Operator
ops003

Experimenter
gpo229

Wide range of MP services

Agg A

Aggr Mgr A

Option: Measurement Data may be fed back to experiment application, e.g., for adaptive protocol

Switch A1

LAN

Experiment gpo229/ sliver001

Meas Pt Srvc gpo229/ sliver002

Agg F

Aggr Mgr F

Discover I&M Srvc and Establish Meas Data Flow

via SOAP

Meas Analysis Present Srvc
ops003/ sliver301

Exp Cntrl Service
ops003

Exp Cntrl Service
gpo229

Discover I&M Srvcs

Measurement Orchestration Service
gpo229

Discover I&M Srvcs

Discover Resources and Assign Slivers

Configure and Program Slivers

Manage Services

Measurement data flow

Service Providers setup long-running I&M services and register them, so that they can be discovered and used by Operators and (when permitted) Experimenters

Register I&M Srvc

via SOAP

Clearinghouse Z

Meas Info Srvc
geni

Lookup Srvc

Topology Srvc

Via CF

Via CF and/or ssh

Via CF and/or https

Agg B

Aggr Mgr B

Switch B1

LAN | MIBs

Meas Pt Srvc
sp001
sliver001

Agg D

Aggr Mgr D

Meas Collect Srvc gpo229/ sliver201

Meas Analysis Present Srvc gpo229/ sliver202

Wide range of measurement analysis and presentation services, running on general-purpose servers

Agg C

Aggr Mgr C

Switch C1

LAN

Experiment gpo229/ sliver101

Meas Pt Srvc gpo229/ sliver102

Meas Collect Srvc gpo229/ sliver103

Wide range of options for MC services, built with general-purpose servers and common software packages

Measurement data file transfer

Server E

Meas Pt Srvc Plat
sp002/sliver001

Aggr Mgr sp002

Monitor

DAG Card

Meas Pt Srvc
ops003
sliver201

Meas Pt Srvc gpo229 sliver401

MP, MC, MAP and/or MDA srvc's may be combined

Server F

Meas Data Archive Srvc Plat sp003/sliver001

Aggr Mgr sp003

User Work Srvc gpo229/ sliver301

Digital Object Archive Srvc sp003/ sliver101

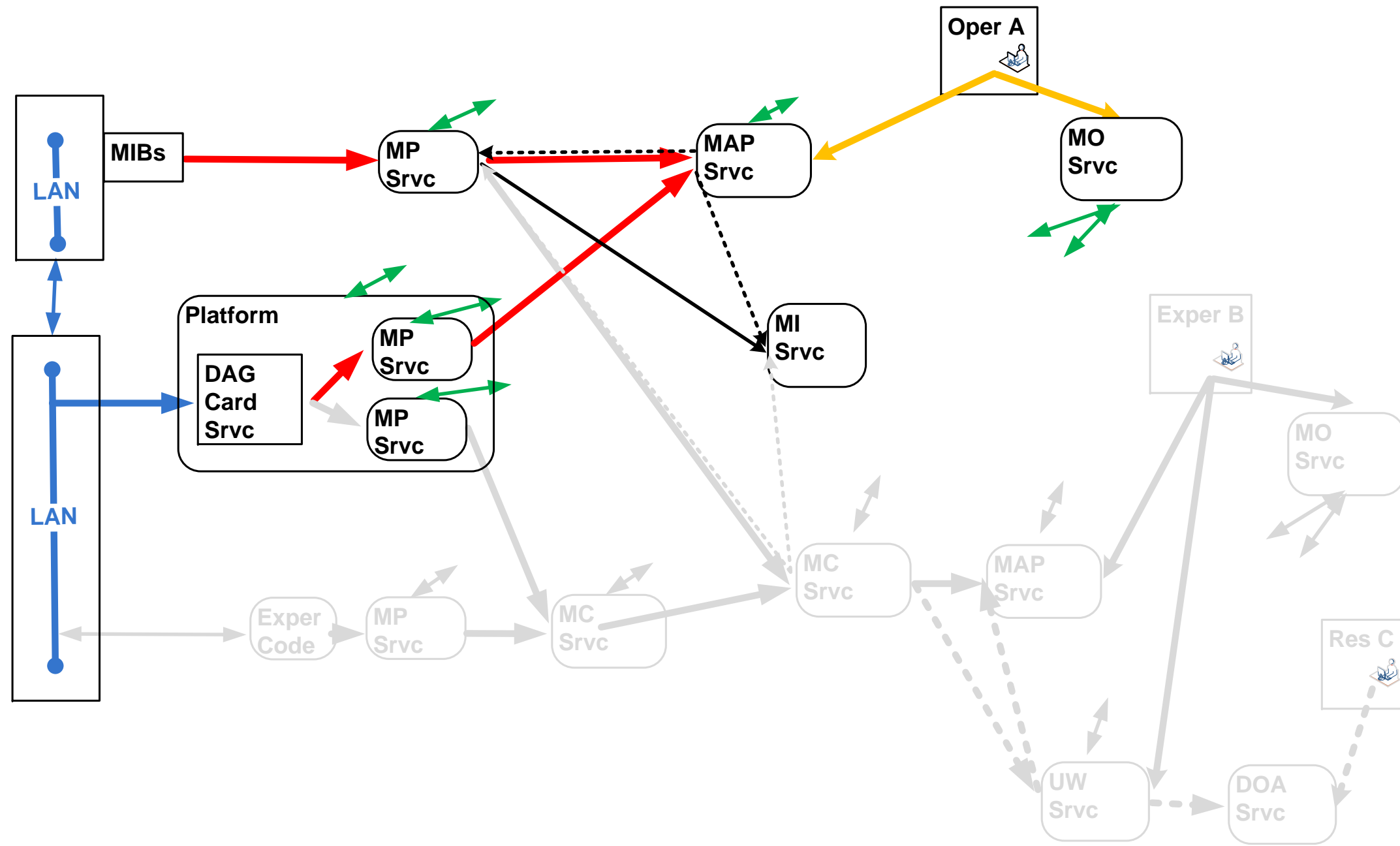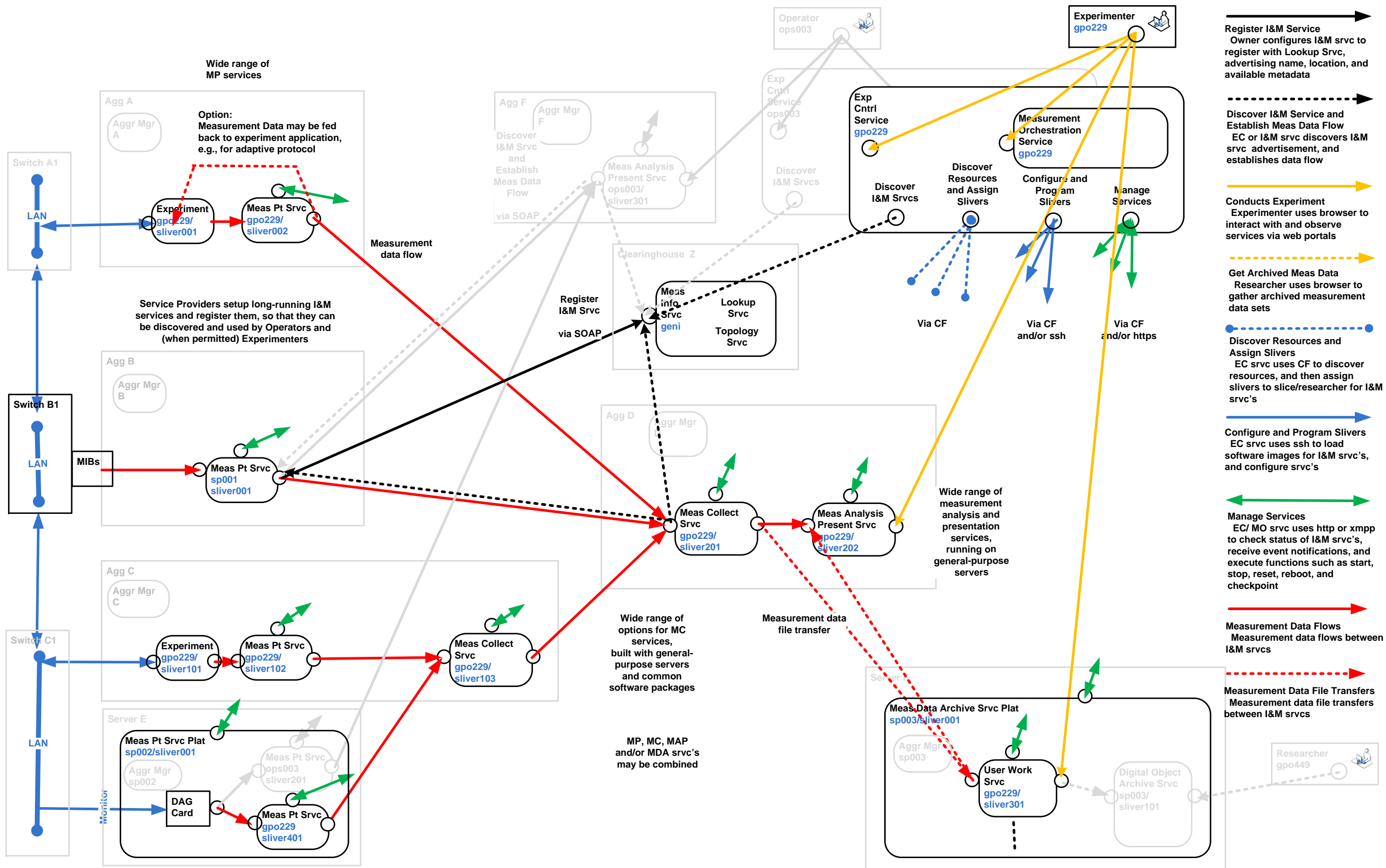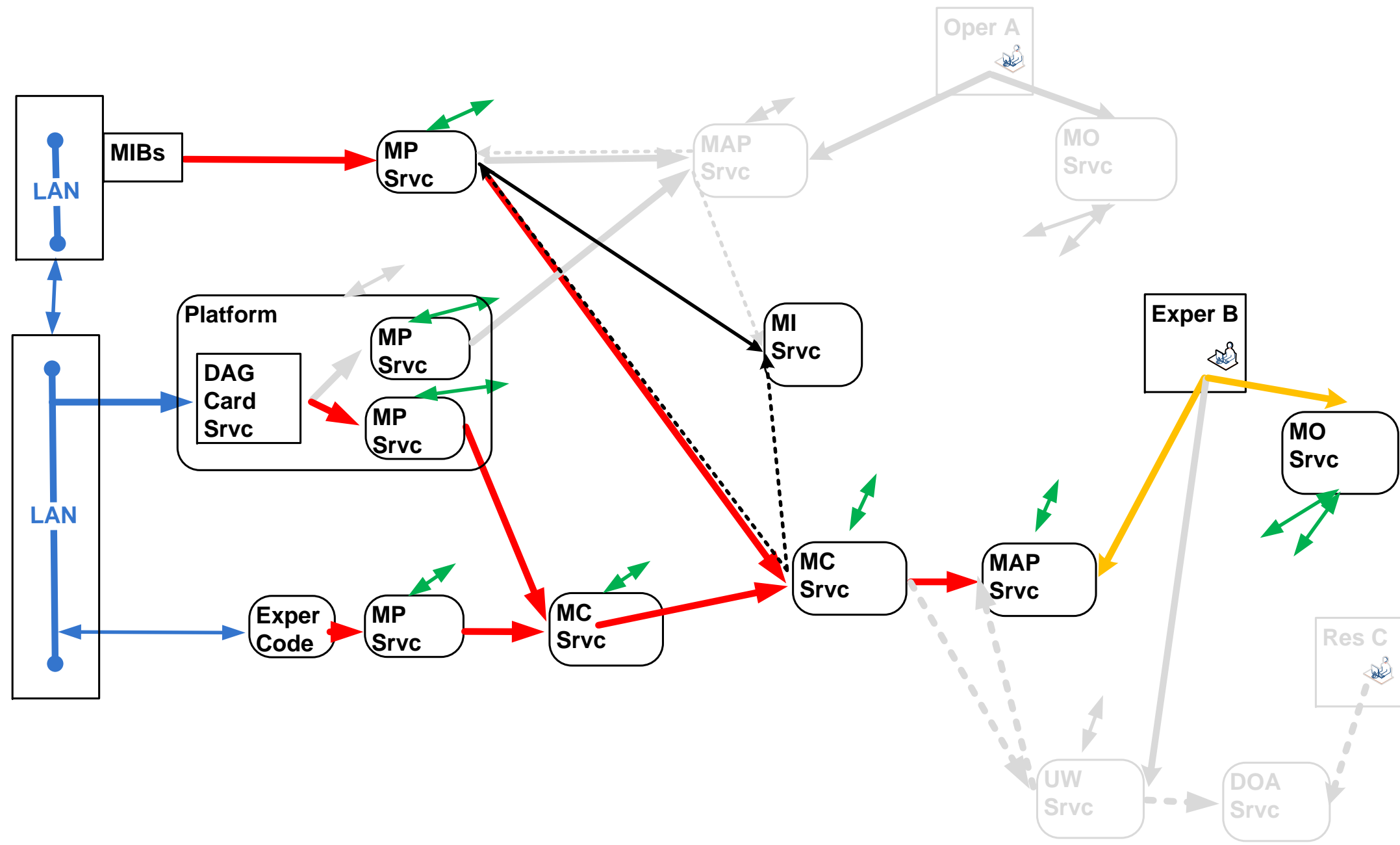**Researcher**
gpo449

Legend:

Register I&M Service
Owner configures I&M srvc to register with Lookup Srvc, advertising name, location, and available metadata

Discover I&M Service and Establish Meas Data Flow
EC or I&M srvc discovers I&M srvc advertisement, and establishes data flow

Conducts Experiment
Experimenter uses browser to interact with and observe services via web portals

Get Archived Meas Data
Researcher uses browser to gather archived measurement data sets

Discover Resources and Assign Slivers
EC srvc uses CF to discover resources, and then assign slivers to slice/researcher for I&M srvc's

Configure and Program Slivers
EC srvc uses ssh to load software images for I&M srvc's, and configure srvc's

Manage Services
EC/ MO srvc uses http or xmpp to check status of I&M srvc's, receive event notifications, and execute functions such as start, stop, reset, reboot, and checkpoint

Measurement Data Flows
Measurement data flows between I&M srvcs

Measurement Data File Transfers
Measurement data file transfers between I&M srvcs

Oper A

LAN

MIBs

MP Srvc

MAP Srvc

MO Srvc

Platform

DAG Card Srvc

MP Srvc

MP Srvc

MI Srvc

LAN

Exper B

MO Srvc

MC Srvc

MAP Srvc

Exper Code

MP Srvc

MC Srvc

Res C

UW Srvc

DOA Srvc

Operator
ops003

Experimenter
gpo229

Wide range of
MP services

Agg A

**Aggr Mgr
A**

Option:
Measurement Data may be fed
back to experiment application,
e.g., for adaptive protocol

Switch A1

LAN

**Experiment
gpo229/
sliver001**

**Meas Pt Srvc
gpo229/
sliver002**

Measurement
data flow

Agg F

**Aggr Mgr
F**

Discover
I&M Srvc
and
Establish
Meas Data
Flow

**Meas Analysis
Present Srvc
ops003/
sliver301**

via SOAP

**Exp
Cntrl
Service
ops003**

Discover
I&M Srvcs

**Exp
Cntrl
Service
gpo229**

**Measurement
Orchestration
Service
gpo229**

Discover
I&M Srvcs

Discover
Resources
and Assign
Slivers

Configure and
Program
Slivers

Manage
Services

Via CF

Via CF
and/or ssh

Via CF
and/or https

Service Providers setup long-running I&M
services and register them, so that they can
be discovered and used by Operators and
(when permitted) Experimenters

Register
I&M Srvc

via SOAP

**Meas
Info
Srvc
geni**

**Lookup
Srvc**

**Topology
Srvc**

Clearinghouse Z

Agg B

**Aggr Mgr
B**

Switch B1

LAN

MIBs

**Meas Pt Srvc
sp001
sliver001**

Agg D

**Aggr Mgr
D**

**Meas Collect
Srvc
gpo229/
sliver201**

**Meas Analysis
Present Srvc
gpo229/
sliver202**

Wide range of
measurement
analysis and
presentation
services,
running on
general-purpose
servers

Agg C

**Aggr Mgr
C**

Switch C1

LAN

**Experiment
gpo229/
sliver101**

**Meas Pt Srvc
gpo229/
sliver102**

**Meas Collect
Srvc
gpo229/
sliver103**

Wide range of
options for MC
services,
built with general-
purpose servers
and common
software packages

Measurement data
file transfer

Server E

**Meas Pt Srvc Plat
sp002/sliver001**

**Aggr Mgr
sp002**

**Meas Pt Srvc
ops003/
sliver201**

**DAG
Card**

Monitor

**Meas Pt Srvc
gpo229
sliver401**

MP, MC, MAP
and/or MDA srvc's
may be combined

**Meas Data Archive Srvc Plat
sp003/sliver001**

**Aggr Mgr
sp003**

**User Work
Srvc
gpo229/
sliver301**

**Digital Object
Archive Srvc
sp003/
sliver101**

**Researcher
gpo449**

Register I&M Service
  Owner configures I&M srvc to
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available metadata

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Establish Meas Data Flow**
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srvc advertisement, and
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Assign Slivers**
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resources, and then assign
slivers to slice/researcher for I&M
srvc's

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software images for I&M srvc's,
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checkpoint

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  Measurement data flows between
I&M srvcs

Measurement Data File Transfers
  Measurement data file transfers
between I&M srvcs

LAN

MIBs

MP Srvc

MAP Srvc

Oper A

MO Srvc

MI Srvc

Exper B

MO Srvc

Platform

DAG Card Srvc

MP Srvc

MP Srvc

LAN

Exper Code

MP Srvc

MC Srvc

MC Srvc
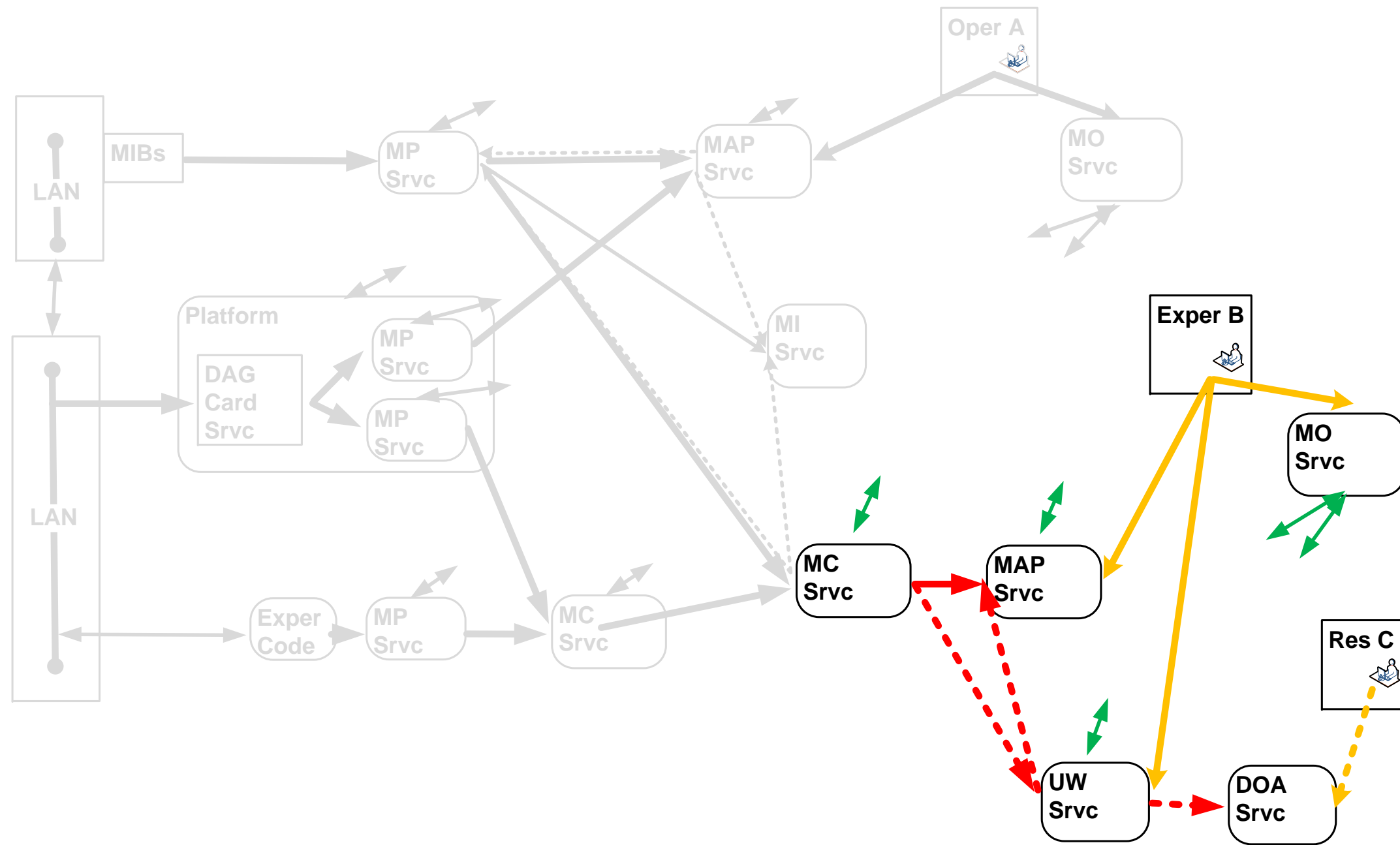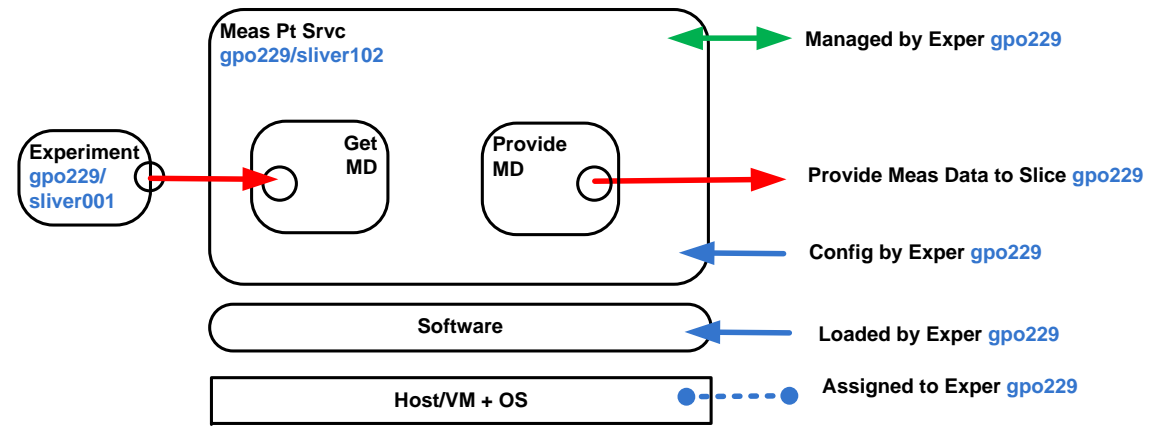
MAP Srvc

Res C

UW Srvc

DOA Srvc

Type 1: Dedicated I&M Service

**I&M service, e.g., Measurement Point (MP) service, that
is setup as part of a slice, and provides MD only for that
slice.**

Example: (1642) Instrumentation Tools

Type 2: Common I&M Service Platform with Multiple Slivers

I&M service platform, e.g., Measurement Point (MP) service, that is setup and managed by a Service Provider, with multiple slivers assigned to multiple slices, which configure and manage the slices
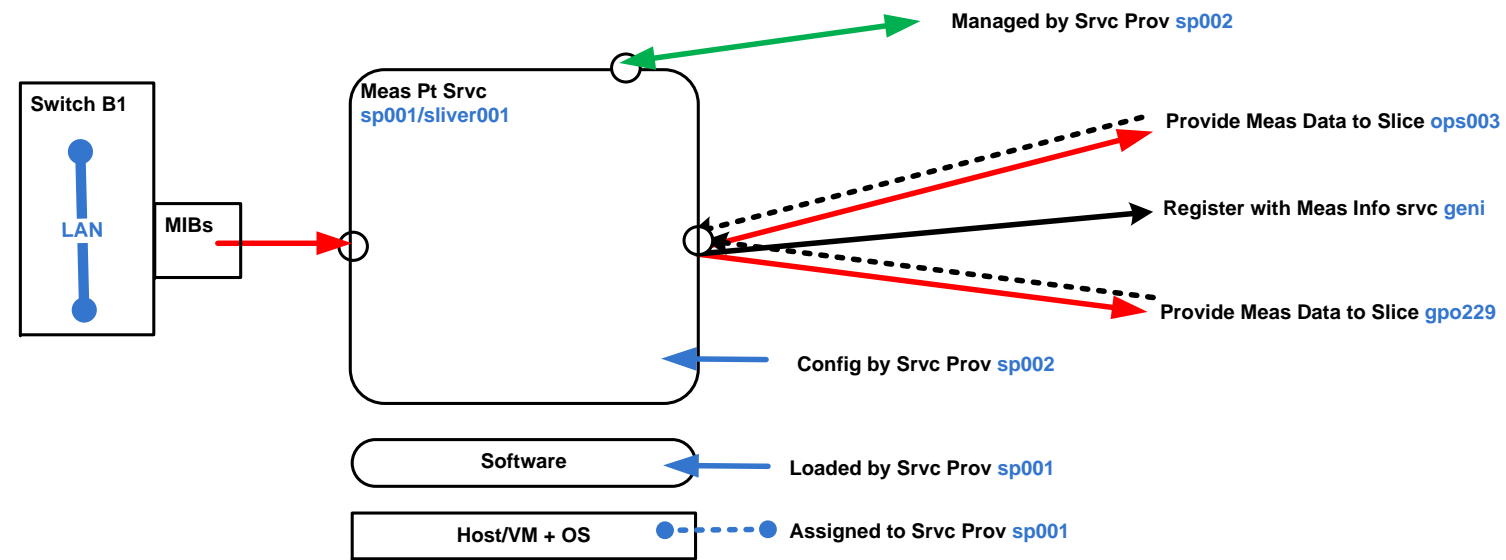
Example: (1628) Measurement System
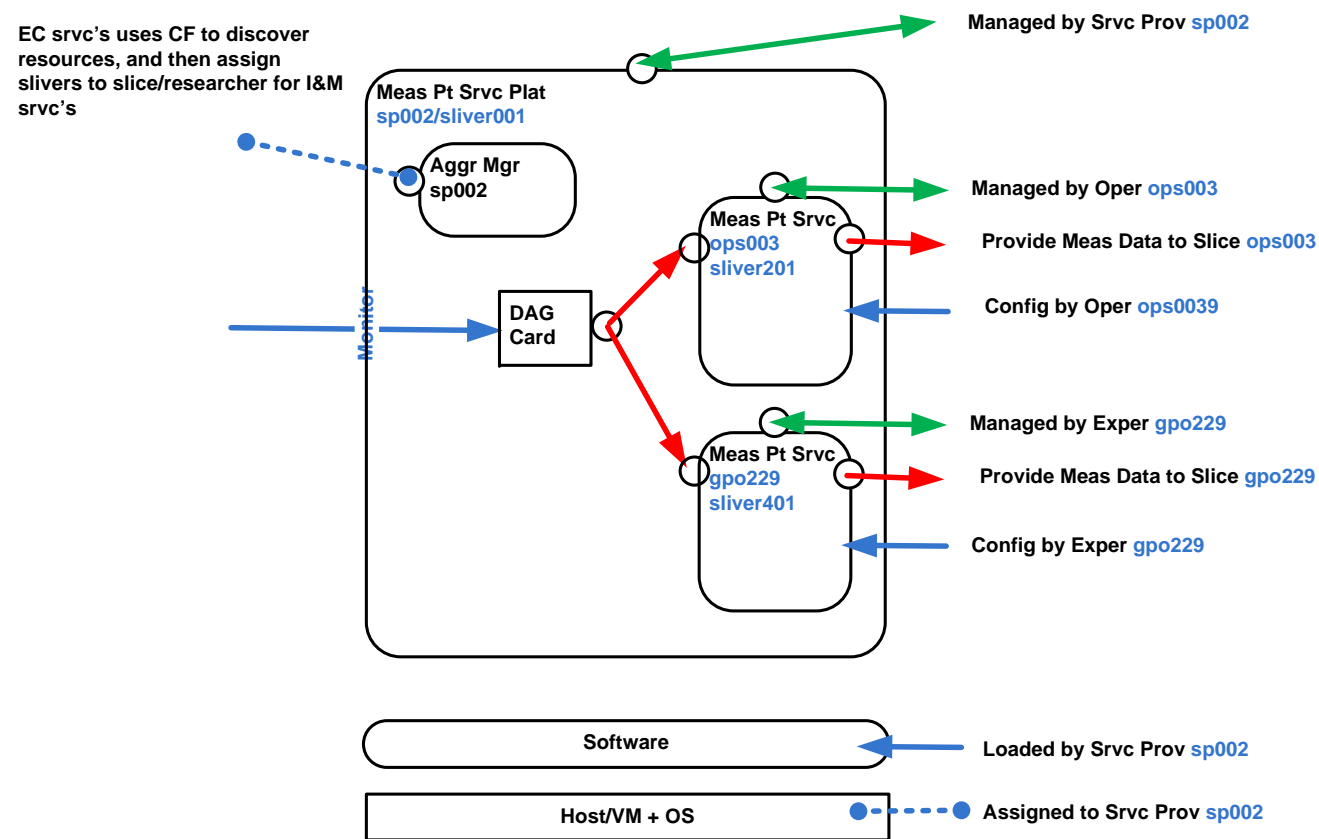
Type 2: Common I&M Service Platform with Multiple Slivers

I&M service platform, e.g., Measurement Data Archive (MDA) service, that is setup and managed by a Service Provider, with multiple slivers assigned to multiple slices, which configure and manage the slices

Example: (1663) Measurement Data Archive Service

EC srvc's uses CF to discover resources, and then assign slivers to slice/researcher for I&M srvc's

Managed by Srvc Prov **sp002**

Meas Pt Srvc Plat
sp002/sliver001

Aggr Mgr
sp002

Meas Pt Srvc
ops003
sliver201

Managed by Oper **ops003**

Provide Meas Data to Slice **ops003**

Config by Oper **ops0039**

DAG Card

Monitor

Meas Pt Srvc
gpo229
sliver401

Managed by Exper **gpo229**

Provide Meas Data to Slice **gpo229**

Config by Exper **gpo229**

Software   Loaded by Srvc Prov **sp002**

Host/VM + OS   Assigned to Srvc Prov **sp002**

EC srvc's uses CF to discover resources, and then assign slivers to slice/researcher for I&M srvc's

Managed by Srvc Prov **sp003**

Meas Data Archive Srvc Plat
sp003/sliver001

Aggr Mgr
sp002

Managed by Exper **gpo229**

User Workspace Srvc
gpo229
sliver301

Transfer Meas Data files from/to Slice **gpo229**

Config by Exper **gpo229**

Digital Object Archive Srvc
sp003/
sliver101

Managed by Exper **gpo821**

User Workspace Srvc
gpo821
sliver301

Transfer Meas Data files from/to Slice **gpo821**

Config by Exper **gpo821**

Software   Loaded by Srvc Prov **sp003**

Host/VM + OS   Assigned to Srvc Prov **sp003**

Type 3: Common I&M Service with Measurement Data (MD) to multiple slices

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 slices. The MD may or may not be customized for each experiment.

Example: perfSONAR

Switch B1

LAN

MIBs

Meas Pt Srvc
sp001/sliver001

Managed by Srvc Prov sp002

Provide Meas Data to Slice ops003

Register with Meas Info srvc geni

Provide Meas Data to Slice gpo229

Config by Srvc Prov sp002

Software

Loaded by Srvc Prov sp001

Host/VM + OS

Assigned to Srvc Prov sp001

Type 4: I&M Service with portal for sharing Meas Data

I&M service, e.g., Meas Analysis and Presentation (MAP) service, that has a portal to allow experimenters and operators to observe Measurement Data

Example: (1642) Instrumentation Tools
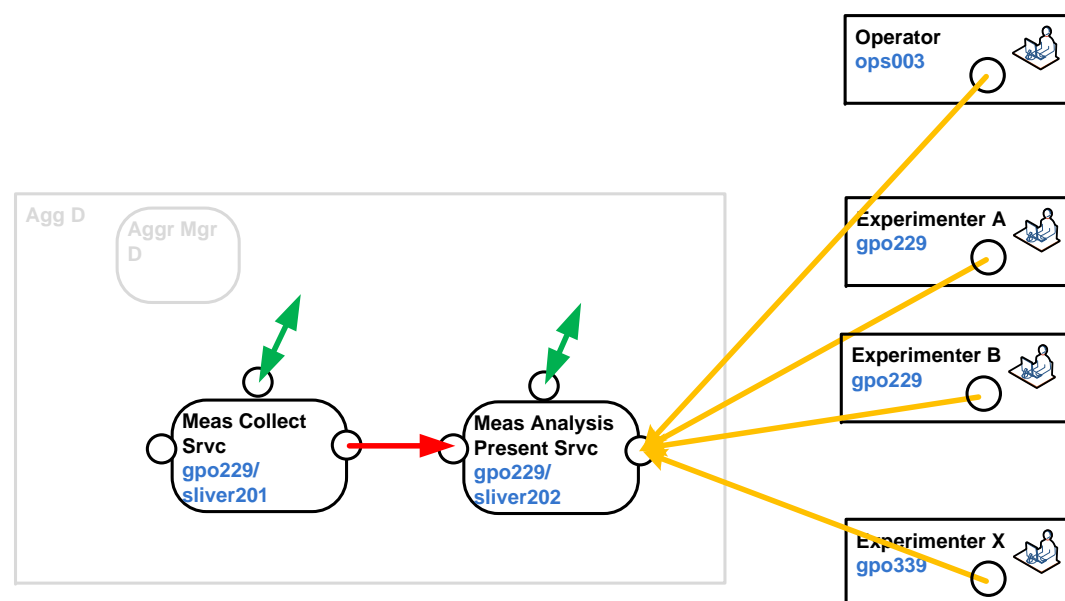
Type 4: I&M Service with portal for sharing Meas Data

I&M service, e.g., Digital Object Archive (DOA) service within Measurement Data Archive (MDA) service, that has a portal to share archived files with researchers

Example: (1663) Digital Object Registry