LaaS: Open Source Evaluation

1 Introduction
- 1.1 Document Purpose
- 1.2 Intended Audience

2 Feature List
- 2.1 List of LaaS features
  - Service Requests
  - Change Management
  - Connection Management
  - Inventory Management
  - Asset Management
  - Process Automation
  - Blueprint Orchestration
  - Capacity Management
  - Reservation Management
- 2.2 Source of the feature list

3 Tools Evaluation
- 3.1 Existing tools
- 3.2 Key considerations while evaluating the open source tools
- 3.3 List of available Open Source tools
  - 3.3.1 Service Requests/Change Management
  - 3.3.2 Connection Management
  - 3.3.3 Inventory Management/Asset Management
  - 3.3.4 Process Automation
  - 3.3.5 Blueprint Orchestration
  - 3.3.6 Reservation Management

4 Our recommendations

5 Next steps

1 Introduction

1.1 Document Purpose

Below is the main intent of the document:

1. To evaluate the various open-source tools available to deliver the identified features for LaaS.
2. To recommend the best open-source tool out of the available options.

1.2 Intended Audience

This document is intended as a reference document for the following set of people:

- Automated LaaS Team
  - Product Owner
  - Architects
  - Developers
- Lab Managers
- Lab Users

2 Feature List

2.1 List of LaaS features

Below is the list of features that need to be covered under LaaS solution with the help of open-source tools:

1. ### Service Requests

   Service Request module is responsible for handling the service requests and incidents raised in the lab. Service requests are primarily of the following type:

- Creating connectivity requests between different lab areas
- Enabling access or reserving some test equipment and tools
- Creating and Provisioning specific test-setups (blueprints) that range from standardized setups to more project-based and specialized configuration

2. ### Change Management

   Change management application provides a systematic approach to control the life cycle of all changes, facilitating beneficial changes to be made with minimum disruption to the lab services.The scope of change management can be summarized as below:
   - Prioritization
   - Scheduling
   - Roll out plan
   - Recovery or Back up plan

3. ### Connection Management

   Connectivity solutions between multiple location labs will be provided.
   It may include the following tasks:
   - IP address assignment and management
   - VPN alignments of connection
   - Security alignment – Firewall configuration and security design
   - Routing request - L3 routers configurations
   - Switching request – L2 switches configuration
   - Cabling

4. ### Inventory Management

   Inventory management system is used for managing the resources in the lab. The resources include all hardware, software and network assets in the lab.
   The major functions of inventory management are as follows:

   - Asset discovery: Scan, discover and update assets
   - Asset life cycle management: Contracts and license agreements
   - Asset reporting and alerting: Triggering the procurement and reconciliation

5. ### Asset Management

   Asset management system is used managing the lab assets. This may include all hardware, network assets, software, licenses, etc.

6. ### Process Automation

   This takes care of the automatic provisioning of network resources required for services.It helps to improve the productivity and efficiency of lab usage by isolating the lab complexities from the lab user.

7. ### Blueprint Orchestration

   It is an intuitive drag and drop graphical editor in the portal is used to develop test topologies by the lab users. The topology editor function houses a database of all managed lab resources.
   The major functions of Blueprint Orchestration are as follows:
   - Blueprint model creation
   - Creates a graphical virtual image of the connections
   - Create a bi-directional connection between lab devices
   - Mapping of blueprint to actual resources

8. ### Capacity Management

   Capacity Management is the allocation of interfaces or links amongst different labs and network elements.

9. ### Reservation Management

   This module is responsible for the allocation of resources to a particular request/user as selected in the blueprint . The lab resources in the Central Inventory Database are presented to the users for booking.

2.2 Source of the feature list

The features that need to be covered using open source tools for LaaS have been identified using the below references:

- LaaS Feature List

3 Tools Evaluation

This section would help us to evaluate the various open source tools available to accommodate the feature we would need to cover under LaaS. Also, it has information about the existing tools that are currently being used in Bonn and Nuremberg.

3.1 Existing tools

The table below contains list of existing tools used in the Lab for the features required in LaaS:

Feature	Bonn	Nuremberg
Service Requests	ngWORM	ngWORM + GARD
Change Management	Sharepoint	Sharepoint
Connection Management	ngWORM	xls sheet
Inventory Management • Discovery • License Management	ngWORM has the complete list of technical resources. No tool for discovery. Patchtool is being used for cabling documentation e2e.	FNT Command and jdisc ALM for license management
Asset Management	ngWORM- Bookable resources database. No tool based solution for license management	SAP, FNT Command in conjunction with Jdisc ALM for license management
Process Automation • Backup and recovery • Ops-task automation	B&R: solarwinds for network elements OPS: Automation Services Factory	B&R: solarwinds for specific network elements OPS: Automated
Blueprint Orchestration	NA	Spirent Velocity
Capacity Management	ngWORM	FNT Command + CheckMK
Reservation Management	NA	ngWORM

Source: LaaS Feature List

3.2 Key considerations while evaluating the open source tools

While evaluating the open-source tools for the identified features, below criteria have been kept in consideration:

1. Open-source license type should not be GPL (General Public License).
2. Scalable for future requirements.
3. Flexible and easy to integrate with other tools and system.
4. Documentation availability for installation and usage.
5. Support available from community.

3.3 List of available Open Source tools

The table below covers the list of features required for the LaaS solution, feature Coverage and evaluation details for the various available open source tools:

Legends:

Coverage	Approximate %
COMPLETE	91% - 100%
HIGH	76% - 90%
MEDIUM	26% - 75%
LOW	0% - 25%

Feature List	Option 1	Option 2	Feature Coverage	Comments
Service Requests	Bugzilla	Trac	**COMPLETE**	Detail
Change Management	Bugzilla	Trac	**COMPLETE**	Detail
Connection Management	Netbox		**COMPLETE**	Detail
Inventory Management	inoERP	Openboxes	**HIGH**	Detail

Asset Management	inoERP	Openboxes	**HIGH**	Detail
Process Automation	Chef	Puppet	**HIGH**	Detail
Blueprint Orchestration	Cloudify		**HIGH**	Detail
Capacity Management	Booked		**HIGH**	• Open source tools are available with GPL license only.- Detail • Inputs are also requested from Software Architect for the suggested tool. • Previously handled using ngWORM tool
Reservation Management	Booked		**HIGH**	

3.3.1 Service Requests/Change Management

Tool Name	**Bugzilla**	**Trac**
Features	• Web based architecture • Mobile app available • API available • Email Notification • Customizable workflow and fields • Indexed full-text search • Integrated reports and charts • Capable of handling large projects	• Web based architecture • Mobile app available • API available • Email Notification • Customizable workflow and fields • Inbuilt reporting • Integrated wiki • Version control system is handy
Technology	Perl	Python
Data sources and integrations	MySQL, Oracle, PostgreSQL, SQLite	SQLite, PostgreSQL, MySQL
Operating systems	• Linux • OS X • Windows	• FreeBSD • Linux • NetBSD • OS X • Windows
Authentication mechanism	Password, LDAP, Radius	Password, LDAP
Input interfaces	Web, Email, GUI, CLI, API,	web, Email
Plugin/APIs available	Yes, multiple plugin available	Yes, many plugins available
Community	Strong, Mozilla Public License	Medium, BSD license
Documentation	High	High
Limitations	• Tough to install on non-Linux platforms • It is hard to manage the logged in errors • Bug numbers are unique in a particular installation.	• No Indexed full-text search • Not capable to handle large projects
Links	• https://www.bugzilla.org/ • https://www.bugzilla.org/docs/ • https://github.com/bugzilla/bugzilla	• https://trac.edgewall.org/ • https://trac.edgewall.org/wiki/TracGuide • https://github.com/edgewall/trac

Other open source tools evaluated having GPL license are Redmine, MantisBT, Combodo ITOP, etc.

3.3.2 Connection Management

Tool Name	**Netbox**

Features	• IP address Management • Exposed REST APIs • Virtual Routing and Forwarding • Caching for performance improvement • Change Logging • Supports rest API • Token-based authentication.
Database supported	PostgreSQL database
Technology	Python
Authentication	LDAP authentication
Community	Apache 2.0, strong
Documentation	Medium
Limitations	• No Network monitoring • No DNS and RADIUS server • No Configuration management • No facilities management
Links	• https://netbox.readthedocs.io/en/stable/ • https://github.com/netbox-community/netbox

Other open source tools evaluated having GPL license are phpIPAM, RackTables, etc.

3.3.3 Inventory Management/Asset Management

Tool Name	**inoERP**	**Openboxes**
Features	• Dynamic Pull Based System • Custom Report Builder • Multi-Device Usage • in-Built CMS & Collaboration • Flexible Architecture	• Stock movements • Inventory Tracking • Dashboard • Reporting • Permission levels by role • Email notifications • Record metadata required for proper handling of particular items. • Supports API
Supported OS	• Cross-platform	• Ubuntu 14.04+ • Mac 10.6+ • Windows 10 • Ubuntu • Docker
Database supported	Oracle 12c, MariaDB, MySQL	MySQL
Technology	PHP, JavaScript	Grails, Spring, Hibernate, REST API
Authentication method	Sessions	Cookies
Community	Low, MPL 2.0	Medium, Eclipse Public License 1.0
Documentation	Medium	High
Limitations	• Limited records can be uploaded in a single transaction • High complexity	Paid features: • Cloud hosting • On-Premise solution • Monitoring • Backup

Links	• http://inoideas.org/ • http://inoideas.org/content.php?content_type=documentation&category_id=30 • https://github.com/inoerp/inoERP	• https://openboxes.com/ • https://openboxes.readthedocs.io/en/develop/ • https://github.com/openboxes/openboxes

Other open source tools evaluated having GPL license are Odoo, PartKeepr, erpnext, dolibarr, etc.

Note: We can use Netbox as inventory management tool to reduce the integration effort as it will be used for the feature "Connection Management" as well but it does not have capabilities like Asset discovery, Asset reporting and alerting, etc.

3.3.4 Process Automation

Tool Name	Chef	Puppet
Features	• Application Deployment • Infrastructure Configuration • Network configuration management • Code-driven approach and has greater flexibility and control of configurations • The “Knife” tool lessens installation headaches • Provides extensive collection of configuration and module recipes • High scalability	• The complete User Interface • Powerful reporting capabilities • Grants access to a well-established support community • High scalability • Scaling-up and scaling-down of machines dynamically • Provide centralized control over all machines • Any changes made in the configuration can be easily propagated to all related machines
Technology	Ruby	PuppetDSL
Availability	If primary server goes down, a backup server takes up the slack.	Incorporates a multi-master architecture
Platform supported	AIX, RHEL/CentOS, Solaris, Ubuntu, and all Linux flavors	• Microsoft Windows Server, CentOS, Linux or Oracle Enterprise • Ruby need to be installed
Interoperability	High	High
Ease of Setup/Management	Complex	Complex
Key Concept	Recipes and cookbooks	Manifests and modules
Methodology	Uses an imperative language.	Uses a declarative language
Community	Strong, Apache 2.0	Strong, Apache 2.0
Documentation	High	High
Limitations	• Does not support push functionality • Knowledge of Ruby and procedural coding is must • Steep learning curve • High complexity	• Support for pre-Ruby versions is in the process of being scaled back • Its model-driven approach and has less control of configurations • Advanced tasks require CLI • Requires knowledge of Ruby at later stage
Links	• https://www.chef.io/ • https://docs.chef.io/ • https://github.com/chef/chef	• https://puppet.com/ • https://puppet.com/docs/ • https://github.com/puppetlabs/puppet

Other open source tools evaluated having GPL license are Ansible, Rudder, etc.

3.3.5 Blueprint Orchestration

Tool Name	Cloudify
Features	• TOSCA-Based Blueprint Modeling • Drag-And-Drop Graphic Editor • Access and Manipulate Data Using Templates • Custom Widgets • Snapshot Creation and Restoration • Role-Based Access Control • Tenant Management • Orchestrate Network Functions Virtualization Infrastructures • Virtualize and Orchestrate Your Infrastructure Incrementally
Technology	Python, YAML, TOSCA
Authentication	LDAP
Platform supported	• Windows • Linux • Mac • Web-based
Deployment	• Cloud Hosted • Open API
Integrations	• Google Cloud Platform • Docker • Kubernetes • Amazon Web Services • OpenStack • Microsoft Azure • ELK-Stack
Community	Strong, Apache 2.0
Documentation	High
Limitations	• Complex UI • Complex installation and configuration • Complex learning curve
Links	• https://cloudify.co/ • https://docs.cloudify.co/5.0.0/

Other tools evaluated are yfiles, ONAP, etc.

3.3.6 Reservation Management

Tool Name	booked
Features	• Integration with Outlook® and Google® Calendar • Limit and control resource usage with a flexible rules and quota system. • Check in and out for accurate tracking • Display real-time availability • Flexible reporting system • Powerful open API • Integrated payment and credit system • Intutive click and drag schedule view
Technology	PHP 5.5+
Database supported	MySQL 5.0+

Authentication	LDAP and Active Directory support
Platform supported	• Windows • Linux • Mac
Community	Medium, GPL license
Documentation	High
Limitations	• Available with GPL license only • No inbuilt alert engine
Links	• https://www.bookedscheduler.com/ • https://www.bookedscheduler.com/help

Other open-source tools evaluated having GPL license are Booked Scheduler**,** seantis.reservation, Rapla, etc.

4 Our recommendations

The table below contains the recommendation for the tools based on the evaluation performed above.

Feature List	Recommended Tool
Service Requests	Bugzilla
Change Management	Bugzilla
Connection Management	Netbox
Inventory Management	inoERP
Asset Management	inoERP
Process Automation	Puppet
Blueprint Orchestration	Cloudify
Capacity Management	Booked (GPL License)
Reservation Management	Booked (GPL License)

Ref. : LaaS Open Source tools ratings

5 Next steps

- Lab architect to provide a list of open source tools in use at DT for the above-mentioned objectives, if any.