$$\begin{aligned} \tau &\in \llbracket \mathcal{P} \rrbracket, t_{max} \geq \max(\tau), \\ \frac{N_P \in \mathsf{Nonce}_P}{\tau \cdot (t_{max}, \operatorname{send}_P(N_P)) \in \llbracket \mathcal{P} \rrbracket} \ \mathsf{P1} \end{aligned}$$

$$\begin{aligned} \tau &\in \llbracket \mathcal{P} \rrbracket, t_{max} \geq \max(\tau), \\ \frac{(t_1, \text{recv}_V(N_P)) \in \tau, N_V \in \mathsf{Nonce}_V}{\tau \cdot (t_{max}, \text{send}_V(MAC_{k(V,P)}(N_P, N_V), N_V)) \in \llbracket \mathcal{P} \rrbracket} \ \, \mathtt{V1} \end{aligned}$$

$$\frac{\tau \in \llbracket \mathcal{P} \rrbracket, t_{max} \ge \max(\tau), (t_1, \text{send}_P(N_P)) \in \tau,}{(t_2, \text{recv}_P(MAC_{k(V,P)}(N_P, N_V), N_V))} + \frac{(t_2, \text{recv}_P(MAC_{k(V,P)}(N_P, N_V), N_V))}{\tau \cdot (t_{max}, \text{claim}_P(auth, V)) \in \llbracket \mathcal{P} \rrbracket}$$
P2

$$\begin{aligned} \tau &\in \llbracket \mathcal{P} \rrbracket, t_{max} \geq \max(\tau), (t_1, \operatorname{recv}_V(N_P)) \in \tau, \\ &(t_2, \operatorname{send}_V(MAC_{k(V,P)}(N_P, N_V), N_V)) \in \tau, \\ &\underbrace{C \in \mathsf{Nonce}_V} \\ &\tau \cdot (t_{max}, \operatorname{send}_V(C)) \in \llbracket \mathcal{P} \rrbracket \end{aligned}$$

$$\begin{split} \tau \in \llbracket \mathcal{P} \rrbracket, t_{max} &\geq \max(\tau), (t_1, \operatorname{send}_P(N_P)) \in \tau, \\ (t_2, \operatorname{recv}_P(MAC_{k(V,P)}(N_P, N_V))) &\in \tau, \\ \underbrace{(t_3, \operatorname{recv}_P(C)) \in \tau}_{\tau \cdot (t_{max}, \operatorname{send}_P(h(k(P, V), N_P, N_V, C)) \in \llbracket \mathcal{P} \rrbracket} \end{split}$$

 $\tau \cdot (t_{max}, \text{claim}_{V}(erasure, P, h(k(P, V), N_P, N_V, C))) \in \mathbb{IPI}$ 

$$\tau \in \llbracket \mathcal{P} \rrbracket, t_{max} \geq \max(\tau), (t_1, \operatorname{recv}_V(N_P)) \in \tau, \\ (t_2, \operatorname{send}_V(MAC_{k(V,P)}(N_P, N_V))) \in \tau, \\ (t_3, \operatorname{send}_V(C)) \in \tau, (t_4, \operatorname{recv}_V(h(k(P, V), N_P, N_V, C)) \in \tau \\ (t_4, \operatorname{recv}_V(h(k(P, V), N_P, N_V, C))) \in \tau \\ (t_4, \operatorname{recv}_V(h(k(P, V), N_P, N_V, C))) \in \tau \\ (t_4, \operatorname{recv}_V(h(k(P, V), N_P, N_V, C))) \in \tau \\ (t_4, \operatorname{recv}_V(h(k(P, V), N_P, N_V, C))) \in \tau \\ (t_4, \operatorname{recv}_V(h(k(P, V), N_P, N_V, C))) \in \tau \\ (t_4, \operatorname{recv}_V(h(k(P, V), N_P, N_V, C))) \in \tau \\ (t_4, \operatorname{recv}_V(h(k(P, V), N_P, N_V, C))) \in \tau \\ (t_5, \operatorname{recv}_V(h(k(P, V), N_P, N_V, C))) \in \tau \\ (t_6, \operatorname{recv}_V(h(k(P, V), N_P, N_V, C))) \in \tau \\ (t_7, \operatorname{recv}_V(h(k(P, V), N_P, N_V, C))) \in \tau \\ (t_8, \operatorname{recv}_V(h(k(P, V), N_P, N_V, C))) \in \tau \\ (t_8, \operatorname{recv}_V(h(k(P, V), N_P, N_V, C))) \in \tau \\ (t_8, \operatorname{recv}_V(h(k(P, V), N_P, N_V, C))) \in \tau \\ (t_8, \operatorname{recv}_V(h(k(P, V), N_P, N_V, C))) \in \tau \\ (t_8, \operatorname{recv}_V(h(k(P, V), N_P, N_V, C))) \in \tau \\ (t_8, \operatorname{recv}_V(h(k(P, V), N_P, N_V, C))) \in \tau \\ (t_8, \operatorname{recv}_V(h(k(P, V), N_P, N_V, C))) \in \tau \\ (t_8, \operatorname{recv}_V(h(k(P, V), N_P, N_V, C))) \in \tau \\ (t_8, \operatorname{recv}_V(h(k(P, V), N_P, N_V, C))) \in \tau \\ (t_8, \operatorname{recv}_V(h(k(P, V), N_P, N_V, C))) \in \tau \\ (t_8, \operatorname{recv}_V(h(k(P, V), N_P, N_V, C))) \in \tau \\ (t_8, \operatorname{recv}_V(h(k(P, V), N_P, N_V, C))) \in \tau \\ (t_8, \operatorname{recv}_V(h(k(P, V), N_P, N_V, C))) \in \tau \\ (t_8, \operatorname{recv}_V(h(k(P, V), N_P, N_V, C))) \in \tau \\ (t_8, \operatorname{recv}_V(h(k(P, V), N_P, N_V, C))) \in \tau \\ (t_8, \operatorname{recv}_V(h(k(P, V), N_P, N_V, C))) \in \tau \\ (t_8, \operatorname{recv}_V(h(k(P, V), N_P, N_V, C))) \in \tau \\ (t_8, \operatorname{recv}_V(h(k(P, V), N_P, N_V, C))) \in \tau \\ (t_8, \operatorname{recv}_V(h(k(P, V), N_P, N_V, C))) \in \tau \\ (t_8, \operatorname{recv}_V(h(k(P, V), N_P, N_V, C))) \in \tau \\ (t_8, \operatorname{recv}_V(h(k(P, V), N_P, N_V, C))) \in \tau \\ (t_8, \operatorname{recv}_V(h(k(P, V), N_P, N_V, C))) \in \tau \\ (t_8, \operatorname{recv}_V(h(k(P, V), N_P, N_V, C))) \in \tau \\ (t_8, \operatorname{recv}_V(h(k(P, V), N_P, N_V, C))) \in \tau \\ (t_8, \operatorname{recv}_V(h(k(P, V), N_P, N_V, C))) \in \tau \\ (t_8, \operatorname{recv}_V(h(k(P, V), N_P, N_V, C)) \in \tau \\ (t_8, \operatorname{recv}_V(h(k(P, V), N_P, N_V, C)) \in \tau \\ (t_8, \operatorname{recv}_V(h(k(P, V), N_P, N_V, C)) \in \tau \\ (t_8, \operatorname{recv}_V(h(k(P, V), N_P, N_V, C)) \in \tau$$