Light color/gating	radiometric/[0,1]	Emitted/projected appearance.
$B_{x,j}, B_{y,j}, B_{z,j}, B_{\alpha,j}$	Brightness state	renderer/ radiometric	Directional source intensity.
q_o	Object orientation/ generalized coordinate	quaternion or joint domain	Object rotation or constrained coordinate.



Unique Variable Glossary

No variable is intentionally duplicated across the appendix

Variable	Meaning	Units / Domain	Role
m_o	Object mass	kg	Inertia.
I_o	Inertia tensor	$\text{kg} \cdot \text{m}^2$	Rotational inertia.
F_{ext}	Net force	N	Physical interaction.



Unique Variable Glossary

No variable is intentionally duplicated across the appendix

Variable	Meaning	Units / Domain	Role
M_{ext}	Net torque	$\text{N} \cdot \text{m}$	Rotational interaction.
Π_i	Perceiver i	structured	Embodied living viewpoint.
N_P	Additional perceivers	count	Number beyond default perceiver.



Unique Variable Glossary

No variable is intentionally duplicated across the appendix

Variable	Meaning	Units / Domain	Role
$N_{\text{body},i}$	Tactile zones	count	Body-map granularity.
$d_{\Lambda,i}$	Vision spectral channels	scalar count	Species/user spectral augmentation.
$d_{\text{H},i}$	Auditory-shape parameters	scalar count	Individual auditory model.



Unique Variable Glossary

No variable is intentionally duplicated across the appendix

Variable	Meaning	Units / Domain	Role
$d_{\Xi,i}$	Olfactory sensitivity dimensions	scalar count	Odor sensitivity state.
$d_{C,i}$	Cognitive state dimensions	scalar count	Attention, memory, imagery.
$d_{A,i}$	Agency dimensions	scalar count	Intent, locomotion, control.



Unique Variable Glossary

No variable is intentionally duplicated across the appendix

Variable	Meaning	Units / Domain	Role
$d_{\text{species},i}$	Species-specific senses	scalar count	Echolocation, UV, polarization, magnetoreception.
N_E	Aircraft engine count	count	Propulsion multiplicity.
$d_{\text{spec},c}$	Camera spectral channels	scalar count	Multispectral/hyperspectral calibration.



Unique Variable Glossary

No variable is intentionally duplicated across the appendix

Variable	Meaning	Units / Domain	Role
$d_{\text{resp},m}$	Microphone response parameters	scalar count	Frequency response calibration.
N_R, N_S, N_I, N_U, N_Q	Observation sample counts	counts	Optical, audio, inertial, astrophysical, quantum.
b_q	Quantum local basis size	integer	Dimension of reduced local basis.



Unique Variable Glossary

No variable is intentionally duplicated across the appendix

Variable	Meaning	Units / Domain	Role
d_{corr}	Quantum correlation augmentation	scalar count	Local explicit correlations.
d_{sem}	Semantic dimensions	scalar count	Meaning/context channels.
d_{profile}	Profile/adaptation dimensions	scalar count	User adaptation state.



Unique Variable Glossary

No variable is intentionally duplicated across the appendix

Variable	Meaning	Units / Domain	Role
d_{task}	Task enhancement channels	scalar count	Computational perception tasks.
d_{collab}	Collaboration dimensions	scalar count	Group synchronization and roles.
d_{policy}	Policy/governance dimensions	scalar count	Privacy, access, consent.



Unique Variable Glossary

No variable is intentionally duplicated across the appendix

Variable	Meaning	Units / Domain	Role
d_{history}	Historical state dimensions	scalar count	Recorded/reconstructed prior states.
d_{branch}	Future branch dimensions	scalar count	Forecasted/authored scenarios.
d_{field}	Field augmentation	scalar count	Magnetic, radiative, plasma, or custom fields.



Unique Variable Glossary

No variable is intentionally duplicated across the appendix

Variable	Meaning	Units / Domain	Role
d_{medium}	Medium augmentation	scalar count	Atmosphere, water, vacuum, plasma.
P_j^{360}	Panorama entry frame	structured	360° source and metadata.
G_r	Route graph	structured	Continuity among panorama nodes.



Unique Variable Glossary

No variable is intentionally duplicated across the appendix

Variable	Meaning	Units / Domain	Role
ρ_z	Reconstruction seed	structured	Geometry/semantics/material/dynamics/confidence.
E_e	Event-replay layer	structured	Past live event world.
Soc_s	Social/share state	structured	Co-presence and shareable viewpoint.



Unique Variable Glossary

No variable is intentionally duplicated across the appendix

Variable	Meaning	Units / Domain	Role
Epoch_h	Epoch reconstruction	structured	Evidence-informed past-world state.
Ad_a	Spatial ad unit	structured	World-anchored commercial content.



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