

# Optimization Model for Scrum-based Software Development

Generated by Meta AI

September 5, 2025

## Contents

<b>1</b>	<b>Sets (Entities)</b>	<b>1</b>
<b>2</b>	<b>Indices</b>	<b>2</b>
<b>3</b>	<b>Goals</b>	<b>3</b>
<b>4</b>	<b>Conditions</b>	<b>5</b>
<b>5</b>	<b>Decision Variables</b>	<b>6</b>

## 1 Sets (Entities)

- Project ( $P$ )
- Team ( $T$ )
- Worker ( $W$ )
- Feature ( $F$ )
- Skill ( $S$ )
- Role ( $R$ )
- ProductOwner ( $PO$ )
- ScrumMaster ( $SM$ )
- ProductBacklog ( $PB$ )
- Sprint ( $SP$ )
- SprintPlanning ( $SPP$ )
- DailyScrum ( $DS$ )

- SprintReview ( $SR$ )
- SprintRetrospective ( $SRE$ )
- SprintBacklog ( $SBL$ )
- SprintGoal ( $SG$ )
- Epic ( $E$ )
- UserStory ( $US$ )
- Task ( $TSK$ )
- DevelopmentSnapshot ( $DEV$ )
- Blocker ( $BL$ )
- Stakeholder ( $SH$ )
- Velocity ( $VEL$ )
- ReleasePlan ( $REP$ )
- Roadmap ( $RM$ )
- ScrumBoard ( $SCB$ )
- FeatureDocumentation ( $FED$ )

## 2 Indices

- $p \in P$  (Project)
- $t \in T$  (Team)
- $w \in W$  (Worker)
- $f \in F$  (Feature)
- $s \in S$  (Skill)
- $r \in R$  (Role)
- $po \in PO$  (ProductOwner)
- $sm \in SM$  (ScrumMaster)
- $pb \in PB$  (ProductBacklog)
- $sp \in SP$  (Sprint)
- $sg \in SG$  (SprintGoal)

- $e \in E$  (Epic)
- $us \in US$  (UserStory)
- $tsk \in TSK$  (Task)
- $dev \in DEV$  (DevelopmentSnapshot)
- $bl \in BL$  (Blocker)
- $sh \in SH$  (Stakeholder)
- $vel \in VEL$  (Velocity)
- $rep \in REP$  (ReleasePlan)
- $rm \in RM$  (Roadmap)
- $scb \in SCB$  (ScrumBoard)
- $fed \in FED$  (FeatureDocumentation)

### 3 Goals

- $G_0$ : maximize\_team\_velocity
  - Maximize:  $\sum_{t \in T} vel_t \cdot avg\_story\_points_t$
  - ID: G0, Name: maximize\_team\_velocity
- $G_1$ : minimize\_blocker\_severity
  - Minimize:  $\sum_{bl \in BL} severity_{bl}$
  - ID: G1, Name: minimize\_blocker\_severity
- $G_2$ : maximize\_sprint\_goal\_achievement
  - Maximize:  $\sum_{sg \in SG} achievement\_status_{sg}$
  - ID: G2, Name: maximize\_sprint\_goal\_achievement
- $G_3$ : minimize\_task\_effort
  - Minimize:  $\sum_{tsk \in TSK} effort_{tsk}$
  - ID: G3, Name: minimize\_task\_effort
- $G_4$ : maximize\_feature\_priority
  - Maximize:  $\sum_{f \in F} priority_f$
  - ID: G4, Name: maximize\_feature\_priority
- $G_5$ : minimize\_sprint\_duration

- Minimize:  $\sum_{sp \in SP} end\_date_{sp} - start\_date_{sp}$
- ID: G5, Name: minimize\_sprint\_duration
- $G_6$ : maximize\_stakeholder\_satisfaction
  - Maximize:  $\sum_{sh \in SH} satisfaction_{sh}$
  - ID: G6, Name: maximize\_stakeholder\_satisfaction
- $G_7$ : minimize\_task\_blockers
  - Minimize:  $\sum_{tsk \in TSK} \sum_{bl \in BL} blocker_{tsk,bl}$
  - ID: G7, Name: minimize\_task\_blockers
- $G_8$ : maximize\_product\_owner\_availability
  - Maximize:  $\sum_{po \in PO} availability_{po}$
  - ID: G8, Name: maximize\_product\_owner\_availability
- $G_9$ : minimize\_scrum\_master\_experience
  - Minimize:  $\sum_{sm \in SM} experience_{sm}$
  - ID: G9, Name: minimize\_scrum\_master\_experience
- $G_{10}$ : maximize\_release\_plan\_status
  - Maximize:  $\sum_{rep \in REP} status_{rep}$
  - ID: G10, Name: maximize\_release\_plan\_status
- $G_{11}$ : maximize\_roadmap\_objectives
  - Maximize:  $\sum_{rm \in RM} objectives_{rm}$
  - ID: G11, Name: maximize\_roadmap\_objectives
- $G_{12}$ : minimize\_development\_snapshot\_bugs
  - Minimize:  $\sum_{dev \in DEV} bugs_{dev}$
  - ID: G12, Name: minimize\_development\_snapshot\_bugs
- $G_{13}$ : maximize\_feature\_documentation\_quality
  - Maximize:  $\sum_{fed \in FED} quality_{fed}$
  - ID: G13, Name: maximize\_feature\_documentation\_quality
- $G_{14}$ : minimize\_sprint\_review\_feedback
  - Minimize:  $\sum_{sr \in SR} feedback_{sr}$
  - ID: G14, Name: minimize\_sprint\_review\_feedback

## 4 Conditions

- $C_0$ : team\_has\_scrum\_master
  - Condition:  $\sum_{t \in T} \sum_{sm \in SM} team\_has\_scrum\_master_{t,sm} \geq 1$
  - ID: C0, Name: team\_has\_scrum\_master
- $C_1$ : product\_owner\_has\_availability
  - Condition:  $\sum_{po \in PO} availability_{po} \geq 0.5$
  - ID: C1, Name: product\_owner\_has\_availability
- $C_2$ : sprint\_has\_goal
  - Condition:  $\sum_{sp \in SP} \sum_{sg \in SG} sprint\_has\_goal_{sp,sg} \geq 1$
  - ID: C2, Name: sprint\_has\_goal
- $C_3$ : task\_has\_effort
  - Condition:  $\sum_{tsk \in TSK} effort_{tsk} \geq 0$
  - ID: C3, Name: task\_has\_effort
- $C_4$ : feature\_has\_priority
  - Condition:  $\sum_{f \in F} priority_f \geq 1$
  - ID: C4, Name: feature\_has\_priority
- $C_5$ : blocker\_has\_severity
  - Condition:  $\sum_{bl \in BL} severity_{bl} \geq 1$
  - ID: C5, Name: blocker\_has\_severity
- $C_6$ : sprint\_retrospective\_has\_improvement\_actions
  - Condition:  $\sum_{sre \in SRE} improvement\_actions_{sre} \geq 1$
  - ID: C6, Name: sprint\_retrospective\_has\_improvement\_actions
- $C_7$ : release\_plan\_has\_features
  - Condition:  $\sum_{rep \in REP} \sum_{f \in F} release\_plan\_has\_features_{rep,f} \geq 1$
  - ID: C7, Name: release\_plan\_has\_features
- $C_8$ : roadmap\_has\_objectives
  - Condition:  $\sum_{rm \in RM} objectives_{rm} \geq 1$
  - ID: C8, Name: roadmap\_has\_objectives
- $C_9$ : development\_snapshot\_has\_test\_status
  - Condition:  $\sum_{dev \in DEV} test\_status_{dev} \geq 0$

- ID: C9, Name: development\_snapshot\_has\_test\_status
- $C_{10}$ : feature\_documentation\_has\_title
  - Condition:  $\sum_{fed \in FED} title_{fed} \neq \emptyset$
  - ID: C10, Name: feature\_documentation\_has\_title
- $C_{11}$ : sprint\_review\_has\_feedback
  - Condition:  $\sum_{sr \in SR} feedback_{sr} \geq 0$
  - ID: C11, Name: sprint\_review\_has\_feedback
- $C_{12}$ : team\_has\_velocity
  - Condition:  $\sum_{t \in T} vel_t \geq 0$
  - ID: C12, Name: team\_has\_velocity
- $C_{13}$ : scrum\_master\_has\_experience
  - Condition:  $\sum_{sm \in SM} experience_{sm} \geq 1$
  - ID: C13, Name: scrum\_master\_has\_experience
- $C_{14}$ : product\_backlog\_has\_features
  - Condition:  $\sum_{pb \in PB} \sum_{f \in F} product\_backlog\_has\_features_{pb,f} \geq 1$
  - ID: C14, Name: product\_backlog\_has\_features

## 5 Decision Variables

- $D_0$ : team\_assignment
  - Type: Boolean
  - Domain:  $\{0, 1\}$
- $D_1$ : product\_owner\_availability
  - Type: Integer
  - Domain:  $\{0, 1, 2, \dots, 100\}$
- $D_2$ : sprint\_goal\_achievement
  - Type: Boolean
  - Domain:  $\{0, 1\}$
- $D_3$ : task\_effort
  - Type: Integer
  - Domain:  $\{0, 1, 2, \dots, 100\}$

- $D_4$ : feature\_priority
  - Type: Integer
  - Domain:  $\{1, 2, 3, \dots, 5\}$
- $D_5$ : blocker\_severity
  - Type: Integer
  - Domain:  $\{1, 2, 3, \dots, 5\}$
- $D_6$ : sprint\_duration
  - Type: Integer
  - Domain:  $\{1, 2, 3, \dots, 30\}$
- $D_7$ : scrum\_master\_experience
  - Type: Integer
  - Domain:  $\{1, 2, 3, \dots, 10\}$
- $D_8$ : release\_plan\_status
  - Type: Boolean
  - Domain:  $\{0, 1\}$
- $D_9$ : roadmap\_objectives
  - Type: Integer
  - Domain:  $\{0, 1, 2, \dots, 10\}$
- $D_{10}$ : development\_snapshot\_test\_status
  - Type: Boolean
  - Domain:  $\{0, 1\}$
- $D_{11}$ : feature\_documentation\_quality
  - Type: Integer
  - Domain:  $\{1, 2, 3, \dots, 5\}$
- $D_{12}$ : sprint\_review\_feedback
  - Type: Integer
  - Domain:  $\{0, 1, 2, \dots, 10\}$
- $D_{13}$ : team\_velocity
  - Type: Integer
  - Domain:  $\{0, 1, 2, \dots, 100\}$
- $D_{14}$ : product\_backlog\_entries
  - Type: Integer
  - Domain:  $\{0, 1, 2, \dots, 100\}$