Event-Driven Operations on JWST
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The JWST is designed to operate in an event-driven manner, allowing for automated and efficient commanding of the observatory. The JWST Operations Scripts Subsystem defines and controls operations through on-board scripts, written in JavaScript, and multiple simultaneous threads of execution, which support parallel operations. All science and calibration programs will be prepared on the ground and then transmitted to the spacecraft for execution according to the Observatory Plan and Observatory events. Operations proceed as commands are sent and verified with on-board telemetry, maintaining the health and safety of the Observatory and efficient observations.

Event-Driven Operations

An ordered sequence of operational steps that are executed based upon the completion of the prior step
- ◇ Scheduling ground software time-orders activities and specifies constraints, such as time ➜ generated Observation Plan
- ◇ On-board Operational Software, with access to key telemetry items, initiates each activity after previous activity completes and when its constraints are met ➜ generated Visit File

- ✦ NO on-board reordering of activities
- ✦ Can SKIP activities based upon a limited set of events:

Event	Telemetry
Time window violation	observatory time
Failed guide star acquisition	success/fail indicator
Failed SI target acquisition	success/fail indicator
Science Instrument offline	SI status indicator

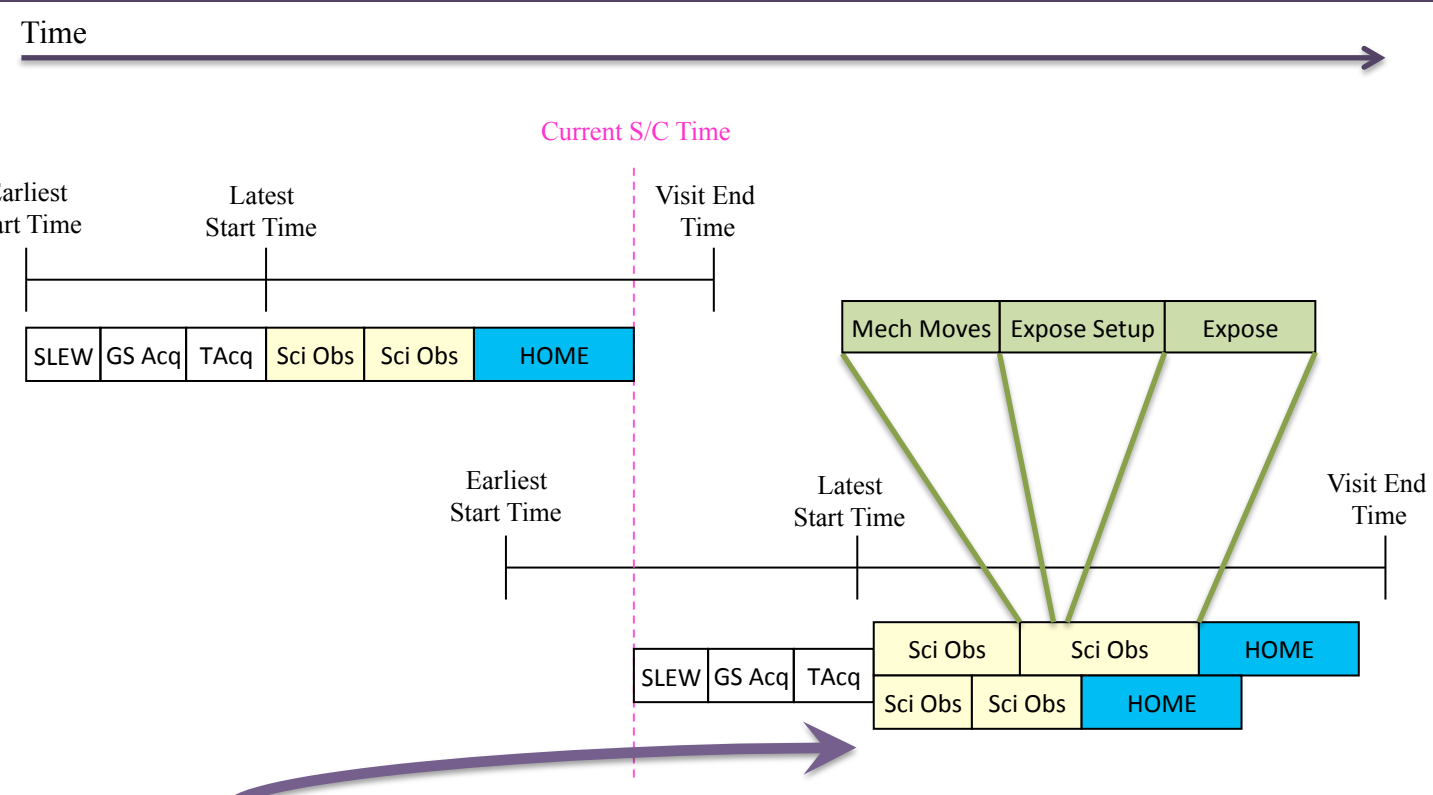## Observation Plan Example

Ordered list of Visit files to execute in order:

```
Visit          Earliest Start      Latest Start        Latest End
V93065001001   2012-001/02:00:00   2025-001/01:00:00   2025-001/03:00:00
V93065001002   2012-001/02:00:00   2025-001/01:00:00   2025-001/03:00:00
V93065002001   2012-001/02:00:00   2025-001/01:00:00   2025-001/03:00:00
V93065002002   2012-001/02:00:00   2025-001/01:00:00   2025-001/03:00:00
V93065003001   2012-001/02:00:00   2025-001/01:00:00   2025-001/03:00:00
V93065003002   2012-001/02:00:00   2025-001/01:00:00   2025-001/03:00:00
V93065004001   2012-001/02:00:00   2025-001/01:00:00   2025-001/03:00:00
V93065004002   2012-001/02:00:00   2025-001/01:00:00   2025-001/03:00:00
SLEW statement;
```
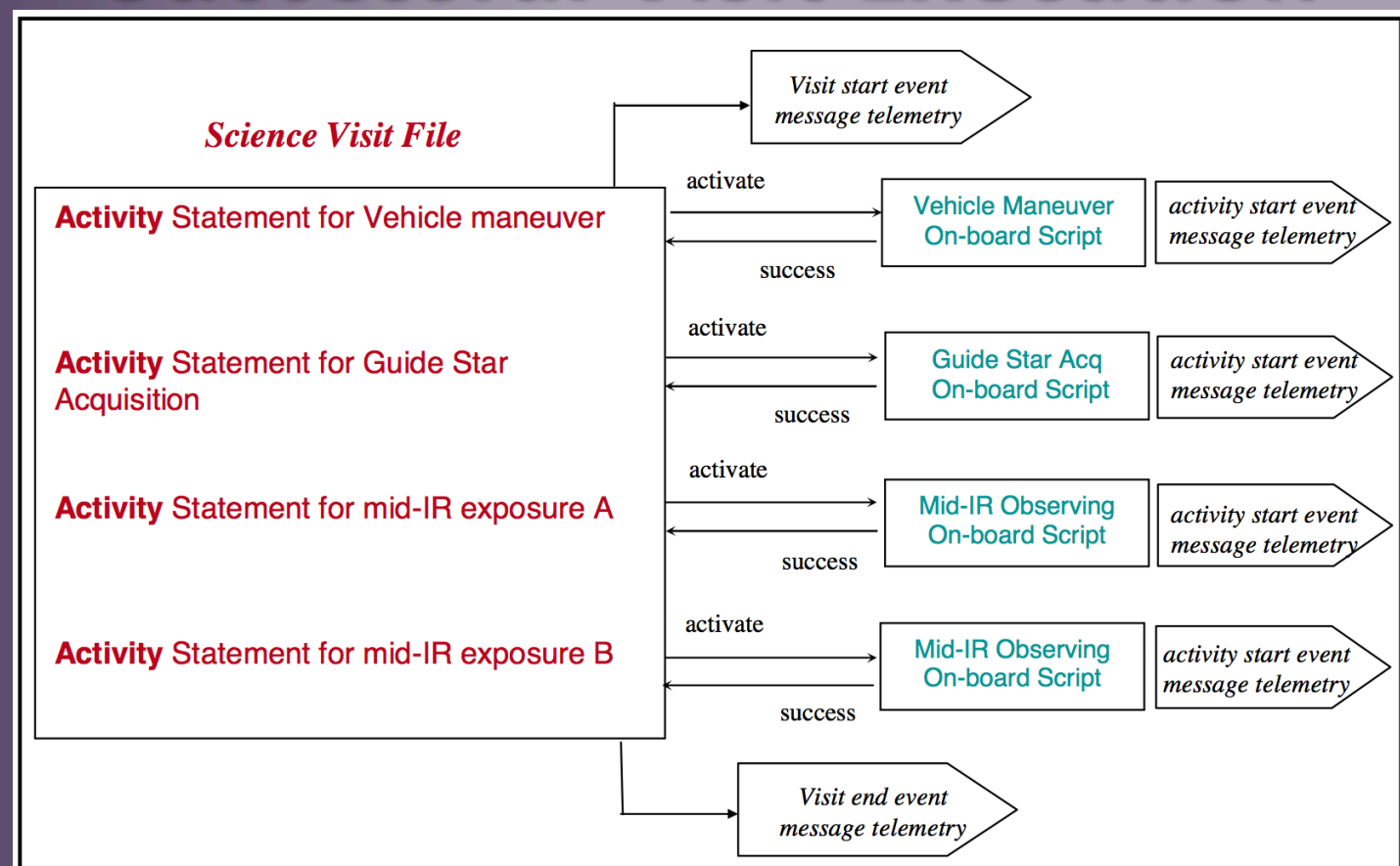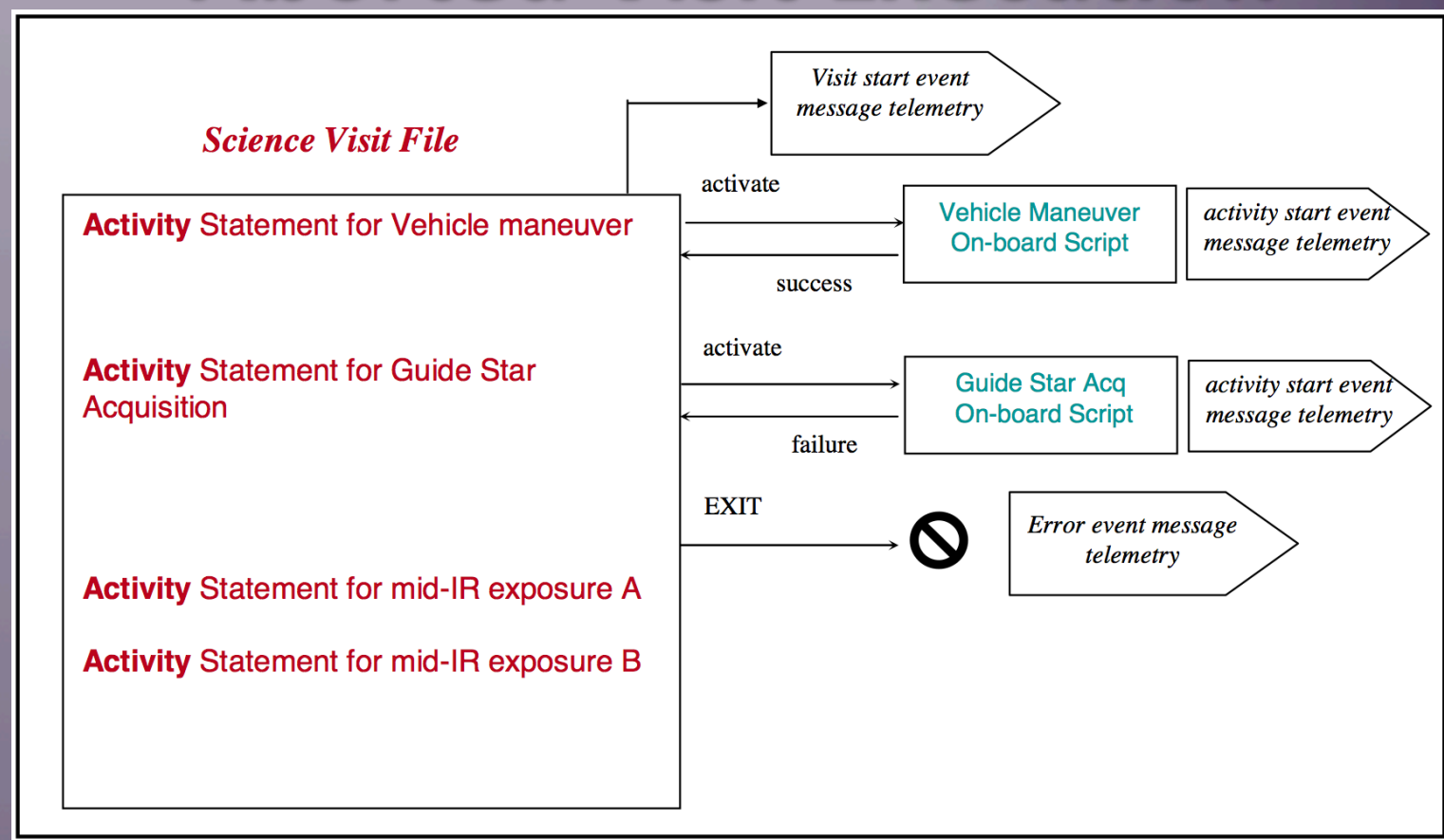
Parallel Science and Calibration Activities:
- ✦ Occur within the Visit file
- ✦ If one parallel activity encounters ERROR:
    - ➜ Other parallel activity completes
    - ➜ Rest of Visit may be skipped, depends on error

Time

Current S/C Time

Previous Visit:

Earliest Start Time | Latest Start Time | Visit End Time

SLEW | GS Acq | TAcq | Sci Obs | Sci Obs | HOME

Mech Moves | Expose Setup | Expose

Next Visit: Science Parallel

Earliest Start Time | Latest Start Time | Visit End Time

SLEW | GS Acq | TAcq | Sci Obs | Sci Obs | HOME
Sci Obs | Sci Obs | HOME

Successful Visit Execution

Science Visit File

Visit start event message telemetry

Activity Statement for Vehicle maneuver — activate — Vehicle Maneuver On-board Script — activity start event message telemetry — success

Activity Statement for Guide Star Acquisition — activate — Guide Star Acq On-board Script — activity start event message telemetry — success

Activity Statement for mid-IR exposure A — activate — Mid-IR Observing On-board Script — activity start event message telemetry — success

Activity Statement for mid-IR exposure B — activate — Mid-IR Observing On-board Script — activity start event message telemetry — success

Visit end event message telemetry

Aborted Visit Execution

Science Visit File

Visit start event message telemetry

Activity Statement for Vehicle maneuver — activate — Vehicle Maneuver On-board Script — activity start event message telemetry — success

Activity Statement for Guide Star Acquisition — activate — Guide Star Acq On-board Script — activity start event message telemetry — failure

EXIT — Error event message telemetry

Activity Statement for mid-IR exposure A

Activity Statement for mid-IR exposure B

Visit End Activities

Guider Termination Script Spawned

Terminate Guiding (if S/C is Fine Guiding)

HOME Path
- Nominal Visit End
- Subsystem or Input Error

No ← Visit took too long, or Observation Plan requested to stop? → Yes

CLEANUP Path
- Visit Took Too Long
- Observation Plan requested to stop

Visit End SI Scripts Spawned in parallel

Command Healthy SIs used in visit to a known state (Problem SIs are left alone)

Command Healthy SIs used in visit to Preferred Safe and then Recover (Problem SIs are left alone)

Exit Overhead

OPE Script Used
- Delete Auxiliary Files associated with visit
- Delete the Visit File
- Enable High Gain Antenna for updates
- Mark SSR Data for Playback

...and the Observation Plan continues on to next Visit