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Energy-Efficient Resource Allocation Algorithm in the UAV-enabled Data and Energy Integrated Network

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Presenter

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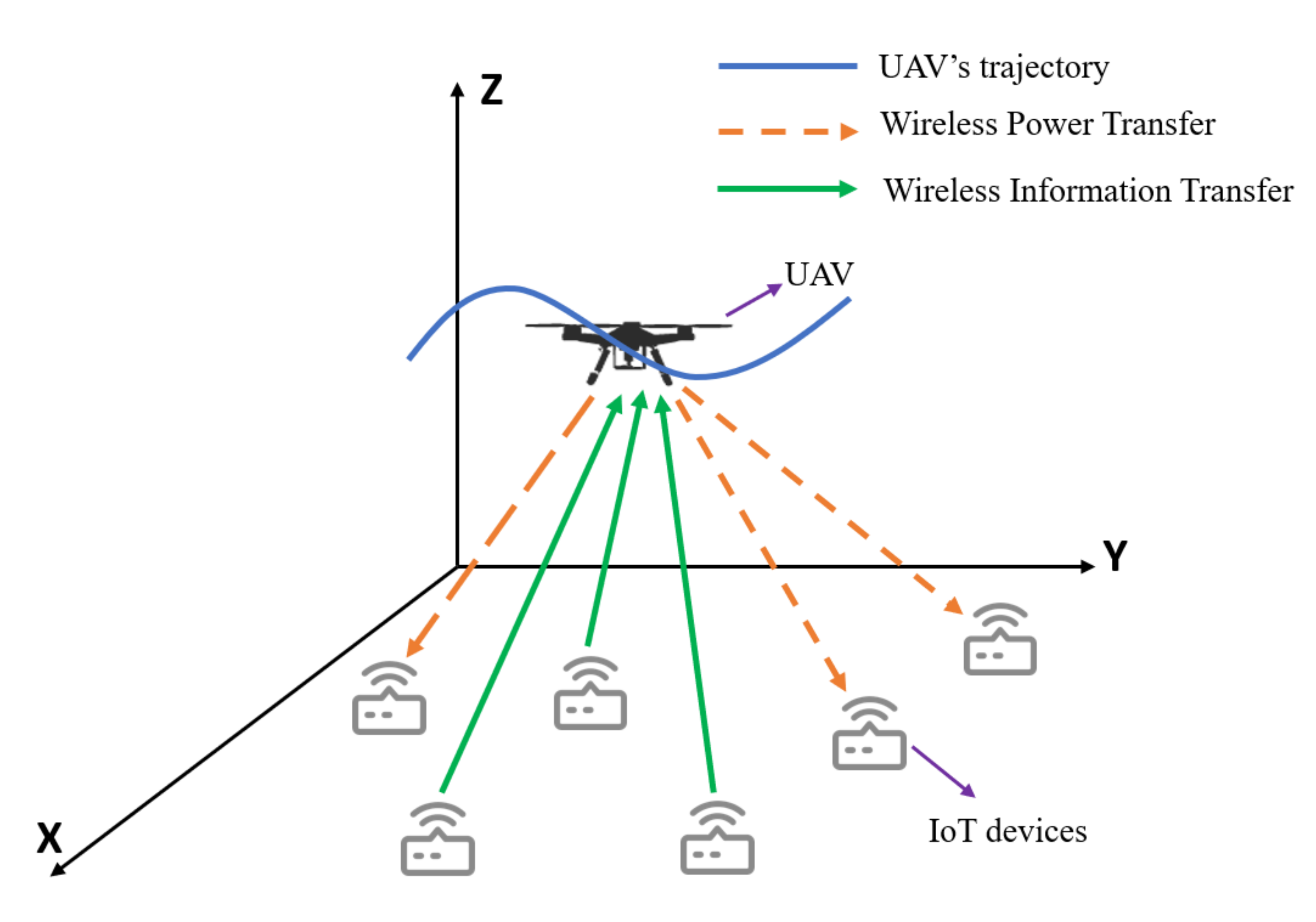
System Model



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Problem Formulation

$$\min_{Q,A,\Xi} E_{cons} \quad (4\text{-}16)$$

$$s.t. a_k(t) = \{0,1\}, \forall k \in \mathcal{K}, t \in \mathcal{M} \quad (4\text{-}16a)$$

$$\sum_{k=1}^{K} a_k(t) \le 1, \forall t \in \mathcal{M} \quad (4\text{-}16b)$$

$$0 \le \xi_k(t) \le 1, \forall k \in \mathcal{K}, t \in \mathcal{M} \quad (4\text{-}16c)$$

$$\sum_{t=1}^{M} a_k(t) r_k(t) (1 - \xi_k(t)) \Delta\tau \ge D_k, \forall k \in \mathcal{K} \quad (4\text{-}16d)$$

$$E_k(m) - \sum_{t=1}^{m} a_k(t) (1 - \xi_k(t)) P_k \Delta\tau \ge \epsilon_k, \forall k \in \mathcal{K}, m \in \mathcal{M} \quad (4\text{-}16e)$$

$$\|\boldsymbol{q}(t) - \boldsymbol{q}(t-1)\| \le v_{h,max} \Delta\tau, \forall t \in \mathcal{M} \quad (4\text{-}16f)$$

$$\min_{Q} E_f \quad (4\text{-}17)$$

$$s.t. \sum_{t=1}^{M} a_k(t) r_k(t) (1 - \xi_k(t)) \Delta\tau \ge D_k, \forall k \in \mathcal{K} \quad (4\text{-}17a)$$

$$E_k(m) - \sum_{t=1}^{m} a_k(t) (1 - \xi_k(t)) P_k \Delta\tau \ge \epsilon_k, \forall k \in \mathcal{K}, m \in \mathcal{M} \quad (4\text{-}17b)$$

$$\|\boldsymbol{q}(t) - \boldsymbol{q}(t-1)\| \le v_{h,max} \Delta\tau, \forall t \in \mathcal{M} \quad (4\text{-}17c)$$

$$\min_{A} E_c \quad (4\text{-}28)$$

$$s.t. a_k(t) = \{0,1\}, \forall k \in \mathcal{K}, t \in \mathcal{M} \quad (4\text{-}28a)$$

$$\sum_{k=1}^{K} a_k(t) \le 1, \forall t \in \mathcal{M} \quad (4\text{-}28b)$$

$$\sum_{t=1}^{M} a_k(t) r_k(t) (1 - \xi_k(t)) \Delta\tau \ge D_k, \forall k \in \mathcal{K} \quad (4\text{-}28c)$$

$$E_k(m) - \sum^{m} a_k(t) (1 - \xi_k(t)) P_k \Delta\tau \ge \epsilon_k, \forall k \in \mathcal{K}, m \in \mathcal{M} \quad (4\text{-}28d)$$

$$\min_{\Xi} E_c \quad (4\text{-}32)$$

$$s.t. 0 \le \xi_k(t) \le 1, \forall k \in \mathcal{K}, t \in \mathcal{M} \quad (4\text{-}32a)$$

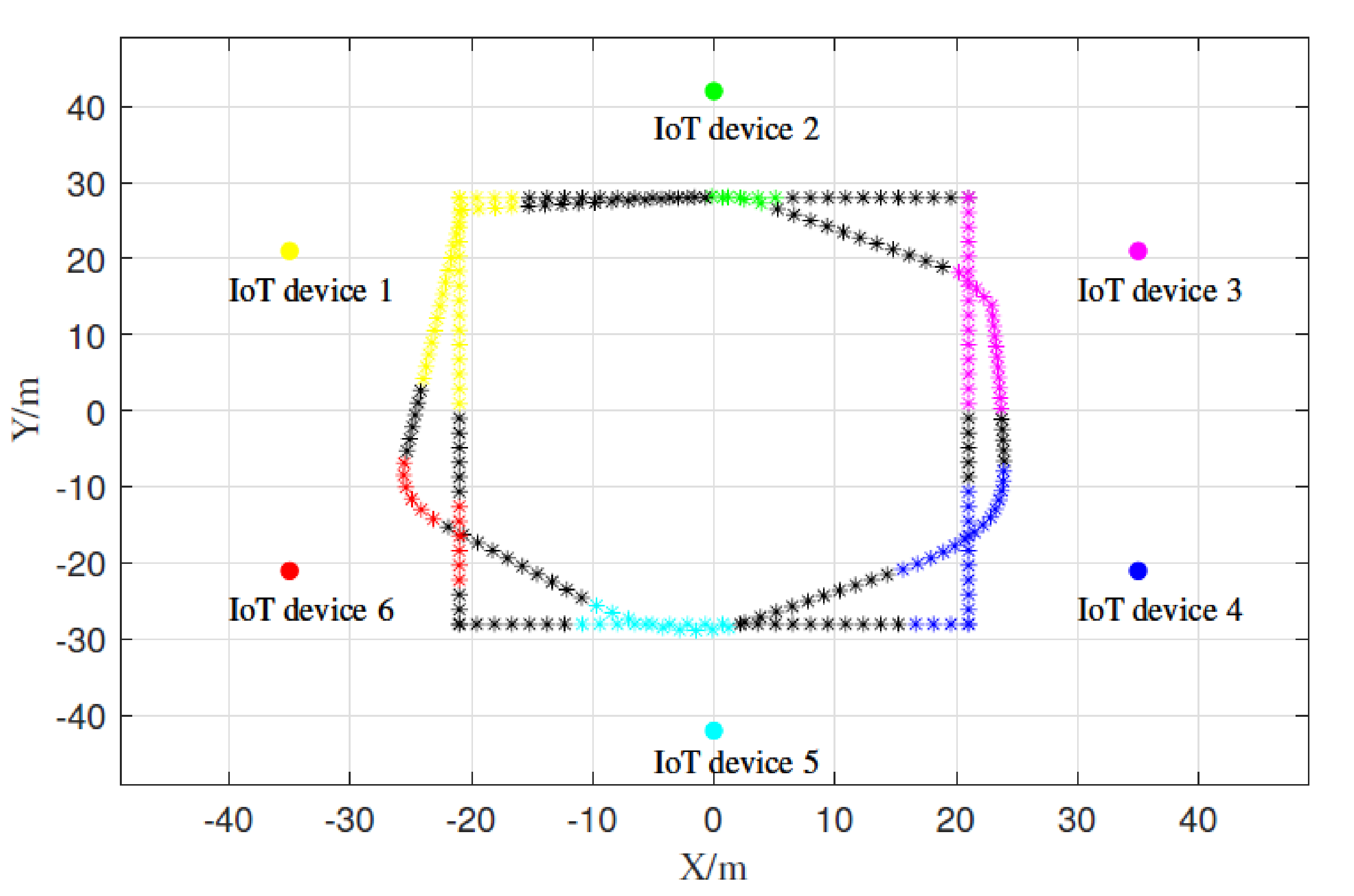
$$\sum_{t=1}^{M} a_k(t) r_k(t) (1 - \xi_k(t)) \Delta\tau \ge D_k, \forall k \in \mathcal{K} \quad (4\text{-}32b)$$

$$E_k(m) - \sum_{t=1}^{m} a_k(t) (1 - \xi_k(t)) P_k \Delta\tau \ge \epsilon_k, \forall k \in \mathcal{K}, m \in \mathcal{M} \quad (4\text{-}32c)$$

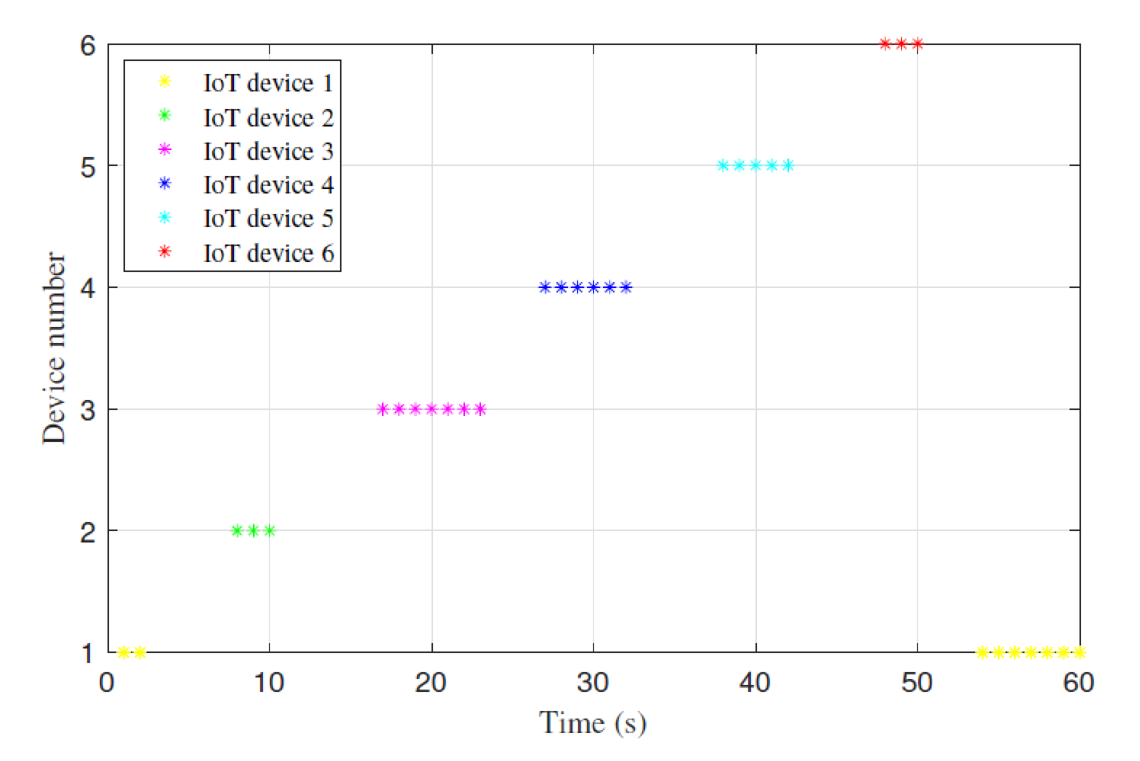
Overall Algorithm

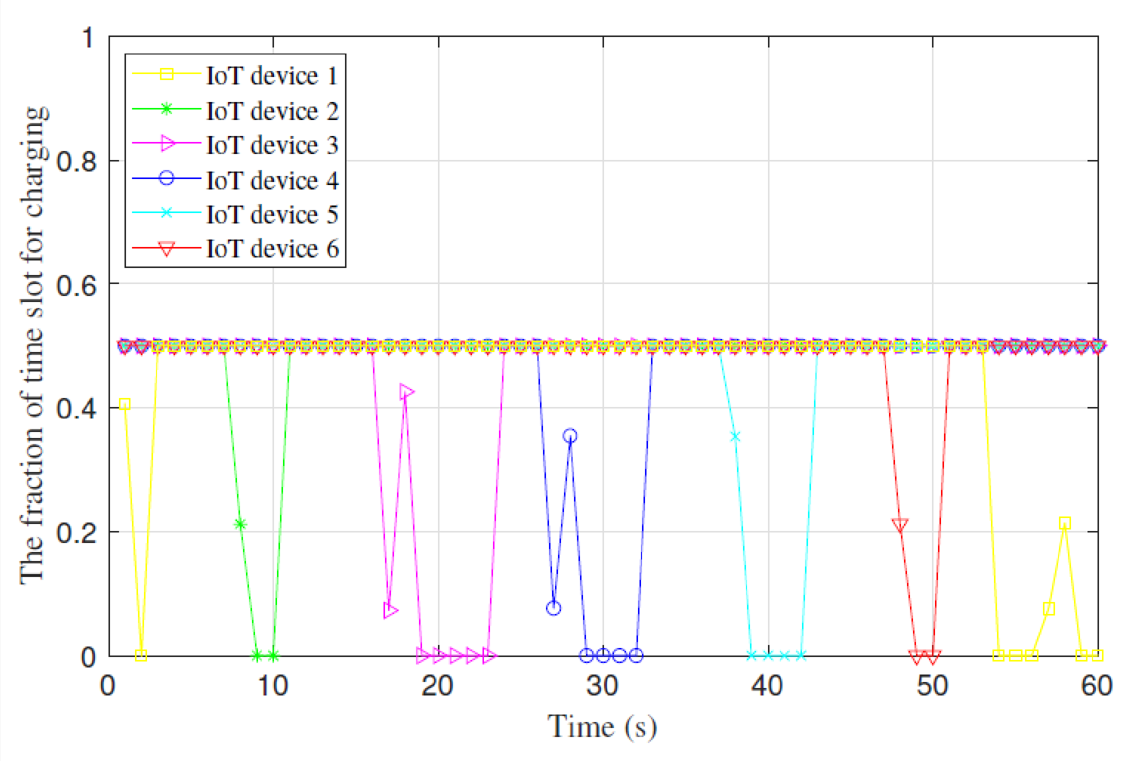
Input: A^0, Ξ^0, $r = 0$, ε, r_{max};
Output: Q^*, A^* and Ξ^*;
while $\left|\frac{E_{cons}^{r} - E_{cons}^{r-1}}{E_{cons}^{r-1}}\right| > \varepsilon$ and $r \leq r_{\max}$, **do**
Slove subproblem (27) for given $\{A^r, \Xi^r\}$ and obtain Q^{r+1};
Slove subproblem (28) for given $\{Q^{r+1}, \Xi^r\}$ and obtain A^{r+1};
Slove subproblem (29) for given $\{Q^{r+1}, A^{r+1}\}$ and obtain Ξ^{r+1};
Update $r = r + 1$;
end
return Q^*, A^* and Ξ^*.

Simulation Results



Simulation Results





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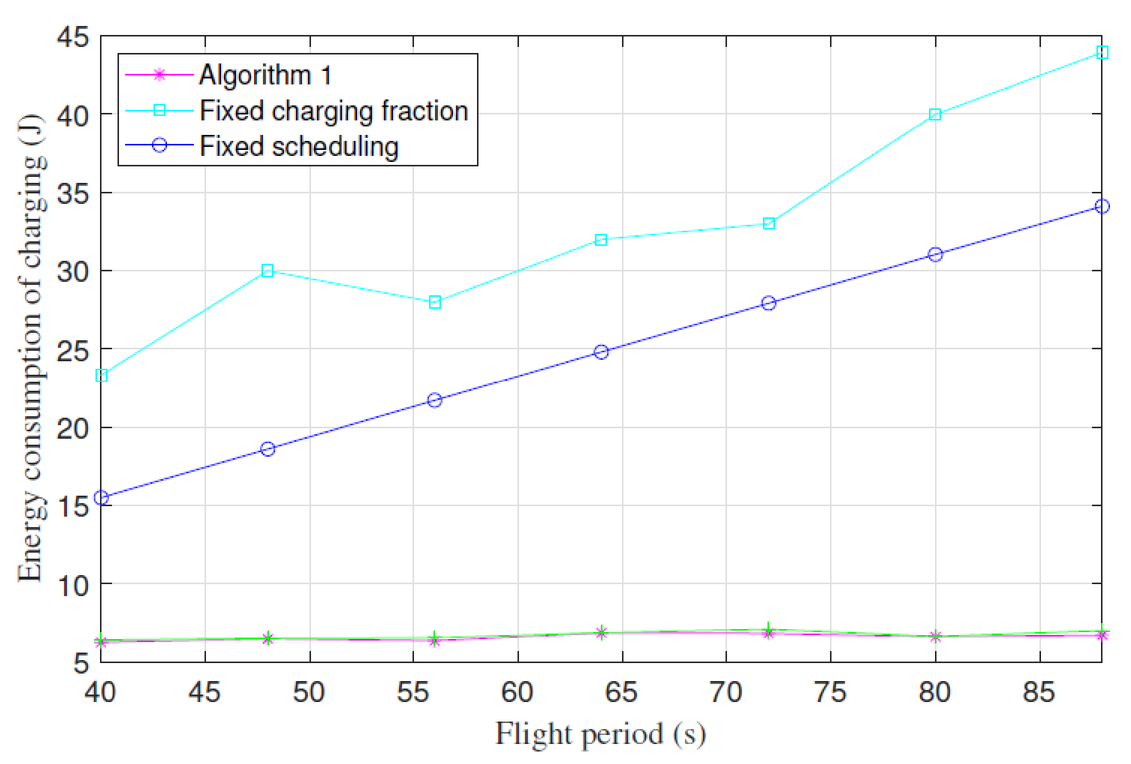
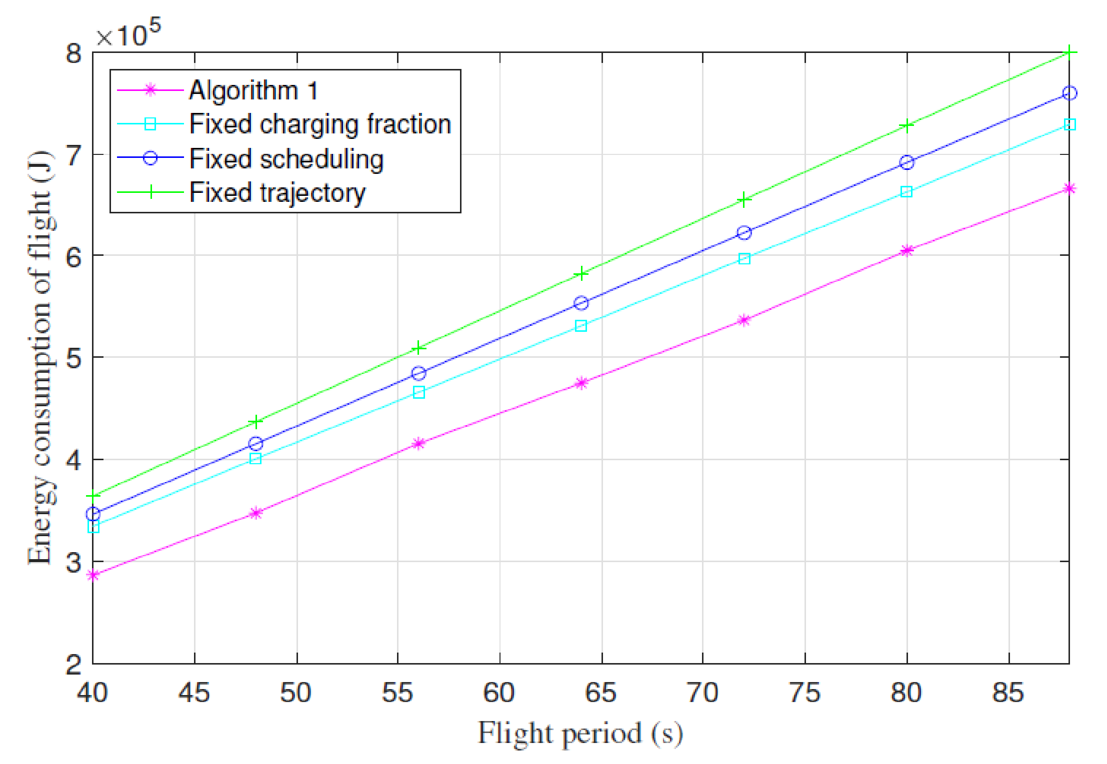
Simulation Results





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Thank you !