![North American SynchroPhasor Initiative (NASPI) logo]

Synchrophasor Standards PMU_ID & standard update

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EPG

NASPI General Meeting
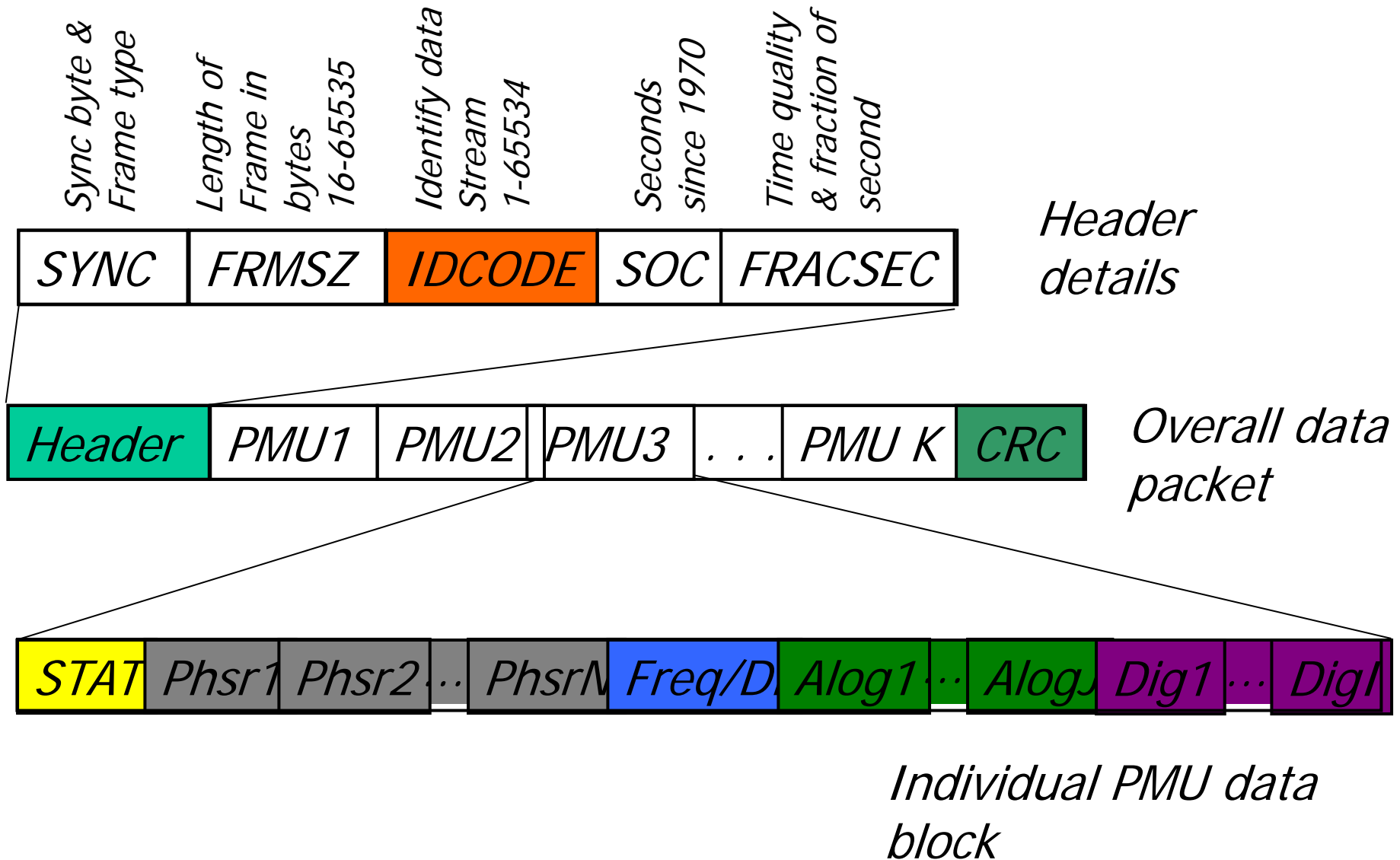
October 13, 2011

San Francisco, CA

C37.118 Messages

- Command frame
  - Start/stop data, send other information
- Data frame
  - Phasor, frequency & other measurements
  - Digital indications (Boolean, 1-bit values)
- Configuration frame
  - Describes data frame, with scaling & naming
- Header frame
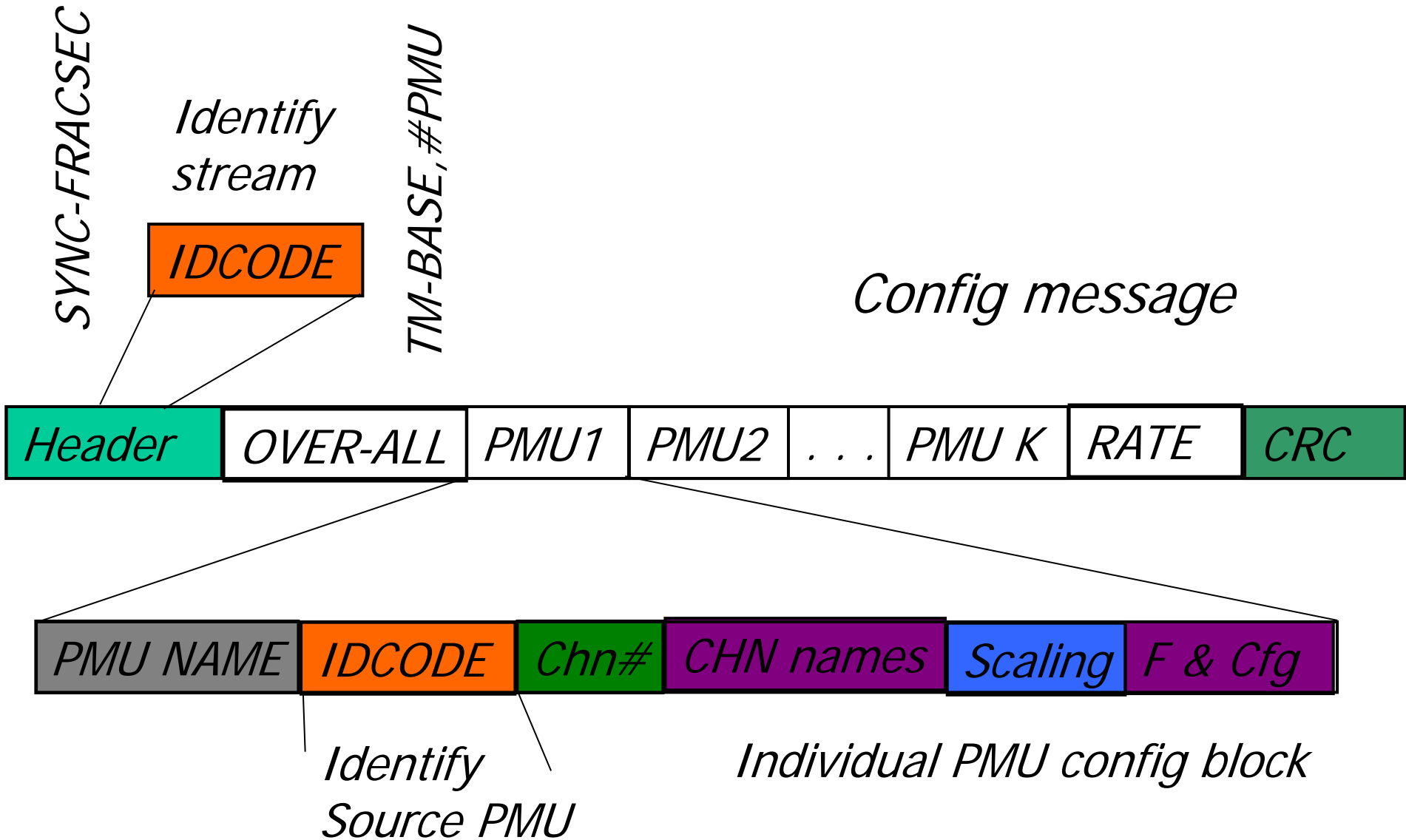 - Text descriptions, user format

PMU/PDC

Commands

Data, Configuration, Header

PDC/Apps

C37.118 message structure - data

Sync byte & Frame type

Length of Frame in bytes 16-65535

Identify data Stream 1-65534

Seconds since 1970

Time quality & fraction of second

| SYNC | FRMSZ | IDCODE | SOC | FRACSEC |

Header details

| Header | PMU1 | PMU2 | PMU3 | . . . | PMU K | CRC |

Overall data packet

| STAT | Phsr1 | Phsr2 | .. | PhsrN | Freq/D | Alog1 | .. | AlogJ | Dig1 | .. | DigI |

Individual PMU data block

PMUID parameter development

- Originally an 8-byte parameter (IEEE 1344)
  - Identified PMU
  - Only used for sending commands
- Change to 16-bit integer in C37.118-2005 standard
  - Concept of network incorporated
  - Extended to identify all frames
  - Continue serial communication support – minimum bytes
  - ID cut to 16-bits, can identify 65000 streams & devices
- PMUID identifies both the stream and PMU device

C37.118 message structure - config

SYNC-FRACSEC

Identify
stream

IDCODE

TM-BASE,#PMU

Config message

| Header | OVER-ALL | PMU1 | PMU2 | . . . | PMU K | RATE | CRC |

| PMU NAME | IDCODE | Chn# | CHN names | Scaling | F & Cfg |

Identify
Source PMU

Individual PMU config block

PMUID parameter

- **PMUID use in Commands**
  - Identify the stream the command will apply to
- **PMUID in Data, Configuration, Header**
  - Identify the information/data source
- **PMUID in general identifies a particular data stream**
  - Commands can be sent for stream control
  - Receiving device identifies data messages
- **Identifies data source**
  - Does uniquely identify source single PMU or PDC
  - May be more than one PMUID from source
  - Original PMU ID may carry through communication chain

Data set limitations

- 65534 possible PMU IDs (0 & 65535 reserved)

- Data message example:
  - Data messages are limited to 65535 bytes/frame
  - With 40 bytes/PMU -> 1385 PMUs max in data set
  - Frame will fragment to 43 Ethernet packets
  - Consequences:
    - 1 packet loss creates frame loss – accelerates loss rate by 43 (loss of one packet makes the frame unusable, so one packet loss makes the frame of 43 packets unusable)
    - Have >14 MBPS on wire continuously

- Even at this rate, PMUID space adequate
  - May need some local ID management

PMU naming

- PMUID identifies the stream
  - Streams can be from PMU or PDC
  - Multiple streams from devices

- PMU identification by PMUID
  - 16-bit numbering has only 65534 available numbers
  - Numbering difficult to coordinate across independent users
  - Data set from PMU may be modified—then how number?

- Recommend: Use name space to apply unique names
  - Identify original PMU & data subsets (w/ or w/o modification)
  - Do NOT try to aggregate all PMUs into system-wide stream
  - Stream locally used data subsets; block transfer for archive
  - 16-byte names from PMU (now, 37.118-2005)
  - Longer names from PDC (end of year, 37.118.2- 2011)

IEEE C37.118.1 & C37.118.2 Outlook

- First ballot in June
  - Standards passed by 90+% but had 209 comments to resolve
- WG resolved comments through July & August
- Recirculate in September
  - No new negative ballots, ballot complete
  - Final documents to IEEE-SA October 3
- Final approval expected at December meeting
- Publication expected in January 2012

IEC 61850-90-5 outlook

- First draft circulation in August 2010
  - Comments resolved over next 2 meetings in October 2010 & February 2011
- Second draft circulation in July 2011
  - Comments resolved by September 2011 meeting
- Completed document to IEC in October 2011
- Final approval expected late 2011

The End

Questions?