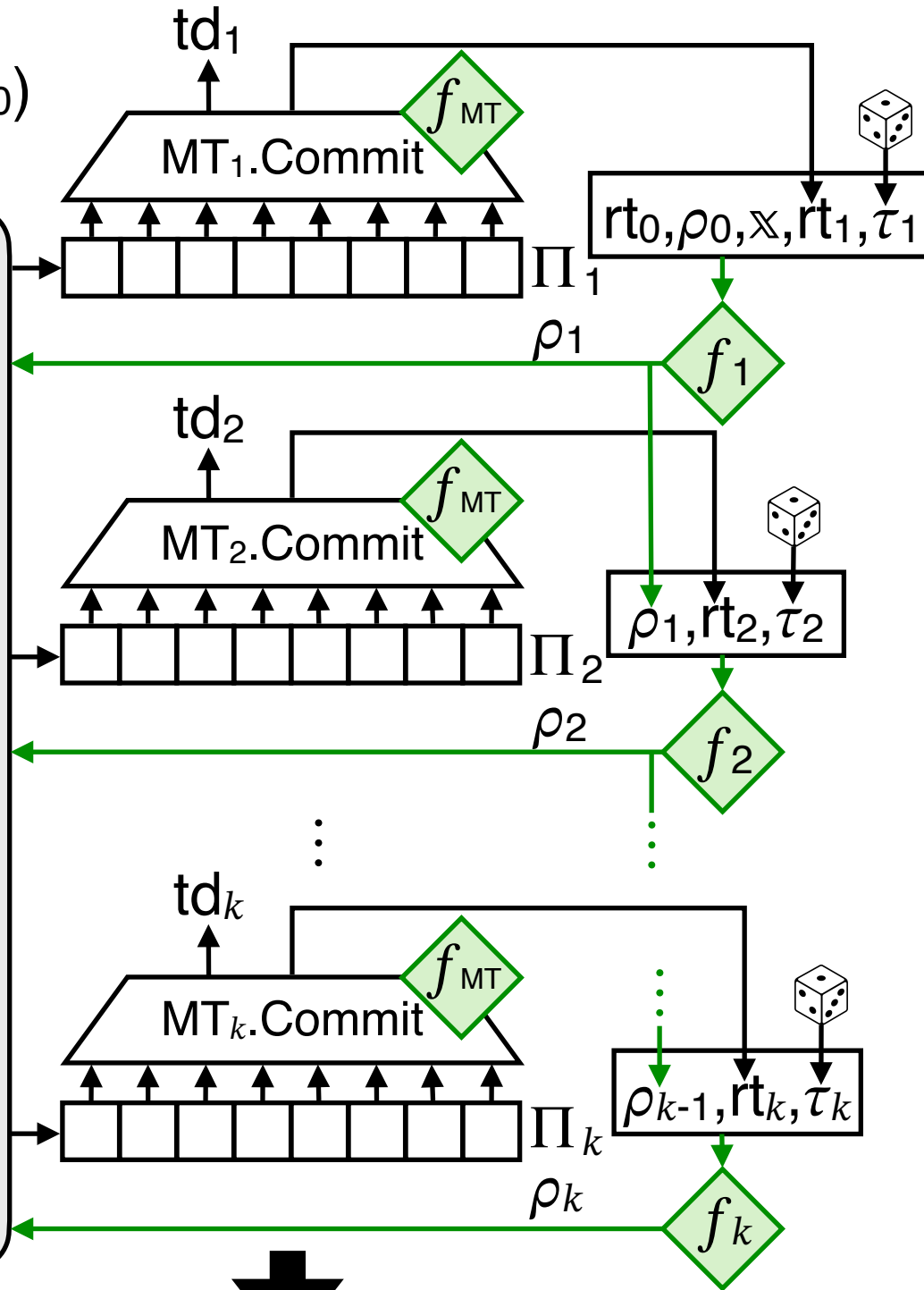


$\mathcal{P}(\text{pik}, \mathbb{X}, \mathbb{W})$

- parse pik as $(\mathring{\text{ip}}, \mathring{\text{iv}}, \text{rt}_0, \text{td}_0, \rho_0)$

$\mathbf{P}_{\text{IOP}}(\mathring{\text{ip}}, \mathbb{X}, \mathbb{W})$

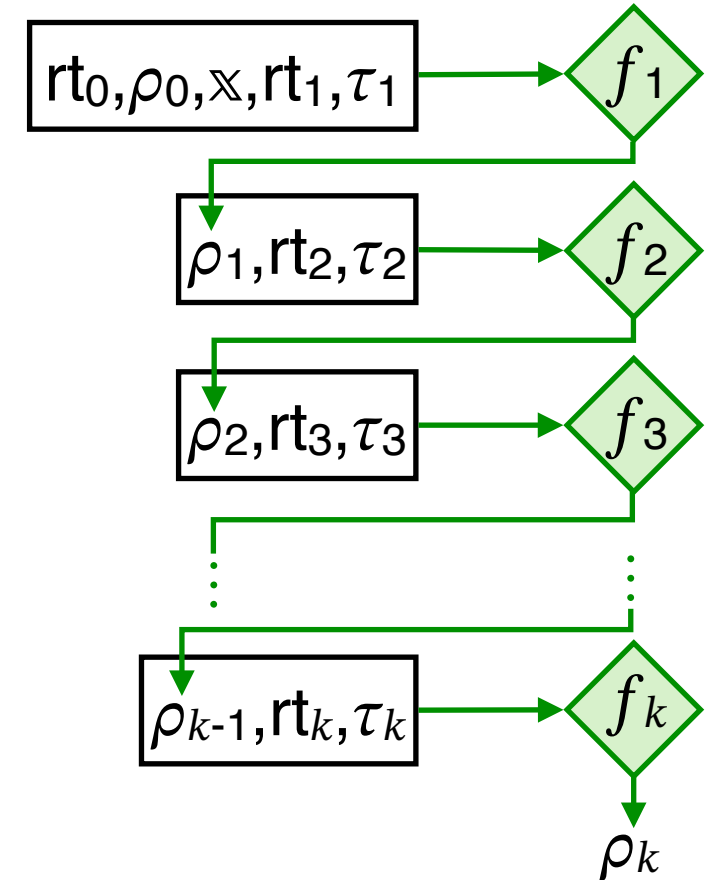


IOP verifier queries: (Q_0, Q_1, \dots, Q_k)
 IOP oracle answers: $(\mathbf{a}_0, \mathbf{a}_1, \dots, \mathbf{a}_k)$
 MT proofs: $(\text{pf}_0, \text{pf}_1, \dots, \text{pf}_k)$

$\pi := ((Q_0, \mathbf{a}_0, \text{pf}_0), ((\text{rt}_i, Q_i, \mathbf{a}_i, \text{pf}_i, \tau_i))_{i \in [k]})$

$\mathcal{V}(\text{vik}, \mathbb{X}, \pi)$

- parse vik as (rt_0, ρ_0)
- parse π as $((Q_0, \mathbf{a}_0, \text{pf}_0), ((\text{rt}_i, Q_i, \mathbf{a}_i, \text{pf}_i, \tau_i))_{i \in [k]})$
- derive IOP randomness



- check MT proofs

$\bigwedge_{i=0}^k \text{MT}_i.\text{Check} \diamond f_{\text{MT}}(\text{rt}_i, Q_i, \mathbf{a}_i, \text{pf}_i)$

- check IOP decision

$\mathbf{V}_{\text{IOP}}[Q_i, \mathbf{a}_i]_{i=0}^k(\mathbb{X}, (\rho_1, \dots, \rho_k))$