Catalogue synchronization (Update)

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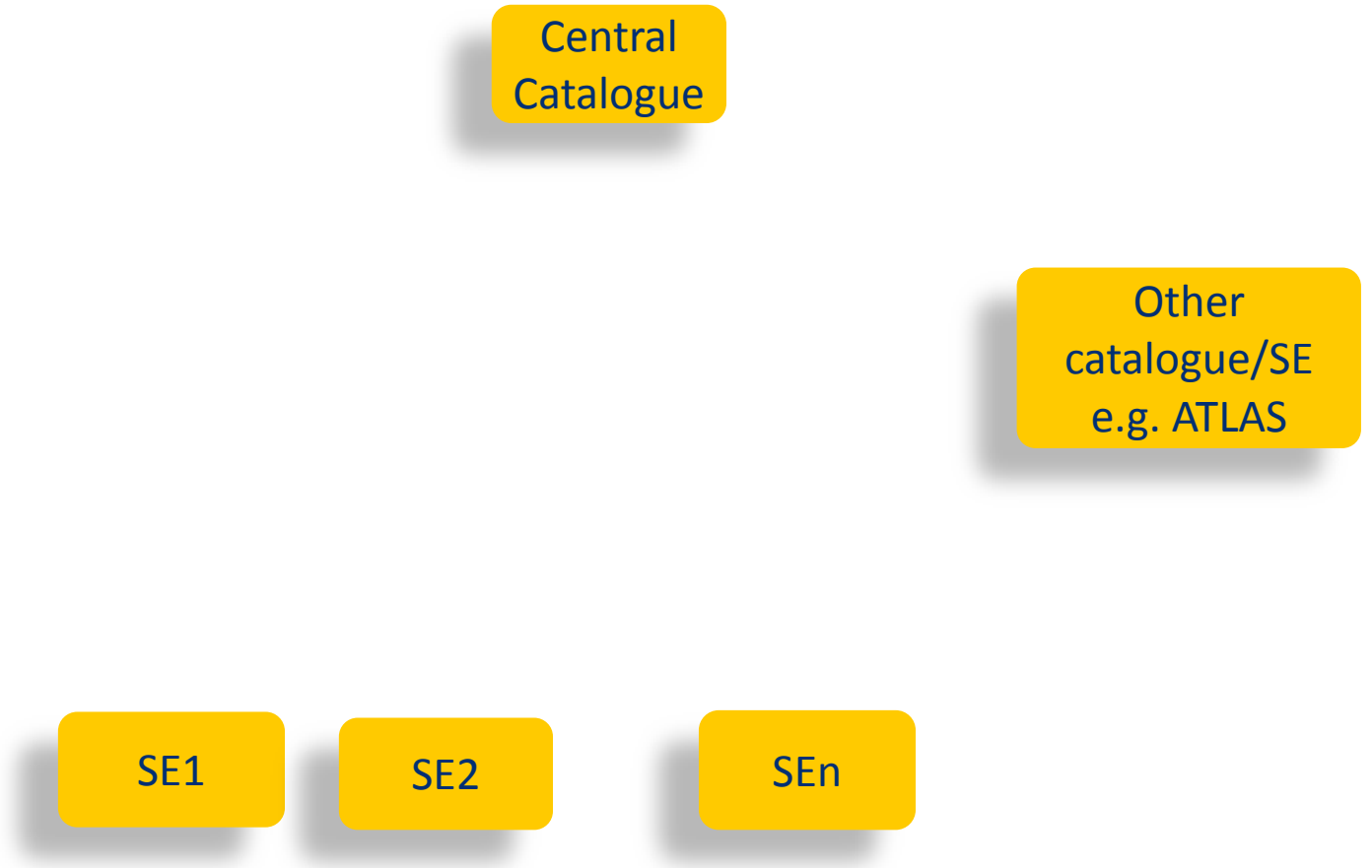
The problem

- Various catalogues keep information that is related
  - E.g. LFC keeps info about the content of remote Storage Elements, each one with its own catalogue
    - A change in the permissions of a file in LFC is not automatically reflected by the peripheric catalogue
    - If a SE looses a file, the LFC does not know
    - If a new file is not correctly registered -> dark data
- Keeping them in sync is a very hard problem
- Namespace scanning for diffs is an expensive workaround

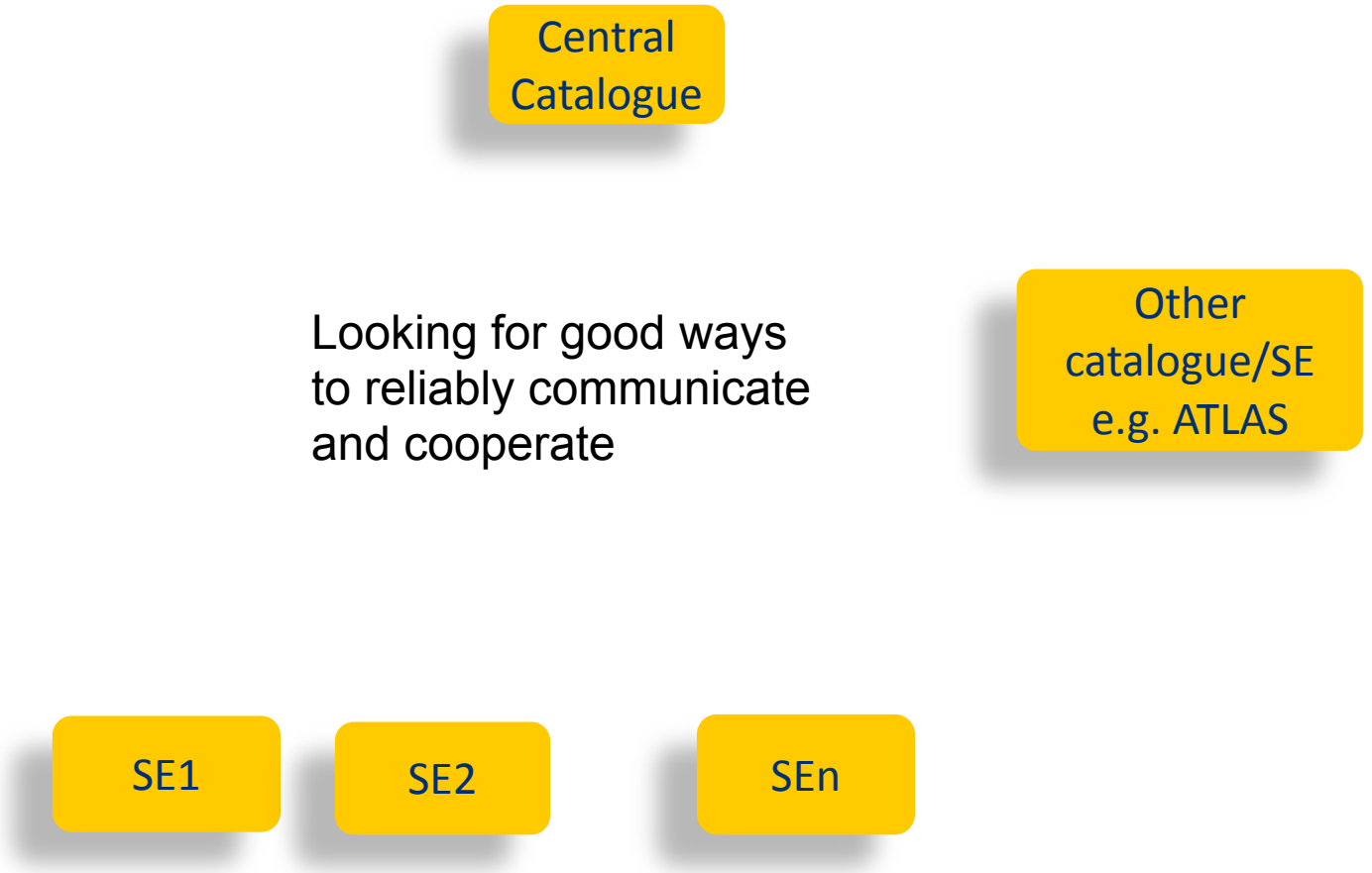
The idea

- Make the various catalogues/SE able to talk to each other
  - In order to exchange messages that keep them synchronized in realtime
  - 2 directions:
    - Central Catalogue->SE (downstream)
      - e.g. to propagate changes in the permissions
    - SE->Central Catalogue (upstream)
      - e.g. to propagate info about lost and missing files

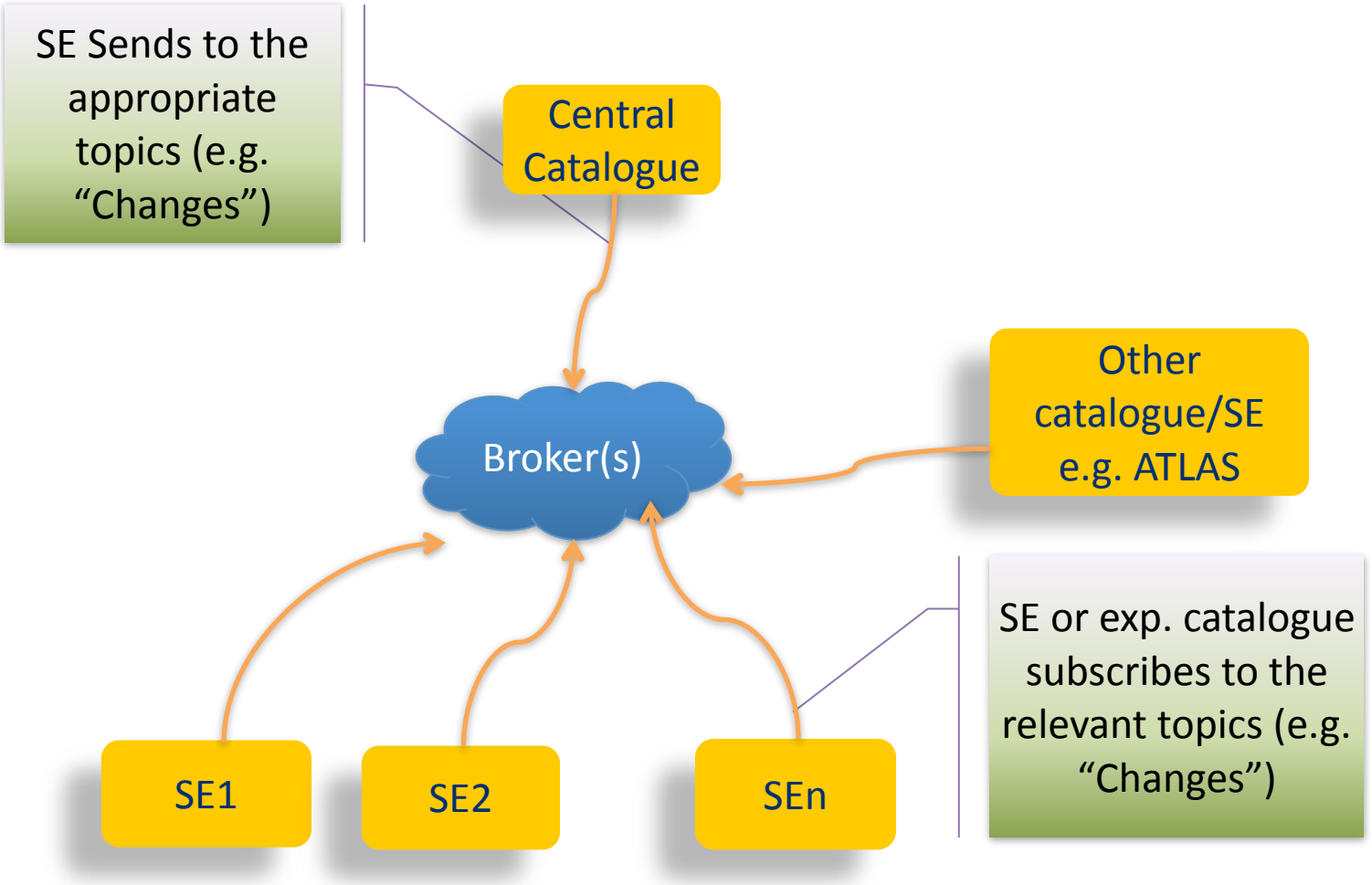
Communication



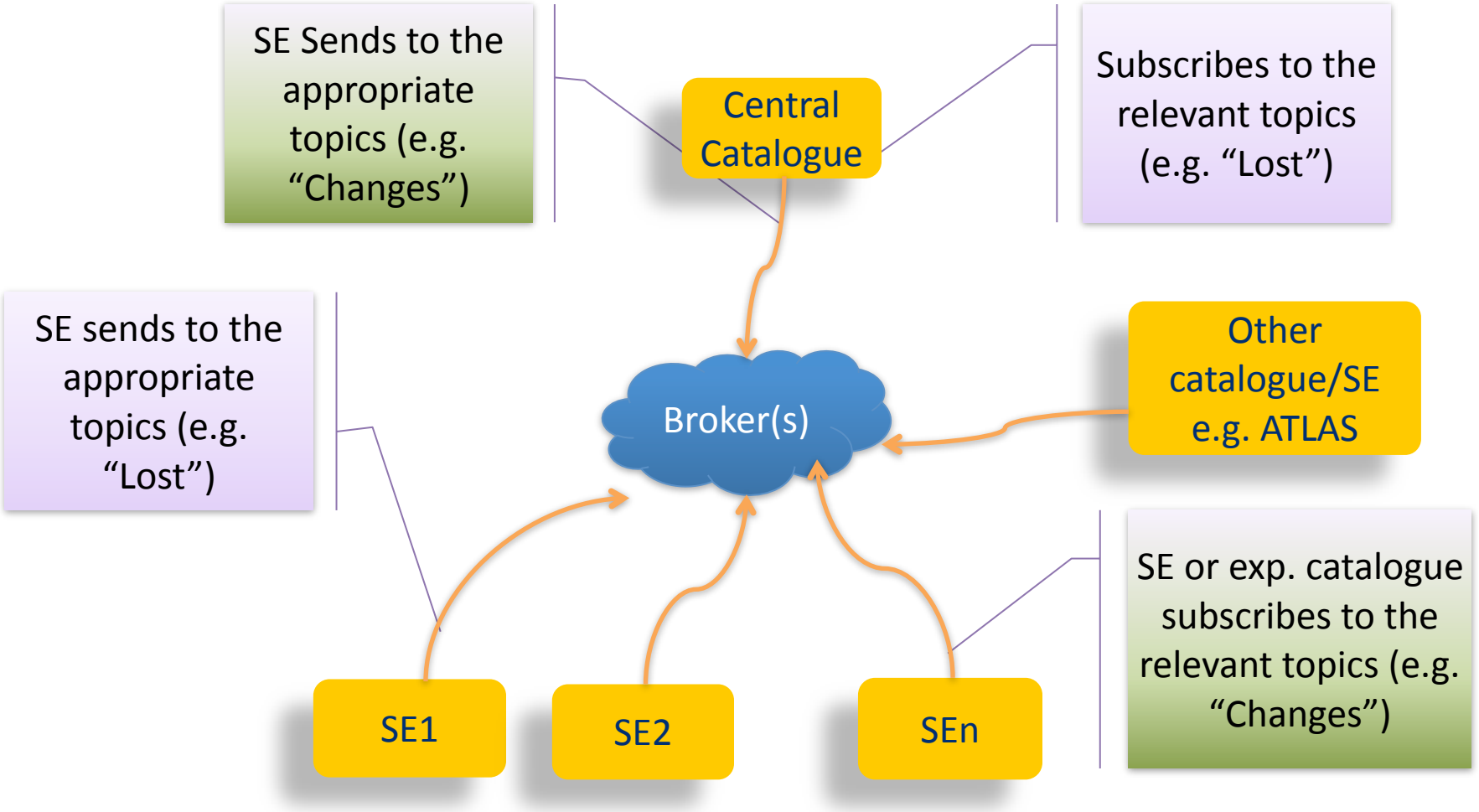
Communication



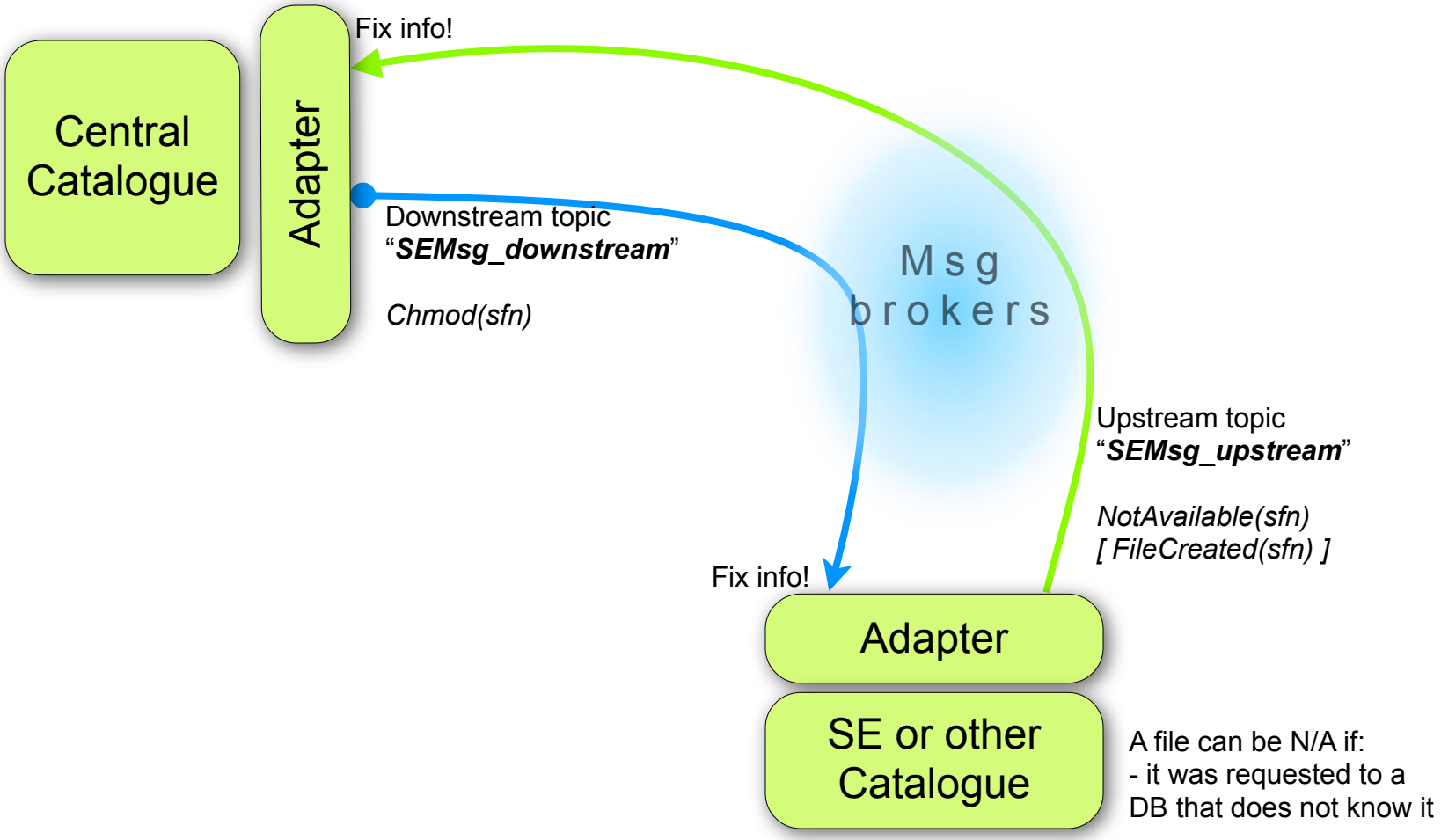
Communication



Communication



Simplified architecture



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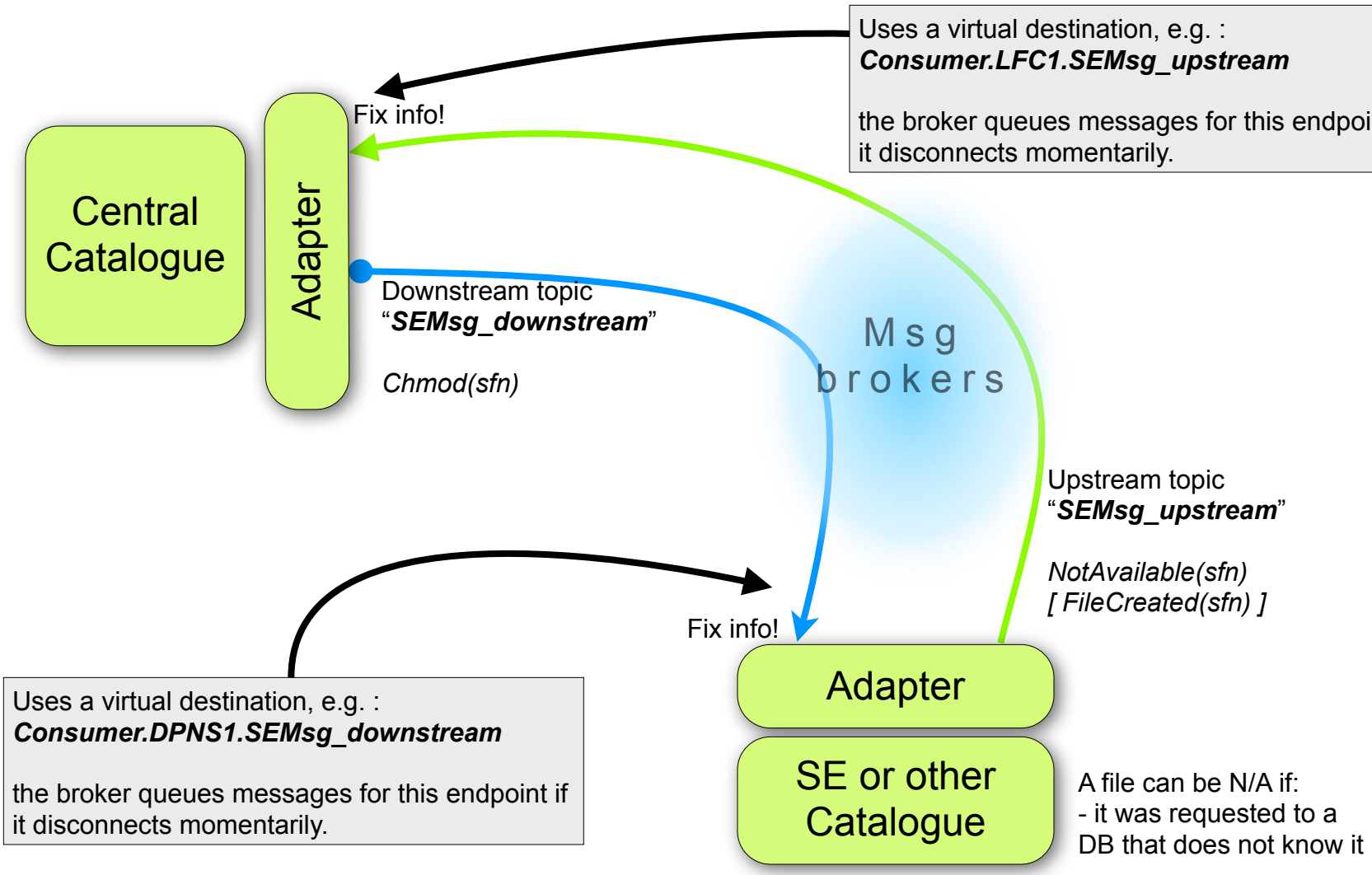

Syncat protocol -> SEMsg

- Full specification of the messaging-based protocol, for others to do the same
- The current implementation is a component called SEMsg
  - Native bulk operations
  - Built to be robust, efficient and easy to integrate
  - Plugin-based (ev. with “null” plugins), loaded at runtime (dlopen)
    - A plugin that performs actions (in the catalogue) when a message comes
    - A plugin that performs SE(Catalogue)-specific actions when a message has to be sent through the API
    - 5 plugins available by now: LFC producer+consumer, DPM producer+consumer, Python consumer
  - Provides a configurable daemon that consumes and dispatches the notifications
  - Provides various kinds of API
    - a CLI to manually send notifications
    - a simple C/C++ API to be used in external systems
    - a very simple and efficient Python consumer API
  - **hides the technicalities of message composition and of the security implementation**
  - ***crafted to avoid bringing in dependencies***
  - The same tools are used for the LFC and DPM prototype, loading different sets of plugins
    - Hence, more sets of plugins can be added, to talk to other systems
  - Easier task for the developer of the integration, no knowledge about messaging/security/X509 crazy details required
    - Everything is documented, though

Detail - SEMsg plugins

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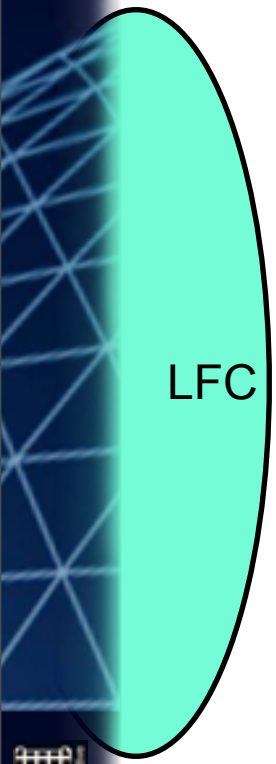
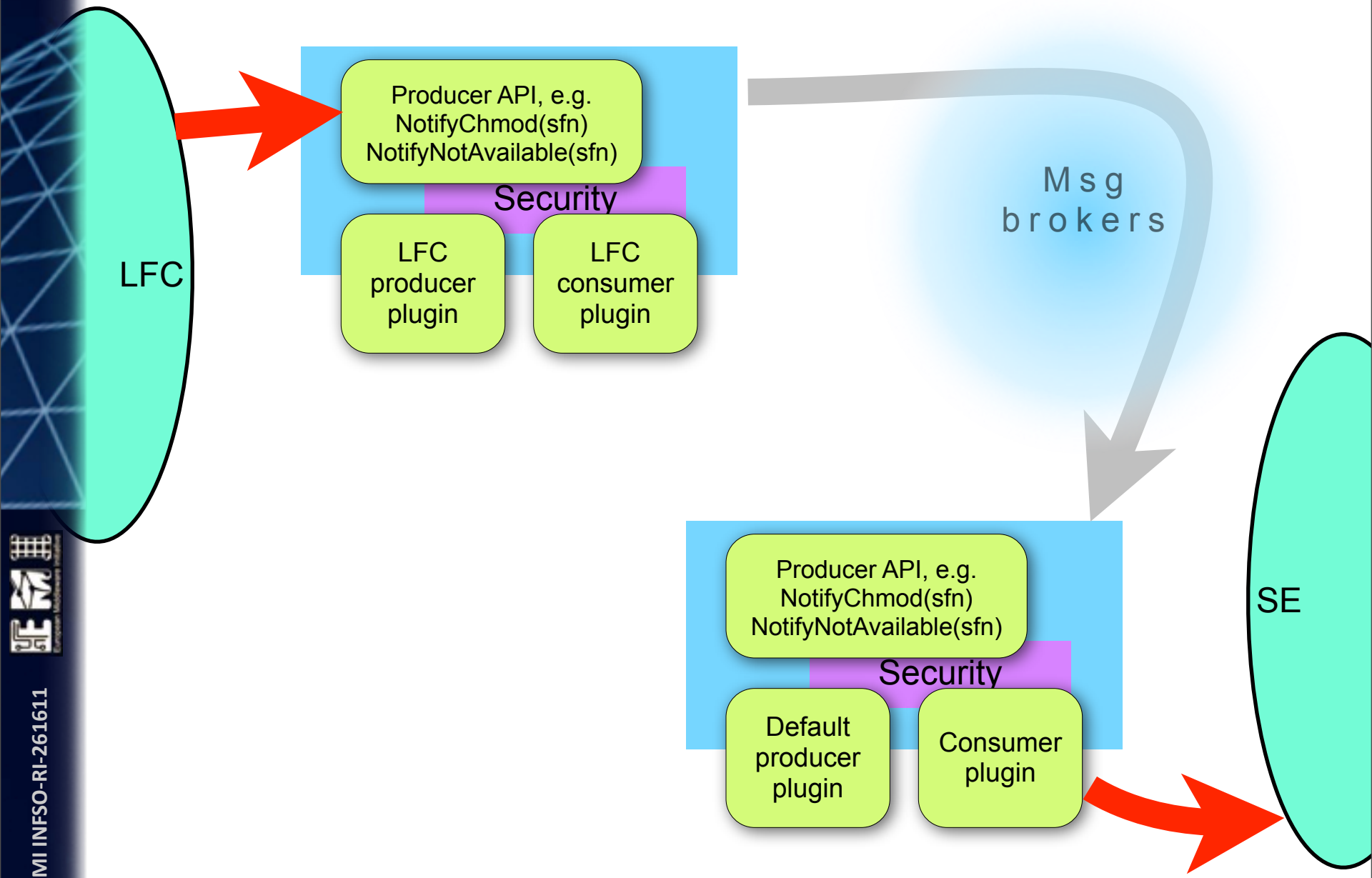
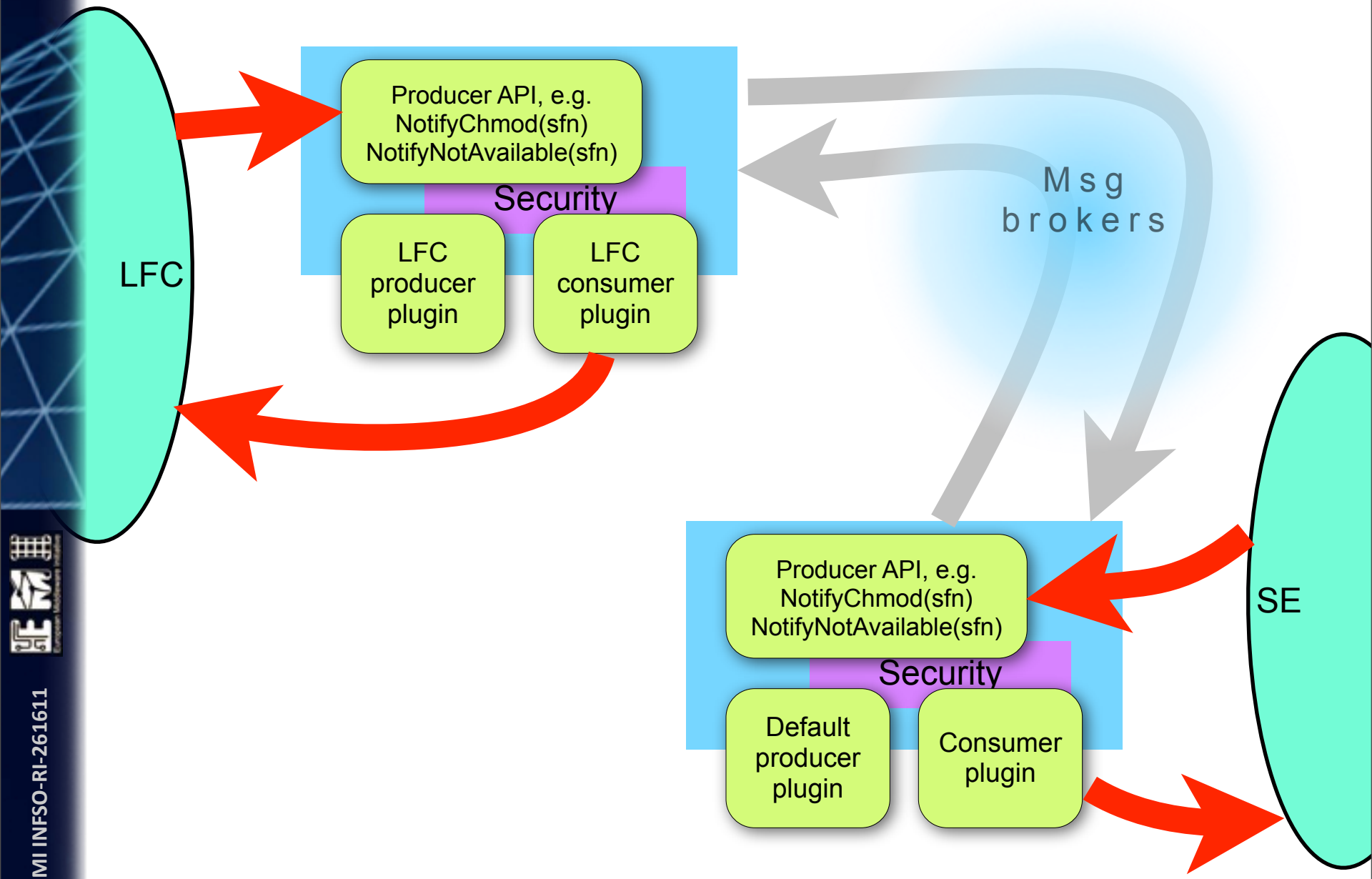


Msg
brokers

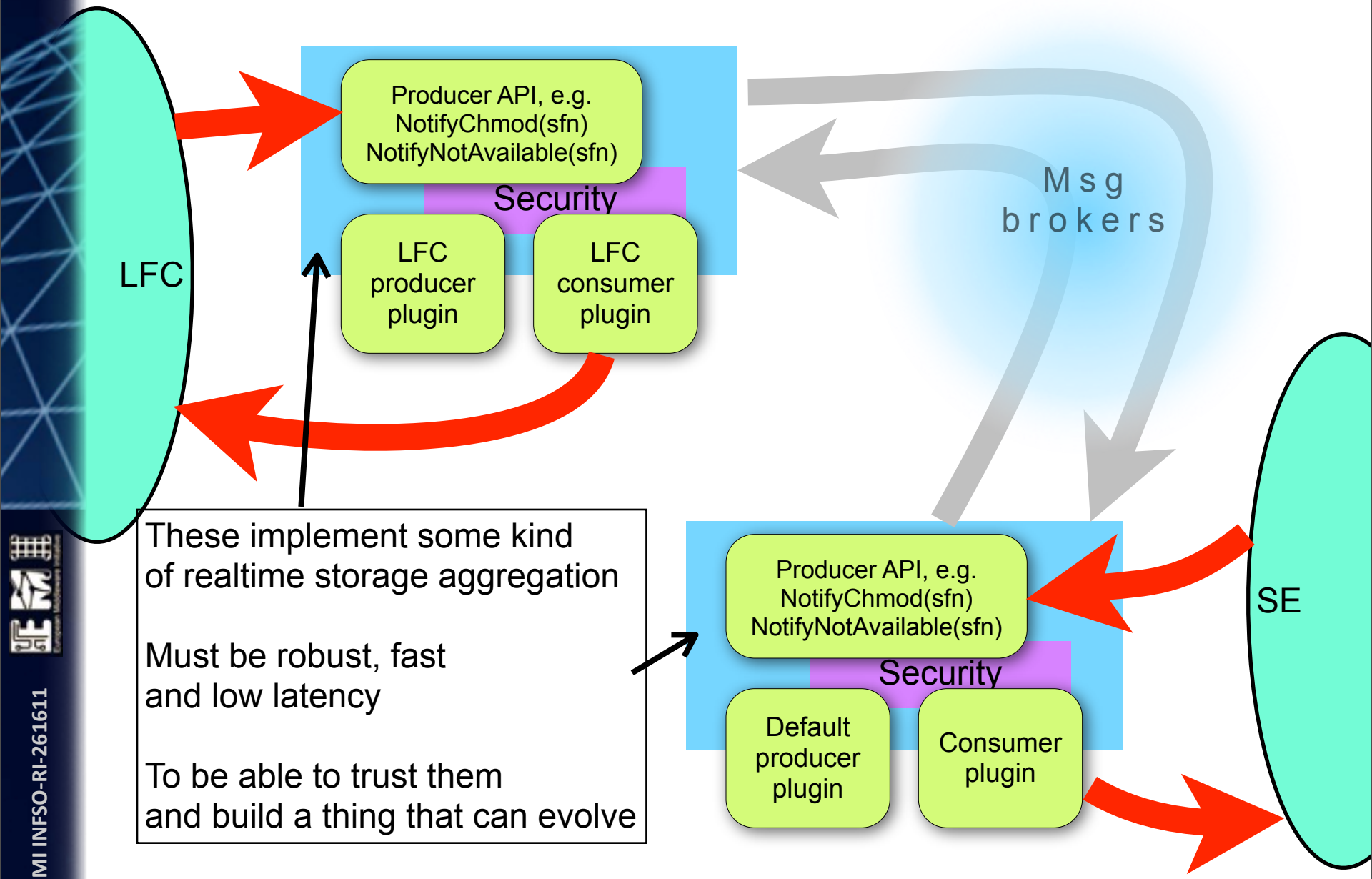
Detail - SEMsg plugins



Detail - SEMsg plugins



Detail - SEMsg plugins



The Python plugin

- One more consumer plugin, in the SEMsg distribution, with the DPM and LFC ones
- Associates python funcs to SEMsg notifications
  - Fully configurable in the SEMsg config file and generic
    - e.g. The notification FileNotAvailable invokes the function 'func1' from the module 'module1' passing its content as individual simple parameters
  - Fast: invokes natively the Python C API, no python spawns are performed
  - Benefits from the SEMsg structure, e.g. the security and the bulk messages
    - ***The Python script only deals with the action to be performed, not with the tech details of the messaging and of the X509 security***
- Tested with Python 2.4, 2.5, 2.6

Dev update: v1.2.0 --> v1.3.0

- Work in progress (90%) about:
  - Whitelisting (an endpoint may choose the endpoints it trusts) based on the existing X509 implementation (since 1.2.0)
  - SEMsg can securely propagate the DN of the requestor of the action that triggered the notification
  - The receiving endpoint can apply its authorization mechanism to this info
  - DPM/LFC supporting this
  - Update of the docs
  - Credits to Gergely Debreczeni (testing and suggestions)

What's next

- Sync with the other SE developers (STORM, dCache)
  - Update on the preferred way to integrate with it
  - Previously agreed schedule:
    - Storm/dCache as producers of notifications:
      - Toy prototype/Proof of concept (these days)
        - » **Action: Storm/dCache teams**
        - » Install SEMsg from https://svnweb.cern.ch/trac/lcgdm/wiki/Dpm/Dev/Components
        - » Point it to valid host/svc certificates
        - » Find WHERE in the code to send the notf
        - » Invoke the CLI from there
      - Development of a Java API for SEMsg (After the toy prototype)
        - » **Action: GT**
      - Utilization of the new Java API inside Storm/dCache
        - » Instead of the CLI invokations
        - » **Action: Storm/dCache teams**
    - Storm/dCache as consumers of notifications: apparently postponed
      - My advice is to use the available Python plugin for a simple prototype

Conclusions

- Making catalogues and SEs interact seems a good way to attack the consistency problem
  - It's a form of realtime interaction between SEs and catalogues
  - By definition, it won't mathematically kill the inconsistencies, but will help making a better system
  - Will be interesting to explore the possibilities of the technology and of the implementation. Many interesting ideas are being proposed.
- SEMsg is available as a pre-release until EMI-2
- Protocol and SEMsg documentation in the Wiki
  - https://twiki.cern.ch/twiki/bin/view/EMI/EmiJra1Syncat
- Packages here:
  - https://svnweb.cern.ch/trac/lcgdm/wiki/Dpm/Dev/Components
- Integration with the other SE developers is starting
- Feedbacks are welcome
- The messaging (test) infrastructure and the tools seem really OK

Thank you

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