

# VDIF - VLBI Data Interchange Format

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# Motivation & Execution

- Variety of VLBI data formats used internationally complicates easy international data transfer
- Internationally constituted VDIF Task Force appointed in Shanghai in June 2008 to study problem and create a recommended uniform transport-independent VLBI data-format standard
- Data-transport standard will be addressed separately
- Combination of data-format and data-transport standards will effectively replace proposed VSI-E

# Assumptions

- Data are assumed to be one or more time series of uniformly time sampled data
- Each time series may have own sample rate, bits/sample and place (i.e. station) of origin

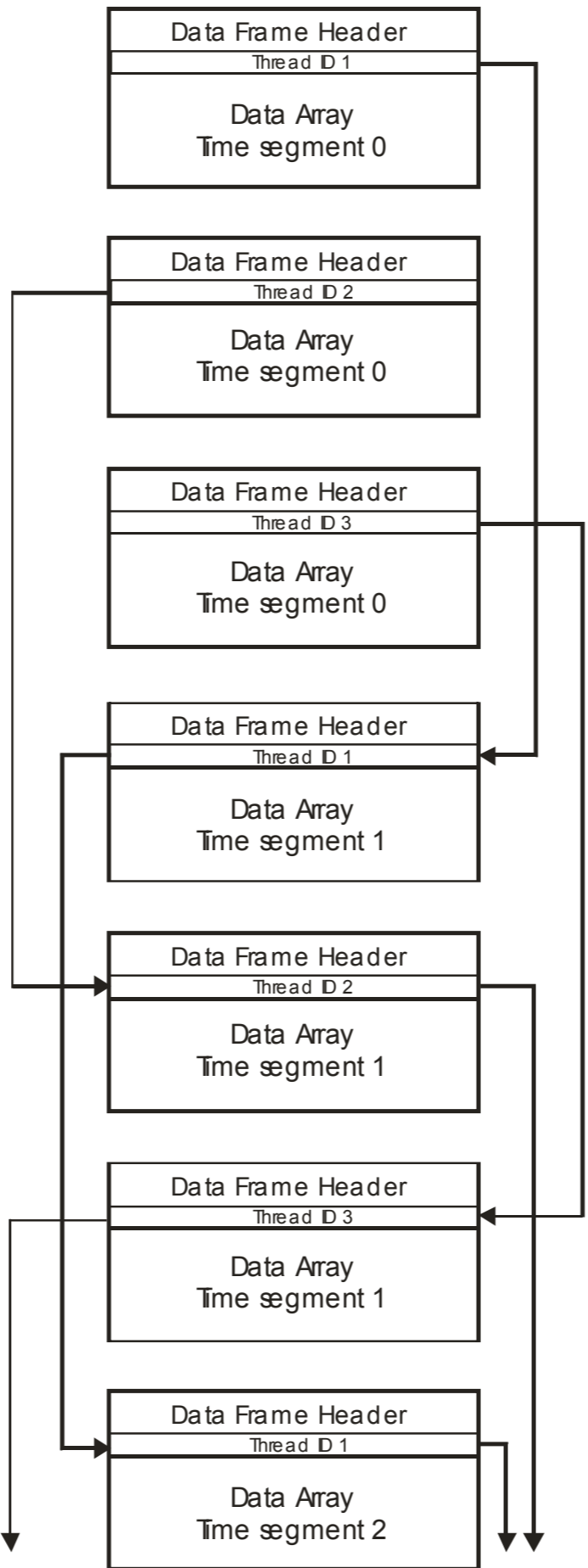
# Starting ground rules

- Data are self-identifying wrt time tag and data identification
- Data may be discontinuous in time (e.g. pulsar data)
- Data may be single-channel or multi-channel
- Data may be single bit or multi-bit samples
- Data can be decoded without external reference
- Number of channels can be arbitrary (i.e. not confined to  $2^n$ )
- Suitable for on-wire transfer as well as disk file storage
- Support data rates up to at least 100Gbps

# Hierarchical Data Structure

- Aggregate data flow is defined as a Data Stream
- A Data Stream is organized into self-identifying Data Threads
  - Each Data Thread may have its own #channels, sample rate, and bits/sample
- Each Data Thread contains of a serial set of Data Frames
- Each Data Frame consists of a Data Frame Header followed by a Data Array
  - Data Array length may be chosen by user
  - Data Array may contain single-channel or multi-channel data

# Illustration of multi-thread VDI/F Data Stream



# Data Frame Header Content

- Time (seconds since specified epoch)
- Frame # within second
- Stream ID
- Station ID (2-char ASCII code)
- 'Data-invalid' marker
- #channels
- Bits/sample
- Data Array length
- VDIF version #
- Optional user-defined 16-byte extension

# Data Frame Rules

- Each Data Frame has 16/32 byte header followed by a Data Array of user-specified length
- Data Frame length for a single Data Thread is fixed for a particular scan
- Data Frame length must be a multiple of 8 bytes
- Data Frames per second must be an integer
- Data Frame may not span a second boundary



# Usage examples

- Data Stream with multiple single-channel Data Threads (VLBI2010 model)
  - Supports arbitrary # of channels
  - Preferred for new equipment and applications
  - Best compatibility with software correlators
- Data Stream with one or more multi-chan Data Threads
  - Multiple channels in a single Data Stream
  - Avoids ‘corner turning’ requirement
  - Adaptable to support some older equipment

# Status

- **VDIF Release 1.0 available for community comment**
  - Has already has been reviewed by several key members of global VLBI community
  - Final ratification anticipated in timeframe of June 09 Madrid meeting
  - Allows FPGA/hardware designers to proceed
- **Work is beginning on companion transport-protocol specification**
  - Goal is to keep this specification simple and basic, with understanding that transport-protocol landscape changes rapidly with time

Thank you