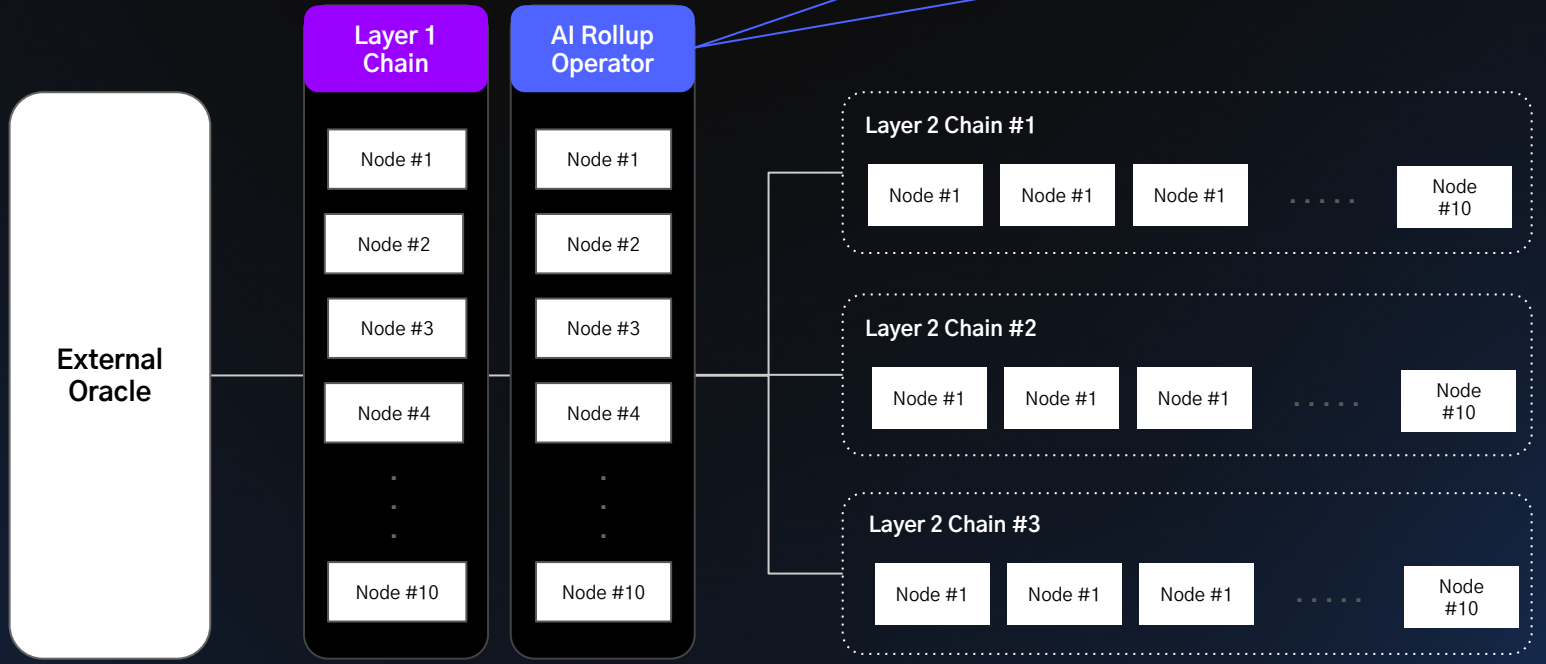
DONO
Layer Architecture

Efficient Layered Blockchain Architecture Utilizing
Layer 2 Offloading and Resource Management

DONO Layer Architecture

Unified Resource Management and Computation Optimization Architecture for Layer 1 and Layer 2 through AI Chain



Scenario

AI Rollup Operator Architecture Scenario

Step **1**	Request for smart contract computation through an external oracle
Step **2**	Layer 1 chain approves the connection to a Layer 2 chain capable of computation
Step **3**	AI Rollup Operator checks the resources of the Layer 2 chain and establishes the connection
Step **4**	Before computation, the Layer 2 chain provides the estimated resource usage to the AI Rollup Operator
Step **5**	AI Rollup Operator calculates the gas fee based on the resource usage of the Layer 2 chain and sends it to the Layer 1 chain
Step **6**	Layer 1 chain imposes the gas fee on the external oracle

Layer 2 Chain in Gas Calculations

Why the AI Rollup Operator Chain Includes Node Resource Information from the Layer 2 Chain in Gas Calculations

Layer 2 Chain Node Resource Items Definition

CPU Usage

Current Utilization
: Current CPU usage (%)

Available Cores
: Number of available CPU cores

Memory Usage

Total Memory
: Total memory capacity of the node (GB)

Used Memory
: Currently used memory (GB)

Available Memory
: Available memory capacity (GB)

Disk Usage

Total Disk Space
: Total disk capacity of the node (GB)

Used Disk Space
: Currently used disk space (GB)

Available Disk Space
: Available disk capacity (GB)

Disk I/O Speed
: Disk input/output speed (MB/s)

Network Bandwidth

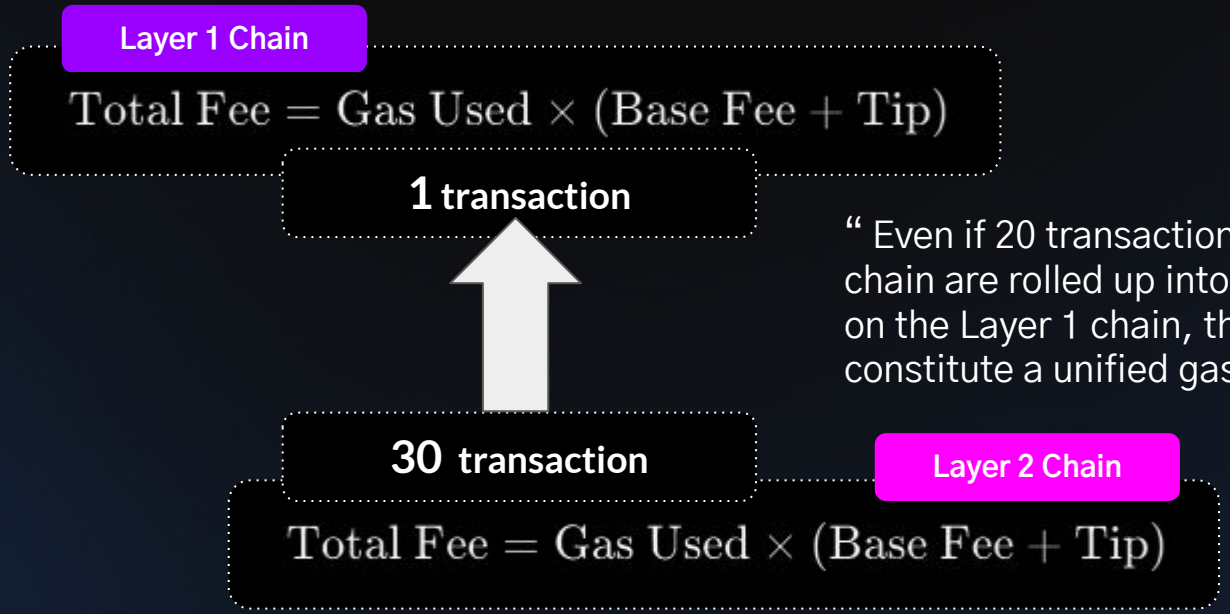
Total Bandwidth
: Total network bandwidth of the node (Mbps)

Used Bandwidth
: Currently used network bandwidth (Mbps)

Available Bandwidth
: Available network bandwidth (Mbps)

Existing Layer Rollup Gas Method

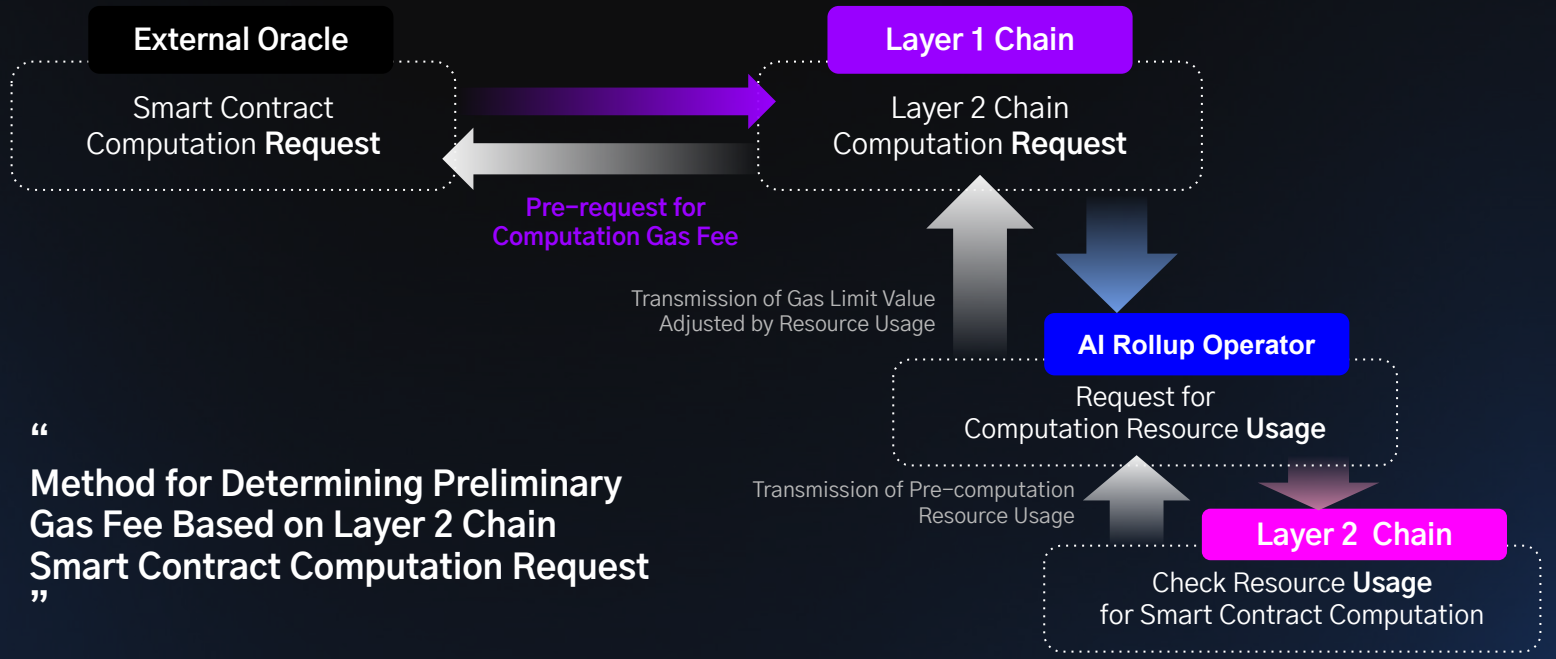
Existing Gas Methods for Layer 1 Chain and Layer 2 Chain



“ Even if 20 transactions on the Layer 2 chain are rolled up into a single transaction on the Layer 1 chain, this does not constitute a unified gas method. “

New Gas Limit Method

Upgrade from Fixed Layer 1 Chain Gas Limit Method to New Gas Limit Method



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Method for Determining Preliminary Gas Fee Based on Layer 2 Chain Smart Contract Computation Request

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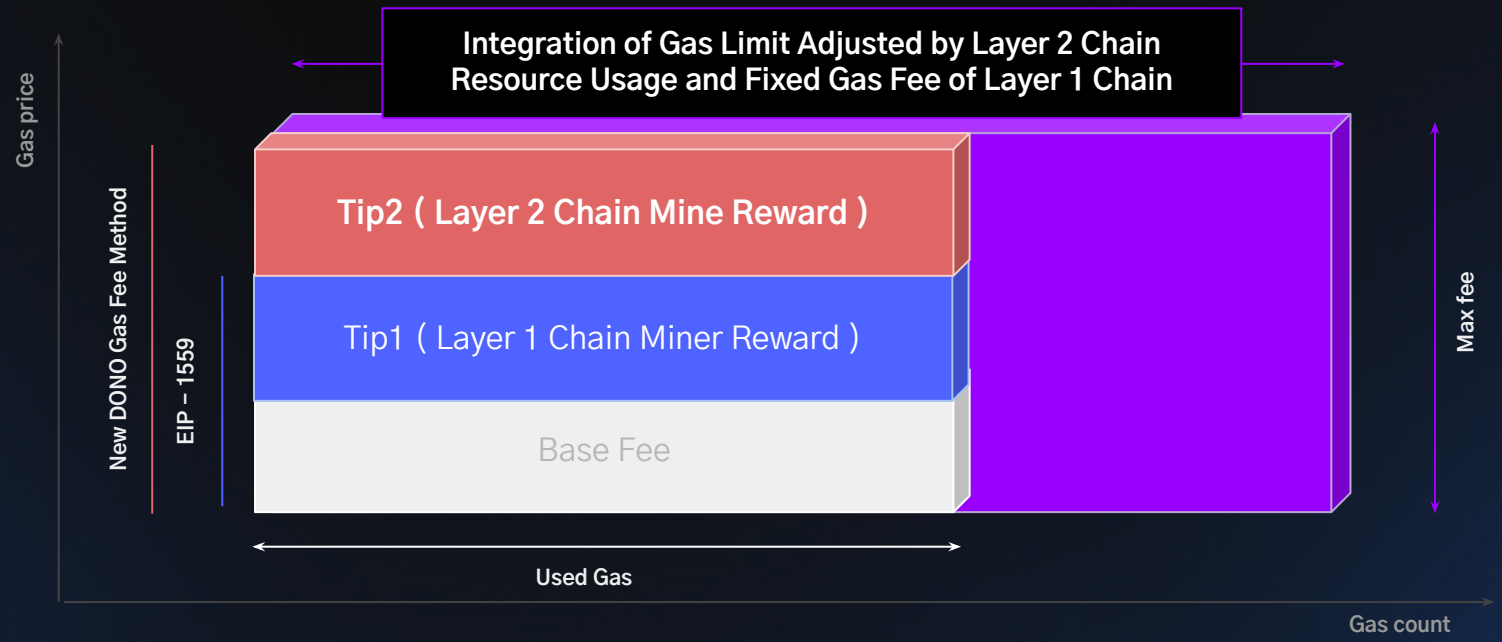
Pre-check Layer 2

Pre-check Layer 2 Resource Amount for Computation Request



Layer 2 chain gas limit maximum

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The maximum gas limit is matched with the default resource percentages and used to determine the final gas limit value based on the actual resource usage.

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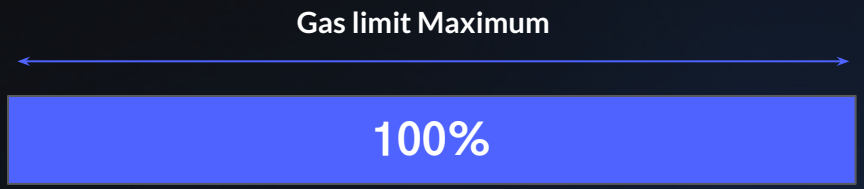

Protocol for Layer 2 Chain

Protocol for Layer 2 Chain Resource Percentage Allocation

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The role of computational
smart contracts varies depending on the content
of Layer 2 chain projects, and consequently,
the importance of resource items also changes.

Therefore, it is important to establish default
resource percentage allocations based on
typical usage patterns. Moving forward,
defining these patterns will require
AI deep learning processes using
NPU and TensorFlow.

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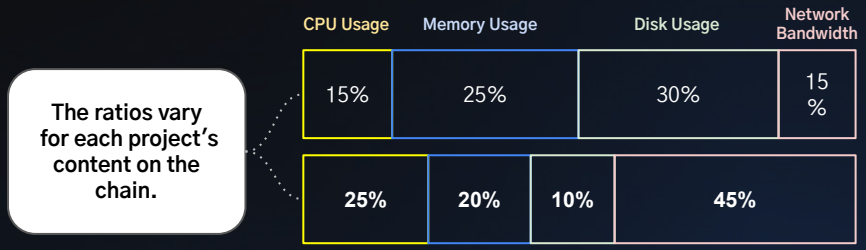

Formula for Calculating Average Resource Usage

Formula for Calculating Average Resource Usage by Setting Default Resource Percentages and Measuring Each Node's Resource Usage

Given Default Resource Percentages

CPU: $P_{CPU}\%$

Memory: $P_{Mem}\%$

Disk: $P_{Disk}\%$

Network Bandwidth: $P_{Net}\%$

Resource Usage for Each Node

CPU usage for node i: CPU_i

Memory usage for node i: Mem_i

Disk usage for node i: $Disk_i$

Network bandwidth usage for node i: Net_i

Number of Nodes

Total number of nodes: N

Calculating Average Resource Usage

1. **Average CPU Usage** ($\overline{CPU}$):
   $$\overline{CPU} = \frac{1}{N-1} \sum_{i=1}^{N} CPU_i$$

2. **Average Memory Usage** ($\overline{Mem}$):
   $$\overline{Mem} = \frac{1}{N-1} \sum_{i=1}^{N} Mem_i$$

3. **Average Disk Usage** ($\overline{Disk}$):
   $$\overline{Disk} = \frac{1}{N-1} \sum_{i=1}^{N} Disk_i$$

4. **Average Network Bandwidth Usage** ($\overline{Net}$):
   $$\overline{Net} = \frac{1}{N-1} \sum_{i=1}^{N} Net_i$$

Calculating the Final Gas Limit

Maximum Gas Limit:

- Default maximum gas limit (GL_{max}) = 30,000

1. **CPU-based Gas Limit** (GL_{CPU}):
   $$GL_{CPU} = GL_{max} \times \frac{P_{CPU}}{100} \times \frac{\overline{CPU}}{100}$$
2. **Memory-based Gas Limit** (GL_{Mem}):
   $$GL_{Mem} = GL_{max} \times \frac{P_{Mem}}{100} \times \frac{\overline{Mem}}{100}$$
3. **Disk-based Gas Limit** (GL_{Disk}):
   $$GL_{Disk} = GL_{max} \times \frac{P_{Disk}}{100} \times \frac{\overline{Disk}}{100}$$
4. **Network Bandwidth-based Gas Limit** (GL_{Net}):
   $$GL_{Net} = GL_{max} \times \frac{P_{Net}}{100} \times \frac{\overline{Net}}{100}$$
5. **Final Gas Limit** (GL_{total}):
   $$GL_{total} = GL_{CPU} + GL_{Mem} + GL_{Disk} + GL_{Net}$$

Calculating the Weighted Average Resource Usage

The weighted average resource usage based on the default resource percentages is calculated as follows:

$$\overline{Resource} = P_{CPU} \times \overline{CPU} + P_{Mem} \times \overline{Mem} + P_{Disk} \times \overline{Disk} + P_{Net} \times \overline{Net}$$

Where:

- $\overline{Resource}$ is the weighted average resource usage.
- $P_{CPU}, P_{Mem}, P_{Disk}, P_{Net}$ are the default percentages for CPU, memory, disk, and network bandwidth respectively.

Example Calculation #1

Default Resource Percentages:

- $P_{CPU} = 0.25$
- $P_{Mem} = 0.20$
- $P_{Disk} = 0.10$
- $P_{Net} = 0.45$

Resource Usage for Each Node:

- Node 1: $CPU_1 = 50, Mem_1 = 40, Disk_1 = 30, Net_1 = 60$
- Node 2: $CPU_2 = 60, Mem_2 = 50, Disk_2 = 20, Net_2 = 70$
- Node 3: $CPU_3 = 70, Mem_3 = 60, Disk_3 = 25, Net_3 = 80$

Number of Nodes: $N = 3$

Example Calculation #1

Calculating Average Resource Usage

1. **Average CPU Usage** $(\overline{CPU})$:
   $\overline{CPU} = \frac{1}{3}(50 + 60 + 70) = \frac{180}{3} = 60$
2. **Average Memory Usage** $(\overline{Mem})$:
   $\overline{Mem} = \frac{1}{3}(40 + 50 + 60) = \frac{150}{3} = 50$
3. **Average Disk Usage** $(\overline{Disk})$:
   $\overline{Disk} = \frac{1}{3}(30 + 20 + 25) = \frac{75}{3} = 25$
4. **Average Network Bandwidth Usage** $(\overline{Net})$:
   $\overline{Net} = \frac{1}{3}(60 + 70 + 80) = \frac{210}{3} = 70$

Example Calculation #1

Calculating the Final Gas Limit

Default Maximum Gas Limit:

- $GL_{max} = 30,000$

1. **CPU-based Gas Limit** (GL_{CPU}):
   $GL_{CPU} = 30000 \times 0.25 \times \frac{60}{100} = 30000 \times 0.25 \times 0.60 = 4500$
2. **Memory-based Gas Limit** (GL_{Mem}):
   $GL_{Mem} = 30000 \times 0.20 \times \frac{50}{100} = 30000 \times 0.20 \times 0.50 = 3000$
3. **Disk-based Gas Limit** (GL_{Disk}):
   $GL_{Disk} = 30000 \times 0.10 \times \frac{25}{100} = 30000 \times 0.10 \times 0.25 = 750$
4. **Network Bandwidth-based Gas Limit** (GL_{Net}):
   $GL_{Net} = 30000 \times 0.45 \times \frac{70}{100} = 30000 \times 0.45 \times 0.70 = 9450$
5. **Final Gas Limit** (GL_{total}):
   $GL_{total} = 4500 + 3000 + 750 + 9450 = 17700$

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Thus, the final gas limit based on resource usage is **17,700**

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THANK YOU

DONO Layer Architecture