Observatory Simulator and Scheduler Interface Definitions

The following sections detail the input and output interfaces for the Observatory Simulator and the Scheduler. Any of the topics or parameters that have a question mark are listed as placeholders and may be expanded or removed as requirements finalize. Parameters that have positively identified types have the types placed in brackets. Notes about the topics or parameters are contained in parentheses.

Scheduler

The Scheduler is integrated into the OCS architecture following the same message-based framework. This is all the inputs and outputs are actually publication and subscription of topics, classified in terms of commands, events and telemetry. This schema provides all the flexibility for the control aspect of the problem, as well as immediate access to relevant information from the system.

Inputs

1. Control
    1. Configuration
        1. Proposal Parameters
        2. Scheduler Observatory Model Parameters
        3. Scheduler Astronomical Sky Parameters
        4. Scheduler Optimizer Parameters
        5. Scheduler Data Parameters
    2. Mode
        1. Scheduler Operation Mode [int] (possible values below)
            - Disabled
            - Active Mode
            - Passive Mode
            - Engineering Mode?
            - Calibration Mode?
    3. Downtime
        1. Duration
        2. Reason
    4. Degraded
        1. Unavailable Filter (array)
        2. Reduced Filter Change Time
        3. Observatory Issues
            1. Mount Reduced Speed
            2. Mount Reduced Range
            3. Dome Reduced Speed

4. Dome Reduced Range
5. Rotator Reduced Speed
6. Rotator Reduced Range
5. Observatory Time
2. Telemetry (all topics need timestamps)
1. Observatory Conditions
1. Dome
1. Altitude
2. Azimuth
3. Altitude Velocity
4. Azimuth Velocity
2. Telescope Mount
1. Altitude
2. Azimuth
3. Altitude Velocity
4. Azimuth Velocity
5. Rotator Angle
6. Rotator Velocity
7. Track Sky [boolean]
3. Camera
1. Current Filter
2. Mounted Filters (array)
3. Unmounted Filter
2. Environment Conditions
1. Transparency (array)
2. Seeing (at zenith, 500 nm)
3. Sky Brightness (array)
4. Weather Data
1. Temperature
2. Wind Direction
3. Wind Speed
4. Relative Humidity
5. Barometric Pressure
3. Forecast
1. Transparency (array, per minute?)
2. Seeing?
3. Weather Data
1. Temperature
2. Wind Direction
3. Wind Speed
4. Relative Humidity

5. Barometric Pressure
3. Image Quality
    1. Point Spread Function Quality
    2. Transparency Map Across Field (array)
    3. Statistics for Seeing
    4. Statistics for Sky Brightness
4. History
    1. Array of Visits (see Visit definition for content)
5. Visit
    1. Target ID
    2. RA
    3. Dec
    4. Sky Angle
    5. Filter
    6. Exposure Times (array)
    7. Raw Seeing (at first open shutter time)
    8. Date (array of visit event times)
    9. Actual Slew Time
    10. Raw Transparency (at first open shutter time)
    11. Airmass (at first open shutter time)
    12. Sky Brightness (at first open shutter time)
    13. Observatory Parameters (begin slew, at first exposure, end of visit)
        1. Mount Altitude
        2. Mount Azimuth
        3. Dome Altitude
        4. Dome Azimuth
        5. Rotator Position

Outputs

1. Targets
    1. Next Target (array?)
        1. RA
        2. Dec
        3. Sky angle
        4. Filter
        5. Exposure Times (array)
        6. Target ID
2. Scheduler Telemetry
    1. Ranking Data
        1. Target ID (primary key)

2. Target Rank Position (secondary key, 1 is winner)
3. Date
4. Filter
5. Shutter Open Time
6. Slew Time
7. Exposure Times
8. Visit Time
9. V Filter Sky Brightness
10. Filter Brightness
11. Seeing
12. Transparency
13. Field ID
14. Expected MJD
15. Local Sidereal Time
16. Observation Night
17. Observatory Parameters
    1. Rotator Angle
    2. Mount Altitude
    3. Mount Azimuth
18. Distance to Moon
19. Moon Profile
    1. RA
    2. Dec
    3. Altitude
    4. Azimuth
    5. Illumination
20. Sun Profile
    1. Altitude
    2. Azimuth
    3. Elongation
21. Weather Profile
    1. Humidity
    2. Wind Speed
2. Interested Proposals
    1. Proposal ID
    2. Target Rank
    3. Subsequence
    4. Subsequence Number
    5. Pair Number

Observatory Simulator

The Observatory Simulator is responsible for generating the input streams needed by the Scheduler and handling the output streams generated by the Scheduler. It will use the same messaging architecture as the Scheduler.

Inputs

1. Targets (see Scheduler definitions)
2. Configuration
    1. Scheduler Parameters (see Scheduler definitions)
    2. ObsSim Observatory Parameters
        1. Site Parameters
        2. Kinematic Parameters
        3. Filter Parameters
    3. Environment Model Parameters
        1. Weather Parameters
        2. Astronomical Sky Parameters(?)
    4. Downtime Parameters
    5. Quality Model Parameters
    6. Simulation Kernel Parameters
3. Scheduler Telemetry (see Scheduler definitions)

Outputs

All of the outputs below are defined in the Scheduler inputs section.

1. Control
2. Visit
3. Telemetry
    1. Observatory Conditions
    2. Environment Conditions
    3. Forecast
4. Image Quality
5. History
    1. Past Observations