Bioscape Digital
Patient Engagement Platform 2023

Table of Contents

1. Introduction
2. System Components
3. Architecture Overview
4. Server Infrastructure
    1. Tablet Server Stack
    2. Client Server Stack
    3. Server Deployment
5. Device Management
    1. Software Components
    2. Startup and Update Process
6. Device Tracking
7. Analytics Dashboard
8. End User Device Overview
9. Key Platform Features
10. Development Tools and Technologies

Introduction

Link to overview slides:
https://xd.adobe.com/view/92c4c7b7-8601-494b-8358-6c9d37d01664-c797/?fullscreen

CarePrime is Bioscape Digital's innovative patient engagement platform delivered through a customized bedside tablet in every room. This tablet solution provides content aggregation and clinical workflow features intended to empower patients to play a positive role in their healthcare and recovery.

This document describes the current architecture of the CarePrime application stack, including reporting analytics, server infrastructure, deployment processes, and key features.

System Components

Backend Services - Scalable backend services for NX Patient Devices and NX tablets. Services provide device configuration, app updates, content distribution, and receive tracking data, usage statistics, and survey results.

Reporting - Reporting engine and database provides dashboards for usage trends, survey results, and device monitoring.

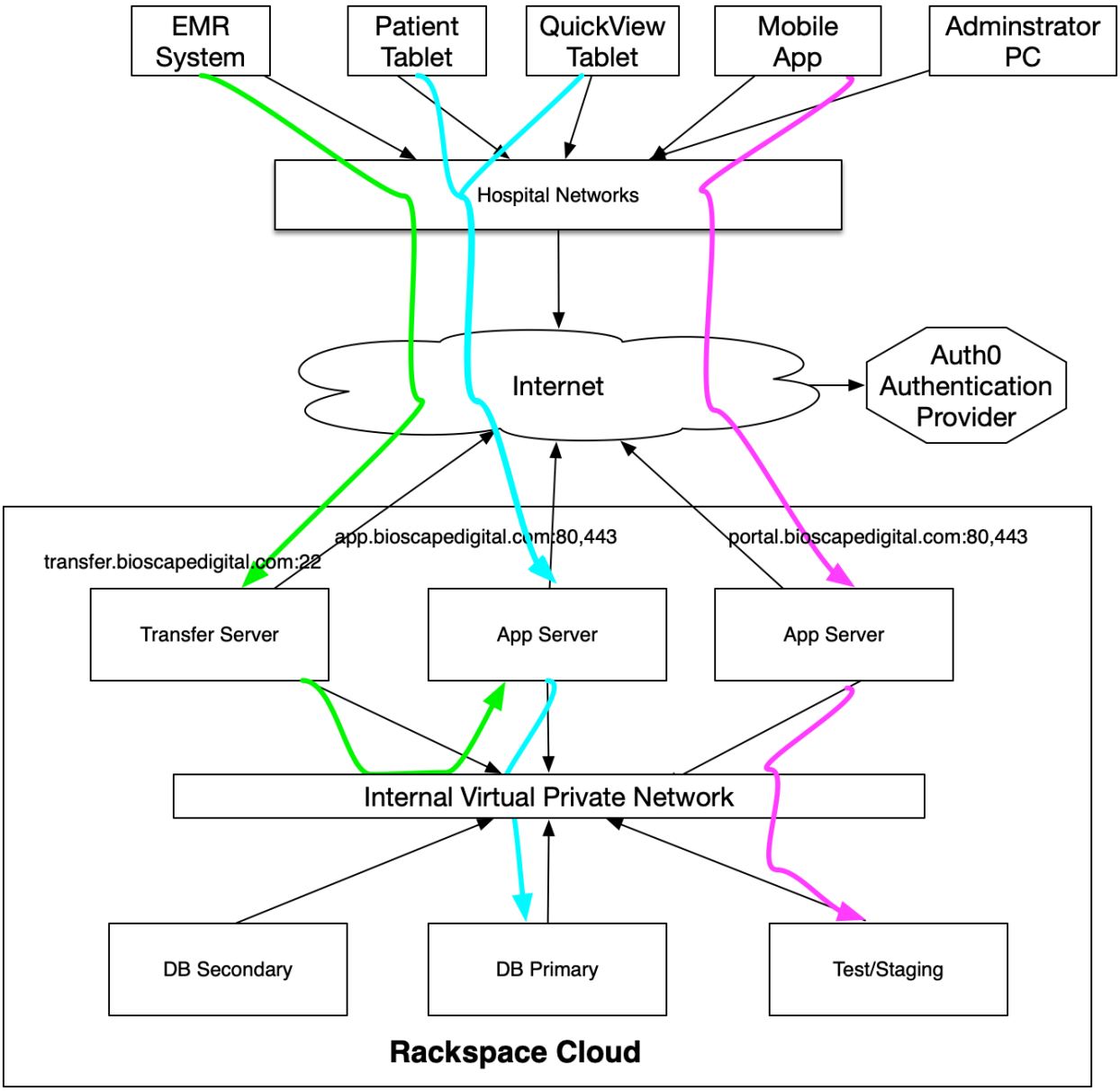
Log Collection - Log collection and analytics system for aggregating system logs.

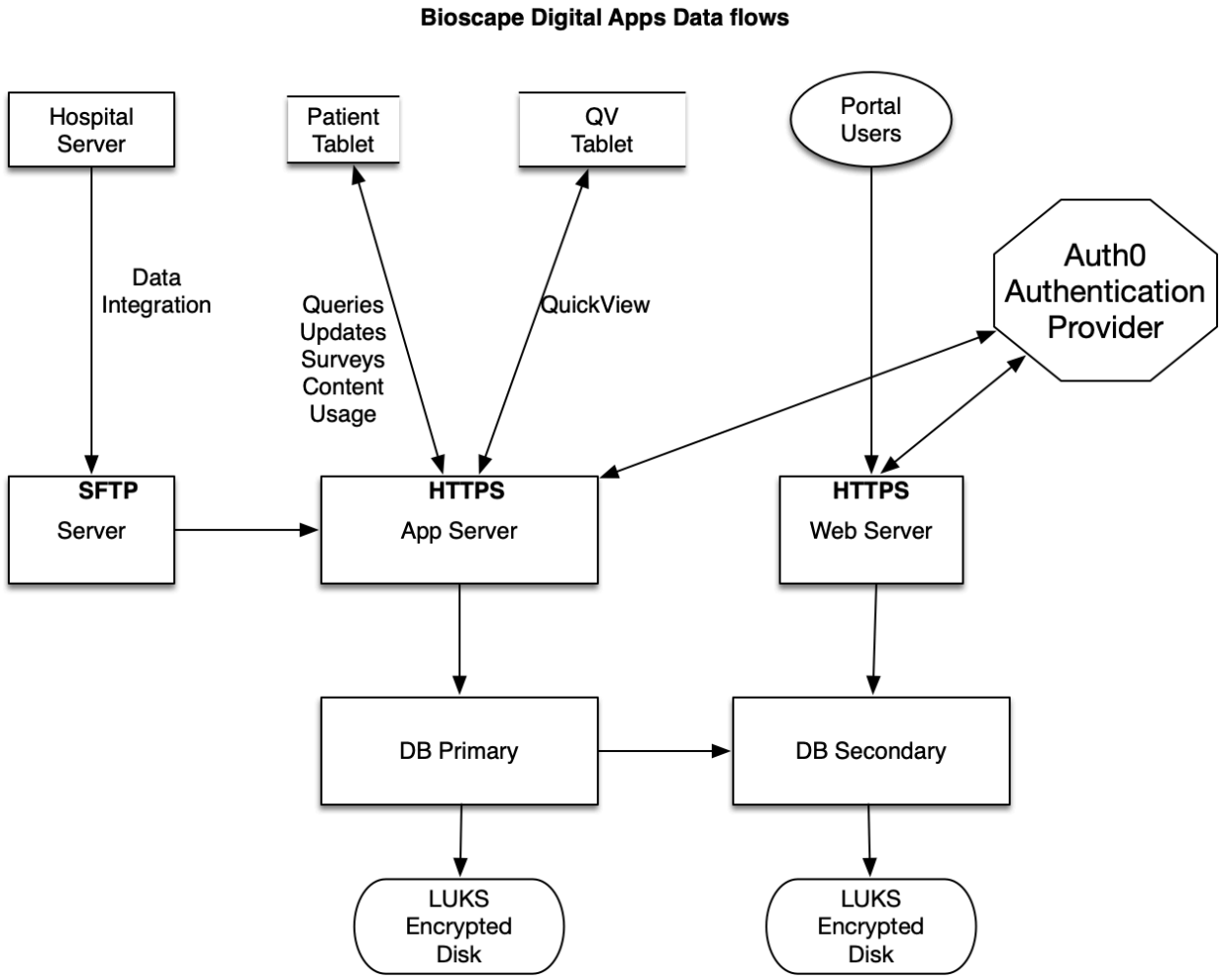
Provisioning - Continuous provisioning of device tracking, tablet deployment, and integrations.

Architecture Overview

High-level architecture diagram *some updates needed here

Bioscape Digital Network Diagram





Server Infrastructure

Tablet Server Stack

Web Frontend - NGINX providing SSL termination and hosting on fixed static IP servers per hospital requirements.
Application - PHP application code deployed separately from other apps/sites via scripted Git. Application versions can be reverted by running deploy scripts.
Operations DB - Main operations database containing device identifiers, locations, build info, assignments, survey results, tracking data, etc. Data older than 14 days is pruned to minimize size.
Replication DB - Hot standby replica of the Operations DB. Used as source for Reporting DB.
Media/Content - Content and media files served to tablets.
Provisioning - Internal system for registering devices and assigning UUIDs/keys with the Operations DB during provisioning.

Client Server Stack

Web Frontend - NGINX for reporting dashboard, user management, etc.
User Management - Auth0 for managing internal and external user access to client-facing apps and data.
Reporting DB - Contains reporting data, may include archived data from Operations DB. Aggregate tables created for reporting.
Reporting Dashboard - Data visualization using Google Charts and custom UI. Data formatted via PHP before sending to the front end.
Quickview - Web/mobile interface for real-time tablet monitoring.
Scheduling Board - Used to manage staff schedules. Uses Firebase Realtime DB for data sync.

Server Deployment

App Server (COBRA): Auth0, NGINX, PHP, Content
Operations DB Server: Operations DB
Reporting DB Server: Replicated Operations DB, Reporting DB
Web Server: Auth0, NGINX

Device Management

Software Components

WX Setup - Java app for provisioning devices on Windows/Linux. Registers IDs, configures software, transfers content.

WX Updater - Primary Android launch app. Checks for updates and verifies software.

WX Utility - Android background service. Checks for updates, runs maintenance, handles reboots.

Firmware Tools - Vendor-provided firmware tools utilized as needed per hardware type.
After provisioning, devices periodically check for configuration, software, and content updates served based on their unique ID.

Startup and Update Process

When the device is powered on, the WX Updater application is launched after Android boot completion. The Updater app performs the following actions:

- Checks connectivity to the WX backend server
- Checks for available updates to the WX Utility service

- Launches the Health Matters primary application
- Sends device tracking data to the server
- Closes after startup tasks complete

The WX Utility background service then runs maintenance tasks including:
- Setting filesystem permissions
- Verifying device timezone
- Clearing application caches

Utility checks for available updates for each installed application, beginning with WX Updater. If updates are available, they are downloaded in the background by Utility. The updates are scheduled to be installed during the next device reboot cycle.

Upon requested or scheduled reboot, the WX Utility service performs the following:
- Installs any downloaded application updates
- Sends tracking data to the server
- Reboots the device

After reboot, the process begins again with WX Updater launch and checking for additional updates.

Device Tracking

Device tracking data is collected by the WX Platform and stored in a MySQL database. The database contains tables to store information such as:
- deviceStatus
- instanceId
- assignedConfig
- inventoryId
- freeSpace
- lastCheckedupdate
- macAddress
- utilityMessage
- deviceMode
- firmwareVersion
- appVersion
- utilityVersion
- launcherVersion
- deviceIp
- internalIp
- deviceTimeReported

- configId
- batteryLife
- batteryState
- savedItems
- useCount

A web interface is provided to view and manage device tracking data. The interface allows administrators to:

- View a list of all registered devices with summaries of status, configuration, and usage statistics.
- Search, filter, and export device tracking data.
- View detailed tracking information for a specific device, or set of devices.
- Remotely configure aspects of devices such as operating mode or status.

The tracking web interface provides both real-time and historical insight into the deployed device fleet for maintenance, troubleshooting, and analytics.

Analytics Dashboard

The analytics dashboard is a customer-facing web interface for organizing, visualizing, and exporting device usage reports and analytics. The dashboard provides insightful charts, graphs, and tables to enable data-driven decision making.
The dashboard includes the following reporting modules:

Marketing Key Views - Tracks and displays key marketing metrics across the device fleet such as impressions, clicks, and conversions and helps identify effective marketing campaigns.

Usage Summary - High-level usage statistics such as number of sessions, average session length, and usage by time of day. Filters available by date, region, facility, and other attributes.

Usage Detail - Detailed usage data at the device level showing applications used, content views, feature adoption, and user behavior.

Customer Feedback - Overview of customer satisfaction scores and trends. Detailed feedback view to analyze specific end user comments, issues, and suggestions.

Education Activity - Tracks learning content usage. Reporting includes content views, assessment performance.

Service Recovery - Captures use of service request features and response metrics.

Opt-Ins - View of permission marketing opt-ins by location and over time.

Rounding Activity - Analytics on provider rounding patterns and effectiveness. Includes visit frequency, patient interaction, and Rounding survey results.

The dashboard provides exporting capabilities via CSV format. The combination of meaningful metrics, visualizations, and raw data extract facilitates analysis of program effectiveness and user value.

End User Device Overview

The Bioscape Digital platform employs a flexible, scalable, and customizable Android-based user experience that is remotely managed and updated by a proprietary suite of tools.
The device interface uses PHP configuration files to control layout, format, and content inclusion. The experience supports various multimedia and interactive content.
Devices can be granularly configured at the hospital system, location, department, and room level. All user interaction and activity on the tablet is securely captured and transmitted to the backend via HTTPS. Activity data is then erased from the device itself at configurable intervals.
Key capabilities include:

Customizable UI - Each device can have a unique interface optimized for its use case and audience. Branding, themes, and components can be adjusted as needed.

Remote Management - Interface layouts, content, apps, and configurations can be remotely updated without user interaction. Provides complete centralized control.

User Analytics - Detailed tracking of feature adoption, content interaction, and overall usage behavior. Enables data-driven engagement.

Security - Device activities are encrypted end-to-end. Sensitive data is automatically wiped from the device on a regular basis. * Separate documentation available for details

As a whole, the proprietary platform enables engaging and secure experiences that can evolve over time based on usage analytics and changing healthcare needs.

Key Platform Features

- Audio/video
- Educational content
- Games

- Web applications
- In-house standalone APKs
- Third party APKs
- Survey/Opt-in collection
- Real-time service recovery
- 3D interactive simulations
- Clinician toolkit
- Patient toolkit
- Rehab scheduling system
- Rounding toolkit
- Around 1500 cataloged “modules”

Tools and Technologies

- Rackspace: DELL PowerEdge R740xd
- VMware virtualization
- Cisco ASA firewall
- Alert Logic Cloud Defender
- Android Studio, Xcode, Visual Studio Code
- Atlassian: Jira, Confluence, SourceTree, Bitbucket
- Zoho CRM
- Adobe Creative Cloud
- Unity, 3DS Max, Modo, Silo
- Google Workspace

- **Backend:**
    Ubuntu 20.04.1
    Nginx 1.18.0
    Php 7.4.2
    MySQL 8.0.34

- **Frontend:**
    Typescript
    Angular
    React
    Android/Java