errors in Li and Hudak's descriptions, not in our models. We suspect most, if not all, of these problems have been corrected by those implementing this protocol (including Li and Hudak). However, corrections to the protocol have never been published. Our analysis therefore reflects problems in the only available protocol description.

Error 1. Multiple processors can claim ownership for the same page because the write servers fail to relinquish ownership when sending grants. From the semi-flow perspective, transitions *swlg*, *swu*, and *hwu* cannot satisfy equations (5) and (6). The corrected model changes transition *swu*, which now puts token <j,p,N,F,∅> (instead of <j,p,N,oj,sj>) in place *PT*; this indicates *j*'s loss of ownership and resets the copy set.

Error 2. Deadlock occurs if a processor requests write access to a page that it owns with read access. Checking sequence 3 unveiled this error. Transition *swlg*, which needs a processor *j* to serve a request from processor *i*, cannot fire with *j=i* because the token <j,p,lj,aj,oj,sj> in place *PT* has lj=T. The handler for *i* has locked the page, waiting for a grant. The server on *i*, meanwhile, waits for the lock to free in order to service the request. Deadlock results. The pseudocode description therefore needs a special case in the write handler for self-requests. Correspondingly, we add transition ***hwol*** *(handler write owner lock)* to the Petri net (Fig. 5). Firing on tokens from *TW* and *PT* indicating self-ownership, *hwol* locks the page and initiates invalidation by putting a token in place *HWI*. We also add guard oi=F to transition *hwl* to distinguish it from the new transition *hwol.*

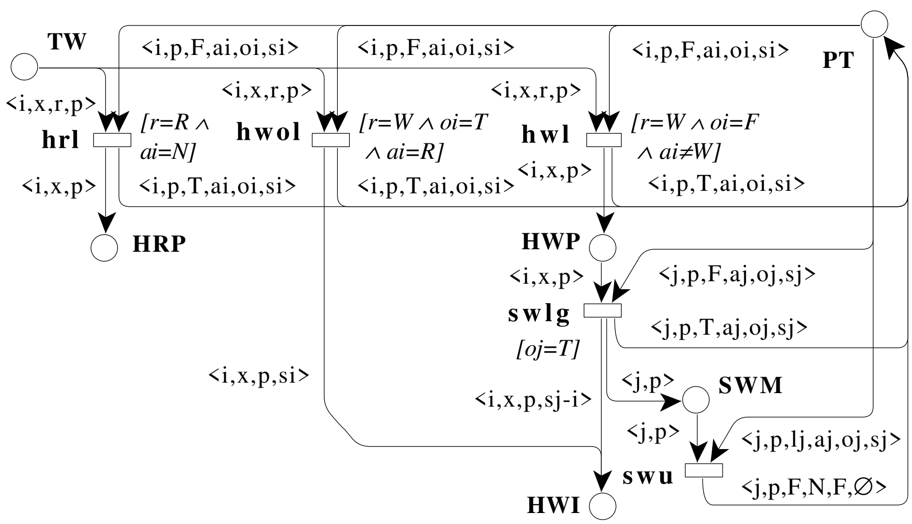

Fig. 5. Corrections for the First Model

Fig. 5 shows the corrections for both errors. It also removes an inefficiency related to invalidations. Consider a processor taking write access to a page for which it had read access. The processor must be in the copy set received from the previous owner. By the pseudocode, the processor therefore sends an (unnecessary) invalidation to itself. Removing the requesting processor from the copy set when the grant is managed avoids the useless invalidation. Fig. 5 adjusts transition *swlg*, putting token <i,x,p,sj-i> (instead of <i,x,p,sj>) in *HWI*. The corrected model satisfies all the desired equations.