‘Cause I’m Strong Enough: Reasoning about Consistency Choices in Distributed Systems

Presented By:
Aldrin Montana

Example

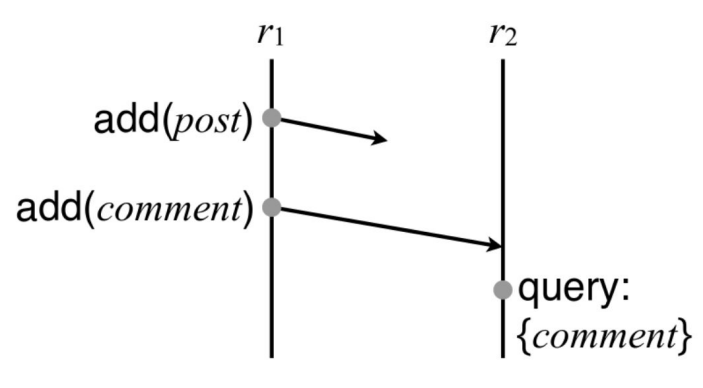

Figure 1A
Illustration of Add and Query

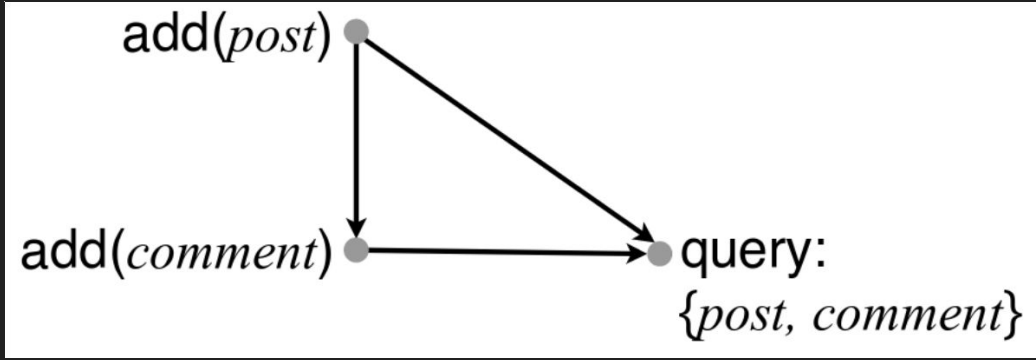

Figure 2A
Example of Definition 1
for Add and Query

Example

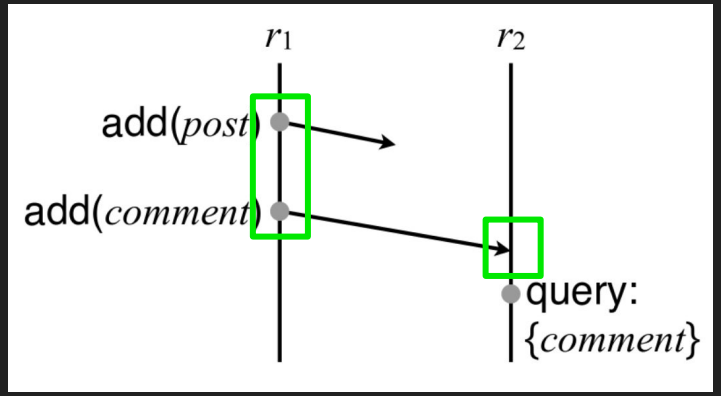

Figure 1A
Illustration of Add and Query

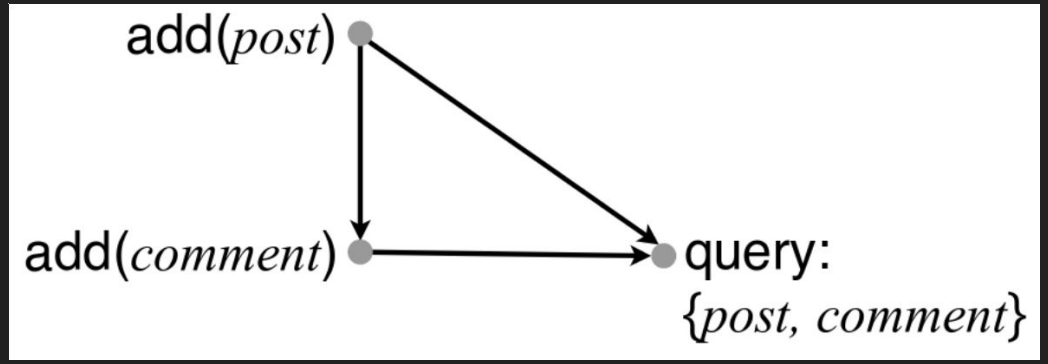

Figure 2A
Example of Definition 1
for Add and Query

Example

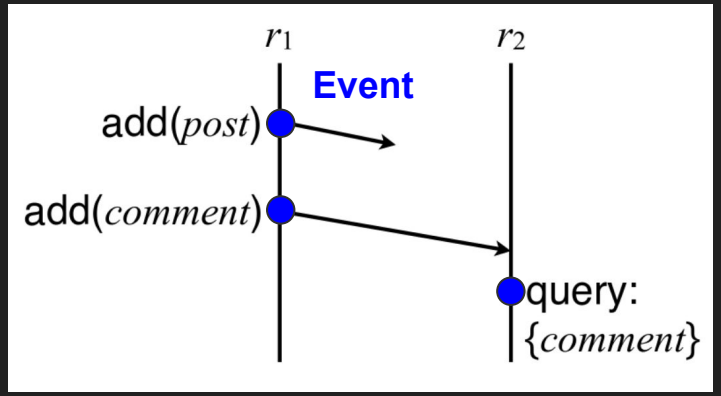

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Illustration of Add and Query

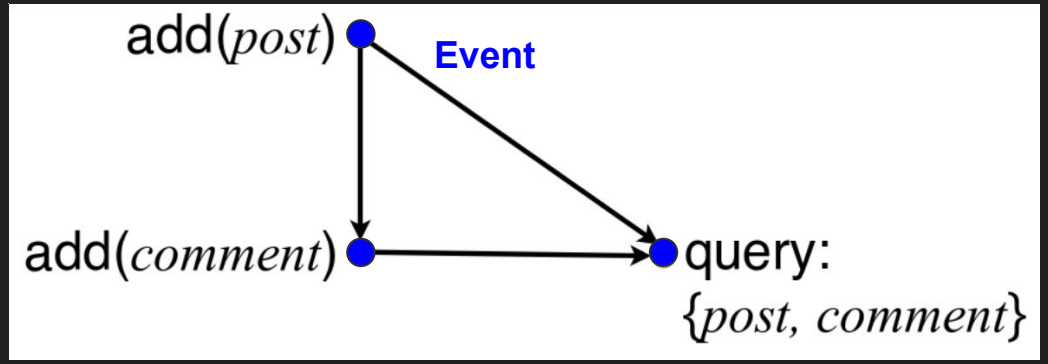

Figure 2A
Example of Definition 1
for Add and Query

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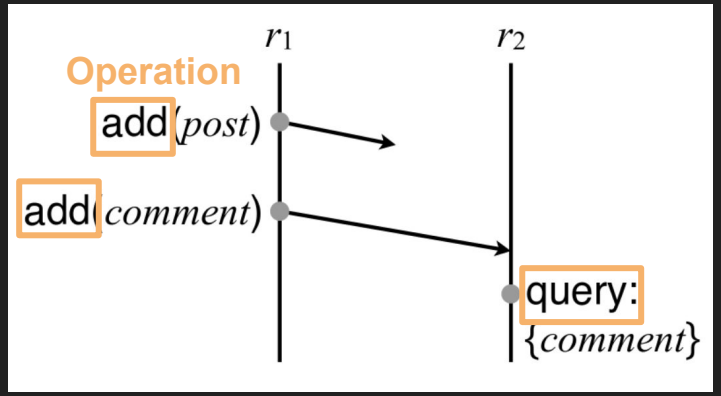

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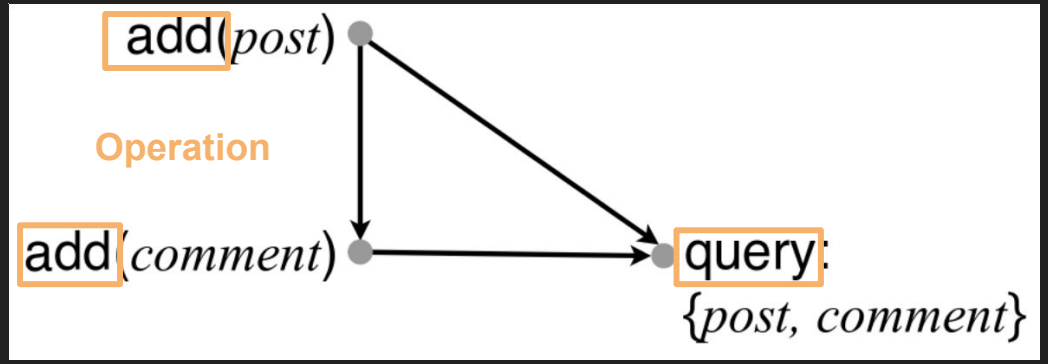
Illustration of Add and Query



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Example of Definition 1
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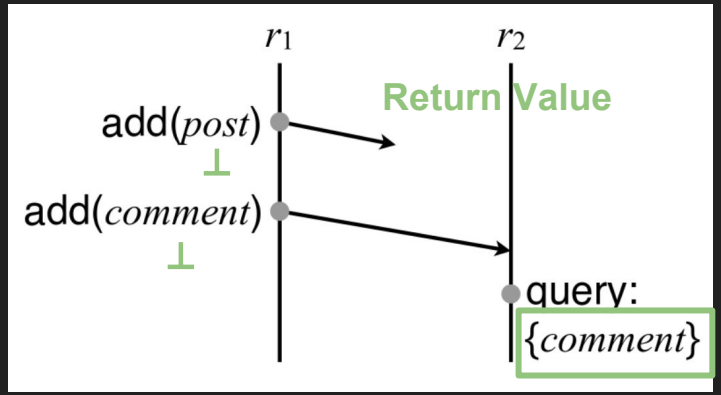

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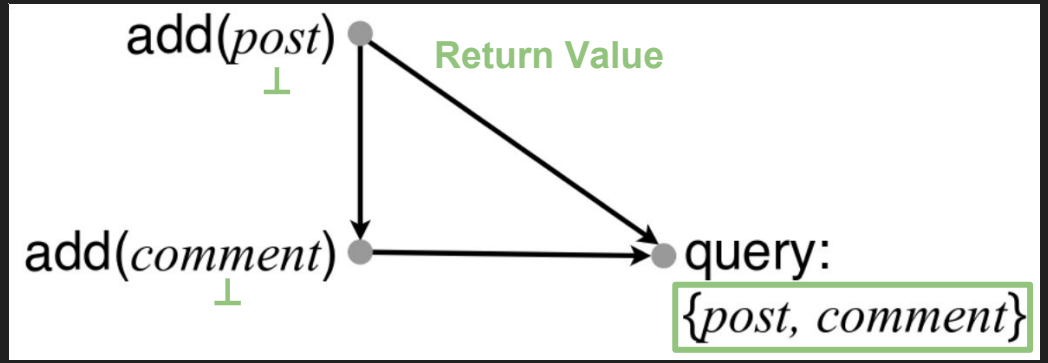
Illustration of Add and Query



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for Add and Query

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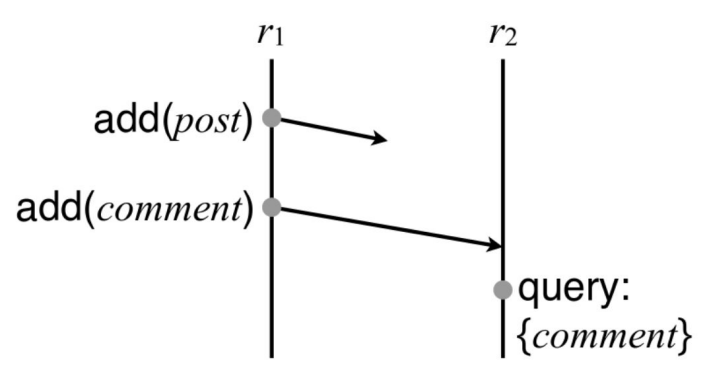

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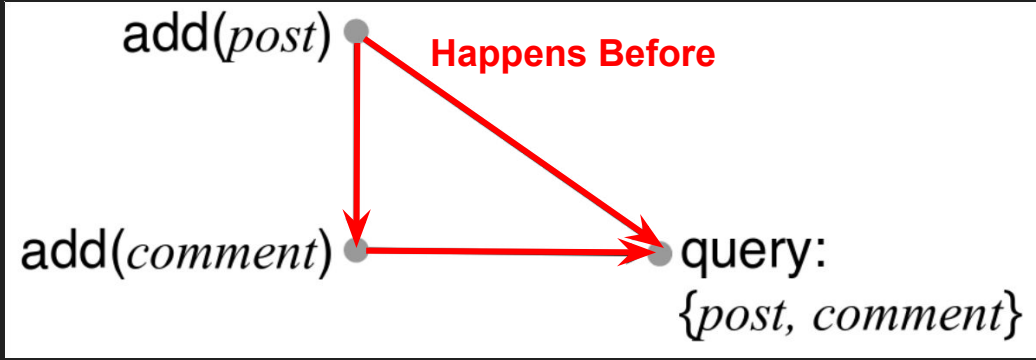

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Example of Definition 1
for Add and Query

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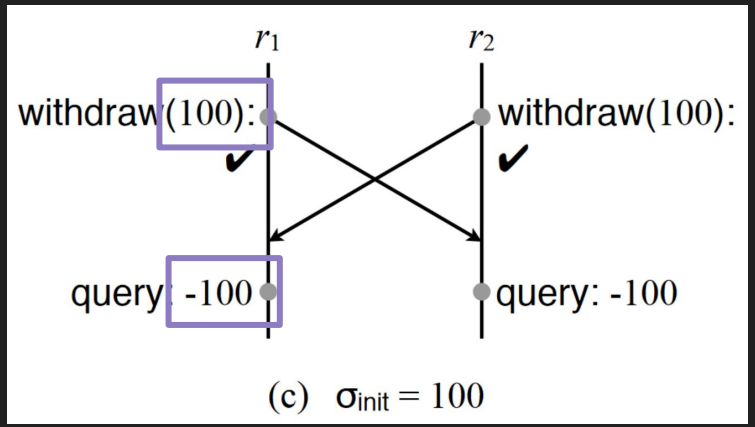

Figure 1C
Illustration of Withdraw and Query

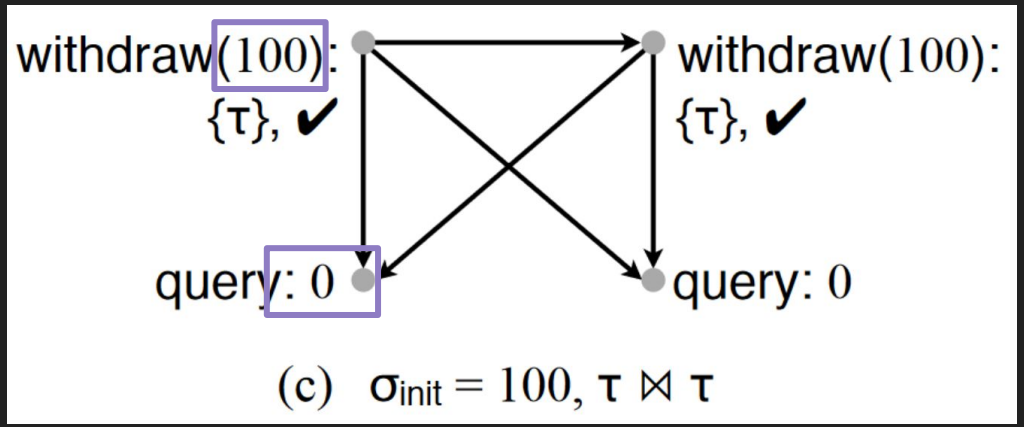

Figure 2C
Example of Definition 1
for Withdraw and Query

Definitions and Notations

$$F \in Op \rightarrow (State \rightarrow (Val \times (State \rightarrow State)))$$

$$F_o(\sigma) = (Val\ ,\ (State \rightarrow State))$$

$$F_o(\sigma) = (F_o^{val}(\sigma)\ ,\ (\ F_o^{eff}(\sigma)\ ))$$

Example

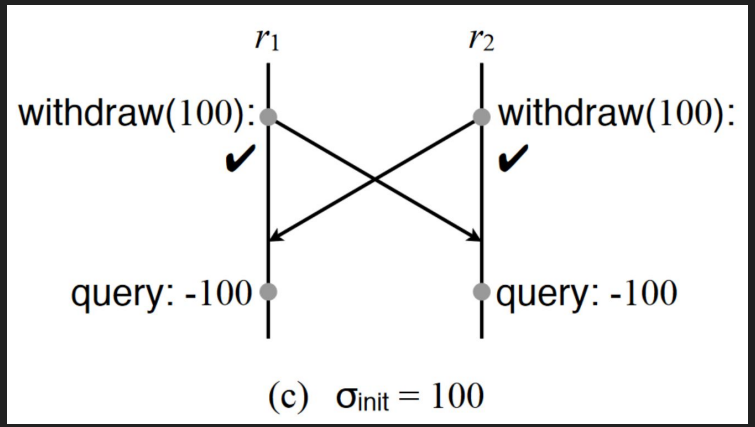

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Illustration of Withdraw and Query

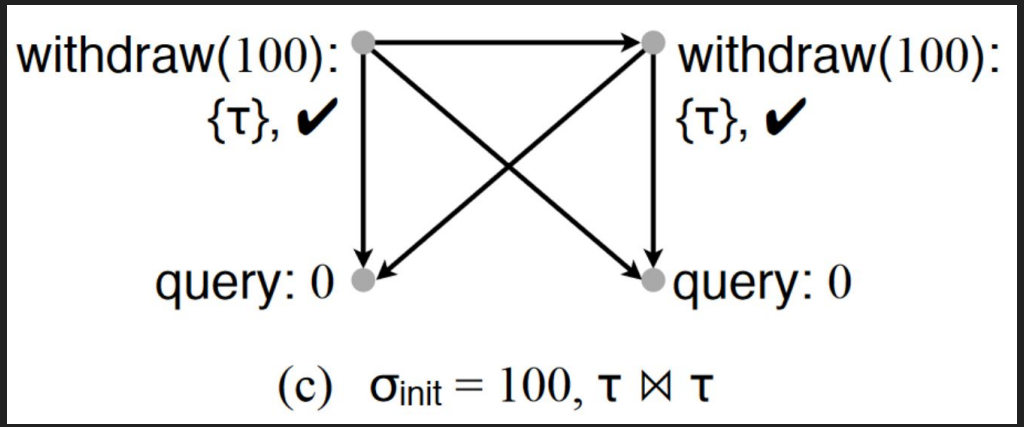

Figure 2C
Example of Definition 1
for Withdraw and Query

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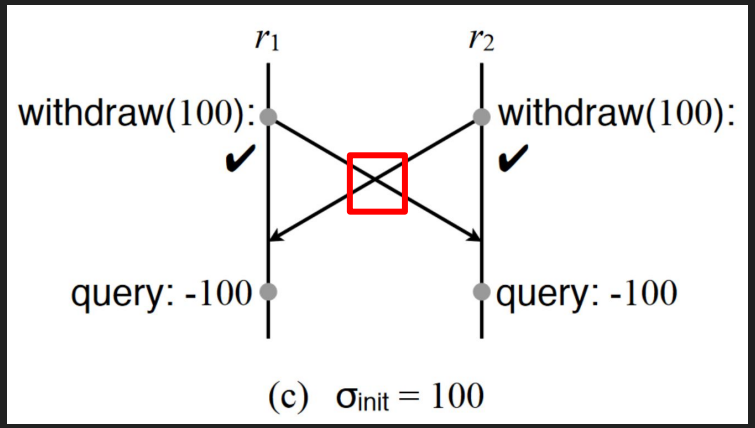

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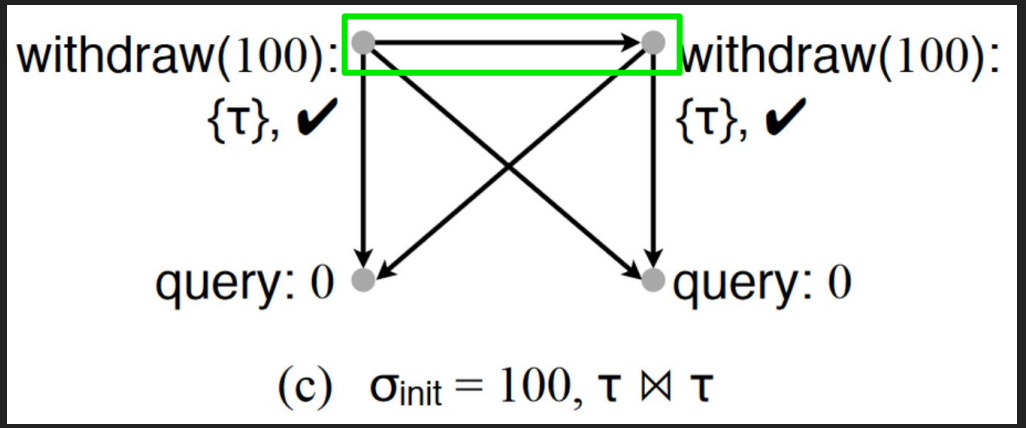

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Example of Definition 1
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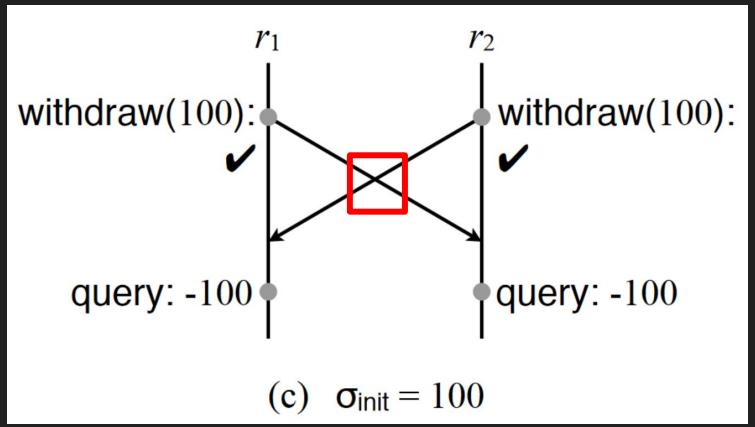

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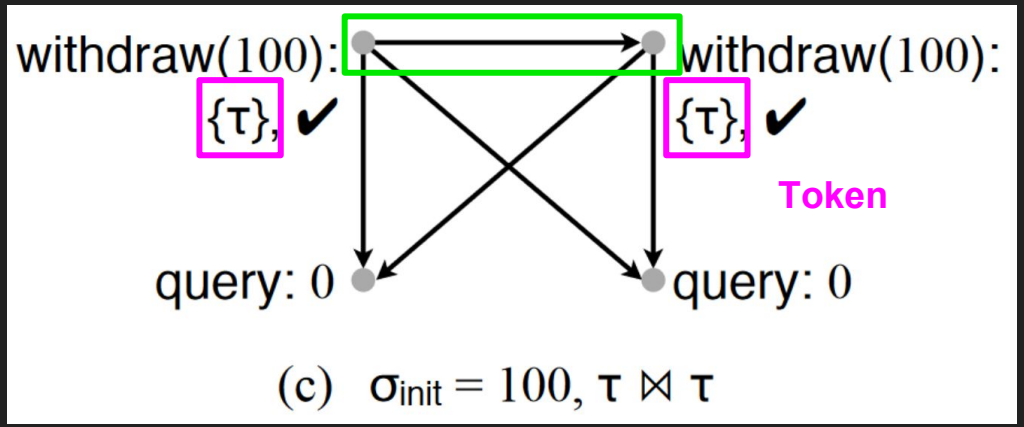


Figure 2C
Example of Definition 1
for Withdraw and Query

Definitions and Notations - Extensions

$I = \{\text{subset of State}\}$ $T = (\text{Token}, \bowtie)$

$$\mathcal{F} \in \text{Op} \rightarrow (\text{State} \rightarrow (\text{Val} \times (\text{State} \rightarrow \text{State}) \times \mathbb{P}(\text{Token})))$$

$$\mathcal{F}_o(\sigma) = (\text{Val}, (\text{State} \rightarrow \text{State}), \mathbb{P}(\text{Token}))$$

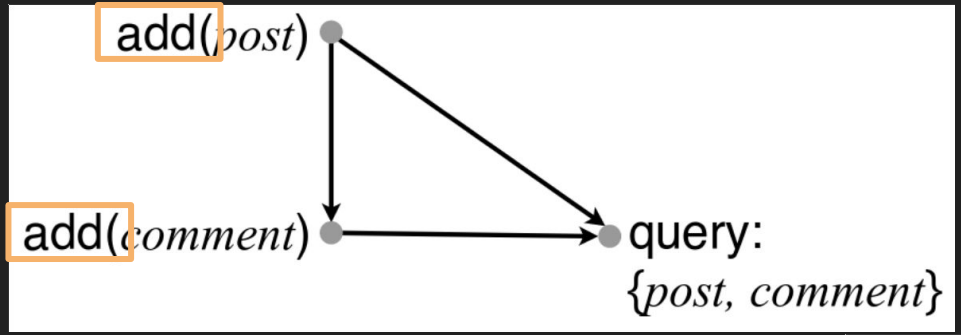
$$\mathcal{F}_o(\sigma) = (\mathcal{F}_o^{\text{val}}(\sigma), (\mathcal{F}_o^{\text{eff}}(\sigma)), \mathcal{F}_o^{\text{tok}}(\sigma))$$

Definitions and Notations - Extensions

$$T = (\text{Token}, \bowtie)$$

$$\mathbb{F}_{\text{withdraw(a)}}(\sigma) = \begin{cases} (\checkmark, (\lambda\sigma'.\sigma' + .05 * \sigma), T), & \text{if } \sigma \geq a \\ (\times, \text{skip}, T), & \text{else} \end{cases}$$

Intuition



If operations **are convergent**,
then tokens **are not necessary**

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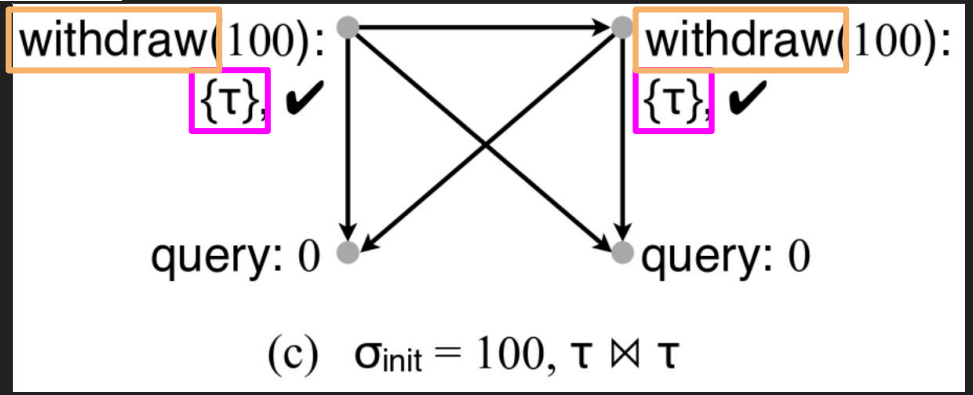

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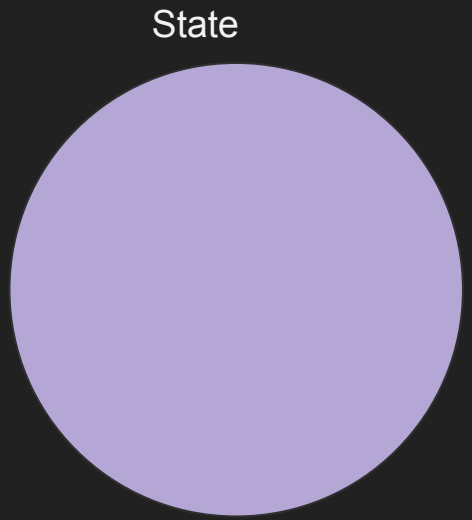
$$F \in Op \rightarrow (State \rightarrow (Val \times (State \rightarrow State)))$$

Definitions and Notations



Definitions and Notations

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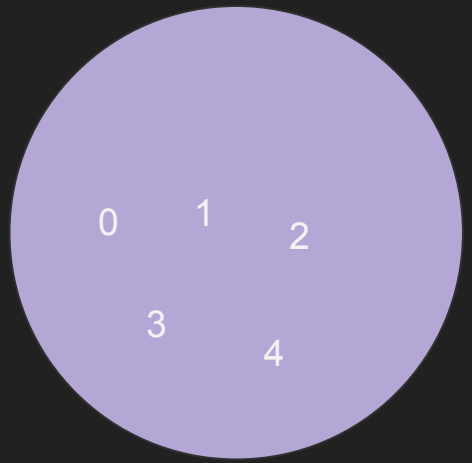
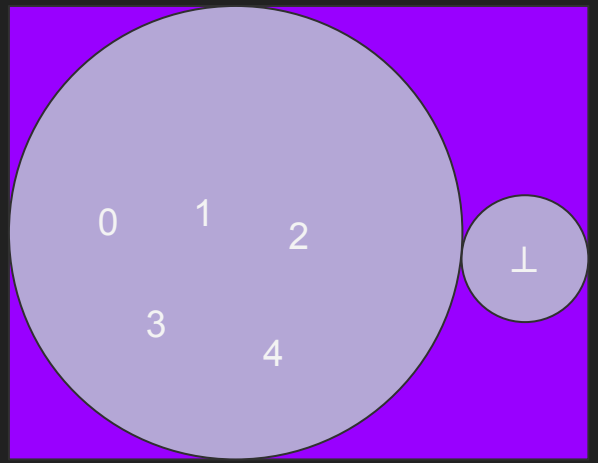
State = $\mathbb{Z}$



Val = $\mathbb{Z}$



Definitions and Notations