

EXTENDS *Naturals*, *FiniteSets*

CONSTANT *Client*, *LoginInfo*, *ValidLogins*, *FileId*, *FileData*, *M*, *Send*(-, -)

ASSUME  $M \in \text{Nat} \wedge M > 0$

ASSUME  $\text{ValidLogins} \subseteq \text{LoginInfo}$

VARIABLE *currentRequests*, *currentConnections*, *authenticatedUsers*, *files*, *active*

$\text{File} \triangleq [\text{allowedUsers} : \text{SUBSET } \text{Client}, \text{data} : \text{FileData}]$

$\text{Msgs} \triangleq \{ \text{"Successful login"}, \text{"Invalid login"}, \text{"File not found"}, \text{"Successful file upload"} \} \cup \text{File}$

ASSUME  $\forall c \in \text{Client}, m \in \text{Msgs} : \text{Send}(c, m) \in \{\text{TRUE}, \text{FALSE}\}$

CONSTANT *NoFile*

ASSUME  $\text{NoFile} \notin \text{File}$

$\text{GetFileRequest} \triangleq [\text{type} : \{ \text{"getFile"} \}, \text{fileId} : \text{FileId}]$

$\text{UploadFileRequest} \triangleq [\text{type} : \{ \text{"uploadFile"} \}, \text{fileId} : \text{FileId}, \text{file} : \text{File}]$

$\text{AuthRequest} \triangleq [\text{type} : \{ \text{"authenticate"} \}, \text{data} : \text{LoginInfo}]$

$\text{Request} \triangleq \text{GetFileRequest} \cup \text{UploadFileRequest} \cup \text{AuthRequest}$

CONSTANT *NoActiveRequest*

ASSUME  $\text{NoActiveRequest} \notin [\text{client} : \text{Client}, \text{request} : \text{Request}]$

$\text{TypeOk} \triangleq \wedge \text{currentRequests} \subseteq [\text{client} : \text{Client}, \text{request} : \text{Request}]$   
 $\wedge \text{currentConnections} \subseteq \text{Client}$   
 $\wedge \text{Cardinality}(\text{currentConnections}) \leq M$   
 $\wedge \text{authenticatedUsers} \subseteq \text{Client}$   
 $\wedge \text{files} \in [\text{FileId} \rightarrow \text{File} \cup \{ \text{NoFile} \}]$   
 $\wedge \text{active} \in [\text{client} : \text{Client}, \text{request} : \text{Request}] \cup \{ \text{NoActiveRequest} \}$

$\text{Init} \triangleq \wedge \text{currentRequests} = \{ \}$   
 $\wedge \text{currentConnections} = \{ \}$   
 $\wedge \text{authenticatedUsers} = \{ \}$   
 $\wedge \text{files} = [\text{fid} \in \text{FileId} \mapsto \text{NoFile}]$   
 $\wedge \text{active} = \text{NoActiveRequest}$

$\text{ReceiveConnection} \triangleq \wedge \text{Cardinality}(\text{currentConnections}) + 1 \leq M$   
 $\wedge \exists c \in \text{Client} \setminus \text{currentConnections} :$   
 $\wedge \text{currentConnections}' = \text{currentConnections} \cup \{ c \}$   
 $\wedge \text{UNCHANGED } \langle \text{active}, \text{authenticatedUsers}, \text{currentRequests}, \text{files} \rangle$

$\text{ReceiveRequest} \triangleq \exists c \in \text{currentConnections}, r \in \text{Request} :$   
 $\wedge \text{currentRequests}' = \text{currentRequests} \cup \{ [\text{client} \mapsto c, \text{request} \mapsto r] \}$   
 $\wedge \text{currentConnections}' = \text{currentConnections} \setminus \{ c \}$   
 $\wedge \text{UNCHANGED } \langle \text{active}, \text{authenticatedUsers}, \text{files} \rangle$

$\text{SelectActive} \triangleq \wedge \text{active} = \text{NoActiveRequest}$

$$\begin{aligned}
& \wedge \text{Cardinality}(\text{currentConnections}) + 1 \leq M \\
& \wedge \exists cr \in \text{currentRequests} : \\
& \quad \wedge \text{active}' = cr \\
& \quad \wedge \text{currentConnections}' = \text{currentConnections} \cup \{cr.\text{client}\} \\
& \quad \wedge \text{currentRequests}' = \text{currentRequests} \setminus \{cr\} \\
& \quad \wedge \text{UNCHANGED } \langle \text{authenticatedUsers}, \text{files} \rangle \\
\text{RespondToAuth} & \triangleq \wedge \text{active}' = \text{NoActiveRequest} \\
& \wedge \text{currentConnections}' = \text{currentConnections} \setminus \{\text{active}.\text{client}\} \\
& \wedge \text{UNCHANGED } \langle \text{currentRequests}, \text{files} \rangle \\
& \wedge \text{IF } \text{active}.\text{request}.\text{data} \in \text{ValidLogins} \\
& \quad \text{THEN } \wedge \text{Send}(\text{active}.\text{client}, \text{"Successful login"}) \\
& \quad \quad \wedge \text{authenticatedUsers}' = \text{authenticatedUsers} \cup \{\text{active}.\text{client}\} \\
& \quad \text{ELSE } \wedge \text{Send}(\text{active}.\text{client}, \text{"Invalid login"}) \\
& \quad \quad \wedge \text{active}' = \text{NoActiveRequest} \\
& \quad \quad \wedge \text{currentConnections}' = \text{currentConnections} \setminus \{\text{active}.\text{client}\} \\
& \quad \quad \wedge \text{UNCHANGED } \text{authenticatedUsers} \\
\text{RespondToGetFile} & \triangleq \wedge \text{active}' = \text{NoActiveRequest} \\
& \wedge \text{currentConnections}' = \text{currentConnections} \setminus \{\text{active}.\text{client}\} \\
& \wedge \text{UNCHANGED } \langle \text{currentRequests}, \text{authenticatedUsers}, \text{files} \rangle \\
& \wedge \text{IF } \text{files}[\text{active}.\text{request}.\text{fileId}] \neq \text{NoFile} \\
& \quad \text{THEN} \\
& \quad \quad \text{IF } \text{active}.\text{client} \in \text{authenticatedUsers} \cap \text{files}[\text{active}.\text{request}.\text{fileId}].\text{allowedUsers} \\
& \quad \quad \quad \text{THEN } \text{Send}(\text{active}.\text{client}, \text{files}[\text{active}.\text{request}.\text{fileId}]) \\
& \quad \quad \quad \text{ELSE } \text{Send}(\text{active}.\text{client}, \text{"Unauthorized access to file"}) \\
& \quad \text{ELSE } \text{Send}(\text{active}.\text{client}, \text{"File not found"}) \\
\text{RespondToUploadFile} & \triangleq \wedge \text{active}' = \text{NoActiveRequest} \\
& \wedge \text{currentConnections}' = \text{currentConnections} \setminus \{\text{active}.\text{client}\} \\
& \wedge \text{UNCHANGED } \langle \text{currentRequests}, \text{authenticatedUsers} \rangle \\
& \wedge \text{files}' = [\text{files} \text{ EXCEPT } ![\text{active}.\text{request}.\text{fileId}] = \text{active}.\text{request}.\text{file}] \\
& \wedge \text{Send}(\text{active}.\text{client}, \text{"Successful file upload"}) \\
\text{RespondToActive} & \triangleq \wedge \text{active} \neq \text{NoActiveRequest} \\
& \wedge \vee \wedge \text{active}.\text{request}.\text{type} = \text{"authenticate"} \\
& \quad \wedge \text{RespondToAuth} \\
& \vee \wedge \text{active}.\text{request}.\text{type} = \text{"getFile"} \\
& \quad \wedge \text{RespondToGetFile} \\
& \vee \wedge \text{active}.\text{request}.\text{type} = \text{"uploadFile"} \\
& \quad \wedge \text{RespondToUploadFile} \\
\text{Next} & \triangleq \vee \text{ReceiveConnection} \\
& \vee \text{ReceiveRequest} \\
& \vee \text{SelectActive} \\
& \vee \text{RespondToActive}
\end{aligned}$$

---

\\* Modification History  
\\* Last modified *Fri Feb 24 20:55:14 ART 2023* by *lautarog*  
\\* Created *Thu Feb 23 21:32:28 ART 2023* by *lautarog*