chain-replication-acks[13,45]

chain-replication-acks{i:l}
(es; Cmd; Rsp; $isupdate$; In; Out; Sys; Ack; f; g; $Delta$; Q)
$\equiv_{\mathrm{def}}$ fifo-antecedent(es;Sys;f) & fifo-antecedent(es;Ack;g)
& ($\forall u$:E(Sys). $(f(u) = u) \iff (\uparrow(u \in_b In))$)
& (E(In) $\subseteq$r E(Sys))
& (E(Out) $\subseteq$r E(Sys))
& (E(Out) $\subseteq$r E(Ack))
& ($\forall e$:E(In). $(\neg(\uparrow(isupdate(In(e))))) \Rightarrow (\uparrow(e \in_b Out))$)
& ($\forall e$:E(Sys). $(\neg(\uparrow(e \in_b In))) \Rightarrow$ (loc($f(e)$) = loc(e)) $\Rightarrow (\neg(\uparrow(e \in_b Out)))$)
& input-forwarding{i:l}
(es; Cmd; Sys; $isupdate$; In; f)
& ($\exists chain$:{e:E| $(\uparrow(e \in_b Sys)) \vee (\uparrow(e \in_b Ack))$} $\rightarrow$(Id List)
(chain-config(es;p-conditional(Ack; Sys);$chain$)
& chain-consistent(f;$chain$)
& ($\forall e$:E(Ack).
($\neg$(loc($g(e)$) = loc(e)))
$\Rightarrow$ (adjacent(Id;$chain(e)$;loc(e);loc($g(e)$))
& adjacent(Id;$chain(g(e))$;loc(e);loc($g(e)$))))))
& ($\forall e$:E(Ack). (loc($g(e)$) = loc(e)) $\Rightarrow (\uparrow(e \in_b Out))$)
& ($\forall e$:E(Ack). $(\uparrow(e \in_b Out)) \Rightarrow (g(e) = e)$)
& ($\forall e$:E(Ack). $(\uparrow((g(e)) \in_b Out)) \Rightarrow$ is-query(In;$isupdate$;$g(e)$) $\Rightarrow (g(e) = e)$)
& ($\forall e$:E(Out).
(is-query(In;$isupdate$;e)
$\Rightarrow$ ($Out(e) = Q$(filter($isupdate$;es-interface-history(es; Sys; e)),$In(e)$)))
& (($\neg$is-query(In;$isupdate$;e))
$\Rightarrow$ ($Out(e) = Delta$(filter($isupdate$;es-interface-history(es; Sys; e))))))
& ($\forall e$:E(Ack).
$Ack(e)$ = if $e \in_b Out$ then ||filter($isupdate$;$Sys(e)$)|| else $Ack(g(e))$ fi)

clarification:

chain-replication-acks{i:l}
(es; Cmd; Rsp; $isupdate$; In; Out; Sys; Ack; f; g; $Delta$; Q)
$\equiv_{\mathrm{def}}$ fifo-antecedent(es;Sys;f) & fifo-antecedent(es;Ack;g)
& ($\forall u$:es-E-interface(es;Sys). ($f(u) = u \in$ es-E(es)) $\iff (\uparrow(u \in_b In))$)
& (es-E-interface(es;In) $\subseteq$r es-E-interface(es;Sys))
& (es-E-interface(es;Out) $\subseteq$r es-E-interface(es;Sys))
& (es-E-interface(es;Out) $\subseteq$r es-E-interface(es;Ack))
& ($\forall e$:es-E-interface(es;In). $(\neg(\uparrow(isupdate(In(e))))) \Rightarrow (\uparrow(e \in_b Out))$)
& ($\forall e$:es-E-interface(es;Sys).
$(\neg(\uparrow(e \in_b In))) \Rightarrow$ (es-loc(es; ($f(e)$)) = es-loc(es; e) $\in$ Id) $\Rightarrow (\neg(\uparrow(e \in_b Out)))$)
& input-forwarding{i:l}

$(es;\ Cmd;\ Sys;\ isupdate;\ In;\ f)$

$\&\ (\exists chain{:}\{e{:}\text{es-E}(es) \mid\ (\uparrow(e \in_b Sys)) \vee (\uparrow(e \in_b Ack))\} \to(\text{Id List})$

$(\text{chain-config}(es;\text{p-conditional}(Ack;\ Sys);chain)$

$\&\ \text{chain-consistent}(es;Sys;In;isupdate;Out;f;chain)$

$\&\ (\forall e{:}\text{es-E-interface}(es;Ack).$

$(\neg(\text{es-loc}(es;\ (g(e))) = \text{es-loc}(es;\ e) \in \text{Id}))$

$\Rightarrow (\text{adjacent}(\text{Id};chain(e);\text{es-loc}(es;\ e);\text{es-loc}(es;\ (g(e))))$

$\&\ \text{adjacent}(\text{Id};chain(g(e));\text{es-loc}(es;\ e);\text{es-loc}(es;\ (g(e))))))))$

$\&\ (\forall e{:}\text{es-E-interface}(es;Ack).$

$(\text{es-loc}(es;\ (g(e))) = \text{es-loc}(es;\ e) \in \text{Id}) \Rightarrow (\uparrow(e \in_b Out)))$

$\&\ (\forall e{:}\text{es-E-interface}(es;Ack).\ (\uparrow(e \in_b Out)) \Rightarrow (g(e) = e \in \text{es-E}(es)))$

$\&\ (\forall e{:}\text{es-E-interface}(es;Ack).$

$(\uparrow((g(e)) \in_b Out)) \Rightarrow \text{is-query}(In;isupdate;g(e)) \Rightarrow (g(e) = e \in \text{es-E}(es)))$

$\&\ (\forall e{:}\text{es-E-interface}(es;Out).$

$(\text{is-query}(In;isupdate;e)$

$\Rightarrow (Out(e) = Q(\text{filter}(isupdate;\text{es-interface-history}(es;\ Sys;\ e)),In(e)) \in Rsp))$

$\&\ ((\neg\text{is-query}(In;isupdate;\text{e}))$

$\Rightarrow (Out(e) = Delta(\text{filter}(isupdate;\text{es-interface-history}(es;\ Sys;\ e))) \in Rsp)))$

$\&\ (\forall e{:}\text{es-E-interface}(es;Ack).$

$Ack(e) = \text{if } e \in_b Out \text{ then } \|\text{filter}(isupdate;Sys(e))\| \text{ else } Ack(g(e)) \text{ fi} \in \mathbb{Z})$

http://www.nuprl.org/FDLcontent/p0_963683_/p0_356716_{chain-replication-acks}.html