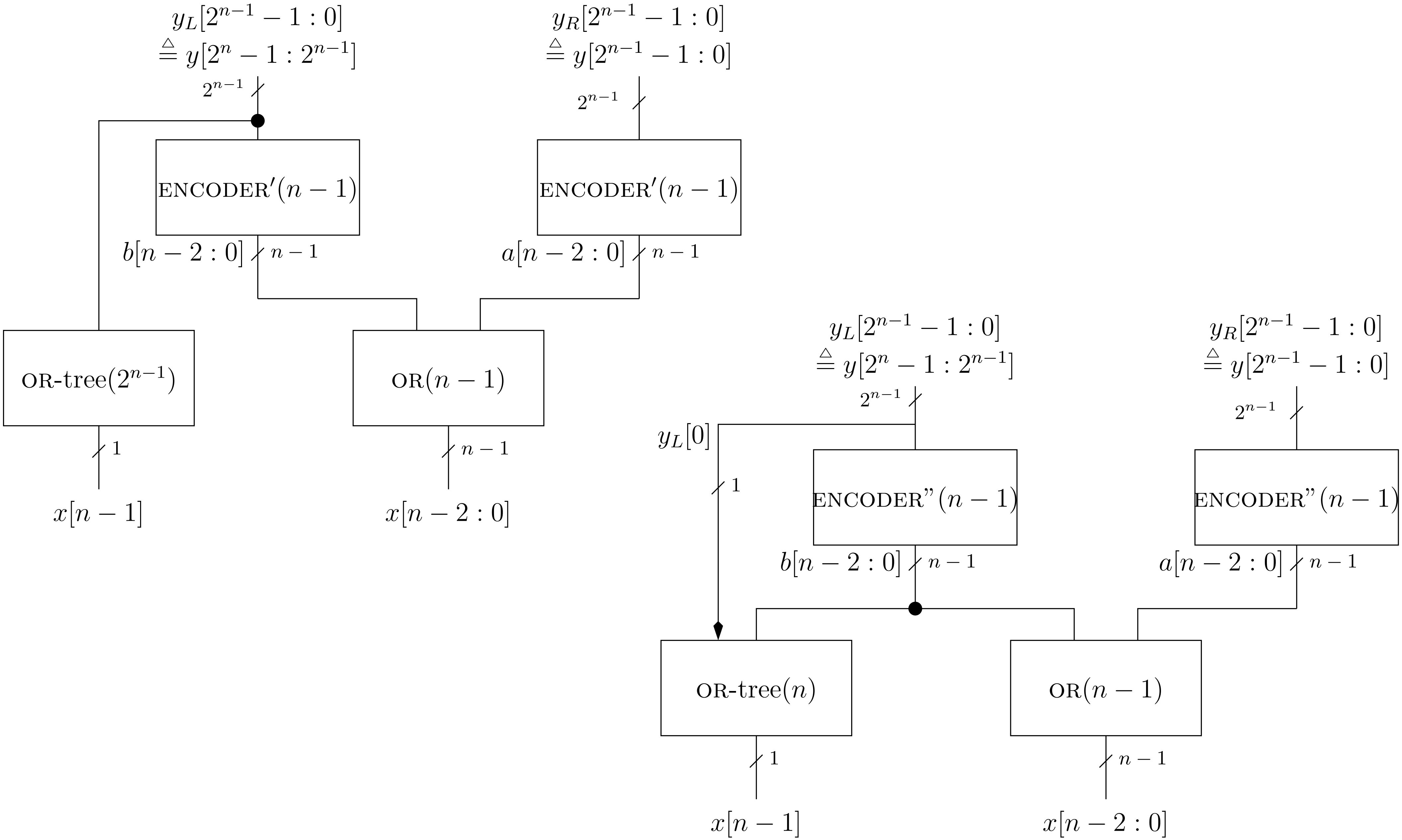
yet another encoder design



Cost analysis of $\textsf{ENCODER}''(n)$

We obtain the recurrence equation:

$$c(n) = \begin{cases} 0 & \text{if n=1} \\ 2 \cdot c(n-1) + 2 \cdot (n-1) \cdot c(\textsf{OR}) & \text{otherwise.} \end{cases}$$

We expand this recurrence to obtain:

$$\begin{aligned} c(n) &= 2 \cdot c(n-1) + 2 \cdot (n-1) \cdot c(\textsf{OR}) \\ &= c(\textsf{OR}) \cdot \left(2(n-1) + 2 \cdot 2(n-2) + \cdots 2^{n-i} \cdot 2(i-1) + \cdots + 2^{n-2} \cdot 2\right) \\ &= c(\textsf{OR}) \cdot 2^n \cdot \left(\frac{1}{2} + \frac{2}{4} + \cdots + \frac{i-1}{2^{(i-1)}} + \cdots + \frac{n-1}{2^{(n-1)}}\right) \\ &\leq c(\textsf{OR}) \cdot 2^n \cdot 2. \end{aligned}$$