

## Guest Application Name (full name + short name for all components)

Name:	Precision Locating
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## Submission Date

Date:	2025-03-24
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## Guest Application Type (filled in by BDHP Guest Application Team)

Integrated
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## BDHP Platform Guest Apps Owner

Name:	Chris Keegan
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## BDHP Platform Owner

Name:	Mark Laurent
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## Guest Application Owner

Name:	
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## Guest Application Team

Role	Precision Locating	DeviceBridge
Marketing	Bryant Van Wagenen	Mel Tinney
PM	Prasad	Mack Davenport
Architect	Collin	Eric Farley, Chris Keegan, Chris Haigney
System Engineer	Liz Dellinger	Chris Haigney, Matt Robbins, Asialyn Dennis
Software Engineer contact(s)	Britten Pipher, Kara Beason, Matt Morgan, Hardik Desai, William Martin,	
DevOps contacts		Jason Hubbard
CloudOps		John Scott
Clinical		
Installation		
EMR Integration		
Service Engineer		Valentina
Support		

## Guest Application Team Requirements

1. Guest application teams must support the application for:
  - a. Security updates
  - b. Platform interoperability across cloud releases (prior to cloud release deployment into production)
2. Guest Applications are required to provide smoke test protocols that would test all integration points (interfaces) to/from the platform to the guest application. These tests would include end-to-end testing to assure proper interoperability with the platform.

## References

1. [BDHP DevOps Architecture Document](#)
2. [Guest Applications Onboarding Document](#)
3. [Developer Guide](#)
4. [Keycloak](#)
- 5.

## Information needed to set up team roles:

Please specify the below fields as it applies to this guest application.

**AZ-ROLE-cs-rd-hpl-hpl-<Role>**

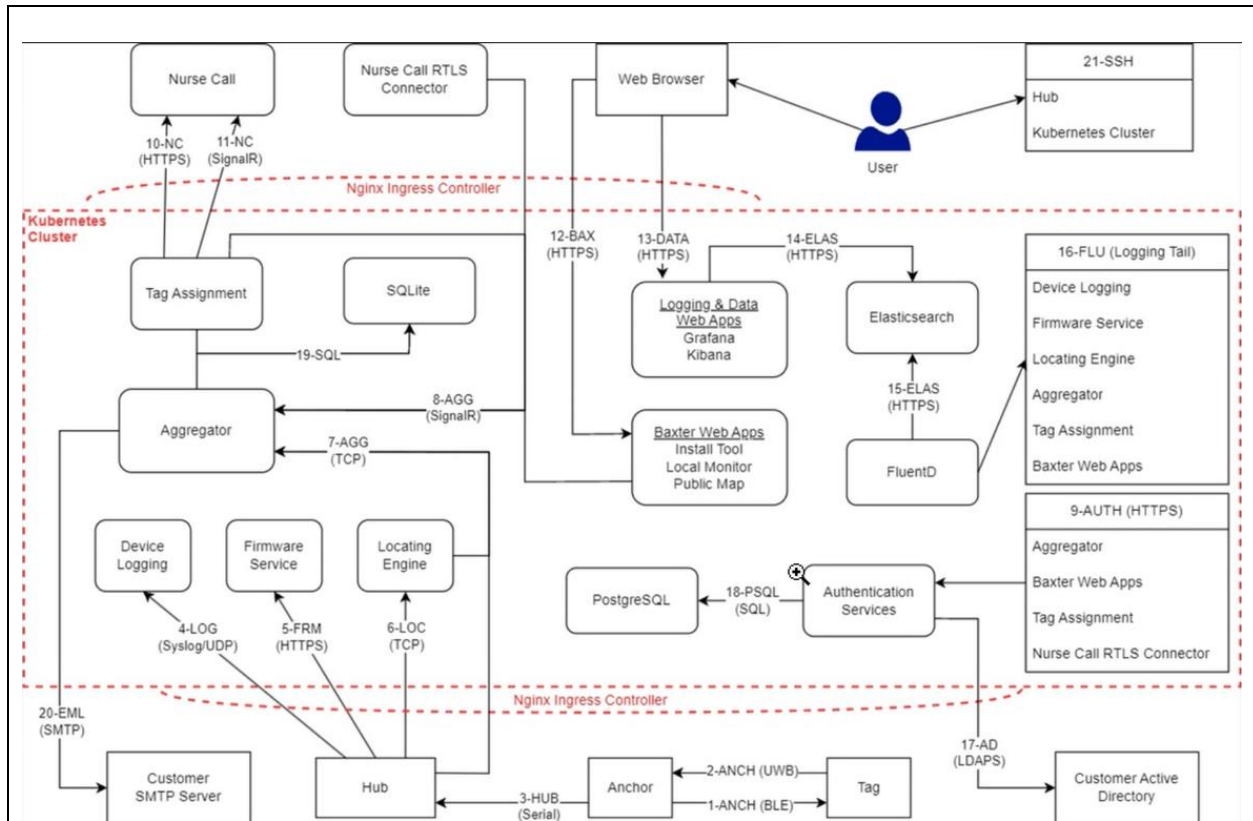
Consider adding permissions / access for: Confluence, Jira, GitHub, Jama

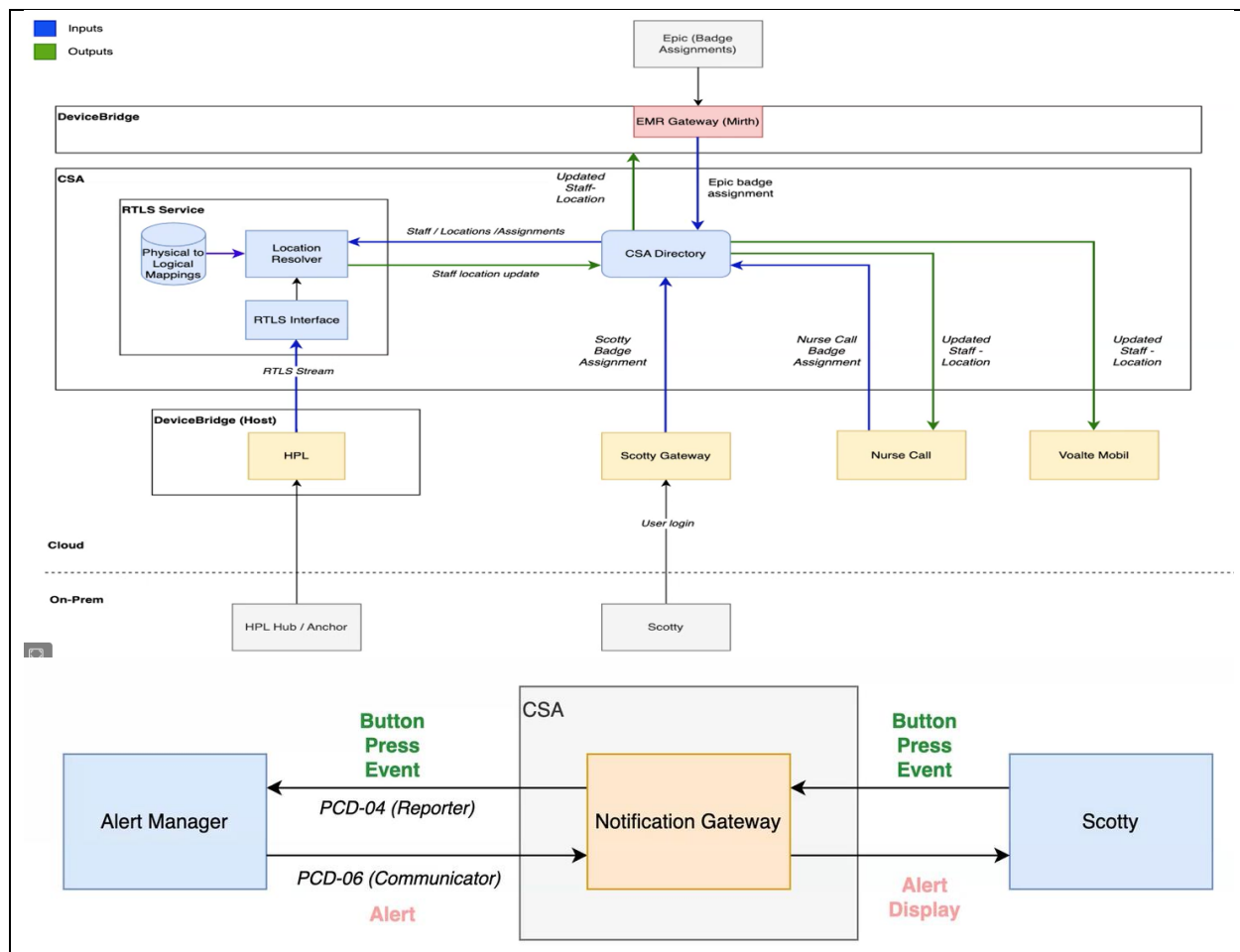
Fields	Examples
Organization	ec – Enterprise Connectivity cs – Care Solutions mdat – Medication Delivery Acute Therapies
Department	rd – Research & Development
Product Family	rsp – Report Service Platform bdhp – Baxter Digital Health Platform dh – Digital Health csa – Common Service Architecture dhp – Digital Health Platform
Product	bdhp – Baxter Digital Health Platform iqegw – IQ Enterprise Gateway
Role	Filled in automatically or copied from another project

## Components:

Service	Build Type

Please describe or reference an overview of the guest application





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## Server Requirements

The Hillrom Precision Locating services and applications are installed on a Kubernetes cluster with multiple nodes, using virtual or physical machines.

	Tier 1	Tier 2	Tier 3
<b>Number of servers</b>	1 primary node 2 secondary nodes	1 primary node 2 secondary nodes	1 primary node 2 secondary nodes
<b>Operating System</b>	RHEL 9.4	RHEL 9.4	RHEL 9.4
<b>Processor</b>	Minimum of dedicated 2-cores per node (6-cores total), 2.4GHz	Primary node: Minimum of dedicated 8-cores, 2.4GHz Secondary nodes: Minimum of dedicated 4-cores per node (8-cores total), 2.4GHz	Minimum of dedicated 8-cores per node (24-cores total), 2.4GHz
<b>Memory</b>	Minimum of 16 GB per node (48 GB total)	Minimum of 32 GB per node (96 GB total)	Minimum of 32 GB per node (96 GB total)
<b>Storage</b>	Minimum of 200 GB for primary node (usually first node), 100 GB for each other node (400 GB total)	Minimum of 200 GB for primary node (usually first node), 100 GB for each other node (400 GB total)	Minimum of 200 GB for primary node (usually first node), 100 GB for each other node (400 GB total)
<b>Number of supported devices</b>	Maximum of 119 total tags, 31 in-motion	Maximum of 398 total tags, 103 in-motion	Maximum of 1,400 total tags, 515 in-motion

- Short term needs – Primary
  - Define approach to decoupling High Precision Locating (HPL) from Nurse Call. This will allow Scotty and HPL to be bundled without Nurse Call and broaden the availability of RTLS to other integrated products.
  - Alert management
- Future State – Secondary
  - Start breaking down system architecture and define architecturally significant component structure.
    - DevOps / Infrastructure
    - Cloud Ops Support / Monitoring
    - Gateways (EMR / Devices)
    - Serviceability
    - Analytics
    - Application integration
    - Security / Identity Management / PKI
    - HA/DR Options and Planning (per platform)
  - Parallel CSA Health Service and DeviceBridge Hackathon.

Hubs connect via a DNS entry which is the aggregator.

Configuration via ECP/Tenant Catalog (team also mentioned CSA Configuration Service)

The system is used for staff and equipment locating

Please describe the customer workflow as the customer would use the system

Please describe or reference the guest application architecture

Please describe the Guest Application product roadmap, including specific project milestones for this integration

Milestones	Application	DeviceBridge
Integration Start		
Dry Run Testing Start		
Module delivery to team		
Dry Run Testing End		
Formal Testing Start		
Engineering Release	2026-01-xx	
Commercial Release	2026Q1	

Identify the integration points used by the guest application:

Service	Y / N	Planned usage	Comments
Existing Product	Yes		
If yes, what migration is required?			
Is User Authentication required?	Yes	User Authentication via Keycloak	3 user roles: Admin / Service, IT / Biomed, User
Is Single Sign-On required?	Yes		
Locating Hub to cloud security	Yes	TBD	
Are service principals required? e.g., service to service authentication	Yes	Hub to connect to the cluster	
CDR consumption e.g., Rabbit MQ message broker	No	No – Cloud First Version	

Service	Y / N	Planned usage	Comments
<b>Data subscription integration</b> e.g., RabbitMQ message broker <need to determine if the GA needs a way to get data from a message broker and if so, does it exist?>	Yes	Any alerts needing to go out the HL7 alarm interface will need to be published on the Rabbit bus	
<b>Device integration (Proprietary)</b>	Yes	Hub to Cloud	
<b>CDR Services</b> List each required FHIR service	No		
<b>Configuration Required</b> e.g., Catalog Service	Yes	CSA uses Catalog Potentially using ECP also for EMR connectivity	Hubs are configured outside ECP as part of PL application
<b>Remote service</b> e.g., Cumulocity agent	No		PL applications can update hub, tags, etc.
<b>Security scanning needs</b> e.g., Clam AV	Yes	Upload map image	
<b>Platform Landing / Application Launching</b>	Yes	PL has 4 tiles: Map, Install, Device Monitor, Local Monitor	
<b>ADT outbound to guest application</b>	No		
<b>EMR data outbound to guest application</b>	No	Yes – later release	
<b>Alarm integration (HL7 PCD-04/05)</b>	TBD	Yellow / Blue Game	
<b>Guest Database(s)</b> e.g., Postgres, Mongo (on premise), Cosmos (Cloud)	Yes	Would like to use PostgreSQL to replace SQLite	
<b>Application Service Integration</b> e.g., Kubernetes support / integration	Yes		
<b>Application services running within BDHP Kubernetes</b>	Yes		
<b>Network connectivity methods (cloud)</b> e.g., VPN, certificates, etc.	Yes	Hub to cloud – Requires mutual authentication & authorization	NO VPN is desired
<b>tenancy model (Single, Multi)</b>	X	Now = Single Future = Multi Team is evaluating multi first	<ol style="list-style-type: none"> <li>1. Multi-tenant application Implies one instance in the cloud.</li> <li>2. Single-tenant application Implies each customer (enterprise) has their own instance in the cloud.</li> </ol>



Service	Y / N	Planned usage	Comments
On Premise, Cloud, Both, Hybrid	Cloud	Cloud now Onprem next for VA, etc.	
Is the guest application a front-end client application or Service Principal or both	Both		
If Single Tenant: What is the relationship between the application instance – facility – enterprise customer?	TBD		
Uptime / availability requirements (i.e., 99.9%)	99.9%	Excludes planned downtime	
Disaster Recovery Requirements	TBD		
Backups and Backup retention requirements	X	Same as DeviceBridge	
Failure recovery requirements: 1. Recovery Point Objective (RPO) 2. Recovery Time Objective (RTO)	X	RPO – 24-hours RTO – 12-hours***	RPO –DeviceBridge = 24-hours RTO – DeviceBridge = 12-hours
What types of user roles are needed?	Yes	3 user roles: Admin / Service, IT / Biomed, User	
What type of interactions should the user have within the system (RBAC profile)?			
What types of system roles are needed (authorization, role-based access)?	X		
Multi-language support	No	US/C English only, not Quebec	
Build Process	X	required to use Terraform and helm charts	
Namespace relationships	X		Discuss Namespace relationships
Secret management	Yes	PL currently using K8 secrets store	Can be provisioned when application deployed Options: K8 secrets Keyvault Keycloak
Certificate Usage	Yes	Hub to Cloud	

Function	Integration Point	Status	Usage / Comments
Service containerization	Kubernetes	Yes	Following DeviceBridge methods - platform cluster / PL namespace (Matt, Kara, Dan)
Clinician Authentication	Keycloak	Yes	Matt, Dan, Kara
Application Configuration	ECP	Yes	<p>User Roles</p> <p>Enterprise structure – PT has sites which = DB facility; then parent zones = DB units; zone = DB rooms; sub-zones = DB bed</p> <p>Inbound / Outbound connections</p> <p>Will need the entire Enterprise levels</p> <p>Q: How to handle single tenant aggregator and should this map to something in DeviceBridge?</p> <p>Q: Does PL need ADT for alarm reporting (Collin)?</p>
Application Configuration	Tenant Catalog	Yes	Data = 1,000 rooms + 2,200 anchors + 10+ hubs + image files (1 / floor)
Service Principals	Keycloak [Rabbit - TBD] Tenant Service	Yes	<p>If backend services are connecting with Keycloak, Rabbit, etc. then service principals are required.</p> <p>Rabbit credentials are available in Kubernetes. TBD – if using Rabbit or Sunstone network (TCP mesh)</p>
Service logging	Loki / Grafana	Yes	<p>Currently uses elastic search / Grafana</p> <p>Can use Loki / Grafana with configuration changes</p> <p>Matt is 99.9% sure to convert to Loki</p>
Application Launching	Landing page	Yes	<p>Add PL app tiles to landing page</p> <ol style="list-style-type: none"> <li>1. Map – used by: Baxter Service + Customer / Clinician / IT</li> <li>2. Install tool – used by: Baxter Service</li> <li>3. Device Manager – used by: Baxter Service</li> <li>4. Local Monitor – used by: Baxter Service + Customer IT</li> </ol>
EMR Integration	HL7 Outbound PCD-01	N/A	Not used – N/A
EMR Integration	HL7 Inbound PCD-01	Yes	Used to get assignments (needed for CSA-Directory)
3 <sup>rd</sup> party integration	HL7 Alarm Reporter PCD-04	Yes	PL needs to send locating events (badge button press) to 3 <sup>rd</sup> party (e.g., alarm manager)
Monitoring and Alerting	Grafana / Prometheus	Yes	Using the same methods as DeviceBridge

Function	Integration Point	Status	Usage / Comments
Location data	Cosmos	No	Need to capture location data (every ~30 seconds) last know data What zones are the last known location of tags, ranging data Data gets replaced periodically (not forever accumulated) Jon's proposal to use PostgreSQL
Message broker	RabbitMQ	TBD	
Anti-Virus	ClamAV	Yes	Need to scan map files when importing Imports image files
Customer to Hub association	TBD	TBD	The proposal is to configure the hub with facility ID with current hub configuration methods.  Hub -> Anchor -> Tag Hub is hardware which is part of a token ring bus Hubs connect to a discovery service to determine how to connect to an aggregator to learn which is a locating engine to connect. Hub needs to know which aggregator to connect. There is 1 aggregator / facility. Potential to use DeviceBridge 4-char facility identifier.
Ingress Controller	IngressClassName	Yes	DeviceBridge uses Nginx ingress, plan is for PL to also use Nginx One ingress controller for the system. Configured via helm chart.
Residency	Cloud Location	Yes	US, Canada Potentially later: UK, WEU
Security Standards		Yes	SOC2 is needed, can benefit with DeviceBridge SOC2. If PL uses substantially the same security controls, then the path is simple.

List all regression testing protocols / test cases for verifying platform integration points to assure interoperability.

Interface	Reference	Comments

Decisions Made:

Description	Date	Status / Result
Applications will be English only US/C (no Quebec)	2025-03-24	
6 applications <ol style="list-style-type: none"> <li>1. Map – WCS</li> <li>2. Install tool – WS</li> <li>3. Device Manager – WS</li> <li>4. Local Monitor – WSC</li> <li>5. Model Viewer – WS</li> <li>6. Landing Page – App icons</li> </ol>	2025-03-24	W = Web app S = Service Usage C = Customer Usage Add app icons to DeviceBridge landing page
Ray Bowles will be program managing the efforts for Precision Locating and CSA into DeviceBridge to support distribution of Precision Locating / Linq beyond Baxter Nurse Call customers	2025-04-23	

### Running Action List:

Owner	Description	Date	Due	Status / Result
Collin / Matt Morgan	What will it take to make PL to be multi-tenant?	2025-03-24	COMPLETE	2025-04-15 – will need an aggregator for each deployment – some services will need to be single tenant. 2025-04-15 –SLA expectations = 99.9% uptime 2025-04-22 – Decision = Multi-tenant except one aggregator and one dispatcher / facility
Matt Morgan	Determine impact of moving from elastic -> Loki	2025-03-24	COMPLETE	Matt says team will do this so there is not an additional component in the system
Jon	Review general device bridge features including Keycloak, etc.	2025-04-15	COMPLETE	2025-04-15 – Jon L to schedule a meeting -> 2025-04-23

Owner	Description	Date	Due	Status / Result
Nelda	Assign a program leader to tie all the lower-level projects together.	2025-03-26	COMPLETE	<p>Projects:</p> <ol style="list-style-type: none"> <li>1. Locating – DeviceBridge integration (Keegan)</li> <li>2. Locating updates (Prasad)</li> <li>3. CDR – Directory Merge (Haigney)</li> <li>4. CSA-Directory Updates</li> </ol> <p>2025-04-15 – Chris K. will follow up with Nelda  2025-04-29 – Project is called Locus and Ray Bowles is leading.</p>
Matt Morgan / Collin	Determine what data needs to be stored in PostgreSQL	2025-03-24	COMPLETE	<p>2025-04-15 – we have an idea of what will go into catalog but some additional work needs to be done</p> <p>2025-04-29 – Data to be stored in JSON configuration data. Data is established via PL configuration tool. Jon’s proposal to use PostgreSQL. Floor plan images stored in PostgreSQL.</p>
Collin / Eric	Define hub to cloud security solution	2025-03-24		2025-04-14 – Discussions, but nothing decided yet.
Collin	What is the RTO	2025-03-24		99.9% and RTO needs to align If RTO is 12 hours, that doesn’t align with 99.9% uptime.
Keegan / Collin	Determine EMR and 3 <sup>rd</sup> party integration methods	2025-03-24		
Liz Dellinger / Matt Robbins	Define CloudOps monitoring requirements	2025-03-24		2025-04-15 – John Scott can provide details on examples from other teams. Matt Robbins will be able to assist with requirements.
Matt Morgan / Jon L. / Hardik	Help define updated helm charts for multi-tenant	2025-03-24	In Progress	2025-04-15 – Jon L. to schedule a meeting to review deployment of multi-tenant (helloworld). Meeting scheduled for 2025-04-23 (Meeting was helpful)
PL Team / J. Pridgon	Comply with GQP-09-24	2025-03-24	In Progress	<p>2025-04-15 – Product does follow this requirement. But haven’t done a PEN test, but is planned for TBD</p> <p>2025-05-06 – Have contract with Pen Test Company (J. Pridgon)</p>

Owner	Description	Date	Due	Status / Result
Bryant Van Wagenen	CCI needs to be able to report on locating data	2025-03-25	TBD	2025-04-15 – May be out of scope for initial release.
Matt M. / Billy Bachman	Define upgrade paths for existing on premise customers to cloud	2025-03-25		<p>2025-04-15 – Discussion has started.</p> <p>2025-04-23 – Requires SQLite data migration (including image files) into PostgreSQL</p> <p>2025-04-29 – Matt proposes a tool to get the data from the on premise database and write it to BDHP PostgreSQL (migration process)</p> <p>2025-05-06 – General idea is known. Need to establish in service documentation.</p>
Matt M. / Hardik / Sai	Determine the methods for onboarding new customers wrt aggregator and locating engine	2025-03-25		<p>Can ECP create a new aggregator service (or process?) per site/facility?</p> <p>When ECP adds locating at a facility, can ECP automatically run a helm chart to add an aggregator service?</p> <p>Can ECP create a new locating engine per facility location? Potentially adding connections at unit level.</p> <p>2025-04-15 – Will review pipeline for deploying application.</p> <p>2025-05-06 – Hardik will reach out to Sai</p>
Britt	Define hub communications channels	2025-03-26		<p>Discussing TCP/IP vs. Web Socket vs. HTTPS</p> <p>2025-04-15 – Leaning towards web sockets</p>
Chris / Jon / John	Speak with John Scott and make sure that any automation from ECP to create namespaces and deploy services into the ns is ok for production change control topics.	2025-05-06		
Sai / Likhith	Add the AZ-ROLE-cs-rd-hpl-hpl groups to the Azure infrastructure and applications	2025-05-06		

### Directory Service Sync options:

A: Remove from CDR: Patients, Staff, Assignments, Locations, Roles and redirect DeviceBridge app calls to Directory.

Topic	Pro	Con
On Premise		<b>Does not produce an on premise product</b>
Database efficiency		Additional Cosmos database instances
Application Dependencies		Applications will need to connect with CDR and Directory
Development time	Simplifies integration	

B: Integrate Directory and all rules into CDR

Topic	Pro	Con
On Premise	premise DeviceBridge	Effort
Database efficiency		
Application Dependencies		
Development time		Effort, brings in the apollo gateway

C: Do nothing

Topic	Pro	Con
On Premise	Still have on premise DeviceBridge	
Database efficiency		Duplicate data across multiple databases
Application Dependencies		Source of truth for common data
Development time		Increases development time to deliver Precision Locating
Data continuity		Requires a sync function between CDR and Directory

D: Merge CDR into Directory

Topic	Pro	Con
On Premise		<b>Does not produce an on premise product</b>
Database efficiency	Reduces number of databases	
Application Dependencies		CDR APIs need to be reworked, or apps need to go through Apollo gateway

Development time	Saves time - Sync not needed. Once merged saves development time vs. supporting two solutions	Effort to migrate
Cost	Apollo is in use across CCC products	Apollo cost is based on usage, so overall costs go up for beds, vitals, etc.
Existing Customer Transition		Effort to migrate existing customers from CDR to Directory
Regional Expansion		Directory team ownership is focused on US/C only

Notes:

1. To get on premise in parallel to cloud: Change the CDR rest APIs to point to either the mongo for on premise or Directory for cloud
- 2.