APPENDIX A
DERIVATION OF (3)

Assume that each potential relay selects one of the s slots of the contention window and transmits in this slot with a certain probability p. Hereafter, n denotes the number of relay candidates.

The probability that out of n candidates k select the same slot in a contention frame of size s is:

$$P_k = \binom{n}{k} \cdot \left(\frac{1}{s}\right)^k \cdot \left(1 - \frac{1}{s}\right)^{n-k} \ . \tag{4}$$

The probability that only one of those k nodes transmits in the selected slot is

$$P_{1,k} = k\,p\,(1-p)^{k-1} \ . \tag{5}$$

The probability that there is exactly one AFR transmission in a given slot is

$$\begin{aligned} P_1 &= \sum_{k=1}^{n} P_k \cdot P_{1,k} \\ &= (s-p)^{n-1}\,\frac{n\,p}{s^n} \ . \end{aligned} \tag{6}$$

The success probability of the contention frame, i.e., the probability that there is at least a single non-colliding transmission from a relay candidate is

$$P_s = 1 - (1 - P_1)^s \ . \tag{7}$$

The access probability p that maximizes P_s is

$$p_{s1,\max} = \begin{cases} \frac{s}{n} & \text{for } s \leq n \\ 1 & \text{for } s > n \ . \end{cases} \tag{8}$$

APPENDIX B
NODE BEHAVIORS IN DIFFERENT PHASES AND STEPS OF CORE-MAC

Here we present the Standard Description Language (SDL) graphs of the different phases of CoRe-MAC to provide the reader a means to test and validate the protocol. The detailed procedures are described in the main text.

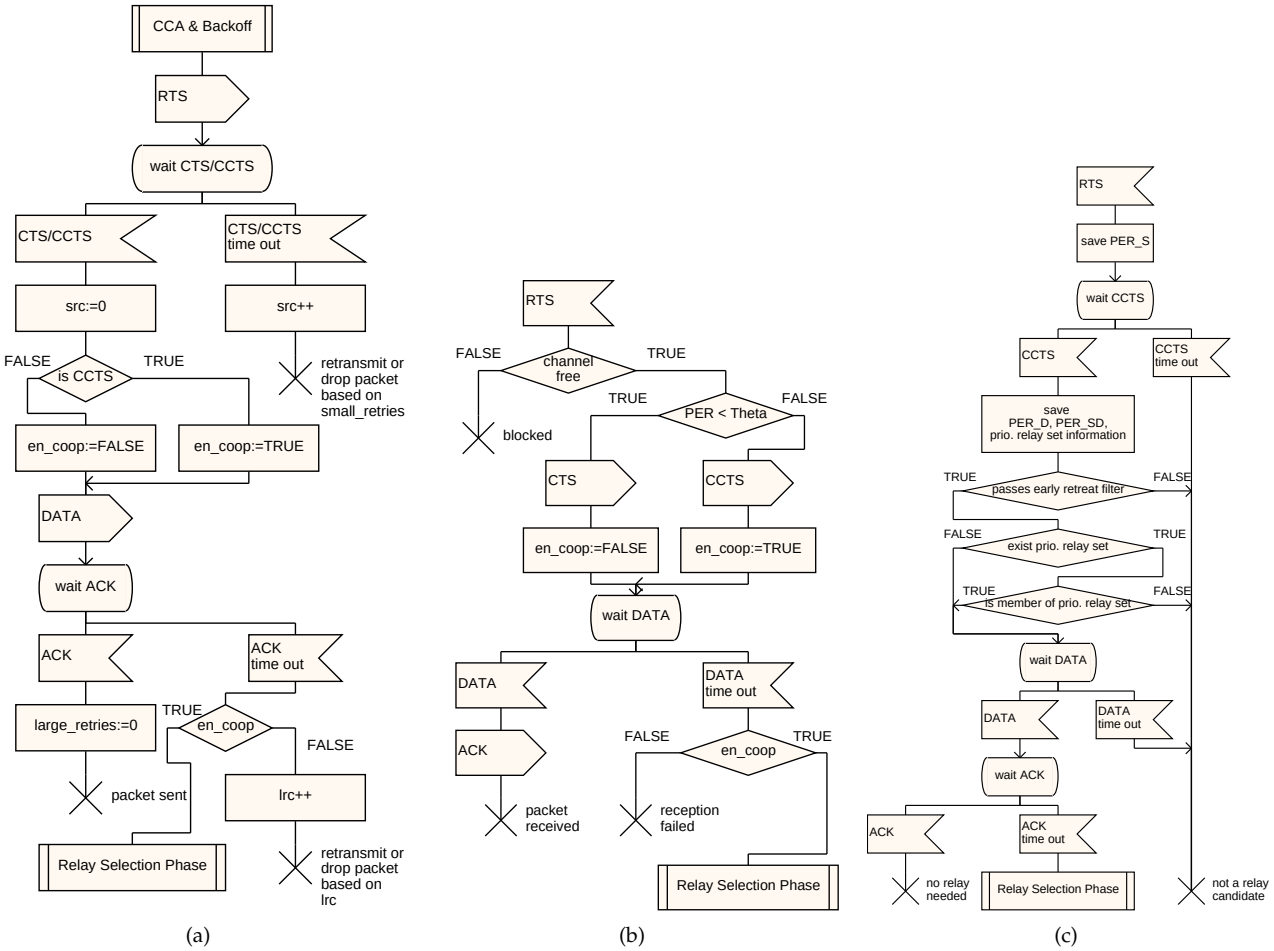

Fig. 19. Behavior of nodes during direct transmission phase: (a) source S, (b) destination D, and (c) neighbors of S and D.

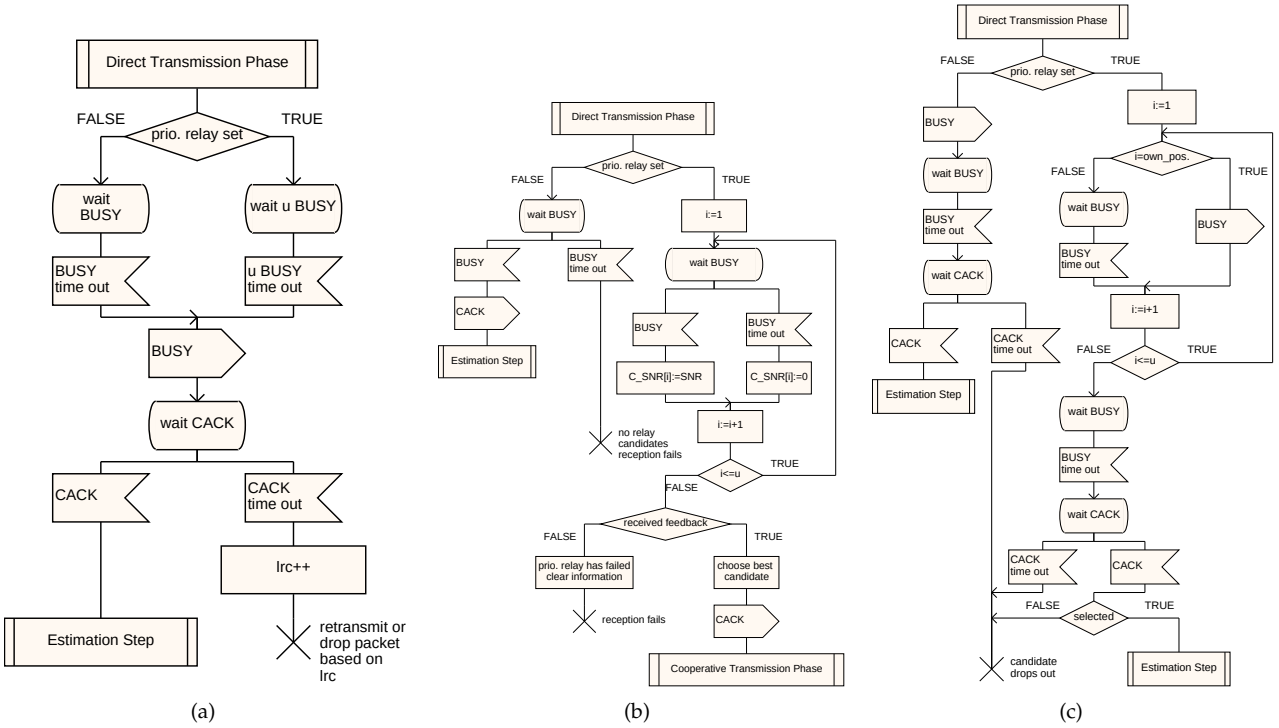

Fig. 20. Behavior of nodes during feedback step: (a) source S, (b) destination D, and (c) relay candidates.

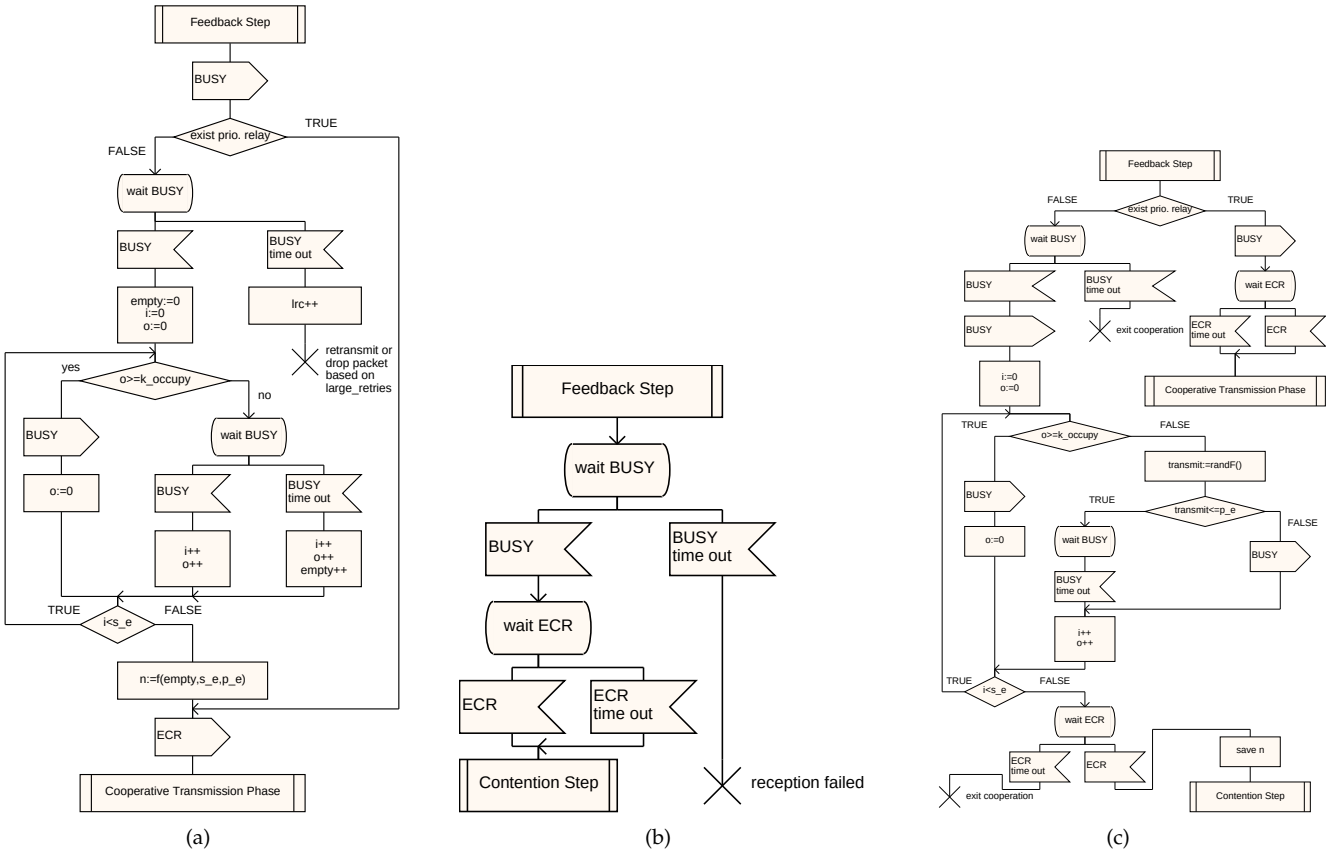

Fig. 21. Behavior of nodes during estimation step: (a) source S, (b) destination D, and (c) relay candidates.

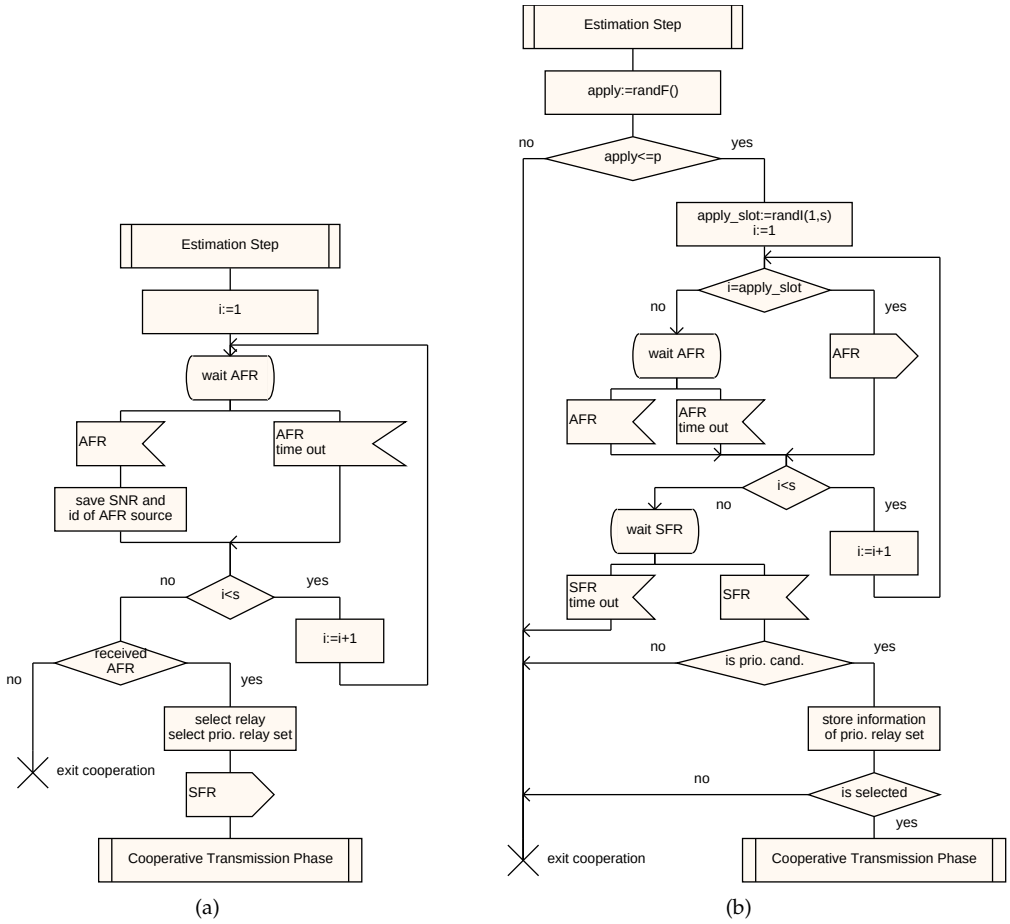

Fig. 22. Behavior of nodes during contention step: (a) destination D and (b) relay candidates.

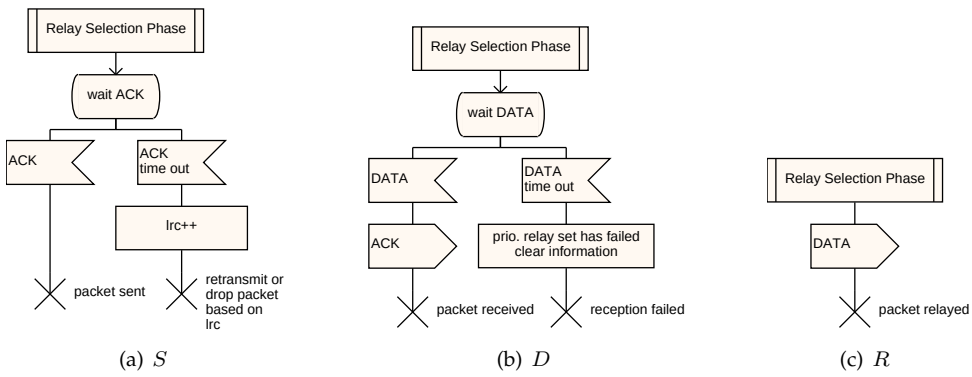

Fig. 23. Behavior of nodes during cooperative transmission phase: (a) source S, (b) destination D, and (c) relay R.