

$$\begin{aligned}
\varphi_1 \mathbf{W} \varphi_2 &\stackrel{\text{def}}{=} (\varphi_1 \mathbf{U} \varphi_2) \vee \mathbf{G} \varphi_1 \\
&\stackrel{\text{n,dsc,t}}{=} \boxed{\varphi_1} \mathbf{U} (\boxed{\varphi_2} \wedge (\boxed{\varphi_1} \vee \textit{sing}) \wedge \textit{alive}) \vee \\
&\quad \neg(\textit{true} \mathbf{U} (\neg \boxed{\varphi_1} \wedge \textit{sing} \wedge \textit{alive}))
\end{aligned}$$