Report on SKA Logging

LMC action team#2

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Working doc: http://tinyurl.com/ho2do8r

Objectives

- **Define SKA Element Logging Architecture**
  - Organization of LMC logging devices to support:
    - Log reporting to TM
    - Log viewing instances in TM
    - Log archiving both at the Element and centrally in TM
    - Log configuration (level/target)
  - Standardized logging
    - Log message format, default log levels per target
    - Common technologies for log generation/inspection/archiving/streaming

- **Investigating suitable logging technologies for standardization**
  - Tango Logging System (TLS) and beyond

- **Providing inputs to refine the TM-LMC ICDs (logging section)**

Element Logging Architecture

SKA Pattern

- LMC provides an **ElementLogger** device (LogConsumer)

- TM provides *CentralLogger* device(s) (LogConsumer)

- **3 pre-configured log targets** for each LMC device:
  - *ElementLogger* @ INFO level (simple Element), @WARN level complex Elements (to support LogViewer instances)
  - *syslog* @ INFO level (to support local & central log archiving/analysis)
  - *CentralLogger* @ ERROR level (to support cross-facility LogViewer instances in TM)

- Log levels and additional targets configurable by TM at runtime, if required
  - Using interface commands provided by LMC
  - Static config for syslog expected

3

Element vs Central Logger
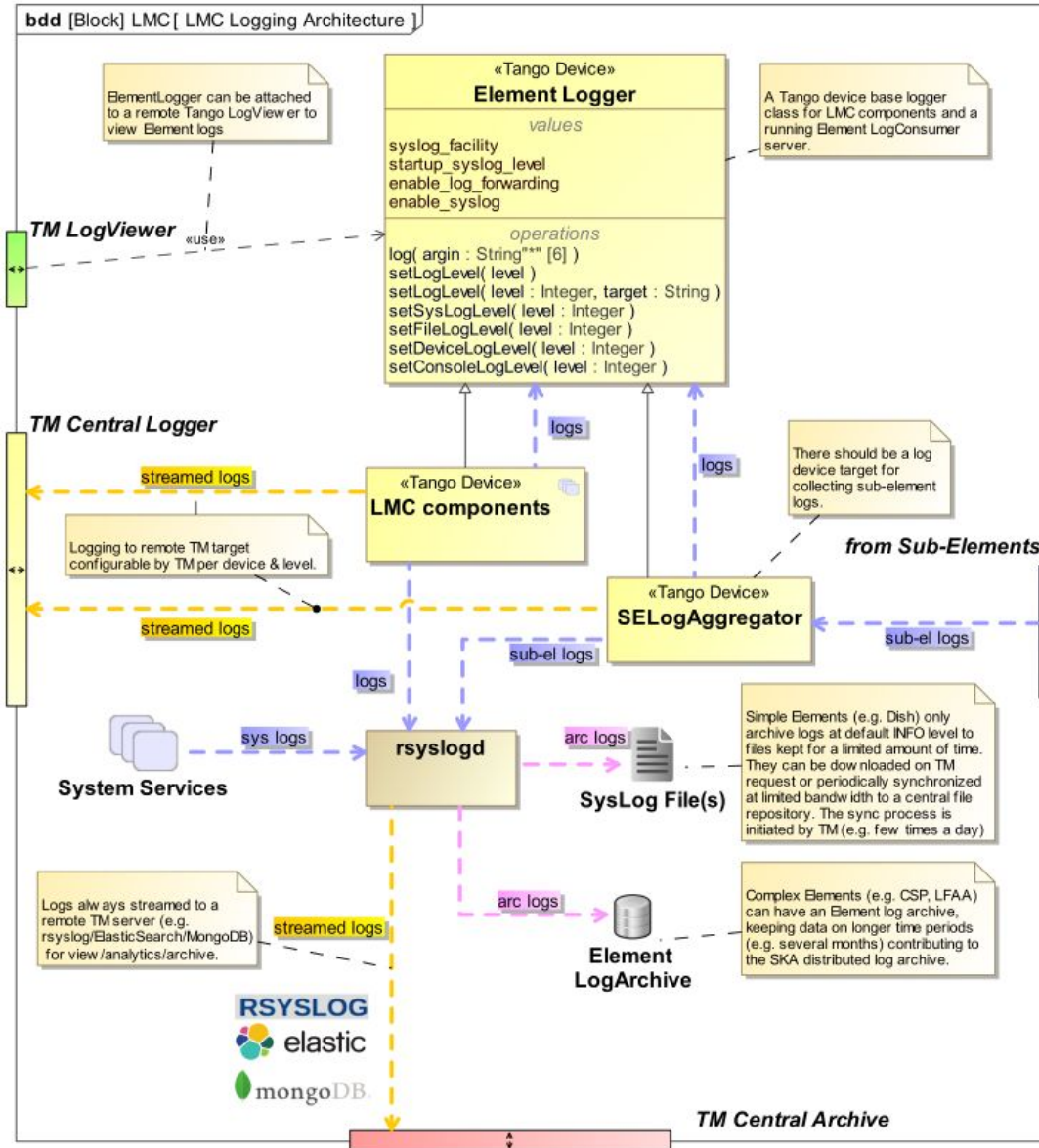
ElementLogger device

- denotes the top level LogConsumer in the Element hierarchy of loggers

- implements the Tango LogConsumer interface

  ```
  void log (Tango::DevVarStringArray details)
  ```

- Enables Element or TM launching *LogViewer* instances with a single endpoint without the need of appending all Element logging sources:

  ```
  $ logviewer $TANGO_HOST/[ElementLoggerName]
  ```
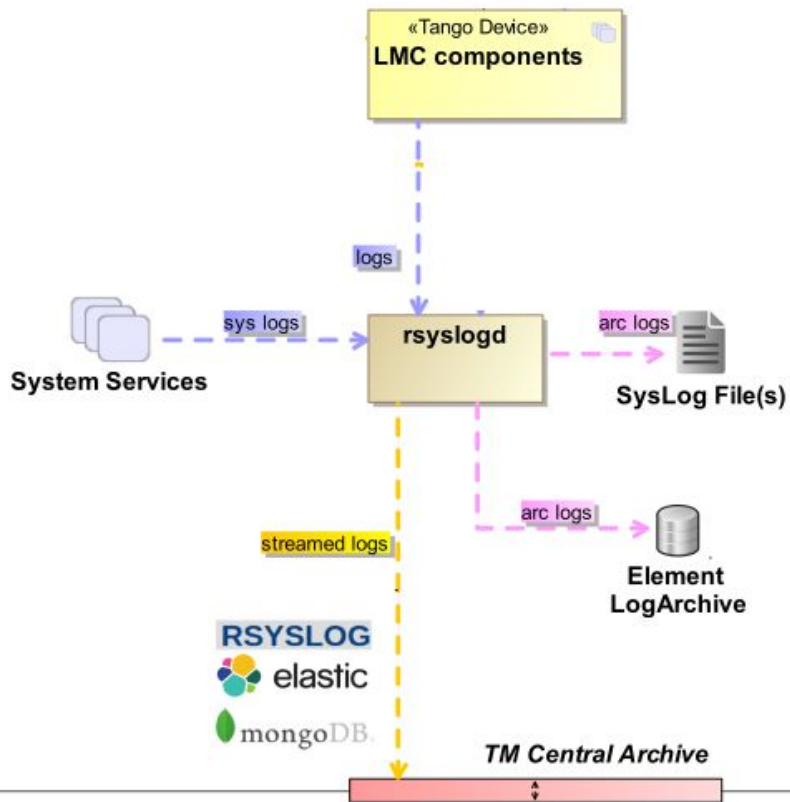
- *ElementLogger* device known to TM by naming convention and exported also on the interface as attribute

TM Central Logger

streamed logs

«Tango Device»
LMC components
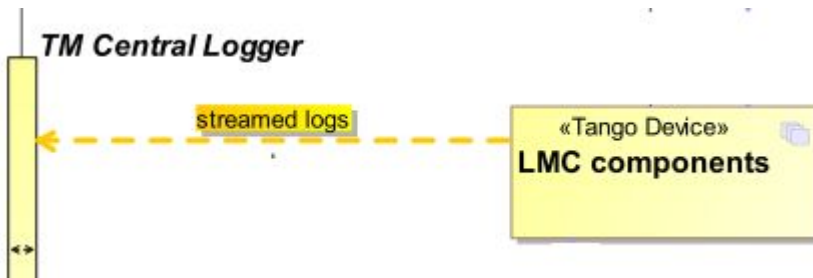
- **No significant features required wrt TANGO**
- **Issues**
  - FQDN not supported by LogViewer, cannot add log sources from different facilities (but not real issue as "aggregation" can be done in the LogConsumer)
  - Different log levels per target is de-activated by default

  (enable APPENDERS_HAVE_LEVEL_THRESHOLD)

CentralLogger device

- collates logs across all Tango facilities in the telescope enabling TM to build cross-facility viewers

- Remote LogConsumer Target already configured at Element startup to catch possible Element startup faults

- Log streaming to *CentralLogger* limited to >ERROR logs by default

- CentralLogger will also archive these selected logs centrally (additional archiving mechanism)

4

Log streaming and archiving

- LMC components shall log to a local rsyslog server to support:

  - Short/Medium-term archiving at the Element

  - Log streaming to TM for long-term archiving and log inspection/analysis (e.g. using Elastic stack tools)

- **"Simple" Elements** (e.g. Dish)

  - Local archive to syslog files (persistence few days)

  - Forward logs via TCP to a remote rsyslog server for archiving in a search engine, like Elastic, or in DB like MongoDB

- **"Complex" Elements** (e.g. CSP, LFAA)

  - Local archive to a database shard (persistence 1 year) part of a SKA distributed archive (TBD)

- Archiving solutions still under investigation in TM (see Matteo's talk)

  - Rsyslog supports log forwarding to several backends (file, remote rsyslog, MongoDB, ElasticSearch, ...) allowing flexibility while TM finalizes the optimal strategy

- Syslog support to be added in device server
- Several libraries available to ease implementation
  - C++: Boost.log, Log4cxx
  - Java: Logback
  - Python: syslog module

Log format

- **Tango Log Format - CONSOLE/FILE/DEVICE**

    - Adhere to Tango Guidelines for log message definition

        `<CLASS_NAME>::<FUNCTION>() - <MSG TEXT>`

    - Device name already added by Tango Core

- **Syslog Log Format -** RFC 3164

Field	Priority	Prescription
FACILITY	Mandatory	local0 - local7
SEVERITY	Mandatory	Tango-syslog mapping Emergency/Alert/Critical = FATAL Error = ERROR Warning = WARNING Notice/Informational = INFO Debug = DEBUG
HOSTNAME	Optional	Host where device is running, with this order of preference: FQDN, Static IP address, Hostname, Dynamic IP address, NILVALUE
TIMESTAMP	Mandatory	ISO 8601/RFC-3339 UTC time (sub-sec precision)
TAG	Mandatory	Device name
CONTENT	Mandatory	`<CLASS_NAME>::<FUNCTION>() - <MSG TEXT>`

- **C++ *ElementLogger* device prototype developed**
  - Can be inserted in the SKA base device or a part of the inheritance chain
  - Define helper log macros to log both to Tango targets and to syslog (Boost.log/Log4cxx tested)

    ```
    LOG(level,"msg"), INFO_LOG("msg"), ERROR_LOG("msg"), WARN_LOG("msg"), DEBUG_LOG("msg")
    ```

  - Enables log forwarding to specified Tango targets maintaining original timestamp and log source

- **Test carried out with a ELK stack**
  - Set up local Tango devices and remote rsyslog server, logstash and ElasticSearch
  - Sample configuration files available in the working doc
  - Rsyslog sample log

```
2016-05-24T19:50:34.911663+02:00 [fromhost: riggi-XXXXXX] [severity: CRIT] [app-name: dshlmc]
[pri: 182] [tag: dshlmc/lmclogger/id1:] [struct: -] [msgid: -] [msgcontent: LMCLogger::test_log
() - A fatal message]
```

  - Retrieve log in the ElasticSearch engine (http request)

```
"_source":{"@timestamp":"2016-05-26T17:32:08.000Z","@version":"1","message":"LMCLogger::test_log
() - A fatal message","sysloghost":"riggi-XXXXX","sourcehost":"XXXXX","severity": "CRIT","
facility":"local6","tag":"dshlmc/lmclogger/id1:","programname":"dshlmc","app-name":"dshlmc","
procid" : "-","type" : "rsyslog","host" : "127.0.0.1"}
```

- **Several syslog library available to implement logger devices in other languages (Java/python)**

Summary

- **LMC responsibilities vs TM**
  - Add an *ElementLogger* in the device hierarchy
  - Add 3 logging targets to all devices (*CentralLogger*, *ElementLogger*, *syslog*) at the default levels (already configured before LMC startup)
  - Configure rsyslog forwarding to remote TM rsyslog server using configuration provided by TM
  - Configure sharding (only complex Elements) (TBD)
  - Provide commands for logging configuration in the interface
  - Provide commands for log file downloading (only small Elements)
  - Export *ElementLogger* device name in the interface

- **TM Responsibility vs LMC**
  - Provide a *CentralLogger* device name to each LMC
  - Provide a rsyslog endpoint (host/port) and configuration (msg template, filters, ...) to each LMC

- **Discuss and finalize logging architecture**
  - Inputs from other Elements, SKAO and Tango experts needed
  - Distributed archiving was suggested by some Elements (TM.LMC and CSP.LMC)
    - Deeper investigation of suitable technologies and prototyping ongoing (see also Matteo's talk)
    - High-level discussion (e.g. SKAO, interested elements, TM) and impact evaluation needed
    - Log archiving choices possibly not in isolation wrt moni data archiving

- **Documentation products**
  - Final pattern going into the SKA Guidelines (just summary points)
  - Working document to be finalized and kept as a reference

- **Inputs to TM-LMC ICDs & LMC Requirements?**