A simple client/server system

The system comprises a server and a client, which communicate via a reliable connection. The client initiates service requests ($t_1$) and awaits responses from the server ($t_2$). If there is no response within a reasonable amount of time, the client may repeat the request ($t_3$). Every now and then, the server may mix up things after receiving a request ($t_4$) and return to its initial state ($t_6$) without responding ($t_5$). The request channel is represented by the places $p_s$ (request sent) and $p'_s$ (no request), and the response channel is modelled by $p_r$.

1. Generate the reachability graph of the system.
2. In the graph, indicate those states where a conflict occurs.
3. Consider 3 variations of the system, lacking one or both of the transitions $t_3$ and $t_6$. Draw their reachability graphs. (You may draw them in the same picture using colours or other mark-up.) Indicate deadlock states. Provide a verbal explanation for each deadlock.
4. If the initial marking of $p_1$ is replaced with $M_0(p_1) = n$, the model represents a system with $n$ indistinguishable clients. Transform the place/transition system into a high-level net, where the server does distinguish the clients from each other. (Hint: alter the domains of at least the places $p_1, p_2, p_s, p_r$ and let the initial marking of $p_1$ be $[1, 2, 3, \ldots, n]$.)
5. Unfold the high-level net to a place/transition system in the case $n = 2$.