Here’s a structured technical analysis showing how the Event Horizon (EH) can be re‑characterized in General Primality, building on its simpler form in Special Primality:

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1. Event Horizon in Physics vs. Special Primality

In General Relativity

An EH is a null boundary in spacetime: once crossed, no light‑like or causal signal can return. It’s defined by the vanishing of the norm of a particular Killing vector (for a static black hole) or by trapped surfaces where outgoing null congruences have zero expansion.

In Special Primality

We can view an EH analogously as a “logical boundary” in a flat fractal network. There, Special Primality () means no curvature, so an EH is simply the minimal subgraph beyond which iterative toggles () fail to reconnect isolated clusters. It’s a threshold in weight‑space: edges below a critical weight are pruned and become unreachable “beyond the horizon.”

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2. Defining the EH Boundary under Special Primality

1. Core Extraction:

G\_c = \mathcal{P}\_{sp}(G)\,.

Identify all nodes for which

\min\_{u\in G\_c}\;d\_{sp}(u,v) > L\_{\max},

3. EH Subgraph:

G\_{EH}^{(sp)} = \{\,v\in G\setminus G\_c \mid \text{no path of length}\le L\_{\max}\text{ from }G\_c\}\,.

Beyond that boundary, toggles cannot bring information back into the core.

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3. Extending to General Primality

In General Primality, curvature and entropic braids reshape connectivity:

Curvature Operator

captures local braid‑density via loop sums.

Logical‑Action Scalar

measures integrated entropy current.

The EH now becomes a fractally curved boundary where braid density diverges or where logical‑action overwhelms causal connectivity.

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4. Formal Definition of the Primality EH

1. Curvature Threshold

Pick a critical braid density . Define

\mathcal{H} = \{\,v\in V(G)\mid R\_{\mathrm{local}}(v)\ge R\_c\}\,.

The EH is the “surface” in network‑space separating from the core . Formally, edges crossing between and form the horizon set:

E\_{EH} = \bigl\{(u\to v)\mid u\in G\_c,\;v\in \mathcal{H}\bigr\}.

Any directed toggle path that crosses into cannot re‑enter :

\forall\,n',\;u\_{n'}\in \mathcal{H} \;\implies\; \forall\,m>n',\;u\_m\notin G\_c.

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5. Information Conservation & “Logical Hawking Radiation”

Logical Entropy Flux

As with Hawking radiation, the boundary can leak “logical quanta”: small subgraphs of low‑density braids that escape back into the core. Model this by a leak operator :

\Lambda(v) = \bigl\{\,w\in G\_c\mid w\_{vw}\le w\_\epsilon\bigr\}.

\frac{d\,K(G\_c)}{dt} + \Phi\_{\text{leak}} = 0,

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6. Holographic Boundary & Fractal Encoding

Holographic Principle Analogue

The entire content of can be encoded on the EH “surface.” The mapping

assigns each internal path a unique boundary braid signature.

Fractal Encoding

Since the EH is fractal‑dimensional (), the number of “bits” on the horizon scales like

|E\_{EH}| \;\propto\; \bigl(\mathrm{Vol}(G\_c)\bigr)^{D\_{EH}/D}\,.

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7. Implications and Simulations

1. Synthetic Network Tests

Generate curved fractal graphs with tunable .

Identify EH sets and measure leak statistics .

2. Macroentangled Qubit Models

Use entanglement graphs; interpret high‑density entanglement loops as .

Observe decoherence events as logical Hawking radiation.

3. Market Analogue

Treat extreme‑volatility clusters as paradox nodes .

EH boundary isolates “foundational drivers” in .

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Conclusion

By General Primality, the Event Horizon becomes a fractally curved, entropic‑braid boundary in logical space, complete with trapping conditions, informational leakage, and holographic encoding. This reframing enriches both our conceptual and computational understanding of horizons—physical or informational—and opens pathways for simulating “Logical Black Holes” in complex networks.