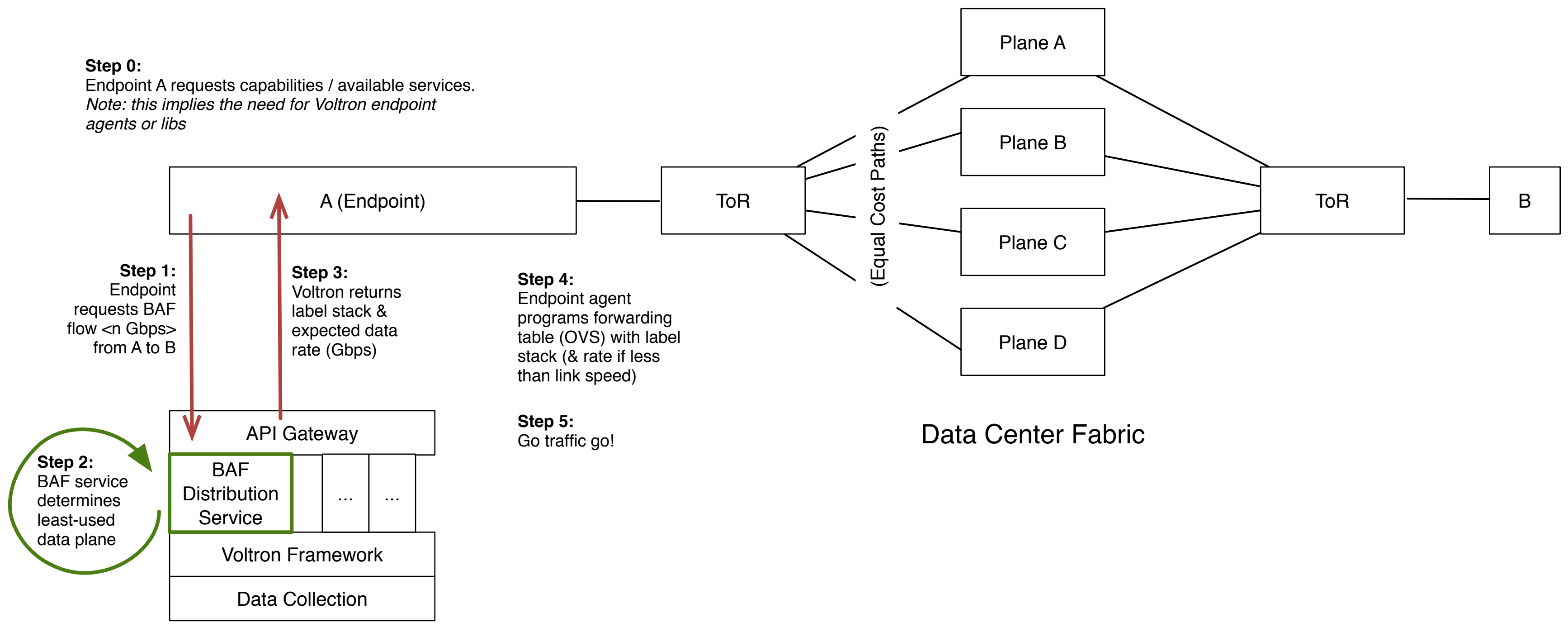
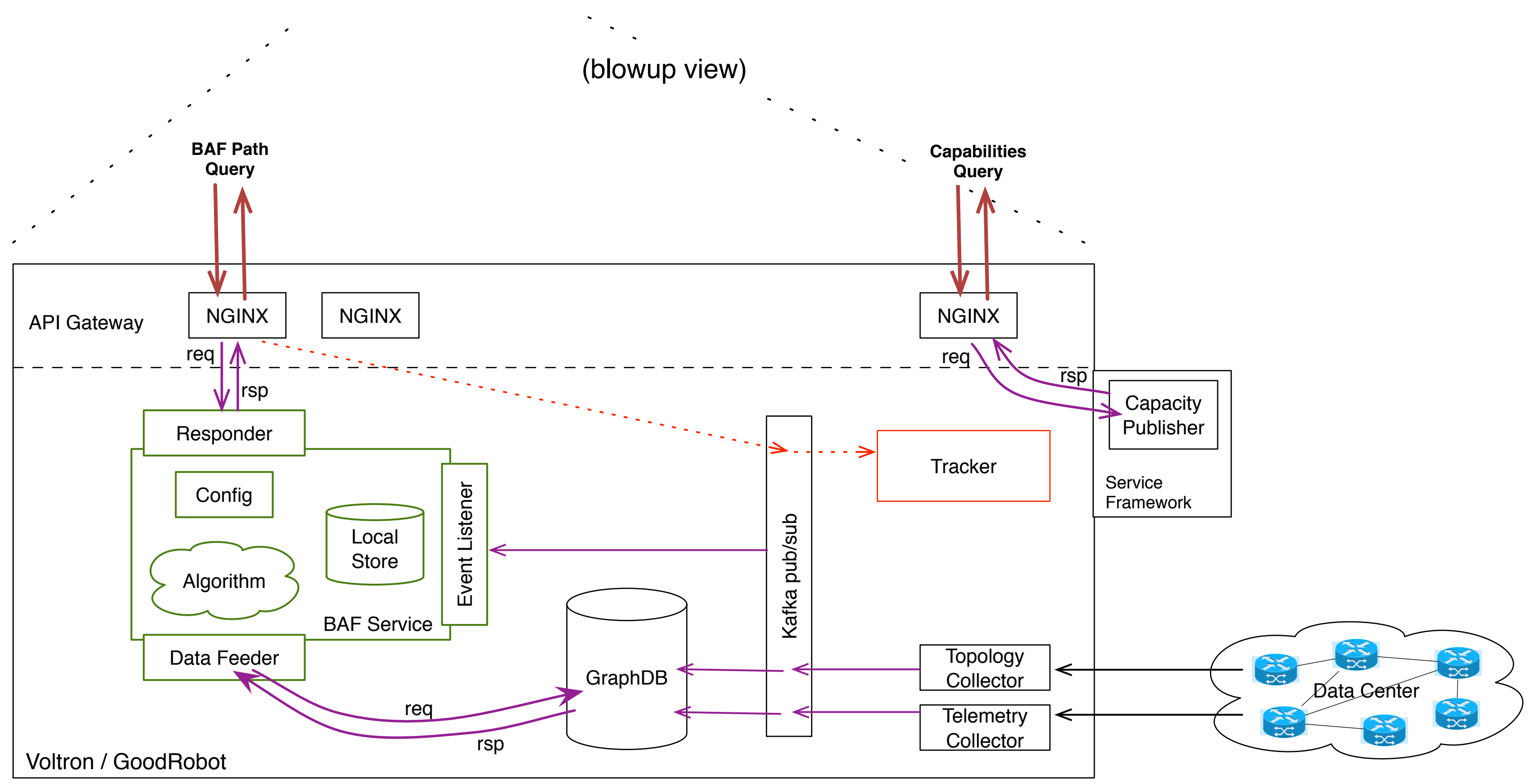
Use Case: BAF, originating at A and going to B

Note: we are not intending to suggest paths for everybody. Just for special types of flows.

Assumptions:
1) A knows how to get to Voltron
2) A knows its own connecting link speed (40 Gbps) and the data size of the BAF transfer (2TB)
3) A is a container running with Contiv networking
4) The API Gateway is a RESTful interface
5) The time between BAF service requests is greater than Volton's update interval
6) The DC is configured with sufficient MTU between A & B for the label stack





BAF Service Configuration Includes:
1) Definition of fabric planes & associated links
2) Initial service parameters:
- algorithm specification
- min time between GraphDB queries
- warmup time (before advertising API)
Note: This implies the need for a Service Lifecycle State Machine [loaded / warmup / active / inactive]

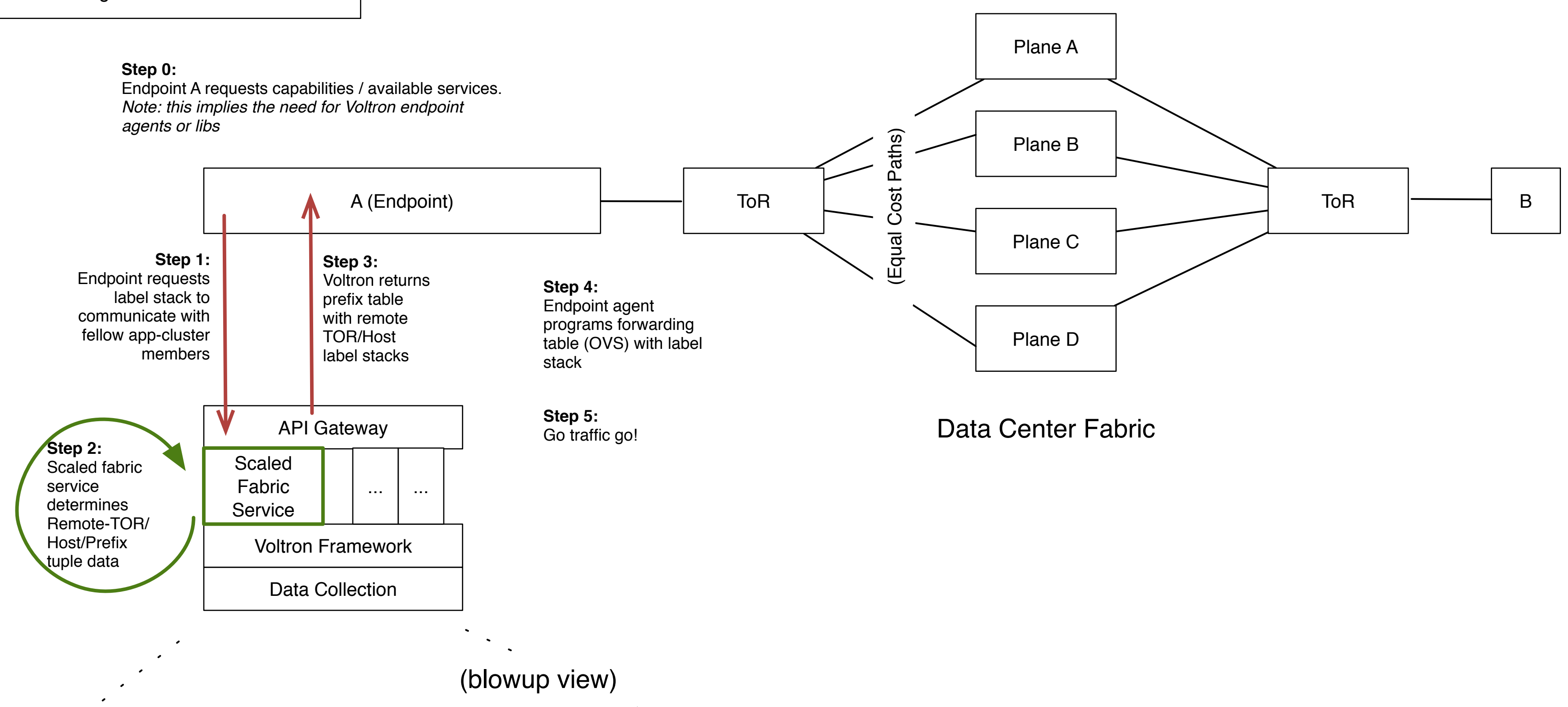
Situations to Consider
* How does BAF service deal with 100's to 1000's of endpoints? *one answer: have a set of best paths and round-robin through them*
* Due to telemetry data lag, need to be flexible of definition of "least used path"   i.e. a set of low utilization paths
* Need to consider synchronization between "best path set" at time t, and new information received from telemetry
* Due to high bi-sectional bandwidth in the fabric, the most probable point of bottle necks is flow polarization to a single egress leaf node (note Max Flow Capacity of paths).
* Can we streamline service needs and data acquisition? Perhaps Kafka topics is a solution

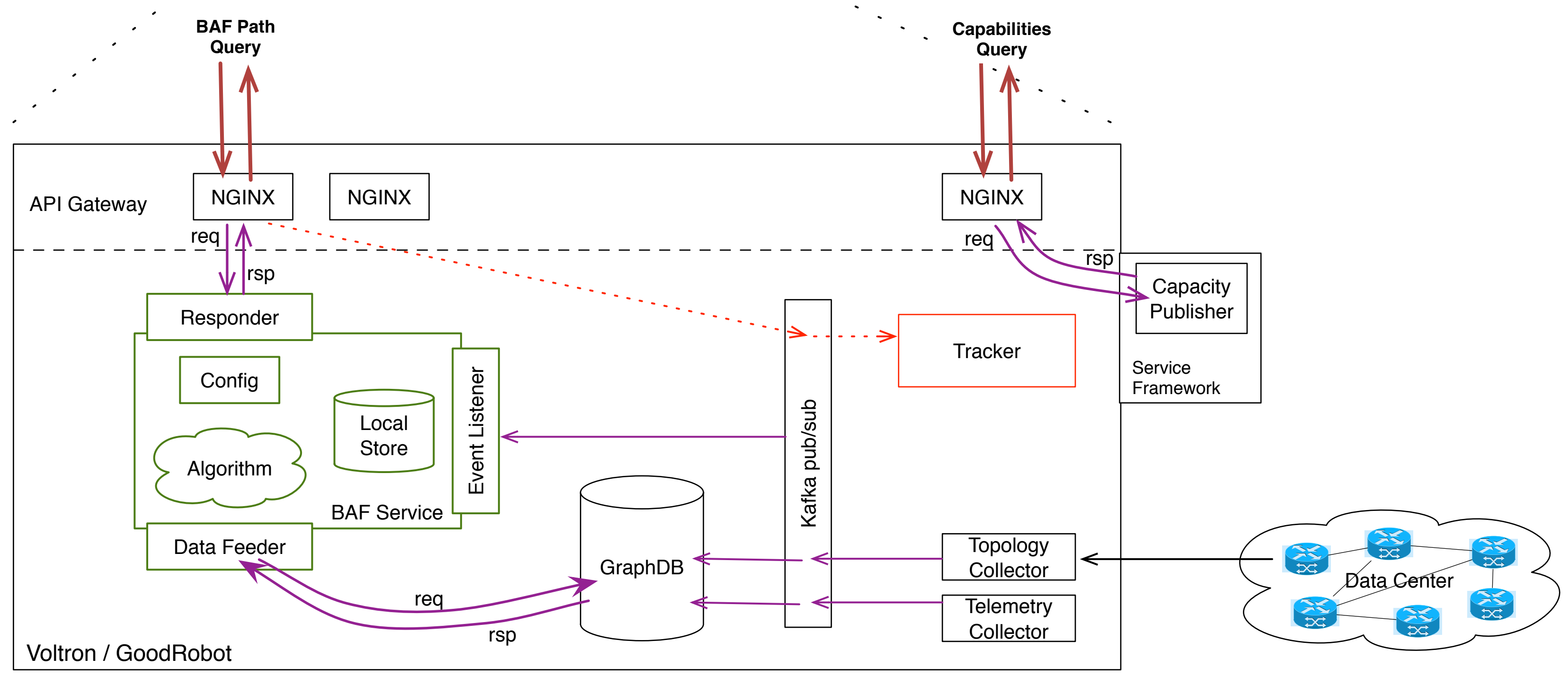
* Debug ability - what events & data do we need to log and/or track within Voltron?

Use Case: Scaling the Fabric

Note: this use case describes a model wherein endpoint prefix scale in the containerized/virtualized data center exceeds forwarding table scale in the DC fabric itself. Initial case is single-tenant.

Assumptions:
1) A knows how to get to Voltron
2) A is a container running with Contiv networking
3) A is a member of an application cluster and therefore cannot be NAT'd behind a host IP
4) A has an IPv4/v6 address that is not summarized at its local TOR
5) TOR prefix-SID is within the SRGB
6) Host prefix-SID is outside of the SRGB
7) The API Gateway is a RESTful interface
8) The DC is configured with sufficient MTU between A & B for the label stack





Fabric Scale Service Configuration Includes:
1) Harvesting TOR prefix-SID and Host label data
  - Host label may simply be an EPE label for outgoing TOR interface
2) Harvesting Host/container prefix data
3) Initial service parameters:
- creation of tuples from TOR-SID, Host-SID, prefix
- min time between GraphDB queries
- warmup time (before advertising API)
Note: This implies the need for a Service Lifecycle State Machine
[loaded / warmup / active / inactive]

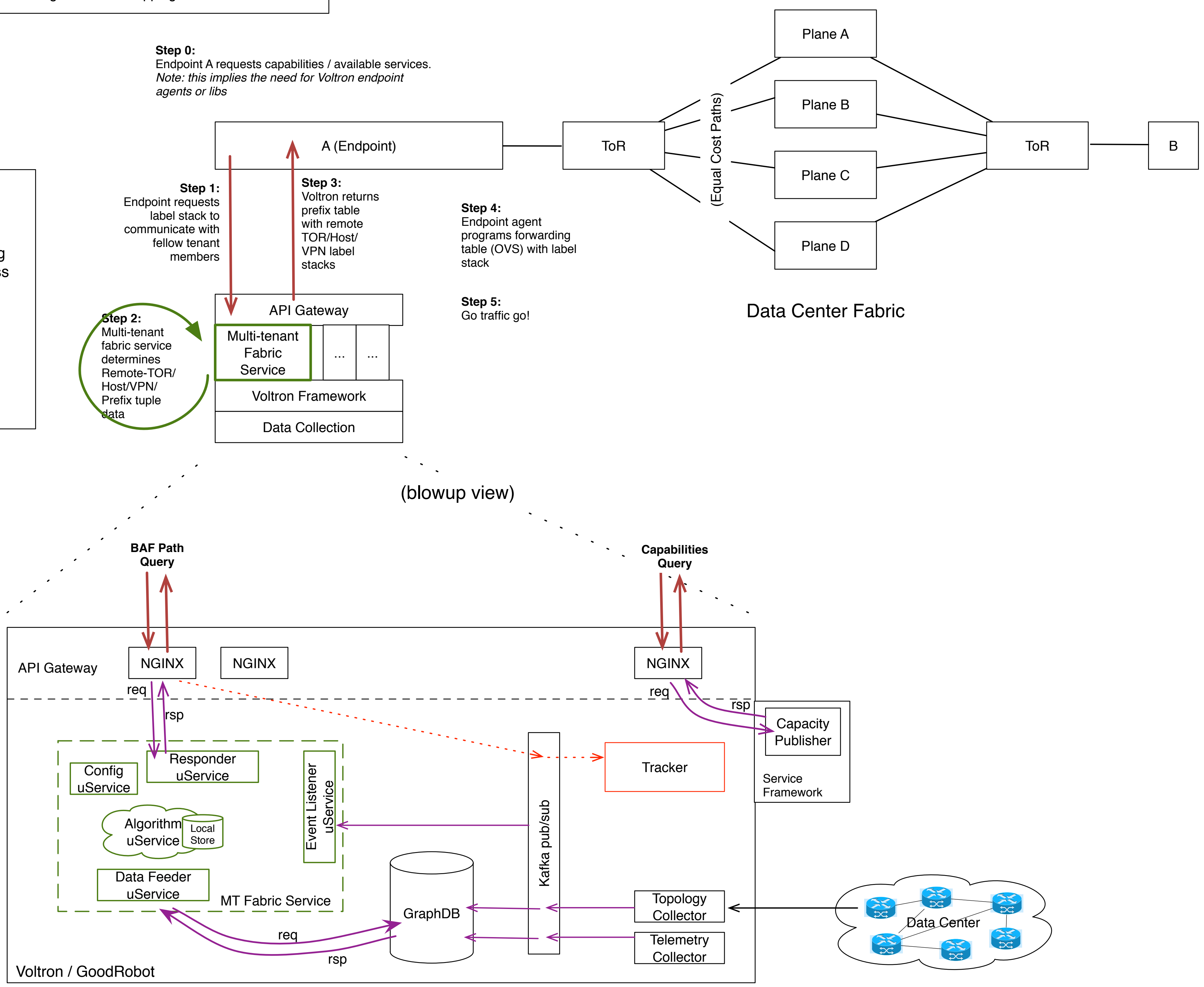
Situations to Consider
* How does BAF service deal with 100's to 1000's of endpoints? *one answer: have a set of best paths and round-robin through them*
* Due to telemetry data lag, need to be flexible of definition of "least used path"   i.e. a set of low utilization paths
* Need to consider synchronization between "best path set" at time t, and new information received from telemetry
* Due to high bi-sectional bandwidth in the fabric, the most probable point of bottle necks is flow polarization to a single egress leaf node (note Max Flow Capacity of paths).
* Can we streamline service needs and data acquisition? Perhaps Kafka topics is a solution

* Debug ability - what events & data do we need to log and/or track within Voltron?

Use Case: Multi-Tenant Fabric

Note: this use case describes a multi-tenant containerized/virtualized data center wherein endpoints may be mobile within the DC and endpoints with different tenant IDs might have overlapping IPv4/v6 addresses

Assumptions:
1) A knows how to get to Voltron
2) A is a container running with Contiv networking
3) Voltron is able to associate A's IPv4/v6 address with A's tenant_ID
5) TOR prefix-SID is within the SRGB
6) Host prefix-SID is outside of the SRGB
7) The API Gateway is a RESTful interface
8) The DC is configured with sufficient MTU between A & B for the label stack



Fabric Scale Service Configuration Includes:
1) Harvesting TOR prefix-SID and Host label data
  - Host label may simply be an EPE label for outgoing TOR interface
2) Harvesting Container VPN/tenant, and prefix data
3) Initial service parameters:
- creation of tuples from TOR-SID, Host-SID, VPN-SID, prefix
- min time between GraphDB queries
- warmup time (before advertising API)
Note: This implies the need for a Service Lifecycle State Machine
[loaded / warmup / active / inactive]

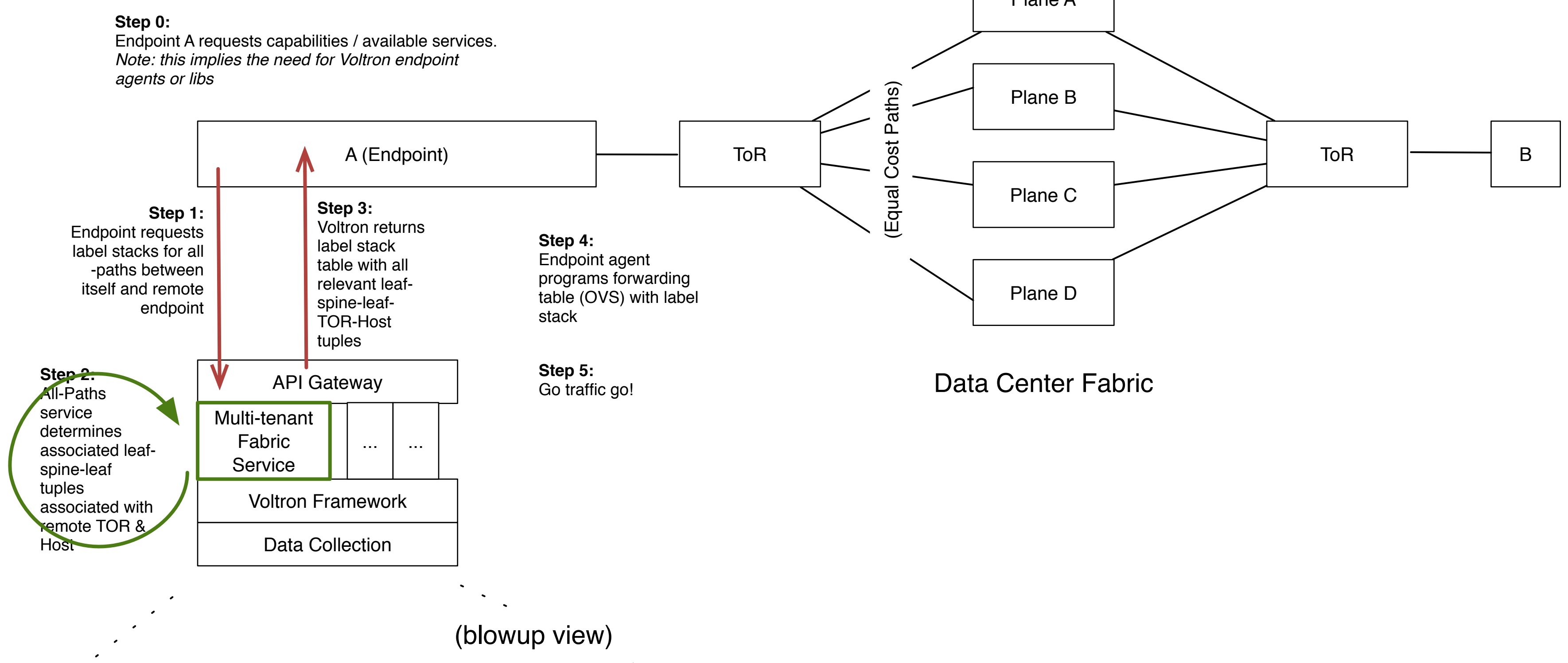
Situations to Consider
* How does BAF service deal with 100's to 1000's of endpoints? *one answer: have a set of best paths and round-robin through them*
* Due to telemetry data lag, need to be flexible of definition of "least used path"   i.e. a set of low utilization paths
* Need to consider synchronization between "best path set" at time t, and new information received from telemetry
* Due to high bi-sectional bandwidth in the fabric, the most probable point of bottle necks is flow polarization to a single egress leaf node (note Max Flow Capacity of paths).
* Can we streamline service needs and data acquisition? Perhaps Kafka topics is a solution

* Debug ability - what events & data do we need to log and/or track within Voltron?

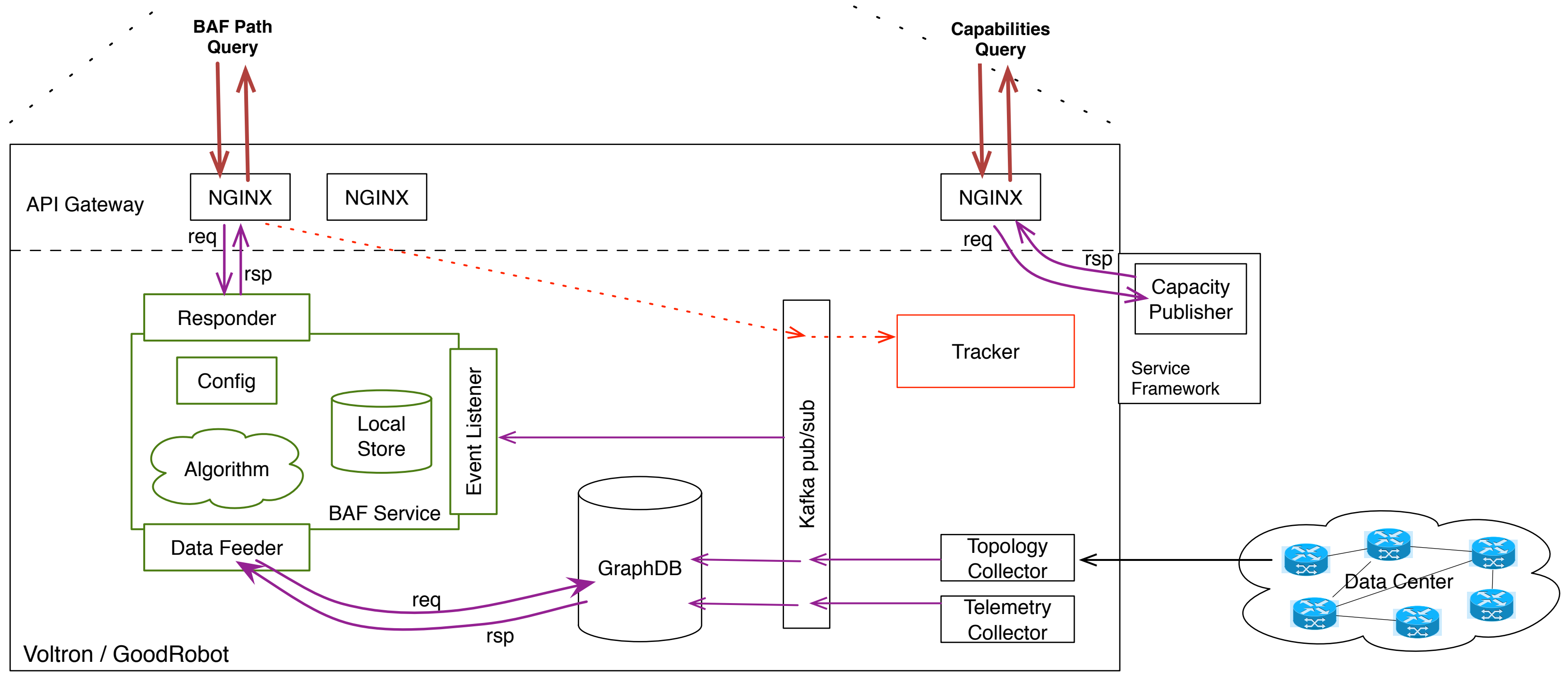
Use Case: All-Paths Service

Note: this use case describes a scenario where an OAM tool needs to test the liveliness (and perhaps latency) of all links in the fabric between itself and another host/endpoint. The micro service returns all-paths between the two endpoints in response to the request.

Assumptions:
1) A knows how to get to Voltron
2) A is a container running with Contiv networking
3) All fabric nodes (Spine, leaf, TOR) have prefix-SIDs within the SRGB
4) Host prefix-SID is outside of the SRGB
7) The API Gateway is a RESTful interface
8) The DC is configured with sufficient MTU between A & B for the label stack



All-Paths Service Configuration Includes:
1) Harvesting TOR prefix-SID and Host label data
  - Host label may simply be an EPE label for outgoing TOR interface
2) Harvesting of fabric node (spine and leaf) prefix-SID (and possibly adj-SID) data
3) Initial service parameters:
- creation of tuples from leaf-spine-leaf to a given remote TOR/Host
- example table size: assuming 3-stage CLOS built across 4-planes, TOR uplinks to 4 leafs (1 per plane), and leaf uplinks to 48 spines within its plane. Once traffic reaches a given leaf it has already entered a DC plane, therefore it has 48 paths to spine, then all spines have a single path to the appropriate egress leaf, so the table size is (4*48*1) = 192 L-S-L tuples or paths.
- warmup time (before advertising API)
Note: This implies the need for a Service Lifecycle State Machine
[loaded / warmup / active / inactive]

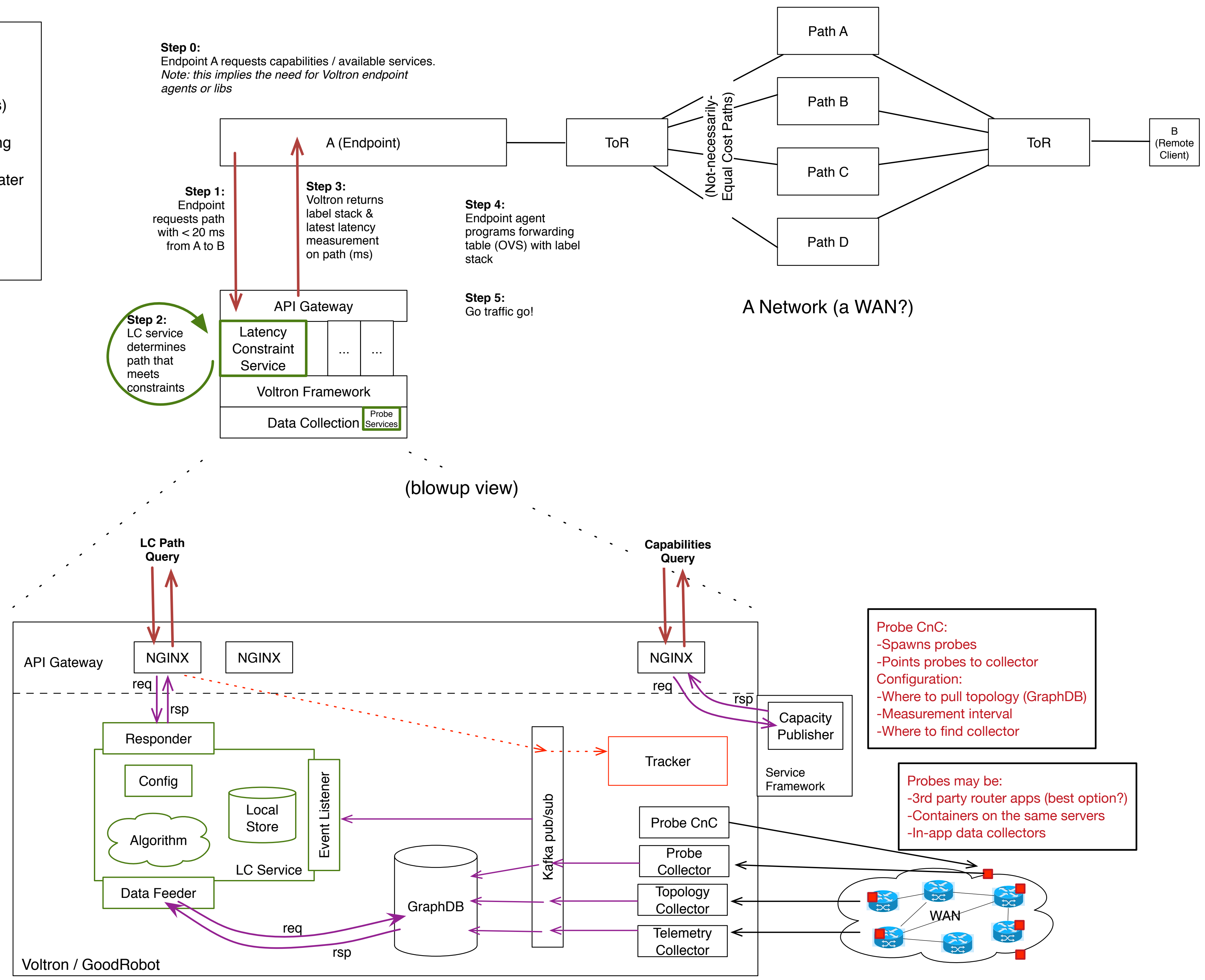


Situations to Consider
* How does BAF service deal with 100's to 1000's of endpoints? *one answer: have a set of best paths and round-robin through them*
* Due to telemetry data lag, need to be flexible of definition of "least used path"   i.e. a set of low utilization paths
* Need to consider synchronization between "best path set" at time t, and new information received from telemetry
* Due to high bi-sectional bandwidth in the fabric, the most probable point of bottle necks is flow polarization to a single egress leaf node (note Max Flow Capacity of paths).
* Can we streamline service needs and data acquisition? Perhaps Kafka topics is a solution

* Debug ability - what events & data do we need to log and/or track within Voltron?

Use Case: Low Latency Flow (sub 20ms), originating at A and going to B

Assumptions:
1) A knows how to get to Voltron
2) A knows its own connecting flow rate (1 Gbps) and its peak latency tolerance (20ms)
3) A is a container running with Contiv networking
4) The API Gateway is a RESTful interface
5) The time between LC service requests is greater than Volton's update interval (required?)
6) The DC is configured with sufficient MTU between A & B for the label stack



Latency Constraint Service Configuration Includes:
1) Location of liveness check for LC data publisher
2) Initial service parameters:
- min time between GraphDB queries
- % of paths covered by measurements before advertising API
- minimum freshness of latency data

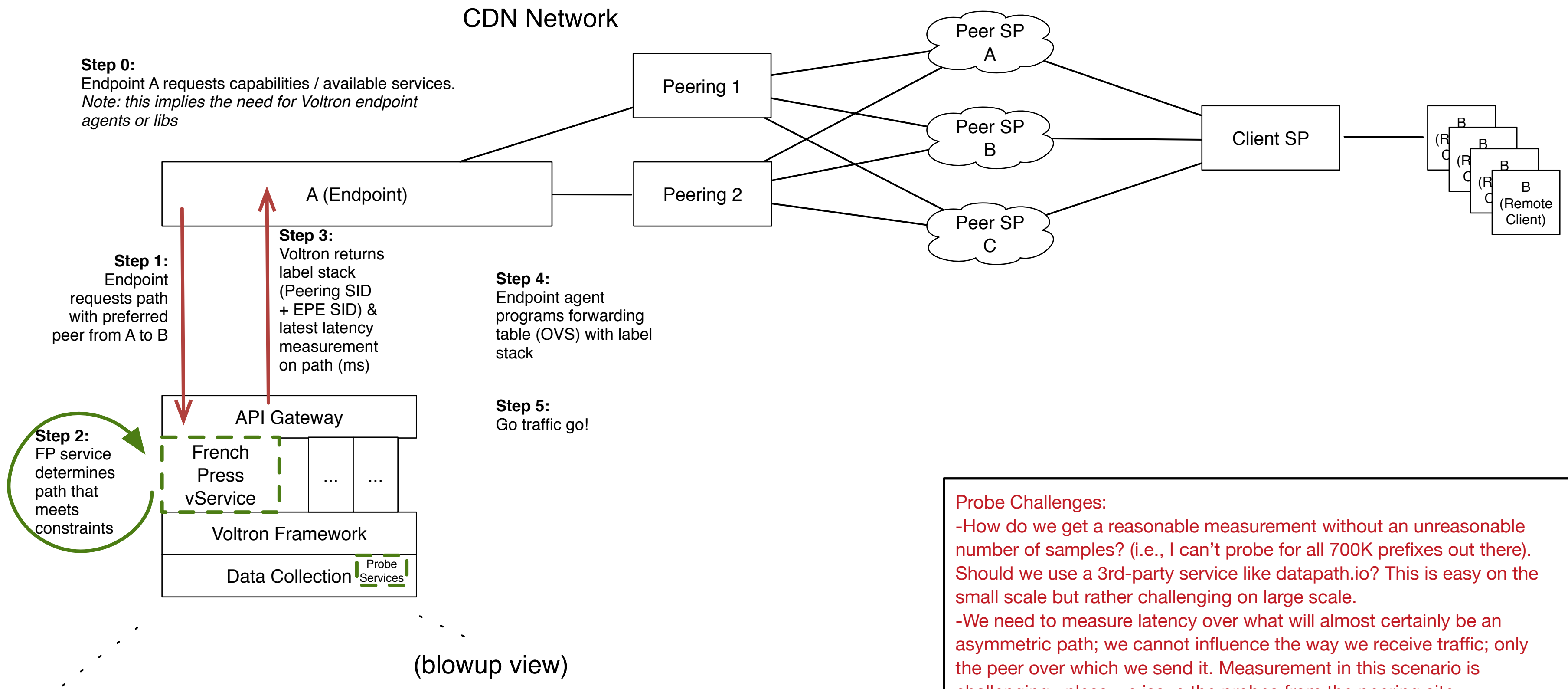
Situations to Consider
* How does BAF service deal with 100's to 1000's of endpoints? *one answer: have a set of best paths and round-robin through them*
* Due to telemetry data lag, need to be flexible of definition of "least used path"   i.e. a set of low utilization paths
* Need to consider synchronization between "best path set" at time t, and new information received from telemetry
* Due to high bi-sectional bandwidth in the fabric, the most probable point of bottle necks is flow polarization to a single egress leaf node (note Max Flow Capacity of paths).
* Can we streamline service needs and data acquisition? Perhaps Kafka topics is a solution

* Debug ability - what events & data do we need to log and/or track within Voltron?

Use Case: Espresso: Picking the egress peer you love the most…

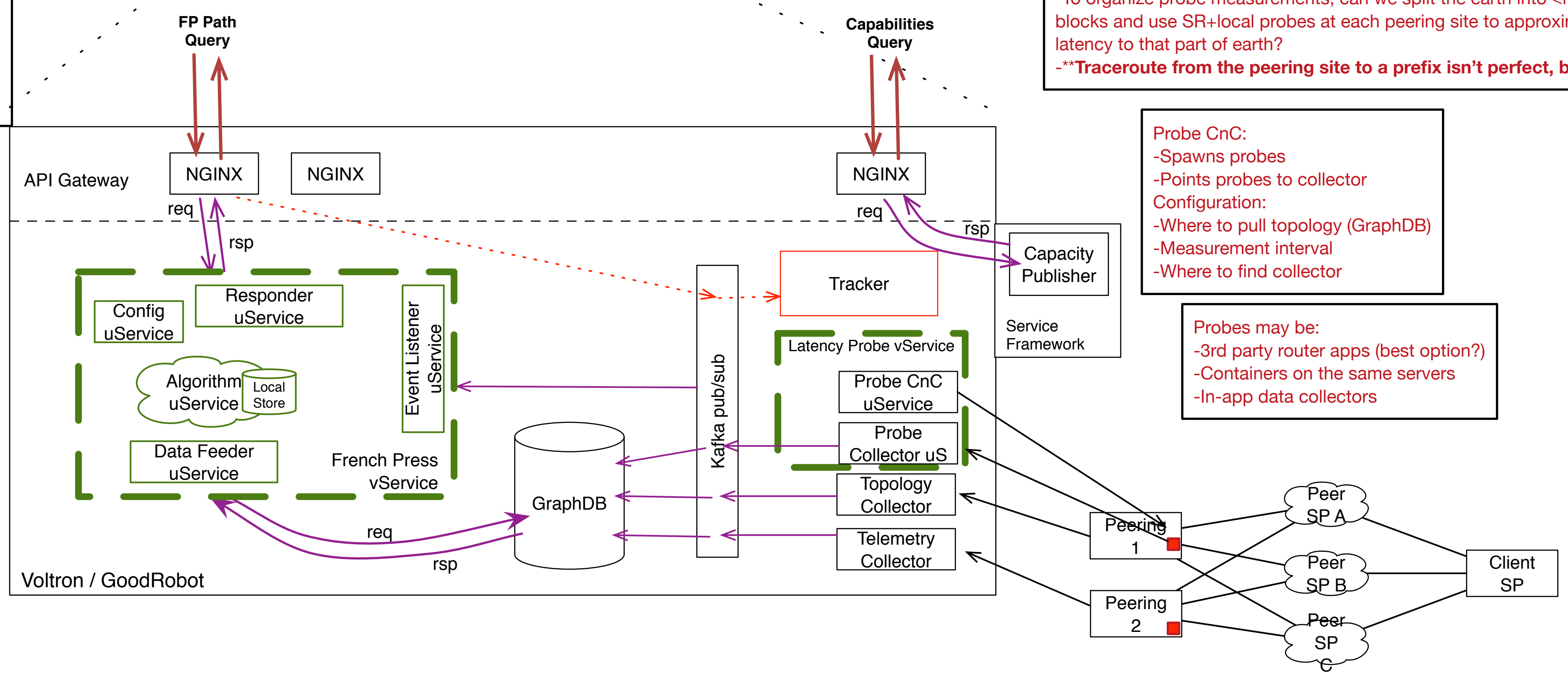
Determining the optimal external peer out of (and eventually in from) a peering fabric

Assumptions:
1) A knows how to get to Voltron
2) A knows its own connecting flow rate (1 Gbps) and its optimization preference (UX vs. BW vs. $$))
3) A is a container running with Contiv networking
4) The API Gateway is a RESTful interface
5) The time between LC service requests is greater than Volton's update interval for bandwidth (required?)
6) The DC is configured with sufficient MTU between A & B for the label stack



French Press Service is relevant only to a peering fabric. In the simpler CDN case, there is only a single peering fabric so no need to associate the host with a fabric. As it scales, though, the host will be responsible only for getting to the "best" peering fabric and the local peering fabric will need to advertise and interpret the received SID to provide the appropriate steering to its external peers.
-A peering fabric service to simply provide shortest path routing to the optimal peering fabric is a base component of this use case. Really, it's just a query to the BGP table from the endpoint.

Probe Challenges:
-How do we get a reasonable measurement without an unreasonable number of samples? (i.e., I can't probe for all 700K prefixes out there). Should we use a 3rd-party service like datapath.io? This is easy on the small scale but rather challenging on large scale.
-We need to measure latency over what will almost certainly be an asymmetric path; we cannot influence the way we receive traffic; only the peer over which we send it. Measurement in this scenario is challenging unless we issue the probes from the peering site.
-To organize probe measurements, can we split the earth into <n> blocks and use SR+local probes at each peering site to approximate latency to that part of earth?
-****Traceroute from the peering site to a prefix isn't perfect, but it'll do in a pinch*****



Probe CnC:
-Spawns probes
-Points probes to collector
Configuration:
-Where to pull topology (GraphDB)
-Measurement interval
-Where to find collector

Probes may be:
-3rd party router apps (best option?)
-Containers on the same servers
-In-app data collectors

French Press Service Configuration Includes:
1) Location of liveness checks for FP data publisher (are data populated for the selected algorithm?)
2) Initial service parameters:
- min time between GraphDB queries
- % of paths covered by measurements before advertising API
- minimum freshness of latency data

Situations to Consider
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