Step 1) Thioester substrates transferred to the acetyl transferase (AT) and malonyl transferase (MT) domains

2) Acetyl group is transferred to ACP

3) Acetyl group binds to the Cys163 of the KSase active site
4) Malonyl substrate undergoes thioesterification with ACP group and ACP transports the malonyl substrate to the KSase active site

5) Decarboxylation leads to enolate and carbon dioxide formation

6) Thioester enolate adds to thioester that is attached to Cys163, forming a tetrahedral intermediate
7) Tetrahedral intermediate collapses to give the \( \beta \)-keto thioester and KSase

8a) Carbonyl reduced at the KR domain (not animated)
8b) Dehydration reaction at the DH domain
8c) Alkene reduced at the ER domain

4-Carbon thioester recycles to step 3 to become 6-carbon chain, then the 6-carbon chain recycles to become 8, etc. until 16 carbon chain is formed and the thioester undergoes hydrolysis to give palmitic acid

Palmitic Acid - a saturated fatty acid