SCRUM Domain Optimization Model

Based on Entities, Relationships, Goals, Conditions, and Decision Variables

Generated for TruelyMostWanted

August 12, 2025

Contents

1 1. Sets (Entities)

- P := set of **Project** (Entity: *Project*, attrs: id, name, project_start, project_end, description, **budget**, status, target_audience, priority).
- T := set of **Team** (Entity: *Team*, attrs: id, name, **team_size**, team_start, **team_status**, location, team_type).
- W := set of **Worker** (Entity: *Worker*, attrs: id, name, first_name, email, start_date, status, **availability**).
- F := set of **Feature** (Entity: *Feature*, attrs: id, title, description, status, **priority**, estimated_effort).
- S := set of **Skill** (Entity: *Skill*, attrs: id, label, description, level, **certified**, category).
- R := set of **Role** (Entity: *Role*, attrs: id, role_name, description, area_of_responsibility).
- PO := set of **ProductOwner** (Entity: *ProductOwner*, attrs: id, name, email, **availability**).
- SM := set of **ScrumMaster** (Entity: *ScrumMaster*, attrs: id, name, email, **experience**).
- PB := set of **ProductBacklog** (Entity: *ProductBacklog*, attrs: id, created_on, **last_updated**, **number_of_entries**, status).
- SP := set of **Sprint** (Entity: *Sprint*, attrs: id, sprint_number, start_date, end_date, **status**, **achievement_of_goal**).
- SPP := set of **SprintPlanning** (Entity: *SprintPlanning*, attrs: id, date, duration_(min), moderation, outcome_documentation).
- DS := set of **DailyScrum** (Entity: *DailyScrum*, attrs: id, date, time, duration, moderation).
- SR := set of **SprintReview** (Entity: *SprintReview*, attrs: id, date, duration, feedback_documentation, **attendees_count**).
- SRE := set of **SprintRetrospective** (Entity: *SprintRetrospective*, attrs: id, date, duration, improvement_actions, team_satisfaction, moderation).
- SBL := set of **SprintBacklog** (Entity: *SprintBacklog*, attrs: id, number_of_tasks, last_updated, status, **total_effort**).
- SG := set of **SprintGoal** (Entity: *SprintGoal*, attrs: id, objective_description, **achievement_status**, **benefit**).
- E := set of **Epic** (Entity: *Epic*, attrs: id, title, description, **priority**, status, estimated_effort).
- US := set of **UserStory** (Entity: *UserStory*, attrs: id, title, description, acceptance_criteria, **priority**, **story_points**, **status**).
- TSK := set of **Task** (Entity: *Task*, attrs: id, title, description, **status**, **effort**, type).
- DEV := set of **DevelopmentSnapshot** (Entity: *DevelopmentSnapshot*, attrs: id, version_number, creation_date, **test_status**, deployment_target, documentation).
- BL := set of **Blocker** (Entity: *Blocker*, attrs: id, title, description, **severity**, status, detected_on, resolved_on).

- $SH :=$ set of **Stakeholder** (Entity: *Stakeholder*, attrs: id, name, organization, role, email, area_of_interest, influence_level, relevance_to_feature).
- $VEL :=$ set of **Velocity** (Entity: *Velocity*, attrs: id, number_of_sprints_used, avg._story_points, max_velocity, min_velocity, **trend**).
- $REP :=$ set of **ReleasePlan** (Entity: *ReleasePlan*, attrs: id, version, planned_date, included_features, status).
- $RM :=$ set of **Roadmap** (Entity: *Roadmap*, attrs: id, start_date, end_date, milestones, objectives, versions).
- $SCB :=$ set of **ScrumBoard** (Entity: *ScrumBoard*, attrs: id, board_type, columns_(todo/done...), number_of_cards, last_updated).
- $FED :=$ set of **FeatureDocumentation** (Entity: *FeatureDocumentation*, attrs: id, title, description, creation_date, change_log, linked_requirements, author).

Relationship-derived incidence sets

- $A^{T,P} \subseteq T \times P$ (*is_assigned_to_project*, R1).
- $A^{W,T} \subseteq W \times T$ (*belongs_to_team*, R2).
- $A^{W,S} \subseteq W \times S$ (*has_skill*, R3).
- $A^{W,R} \subseteq W \times R$ (*takes_on_role*, R4).
- $A^{PO,PB} \subseteq PO \times PB$ (*manages_backlog*, R5).
- $A^{T,SM} \subseteq T \times SM$ (*is_supported_by*, R6).
- $A^{PB,F} \subseteq PB \times F$ (*contains_feature*, R7).
- $A^{PB,E} \subseteq PB \times E$ (*contains_epic*, R8).
- $A^{E,US} \subseteq E \times US$ (*contains_user_story*, R9).
- $A^{US,TSK} \subseteq US \times TSK$ (*consists_of_tasks*, R10).
- $A^{US,SBL} \subseteq US \times SBL$ (*is_in_sprint_backlog*, R11).
- $A^{SBL,SP} \subseteq SBL \times SP$ (*belongs_to_sprint*, R12).
- $A^{SP,SG} \subseteq SP \times SG$ (*pursues_goal*, R13).
- $A^{SCB,TSK} \subseteq SCB \times TSK$ (*contains_tasks*, R14).
- $A^{FED,F} \subseteq FED \times F$ (*documents_feature*, R15).
- $A^{TSK,BL} \subseteq TSK \times BL$ (*is_blocked_by*, R16).
- $A^{SH,SR} \subseteq SH \times SR$ (*participates_in*, R17).
- $A^{SM,SRE} \subseteq SM \times SRE$ (*moderates_retrospective*, R18).
- $A^{VEL,T} \subseteq VEL \times T$ (*refers_to_team*, R19).
- $A^{REP,F} \subseteq REP \times F$ (*plans_release*, R20).
- $A^{REP,RM} \subseteq REP \times RM$ (*is_part_of_roadmap*, R21).
- $A^{SP,DEV} \subseteq SP \times DEV$ (*generates_snapshot*, R22).

Parameters (from entity attributes)

- $budget_p \in \mathbb{R}_{\geq 0}$, $p \in P$.
- $teamSize_t \in \mathbb{Z}_{\geq 0}$, $t \in T$.
- $avail_w \in \mathbb{R}_{\geq 0}$, $w \in W$.
- $prio_f^F \in \mathbb{Z}_{\geq 0}$, $f \in F$; $prio_u^{US} \in \mathbb{Z}_{\geq 0}$, $u \in US$.
- $spoints_u \in \mathbb{Z}_{\geq 0}$, $u \in US$.
- $effort_k^{attr} \in \mathbb{Z}_{\geq 0}$, $k \in TSK$ (task attribute if treated as parameter).
- $severity_b \in \mathbb{Z}_{\geq 0}$, $b \in BL$.
- $attend_r \in \mathbb{Z}_{\geq 0}$, $r \in SR$.
- $trend_v \in \mathbb{R}$, $v \in VEL$.
- $benefit_g \in \mathbb{R}_{\geq 0}$, $g \in SG$.
- $totalEff_{sbl} \in \mathbb{Z}_{\geq 0}$, $sbl \in SBL$.

2 2. Indices

- $p \in P$; $t \in T$; $w \in W$; $f \in F$; $s \in S$; $r \in R$; $po \in PO$; $sm \in SM$; $pb \in PB$; $sp \in SP$; $spp \in SPP$; $ds \in DS$; $sr \in SR$; $sre \in SRE$; $sbl \in SBL$; $sg \in SG$; $e \in E$; $u \in US$; $k \in TSK$; $d \in DEV$; $b \in BL$; $sh \in SH$; $v \in VEL$; $rep \in REP$; $rm \in RM$; $scb \in SCB$; $fed \in FED$.

3 3. Goals

- **G0 maximize_team_capacity** (IsSum=True, GoalType=max). Logical: *Prefer assignments that bring more team capacity to projects.*
  Mathematical:
  $$\max \sum_{(t,p)\in T\times P} teamSize_t \cdot x_{t,p}$$
- **G1 minimize_project_budget** (IsSum=True, GoalType=min). Logical: *Prefer cheaper projects among assigned ones.*
  Mathematical:
  $$\min \sum_{(t,p)\in T\times P} budget_p \cdot x_{t,p}$$
- **G2 maximize_story_points_planned** (IsSum=True, GoalType=max). Logical: *Select user stories to maximize planned throughput.*
  Mathematical:
  $$\max \sum_{u\in US} spoints_u \cdot y_u$$
- **G3 minimize_open_blocker_severity** (IsSum=True, GoalType=min). Logical: *Reduce exposure to severe blockers on assigned tasks.*
  Mathematical:
  $$\min \sum_{w\in W} \sum_{k\in TSK} \sum_{b:(k,b)\in A^{TSK,BL}} severity_b \cdot z_{k,w}$$

- **G4 maximize_velocity_trend** (IsSum=True, GoalType=max). Logical: *Prefer teams with positive velocity trend to be assigned.*
  Mathematical:
$$\max \quad \sum_{(v,t)\in A^{VEL,T}} \sum_{p\in P} trend_v \cdot x_{t,p}$$

- **G5 minimize_task_effort** (IsSum=True, GoalType=min). Logical: *Prefer lower estimated effort when setting task estimates.*
  Mathematical:
$$\min \quad \sum_{k\in TSK} \widehat{effort}_k$$

- **G6 maximize_feature_priority_covered** (IsSum=True, GoalType=max). Logical: *Include high-priority features in release planning.*
  Mathematical:
$$\max \quad \sum_{f\in F} prio_f^F \cdot q_f$$

- **G7 minimize_cycle_time_proxy** (IsSum=False, GoalType=min). Logical: *Use planned sprint duration as a cycle-time proxy.*
  Mathematical:
$$\min \quad sLen$$

- **G8 maximize_team_availability** (IsSum=True, GoalType=max). Logical: *Allocate work to leverage available capacity.*
  Mathematical:
$$\max \quad \sum_{w\in W} \sum_{k\in TSK} avail_w \cdot z_{k,w}$$

- **G9 minimize_sprint_backlog_total_effort** (IsSum=True, GoalType=min). Logical: *Prefer smaller sprint backlog effort.*
  Mathematical (as proxy via selected stories):
$$\min \quad \sum_{u\in US} spoints_u \cdot y_u$$

- **G10 maximize_review_attendance** (IsSum=True, GoalType=max). Logical: *Prefer plans associated with higher Sprint Review attendance.*
  Mathematical (parameter-only objective for reference):
$$\max \quad \sum_{sr\in SR} attend_{sr}$$

- **G11 minimize_number_of_backlog_entries** (IsSum=True, GoalType=min). Logical: *Timebox backlog size through a planning cap.*
  Mathematical:
$$\min \quad cap^{PB}$$

4 4. Conditions

- **C0 minimize_overallocated_workers**. Logical: *Assigned task effort must not exceed worker availability.*
  Mathematical (capacity):
$$\forall w \in W: \quad \sum_{k\in TSK} \widehat{effort}_k \, z_{k,w} \;\le\; avail_w$$

- **C1 minimize_unachieved_sprint_goals**. Logical: *Select sprint goals likely to be achieved.*
  Mathematical (benefit threshold):

$$\sum_{sg \in SG} benefit_{sg}\, g_{sg} \;\geq\; \beta, \quad \beta \geq 0 \text{ (planning parameter)}$$

- **C2 maximize_certified_skill_coverage**. Logical: *Favor certified skills for critical tasks.*
  Mathematical (coverage proxy):

$$\sum_{(w,s) \in A^{W,S}} certified_s \;\geq\; \gamma \quad \text{(planning target } \gamma\text{)}$$

- **C3 minimize_low_experience_scrum_master_use**. Logical: *Discourage assignment of very low-experience Scrum Masters.*
  Mathematical (experience floor if assigned):

$$\forall t \in T: \sum_{sm \in SM} m_{sm,t} \leq 1, \qquad \sum_{sm \in SM} exp_{sm}\, m_{sm,t} \;\geq\; \underline{exp} \sum_{sm} m_{sm,t}$$

- **C4 maximize_ready_user_stories**. Logical: *Only READY stories may be selected.*
  Mathematical (readiness filter):

$$\forall u \in US: \; y_u \;\leq\; \mathbf{1}[status_u^{US} = \text{READY}]$$

- **C5 minimize_blocked_tasks**. Logical: *Avoid assigning tasks that are currently blocked.*
  Mathematical (blocking filter):

$$\forall k \in TSK: \; \big(\exists b : (k,b) \in A^{TSK,BL}\big) \Rightarrow \sum_{w \in W} z_{k,w} = 0$$

- **C6 maximize_active_team_status**. Logical: *Only active teams can be assigned to projects.*
  Mathematical:

$$\forall (t,p) \in T \times P: \; x_{t,p} \;\leq\; \mathbf{1}[team\_status_t = \text{ACTIVE}]$$

- **C7 minimize_past_due_release_plans**. Logical: *Do not plan inclusions beyond planned release date.*
  Mathematical:

$$\forall f \in F: \; q_f \;\leq\; \mathbf{1}[\text{today} \leq planned\_date(rep(f))]$$

- **C8 maximize_high_benefit_sprint_goals**. Logical: *If selecting a sprint goal, enforce minimum benefit.*
  Mathematical:

$$\forall sg \in SG: \; g_{sg} \;\leq\; \mathbf{1}[\, benefit_{sg} \geq \underline{b}\,]$$

- **C9 minimize_outdated_backlog**. Logical: *Backlogs must be recently updated if used.*
  Mathematical:

$$\forall pb \in PB: \; o_{po,pb} \;\leq\; \mathbf{1}[\,\text{now} - last\_updated_{pb} \leq \Delta\,], \quad \forall po \in PO$$

- **C10 maximize_tested_snapshots**. Logical: *Only snapshots with successful tests are considered done.*
  Mathematical:

$$\forall (sp,d) \in A^{SP,DEV}: \; \mathbf{1}[test\_status_d = \text{PASSED}] = 1$$

- **C11 minimize_unresolved_blockers_age**. Logical: *Tasks with old, unresolved blockers should not be assigned.*
  Mathematical:

$$\forall k \in TSK: \ \big(\exists b : (k,b) \in A^{TSK,BL} \ \wedge \ resolved\_on_b = \varnothing \ \wedge \ \text{age}_b > \overline{a}\big) \Rightarrow \sum_{w \in W} z_{k,w} = 0$$

- **Structural constraints from relationships (samples)**:

$$\forall t \in T: \ \sum_{p \in P} x_{t,p} \leq 1 \quad \text{(each team to at most one project)}$$

$$\forall k \in TSK: \ \sum_{w \in W} z_{k,w} \leq 1 \quad \text{(a task assigned to at most one worker)}$$

$$\sum_{u \in US} y_u \leq cap^{PB} \quad \text{(backlog cap)}$$

5 5. DecisionVariables

- **DV0 assign_team_to_project** ($x_{t,p}$): binary, domain $\{0,1\}$, $0 \leq x_{t,p} \leq 1$.
- **DV1 select_user_story_for_sprint** (y_u): binary, domain $\{0,1\}$, $0 \leq y_u \leq 1$.
- **DV2 allocate_task_to_worker** ($z_{k,w}$): binary, domain $\{0,1\}$, $0 \leq z_{k,w} \leq 1$.
- **DV3 set_sprint_duration_days** ($sLen$): integer, domain $\{7, 10, 14, 21, 28\}$, $7 \leq sLen \leq 28$.
- **DV4 choose_scrum_master_for_team** ($m_{sm,t}$): binary, domain $\{0,1\}$.
- **DV5 prioritize_feature_rank** (r_f^{rank}): integer rank, domain $\{1, \ldots, 100\}$, $1 \leq r_f^{rank} \leq 100$.
- **DV6 select_epic_for_backlog** (e_e^{sel}): binary, domain $\{0,1\}$.
- **DV7 plan_release_includes_feature** (q_f): binary, domain $\{0,1\}$.
- **DV8 set_task_effort_estimate** ($\widehat{effort}_k$): integer, domain $\{1, \ldots, 100\}$, $1 \leq \widehat{effort}_k \leq 100$.
- **DV9 assign_product_owner_to_backlog** ($o_{po,pb}$): binary, domain $\{0,1\}$.
- **DV10 choose_sprint_goal** (g_{sg}): binary, domain $\{0,1\}$.
- **DV11 limit_max_backlog_entries** (cap^{PB}): integer cap, domain $\{10, \ldots, 1000\}$, $10 \leq cap^{PB} \leq 1000$.