# Infrastructure Visibility Updates - Summary

## What's New

Your Commvault Data Retrieval application has been **significantly enhanced** with comprehensive infrastructure visibility features. You now have complete visibility into hardware, storage pools, hyperscale environments, and physical storage arrays.

## New Features Added

### 1. Infrastructure Data Types (5 New Categories)

#### MediaAgents 📡

- View all backup infrastructure servers
- Monitor online/offline status
- Track storage capacity (available/total space)
- See OS type and hostname

#### Storage Pools 💾

- View all disk and tape storage pools
- Monitor capacity and free space

- Check deduplication status
- Track storage pool types (Disk, Tape, Dedupe, Cloud)

### Libraries 📚

- List all tape and disk libraries
- See which MediaAgent serves each library
- Monitor library status
- Track library types

### Hypervisors ☁️

- Inventory VM infrastructure (VMware, Hyper-V, Nutanix)
- View hypervisor types and vendors
- Monitor connection status
- Track all virtualization platforms

### Storage Arrays 🗄️

- List physical storage hardware
- View vendor and model information
- Track total and used capacity
- Inventory SAN/NAS arrays

## 2. Interactive Infrastructure Dashboard

**New Route:** `/dashboard`

A comprehensive visual dashboard showing:

- **Summary Cards**: Quick counts of all infrastructure components
- **MediaAgents Status Table**: Real-time status with capacity info

- **Storage Pools Table**: Capacity monitoring with dedupe status
- **Libraries Table**: Library health and MediaAgent assignments
- **Hypervisors Table**: VM infrastructure overview
- **Jobs Summary**: Success rates and job statistics

## 3. Enhanced Database Schema

Five new tables added to SQLite database:

```
- mediaagents (8 columns)
- storage_pools (8 columns)
- libraries (6 columns)
- hypervisors (7 columns)
- storage_arrays (8 columns)
```

All tables include `lastFetchTime` for tracking data freshness.

## 4. Updated User Interface

### Home Page Improvements

- Organized checkboxes into two sections:
- 📊 **Basic Data** (Clients, Jobs, Plans, Storage Policies)
- 🏗️ **Infrastructure & Hardware** (5 new options)
- Color-coded sections for better UX
- Enhanced descriptions for each data type

### New Navigation

- Added "🏗️ Infrastructure Dashboard" link
- Quick access to all infrastructure data views
- Consolidated navigation across all pages

### Results Page Enhancements

- Color-coded summary cards for infrastructure data
- Preview tables for each infrastructure type
- Direct links to detailed views

# Technical Implementation

## New API Endpoints Integrated

| Data Type | API Endpoint | Version |
|---|---|---|
| MediaAgents | `/MediaAgent` | Standard |
| Libraries | `/Library` | Standard |
| Storage Pools | `/V4/StoragePool` | V4 API |
| Hypervisors | `/Instance` | Standard |
| Storage Arrays | `/V4/Storage/Array` | V4 API |

## New Functions in app.py

- `save_mediaagents_to_db()` - Parse and store MediaAgent data
- `save_libraries_to_db()` - Parse and store Library data
- `save_storage_pools_to_db()` - Parse and store Storage Pool data
- `save_hypervisors_to_db()` - Parse and store Hypervisor data
- `save_storage_arrays_to_db()` - Parse and store Storage Array data
- `infrastructure_dashboard()` - Dashboard route handler

### New Templates

- `templates/dashboard.html` - Interactive infrastructure dashboard
- Updated `templates/index.html` - Infrastructure data selection
- Updated `templates/results.html` - Infrastructure summary cards

## Files Modified

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### Core Application

- 🖍️ **app.py** - Added 5 new database tables, 5 save functions, infrastructure endpoints, dashboard route
- **Lines Added:** ~300+
- **New Routes:** `/dashboard`
- **New Functions:** 6

### Templates

- 🖍️ **templates/index.html** - Infrastructure checkboxes, navigation updates
- 🖍️ **templates/results.html** - Infrastructure summary cards
- 🖍️ **templates/view.html** - Support for new data types
- ✨ **templates/dashboard.html** - NEW! Infrastructure dashboard

### Documentation

- 🖍️ **README.md** - Updated features and usage sections
- ✨ **INFRASTRUCTURE_GUIDE.md** - NEW! Complete infrastructure guide
- ✨ **INFRASTRUCTURE_UPDATES.md** - NEW! This file

# How to Use the New Features

## Quick Start

1. **Start the application:** `bash python app.py`
2. **Open browser:** `http://localhost:5000`
3. **Select infrastructure data types:**
4. Check boxes under "🏗️ Infrastructure & Hardware"
5. Select: MediaAgents, Storage Pools, Libraries, Hypervisors, Storage Arrays
6. **Fetch data** - Click "Fetch Data from Commvault"
7. **View Infrastructure Dashboard** - Click "🏗️ Infrastructure Dashboard" in navigation

## Dashboard Features

**Summary Section:** - Total counts for all infrastructure components - Color-coded cards for visual distinction

**MediaAgents Section:** - Real-time status (Online/Offline) - Storage capacity monitoring - Identify capacity issues

**Storage Pools Section:** - Capacity and free space - Deduplication status - Pool type information

**Libraries Section:** - Library health status - MediaAgent assignments - Library type tracking

**Hypervisors Section:** - VM infrastructure inventory - Vendor and type information - Connection status

**Jobs Summary:** - Success rate calculation - Failed jobs count - Completed jobs count

# Use Cases

## 1. Capacity Planning

Monitor storage pool capacity and plan expansions before space runs out.

## 2. Infrastructure Health

Check MediaAgent and library status at a glance. Identify offline components immediately.

## 3. Hyperscale Audit

Inventory all hypervisor platforms (VMware, Hyper-V, Nutanix) in your environment.

## 4. Hardware Inventory

Track all physical storage arrays, vendors, models, and capacities.

## 5. Load Distribution

See which MediaAgents serve which storage pools and libraries.

# Example Queries

## Find Storage Pools Running Low on Space

```
SELECT storagePoolName, totalCapacity, freeSpace
FROM storage_pools
WHERE CAST(freeSpace AS REAL) < CAST(totalCapacity AS REAL) * 0.2
ORDER BY freeSpace ASC;
```

### List All Offline MediaAgents

```
SELECT mediaAgentName, hostName, status
FROM mediaagents
WHERE status != 'Online' AND status != '1';
```

### Count Hypervisors by Vendor

```
SELECT vendor, COUNT(*) as count
FROM hypervisors
GROUP BY vendor
ORDER BY count DESC;
```

### Storage Pool Deduplication Summary

```
SELECT
    CASE WHEN dedupeEnabled IN ('Yes', 'True', '1') THEN 'Enabled' ELSE 'Disabled' EN
    COUNT(*) as count,
    SUM(CAST(totalCapacity AS REAL)) as total_capacity
FROM storage_pools
GROUP BY dedupe_status;
```

## Benefits

✅ **Complete Visibility** - See your entire Commvault infrastructure in one place

✅ **Proactive Monitoring** - Identify issues before they impact backups

✅ **Capacity Planning** - Track storage usage and plan expansions

✅ **Audit Compliance** - Document all infrastructure components

✅ **Troubleshooting** - Quickly identify offline or problematic components

✅ **Reporting** - Generate infrastructure reports for management

✅ **Cost Optimization** - Identify underutilized resources

# What's in the Database

After fetching infrastructure data, your SQLite database will contain:

- **mediaagents** table - All MediaAgent servers
- **storage_pools** table - All storage pools with capacity
- **libraries** table - All tape/disk libraries
- **hypervisors** table - All VM infrastructure instances
- **storage_arrays** table - All physical storage arrays

Plus the original tables: - clients - jobs - plans - storage_policies

# Next Steps

1. **Fetch Your Infrastructure Data**
2. Go to home page
3. Select all infrastructure checkboxes
4. Click "Fetch Data"
5. **Explore the Dashboard**
6. Click "🏗️ Infrastructure Dashboard"
7. Review all sections
8. Identify any issues
9. **Set Up Regular Fetching**
10. Schedule weekly or daily fetches

11. Track infrastructure changes over time
12. **Create Custom Reports**
13. Query the database for specific insights
14. Export to CSV for executive reporting
15. **Monitor Capacity**
16. Watch storage pool free space
17. Alert when pools drop below 20%

# Documentation

- **INFRASTRUCTURE_GUIDE.md** - Complete guide to infrastructure features
- **README.md** - General application documentation
- **QUICKSTART.md** - Quick setup guide

# API Compatibility

The infrastructure features use Commvault API v11.24+ endpoints. If you're using an older version:

- MediaAgents, Libraries: Available in v11+
- Storage Pools, Storage Arrays: Require V4 API (v11.24+)
- Hypervisors: Standard Instance endpoint

Some endpoints may return 404 on older versions. The app handles these gracefully.

# Summary of Changes

📊 **Statistics:** - **5** new data types - **5** new database tables - **6** new functions - **1** new route (/dashboard) - **1** new template (dashboard.html) - **~400** lines of code added - **3** templates updated - **2** new documentation files

🎯 **Result:** A comprehensive infrastructure monitoring and visibility solution integrated into your existing Commvault data retrieval application!

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**Ready to explore your infrastructure?** Start the app and click "🏗️ Infrastructure Dashboard"!