We consider a parallel two-way relaying orthogonal frequency division multiple access (PTWR-OFDMA) scheme based on analog network coding in which mobile terminals (MTs) are divided into near-nodes (NNs) and far-nodes (FNs). An NN communicates with the base station (BS) directly while an FN communicates indirectly via the assistance of NNs. We study the design and analysis issues for PTWR-OFDMA. The proposed scheme has some noticeable advantages. First, the throughput of PTWR-OFDMA increases like $\ln K$, much higher than that of $\ln\ln K$ in conventional OFDMA (K is the number of MTs). Second, PTWR-OFDMA can provide much better fairness than conventional OFDMA. Third, the power overhead per NN reduces quickly when K increases if there is a peak rate limitation, implying that there is no strong incentive for some users to avoid providing relaying.