POWER SOUTH

PITSS America

Troy, MI

http://pitss.com/us

Industry: Software and Services

Power South Energy Cooperative

Andalusia, AL

http://www.powersouth.com

Industry: Utilities

Products & Services:

- Oracle ADF Mobile
- Oracle JDeveloper / Oracle ADF
- Oracle WebLogic Server
- Oracle HTTP Server
- Oracle DB
- SOAP Web Services

Project Scale:

- 6 Developers
- 8 weeks to develop

Credits:

Ross Smith, PITSS America

Martin Disterheft, PITSS America

Oracle Product Management

"Oracle ADF Mobile allowed us to rapidly build the Power South mobile application. With out-of-the-box functionality provided by Oracle ADF Mobile we easily integrated with native device functionality including GPS and camera." – Martin Disterheft, PITSS President

Executive Summary

Power South Energy Cooperative, headquartered in Andalusia, Ala., is an electricity generation and transmission (G&T) cooperative. Power South's field inspectors needed a way to take photographs, collect GPS coordinates, and fill out reports in the field without a laptop. This project was an Oracle Forms modernization effort that would provide support for offline work and data synchronization. Power South chose Oracle ADF Mobile as the development platform for the project because it offered simplified mobile development and easy integration with native device features providing field inspectors with all the functionality required on a mobile tablet. Not only does the application collect rich coordinate and photographic data, it ensures high data quality through an excellent user interface built with an iterative design approach. Power South's inspectors now do their work faster and with higher data integrity, leading to more reliable reporting and business intelligence. Power South's internal team is better prepared to support tablet (iOS) technology going forward.

> *"Leveraging Oracle ADF Mobile, we were able to transition our employees to use new mobile devices (iOS) leveraging the latest device capabilities and allowing for offline work." – Kenneth Jones, Power South Business Applications Supervisor*

Organization

The intended users of the Power South mobile application are inspectors internal to Power South. These inspectors needed the ability to replace the existing paper report and Oracle Forms Application with native device functionality running on an iPad. The ability to collect meter reading data on equipment, take pictures of the equipment, collect GPS coordinates for the location of the equipment and refer to the prior inspection report for each piece of equipment were essential to the solution.

The Business Drivers

Power South had prior experience with mobile devices for data gathering in the field. Their team had previously assembled some impressive Forms-based solutions accessed via handheld Windows laptop computers. However, these machines were an order of magnitude more expensive than iPads and did not provide camera or GPS capabilities. Learning about Oracle ADF Mobile spurred Power South to consider a new iPad-based solution to bring all these needs into one device.

Solution

Power South asked PITSS to propose a new solution with Oracle ADF Mobile, emphasizing that the application required an intuitive, easy to use interface. In addition to the camera and GPS location capabilities, the application had to be easy to use and intuitive for a variety of users. The iPads would need to operate in full daylight, so a high contrast, visually clear layout would be important. Lastly, the application needed to work offline, so it would be necessary to store locally all relevant tables from the server when working in a disconnected mode.

PITSS began by reviewing the existing Forms application and proposing a new

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set of application design wireframes for review. After discussions and review the application wireframes were finalized. (See "Interface Design and Application Views" below for more detail.) The wireframes were used to guide the initial development and once an initial version of the interface was developed, a series of iterative build-and-review steps began. This iterative process would continue until the mobile application was complete.

The following image is the inspection editor screen from the new Oracle ADF Mobile application. The organization of equipment, questions, and answers is easier to see at a glance. The color contrast is stronger and several new features are present. Equipment is grouped by type; questions where problems were found are highlighted with a black-and-yellow stripe icon; and hierarchical questions are displayed inline as the user answers them.

> *"The mobile application interface is so intuitive that our users don't need any training. Thanks go to Oracle ADF Mobile's great components, which let us quickly turn our design plans into reality." – Ross Smith, PITSS Lead Architect*
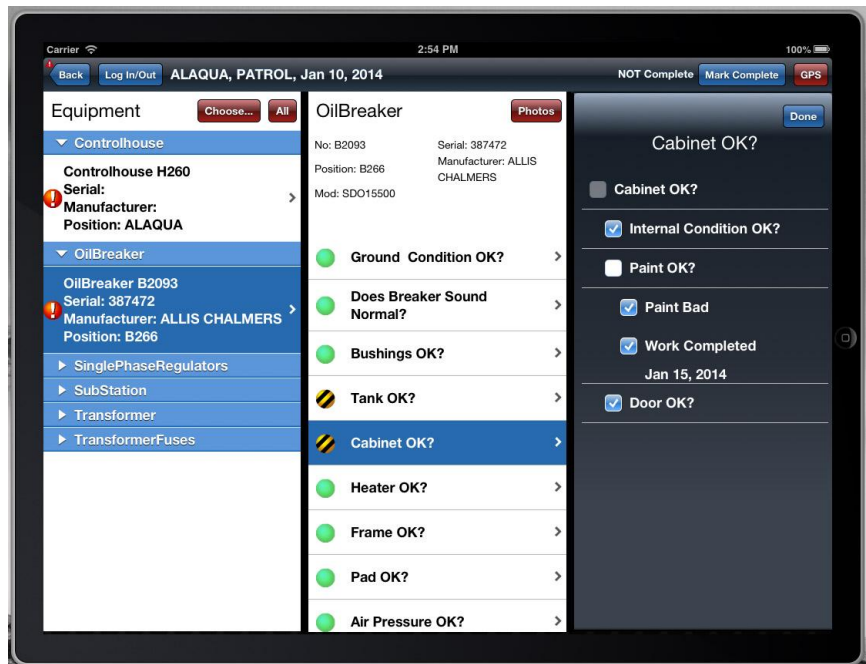
Inspection editor screen from the Oracle ADF Mobile application.
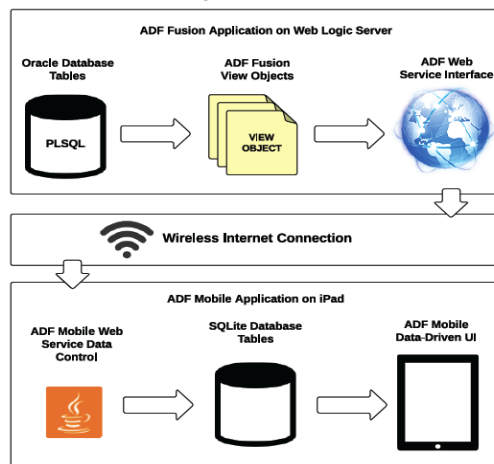
Hardware / Software Architecture

The mobile user interface is an Oracle ADF Mobile application running on an iPad communicating over VPN-secured wireless internet to an Oracle WebLogic server configured for Oracle ADF. The iPads use a VPN client application available from the Apple App Store, configured to connect to Power South's network.

The application had to function when inspectors worked at remote sites without data coverage so an "offline sync" process was required. All the relevant inspection records, equipment tables, photographs, and meter readings had to be stored on the iPad and refreshed and synchronized when a VPN-secured internet connection became available.
This offline mode was accomplished with the following components:
- **Web Service**: The ADF application on the WebLogic server exposed a

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SOAP-based web service to view objects on each relevant entity.

- **Sync User Interface**: When online, the iPad user begins a one-button "Sync" operation to upload all completed inspections to the web service and then download the latest records. This keeps the iPad up to date with server state.
- **Java customization code**: In the Java code, the application leverages the AdfmfJavaUtilities class to programmatically access the web service for this upload/download process. The customization code includes model and collection classes for the record types in the web service. This allows the data to be provided through Java Bean-backed DataControls in the AMX page views.
- **SQLite Encrypted Database**: The Java customization classes interact with a local SQLite encrypted database for persistence. SQLite was deemed the ideal long-term storage method because of its table-based approach and the ability to query data with SQL, mirroring the structure of data in the server and reporting environment where the data originates.

Architecture

Key Software Design Considerations

Configuration driven interface: PITSS developed an innovative approach that allowed them to dynamically show information on a page, based on dynamic requirements. This is used in both list components as well as outside of lists. This provides control over which AMX page elements are shown and when.

Managing photographs: Generically using large images in mobile applications can be costly and influence performance and storage aspects of mobile applications. Images captured as files use up device storage and images captured as Base64 strings are very processor-intensive to show on screen.

To avoid this problem PITSS leveraged the support for using Java in Oracle ADF Mobile and created a Java component to handle Base64 encoding and decoding. A PhotoUtil class handles the logic of capturing photographs with the normal ADF Mobile APIs, writing the files to disk, and updating the relevant data models. The same class is used when synchronizing with the server. It is used to encode image files as Base64 Strings for upload and to decode Base64 Strings from the server to write as local files. With this process, the mobile application is never showing Base64 images or dealing with the upload and download of file attachments.

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### Interface Design and Application Views

The following images show the former Oracle Forms application along with some wireframes of the user interface and the final screens they became.
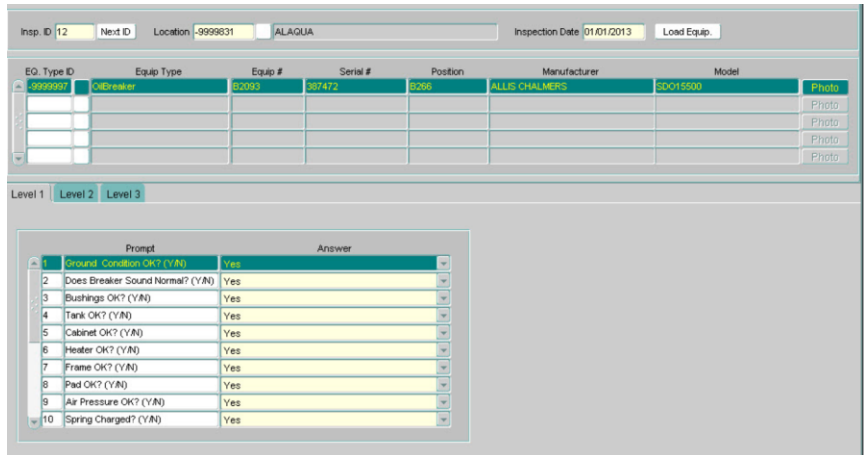

This image is the inspection editor screen from the old Oracle Forms-based application. From top to bottom, users will: select a power sub-station location; select a piece of equipment to inspect; answer the question prompts about that equipment. Some questions are multi-level, requiring further answers in the Level 2 and Level 3 tabs.
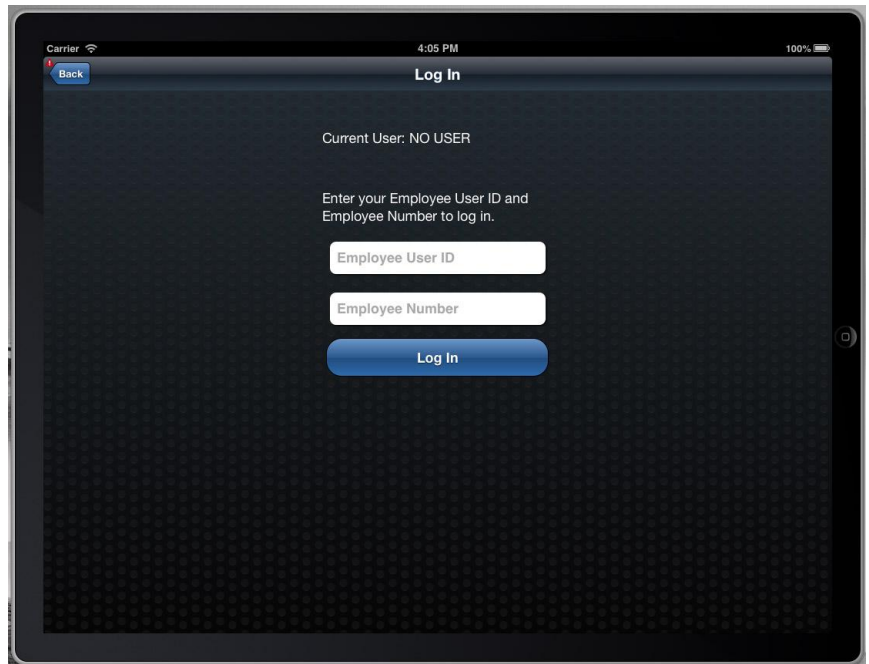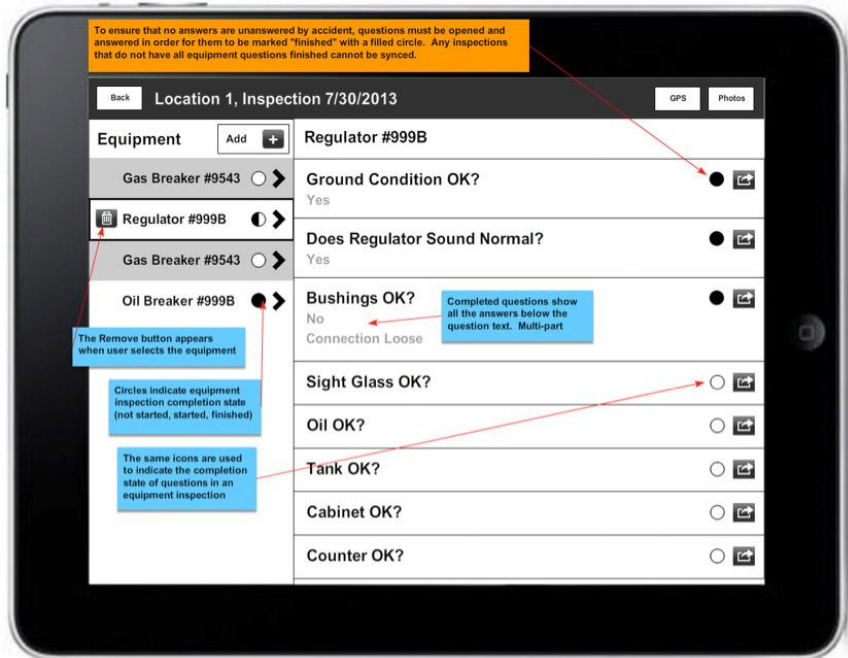

The login screen for the new Oracle ADF Mobile application. Offline sync allows users to login without being online.
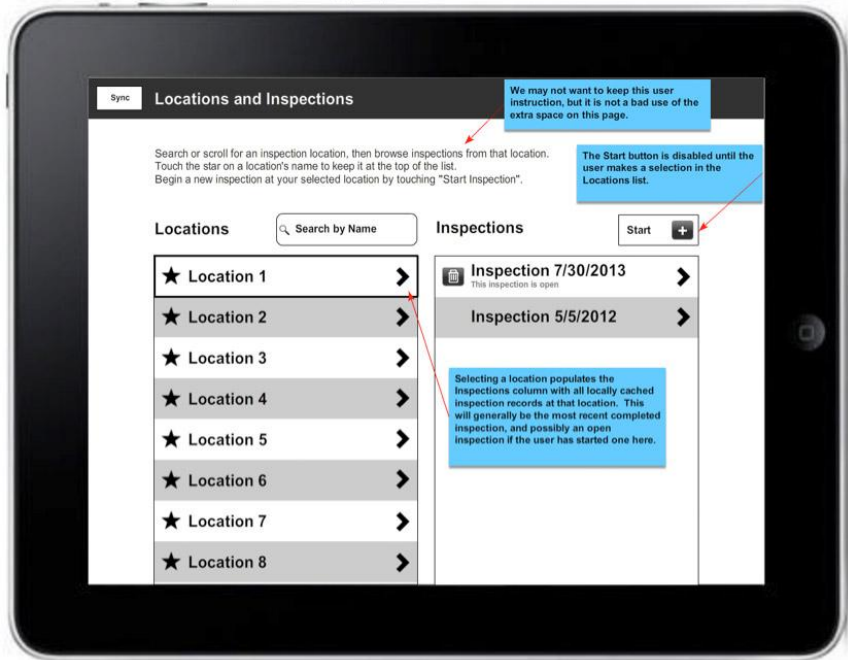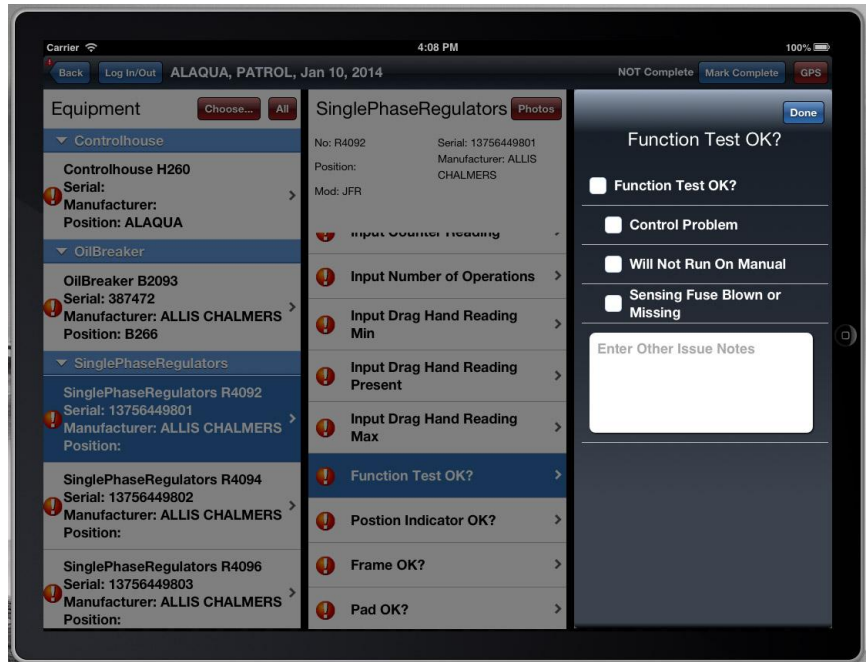
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The wireframe of the location selection page.
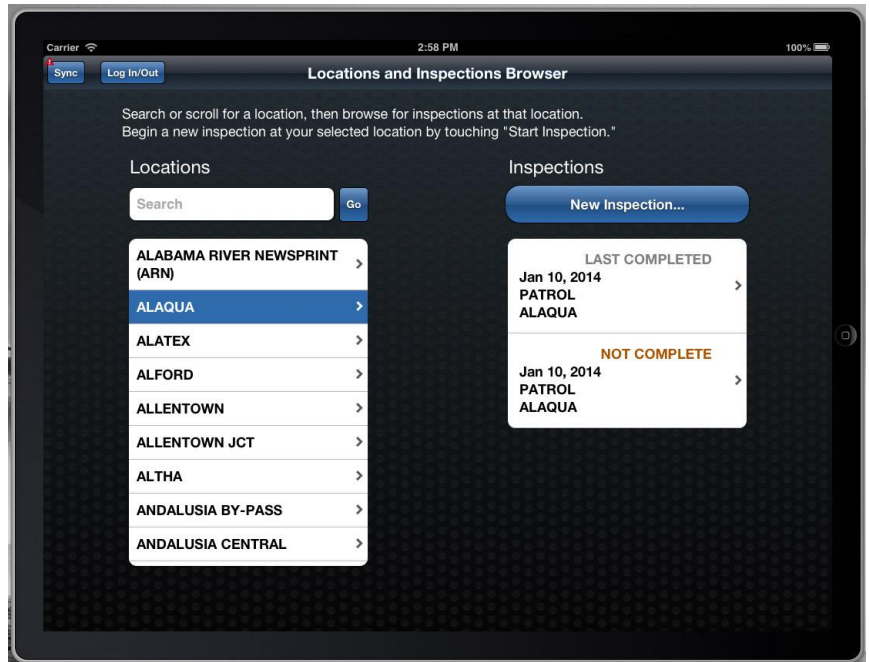
Oracle ADF Mobile location selection page. Here users select which location and inspection they want to view or edit.

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The wireframe of the inspection page.

Oracle ADF Mobile inspection page: Once an open inspection is selected, inspectors progress through each piece of equipment, answering all relevant questions.

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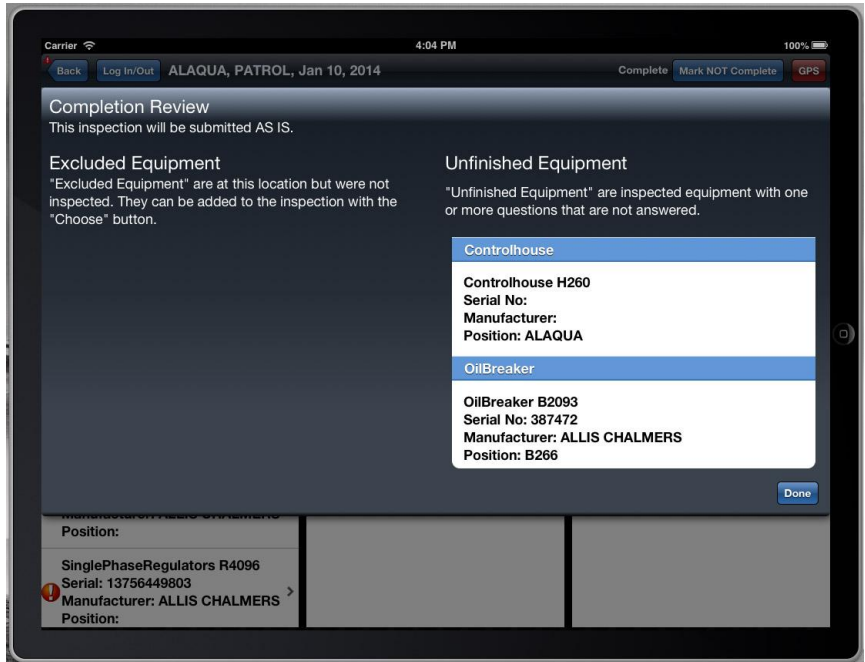
After the inspector is satisfied the inspector marks the inspection complete. A review form appears alerting them to any incomplete items.
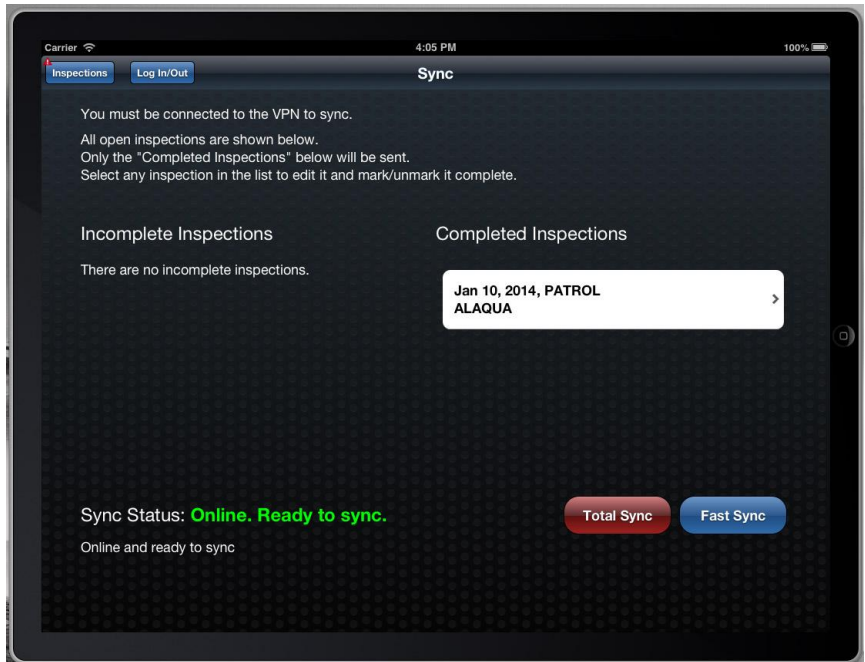
When the user is connected to VPN they go to the Sync screen and choose "Fast Sync" to update quickly, uploading all completed inspections and downloading only the most recently changed data. They may also choose "Total Sync" to dump and reload every remote table relevant to the application.

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About Power South

Power South Energy Cooperative, headquartered in Andalusia, Ala., is a generation and transmission (G&T) cooperative providing the wholesale power needs of 20 distribution members — 16 electric cooperatives and four municipal electric systems — in Alabama and northwest Florida.

About PITSS America

With more than 400 customers across all industry sectors and geographies, PITSS has gained an excellent worldwide reputation and is considered an expert in modernizing and/or developing Oracle Forms or Oracle ADF based applications.

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