Proposal for perfSONAR xml format to handle high-resolution measurement data

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Outline

- perfSONAR-PS High Resolution measurement Archive Measurement Archive (HRA-MA)
  - capturing and storing all packets on 10Gbps link with 100-nanosecond resolution time stamp.
  - providing bit-rate data calculated from every 100-microseconds.
- HRA (High Resolution Archive) file formats
- Extension of Timestamps formats and resolution definition in XML messages.
Implementation of perfSONAR-PS HRA-MA

**Modified perfSONAR-PS SNMP-MA** accepts “SetupDataRequest” whose resolution is 1 second or less and decides whether to use HRA or RRD according to the requested resolution.

**HRA daemon** captures packets using **PRESTA 10G NIC** and stores length of the packets and timestamps in the HRA formats.

**HRA processor** reads the stored data and calculates traffic bit-rate in requested resolution.

**PRESTA 10G NIC** provides:
- 10-Gbps wire-rate capturing.
- Accurate and 100-nanosecond resolution timestamps.

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**What we made.**

**Existing codes.**

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The diagram illustrates the flow of data and processes:
- **HRA Viewer**
- **Existing perfSONAR-UI**
- **HRA Viewer**
- **Modified perfSONAR-PS SNMP-MA (ver. 3.1.8)**
- **HRA IF**
- **RRD IF**
- **HRA processor**
- **RRDtools**
- **RRD archive**
- **SNMP**
- **pcap file**
- **HRA daemon**
- **HRA archive**
- **Requested resolution**
- **Res. <= 1s**
- **Res. > 1s request.**
- **Res. > 1s request.**
- **Res. <= 1s**
- **Res. > 1s request.**
- **Res. > 1s.**

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It can make the bit rate visible by a high resolution as if the loupe.
HRA file format

- **Index (The number of records in 1 second)**
- **Time stamp**
- **Packet length**
- **Padding**

0 16 32 48 64 (bit)

- **Time stamp**
- **Packet length**
- **Padding**

Index

- **Time stamp**
- **Packet length**
- **Padding**

Index

- **Time stamp**
- **Packet length**
- **Padding**

Index

- **Time stamp**
- **Packet length**
- **Padding**

Index

- **Time stamp**
- **Packet length**
- **Padding**

HRA file

1 second

1 hour
Requirement for XML message format

Current Definitions

- SetupDataRequest message
  - “StartTime”: ISO-8601 or unix timestamp format
  - “EndTime”: ISO-8601 or unix timestamp format
  - “Resolution”: The number of second

- SetupDataResponse message
  - “timeValue”: ISO-8601 or unix timestamp format

Necessary to enhance to specify time and the number of seconds for one second or less.
Extension of XML message format

“startTime” and “endTime”

<ISO-8601 or unix timestamp>.<the number of microsecond>

“Resolution”

unit “u” which represent microsecond and “m” which represent microsecond

<parameters id="parameters_1">
  <parameter name="startTime" xmlns="http://ggf.org/ns/nmwg/base/2.0/">1264411508.966000</parameter>
  <parameter name="endTime" xmlns="http://ggf.org/ns/nmwg/base/2.0/">1264411518.966000</parameter>
  <parameter name="consolidationFunction" xmlns="http://ggf.org/ns/nmwg/base/2.0/">AVERAGE</parameter>
  <parameter name="resolution" xmlns="http://ggf.org/ns/nmwg/base/2.0/">10000u</parameter>
</parameters>

“timeValue”

<ISO-8601 or unix timestamp>.<the number of microsecond>

<nmwg:data metadataIdRef="metadata.13245760" id="data.8135423">
  <nmwg:datum timeType="unix" value="3290400000" valueUnits="Bps" timeValue="1264411508.966000" />
  <nmwg:datum timeType="unix" value="3110400000" valueUnits="Bps" timeValue="1264411508.976000" />
  <nmwg:datum timeType="unix" value="2779200000" valueUnits="Bps" timeValue="1264411508.986000" />
  ...... 
  <nmwg:datum timeType="unix" value="0" valueUnits="Bps" timeValue="1264411518.946000" />
  <nmwg:datum timeType="unix" value="0" valueUnits="Bps" timeValue="1264411518.956000" />
  <nmwg:datum timeType="unix" value="0" valueUnits="Bps" timeValue="1264411518.966000" />
</nmwg:data>
Conclusion & discussion

- perfSONAR-PS High Resolution measurement Archive Measurement Archive (HRA-MA)
  - perfSONAR-PS SNMP-MA are modified to handle high resolution measurement data.
  - HRA daemon and HRA processor write and read HRA file.

- HRA file formats
  - Simple format with fixed-length index to accelerate the calculation of bit-rate.

- Extension of timestamp format and resolution expression in XML messages
  - Sub-second expression is added to ISO-8601, UNIX timestamps.
  - Unit of millisecond (“m”) and microsecond (“u”) are defined.

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Proposal of extension of timestamp format

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“startTime”, “endTime” and “timeValue”
  <ISO-8601 or unix timestamp>.<the number of microsecond>

“Resolution”
  unit “u” which represent microsecond and “m” which represent microsecond
```

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