

ALLOY PARAGRAPHS
AND COMMANDS

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PROJECT TEAMS

- TEAMS OF 2 OR 3 FOR PROJECT
- CAN WORK ALONE, BUT I DISCOURAGE THAT
- TAKE 5 MINUTES TO VERIFY TEAMS AND DECIDE ON A TEAM NAME

PARAGRAPHS

FACTS, ASSERTIONS,
PREDICATES, FUNCTIONS



FACTS

- ALWAYS ASSUMED TO HOLD
- EXAMPLE...

SIGNATURE FACTS

- CAN GIVE SIMPLE FACTS ABOUT A SIGNATURE AFTER ITS DECLARATION:

- **sig** Host { }

- **sig** Link { from, to: Host } { from != to }

EQUIVALENT

fact { **all this**: Link | **this**.from != **this**.to }

FUNCTIONS & PREDICATES

- FOR REUSE AND CLARITY:
 - FUNCTIONS ARE NAMED EXPRESSIONS
 - PREDICATES ARE NAMED CONSTRAINTS
- EXAMPLE...

MORE OO-LIKE NOTATION

- **INSTEAD OF:**

- **fun** redLights[s: LightState]: **set** Light { s.color.Red }
pred mostlyRed[s: LightState, i: Intersection] {
 lone i.lights - redLights[s]
}

- **CAN WRITE:**

- **fun** LightState.redLights[]: **set** Light { **this**.color.Red }
}
pred LightState.mostlyRed[i: Intersection] {
 lone i.lights - **this**.redLights[]
}

FACTS VS. PREDICATES

- **SMALL MODELS:**

- **FAVOR FACTS – MORE SUCCINCT, EASY TO CHANGE INTO PREDICATES IF NEEDED**

- **LARGE MODELS:**

- **USE HELPER PREDICATES TO DEFINE PROPERTIES**
- **USE OTHER PREDICATES OR FACTS TO PACKAGE PROPERTIES TOGETHER**

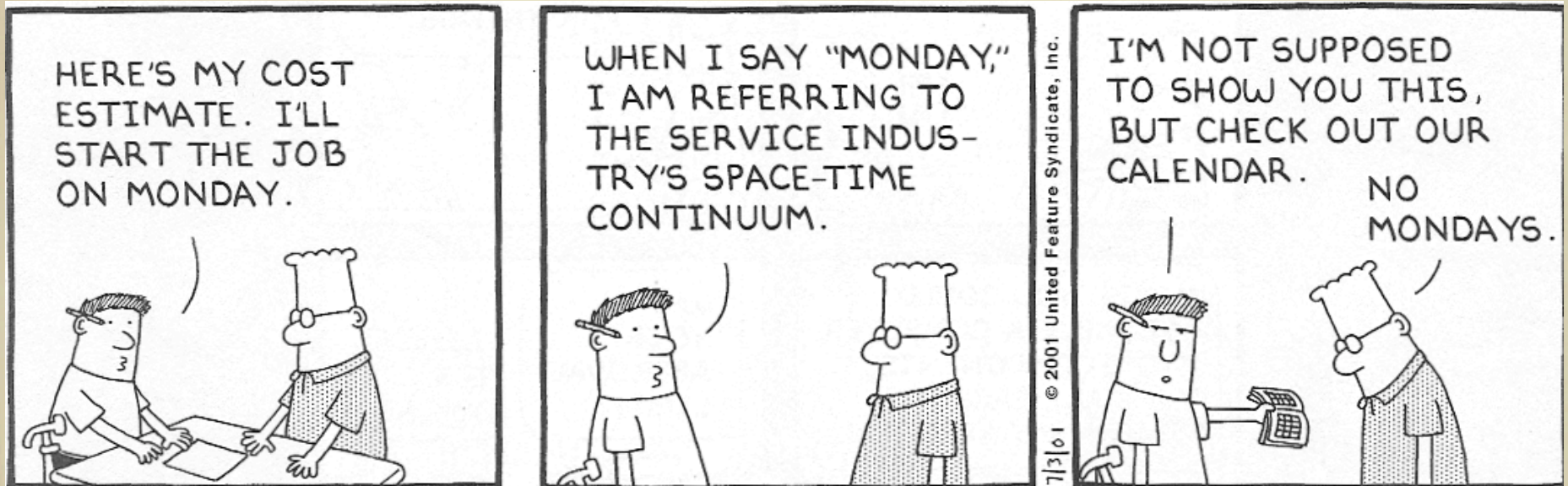
ASSERTIONS

- CONSTRAINTS THAT ARE INTENDED TO FOLLOW FROM THE FACTS
- ALLOY LOOKS FOR COUNTEREXAMPLES
 - THINK “BUG REPORTS”
- EXAMPLE...

TYPICAL ASSERTIONS...

- ...EXPRESS MUNDANE PROPERTIES
 - USED TO DETECT FLAWS IN OUR THINKING
 - “ELEVATOR HAS ONLY ONE CHOICE OF NEXT MOVE”
- ...OR EXPRESS ESSENTIAL PROPERTIES
 - “ELEVATOR EVENTUALLY SERVICES ALL REQUESTS”

CARTOON OF THE DAY





COMMANDS & SCOPE

TWO COMMANDS

- **run** – SEARCH FOR AN INSTANCE OF A PREDICATE
- **check** – SEARCH FOR A COUNTEREXAMPLE FOR AN ASSERTION

SCOPE

- NOT SPECIFIED?
 - COMMAND USES DEFAULT:
3 OF EACH TOP-LEVEL SIGNATURE
- CAN BOUND MIX OF TOP-LEVEL AND SUB-SIGNATURES
 - AS LONG AS BOUNDS ARE COMPLETE...

CHOOSING THE SCOPE

- SMALL SYSTEM? SCOPE MIGHT MATCH REAL WORLD
 - E.G., THREE TREATMENT ROOMS
- LARGER SYSTEMS
 - SCOPE IS SET LARGE ENOUGH FOR CONFIDENCE
 - SMALL ENOUGH FOR SPEED

THINK “UNIT TESTS”

