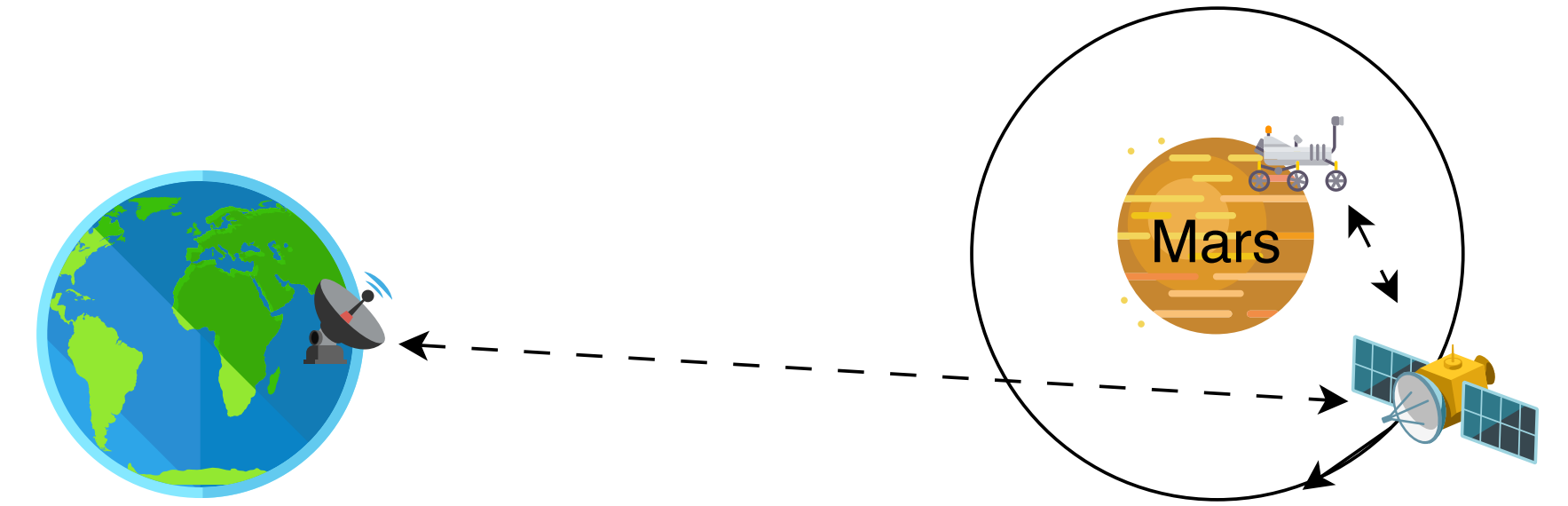


Implementing the TVR Schedule Data Model

IETF 121 TVR Working Group Meeting

Implementation Context



- Earth-Mars schedules (Earth-Orbiter, Orbiter-Rover, Orbiter-Earth) currently used by missions (provided by and in collaboration with JPL)
- These are what could be used for TVR in deep space.
- Focus is on the orbiter which acts as relay/forwarder/router
- Implemented using the TVR schedule data model (draft-ietf-tvr-schedule-yang)
- To be used for Earth-Mars IP network simulations

Source Dataset

- Earth-Mars Communication windows
 - Records (5 orbiters, 3 rovers/landers, ~10K records over 3 months period):
 - Earth->Orbiter1: start date-time, end date-time
 - Orbiter1<->Rover1: start date-time, end date-time
 - Orbiter1->Earth: start date-time, end date-time
 - Contains a lot more information but here only focusing on the issue at hand
- Period of the data is 2024Q2
 - where the Earth-Mars one-way light time (OWLT) is between 15 and 17 minutes. Roughly, OWLT changes 1 sec/day

Time Reference?

- For the TVR to be used/executed locally on the orbiter, it shall be in the local time reference. Called SCET SpaceCraft Event Time.
- Some date-time in the raw dataset was in UTC, some were in SCET
- Had to convert all data to a single time reference, which should be SCET.
- But:
 - No provision in the TVR data model for the concept of SCET.
 - No current Date-time tools/libraries/... understand SCET
 - SCET is not a static mapping to UTC, since OWLT changes over time.

TVR Schedule

- `+--rw (schedule-type)?`
- `| +--:(period)`
- `| | +--rw period-description? string`
- `| | +--rw period-start yang:date-and-time`
- `| | +--rw time-zone-identifier? sys:timezone-name`
- `| | +--rw (period-type)?`
- `| | +--:(explicit)`
- `| | | +--rw period-end? yang:date-and-time`
- `| | +--:(duration)`
- `| | +--rw duration? duration`
-

What to Do?

- Use the “local offset” in the yang:date-and-time (aka: YYYY-MM-DD HH:MM:SS +HH:MM to correspond to the transmission light time at that moment.
 - Could be computed by the orchestrator. Will tools work with a different offset for every record (they should!)?
 - But resolution is minutes, not seconds. Oops.
- Define a local timezone (SCET?, Mars?, ...) and use it in the data model (time-zone-identifier? sys:timezone-name)
 - However, then all the tools, libraries, ... for time/date are not aware and will need to be augmented.
 - Should the TVR data model permit any timezone « string »? Naming consistency?
- Don't do anything, and just recalculate locally with variable OWLT
 - Means the spacecraft on-board need to know the algorithm for calculating OWLT based on where the spacecraft is at that time or has a static table of all the OWLT over the whole mission period
- Punt this to someone else...
- For now, we converted every date-time to SCET (based on OWLT over time), then declared SCET be UTC and then use tools locally pretending the spacecraft is at UTC. But this is just a big hack for a prototype, but shall not be used.
- (FYI, NASA has an on going initiative to define Moon time, mostly for PNT, but ...)

Comments, Suggestions?

Contact: marc.blanchet@viagenie.ca