



Design and Architecture of Planning and Sequence System for Mars Exploration Rover (MER) Operations

Adans Ko

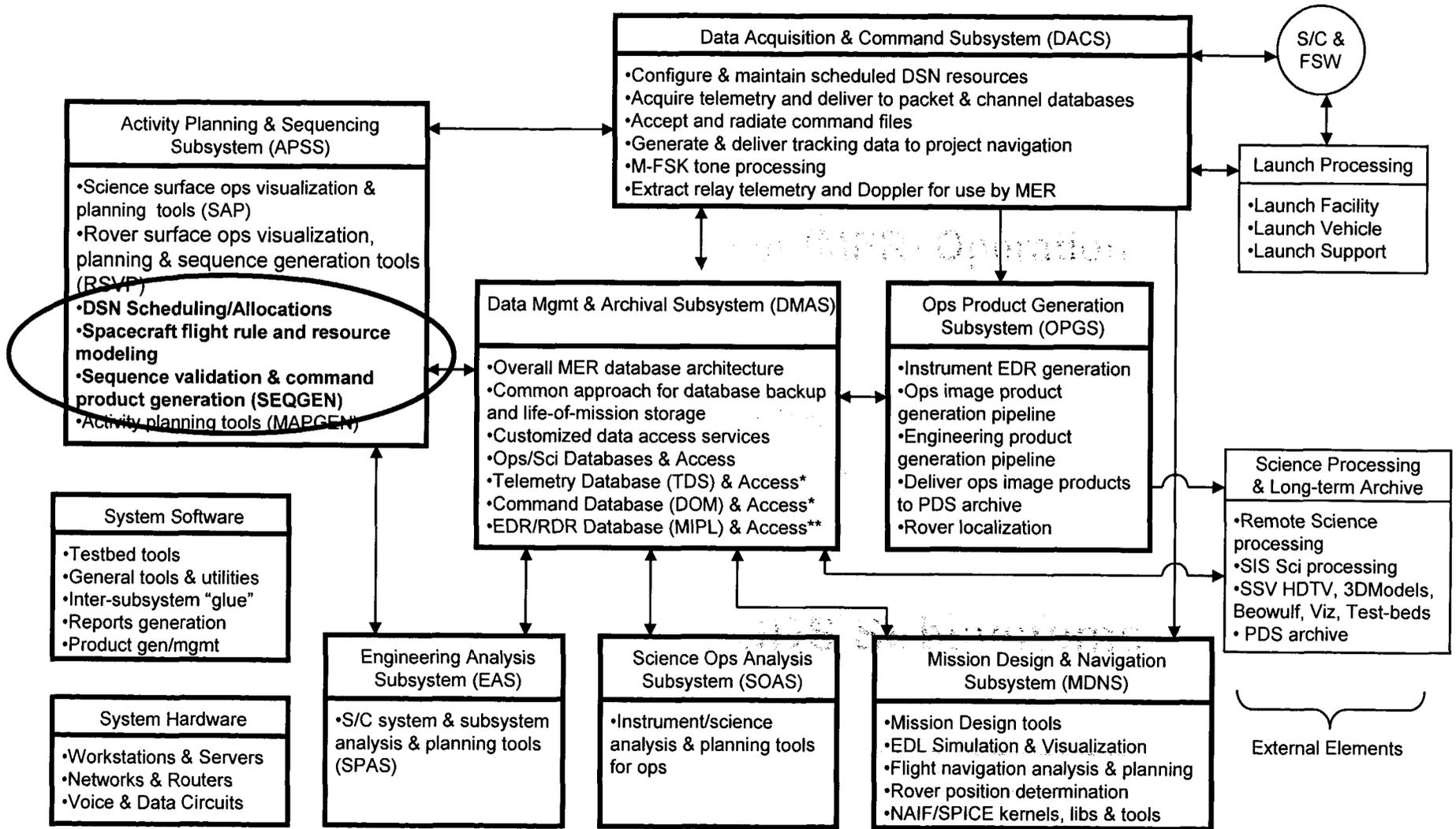
Dennis Page

Jeff Bixler

Scott Lever

Kar-Ming Cheung

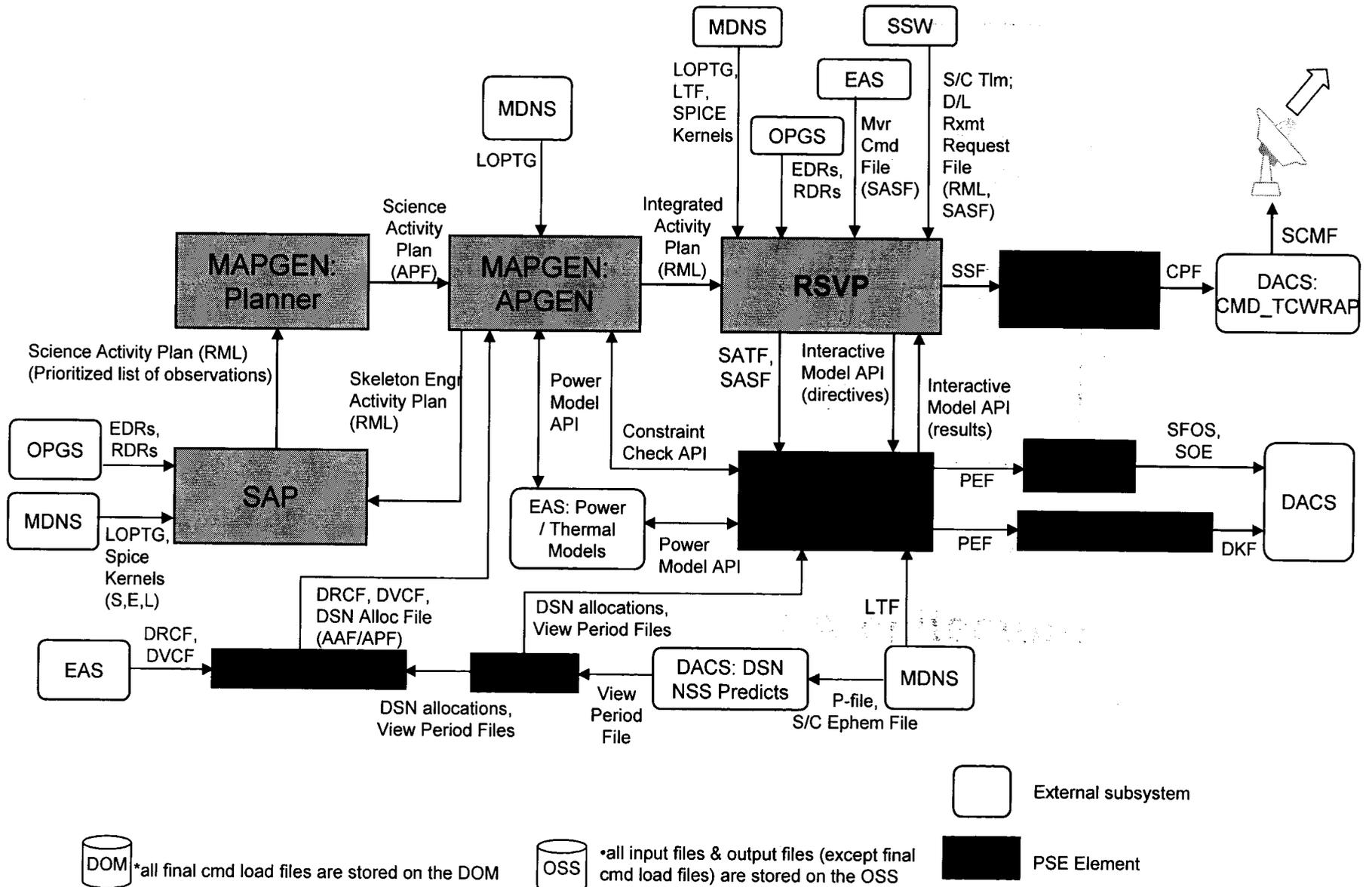
Context Overview: GDS Subsystems



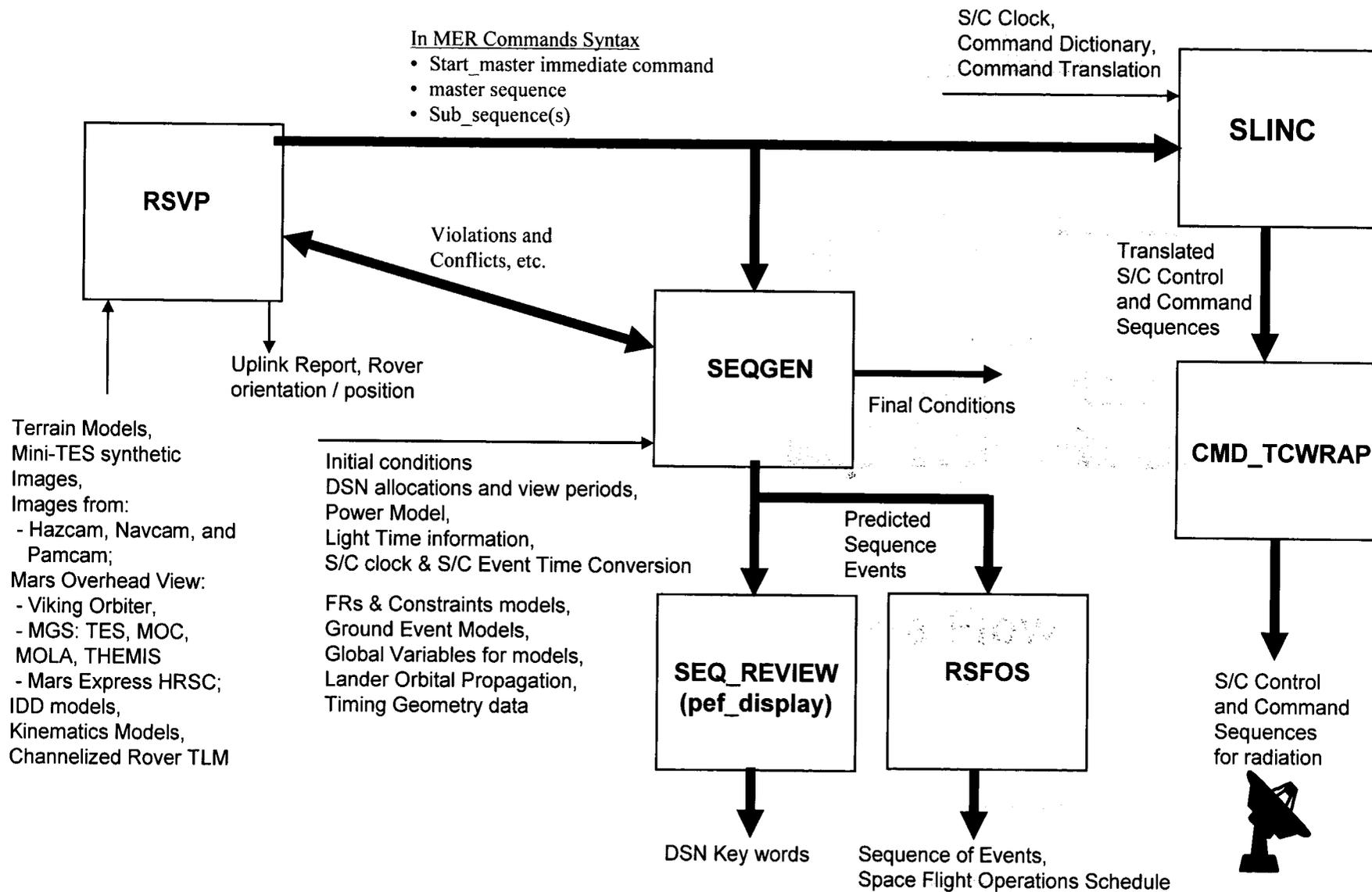
* TDS & DOM core software provided by DACS

**MIPL D/B core software provided by OPGS

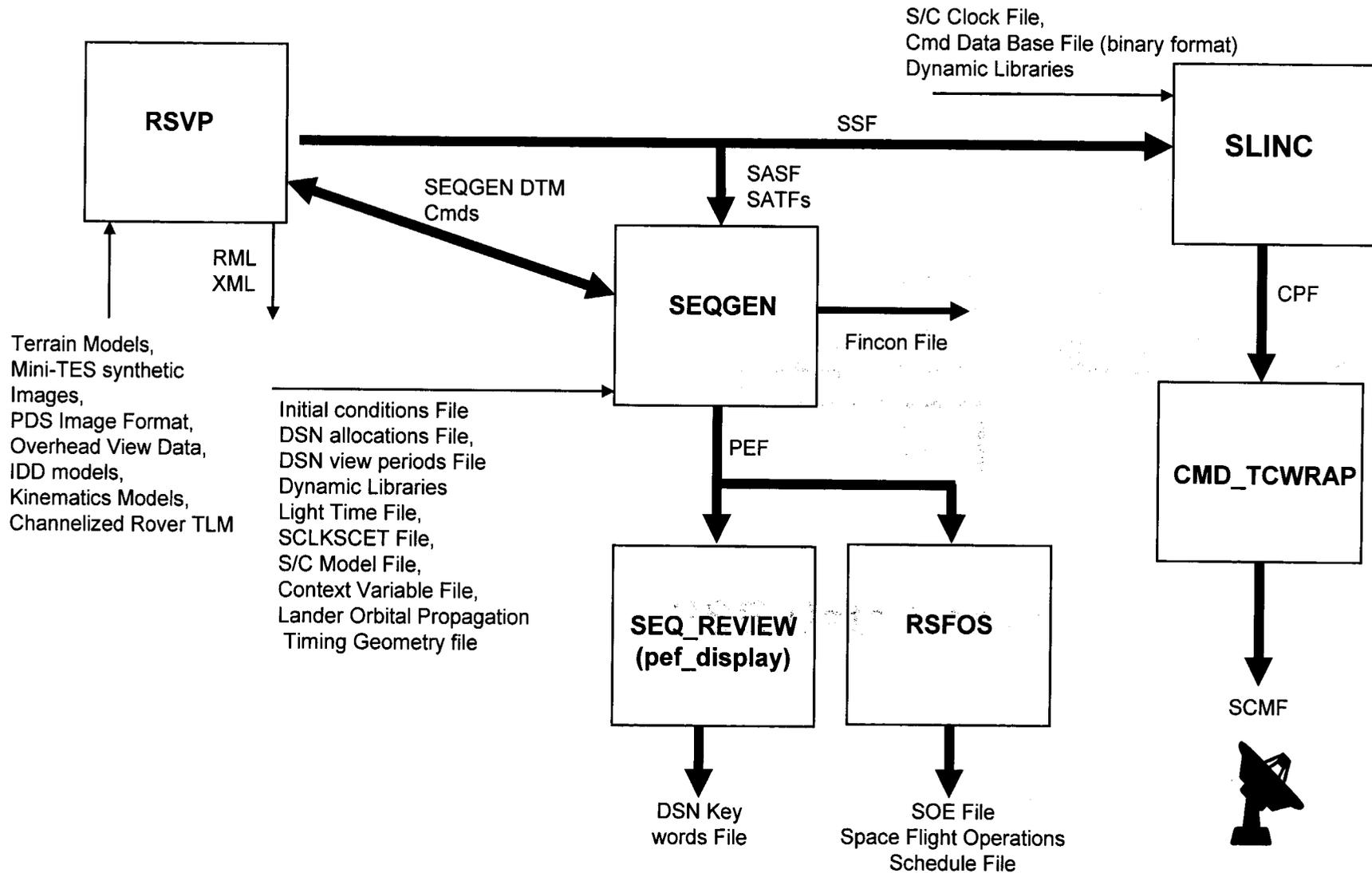
Context Overview: APSS Architecture



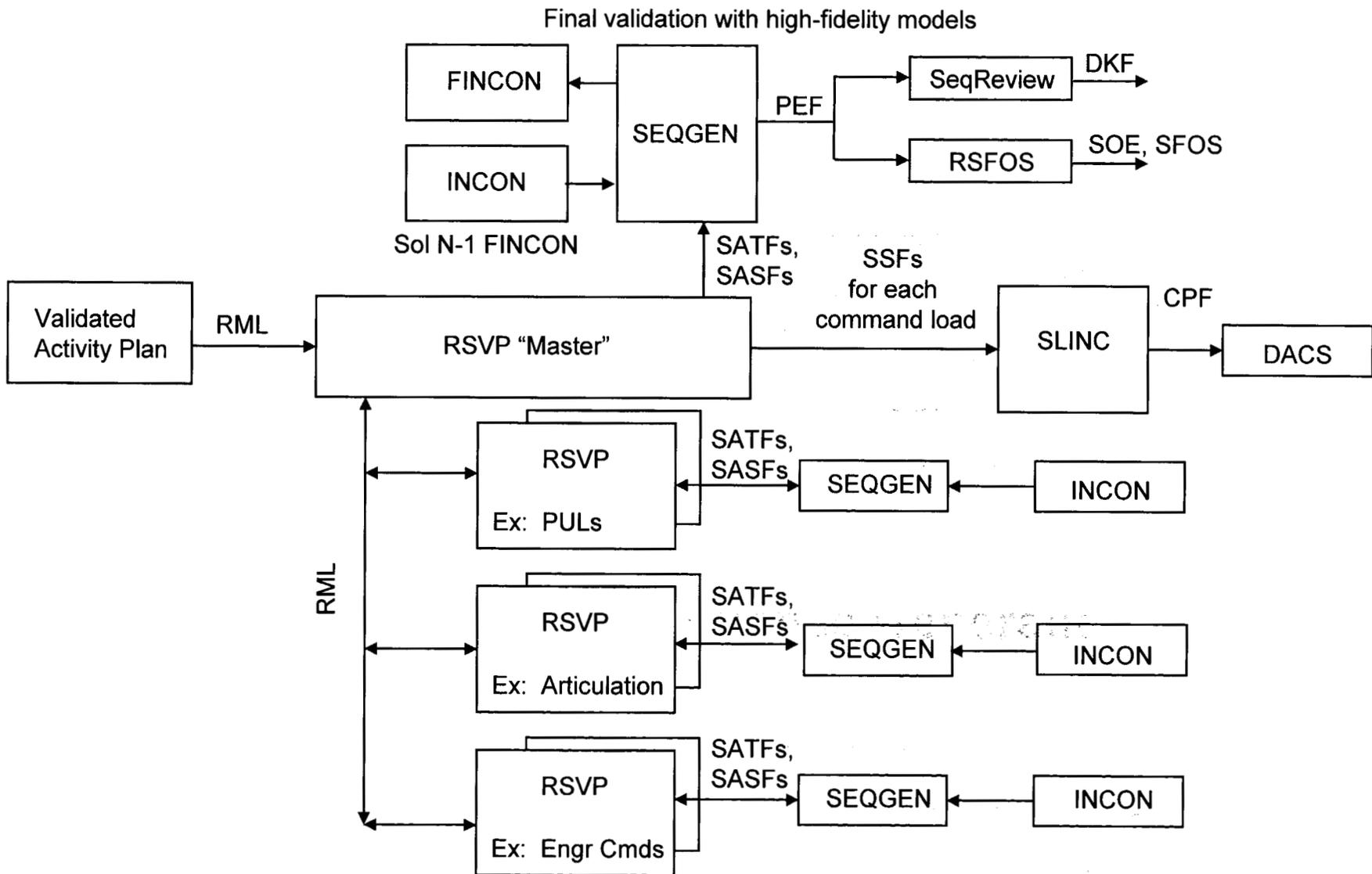
PSE Overview: PSE Data Flow



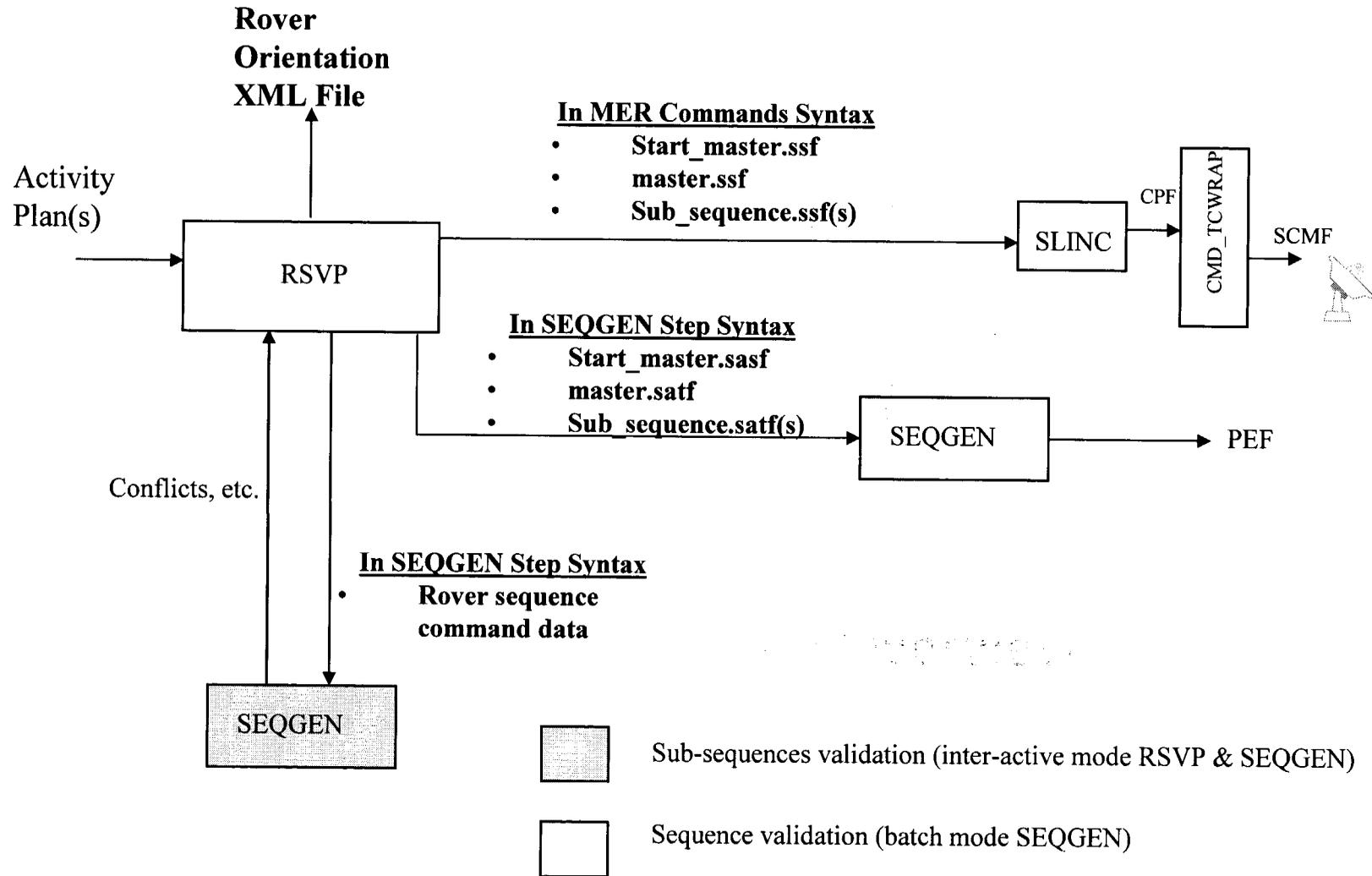
PSE Overview: PSE Data Format



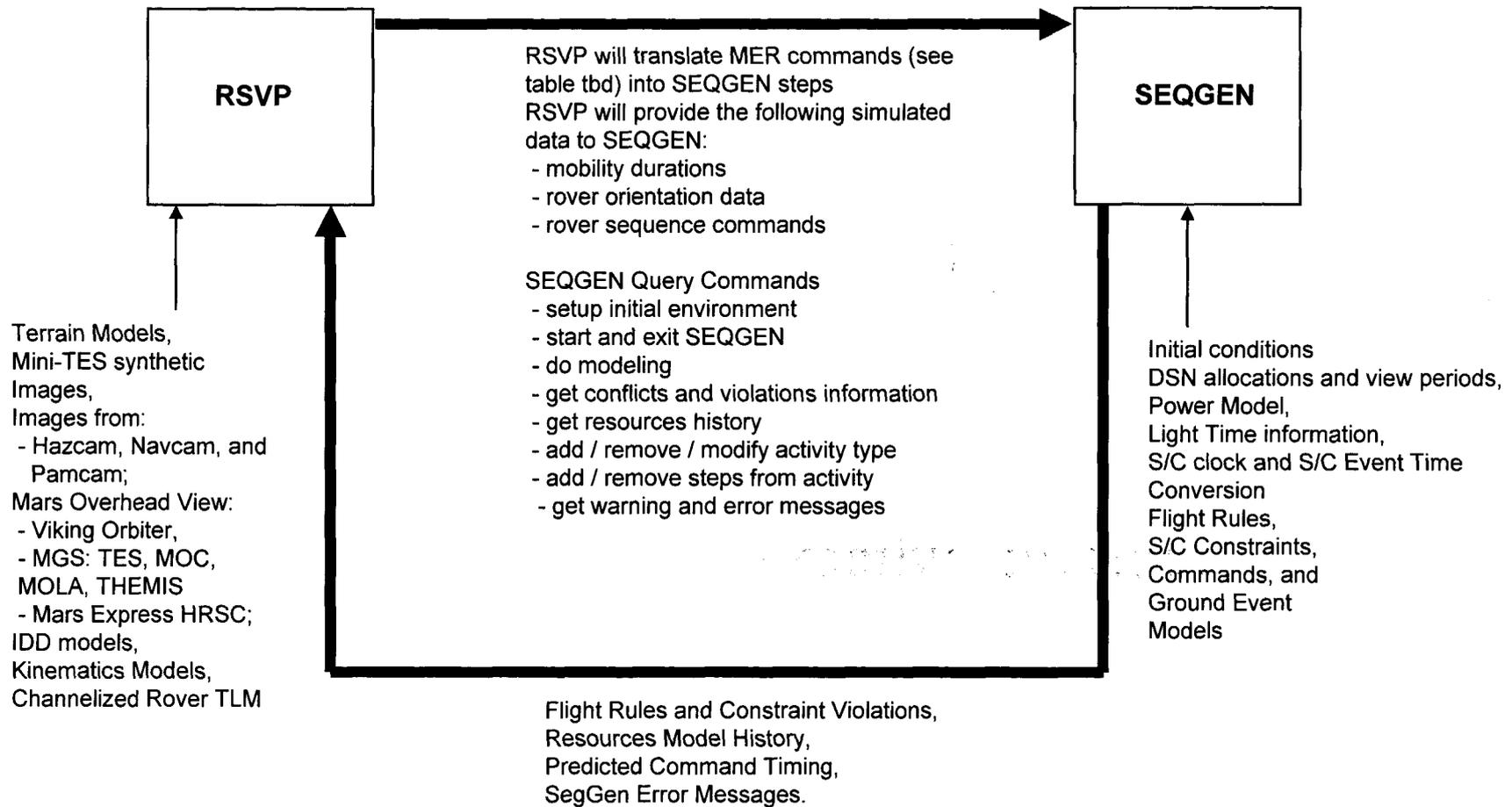
RSVP Interface: Sequence Generation



RSVP Interface: Design Overview



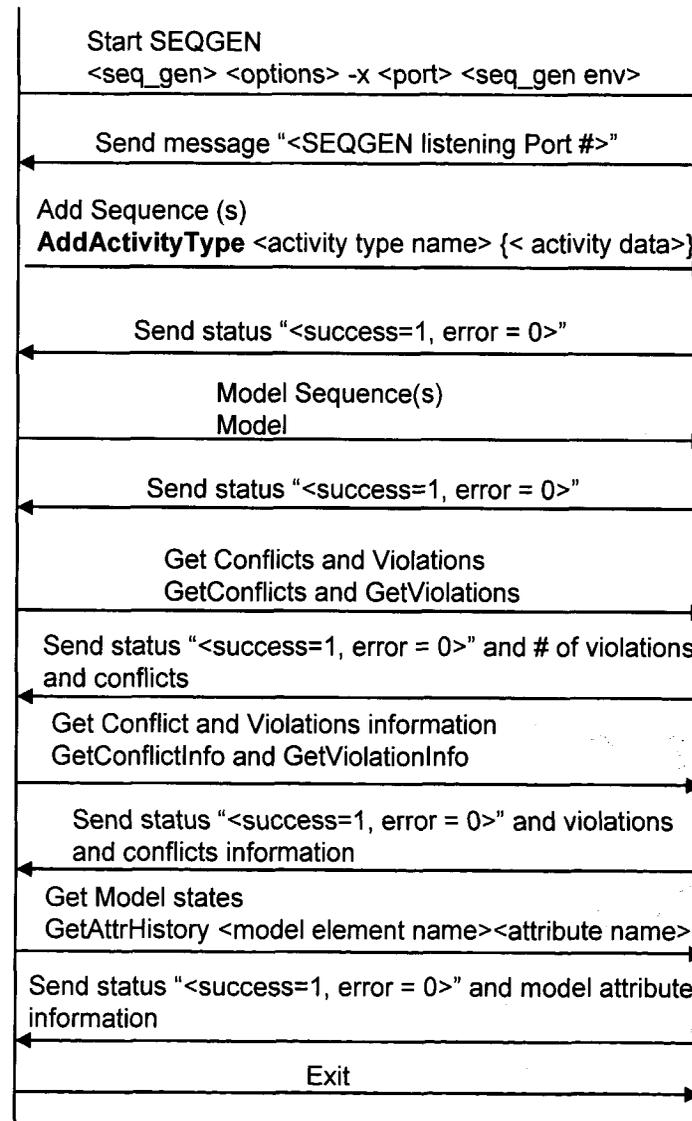
RSVP Interface: Interactive Interface



RSVP Interface: Timeline (sample)

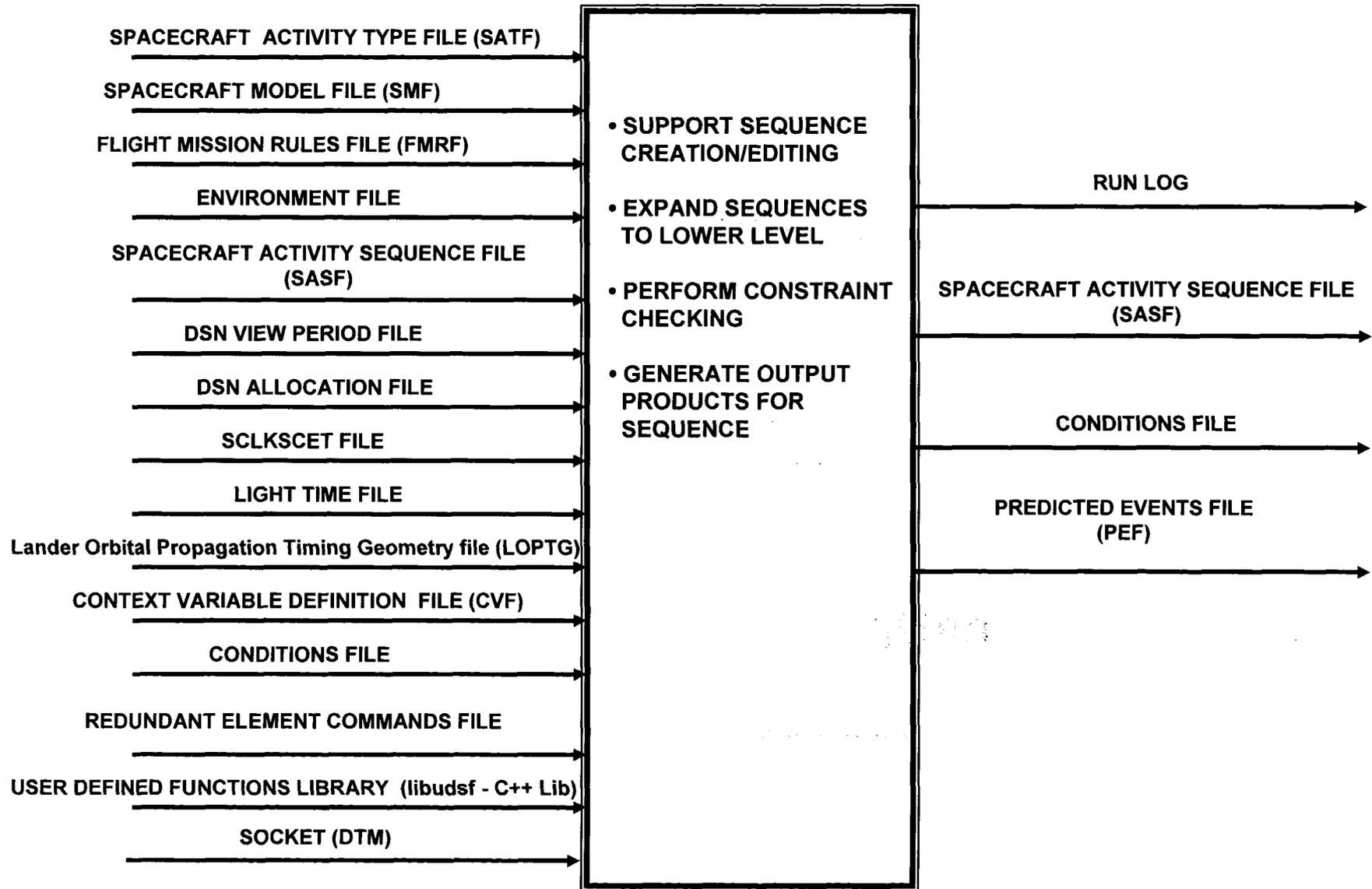
RSVP

SEQGEN

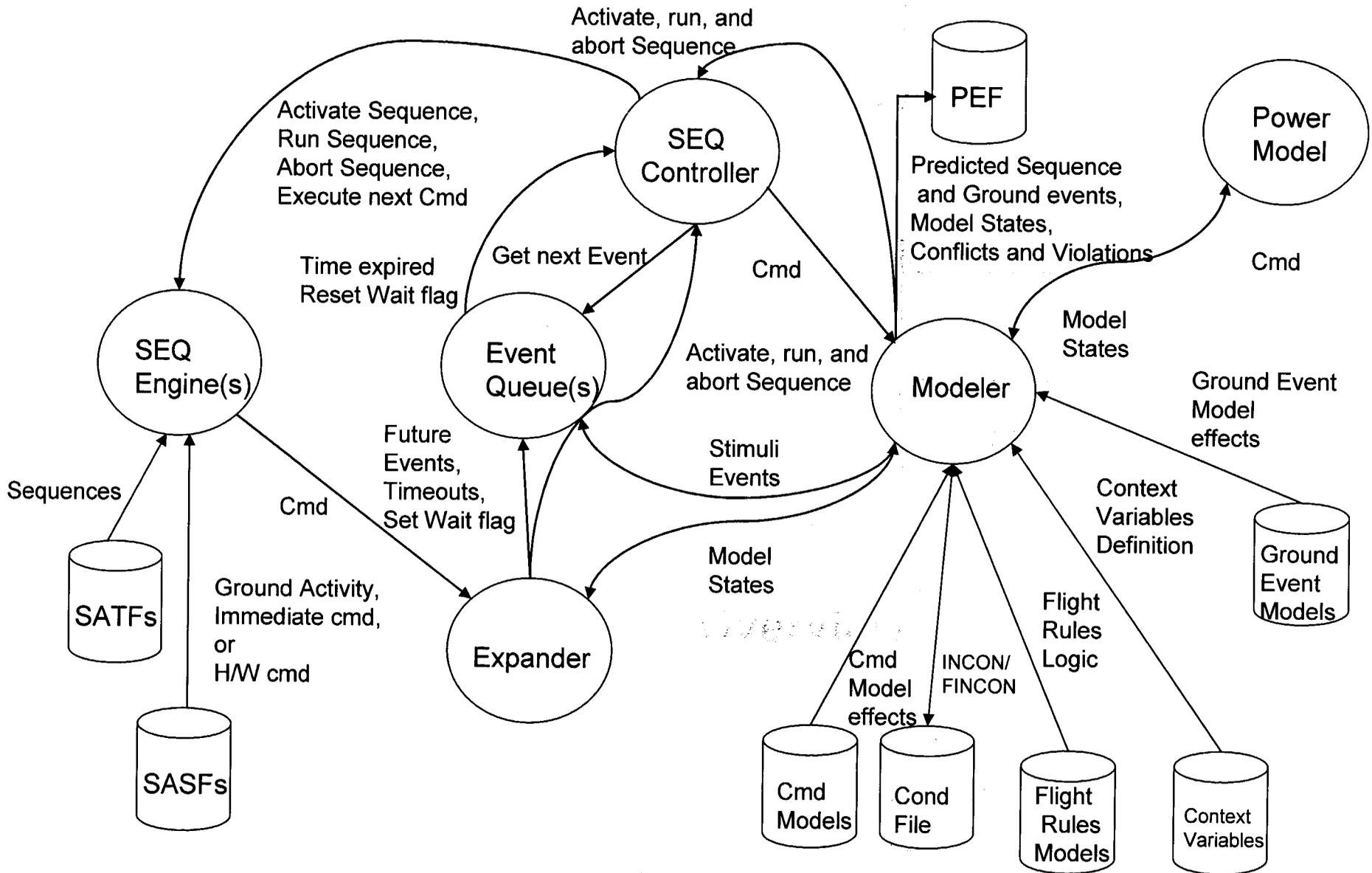


Pre-requisite steps prior to the interface:
 Use env_gen to create the required SEQGEN environment file.
 The environment file will list the following files:
 -activate "master" sequence sasf
 -master.saf
 -Model files (SMF)
 -Light time fle (LTF)
 -SCKLSCET file
 -Context Variables File
 -Initial Conditions File

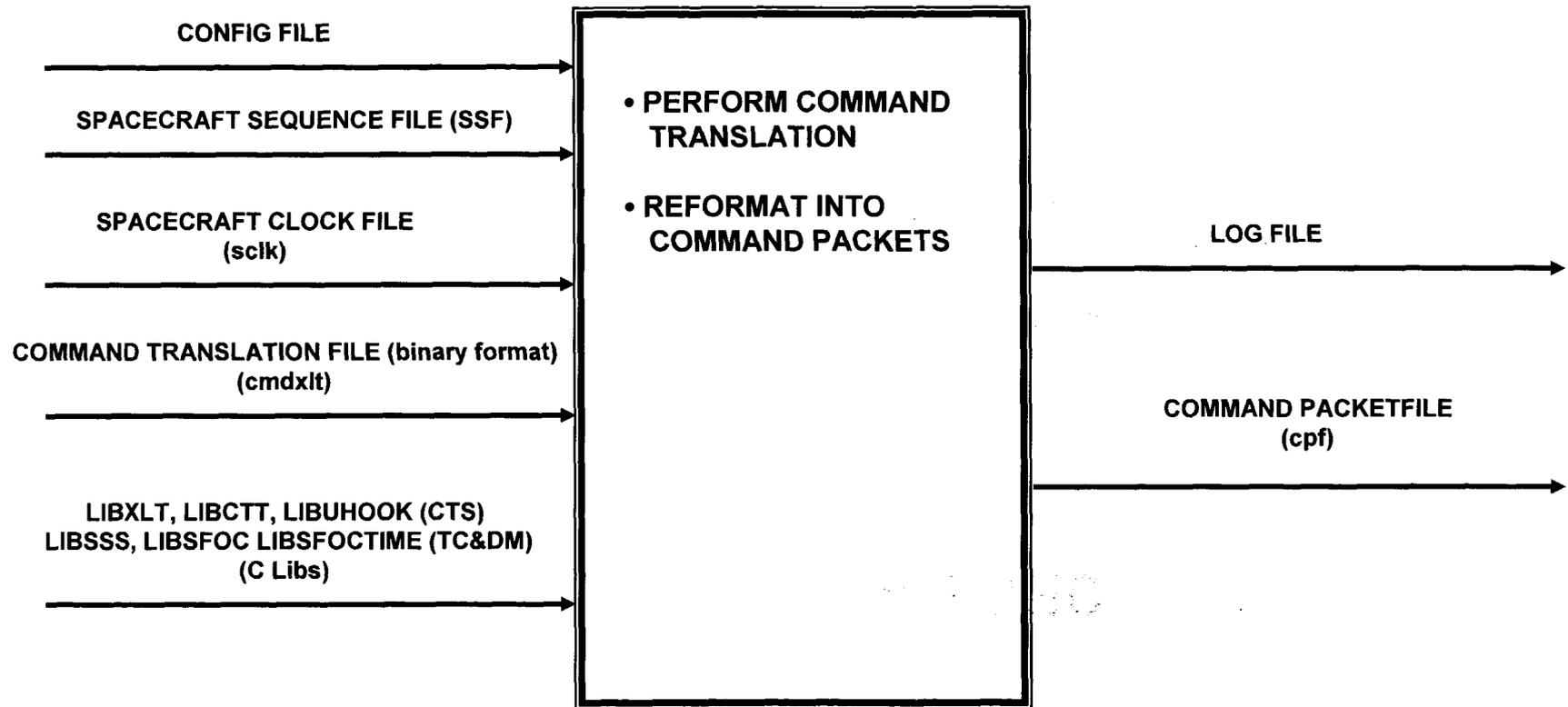
Internal Interfaces: SegGen



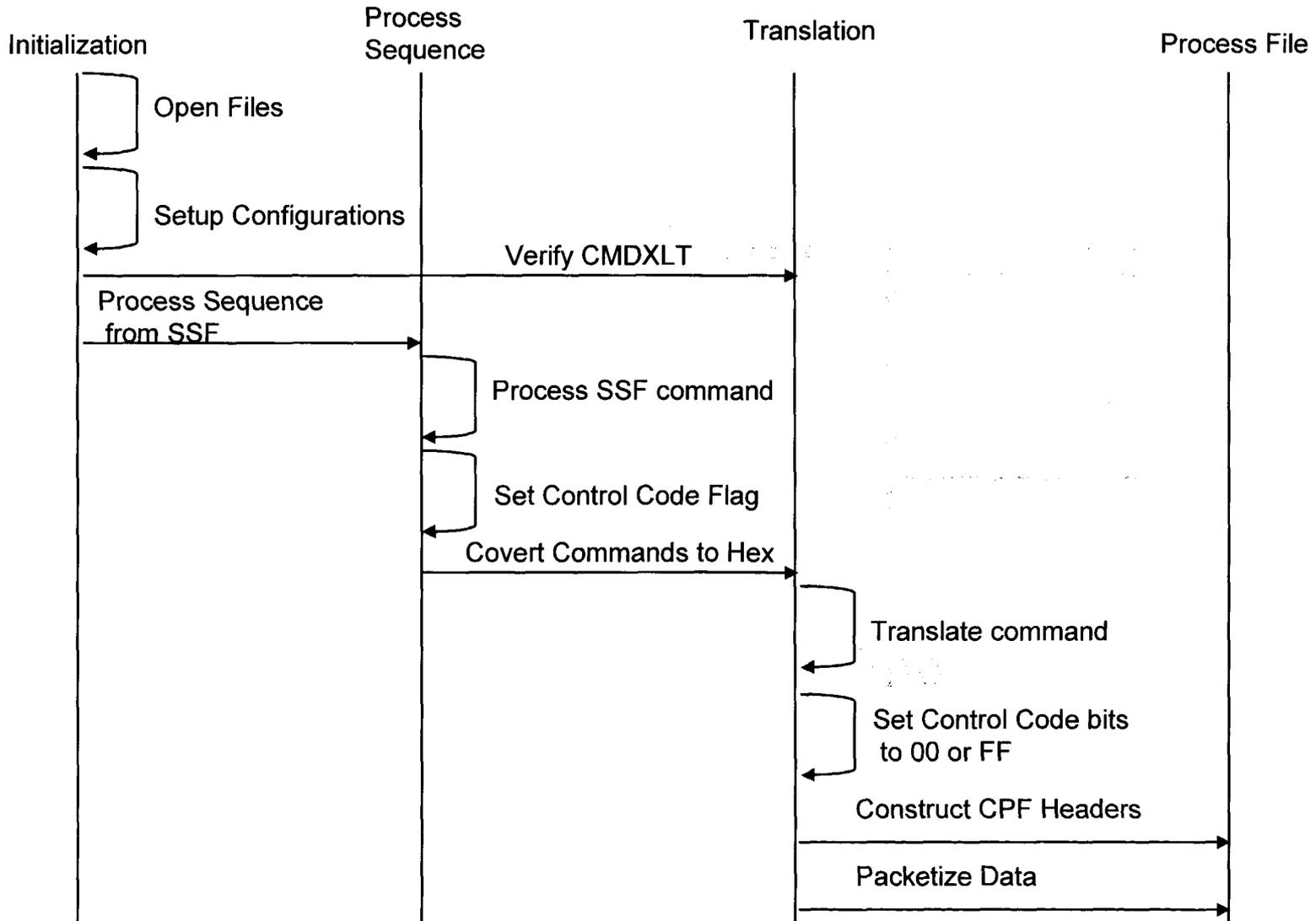
SegGen Overview



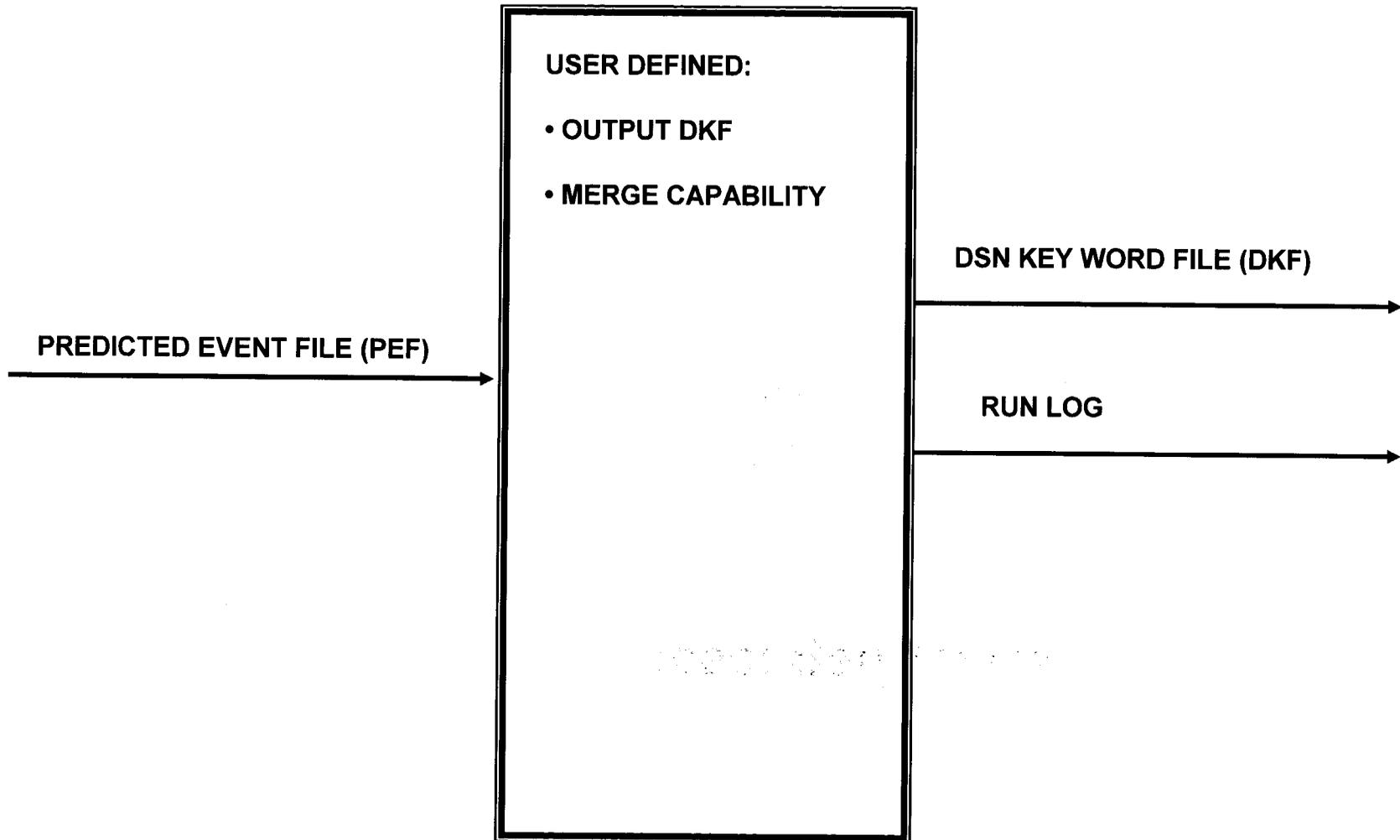
Internal Interfaces: SLINC



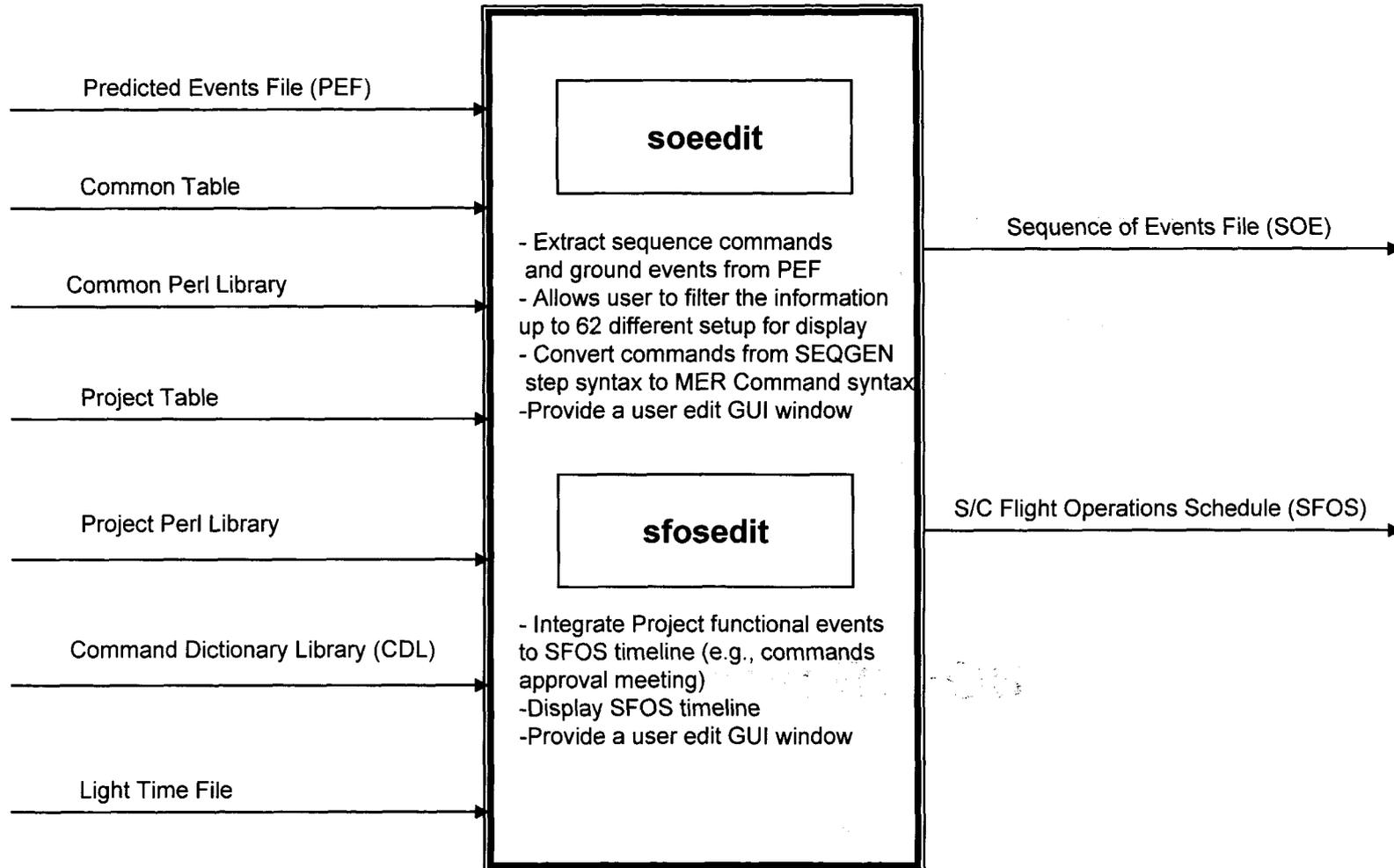
SLINC Process Timeline



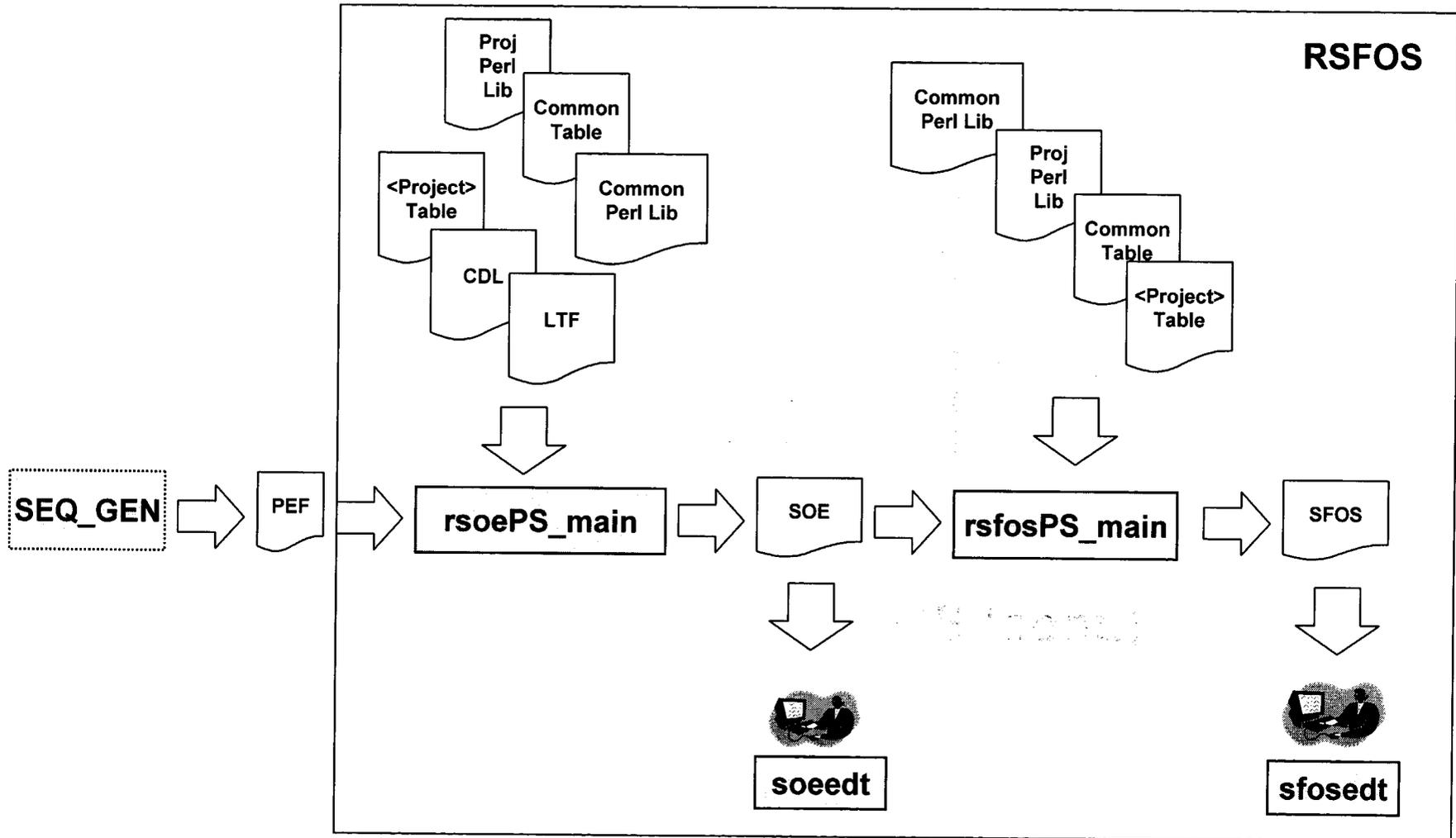
Internal Interfaces: SeqReview



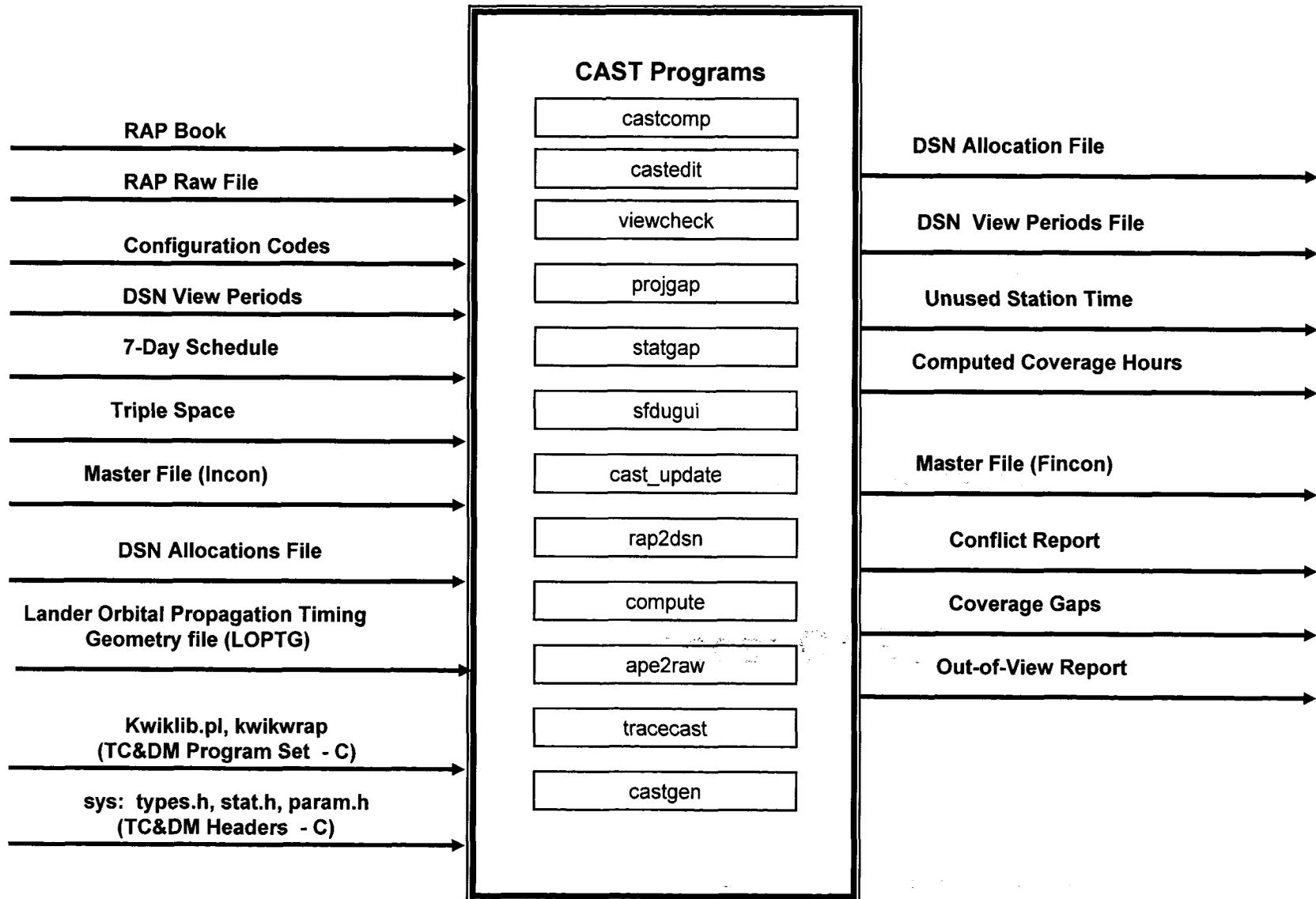
Internal Interfaces: RSFOS



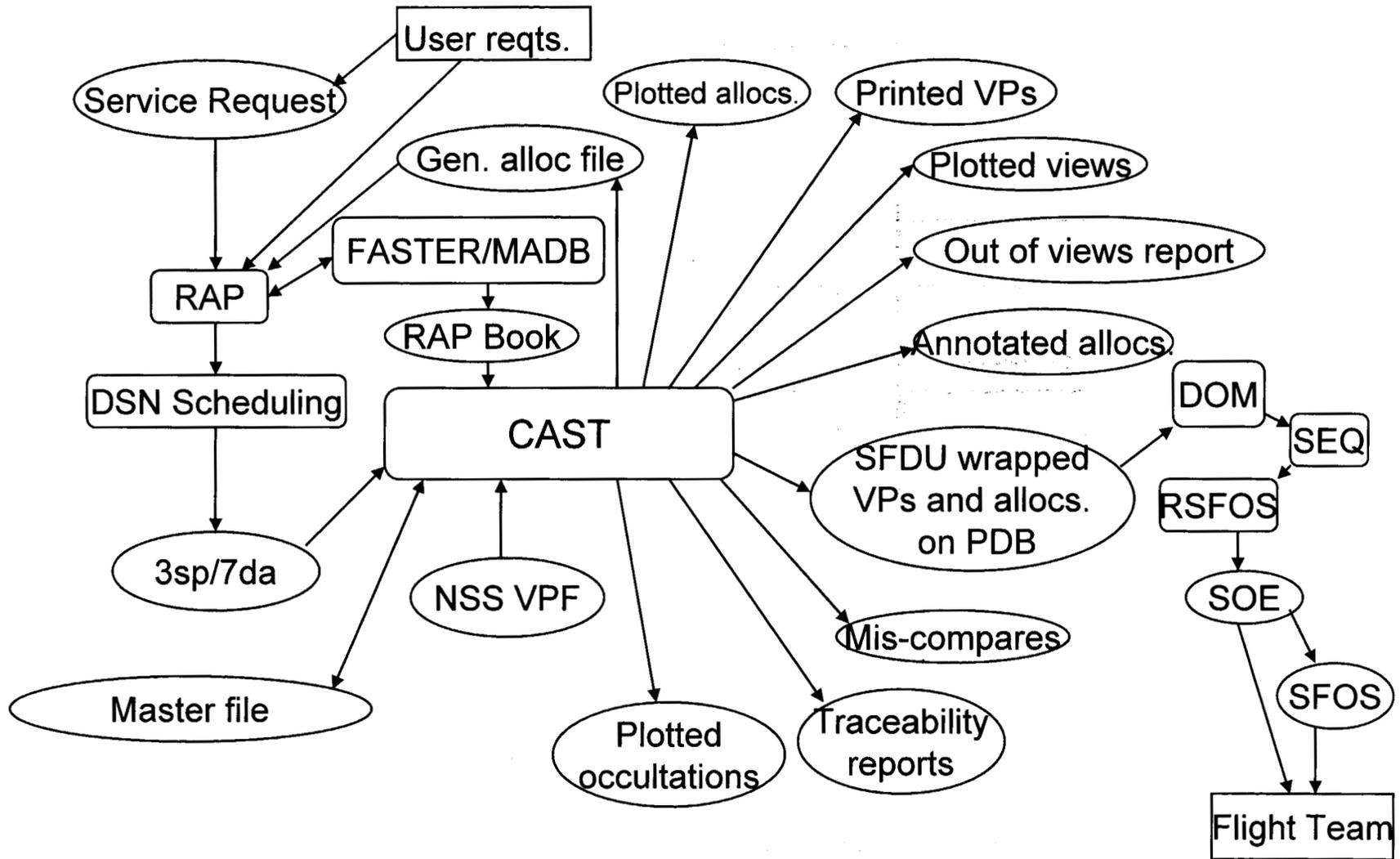
Internal Interfaces: RSFOS (cont.)



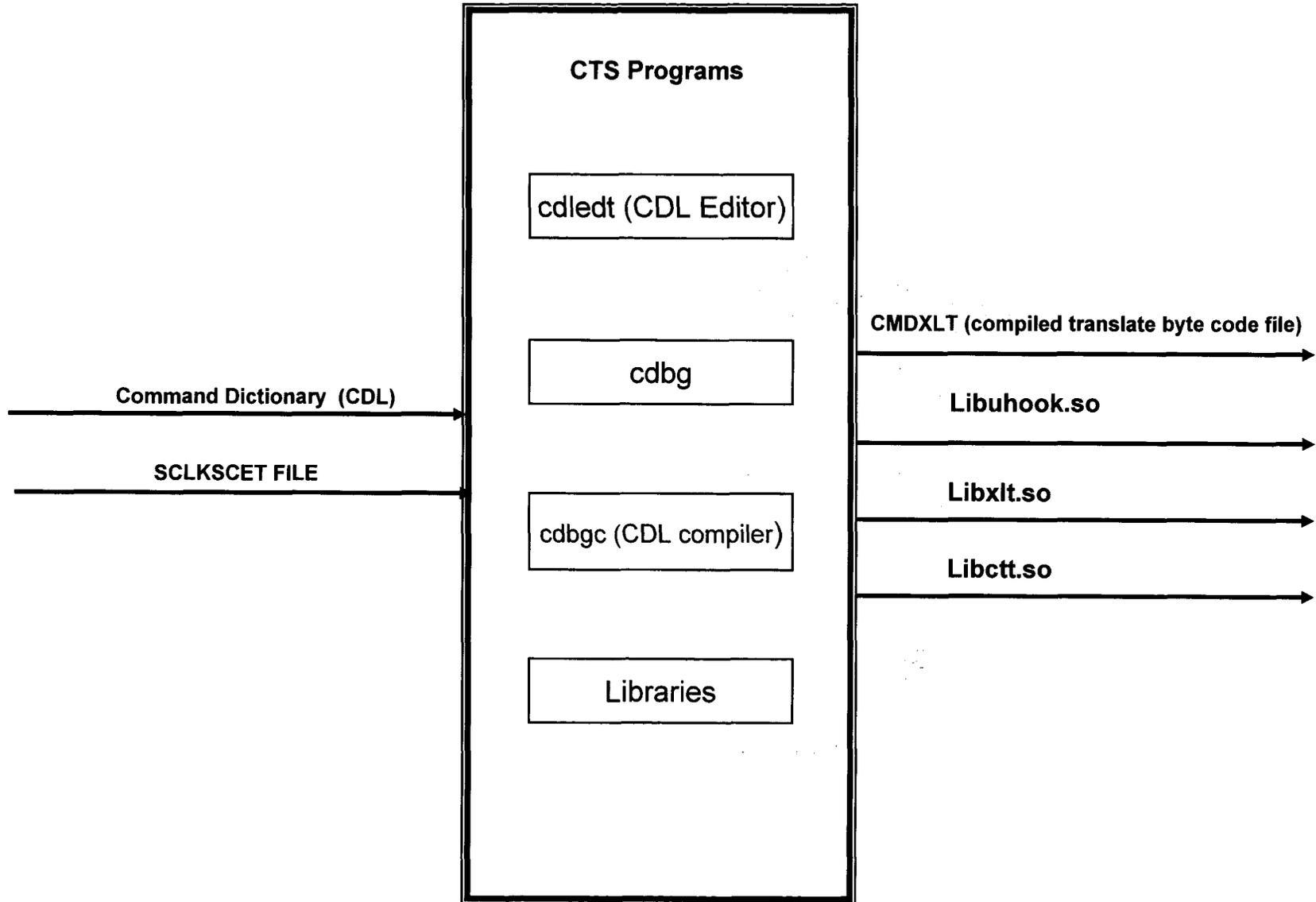
Internal Interfaces: CAST



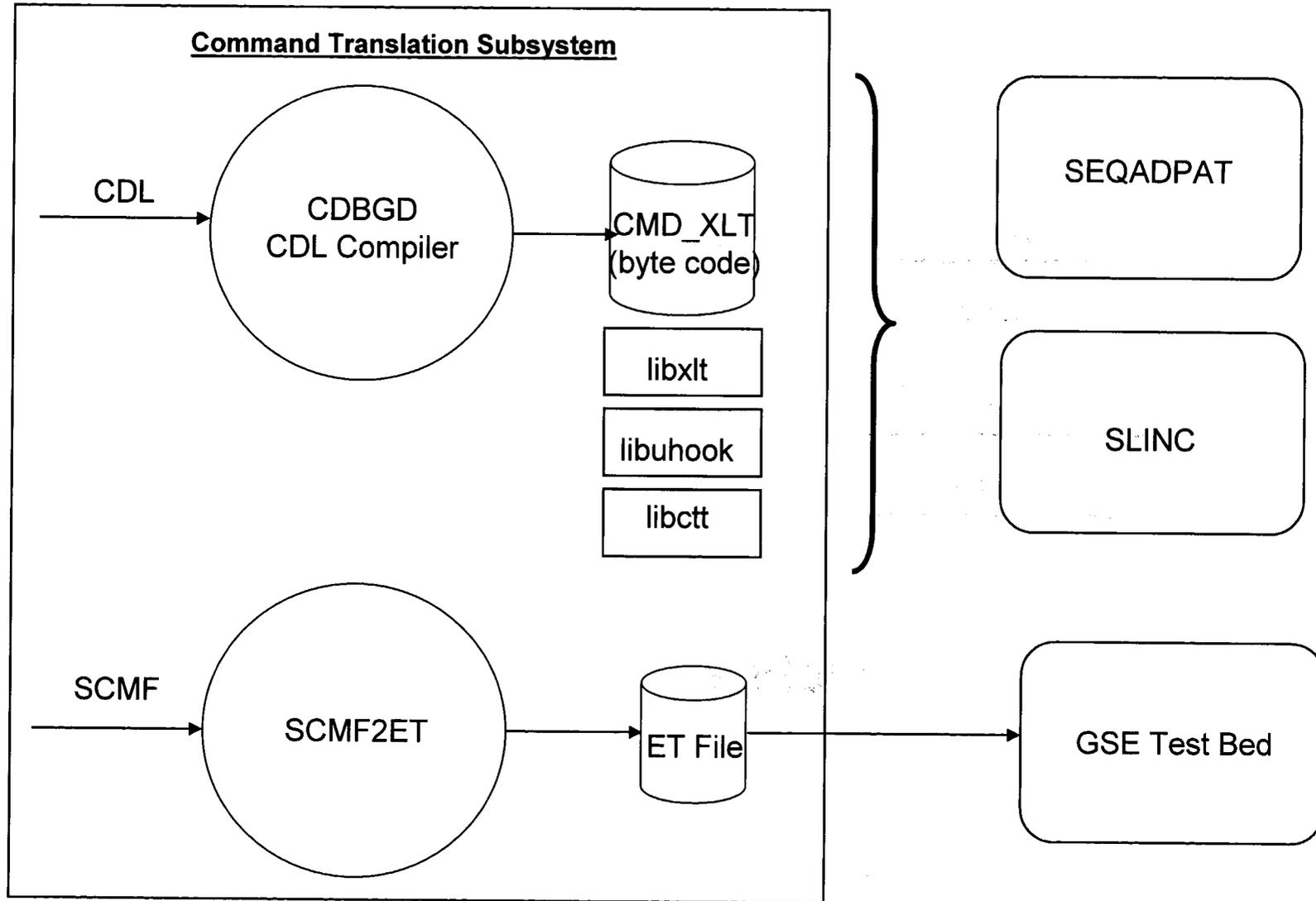
CAST Process Flow



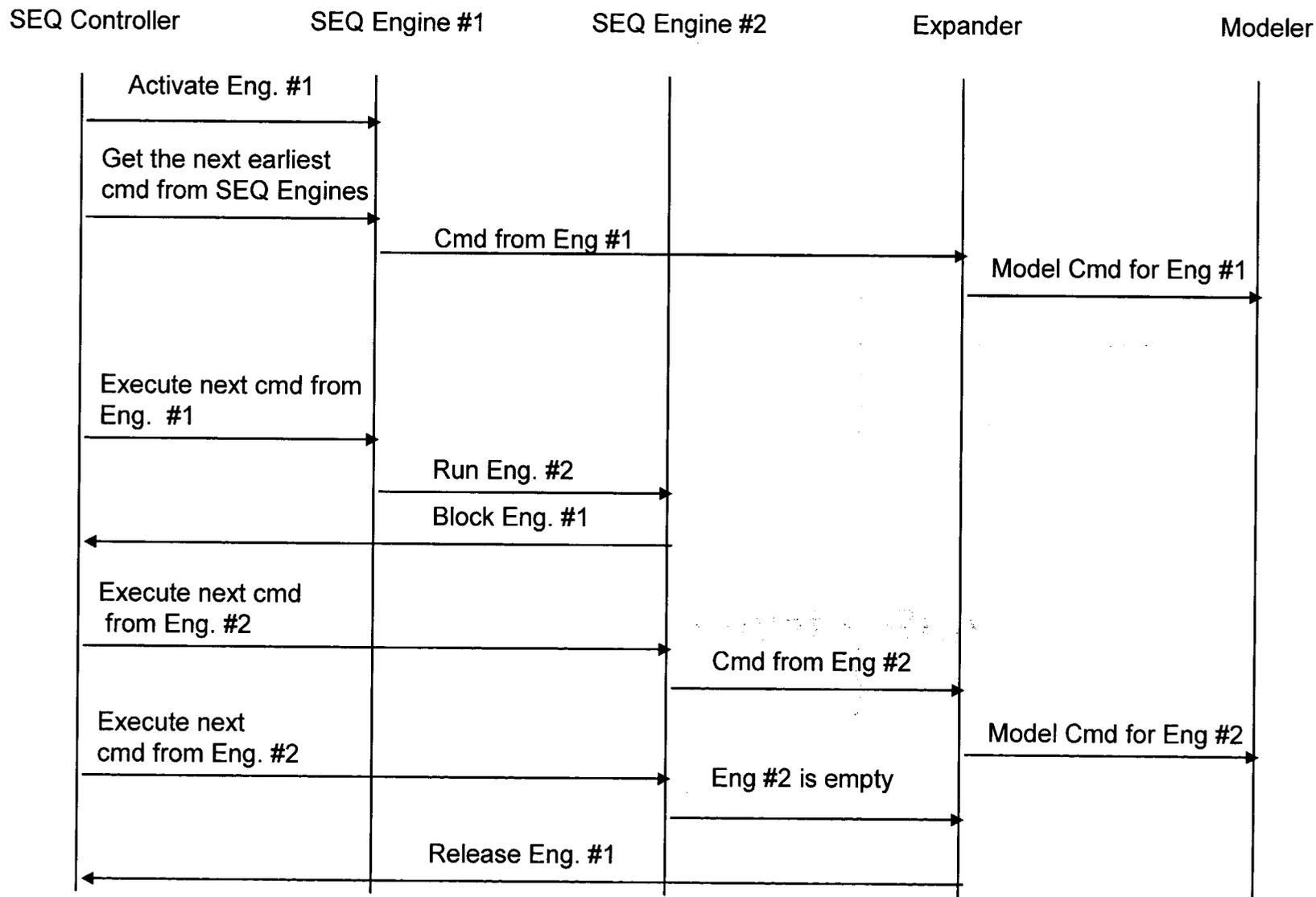
Internal Interfaces: CTS



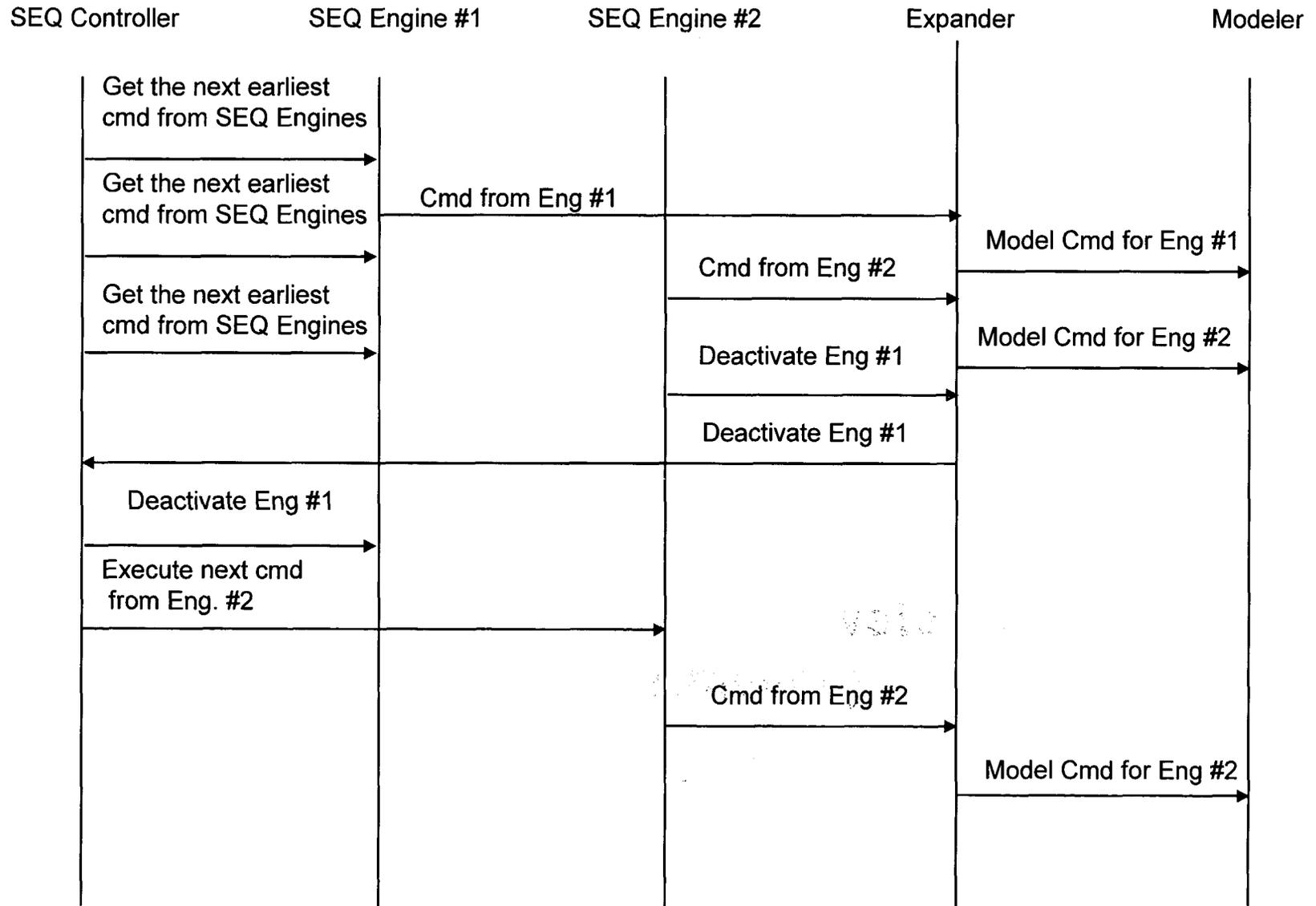
CTS Process Flow



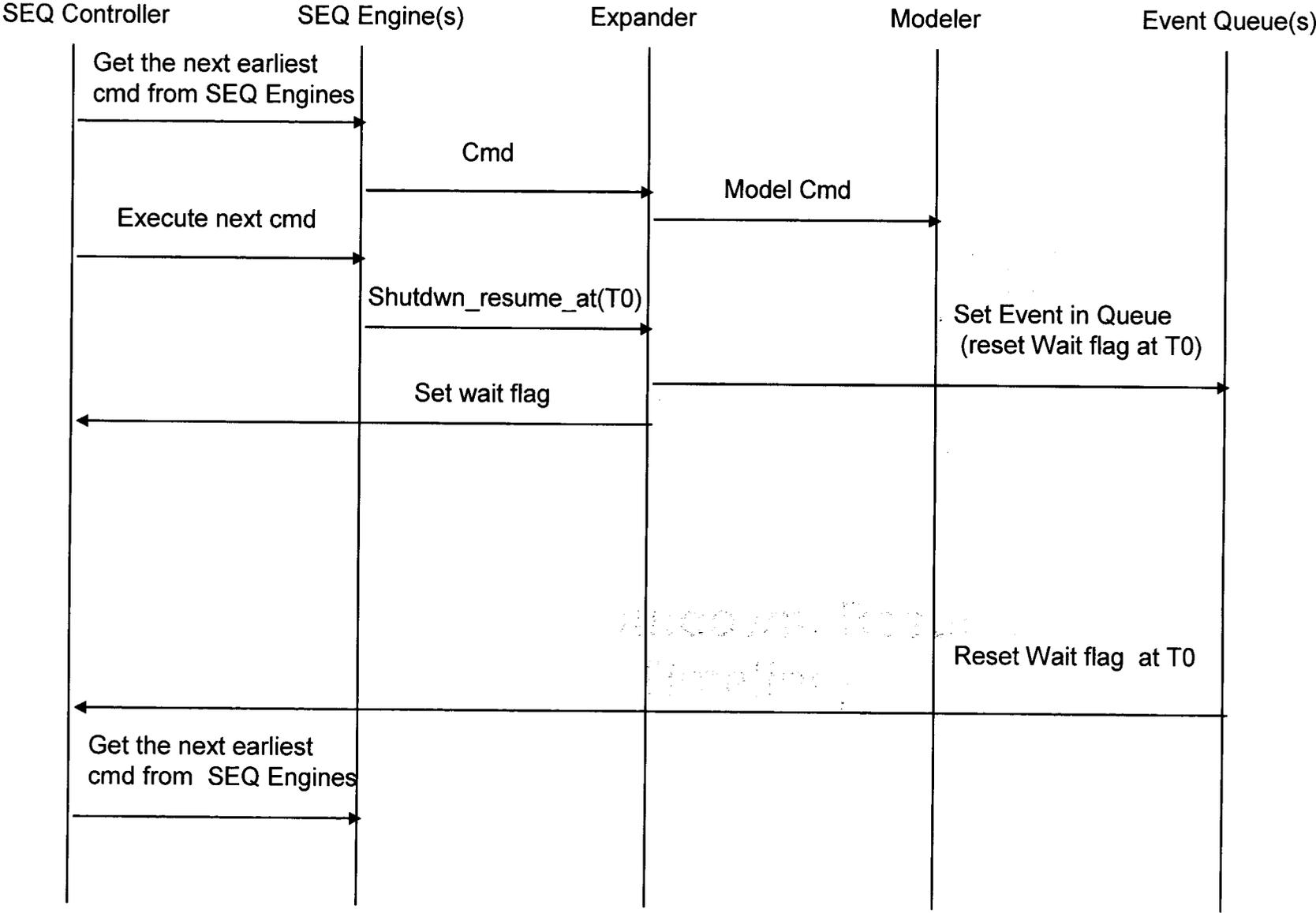
SEQ Mgt/Ctrl – Activate, Run (Process Timeline)



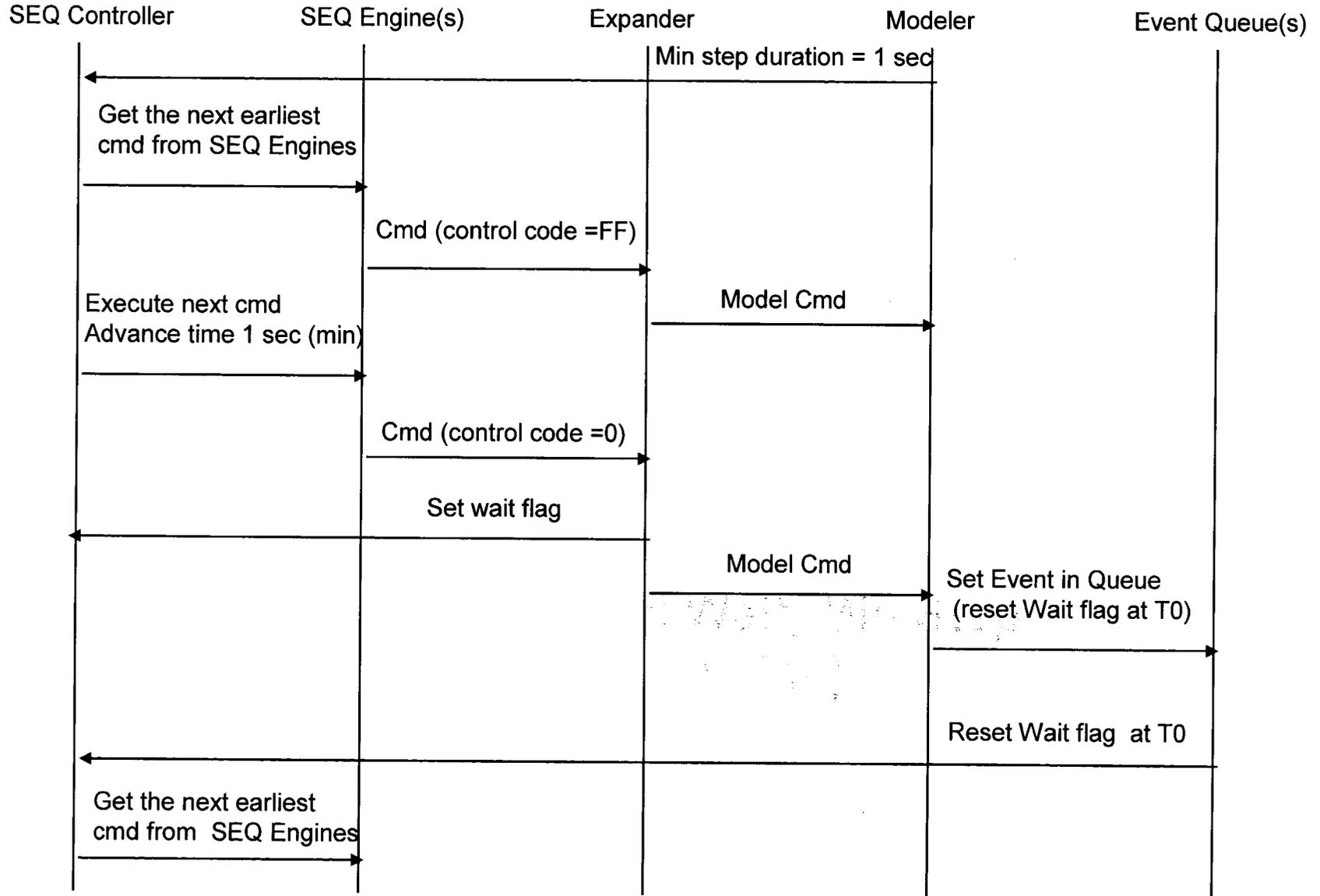
Seq Mgt/Ctrl – DeActivate (Process Timeline)



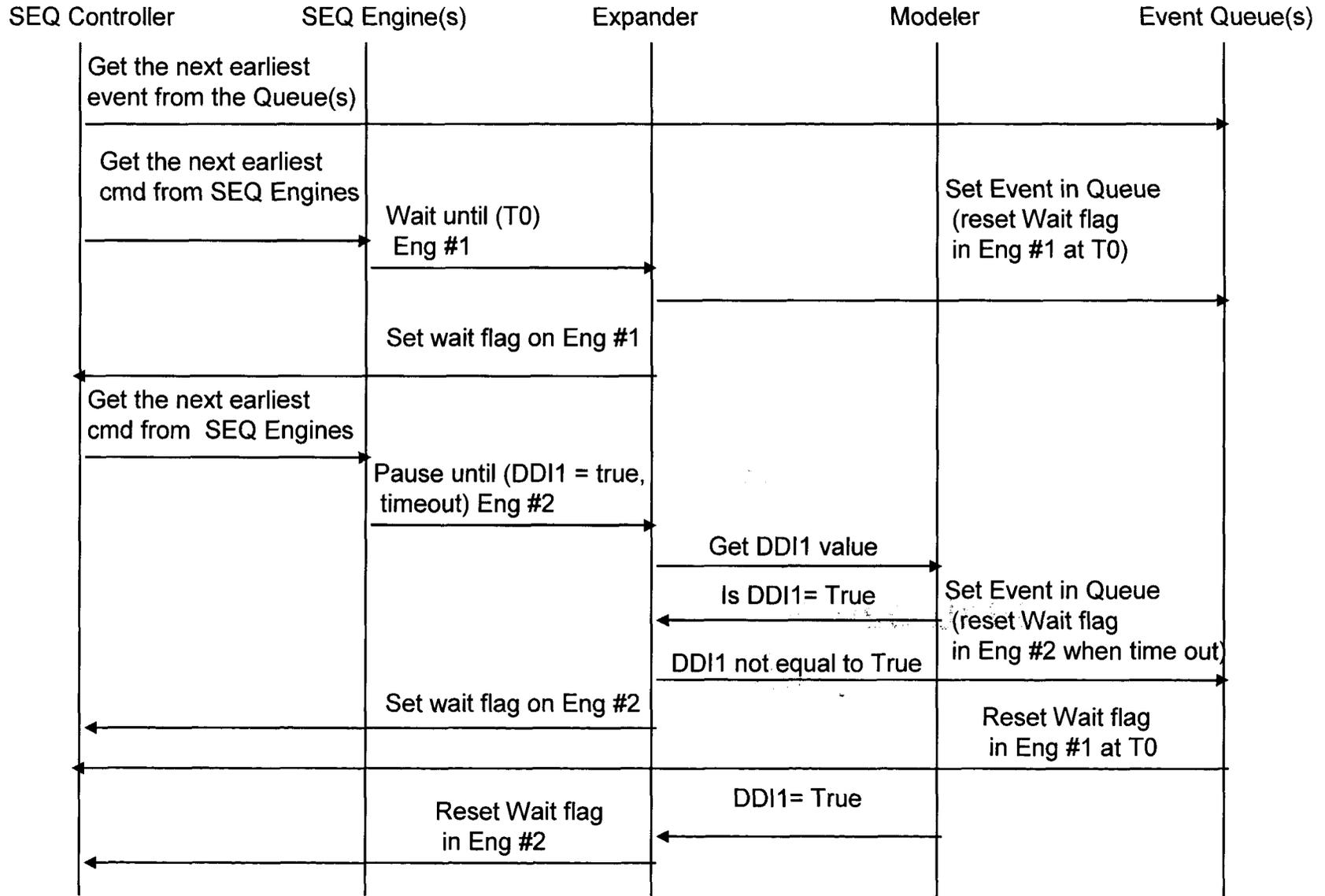
Seq Mgt/Ctrl – Shutdown, Resume (Process Timeline)



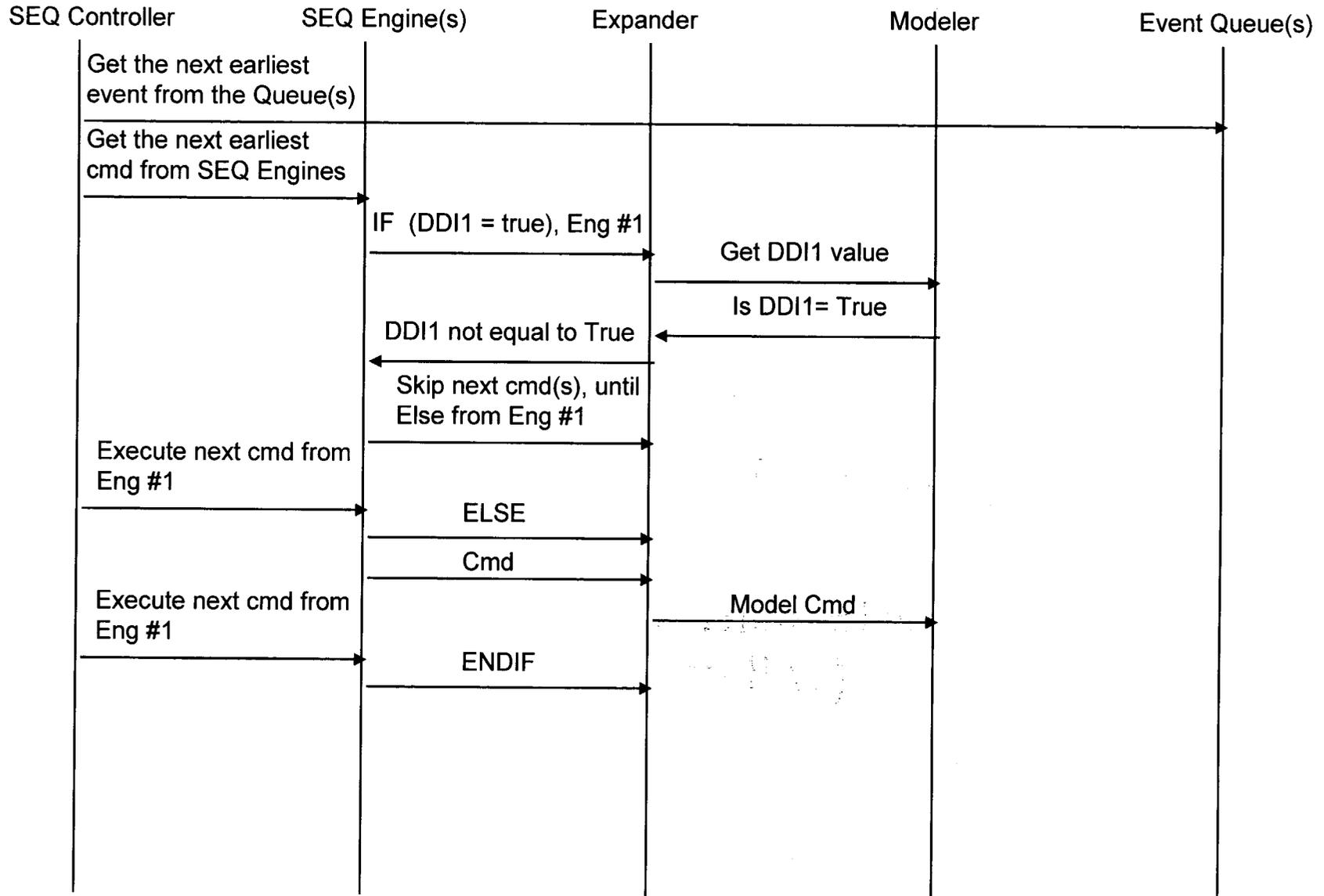
Seq Mgt/Ctrl – Cmd Wait, Min Step (Process Timeline)



Seq Mgt/Ctrl – Wait Until, Pause Until (Process Timeline)



Seq Mgt/Ctrl – If, Then, Else (Process Timeline)

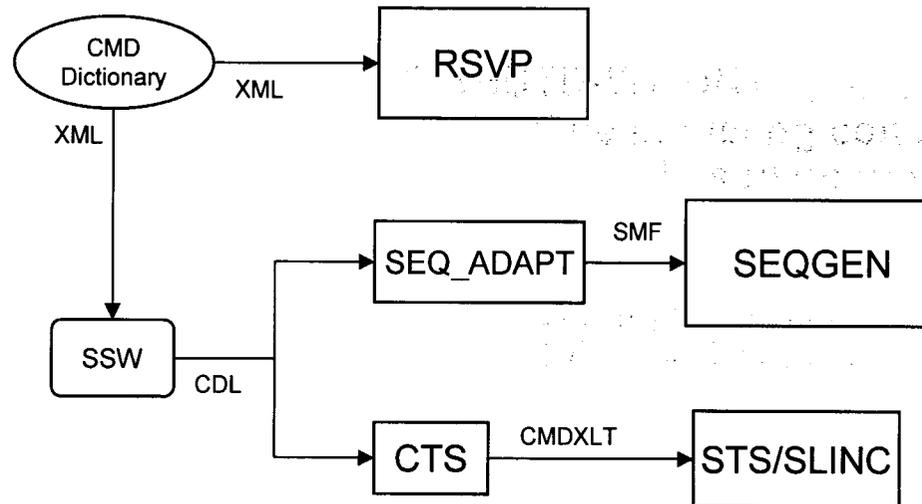


Adaptation: Mars Times

Eight commands have a variable time type parameter.

- For the PAUSE_UNTIL, PAUSE_UNTIL_AND, and PAUSE_UNTIL_OR commands, current approach is for RSVP to replace these commands with a SeqGen “wait” step to allow sequence control based on a future condition. RSVP will also need to convert the duration for these commands to Earth seconds, since this is the only acceptable time type for the SeqGen “wait” step.
- For the WAIT_UNTIL, RESUME_AT, SHUTDOWN_UNTIL, SHUTDOWN_DMT_TIL, SHUTDOWN_RESUM_AT commands, the time modeling consists of constructing conditional command durations, based upon the timetyp command parameter:
 - If the timetyp is RLTV, the RLTV parameter value is plugged in for the duration.
 - If the timetyp is SCLK, the duration between "NOW" and when the SCLK occurs is plugged in. In the case of a negative duration (SCLK in the past), MINIMUM_STEP_DURATION is plugged in, which is 1 sec, and an error is generated.
 - If timetyp is GST, MINIMUM_STEP_DURATION is plugged in, which is 1 sec.
- Notes:
 - It has been requested to implement GST. Design/approach is still TBD.
 - There are many other commands that may need a duration calculation. Andy is in the process of defining them.

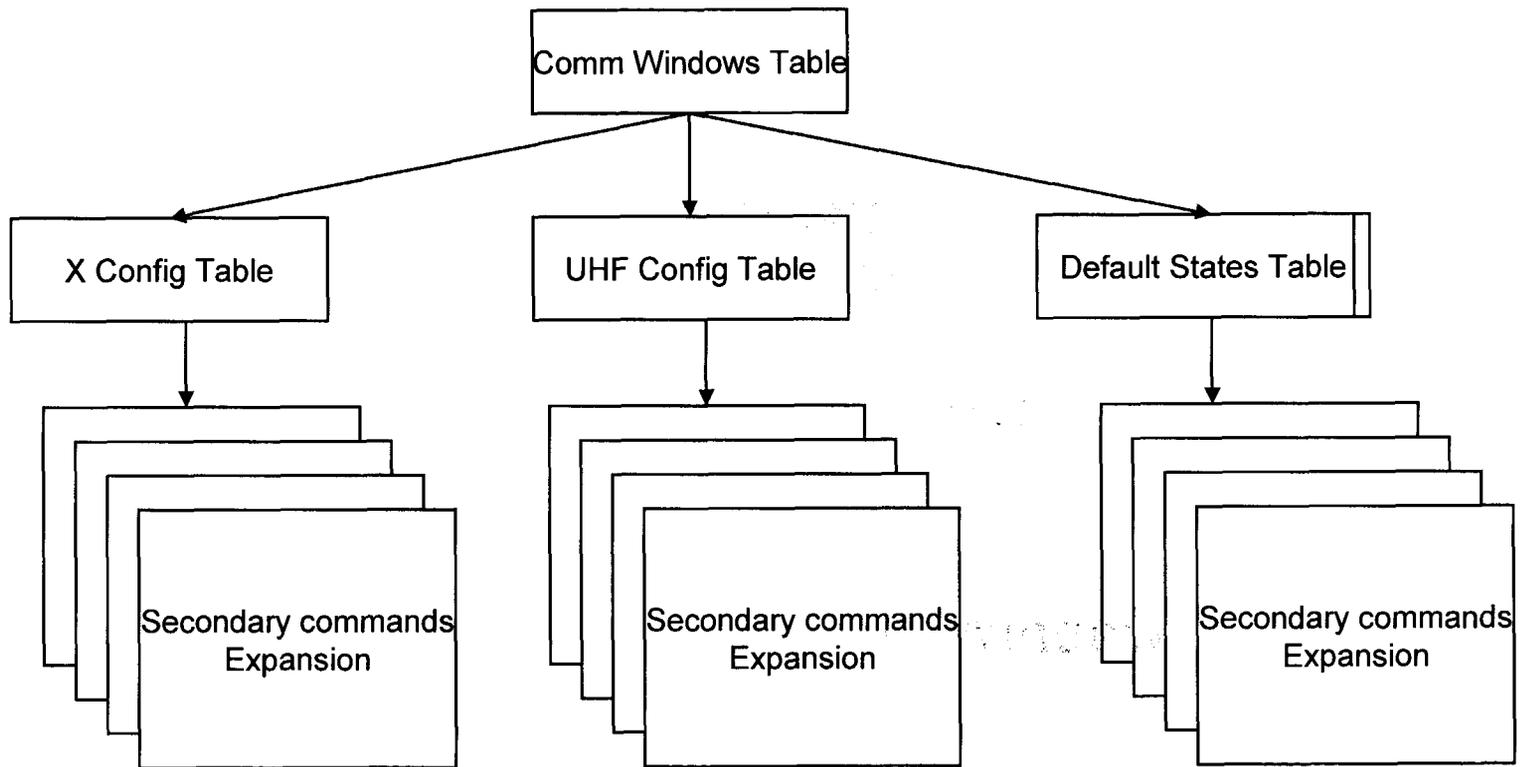
Adaptation: Cmd Dict Translation



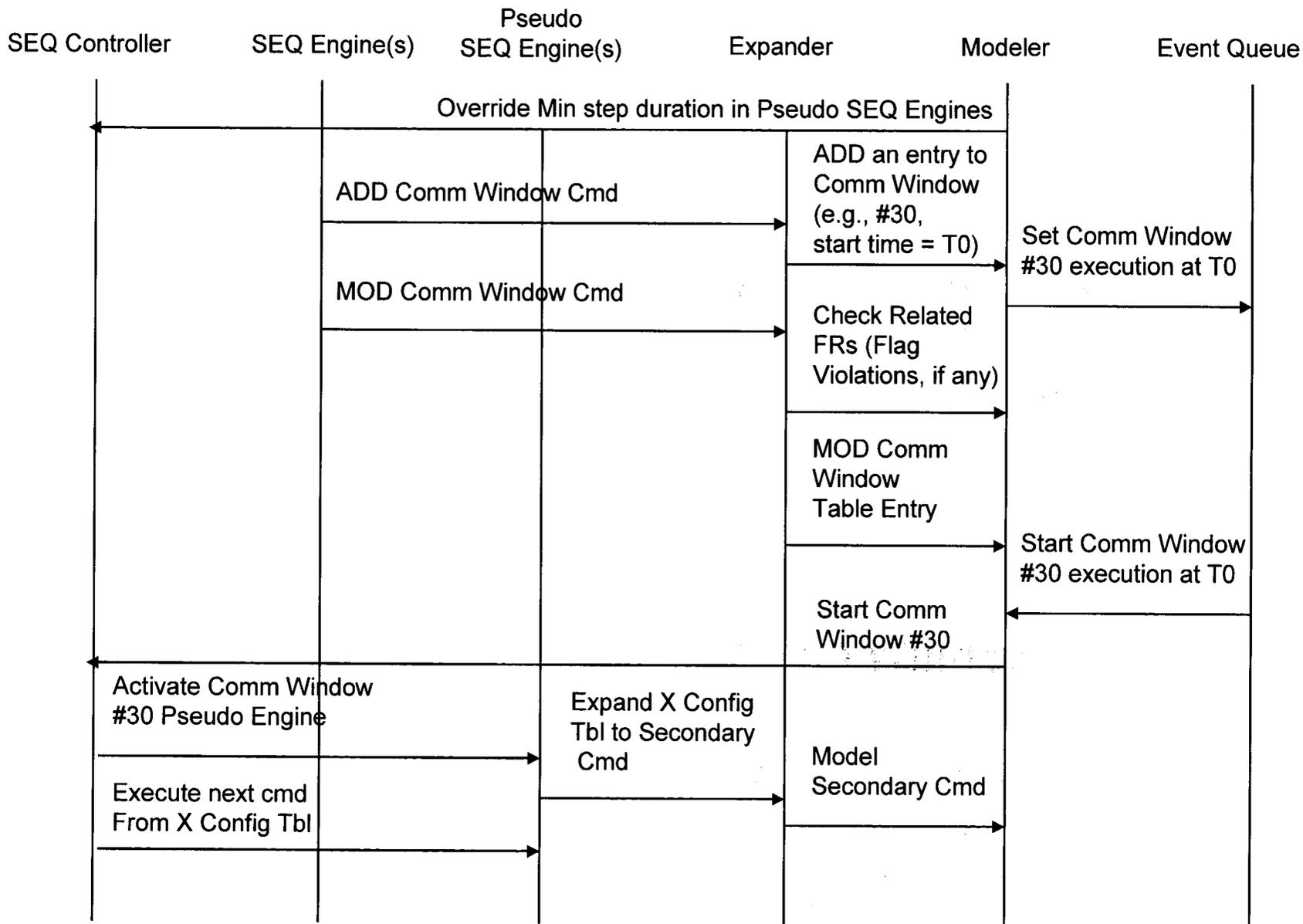
Adaptation: Modeling - Telecom/Comm Window

- **Comm Windows Behavior:**
 - **Creates four major tables in SEQGEN database:**
 - Comm Windows Table
 - X-Band H/W Configurations Table
 - UHF H/W Configurations Table
 - Default States Table
 - **Models Telecom primary commands (SMF)**
 - **Models Telecom secondary commands (SMF)**
 - **Models DSN Ground Events (SMF)**
 - **Generates DSN Keywords (SMF and Pef_display)**

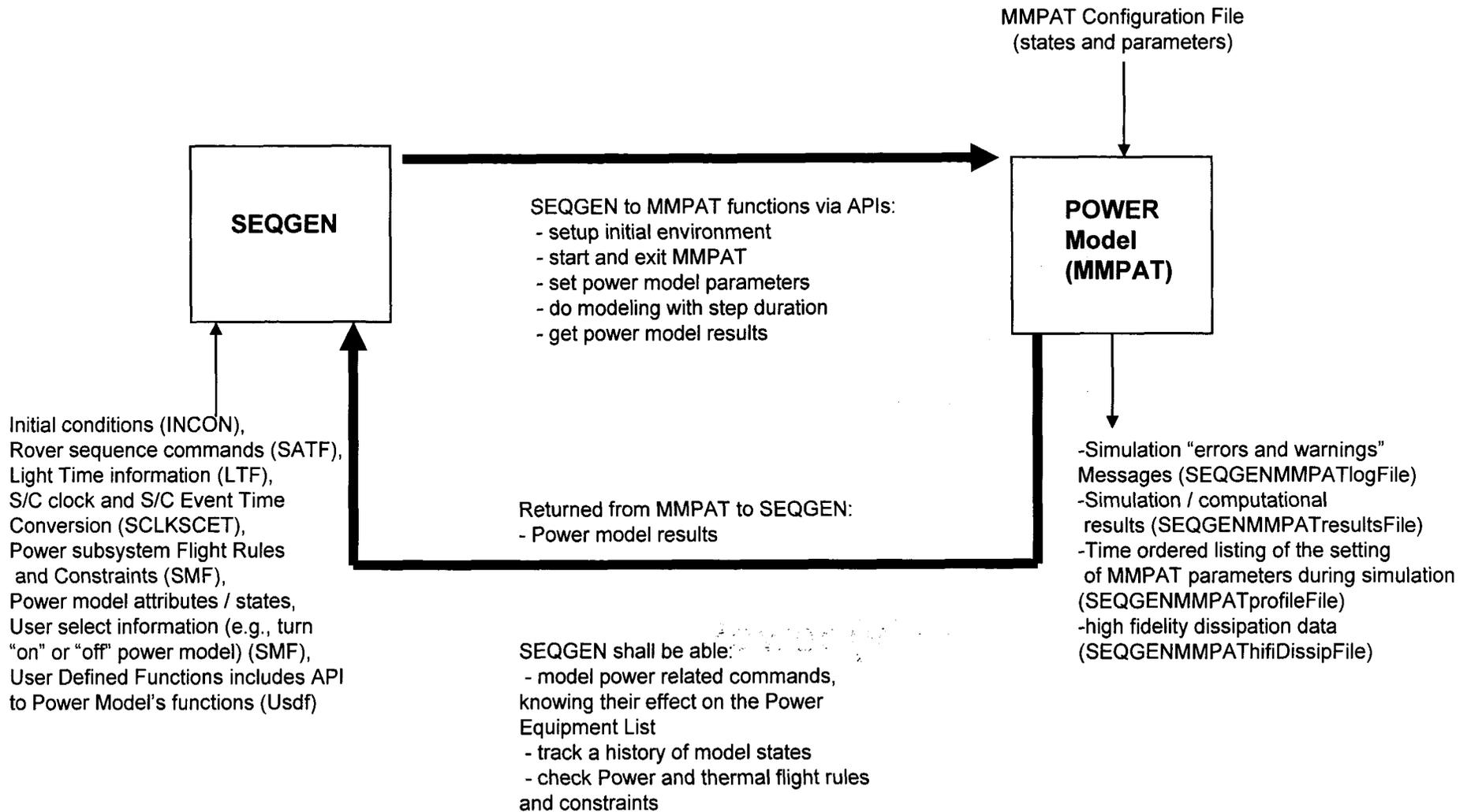
Modeling - Telecom/Comm Window



Modeling - Telecom/Comm Window



Modeling – Power (via API)



SEQGEN MMPAT Power Model (Process Timeline)

