

## t9\_osafree

(TMSjVJoC8JbojVvSgT1wGx9S7E1xPSHeHXE)

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Let  $v2\_struct\_0 : \iota \Rightarrow o$  be given. Let  $v11\_struct\_0 : \iota \Rightarrow o$  be given. Let  $v4\_osalg\_1 : \iota \Rightarrow o$  be given. Let  $v5\_osalg\_1 : \iota \Rightarrow o$  be given. Let  $l3\_osalg\_1 : \iota \Rightarrow o$  be given. Let  $v1\_relat\_1 : \iota \Rightarrow o$  be given. Let  $v2\_relat\_1 : \iota \Rightarrow o$  be given. Let  $v4\_relat\_1 : \iota \Rightarrow \iota \Rightarrow o$  be given. Let  $u1\_struct\_0 : \iota \Rightarrow \iota$  be given. Let  $v1\_funct\_1 : \iota \Rightarrow o$  be given. Let  $v1\_partfun1 : \iota \Rightarrow \iota \Rightarrow o$  be given. Let  $m1\_subset\_1 : \iota \Rightarrow \iota \Rightarrow o$  be given. Let  $k1\_funct\_1 : \iota \Rightarrow \iota \Rightarrow \iota$  be given. Let  $u3\_msualg\_1 : \iota \Rightarrow \iota \Rightarrow \iota$  be given. Let  $k8\_osafree : \iota \Rightarrow \iota \Rightarrow \iota$  be given. Let  $m1\_dtconstr : \iota \Rightarrow \iota \Rightarrow \iota \Rightarrow o$  be given. Let  $k2\_osafree : \iota \Rightarrow \iota \Rightarrow \iota$  be given. Let  $k5\_trees\_3 : \iota \Rightarrow \iota$  be given. Let  $k4\_dtconstr : \iota \Rightarrow \iota$  be given. Let  $r3\_orders\_2 : \iota \Rightarrow \iota \Rightarrow \iota \Rightarrow o$  be given. Let  $k1\_trees\_4 : \iota \Rightarrow \iota$  be given. Let  $k4\_tarSKI : \iota \Rightarrow \iota \Rightarrow \iota$  be given. Let  $u4\_struct\_0 : \iota \Rightarrow \iota$  be given. Let  $k1\_xboole\_0 : \iota$  be given. Let  $k2\_msualg\_1 : \iota \Rightarrow \iota \Rightarrow \iota$  be given. Let  $l1\_msualg\_1 : \iota \Rightarrow o$  be given. Let  $m2\_pboole : \iota \Rightarrow \iota \Rightarrow \iota \Rightarrow \iota \Rightarrow o$  be given. Let  $k3\_relat\_1 : \iota \Rightarrow \iota \Rightarrow \iota$  be given. Let  $u1\_msualg\_1 : \iota \Rightarrow \iota$  be given. Let  $k6\_finseq\_2 : \iota \Rightarrow \iota \Rightarrow \iota$  be given. Let  $u2\_msualg\_1 : \iota \Rightarrow \iota$  be given. Let  $g3\_msualg\_1 : \iota \Rightarrow \iota \Rightarrow \iota \Rightarrow \iota$  be given. Let  $v3\_msualg\_1 : \iota \Rightarrow \iota \Rightarrow o$  be given. Let  $v4\_msualg\_1 : \iota \Rightarrow \iota \Rightarrow o$  be given. Let  $v12\_osalg\_1 : \iota \Rightarrow \iota \Rightarrow o$  be given. Let  $k5\_osafree : \iota \Rightarrow \iota \Rightarrow \iota$  be given. Let  $v11\_osalg\_1 : \iota \Rightarrow \iota \Rightarrow o$  be given. Let  $l1\_osalg\_1 : \iota \Rightarrow o$  be given. Let  $l2\_osalg\_1 : \iota \Rightarrow o$  be given. Let  $l3\_msualg\_1 : \iota \Rightarrow \iota \Rightarrow o$  be given. Let  $k7\_osafree : \iota \Rightarrow \iota \Rightarrow \iota$  be given. Let  $k4\_osafree : \iota \Rightarrow \iota \Rightarrow \iota \Rightarrow \iota$  be given. Let  $u4\_msualg\_1 : \iota \Rightarrow \iota \Rightarrow \iota$  be given. Assume the following.

$$\begin{aligned}
 & \forall X0. \forall X1. \forall X2. (((\neg v2\_struct\_0 X0) \wedge (l1\_msualg\_1 \\
 & X0)) \wedge (((v1\_relat\_1 X1) \wedge ((v4\_relat\_1 X1 (u1\_struct\_0 X0)) \wedge (( \\
 & v1\_funct\_1 X1) \wedge (v1\_partfun1 X1 (u1\_struct\_0 X0)))))) \wedge (m2\_pboole \\
 & X2 (u4\_struct\_0 X0) (k3\_relat\_1 (u1\_msualg\_1 X0) (k6\_finseq\_2 \\
 & (u1\_struct\_0 X0) X1)) (k3\_relat\_1 (u2\_msualg\_1 X0) X1)))) \Rightarrow (\forall X3. \\
 & \forall X4. \forall X5. (g3\_msualg\_1 X0 X1 X2 = g3\_msualg\_1 X3 X4 X5) \Rightarrow \\
 & ((X0 = X3) \wedge ((X1 = X4) \wedge (X2 = X5))))
 \end{aligned} \tag{1}$$

Assume the following.

$$\begin{aligned} \forall X0.\forall X1.(((\neg v2\_struct\_0 X0)\wedge(\neg v11\_struct\_0 X0)\wedge \\ ((v4\_osalg\_1 X0)\wedge(v5\_osalg\_1 X0)\wedge(l3\_osalg\_1 X0))))\wedge((v1\_relat\_1 \\ X1)\wedge((v2\_relat\_1 X1)\wedge((v4\_relat\_1 X1 (u1\_struct\_0 X0))\wedge((v1\_funct\_1 \\ X1)\wedge(v1\_partfun1 X1 (u1\_struct\_0 X0))))))\Rightarrow((v3\_msualg\_1 (k8\_osafree \\ X0 X1) X0)\wedge((v4\_msualg\_1 (k8\_osafree X0 X1) X0)\wedge(v12\_osalg\_1 ( \\ k8\_osafree X0 X1) X0))) \end{aligned} \quad (2)$$

Assume the following.

$$\begin{aligned} \forall X0.\forall X1.(((\neg v2\_struct\_0 X0)\wedge(\neg v11\_struct\_0 X0)\wedge \\ ((v4\_osalg\_1 X0)\wedge(v5\_osalg\_1 X0)\wedge(l3\_osalg\_1 X0))))\wedge((v1\_relat\_1 \\ X1)\wedge((v2\_relat\_1 X1)\wedge((v4\_relat\_1 X1 (u1\_struct\_0 X0))\wedge((v1\_funct\_1 \\ X1)\wedge(v1\_partfun1 X1 (u1\_struct\_0 X0))))))\Rightarrow((v1\_relat\_1 (k5\_osafree \\ X0 X1))\wedge((v2\_relat\_1 (k5\_osafree X0 X1))\wedge((v4\_relat\_1 (k5\_osafree \\ X0 X1) (u1\_struct\_0 X0))\wedge((v1\_funct\_1 (k5\_osafree X0 X1))\wedge((v1\_partfun1 \\ (k5\_osafree X0 X1) (u1\_struct\_0 X0))\wedge(v11\_osalg\_1 (k5\_osafree \\ X0 X1) X0)))))) \end{aligned} \quad (3)$$

Assume the following.

$$\forall X0.(l3\_osalg\_1 X0)\Rightarrow((l1\_osalg\_1 X0)\wedge(l2\_osalg\_1 X0)) \quad (4)$$

Assume the following.

$$\forall X0.(l1\_osalg\_1 X0)\Rightarrow(l1\_msualg\_1 X0) \quad (5)$$

Assume the following.

$$\begin{aligned} \forall X0.\forall X1.(((\neg v2\_struct\_0 X0)\wedge(\neg v11\_struct\_0 X0)\wedge \\ ((v4\_osalg\_1 X0)\wedge(v5\_osalg\_1 X0)\wedge(l3\_osalg\_1 X0))))\wedge((v1\_relat\_1 \\ X1)\wedge((v2\_relat\_1 X1)\wedge((v4\_relat\_1 X1 (u1\_struct\_0 X0))\wedge((v1\_funct\_1 \\ X1)\wedge(v1\_partfun1 X1 (u1\_struct\_0 X0))))))\Rightarrow((v12\_osalg\_1 (k8\_osafree \\ X0 X1) X0)\wedge(l3\_msualg\_1 (k8\_osafree X0 X1) X0)) \end{aligned} \quad (6)$$

Assume the following.

$$\begin{aligned} \forall X0.\forall X1.(((\neg v2\_struct\_0 X0)\wedge(\neg v11\_struct\_0 X0)\wedge \\ ((v4\_osalg\_1 X0)\wedge(v5\_osalg\_1 X0)\wedge(l3\_osalg\_1 X0))))\wedge((v1\_relat\_1 \\ X1)\wedge((v2\_relat\_1 X1)\wedge((v4\_relat\_1 X1 (u1\_struct\_0 X0))\wedge((v1\_funct\_1 \\ X1)\wedge(v1\_partfun1 X1 (u1\_struct\_0 X0))))))\Rightarrow(m2\_pboole (k7\_osafree \\ X0 X1) (u4\_struct\_0 X0) (k3\_relat\_1 (u1\_msualg\_1 X0) (k6\_finseq\_2 \\ (u1\_struct\_0 X0) (k5\_osafree X0 X1))) (k3\_relat\_1 (u2\_msualg\_1 \\ X0) (k5\_osafree X0 X1))) \end{aligned} \quad (7)$$

Assume the following.

$$\begin{aligned}
& \forall X0.((\neg v2\_struct\_0 X0) \wedge ((\neg v11\_struct\_0 X0) \wedge ((v4\_osalg\_1 \\
& X0) \wedge ((v5\_osalg\_1 X0) \wedge (l3\_osalg\_1 X0)))))) \Rightarrow (\forall X1.((v1\_relat\_1 \\
& X1) \wedge ((v2\_relat\_1 X1) \wedge ((v4\_relat\_1 X1 (u1\_struct\_0 X0)) \wedge ((v1\_funct\_1 \\
& X1) \wedge (v1\_partfun1 X1 (u1\_struct\_0 X0)))))) \Rightarrow (\forall X2.((v1\_relat\_1 \\
& X2) \wedge ((v4\_relat\_1 X2 (u1\_struct\_0 X0)) \wedge ((v1\_funct\_1 X2) \wedge ((v1\_partfun1 \\
& X2 (u1\_struct\_0 X0)) \wedge (v11\_osalg\_1 X2 X0)))))) \Rightarrow ((X2 = k5\_osafree \\
& X0 X1) \Leftrightarrow (\forall X3.(m1\_subset\_1 X3 (u1\_struct\_0 X0)) \Rightarrow (k1\_funct\_1 \\
& X2 X3 = k4\_osafree X0 X1 X3))))))
\end{aligned} \tag{8}$$

Assume the following.

$$\begin{aligned}
& \forall X0.((\neg v2\_struct\_0 X0) \wedge ((\neg v11\_struct\_0 X0) \wedge ((v4\_osalg\_1 \\
& X0) \wedge ((v5\_osalg\_1 X0) \wedge (l3\_osalg\_1 X0)))))) \Rightarrow (\forall X1.((v1\_relat\_1 \\
& X1) \wedge ((v2\_relat\_1 X1) \wedge ((v4\_relat\_1 X1 (u1\_struct\_0 X0)) \wedge ((v1\_funct\_1 \\
& X1) \wedge (v1\_partfun1 X1 (u1\_struct\_0 X0)))))) \Rightarrow (\forall X2.(m1\_subset\_1 \\
& X2 (u1\_struct\_0 X0)) \Rightarrow (k4\_osafree X0 X1 X2 = ReplSep (toset (\lambda X3 : \\
& \iota.m1\_dtconstr X3 (u1\_struct\_0 (k2\_osafree X0 X1)) (k5\_trees\_3 \\
& (u1\_struct\_0 (k2\_osafree X0 X1))) (k4\_dtconstr (k2\_osafree X0 \\
& X1)))) (\lambda X3 : \iota.\neg(\forall X4.(m1\_subset\_1 X4 (u1\_struct\_0 \\
& X0)) \Rightarrow (\forall X5.\neg(r3\_orders\_2 X0 X4 X2) \wedge ((X5 \in k1\_funct\_1 X1 X4) \wedge \\
& (X3 = k1\_trees\_4 (k4\_tarski X5 X4)))))) \wedge (\forall X4.(m1\_subset\_1 \\
& X4 (u4\_struct\_0 X0)) \Rightarrow (\neg(k4\_tarski X4 (u1\_struct\_0 X0) = k1\_funct\_1 \\
& X3 k1\_xboole\_0) \wedge (r3\_orders\_2 X0 (k2\_msualg\_1 X0 X4) X2)))) (\lambda X3 : \\
& \iota.X3))))))
\end{aligned} \tag{9}$$

Assume the following.

$$\begin{aligned}
& \forall X0.((\neg v2\_struct\_0 X0) \wedge ((\neg v11\_struct\_0 X0) \wedge ((v4\_osalg\_1 \\
& X0) \wedge ((v5\_osalg\_1 X0) \wedge (l3\_osalg\_1 X0)))))) \Rightarrow (\forall X1.((v1\_relat\_1 \\
& X1) \wedge ((v2\_relat\_1 X1) \wedge ((v4\_relat\_1 X1 (u1\_struct\_0 X0)) \wedge ((v1\_funct\_1 \\
& X1) \wedge (v1\_partfun1 X1 (u1\_struct\_0 X0)))))) \Rightarrow (k8\_osafree X0 X1 = \\
& g3\_msualg\_1 X0 (k5\_osafree X0 X1) (k7\_osafree X0 X1)))
\end{aligned} \tag{10}$$

Assume the following.

$$\begin{aligned}
& \forall X0.\forall X1.(((\neg v2\_struct\_0 X0) \wedge (l1\_msualg\_1 X0)) \wedge \\
& (l3\_msualg\_1 X1 X0)) \Rightarrow ((v3\_msualg\_1 X1 X0) \Rightarrow (X1 = g3\_msualg\_1 X0 \\
& (u3\_msualg\_1 X0 X1) (u4\_msualg\_1 X0 X1)))
\end{aligned} \tag{11}$$

**Theorem 1**

$$\begin{aligned} & \forall X0.((\neg v2\_struct\_0 X0) \wedge ((\neg v11\_struct\_0 X0) \wedge ((v4\_osalg\_1 \\ & X0) \wedge ((v5\_osalg\_1 X0) \wedge (l3\_osalg\_1 X0)))))) \Rightarrow (\forall X1.((v1\_relat\_1 \\ X1) \wedge ((v2\_relat\_1 X1) \wedge ((v4\_relat\_1 X1 (u1\_struct\_0 X0)) \wedge ((v1\_funct\_1 \\ X1) \wedge (v1\_partfun1 X1 (u1\_struct\_0 X0)))))) \Rightarrow (\forall X2.(m1\_subset\_1 \\ X2 (u1\_struct\_0 X0)) \Rightarrow (k1\_funct\_1 (u3\_msualg\_1 X0 (k8\_osafree \\ X0 X1)) X2 = ReplSep (toset (\lambda X3 : \iota.m1\_dtconstr X3 (u1\_struct\_0 \\ (k2\_osafree X0 X1)) (k5\_trees\_3 (u1\_struct\_0 (k2\_osafree X0 X1))) \\ (k4\_dtconstr (k2\_osafree X0 X1)))) (\lambda X3 : \iota.\neg(\forall X4. \\ (m1\_subset\_1 X4 (u1\_struct\_0 X0)) \Rightarrow (\forall X5.\neg(r3\_orders\_2 \\ X0 X4 X2) \wedge ((X5 \in k1\_funct\_1 X1 X4) \wedge (X3 = k1\_trees\_4 (k4\_tarski X5 \\ X4)))))) \wedge (\forall X4.(m1\_subset\_1 X4 (u4\_struct\_0 X0)) \Rightarrow (\neg(k4\_tarski \\ X4 (u1\_struct\_0 X0) = k1\_funct\_1 X3 k1\_xboole\_0) \wedge (r3\_orders\_2 \\ X0 (k2\_msualg\_1 X0 X4) X2)))) (\lambda X3 : \iota.X3)))) \end{aligned}$$