IAG-IASPEI Kobe Japan, 3 August 2017

FDSN Working Group V

Portable Instrumentation

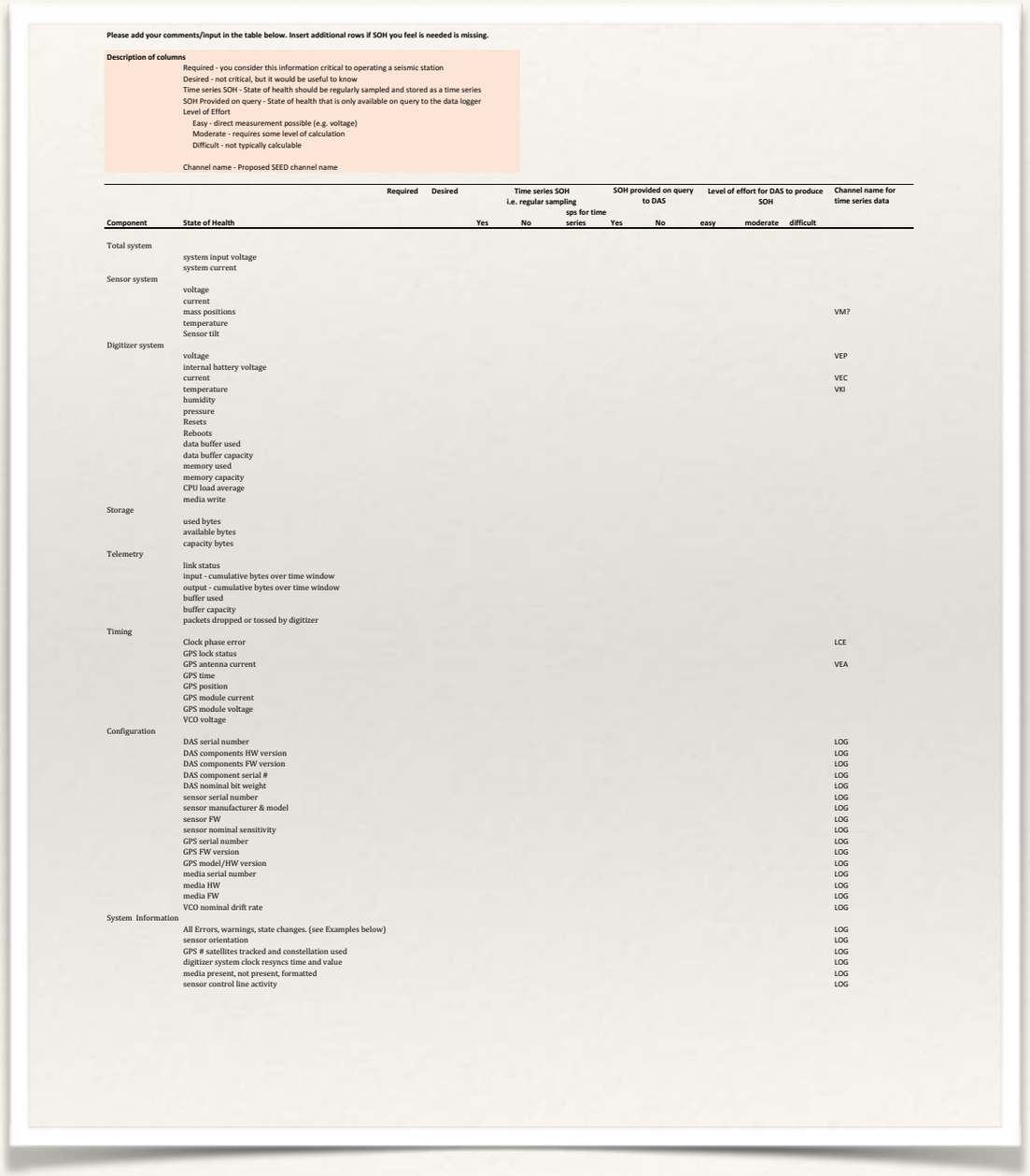
- Review of agenda and additions, approve 2015 minutes
- Group/facility presentations
- SOH recommendations – suggestions on how best to make progress
- How to better track in meta-data stations that move (e.g. deployments on glaciers or oceans gliders)
- OBS data
  - Accounting for OBS clock drift
  - Current state of OBS integration into data centers and future paths/roadblocks
  - Standard methods/filters for decimating seismology data
- WG-V web presence

  Request for web page updates. QC, best practices, or inventories. Lots of broken links. Are these sections worth maintaining?
- Survey of available methods for creating & verifying StationXML

Group/facility presentations

SOH Recommendation from Prague 2015 Meeting

FDSN (WG - V and perhaps WG - I) will develop a list of standardized digitizer outputs (e.g. SOH channels, meta-data) for vendors to meet when developing new equipment. Also will work on future potential equipment characteristics.



Please add your comments/input in the table below. Insert additional rows if SOH you feel is needed is missing.

Description of columns

Required - you consider this information critical to operating a seismic station
Desired - not critical, but it would be useful to know
Time series SOH - State of health should be regularly sampled and stored as a time series
SOH Provided on query - State of health that is only available on query to the data logger
Level of Effort
Easy - direct measurement possible (e.g. voltage)
Moderate - requires some level of calculation
Difficult - not typically calculable

Channel name - Proposed SEED channel name

		Required	Desired	Time series SOH i.e. regular sampling sps for time series			SOH provided on query to DAS		Level of effort for DAS to produce SOH			Channel name for time series data
Component	**State of Health**			**Yes**	**No**		**Yes**	**No**	**easy**	**moderate**	**difficult**	
Total system												
	system input voltage											
	system current											
Sensor system												
	voltage											
	current											
	mass positions											VM?
	temperature											
	Sensor tilt											
Digitizer system												
	voltage											VEP
	internal battery voltage											
	current											VEC
	temperature											VKI
	humidity											
	pressure											
	Resets											
	Reboots											
	data buffer used											
	data buffer capacity											
	memory used											
	memory capacity											
	CPU load average											
	media write											
Storage												
	used bytes											
	available bytes											
	capacity bytes											
Telemetry												
	link status											
	input - cumulative bytes over time window											
	output - cumulative bytes over time window											
	buffer used											
	buffer capacity											
	packets dropped or tossed by digitizer											
Timing												
	Clock phase error											LCE
	GPS lock status											
	GPS antenna current											VEA
	GPS time											
	GPS position											
	GPS module current											
	GPS module voltage											
	VCO voltage											
Configuration												
	DAS serial number											LOG
	DAS components HW version											LOG
	DAS components FW version											LOG
	DAS component serial #											LOG
	DAS nominal bit weight											LOG
	sensor serial number											LOG
	sensor manufacturer & model											LOG
	sensor FW											LOG
	sensor nominal sensitivity											LOG
	GPS serial number											LOG
	GPS FW version											LOG
	GPS model/HW version											LOG
	media serial number											LOG
	media HW											LOG
	media FW											LOG
	VCO nominal drift rate											LOG
System Information												
	All Errors, warnings, state changes. (see Examples below)											LOG
	sensor orientation											LOG
	GPS # satellites tracked and constellation used											LOG
	digitizer system clock resyncs time and value											LOG
	media present, not present, formatted											LOG
	sensor control line activity											LOG

How to better track in meta-data stations that move (e.g. deployments on glaciers or oceans gliders)

- new blockette?
- new mseed channel (timestamped tuples)?
- ?
- not aware of any existing data logger that creates a time series of GPS location

OBSs: clock drift

- Problem
  - OBSs are synchronized at beginning & end of experiment, have (mostly) linear drift between
- Solutions
  - In miniSEED
    - If we have synchronization before and after
      - **IF/HOW TO APPLY TIME CORRECTION**
      - Put time correction in record header field
      - Set record header activity flag bit 1 [« Time Correction Applied »] as appropriate
      - **Set I/O bit 5 [« clock locked »] to 1**
    - If we do not have synchronization before and after
      - **Set I/O bit 5 [« clock locked »] to 0**
  - In stationXML
    - **Add comment(s) with**
      - **Time base information [type, manufacturer, model, nominal performance]**
      - **Start sync information**
      - **End sync information**
- **Possible additions to miniSEED/StationXML**
  - **miniSEED**
    - Sample rate blockette with 8-byte float (52-bit mantissa=>10^15 precision compared to 10^7 precision for 4-byte floats (23-bit mantissa))
    - Flag for « linear clock drift »?
      - New IO/clock bit (only 5 used now)? Or small comment blockette allowed in miniSEED?
  - **StationXML**
    - New CommentList type allowing multiple lines of comment under a subject header (or specific Clock type if land stations could benefit)

OBSs: clock drift

- **HOW TO APPLY CLOCK DRIFT CORRECTION IN MINISEED FILES**
  - Update time correction once per daily file
    - Simple, many tools
    - Could have significant change between days (up to 8 msec for high drift MCXO)
  - Update time correction **in each record**
    - Only qmerge or proprietary software
  - Update time correction **when it becomes significant**
    - Done for LDEO and WHOI facilities? (proprietary software?)
  - **Resample** the data to the desired sampling rate
    - Proposed by DEPAS and some at ETH
    - But signal is no longer RAW
  - **Do not correct** the drift, provide purely raw time series
    - Everyone has to figure out the drift themselves?

OBSs: integration into data centers

- US
  - All new OBS data is integrated into IRIS through OBSIP
    - but individual parks create data/metadata files using different software
- Europe
  - Only a few data integrated or in progress
    - RHUM-RUM experiment (France/Germany 2012-2013)
    - EMSO-MOMAR (France 2007-present)
    - SISMANTILLES (France/Germany, 2007)
- **Other countries/regions???**

OBSs: integration into data centers

- Challenges
  - Facilities don't have tools to create correct/standard data and metadata
  - No huge motivation to develop them (except country's funding pressure)
  - Hard/wasteful to make multiple tools that all give the same format output

- Solution
  - Standard tools for data and stationXML preparation
    - EPOS + French INSU funded project
      - Tools apply clock drift, make stationXML, provenance
      - Preliminary version will be used with on SISMANTILLES dataset (IPGP, GeoAzur, GEOMAR and DEPAS OBSs: EPOS funded)
  - But standard tools need standards...
  - **If others want to participate/use, they are welcome!**

OBSs: downsampling data

- **Should/can FDSN specify recommended decimation filters?**
  - **E.g., for 2x, 3x, 5x decimation**

- OBSs only store data at one rate (e.g. 100 sps)
- Users may want data at a lower rate (e.g. 1 sps)
- There is no standard way to downsample data

- WG-V web presence

  Request for web page updates. QC, best practices, or inventories. Lots of broken links. Are these sections worth maintaining?

  Action Item Prague 2015: *Survey the mailing list to find links to add to WG-V page related to QC: best practices related to Quality control (break out archive QC tools and field tools)*

Survey of available methods for creating & verifying StationXML

- Current
  - FDSN StationXML-SEED Converter - IRIS
  - RESIF - we generate stationXML metadata with home made scripts and routine (python, C) querying our relational databases plus our responses library (NOT the NRL, not in RESP format, but self described files for analog filter, digitizer + sampling, and sensor). This is a legacy of the times we where working with french data loggers. Our library is progressively updated with all the instruments of RESIF (mobile, permanent, OBS) and will be available on GIT soon.
- Planned or soon to release
  - Nexus - PASSCAL (release fall/winter 2017)
  - RESIF - we are going to start a project to create a quite generic tool ('à la PDCC') that will be able to use the NRL instrument library as well as other libraries (at least our library). RESIF plan to support the development (we will probably externalize the realization).