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POLKA - WEB MANAGEMENT TOOL FOR TANGO CONTROLS*

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Abstract

Modern control systems often span large, distributed infrastructures, and managing them requires tools that are intuitive to use and not tied to any single operating system. Polka was developed to meet this need as a lightweight web-based management tool for the TANGO Controls framework. It provides a user-friendly web interface for administering multiple TANGO control databases and managing device server processes (via TANGO "Starter" instances), along with organizing those servers into branches and configuring their pooling settings (through a pooling manager, profiler, and thread manager). Polka is built with a modern web technology stack – a React front-end and a WebSocket-based backend (using TangoGQL) – to deliver a responsive, real-time management interface accessible from any standard web browser. Unlike earlier desktop-based TANGO management tools (such as the legacy Astor application), Polka requires no client-side installation and is accessible on any platform for both administrators and operators. In line with conference guidelines, the content here is structured accordingly and uses the recommended numeric citation format.

COMPARISON WITH EXISTING TOOLS

Astor has long been the standard tool for TANGO Controls administration. It is a desktop application (Java GUI) that allows basic tasks like starting/stopping device servers and viewing their status. However, Polka introduces several improvements over Astor in functionality and usability. First, Polka is entirely web-based [1], so it eliminates the need to install a dedicated client program – users can manage the control system from any browser, which greatly improves platform independence. Polka also supports multiple TANGO databases simultaneously, a capability aimed at large or multi-site installations that was not available in Astor's single-database scope. In addition, Polka allows editing and configuring Starter processes in ways Astor did not: for example, users can rename server branches and even move device servers (or entire Starter instances) between branches to reorganize the control system layout. These features reintroduce and expand management functions (branch migration, Starter editing) that had been limited or absent in Astor's GUI. Polka further provides new tools for pooling management – it can configure device server pooling, profile pooling performance with visual charts, check pooling status, and manage pool threads – whereas Astor offered only basic pooling controls. Moreover, Polka includes modern monitoring dashboards for live statistics on Starters and servers, giving operators real-time insight into system health (an improvement over Astor's static displays) [2]. Importantly, because of its web-based nature, Polka is well-suited for today's distributed and cloud environments: it can be used to manage TANGO control systems deployed in the cloud or on Kubernetes clusters, where running a desktop GUI like Astor is not practical. In summary, while Astor remains useful for basic diagnostics, Polka preserves those core management capabilities and extends them with a scalable, modern web interface tailored to the needs of current distributed control systems [2].

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KEY BENEFITS OF POLKA

Polka offers several clear benefits over traditional TANGO management tools.

Modern Web UI and Usability

Polka features a refreshed web-based user interface with various intuitive design enhancements for better usability [2]. Operators can access the system via a browser (Fig. 1), avoiding the quirks and limitations of older Java GUIs. The web UI makes it easy to visualize system status and perform administrative tasks from anywhere on the network.

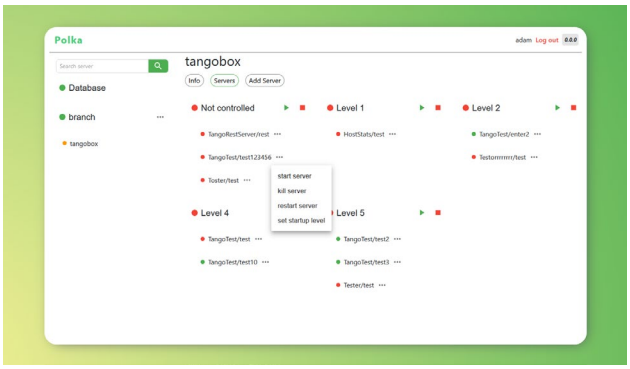

Figure 1: Start / Kill / Restart server.

Platform Independence

Because Polka runs entirely on a server and communicates through standard web protocols, there is no need to install any client application. This means it works uniformly across different operating systems and devices. Administrators can simply open Polka in a browser on Windows, Linux, or macOS and have full functionality, which lowers the barrier to use and deployment.

Multiple Database Support

Unlike Astor which traditionally manages one TANGO database at a time, Polka can connect to and administer multiple TANGO databases from one interface. This is

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especially beneficial for large research facilities or collaborations that maintain separate TANGO databases – Polka allows centralized oversight of all those control domains in one tool.

Real-Time Operation via WebSockets

Polka leverages WebSocket communication (through TangoGQL) to push updates to the UI in real time [2]. Any changes in device server status or other metrics are reflected immediately on the interface without manual refresh. This event-driven, real-time design enables faster diagnostics, and a more responsive control experience compared to polling or refresh-based tools.

Enhanced Monitoring and Pooling Tools

The application introduces comprehensive pooling configuration and monitoring features that were not present before. Users can configure how device servers are pooled (grouped into processes/threads), profile the performance of these pools with dynamic charts, and manage pooling threads directly [2]. Polka also provides updated statistics dashboards, giving a live overview of Starter status and device server health (such as uptime, errors, or resource usage) at a glance [2]. These improvements help operators quickly identify and address problems, thereby improving overall operational efficiency.

ARCHITECTURE

Polka's architecture follows a modern web application model (Fig. 2). The front-end is built with React (using TypeScript) to create a dynamic single-page application interface.

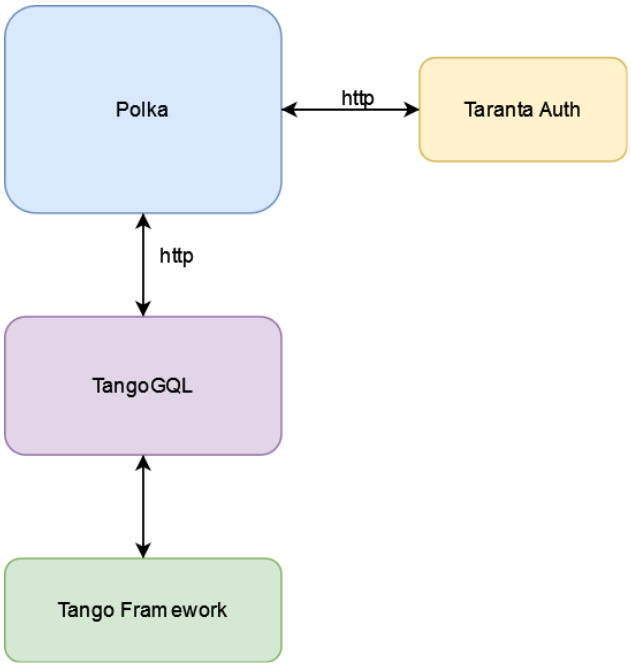

Figure 2: Architecture.

The back-end communicates with TANGO control system services via TangoGQL over WebSockets, enabling bidirectional real-time data flow between the browser and the TANGO database/devices [2]. This design ensures that the UI remains in sync with the live system state (for example, if a device server's status changes, the update is sent instantly to the browser). The use of WebSockets and GraphQL (TangoGQL) means that clients can subscribe to specific data (like device server health, logs, or property changes) and receive updates only when things change, which is efficient for distributed systems. The Polka application is structured to be modular and maintainable, so new features or support for future TANGO developments can be added easily [2]. It is also designed for integration with existing scientific infrastructure – for instance, it can be deployed on a central server or in the cloud and interface with the facility's TANGO databases securely. This architecture not only makes Polka responsive and fast, but also convenient to deploy in various environments (from local control room networks to cloud-hosted setups).

CORE FEATURES

Polka provides a rich set of features for daily control system management. It preserves all crucial functionalities that existing users expect (starting/stopping device servers, configuring startup, etc.) while adding a multitude of improvements. Polka's support for multiple databases and its web-based deployment also make it well-suited for distributed control systems or modern containerized environments. For example, one can deploy Polka on a server in the cloud and oversee a TANGO control system remotely, something that was cumbersome with traditional GUI tools. This broad feature set and flexibility highlight Polka's value for facilities aiming to modernize their control system operations.

Multi-Database Management

Polka can connect to several TANGO databases at once and display or manage devices across all of them. An administrator can switch between different TANGO control systems or even perform operations on multiple systems from the unified Polka interface (Fig. 3). This is particularly useful for big installations or federated deployments where multiple TANGO instances are in use (for example, different labs or divisions).

Starter and Branch Management

The tool makes it easy to manage TANGO Starter processes, which are the device server launchers on each host. Users can create and register a new Starter in a Tango database (for a new host machine), edit the properties of existing Starters (such as their startup configuration), and even remove or disable them if needed. Polka also enables organizing device servers into logical branches under each Starter. It adds the ability to rename these branches and to move device servers between branches through the interface. This flexibility means administrators can reorganize how device servers are grouped and started without manual database edits. Such branch management features were reintroduced in Polka to give finer control, which helps when restructuring or scaling the system.

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Pooling Configuration and Profiling

Polka introduces powerful features for managing pooled device servers. In TANGO, pooling allows multiple device server instances to run in a shared process or thread pool for efficiency. With Polka, administrators can configure pooling settings for servers (assign servers to pools, define pool sizes, etc.) through a dedicated UI. It also includes a Pooling Profiler tool with graphical charts that show the performance of pooled device servers (for example, monitoring response times or resource usage of the pool). Additionally, Polka provides a pool thread manager and a status checker to examine the state of each pool in real time (e.g. how many threads are active). These pooling-focused tools are invaluable for optimizing and debugging the performance of large TANGO installations that make heavy use of device server pools.

Live Statistics and Dashboards

To improve observability, Polka offers built-in dashboards displaying live statistics of the control system. Users can view metrics for each Starter (such as how many device servers it's running, their uptime, and any error states) and overall device server statistics aggregated by branch or by host [2]. The interface uses interactive charts and updated visuals to make spotting anomalies easier – for instance, a sudden crash of a device server or high load on a Starter would show up in real time on the dashboard. This level of system insight was not readily available in older tools, and it helps operators and system administrators to proactively maintain system health.

CONCLUSION

Polka represents a significant step forward in managing TANGO Controls systems by combining the convenience of a web application with the power of TANGO's native management capabilities. It effectively bridges the gap between the robust but aging desktop tools and the needs of today's large-scale, distributed installations. By providing real-time, platform-independent access to device server management, Polka improves the efficiency of control system administration and reduces the effort required to keep complex installations running smoothly.

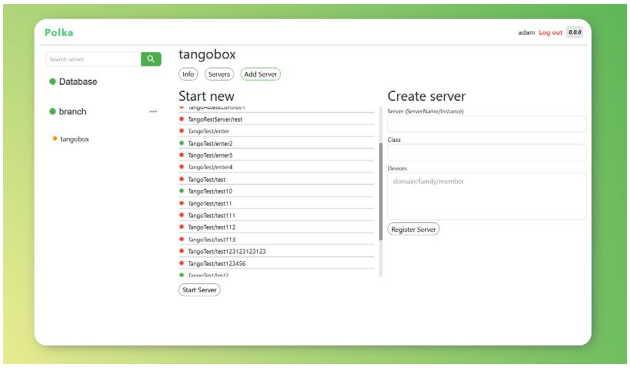

Figure 3: Multi-database manager.

This project has been developed by S2Innovation, a company specializing in control system integration and software development for Big Science laboratories, with a particular focus on the TANGO ecosystem. S2Innovation is an active contributor within the TANGO Controls community and has created Polka as part of its mission to modernize managing device server for scientific and industrial users. Moving forward, the Polka project is open to collaboration and feedback from the community. The team welcomes partners who are interested in using Polka. In fact, S2Innovation encourages interested scientific facilities to get in touch to jointly shape Polka's future enhancements and ensure it continues to meet the evolving needs of TANGO-based facilities. With continued development and community collaboration, Polka could become the new standard for TANGO Controls management, fostering a more accessible and scalable control environment for all users.

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