Updates to the CPF and CRD Formats

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Need for Changes

- New mission with new requirements
- Expanded configuration information
- Expanded calibration information
- Correct oversights in and clarify the original formats and manuals
- Accommodate debris and other non-SLR/LLR tracking to avoid multiple format branches
- Update manuals

Fortunately, the formats were designed to be flexible and expandable

Consolidated Prediction Format (CPF) - I

- ELT mission:
  - Transponder Clock Reference Time was added (in the “H4” record)
  - Ephemeris sub-daily sequence number (in the filename and “H1” record) has been expanded to 2 digits for more than 9 updates/day
- Split Target Type (“H2” record) into 2 fields, target class and target location
- Headers (“H” records) now support free format reading like the rest of the record types.
- Rewrote the manual to free it from its “replace the TIV format” heritage

Consolidated Prediction Format (CPF) -II

- Clarified filename conventions:
  - Filename date/time must agree with “H2” record ephemeris start date/time
  - “H2” record start time must be the intended start of ephemeris (e.g. set to 0hr UTC, even though there may be 4-5 “10” records before this time for precise interpolation)
  - Filename sequence number is the “H1” record production day of year (no 500 added)
  - Filename sub-daily sequence number is now 2 digits
- Updated the description of leap second handling, to embrace the new “coffee break rule”

Consolidated Range Data Format (CRD)

- Header (“H” records) now support free format reading like other record types
- Split Target Type (“H3” record) into 2 fields (same as CPF)
- Added prediction (“H5”) header to allow tracking prediction issues (includes format, source, date, sequence number)
- Added more configuration information
  - “C5”: Software – New
  - “C6”: Meteorological Instrumentation – New
  - “C0”: Updated to allow “C5” and “C6”
  - Added amplifier information to “C2” Detector Configuration record
- Revamped calibration “40” record and added the “41” calibration detail record to describe over-all calibration and separate pre- and post-cals, respectively

Consolidated Range Data Format – cont.

- Added transmit amplitude (already had receive amplitude) (“10” raw range record)
- Return rate (SLR) and signal:noise (LLR) split into 2 separate fields (“11” normal point record)
- Added sky temperature and renamed “precipitation type” to “weather conditions,” allowing use of meteorological sensor SYSOP/WMO codes (“21” meteorology supplement record)
- Manual includes appendix with acceptable values for all fields
  - This is result of OCs' QC harmonization efforts (currently V1)

CRD – Changes mainly to support non-SLR/LLR tracking

- Added network name to “H2” station header record and to non-SLR/LLR data filename
- In the CRD filename for debris tracking, a network name will be included to prevent debris data from being mistaken for SLR/LLR data at the OCs and DCs
- Made station and target wording in the manual more general (“H2” station header and “H3” target header records)
- Added az, el, and range rates (“12” range supplement and “30” pointing angles records)

Changes discussed but not included

- Seconds of day – leaving minimum value at 0 and maximum value at 86400: the problem dictating SOD beyond these limits no longer exists
- Lunar data: Detailed APOLLO station processing info to remain in comment lines (“00”)

Current Status

- Recruited 4 - 5 stations, 1 prediction provider, and the ILRS ASC to perform pilot tests of the formats
- June 2018 – new “v2” directories set up on CDDIS and EDC; CPF files can be handled
- July 2018: Released CPF v2 manual, sample code, and test data on CDDIS web site
  - Three of the pilot stations reportedly saw no problems integrating and testing CPF v2
- September 2018: Released CRD v2 manual, sample code, and test data on CDDIS web site
- October 2018: MLRS analysis code incorporates CRD v2 code.
- November 2018: CPF and CRD v2 on-line format checkers are now available (EDC – Christain Schwatke)

Implementation Schedule

- Jan 1, 2019: One or two stations should be able to produce v2 CRD
- Jan 1, 2019: At least one prediction provider should be producing v2 CPFs; all should be by Jan 1, 2020
- Feb 1, 2019: OCs, DCs should be able to handle v2 CRDs
- Mar 1, 2019: Some analysts should be able to process v2 CRD files; all should be by Jan 1, 2020
- Dec 1, 2019: Almost all stations should be able to use v2 CPFs (required for those tracking ELT)
- June 1, 2020: Almost all stations should be producing v2 CRDs

Implementation Notes

- Predictions providers must be able to produce version 1 and 2 CPFs for a number of years
- OCs, DCs, and ACs must be able to accept data in format versions 1 and 2 permanently – mainly because of old v1 data
- Sample code includes converters between CPF version 1 and 2 and CRD version 1 and 2
  - Convert in both directions
  - Of limited use because of version differences, but helpful for testing

Conclusion

- Due to several waves of comments and suggestions for additions, the process of finalizing the new formats has taken longer than expected.
- The new format version manuals and other materials are available on the CDDIS web site.
- Some stations have begun implementation of both formats
- OCs and DCs are nearly ready to go
- The ASC will facilitate testing of the CRD files

Visit Clinic Session 4 and the DF&PSC for more information!