Topic 3: GENI I&M Resources

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Fundamental Questions

- What are the I&M resources?
- Who/what are the users of I&M resources?
- What is the granularity of an I&M resource?
- How are the I&M resources:
  - created/deleted
  - registered/advertised/described
  - discovered/found
  - controlled – e.g., started/stopped
  - protected from unauthorized access
  - connected together (i.e., interconnecting channels)

CF/I&M Relationship?

- In what ways does an I&M infrastructure differ from the CF infrastructure? Note that they offer very similar services.
- Should the I&M infrastructure be integrated into the CF infrastructure?
- Should the I&M infrastructure be distinct but leverage the CF infrastructure as much as possible?
- Should the I&M infrastructure be completely separate from the CF infrastructure?

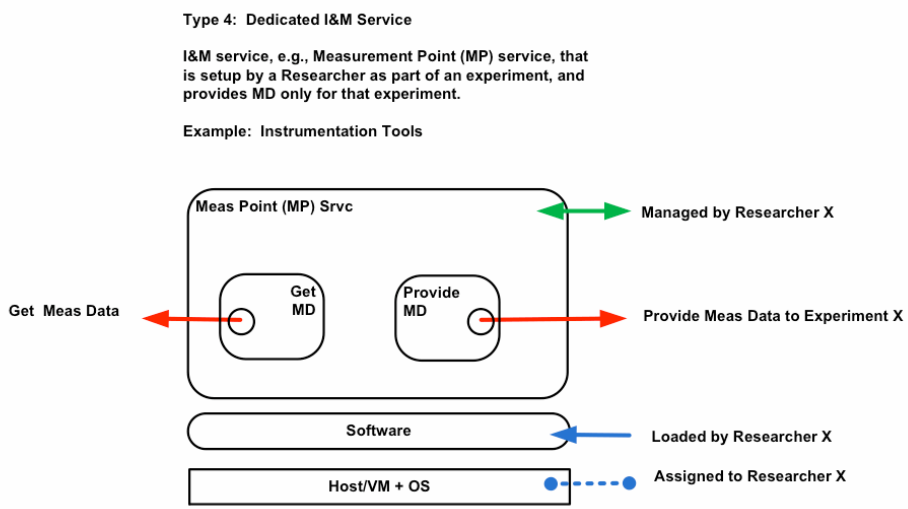
Approach 1:
A Usage Model View of Resources

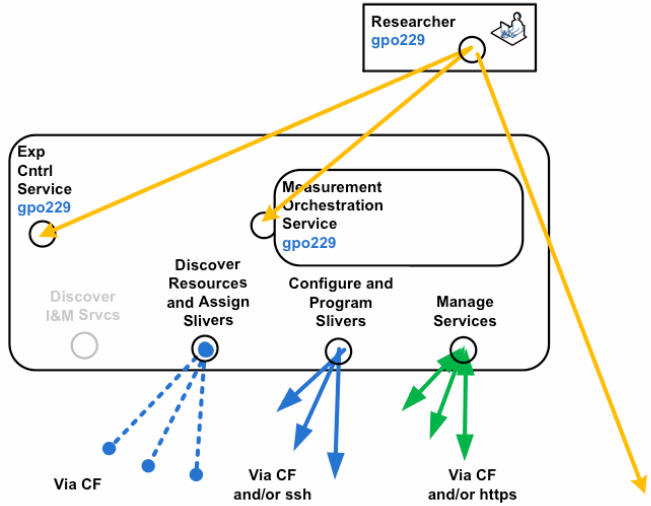
(Adapted from slides by Harry Mussman)

- Three basic Monitoring Situations (see Harry's diagrams)
  - Internal Slice Monitoring Services
    - "Dedicated I&M Services"
    - Example - INSTOOLS
  - Slice-aware Monitoring Services
    - "Common I&M Service with dedicated slivers"
    - Example – Wisconsin packet capture devices
  - General Monitoring Services
    - "Common I&M Service with Available Data"
    - Example – Perfsonar
- Problem: Not clear who is responsible for these services
  - The CFs?
  - New (yet to be developed) I&M Infrastructure
  - Device/Service "owners" (for some definition of owner)?

Dedicated I&M Server

(Figures by Harry Mussman)





Common I&M Srvc, Dedicated Slivers

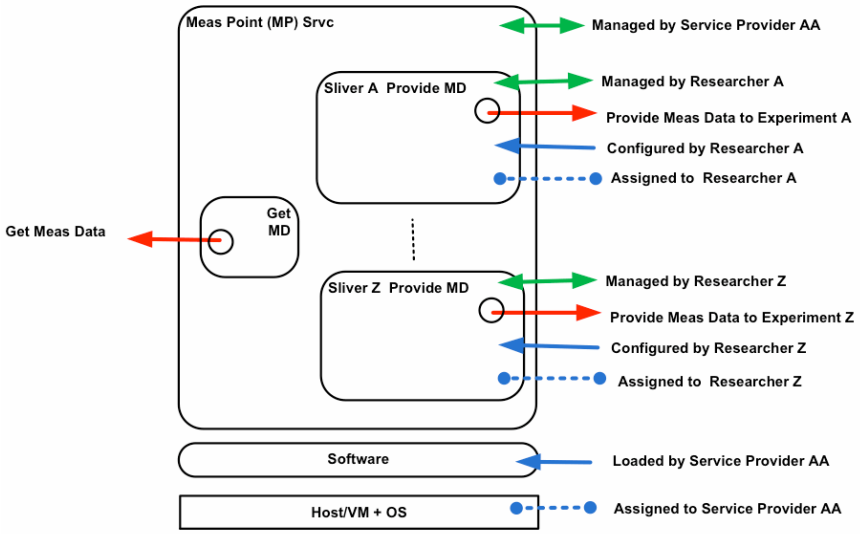
(Figures by Harry Mussman)

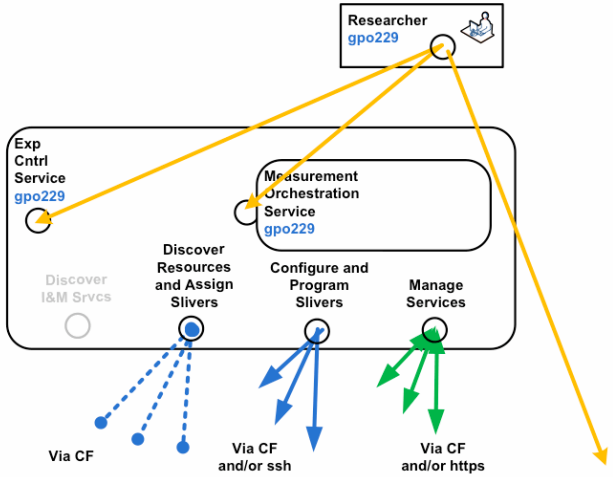
Type 5: Common I&M Service with Dedicated Slivers

I&M service, e.g., Measurement Point (MP) service, that is setup and managed by a Service Provider, with multiple Slivers setup by Researchers as part of their experiments, where each Sliver provides MD only for that experiment.

Example: (1628) Measurement System

Issue: A sliver dedicated to a Researcher gathers MD for that Researcher. How can we be sure that a Researcher doesn't ask a sliver to gather someone else's MD?





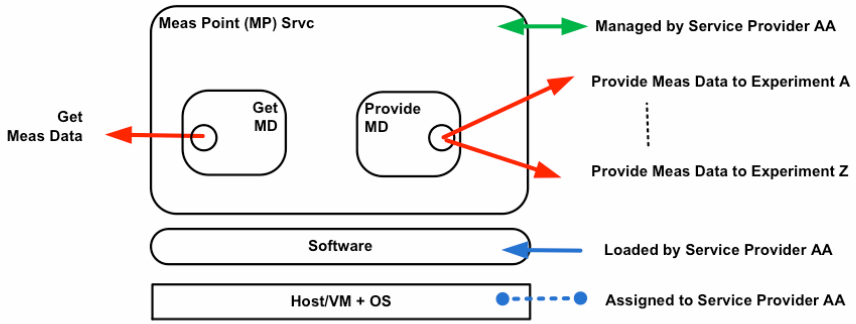
Common I&M Services with available Data

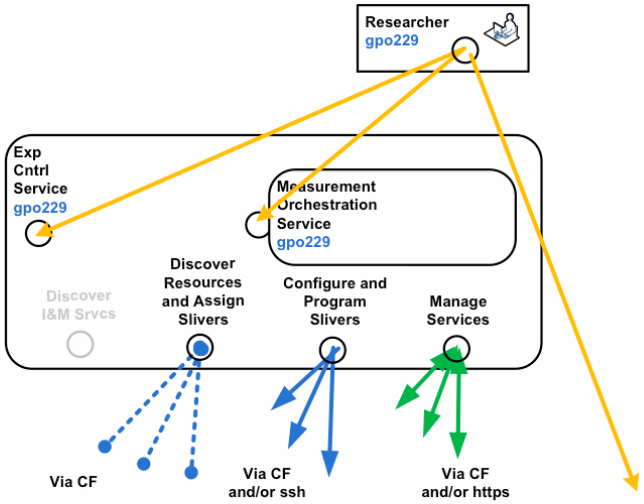
(Figures by Harry Mussman)

Type 6: Common I&M Service with Available Measurement Data (MD)

I&M service, e.g., Measurement Point (MP) service, that is setup and managed by a Service Provider, with available Measurement Data (MD) that is registered with a Measurement Information Service in a CH, which can be provided to multiple experiments when requested by the associated Researchers. The MD may or may not be customized for each experiment.

Example: (1788) perfSONAR

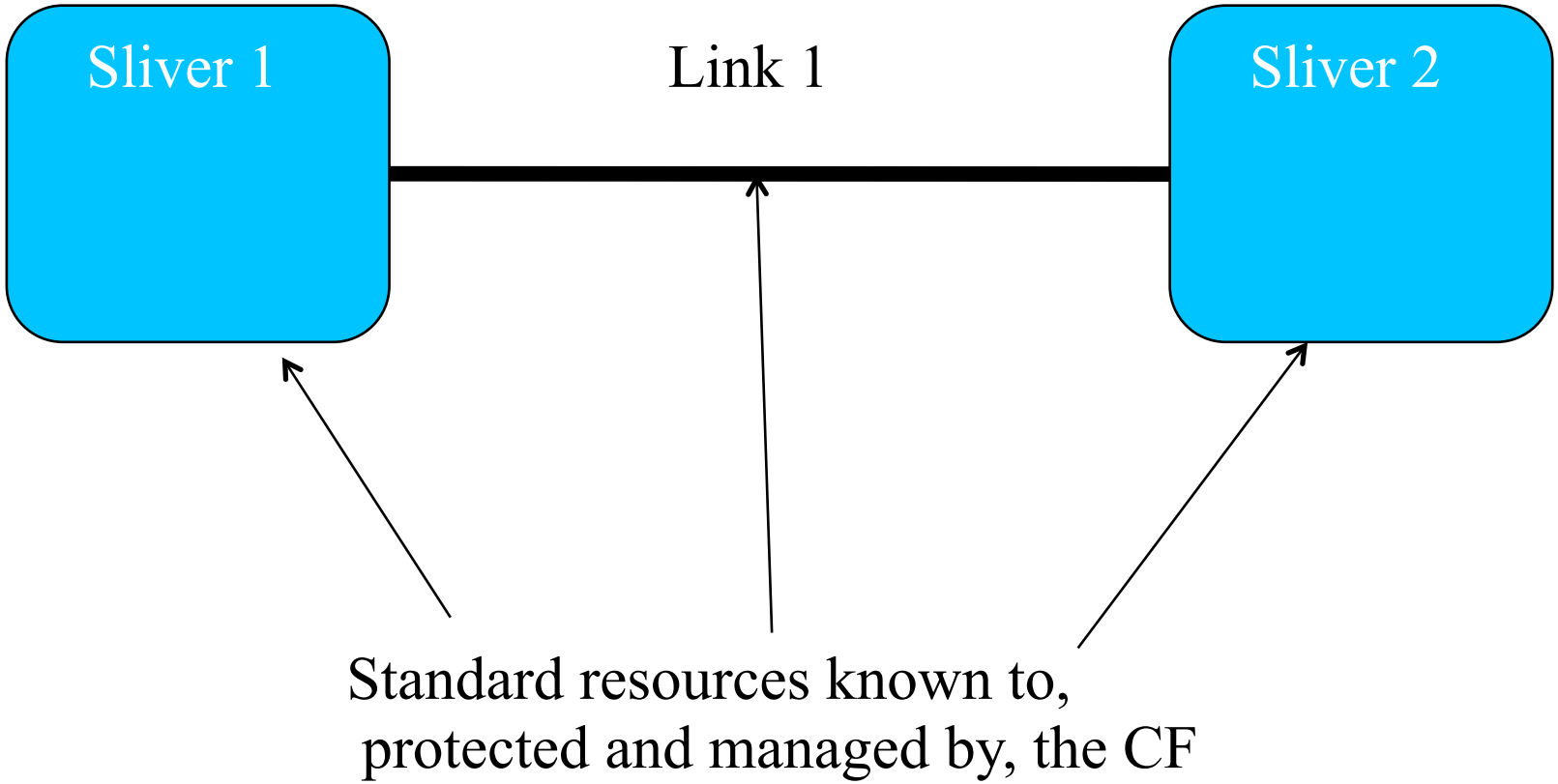




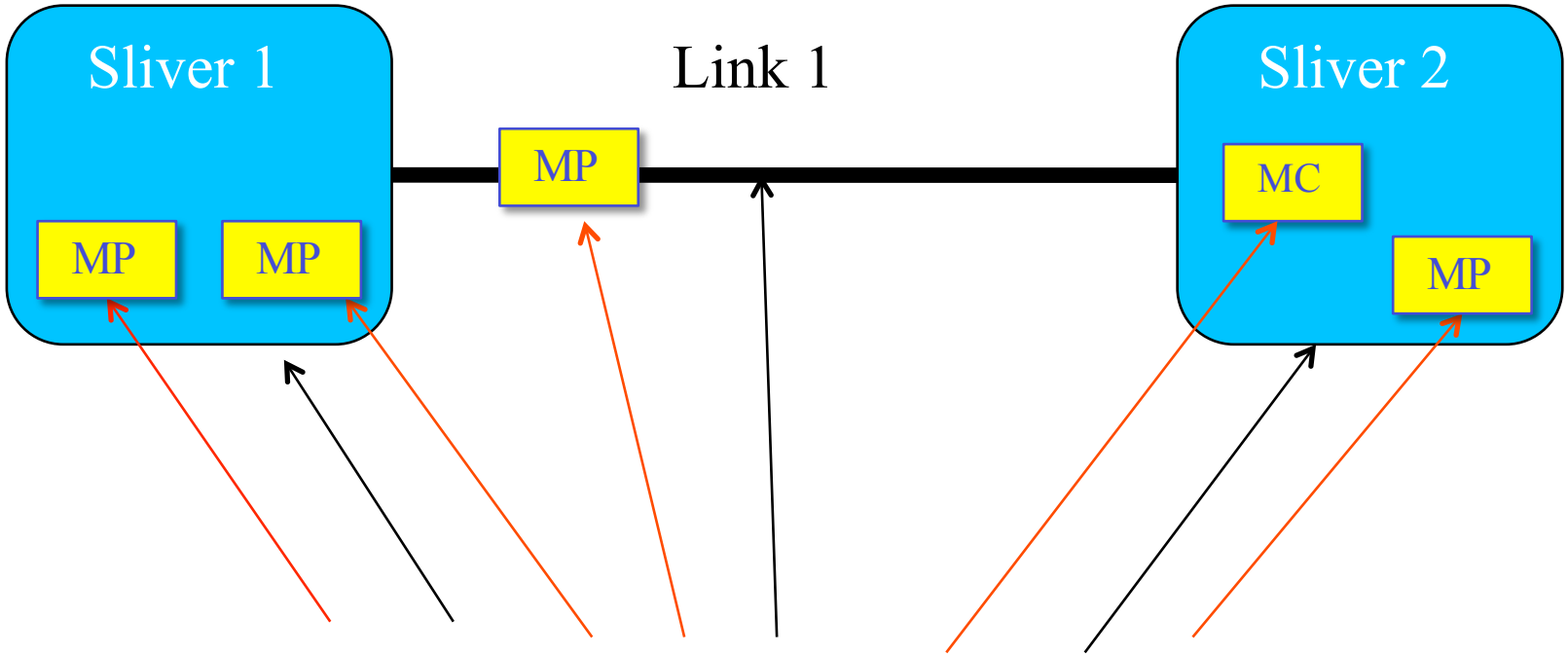
Approach 2:
I&M supported completely by CF

- Observation: CF knows how to register, discover, create, delete, access, etc resources.
- Idea: Add new types of resources to the list already managed by CFs – e.g., define new MP, MC, MAP, MIS, MOS, … etc…, resources for the CFs to manage. CFs will also allocate/manage the "links" that connect these services. (Think of I&M services as slivers that the CF allocates and sets up on hardware it controls/owns).
- Problems:
  - Instrumentation services must be known and managed by the CF.
  - To achieve "shared" monitoring, some services (slivers) would need to be part of multiple slices.
  - These new resource (services) may need to exist outside of a CFs control. (e.g., an archive service may be provided by S3).

First Class I&M Resources



First Class I&M Resources



Standard resources + I&M resources known to, protected and managed by, the CF

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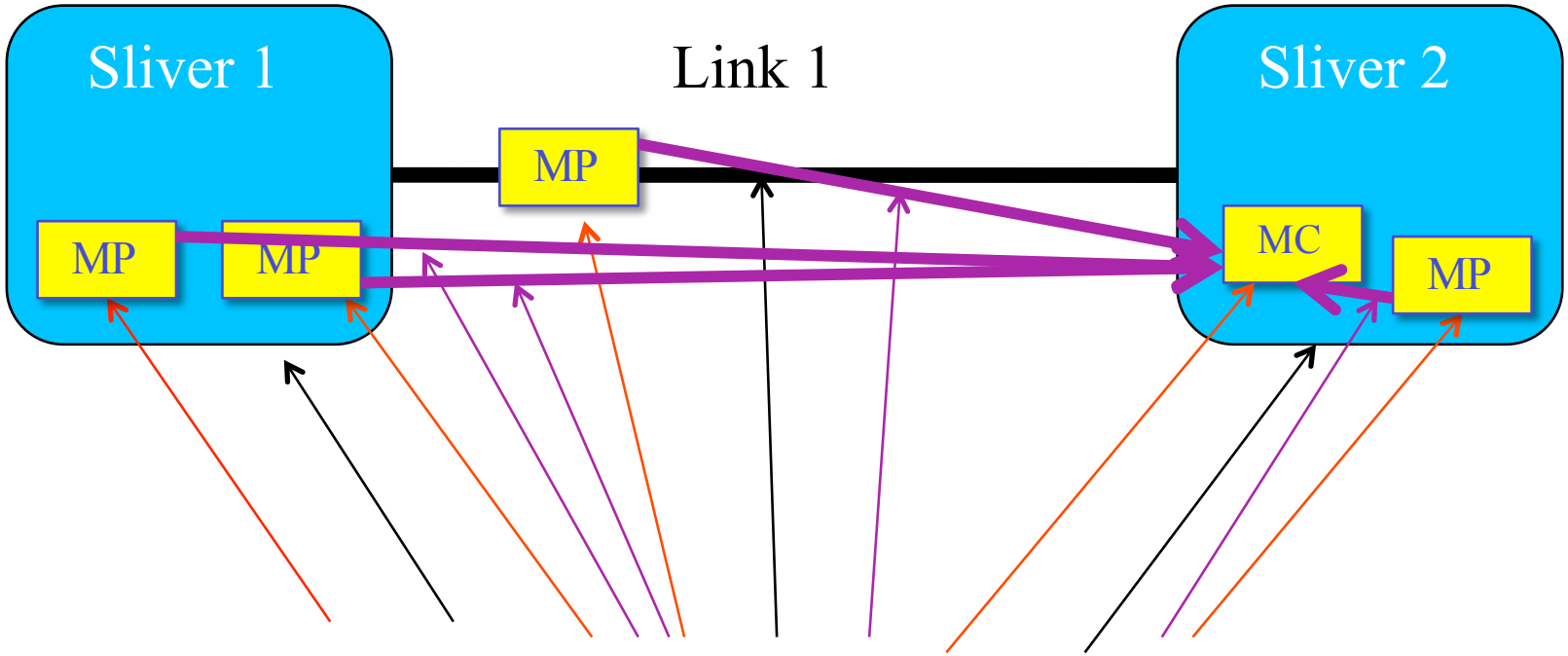


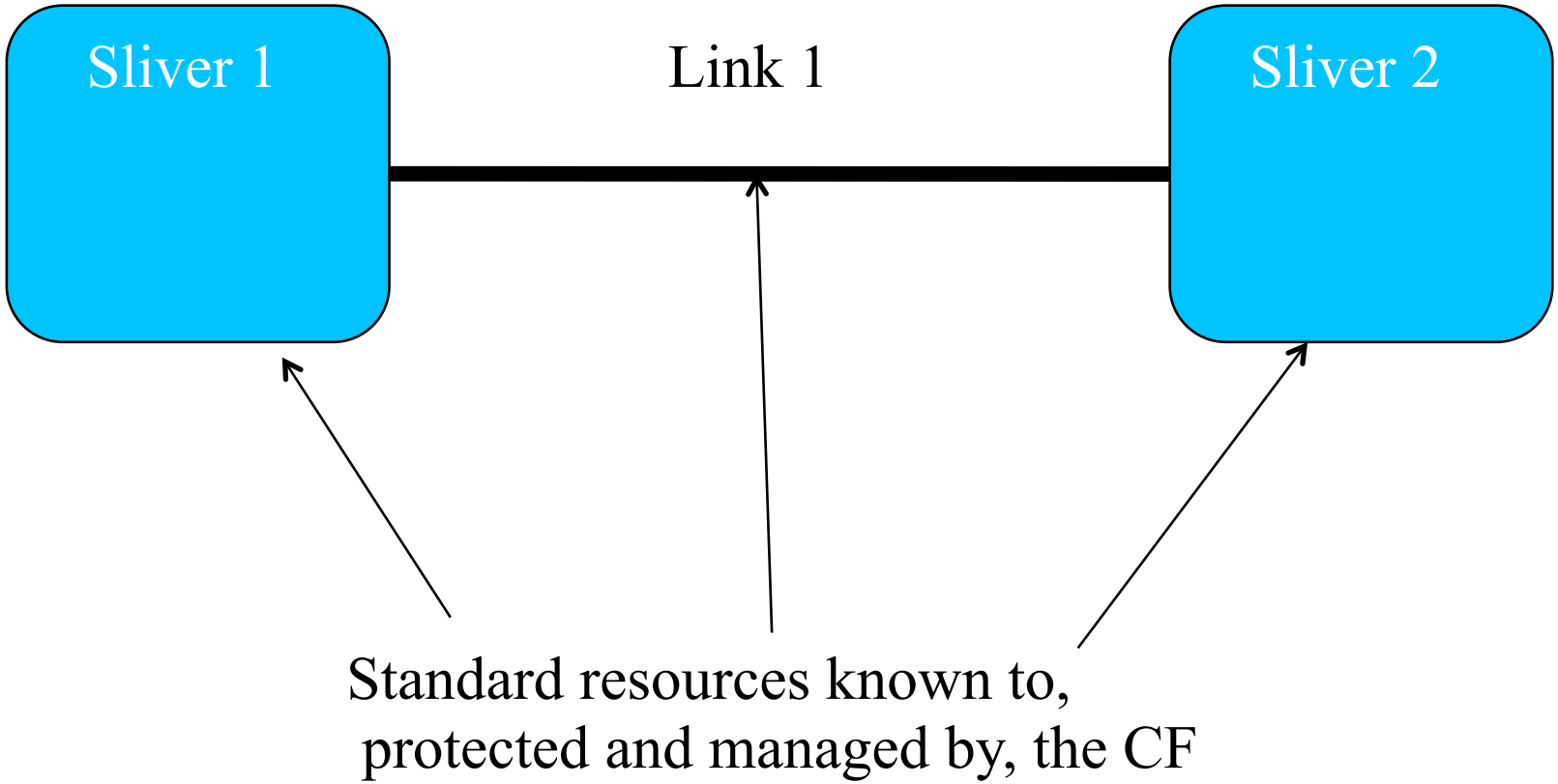
Standard resources + I&M resources known to, protected and managed by, the CF

Approach 3:
I&M relies on CF as much as possible

- I&M uses CF functionality to describe, register, discover, create, delete, access, etc resources to the largest extend possible. This should get us 90-100% of the way there.
- Let the I&M develop additional functionality/enhancements if we find it is necessary.
- Think of "instrumentation" (i.e., I&M services) as characteristics/attributes of resources. A (virtual) node or a (virtual) link (i.e., a resource) is instrumented with one or more measurement services (described as attributes of the resource) .
- Because attributes are still part of the resource description, this still leverages
  - CF resource discovery/creation functionality to find/create measurement services.
  - CF resource authorization functionality to verify that a user can access a measurement service (i.e., if they can access the resource, they can access the measurement service associated with the resource).
  - CF link creation functionality to connect resources that have measurement services.
- But yet allows the I&M to build its own enhanced functionality (e.g, only allowing users from another slice to see slice data, or using other (non-CF) communication channels to communicate between measurement services) if desired. In other words, the I&M infra does not need to be completely described and managed by the CF.

Resources can be Instrumented

(e.g., resources have attributes)



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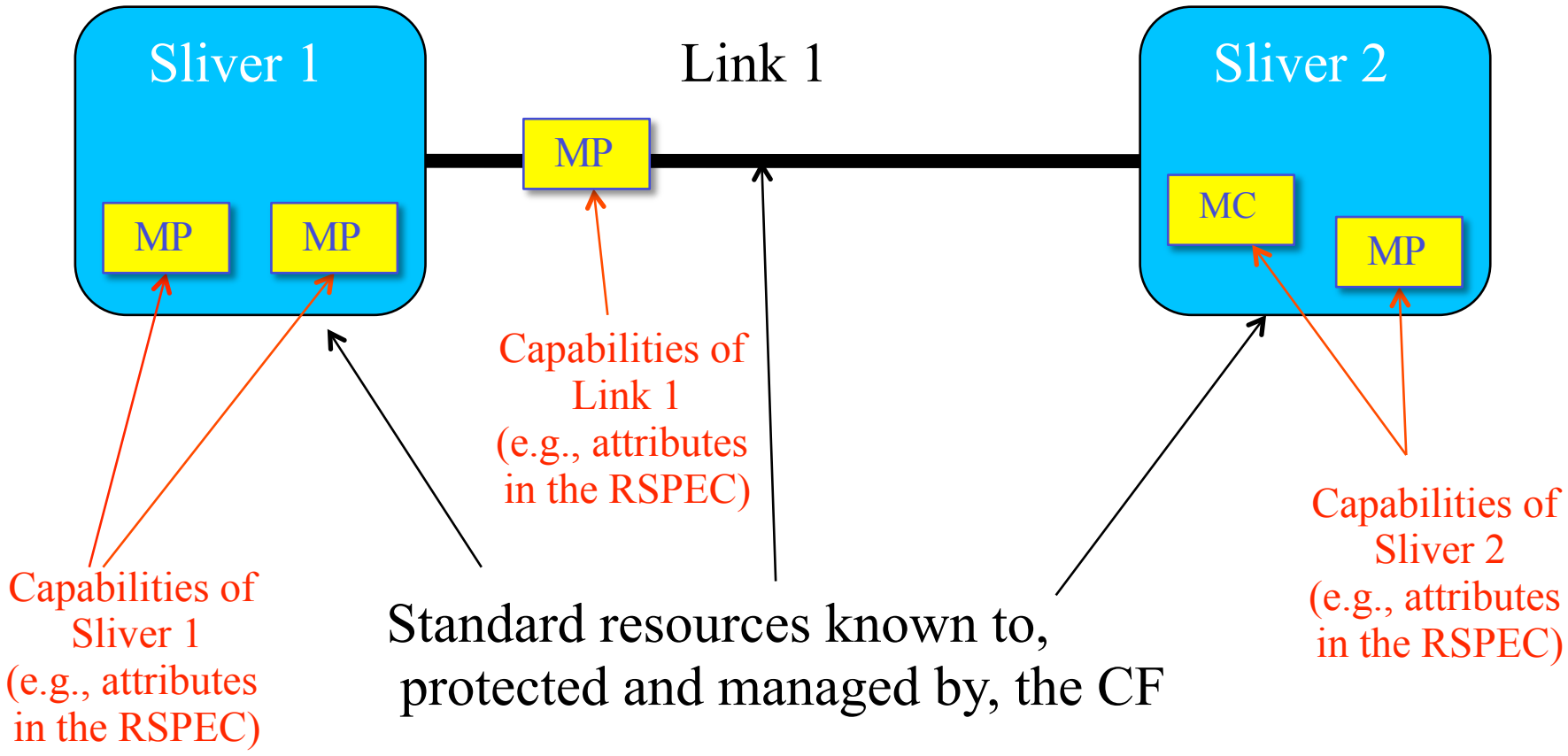

A possible way forward

(Inspired by Cluster C Members)

- Leverage (enhanced) CF functionality where it makes sense:
  - Resource registration/discovery:
    - represent I&M capabilities as attributes of resources (which may be virtual resources *not* controlled by the CF)
    - may require enhancing RSPEC definition
  - User Authorization:
    - make it available to the I&M services to check access
    - may require credentials for resources, services, etc.
- Monitor slices – resources and their instrumentation belong to slices.
- GMOC monitoring is done via a GMOC slice.
- Shared access to monitoring data?
  - Give access to users outside of a slice?
  - Represent share data as virtualizable resources (mapped to multiple slices).
- Let I&M build other functionality as necessary (for example to interact with resources outside of GENI).