

TorUsNetP V1.0 (Photonic) ENG

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General Introduction: Birth of TorUsNetP

TorUsNetP is the photonic version of the TorUsNet protocol. Where TorUsNet relies on a numerical directional architecture — private tori, exponential paths, normal/phantom inversion — TorUsNetP transposes this logic into a photonic processor, where each operation becomes a luminous instruction, each stage an intensity, and each key a fractal directional geometry.

TorUsNetP is not a simple evolution: it is the transformation of the directional protocol into a physical structure, where light itself encodes exponent towers, levels, paths, and internal mutations of the torus.

In TorUsNetP:

- exponent towers become photonic structures,
- fractional exponents become intensity fractions,
- dynamic stages become luminous thresholds,
- directional paths become photonic trajectories,
- normal/phantom inversions become internal torus mutations,
- keys become living geometries, non-numerical and non-derivable.

TorUsNetP introduces a model where:

- a public tower is transmitted in clear form over the photonic network,
- a private tower remains inside the torus,
- both are crossed to determine the actual path,
- and each traversal mutates the towers and the internal geometry.

Thus, TorUsNetP becomes the first protocol where:

- the key is not a number,
- the key is not a hash,
- the key is not a static secret,

- the key is an intensity distribution,
- a directional structure,
- a photonic geometry,
- evolving at every use.

TorUsNetP is therefore the photonic directional version of TorUsNet: a protocol where light encodes security, where geometry replaces cryptography, and where each transmission becomes a unique directional event — impossible to replay, impossible to simulate, impossible to invert.

Chapter 1 — Photonic Introduction to the TorUsNetP Protocol

TorUsNetP is the photonic version of the directional TorUsNet protocol. It transposes all directional mechanisms — exponent towers, dynamic stages, normal/phantom inversion, internal torus geometry — into a photonic processor, where each operation becomes a luminous instruction.

In TorUsNet, directional keys were numerical. In TorUsNetP, they become physical, luminous, geometric.

Light is no longer a simple signal: it becomes the directional structure, the key, the path, and the internal mutation of the torus.

TorUsNetP is based on four fundamental principles:

1. **Directional Photonic Transmission** An exponent tower is sent in clear form over the photonic network. It serves as a directional starting point.
2. **Private Exponent Tower** The private torus contains an internal exponent tower, invisible to the network. This tower encodes intensity levels, thresholds, limits, and transitions of the photonic processor.
3. **Directional Crossing of Towers** The actual path inside the torus is never determined by the public tower alone. It is determined by the crossing between the public tower and the private tower. This crossing produces a fractal directional geometry, impossible to reconstruct without the private tower.
4. **Directional Mutation at Each Traversal** At every movement inside the torus:
 - normal/phantom bits invert,
 - internal geometry changes,

- the private tower mutates,
- the public tower mutates,
- and the photonic key becomes non-replayable.

Thus, TorUsNetP introduces a security model where:

- the key is not a number,
- the key is not a hash,
- the key is not a static secret,
- the key is a distribution of luminous intensity,
- a living directional structure,
- evolving at every use.

TorUsNetP is the first protocol where cryptography is no longer mathematical: it becomes geometric, directional, photonic, and self-mutating.

Chapter 2 — Photonic Directional Exponent Towers

Exponent towers form the directional backbone of the TorUsNetP protocol. They define the jumps within the photonic torus, the luminous intensity levels, the thresholds, the transitions, and the internal mutation of the private torus. In TorUsNetP, an exponent tower is not a classical mathematical power: it represents a **luminous directional instruction**, composed of fractional stages that modulate intensity and determine the internal traversal.

2.1 — Directional Nature of an Exponent Tower

A photonic exponent tower has the structure:

$$T = b^{a_1^{a_2^{\alpha_3}}}$$

where:

- **b** represents a base intensity,
- **a₁, a₂, a₃...** are fractional directional exponents,
- each exponent encodes a portion of intensity applied to a direction.

In TorUsNetP, a fractional exponent is interpreted as:

$$b^{\alpha} = b \times \alpha$$

It is a **fraction of intensity**, not a power.

Thus:

- $23^{2/3}$ means: jump of 23 cells with intensity $2/3$,
- $45^{5/3}$ means: intensity level 45 with fraction $5/3$,
- the fusion of both yields: total intensity $7/3$.

Each stage is a photonic directional instruction.

2.2 — Directional Stages and Intensity Levels

The photonic processor uses intensity levels organized into thresholds:

- **Level 1:** minimal intensity → progressive rise → saturation → transition.
- **Level 2:** return to low intensity → rise → saturation → transition.
- **Level 3:** same logic.
- etc.

Each level corresponds to a **directional stage**. Each progressive rise corresponds to a **fractional exponent**. Each saturation corresponds to a **jump point** toward the next level.

The exponent tower therefore encodes:

- luminous thresholds,
- limits,
- transitions,
- directional jumps,
- directional depth,
- the internal geometry of the photonic torus.

2.3 — Simultaneous Reading of Public and Private Towers

The public and private towers are always read **two stages at a time**, and each reading depends on the previous stages.

Public Tower Reading

Example:

$$23^{2/3}$$

Interpretation:

- **23** = number of cells to jump,
- **2/3** = intensity fraction applied to the jump.

Private Tower Reading

Example:

$$45^{5/3}$$

Interpretation:

- **45** = internal intensity level,
- **5/3** = directional fraction applied to this level.

Directional Fusion

The fusion of both readings yields:

- **actual jump**: 23 cells,
- **total intensity**: $2/3 + 5/3 = 7/3$.

This fusion determines the actual displacement inside the photonic torus.

2.4 — Control Bits Transmitted Over the Network

After directional fusion, **3 bits** are transmitted:

1. **Layer bit**: selects normal or phantom bit.
2. **Case selection bit (1)**: chooses one of 4 cases for directional injection.
3. **Case selection bit (2)**: completes the selection among the 4 cases.

The two selection bits determine the **directional case** where a new exponent will be injected into the private tower.

2.5 — Directional Mutation of the Private Tower

The private tower mutates at each traversal according to:

$$\text{mutation} = \left(\frac{2}{3}\right)_{\text{pub}} + \left(\frac{5}{3}\right)_{\text{priv}} + I_{\text{case}}$$

where:

- $2/3$ is the public directional fraction,
- $5/3$ is the private directional fraction,
- I_{case} is the intensity stored in the selected case among the four.

The resulting value:

- may be positive or negative,
- may contain a new intensity level,
- becomes a **new directional stage**,
- is added to the private tower,
- modifies the internal geometry of the torus.

The private tower thus becomes a **living, evolving, non-reproducible structure**.

2.6 — Role of Exponent Towers in TorUsNetP

Exponent towers ensure:

- the definition of directional jumps,
- luminous intensity modulation,
- directional depth,
- internal torus mutation,
- normal/phantom selection,
- generation of new stages,
- photonic directional security.

They completely replace:

- numerical keys,
- cryptographic hashes,
- static secrets.

In TorUsNetP, the key is a **photonic directional geometry**, and security relies on internal torus mutation and directional fusion of the towers.

Complementary Document

The following document must be read in complement to the current one:

<https://zenodo.org/records/22720808>

Technical Note on the Forteresse de Verre

It is important to specify that the Forteresse de Verre retains the architecture of the previous iteration. The only structural modification applied to the private torus concerns the former displacement cases, now replaced by functional cases dedicated to the generation and injection of new exponent tower stages. These cases no longer define an internal movement but serve as directional writing points enabling controlled mutation of the private tower.