

# XTC Quality Check

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## Data file structure quality check

### Datagram and XTC structure check

Stand-alone C++ application which uses the `pdsdata` library.

Assumes the loop over all Drgams in a single XTC file/stream with iterations over all XTC containers. Retrieved information is tested for consistency, as explained below.

#### **Datagram header records in log-file:**

|                       |                            |       |                       |                         |                |             |      |
|-----------------------|----------------------------|-------|-----------------------|-------------------------|----------------|-------------|------|
| Datagram:10           | Transition:Configure       | /4    | seqtype:0             | 2012-02-05 10:27:28.997 | fiducial:1ffff | ticks:0     | pos: |
| Datagram:29b004       | Transition:BeginRun        | /6    | seqtype:0             | 2012-02-05 20:12:35.948 | fiducial:1ffff | ticks:0     | pos: |
| Datagram:39b0cc       | Transition:BeginCalibCycle | /8    | seqtype:0             | 2012-02-05 20:12:36.74  | fiducial:1ffff | ticks:0     | pos: |
| Datagram:49b294       | Transition:Enable          | /10   | seqtype:0             | 2012-02-05 20:12:36.75  | fiducial:1ffff | ticks:0     | pos: |
| Datagram:59b35c       | Transition:L1Accept        | /12   | seqtype:0             | 2012-02-05 20:12:36.108 | fiducial:985d  | ticks:50f06 | pos: |
| Datagram:698ea30      | Transition:L1Accept        | /12   | seqtype:0             | 2012-02-05 20:12:36.158 | fiducial:986f  | ticks:50d7e | pos: |
| Datagram:7127eea8     | Transition:L1Accept        | /12   | seqtype:0             | 2012-02-05 20:12:36.208 | fiducial:9881  | ticks:50b16 | pos: |
| Datagram:81b6f320     | Transition:L1Accept        | /12   | seqtype:0             | 2012-02-05 20:12:36.258 | fiducial:9893  | ticks:50e5e | pos: |
| Datagram:9245f834     | Transition:L1Accept        | /12   | seqtype:0             | 2012-02-05 20:12:36.308 | fiducial:98a5  | ticks:50a36 | pos: |
| Datagram:102d4fcac    | Transition:L1Accept        | /12   | seqtype:0             | 2012-02-05 20:12:36.358 | fiducial:98b7  | ticks:50f06 | pos: |
| Datagram:2086b2b30    | Transition:L1Accept        | /12   | seqtype:0             | 2012-02-05 20:12:36.858 | fiducial:996b  | ticks:50f3e | pos: |
| Datagram:30e018c10    | Transition:L1Accept        | /12   | seqtype:0             | 2012-02-05 20:12:37.358 | fiducial:9a1f  | ticks:50e18 | pos: |
| Datagram:401397ba94   | Transition:L1Accept        | /12   | seqtype:0             | 2012-02-05 20:12:37.858 | fiducial:9ad3  | ticks:50980 | pos: |
| Datagram:100351d68c0  | Transition:L1Accept        | /12   | seqtype:0             | 2012-02-05 20:12:40.858 | fiducial:9f0b  | ticks:50ec0 | pos: |
| Datagram:2006cfc3518  | Transition:L1Accept        | /12   | seqtype:0             | 2012-02-05 20:12:45.858 | fiducial:a613  | ticks:50a60 | pos: |
| Datagram:300a4db020c  | Transition:L1Accept        | /12   | seqtype:0             | 2012-02-05 20:12:50.858 | fiducial:ad1b  | ticks:50f5a | pos: |
| Datagram:400dcb99d40  | Transition:L1Accept        | /12   | seqtype:0             | 2012-02-05 20:12:55.859 | fiducial:b423  | ticks:50b08 | pos: |
| Datagram:50014986a34  | Transition:L1Accept        | /12   | seqtype:0             | 2012-02-05 20:13:00.860 | fiducial:bb2b  | ticks:50956 | pos: |
| Datagram:6004c773728  | Transition:L1Accept        | /12   | seqtype:0             | 2012-02-05 20:13:05.861 | fiducial:c233  | ticks:50bbe | pos: |
| Datagram 697          | Damage Depth:0 Type:Xtc    | bit:1 | : DroppedContribution |                         |                |             |      |
| Datagram 697          | Damage Depth:1 Type:Xtc    | bit:1 | : DroppedContribution |                         |                |             |      |
| Datagram 697          | Damage Depth:2 Type:Any    | bit:1 | : DroppedContribution |                         |                |             |      |
| Datagram 698          | Damage Depth:0 Type:Xtc    | bit:1 | : DroppedContribution |                         |                |             |      |
| Datagram 698          | Damage Depth:1 Type:Xtc    | bit:1 | : DroppedContribution |                         |                |             |      |
| Datagram 698          | Damage Depth:2 Type:Any    | bit:1 | : DroppedContribution |                         |                |             |      |
| Datagram:700845603dc  | Transition:L1Accept        | /12   | seqtype:0             | 2012-02-05 20:13:10.863 | fiducial:c93b  | ticks:508a0 | pos: |
| Datagram:800bc34d0d0  | Transition:L1Accept        | /12   | seqtype:0             | 2012-02-05 20:13:15.864 | fiducial:d043  | ticks:50a0c | pos: |
| Datagram:900f4136c04  | Transition:L1Accept        | /12   | seqtype:0             | 2012-02-05 20:13:20.865 | fiducial:d74b  | ticks:50b5c | pos: |
| Datagram:10002bf23994 | Transition:L1Accept        | /12   | seqtype:0             | 2012-02-05 20:13:25.866 | fiducial:de53  | ticks:50b32 | pos: |

**XTC header records in log-file (if needed):**

```

Datagram:100 Transition:L1Accept/12 seqtype:0 2012-02-06 19:47:24.450 fiducial:00fd52 ticks:050d7e pos
0x378db6cc
Depth:0 XTC header: dmg:0 payload:9803432 extent:9803452 Src:Level:3 Event:ProcInfo(172.21.26.100,
pid=18143) TypeId:ver:0 id:1:Xtc
Depth:1 XTC header: dmg:0 payload:500 extent:520 Src:Level:2 Segment:ProcInfo(172.21.26.39, pid=6099)
TypeId:ver:0 id:1:Xtc
Depth:2 XTC header: dmg:0 payload:32 extent:52 Src:Level:1 Source:DetInfo(CxiDg2.0:Ipimb.1) TypeId:ver:2
id:22:IpimbData
Depth:2 XTC header: dmg:0 payload:28 extent:48 Src:Level:1 Source:DetInfo(CxiDg2.0:Ipimb.1) TypeId:ver:1
id:31:IpmFex
Depth:2 XTC header: dmg:0 payload:32 extent:52 Src:Level:1 Source:DetInfo(CxiDg4.0:Ipimb.0) TypeId:ver:2
id:22:IpimbData
Depth:2 XTC header: dmg:0 payload:28 extent:48 Src:Level:1 Source:DetInfo(CxiDg4.0:Ipimb.0) TypeId:ver:1
id:31:IpmFex
Depth:2 XTC header: dmg:0 payload:32 extent:52 Src:Level:1 Source:DetInfo(CxiSc1.0:Ipimb.0) TypeId:ver:2
id:22:IpimbData
Depth:2 XTC header: dmg:0 payload:28 extent:48 Src:Level:1 Source:DetInfo(CxiSc1.0:Ipimb.0) TypeId:ver:1
id:31:IpmFex
Depth:2 XTC header: dmg:0 payload:32 extent:52 Src:Level:1 Source:DetInfo(CxiDg1.0:Ipimb.0) TypeId:ver:2
id:22:IpimbData
Depth:2 XTC header: dmg:0 payload:28 extent:48 Src:Level:1 Source:DetInfo(CxiDg1.0:Ipimb.0) TypeId:ver:1
id:31:IpmFex
Depth:2 XTC header: dmg:0 payload:32 extent:52 Src:Level:1 Source:DetInfo(CxiDg2.0:Ipimb.0) TypeId:ver:2
id:22:IpimbData
Depth:2 XTC header: dmg:0 payload:28 extent:48 Src:Level:1 Source:DetInfo(CxiDg2.0:Ipimb.0) TypeId:ver:1
id:31:IpmFex
Depth:1 XTC header: dmg:0 payload:0 extent:20 Src:Level:2 Segment:ProcInfo(172.21.26.26, pid=20346)
TypeId:ver:0 id:1:Xtc
Depth:1 XTC header: dmg:0 payload:132 extent:152 Src:Level:2 Segment:ProcInfo(172.21.26.102, pid=16207)
TypeId:ver:0 id:1:Xtc
Depth:2 XTC header: dmg:0 payload:32 extent:52 Src:Level:6 Reporter:BldInfo(FEEGasDetEnergy) TypeId:ver:0
id:14:FEEGasDetEnergy
Depth:2 XTC header: dmg:0 payload:60 extent:80 Src:Level:6 Reporter:BldInfo(EBeam) TypeId:ver:1 id:15:
EBeamBld
Depth:1 XTC header: dmg:0 payload:614436 extent:614456 Src:Level:2 Segment:ProcInfo(172.21.26.26,
pid=20340) TypeId:ver:0 id:1:Xtc
Depth:2 XTC header: dmg:0 payload:614416 extent:614436 Src:Level:1 Source:DetInfo(CxiSc1.0:Tm6740.0)
TypeId:ver:1 id:2:Frame
Depth:1 XTC header: dmg:0 payload:36 extent:56 Src:Level:2 Segment:ProcInfo(172.21.26.25, pid=17284)
TypeId:ver:0 id:1:Xtc
Depth:2 XTC header: dmg:0 payload:16 extent:36 Src:Level:1 Source:DetInfo(NoDetector.0:Evr.0) TypeId:ver:
3 id:19:EvrData
Depth:1 XTC header: dmg:0 payload:0 extent:20 Src:Level:2 Segment:ProcInfo(172.21.26.27, pid=13359)
TypeId:ver:0 id:1:Xtc
Depth:1 XTC header: dmg:0 payload:4594084 extent:4594104 Src:Level:2 Segment:ProcInfo(172.21.26.139,
pid=5224) TypeId:ver:0 id:1:Xtc
Depth:2 XTC header: dmg:0 payload:4594064 extent:4594084 Src:Level:1 Source:DetInfo(CxiDs1.0:Cspad.0)
TypeId:ver:2 id:28:CspadElement
Depth:1 XTC header: dmg:0 payload:4594084 extent:4594104 Src:Level:2 Segment:ProcInfo(172.21.26.95,
pid=3697) TypeId:ver:0 id:1:Xtc
Depth:2 XTC header: dmg:0 payload:4594064 extent:4594084 Src:Level:1 Source:DetInfo(CxiDsd.0:Cspad.0)
TypeId:ver:2 id:28:CspadElement

```

## Accumulate statistics for transitions

```
=====
```

#### Quality check summary

```
=====
```

Total number of dgrams=13743

```
QCStatistics::printTransIdStatistics()
```

Total number of known TransitionId : 13

|                 |         |               |     |
|-----------------|---------|---------------|-----|
| Unknown         | : 0     | Reset         | : 0 |
| Map             | : 0     | Unmap         | : 0 |
| Configure       | : 1     | Unconfigure   | : 0 |
| BeginRun        | : 1     | EndRun        | : 1 |
| BeginCalibCycle | : 1     | EndCalibCycle | : 1 |
| Enable          | : 2     | Disable       | : 2 |
| L1Accept        | : 13734 |               |     |

In most cases the number of "Begin"-like transitions should be the same as the number of "End"-like transitions.

## Check correctness of the datagram time sequence

In perfect world it should be

$$t(Dg1) < t(Dg2) < t(Dg3) < \dots < t(DgN)$$

search for datadrams with wrong time sequence, like

$$t(Dgi) > t(Dg[i+1])$$

Content of each record:

```
struct BrokenTimeRecord {
    unsigned    ndg;
    uint32_t    damage_value;
    Pds::ClockTime time_dg;
    Pds::ClockTime time_dg_prev;
};
```

Print summary for broken time records:

```
QCStatistics::printBrokenTimeRecords()
```

Total number of broken time records : 100

|                          |   |                           |                         |          |
|--------------------------|---|---------------------------|-------------------------|----------|
| BrokenTimeRecord: Dgram: | 1 | t:1969-12-31 16:00:00.997 | t-previous:16:00:00.000 | damage:0 |
| BrokenTimeRecord: Dgram: | 2 | t:2012-02-05 10:27:28.948 | t-previous:10:27:28.997 | damage:0 |
| BrokenTimeRecord: Dgram: | 3 | t:2012-02-05 20:12:35.074 | t-previous:20:12:35.948 | damage:0 |
| ...                      |   |                           |                         |          |

## Size consistency of XTC containers

- Check that the XTC container size does not exceed certain maximal value.
- The total size of internal XTC containers should be consistent (and not exceed) with size of overlapping XTC container.
- Accumulate XTC container size error records; content of each record:

```

struct SizeErrorRecord {
    unsigned ndg;
    unsigned depth;
    int remaining;
    uint32_t damage_ext;
    uint32_t damage_int;
    Pds::TypeId::Type typeid_ext;
    Pds::TypeId::Type typeid_int;
};

```

Print in summary the XTC size error records:

```

QCStatistics::printXTCSIZEErrorRecords()
Total number of size error records : 91
Size Error Record: Dgram:      1  depth:1  remaining:0  damage_ext:0  damage_int:0  name_ext:Xtc  name_int:Xtc
Size Error Record: Dgram:      1  depth:1  remaining:0  damage_ext:0  damage_int:0  name_ext:Xtc  name_int:Xtc
Size Error Record: Dgram:      1  depth:1  remaining:0  damage_ext:0  damage_int:0  name_ext:Xtc  name_int:Xtc

```

## Accumulate statistics for data types

Count occurrence of each data type in XTC containers.

```

QCStatistics::printTypeIdCounter()
Total number of known TypeId : 58
Ind: TypeId name          : Entries Vers      payload      Depth      Src:Level      Src:Names
      :                  :      min/max    min/max      : #zeros    min/max      min/max
0: Any                  : 2          0/0          0/0          : 2          2/2          6/6          BldInfo
(FEEGasDetEnergy)
1: Xtc                  : 14365      0/1          0/9816324 : 2619      0/2          1/3          ProcInfo
(172.21.26.100, pid=18143)
(172.21.26.25, pid=17284)
(172.21.26.39, pid=6099)
(172.21.26.26, pid=20340)
(172.21.26.95, pid=3697)
(172.21.26.26, pid=20346)
(172.21.26.102, pid=16207)
0:NoDevice.0)
(172.21.26.139, pid=5224)
(172.21.26.27, pid=13359)
2: Frame                : 1589      1/1          614416/614416 : 0          2/2          1/1          DetInfo(CxiSc1.
0:Tm6740.0)
3: AcqWaveform          : 0
4: AcqConfig             : 0
5: TwoDGaussian          : 0
6: Opal1kConfig          : 0
7: FrameFexConfig        : 1          1/1          28/28        : 0          2/2          1/1          DetInfo(CxiSc1.
0:Tm6740.0)
8: EvrConfig             : 2          5/5          192/192      : 0          2/2          1/1          DetInfo
(NoDetector.0:Evr.0)
9: TM6740Config          : 1          2/2          12/12        : 0          2/2          1/1          DetInfo(CxiSc1.
0:Tm6740.0)
10: RunControlConfig     : 2          1/1          24/24        : 0          2/2          0/0          ProcInfo
(0.0.0.0, pid=24604)
11: pnCCDframe          : 0

```

|                          |         |     |                 |     |     |     |                 |
|--------------------------|---------|-----|-----------------|-----|-----|-----|-----------------|
| 12: pnCCDconfig          | : 0     |     |                 |     |     |     |                 |
| 13: Epics                | : 20997 | 1/1 | 24/496          | : 0 | 2/2 | 1/1 | DetInfo         |
| (EpicsArch.0:NoDevice.0) |         |     |                 |     |     |     |                 |
| 14: FEEGasDetEnergy      | : 1588  | 0/0 | 32/32           | : 0 | 2/3 | 6/6 | BldInfo         |
| (FEEGasDetEnergy)        |         |     |                 |     |     |     |                 |
| 15: EBeamBld             | : 1590  | 1/1 | 60/60           | : 0 | 2/3 | 6/6 | BldInfo(EBeam)  |
| 16: PhaseCavity          | : 0     |     |                 |     |     |     |                 |
| 17: PrincetonFrame       | : 0     |     |                 |     |     |     |                 |
| 18: PrincetonConfig      | : 0     |     |                 |     |     |     |                 |
| 19: EvrData              | : 1589  | 3/3 | 16/16           | : 0 | 2/2 | 1/1 | DetInfo         |
| (NoDetector.0:Evr.0)     |         |     |                 |     |     |     |                 |
| 20: FrameFccdConfig      | : 0     |     |                 |     |     |     |                 |
| 21: FccdConfig           | : 0     |     |                 |     |     |     |                 |
| 22: IpimbData            | : 7945  | 2/2 | 32/32           | : 0 | 2/2 | 1/1 | DetInfo(CxiDg2. |
| 0:Ipimb.1)               |         |     |                 |     |     |     | DetInfo(CxiDg4. |
| 0:Ipimb.0)               |         |     |                 |     |     |     | DetInfo(CxiSc1. |
| 0:Ipimb.0)               |         |     |                 |     |     |     | DetInfo(CxiDg1. |
| 0:Ipimb.0)               |         |     |                 |     |     |     | DetInfo(CxiDg2. |
| 0:Ipimb.0)               |         |     |                 |     |     |     | DetInfo(CxiDg1. |
| 23: IpimbConfig          | : 5     | 2/2 | 60/60           | : 0 | 2/2 | 1/1 | DetInfo(CxiDg1. |
| 0:Ipimb.0)               |         |     |                 |     |     |     | DetInfo(CxiDg2. |
| 0:Ipimb.0)               |         |     |                 |     |     |     | DetInfo(CxiDg2. |
| 0:Ipimb.1)               |         |     |                 |     |     |     | DetInfo(CxiDg4. |
| 0:Ipimb.0)               |         |     |                 |     |     |     | DetInfo(CxiSc1. |
| 0:Ipimb.0)               |         |     |                 |     |     |     |                 |
| 24: EncoderData          | : 0     |     |                 |     |     |     |                 |
| 25: EncoderConfig        | : 0     |     |                 |     |     |     |                 |
| 26: EvrIOConfig          | : 0     |     |                 |     |     |     |                 |
| 27: PrincetonInfo        | : 0     |     |                 |     |     |     |                 |
| 28: CspadElement         | : 3178  | 1/2 | 4594064/4594064 | : 0 | 2/2 | 1/1 | DetInfo(CxiDs1. |
| 0:Cspad.0)               |         |     |                 |     |     |     | DetInfo(CxiDsd. |
| 0:Cspad.0)               |         |     |                 |     |     |     |                 |
| 29: CspadConfig          | : 2     | 3/3 | 287844/287844   | : 0 | 2/2 | 1/1 | DetInfo(CxiDsd. |
| 0:Cspad.0)               |         |     |                 |     |     |     | DetInfo(CxiDs1. |
| 0:Cspad.0)               |         |     |                 |     |     |     |                 |
| 30: IpimFexConfig        | : 5     | 2/2 | 520/520         | : 0 | 2/2 | 1/1 | DetInfo(CxiDg1. |
| 0:Ipimb.0)               |         |     |                 |     |     |     | DetInfo(CxiDg2. |
| 0:Ipimb.0)               |         |     |                 |     |     |     | DetInfo(CxiDg2. |
| 0:Ipimb.1)               |         |     |                 |     |     |     | DetInfo(CxiDg4. |
| 0:Ipimb.0)               |         |     |                 |     |     |     | DetInfo(CxiSc1. |
| 0:Ipimb.0)               |         |     |                 |     |     |     |                 |
| 31: IpimFex              | : 7945  | 1/1 | 28/28           | : 0 | 2/2 | 1/1 | DetInfo(CxiDg2. |
| 0:Ipimb.1)               |         |     |                 |     |     |     | DetInfo(CxiDg4. |
| 0:Ipimb.0)               |         |     |                 |     |     |     | DetInfo(CxiSc1. |
| 0:Ipimb.0)               |         |     |                 |     |     |     | DetInfo(CxiDg1. |
| 0:Ipimb.0)               |         |     |                 |     |     |     | DetInfo(CxiDg2. |
| 0:Ipimb.0)               |         |     |                 |     |     |     |                 |
| 32: DiodeFexConfig       | : 0     |     |                 |     |     |     |                 |
| 33: DiodeFex             | : 0     |     |                 |     |     |     |                 |
| 34: PimImageConfig       | : 1     | 1/1 | 8/8             | : 0 | 2/2 | 1/1 | DetInfo(CxiSc1. |
| 0:Tm6740.0)              |         |     |                 |     |     |     |                 |
| 35: SharedIpimb          | : 0     |     |                 |     |     |     |                 |
| 36: AcqTDCConfig         | : 0     |     |                 |     |     |     |                 |

```

37: AcqTDCData      : 0
38: Index           : 0
39: XampsConfig     : 0
40: XampsElement    : 0
41: Cspad2x2Element : 0
42: SharedPIM       : 0
43: Cspad2x2Config  : 0
44: FexampConfig     : 0
45: FexampElement    : 0
46: Gsc16aiConfig   : 0
47: Gsc16aiData     : 0
48: PhasicsConfig   : 0
49: TimepixConfig    : 0
50: TimepixData      : 0
51: CspadCompressedElement : 0
52: OceanOpticsConfig : 0
53: OceanOpticsData  : 0
54: EpicsConfig      : 0
55: FliConfig        : 0
56: FliFrame         : 0
57: QuartzConfig     : 0

```

## Accumulate statistics of damages

- Accumulate counters for
  - damage bits
  - damage data type
  - damage bits vs data type
- Accumulate damage records; content of each record:

```

struct DamageRecord {
    unsigned ndg;
    unsigned depth;
    uint32_t damage_value;
    Pds::TypeId::Type type_id;
};

```

## Summary table for damage bit counters

```

QCStatistics::printDamageBitCounter()   Damage counter
Damage bit:1  : DroppedContribution      6
Damage bit:12 : OutOfOrder                0
Damage bit:13 : OutOfSynch                0
Damage bit:14 : UserDefined                4
Damage bit:15 : IncompleteContribution     9
Damage bit:16 : ContainsIncomplete        18

```

## Summary table for damage bit vs data types counters

QCStatistics::printDamageCounter()

Total number of known TypeId : 58

| Ind: TypeId name           | : Entries | DmgTot | Bits:1 | 12 | 13 | 14 | 15 | 16 |
|----------------------------|-----------|--------|--------|----|----|----|----|----|
| 0: Any                     | : 2       | 2      | 2      | 0  | 0  | 0  | 0  | 0  |
| 1: Xtc                     | : 14365   | 26     | 4      | 0  | 0  | 4  | 0  | 18 |
| 2: Frame                   | : 1589    | 0      | 0      | 0  | 0  | 0  | 0  | 0  |
| 3: AcqWaveform             | : 0       |        |        |    |    |    |    |    |
| 4: AcqConfig               | : 0       |        |        |    |    |    |    |    |
| 5: TwoDGaussian            | : 0       |        |        |    |    |    |    |    |
| 6: Opal1kConfig            | : 0       |        |        |    |    |    |    |    |
| 7: FrameFexConfig          | : 1       | 0      | 0      | 0  | 0  | 0  | 0  | 0  |
| 8: EvrConfig               | : 2       | 0      | 0      | 0  | 0  | 0  | 0  | 0  |
| 9: TM6740Config            | : 1       | 0      | 0      | 0  | 0  | 0  | 0  | 0  |
| 10: RunControlConfig       | : 2       | 0      | 0      | 0  | 0  | 0  | 0  | 0  |
| 11: pnCCDframe             | : 0       |        |        |    |    |    |    |    |
| 12: pnCCDconfig            | : 0       |        |        |    |    |    |    |    |
| 13: Epics                  | : 20997   | 0      | 0      | 0  | 0  | 0  | 0  | 0  |
| 14: FEEGasDetEnergy        | : 1588    | 0      | 0      | 0  | 0  | 0  | 0  | 0  |
| 15: EBeamBld               | : 1590    | 0      | 0      | 0  | 0  | 0  | 0  | 0  |
| 16: PhaseCavity            | : 0       |        |        |    |    |    |    |    |
| 17: PrincetonFrame         | : 0       |        |        |    |    |    |    |    |
| 18: PrincetonConfig        | : 0       |        |        |    |    |    |    |    |
| 19: EvrData                | : 1589    | 0      | 0      | 0  | 0  | 0  | 0  | 0  |
| 20: FrameFccdConfig        | : 0       |        |        |    |    |    |    |    |
| 21: FccdConfig             | : 0       |        |        |    |    |    |    |    |
| 22: IpimbData              | : 7945    | 0      | 0      | 0  | 0  | 0  | 0  | 0  |
| 23: IpimbConfig            | : 5       | 0      | 0      | 0  | 0  | 0  | 0  | 0  |
| 24: EncoderData            | : 0       |        |        |    |    |    |    |    |
| 25: EncoderConfig          | : 0       |        |        |    |    |    |    |    |
| 26: EvrIOConfig            | : 0       |        |        |    |    |    |    |    |
| 27: PrincetonInfo          | : 0       |        |        |    |    |    |    |    |
| 28: CspadElement           | : 3178    | 9      | 0      | 0  | 0  | 0  | 9  | 0  |
| 29: CspadConfig            | : 2       | 0      | 0      | 0  | 0  | 0  | 0  | 0  |
| 30: IpmFexConfig           | : 5       | 0      | 0      | 0  | 0  | 0  | 0  | 0  |
| 31: IpmFex                 | : 7945    | 0      | 0      | 0  | 0  | 0  | 0  | 0  |
| 32: DiodeFexConfig         | : 0       |        |        |    |    |    |    |    |
| 33: DiodeFex               | : 0       |        |        |    |    |    |    |    |
| 34: PimImageConfig         | : 1       | 0      | 0      | 0  | 0  | 0  | 0  | 0  |
| 35: SharedIpimb            | : 0       |        |        |    |    |    |    |    |
| 36: AcqTDCCConfig          | : 0       |        |        |    |    |    |    |    |
| 37: AcqTDCData             | : 0       |        |        |    |    |    |    |    |
| 38: Index                  | : 0       |        |        |    |    |    |    |    |
| 39: XampsConfig            | : 0       |        |        |    |    |    |    |    |
| 40: XampsElement           | : 0       |        |        |    |    |    |    |    |
| 41: Cspad2x2Element        | : 0       |        |        |    |    |    |    |    |
| 42: SharedPIM              | : 0       |        |        |    |    |    |    |    |
| 43: Cspad2x2Config         | : 0       |        |        |    |    |    |    |    |
| 44: FexampConfig           | : 0       |        |        |    |    |    |    |    |
| 45: FexampElement          | : 0       |        |        |    |    |    |    |    |
| 46: Gsc16aiConfig          | : 0       |        |        |    |    |    |    |    |
| 47: Gsc16aiData            | : 0       |        |        |    |    |    |    |    |
| 48: PhasicsConfig          | : 0       |        |        |    |    |    |    |    |
| 49: TimepixConfig          | : 0       |        |        |    |    |    |    |    |
| 50: TimepixData            | : 0       |        |        |    |    |    |    |    |
| 51: CspadCompressedElement | : 0       |        |        |    |    |    |    |    |
| 52: OceanOpticsConfig      | : 0       |        |        |    |    |    |    |    |
| 53: OceanOpticsData        | : 0       |        |        |    |    |    |    |    |
| 54: EpicsConfig            | : 0       |        |        |    |    |    |    |    |
| 55: FliConfig              | : 0       |        |        |    |    |    |    |    |
| 56: FliFrame               | : 0       |        |        |    |    |    |    |    |
| 57: QuartzConfig           | : 0       |        |        |    |    |    |    |    |

Print in summary all damage records

```

QCStatistics::printDamageRecords()
Total number of damage records : 33
Damage Record: Dgram:    72  depth:0  type:Xtc          damage: 65536  bit:16: ContainsIncomplete
Damage Record: Dgram:    72  depth:1  type:Xtc          damage: 65536  bit:16: ContainsIncomplete
Damage Record: Dgram:    72  depth:2  type:CspadElement  damage: 32768  bit:15:
IncompleteContribution
Damage Record: Dgram:   123  depth:0  type:Xtc          damage: 65536  bit:16: ContainsIncomplete
Damage Record: Dgram:   123  depth:1  type:Xtc          damage: 65536  bit:16: ContainsIncomplete
Damage Record: Dgram:   123  depth:2  type:CspadElement  damage: 32768  bit:15:
IncompleteContribution
Damage Record: Dgram:   272  depth:0  type:Xtc          damage:      2  bit: 1: DroppedContribution
Damage Record: Dgram:   272  depth:1  type:Xtc          damage:      2  bit: 1: DroppedContribution
Damage Record: Dgram:   272  depth:2  type:Any          damage:      2  bit: 1: DroppedContribution
Damage Record: Dgram:   284  depth:0  type:Xtc          damage: 81920  bit:14: UserDefined
                                                bit:16: ContainsIncomplete
Damage Record: Dgram:   284  depth:1  type:Xtc          damage: 81920  bit:14: UserDefined
                                                bit:16: ContainsIncomplete
                                                damage: 32768  bit:15:
Damage Record: Dgram:   284  depth:2  type:CspadElement
IncompleteContribution
Damage Record: Dgram:   332  depth:0  type:Xtc          damage: 65536  bit:16: ContainsIncomplete
Damage Record: Dgram:   332  depth:1  type:Xtc          damage: 65536  bit:16: ContainsIncomplete
Damage Record: Dgram:   332  depth:2  type:CspadElement  damage: 32768  bit:15:
IncompleteContribution
Damage Record: Dgram:   479  depth:0  type:Xtc          damage:      2  bit: 1: DroppedContribution
Damage Record: Dgram:   479  depth:1  type:Xtc          damage:      2  bit: 1: DroppedContribution
Damage Record: Dgram:   479  depth:2  type:Any          damage:      2  bit: 1: DroppedContribution
Damage Record: Dgram:   700  depth:0  type:Xtc          damage: 65536  bit:16: ContainsIncomplete
Damage Record: Dgram:   700  depth:1  type:Xtc          damage: 65536  bit:16: ContainsIncomplete
Damage Record: Dgram:   700  depth:2  type:CspadElement  damage: 32768  bit:15:
IncompleteContribution
Damage Record: Dgram:   790  depth:0  type:Xtc          damage: 65536  bit:16: ContainsIncomplete
Damage Record: Dgram:   790  depth:1  type:Xtc          damage: 65536  bit:16: ContainsIncomplete
Damage Record: Dgram:   790  depth:2  type:CspadElement  damage: 32768  bit:15:
IncompleteContribution
Damage Record: Dgram:   923  depth:0  type:Xtc          damage: 65536  bit:16: ContainsIncomplete
Damage Record: Dgram:   923  depth:1  type:Xtc          damage: 65536  bit:16: ContainsIncomplete
Damage Record: Dgram:   923  depth:2  type:CspadElement  damage: 32768  bit:15:
IncompleteContribution
Damage Record: Dgram:  1025  depth:0  type:Xtc          damage: 65536  bit:16: ContainsIncomplete
Damage Record: Dgram:  1025  depth:1  type:Xtc          damage: 65536  bit:16: ContainsIncomplete
Damage Record: Dgram:  1025  depth:2  type:CspadElement  damage: 32768  bit:15:
IncompleteContribution
Damage Record: Dgram:  1305  depth:0  type:Xtc          damage: 81920  bit:14: UserDefined
                                                bit:16: ContainsIncomplete
Damage Record: Dgram:  1305  depth:1  type:Xtc          damage: 81920  bit:14: UserDefined
                                                bit:16: ContainsIncomplete
                                                damage: 32768  bit:15:
Damage Record: Dgram:  1305  depth:2  type:CspadElement
IncompleteContribution

```

## Data quality check

- psana-based analysis for selected types of data with known properties.
- This is data-specific check, which can not be universal for all data types.

## Indexing?

The same procedure of the loop over datagrams with iteration over XTC containers can be used for XTC data indexing..., but need to read all files for streams and chunks within run using the same algorithm like in psana.

## Command line interface

```

xtcqc [-h] [-l <logfile>] [-b <basedir>] <fname1> [<fname2> [<fname3> ...]]

```

Optional parameters:

- h - help, showing usage of the command line parameters.
- l - log-file; if specified, then output will be re-directed to this file, otherwise on stdout.
- b - base-directory, i.e.: /reg/d/psdm/<INSTRUMENT>/<experiment>/xtc; if specified, then all xtc file names will be defined w.r.t. this directory.

Non-optional parameters:

<fname1> [<fname2> [<fname3> ...]] - all xtc file names should be listed without options. At least one xtc file name should be provided.



Unpleasant feature of getopt:

The options -l and -b require the file name as a trailed optional parameter. If the optional parameter is mistakenly missed, then entire input will be corrupted.

## Database for XTC Quality Check

Whenever the xtc file is processed, the results are saved in the database

```
/reg/d/psdm/<INSTRUMENT>/<experiment>/xtcqc/<xtc-like-file-name>.qc
```

## Web-based control and access

Igor is going to produce web-based interface, like for translator, with functionality as follows.

- Show list of files with processed/not-processed flag,
- Control on job submission for quality check,
- Browser for QC results of particular file/run;
  - show log file content - minimal version,
  - show statistics in the database - full-scale version.