# CS 4530: Fundamentals of Software Engineering
# Module 4.2: Agile Planning and Estimation

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# Learning Goals for this Lesson

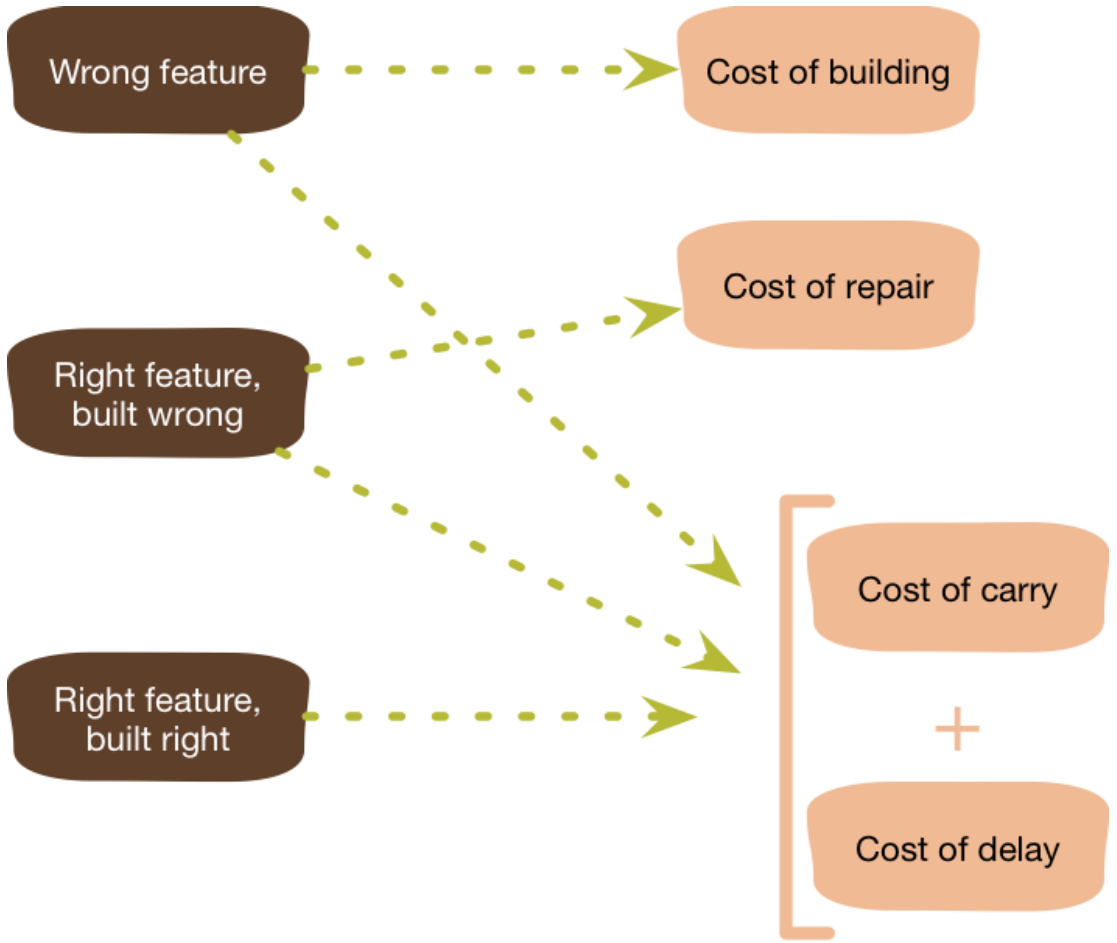
- At the end of this lesson, you should be able to
  - Describe how agile planning manages uncertainty by creating detailed plans only for the most immediate tasks
  - Explain how agile planning decomposes large projects into individual tasks that can be estimated
  - Understand the key artifacts and process steps in Scrum

# Requirements: Which to pick?

- There are four knobs you can adjust when negotiating requirements:
  - Project scope
  - Project duration
  - Project quality
  - Project cost
- Usually cost is most constrained: you have a budget to spend, and you have a headcount of developers to pay
- Determining feasible scope, timeline and maximizing quality is the subject of much software engineering research

# Agile Principles for Effective Planning: YAGNI

- YAGNI – "You Aren't Going To Need It"
- Do not prematurely plan or implement features
- Why? Uncertainty *in what we actually need*
- Focus on *prioritization*, independent of estimation




Graphic: Martin Fowler

# The product backlog is a key tool in agile planning and estimation

- List of user stories for the product
- All entries should add value
- No low level tasks

PlowTracker Product Backlog

| Item | Priority | Value |
|---|---|---|
| The driver's interface should display unplowed streets | Essential | Required for MVP – drivers must know where to go |
| The driver's interface should track which streets have been plowed | Essential | Required for MVP – informs rest of system what has been plowed |
| The city official's internal interface should show estimated arrival times for plows | Desirable | City officials field thousands of complaint calls, expected to increase citizen satisfaction |
| The driver's interface should show an optimized plowing route | Extension | Plowing will become more efficient, cuts fuel and labor costs |
| Members of the public should be able to see real-time plow status | Extension | Government transparency groups want this; it might reduce phone complaints |

# An agile project should re-prioritize tasks to meet changing conditions

- List of user stories for the product
- All entries should add value
- No low level tasks
- Items are prioritized
- A living document

PlowTracker Product Backlog

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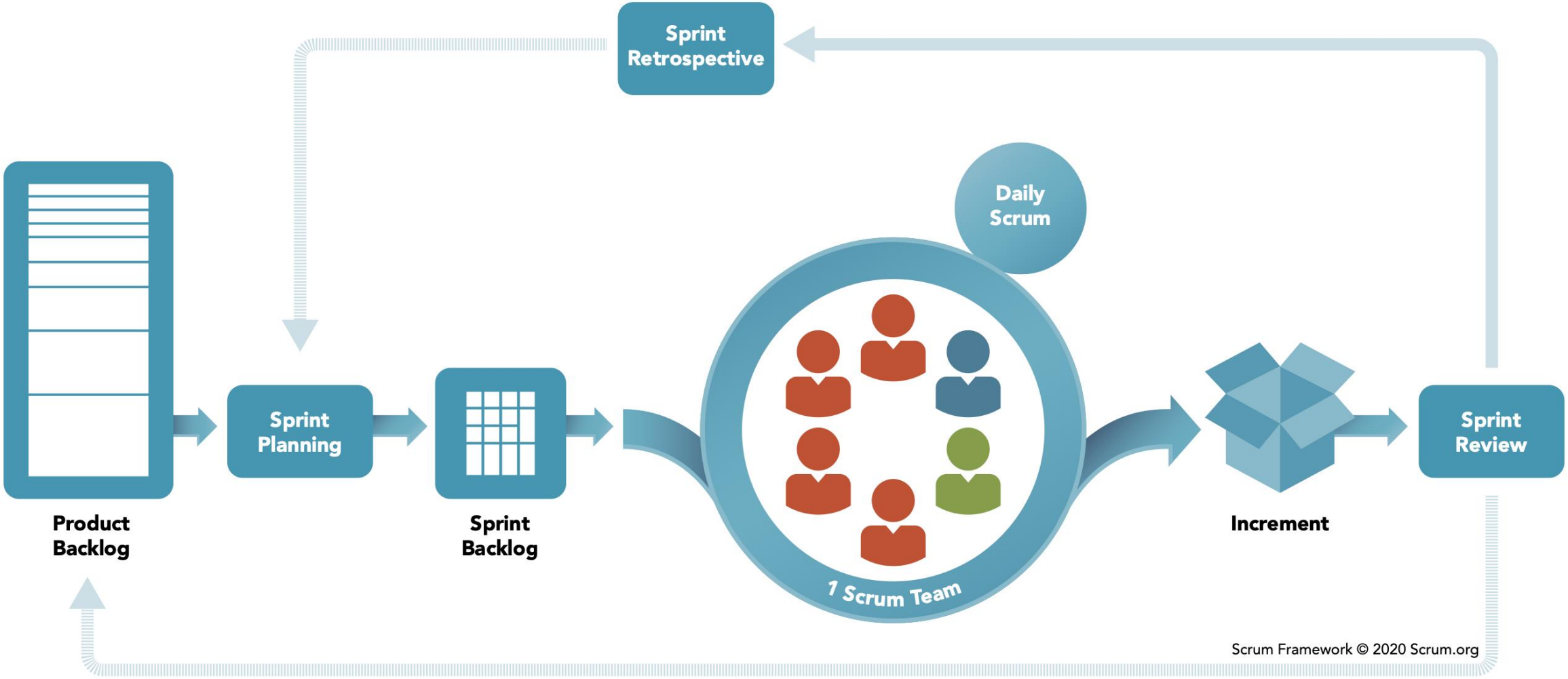
# Scrum is the most common approach to organizing agile projects.



# Planning a Sprint

- Select user stories for the sprint based on priority and value
- Decompose stories into detailed tasks
- Estimate duration of each task (max 1 day each)
- Time-boxed meeting – don’t make every decision here
- Include non-story tasks as needed (e.g. quality improvements, knowledge acquisition)

# Planning a Sprint Backlog

- Sprint Focus:
  - “The driver’s interface should display unplowed streets”
  - “The driver’s interface should track which streets have been plowed”
- Sprint tasks:
  - Tasks for API design
    - Work out the interface for CRUD on plowed streets
  - Tasks for app development
    - Design the interface for viewing unplowed streets
    - Create the map interface that shows streets in the city
    - Fetch unplowed streets from API and update the map
    - Update the API with current location while plowing in progress
  - Tasks for backend development
    - Determine how to model and store plowed street data
    - Implement tests for expected API behavior
    - Implement API to mark street as plowed
    - Implement API to fetch unplowed streets

# Estimating Task Time

- Collaborative team process:
  - Estimate how long each task will take (hard)
  - Estimate relative size of each task (easier)

# Estimating with T-Shirt Sizes


made by :codica

codica.com

# Estimating with “Fibonacci”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# Estimating with “Modified Fibonacci”


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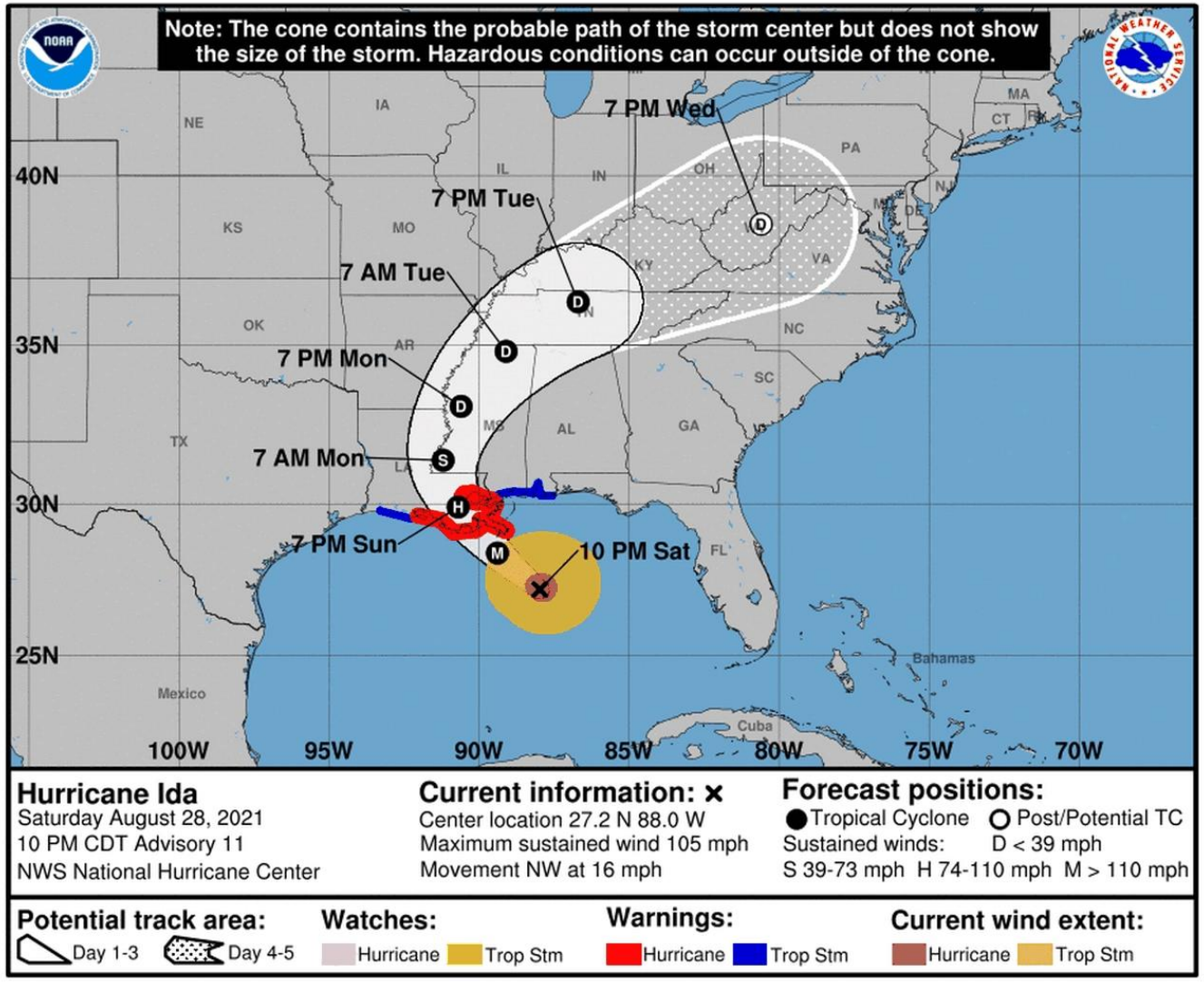
# Lesson from Meteorology: Uncertainty in Estimation



# Example: Estimating with T-Shirt

Discussion: Would you accept these estimates? Why? What factors should the team consider? Are tasks missing?

| Task | Size | Rationale |
|---|---|---|
| Work out the interface for CRUD on plowed streets | Medium | We've designed similar APIs before, there will likely be some new aspects, but it will not be too hard. It will require coordination. |
| Design the interface for viewing unplowed streets | Small | The client has already shared mockups of what they want |
| Create the map interface that shows streets in the city | Large | We haven't worked with mapping APIs before; maybe we should decompose this into smaller tasks, there is risk here. |
| Fetch unplowed streets from API and update the map | Medium | We think that this should be easy, it's just patching a few components together, but don't yet know enough about how the map will be implemented to know for sure how hard this is. |
| Update the API with current location while plowing in progress | Small | We know exactly what API call to make here, and how to fetch location, it's easy |

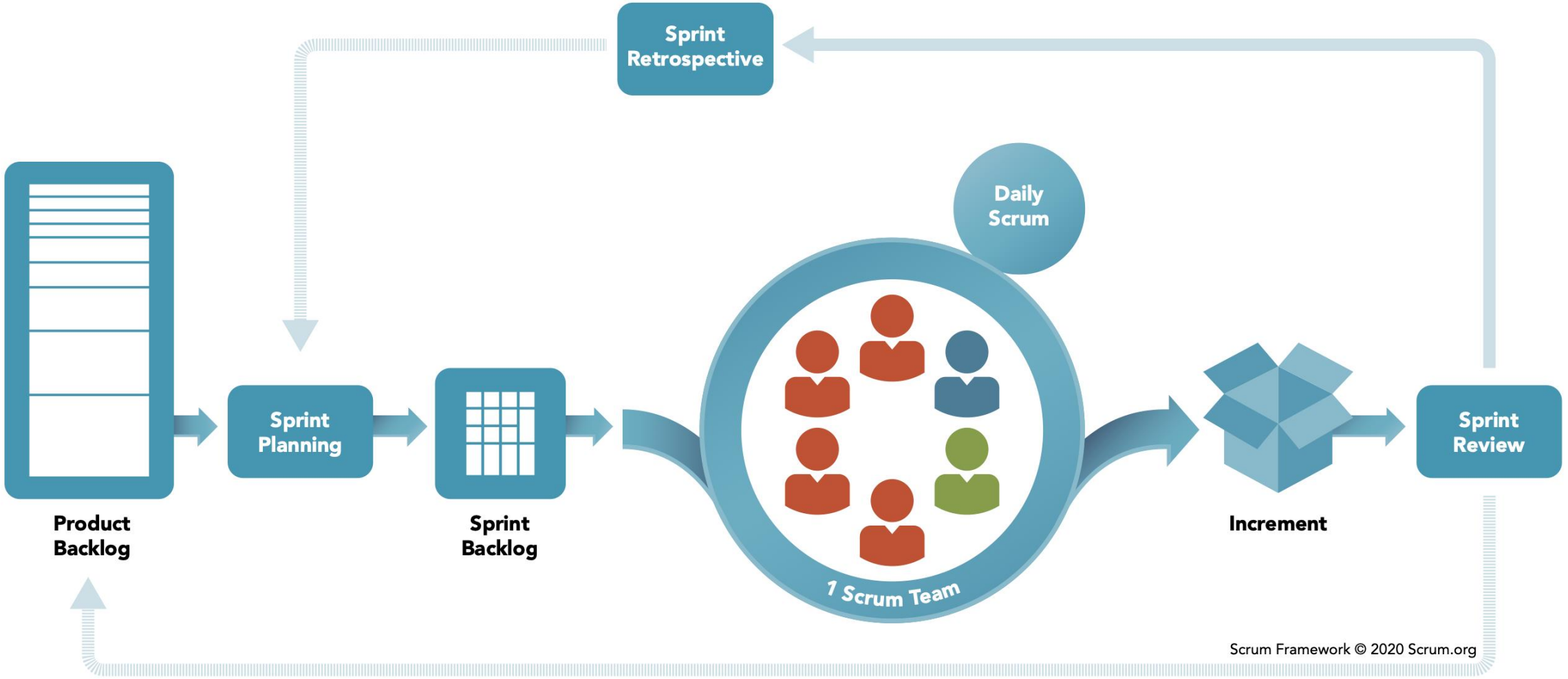
# Planning helps us find what we don’t know

| Task | Size | Rationale |
| --- | --- | --- |
| Research OpenStreetMap API and examples of its usage | Small | We’ve learned how to use other APIs before. This one looks well documented, and spending a few hours looking at examples will probably go a long way. |
| Create OpenStreetMap prototype, showing a static map with streets | Small | A quick internet search shows plenty of examples, this should be easy to adapt |
| Create the map interface that shows streets in the city | Medium | Once we’ve built a throwaway prototype that shows the city map, we can leverage that knowledge to build the map in our app |

# ”Sprint 0” Tasks to Help Estimate Stories

- Find resources to gain more experience about a technology or about a problem domain
- Create prototypes that you can throw away
- Consider having multiple developers implement different approaches
- Create load tests/simulations to identify the performance limits of technology or architecture
- Learn just enough to make a *responsible* estimate

# The Daily Scrum meeting is the key



# Daily Scrum is also called “stand up”

- 15 minutes maximum “stand up” meeting
  - What have I done?
  - What am I working on?
  - What am I stuck on/need help on?
- Conversation focuses on goals:
  - Transparency between team members
  - Encourage adaptation

# Sprint Review and Retrospective

- Sprint Review:
  - Provide a working demo
  - What did we get done?
  - What value did we deliver?
- Sprint Retrospective
  - What went well?
  - What could we have done better?
  - If incidents occurred: conduct a blameless postmortem
- Provides an opportunity to reflect on overall project velocity

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