TSI CloudShell Capabilities for
White Paper Submission

Scope

Since infrastructure orchestration and automation can apply to hundreds of use cases (cyber ranges, data centers, SDN, SD-WAN, NFV, test automation, application migration, DevOps, DecSecOps, regression analysis, HPC, etc.), this document will list an overview of the basic capabilities of TSI's CLOUDSHELL solution. What CLOUDSHELL does is as simple as automating and tracking any network centric asset and operation while seamlessly merging physical and virtual worlds. It's the 'how' CLOUDSHELL does it that demonstrates the value.

Technology and Functionality Overview

The following outlines primary capabilities of CLOUDSHELL's Orchestration and Automation Platform product regarding an enterprise wide methodology for provisioning of IT resources (physical and virtual), automation of IT networks and processes, and aggregation of all network data into a unified, query-centric database.

The capabilities are broken into the following functional areas:

1. Enterprise and Network
2. User Environment
3. Technical
   a. Resource Provisioning
   b. Automation
   c. Data Aggregation
4. Virtualization

1. Enterprise and Network
   1.1. CLOUDSHELL provides a framework approach that allows both local and enterprise users to traverse the entire network lifecycle – creation, provisioning, execution, analysis, and maintenance.
   1.2. CLOUDSHELL provides an environment that allows LAN and WAN sharing of IT resources, network IP, and results data in either a local or distributed environment.
   1.3. CLOUDSHELL provides a centralized control service that allows dynamic allocation of creation and execution stations while maintaining awareness of all resources available.
   1.4. CLOUDSHELL utilizes MS-SQL Server as the central database repository for all system, provisioning, network, logging, and report data.
   1.5. CLOUDSHELL supports all Technical requirement areas (Resource Provisioning, Network Automation, and Data Aggregation) and has a consistent user interface between these areas.
   1.6. CLOUDSHELL is delivered in a client-server configuration.
   1.7. CLOUDSHELL is scalable from 1 to thousands of users.
   1.8. CLOUDSHELL is vendor agnostic in the utilization of:
      1.8.1. IT equipment
      1.8.2. Network equipment control APIs
      1.8.3. Test equipment
      1.8.4. Reuse of existing network scripts
      1.8.5. Proprietary or custom equipment and network processes
      1.8.6. Virtual or physical assets
      1.8.7. Open Stack and Open Flow

1.8.8. Public and Private Clouds

1.8.9. Software Containers

1.9. CLOUDSHELL allows for and enforces project enclaves, with user and group privileges control and enforcement within those domains through manual and automated methods specifically supporting AD/LDAP/SLDAP implementations. CLOUDSHELL supports tenacity security controls such as SSO, SAML, TLS and other standards.

2. User Environment

2.1. CLOUDSHELL provides a web portal client that allows for scheduling of topologies (sandboxes), networks, and devices (physical or virtual) that are sharable across different user domains and systems.

2.2. CLOUDSHELL provides automatic conflict management of resources for more efficient use of devices (physical or virtual) and networks.

2.3. CLOUDSHELL provides a drag and drop, technician level interface for all tasks and does not require specific programming skills.

2.4. CLOUDSHELL allows automatic capture and replaying of console and GUI actions via embedded tools to allow non-programmers to easily build and maintain custom automation and control of network assets.

2.5. CLOUDSHELL allows automatic capture and replay embedded capability to allow non-programmers to easily automate existing manual networks.

2.6. CLOUDSHELL allows reuse of all network IP as easily defined asset modules.

2.7. CLOUDSHELL allows variables to be used in place of hard coded parameters and provide real time communication of the status of these variables.

2.8. CLOUDSHELL allows co-execution of both manual and automated networks.

2.9. CLOUDSHELL allows execution of both serial and parallel network scenarios from multiple concurrent users.

2.10. CLOUDSHELL provides means of having both shared and local resources to encourage team development efforts as well as allowing individual contributions.

2.11. CLOUDSHELL provides a user environment that requires a minimum of user training to create and execute scenarios in the Technical requirement areas.

2.12. CLOUDSHELL has out of the box integrations for HP QC, IBM RQM and SVN.

2.13. CLOUDSHELL supports multiple sandbox instantiations as well as multiple user sharing of sandboxes and the resources within the sandbox.

3. Technical

3.1. Resource Provisioning

3.1.1. CLOUDSHELL provides an automated environment that provides for persistent monitoring of the IT configuration, creation of network and IT topologies, and automated resource management and scheduling via a schedule-based reservation management environment.

3.1.2. CLOUDSHELL provides visibility to management to view in real time the status of resources and the ability to reallocate resources as needed to meet the goals and demands of networking initiatives.

3.1.3. CLOUDSHELL provides control of the network resource topology from within the library of network functions to allow full configuration management.

3.1.4. CLOUDSHELL provides automatic generation of report data that is populated in the central repository for viewing and analysis.

3.1.5.   CLOUDSHELL provides real time capability to create, reserve, and deploy network topologies (sandboxes) via an intuitive GUI environment or through an API as needed.

3.1.6.   CLOUDSHELL has the ability to query the network to automatically create resource models of the network devices with their applicable attributes.

3.1.7.   Specifically, CLOUDSHELL provides:

3.1.7.1.   An environment where all resources are managed by a central service but can be dynamically allocated based upon user defined criteria as well as resource availability.

3.1.7.2.   User definable resource models, families and structures with user defined parameters (attributes) as well as viewing protection for password attribute types. Users can define the device, connections and attributes of any resource in the network.

3.1.7.3.   Out of the box integration with Layer 1 switches from all major vendors with the ability to automatically calculate paths as well as either hide or show paths.

3.1.7.4.   Out of the box integration with major network hardware vendors: Ixia, Spirent, GL Communications, Abacus, Apcon, MRV, NetScout, Calient, Polatis, and others.

3.1.7.5.   Out of the box integration tools for custom or proprietary devices.

3.1.7.6.   Drag and drop IT topology creation (blueprints) with either user defined resource allocation or abstract allocation which allows the system to determine the optimal provisioning of network connectivity and configuration.

3.1.7.7.   The ability to support and share local and enterprise network assets.

3.1.7.7.1.   Specific network assets (devices) supported include: Cisco, Juniper, NetScout, Calient, MRV, GE IEDS, ABB, SEL, JDS, Brocade, Eaton, HP, EMC, Dell, VMWare, TinTri, and many more (please request specific manufacture and model if not listed).

3.1.7.7.2.   Any unique or unsupported asset can be easily integrated into CLOUDSHELL via either a graphical driver builder or Python scripting (user's choice).

3.1.7.8.   Resource monitoring to determine equipment location, configuration, availability, and utilization.

3.1.7.9.   Built in Power Control of devices (with Power Management Units) to provide 'green' command/control of devices in the network.

3.1.7.10.   Resource maintenance for applying configuration upgrades, power on/off sequences, and other maintenance items.

3.1.7.11.   Representation of physical cable runs through patch panels and intelligent patch panel support in a mixed environment of Layer 1 Switches and/or patch panels.

3.1.7.12.   Ability to customize without coding/programming to add device specific custom commands. These become context sensitive commands based on the needs of the provisionary and the device type.

3.1.7.13.   A reservation and scheduling service that allows:

3.1.7.13.1.   Easy to use web-based scheduling interface.

3.1.7.13.2.   Drag and drop reservations of topologies and resources.

3.1.7.13.3.   An automated scheduling tool that factors in priorities and employs rules and preset privileges to guide the scheduling process and to ensure that higher-priority networks take precedence and processes that run past their allocated time window will be allowed to complete. Tool allows for automatic conflict management and suggestion of next available time slots for deployment of the sandbox.

3.1.7.13.4.   Hierarchical user defined rules to resolve other resource or time conflicts.

3.1.7.13.5.   Automatic allocation of processes to the appropriate available station via a centralized application that can dynamically abstract resources by defining their

structure (chassis, card, port, etc.), follow protocols and rules and remotely control all resources and stations.

      3.1.7.13.6.   24/7 and remote creation and execution of topologies with demonstrated scalability of up to and over 1000 concurrent topologies(sandboxes) of multiple devices with topology size demonstrated at over 500 devices.

      3.1.7.13.7.   Event driven notification (email and other) of topology (sandbox) and resource usage (start, stop just before ending, etc.).

3.2. Automation

    3.2.1.   CLOUDSHELL provides code free authoring of process sequences using pre-defined network modules.

    3.2.2.   CLOUDSHELL allows automatic capture and replaying of console and GUI actions via embedded tools to allow non-programmers to easily build and maintain custom networks.

    3.2.3.   CLOUDSHELL provides local and enterprise management of network IP.

    3.2.4.   CLOUDSHELL provides sharing and reuse of network IP.

    3.2.5.   CLOUDSHELL provides a network creation GUI that is consistent with the execution and scheduling GUIs.

    3.2.6.   CLOUDSHELL allows variables to be used in place of hard coded parameters and provide real time communication of the status of these variables.

    3.2.7.   CLOUDSHELL provides decision trees for network execution.

    3.2.8.   CLOUDSHELL provides data manipulation and extraction tools to allow easy customization of networks.

    3.2.9.   CLOUDSHELL provides a network automation environment that co-exists with the resource provisioning and data aggregation environments to allow:

      3.2.9.1.   Serial or parallel network execution by concurrent users

      3.2.9.2.   Network reservations with either user or system defined resources

      3.2.9.3.   Conflict resolution via user defined hierarchical rules

      3.2.9.4.   Automated regression testing of networks and assets

    3.2.10. CLOUDSHELL is vendor agnostic in terms of:

      3.2.10.1.   IT equipment - Cisco, Juniper, OnPath, Netscout, MRV, GE IEDS, ABB, SEL, JDS, Brocade, Eaton, and many more (please request specific manufacturer and model if not listed).

      3.2.10.2.   Equipment control APIs and protocols – GPIB, Telnet, SSH, SNMP, FTP/TFTP, UDP/UDP, DNP, MODBUS, and many others.

      3.2.10.3.   Support of scripts and CM tools - VBScript, Perl, Python, TCL, batch files, Ansible, Puppet, Chef, Powershell, BASH, and others.

      3.2.10.4.   Support for full programming automation of all CLOUDSHELL commands for full integration of the CLOUDSHELL toolset in other frameworks.

      3.2.10.5.   Proprietary or custom equipment and network processes

    3.2.11. CLOUDSHELL provides the ability for the user to automatically create custom network DLLs.

    3.2.12. CLOUDSHELL provides automatic generation of report data that is populated in the central repository for viewing and analysis.

    3.2.13. CLOUDSHELL has the ability to support and reuse existing network scripts from standard test languages such as TCL, Python, VBScript, Perl, JAVA, Powershell, BASH, batch files, and other user definable script languages.

    3.2.14. CLOUDSHELL provides event driven notification (email and other) of network execution and status.

3.2.15. CLOUDSHELL provides an open source modeling standard to allow users to build automation and provisioning shells to support any vendor resource. CLOUDSHELL allows for downloads of vendor supplied models as well as user defined shells for support of any resource type.

3.2.16. CLOUDSHELL provides a SAVE and RESTORE capability

    3.2.16.1.   Allows users to save a snapshot of their current environment and be able to restore the workspace at a later time

    3.2.16.2.   Applicable to VMWare and physical infrastructures

3.3. Data Aggregation

3.3.1.   CLOUDSHELL provides a scalable distributed database architecture to handle the control and sharing of network management and automation libraries and functions, user and group controls, as well as IT resources.

3.3.2.   CLOUDSHELL provides a single data repository for all data created through system setup, resource provisioning, network creation, and network execution. This data will be formatted to ensure real time access to mission critical analysis and metrics.

3.3.3.   CLOUDSHELL provides 'Dashboard' data displays for monitoring of resource utilization, user, sandbox and other system metrics.

3.3.4.   CLOUDSHELL provides the ability to easily generate charts and reports to create custom business intelligence about networks, the networking process, or resource utilization.

3.3.5.   CLOUDSHELL provides event driven notification on network results or of aggregated test results.

3.3.6.   CLOUDSHELL is scalable to allow local, distributed, or global implementations in either off-premise or on-premise usage models.

3.3.7.   CLOUDSHELL provides a distributed architecture that allows users to schedule and manage their own sandboxes.

3.3.8.   CLOUDSHELL provides built in functionality to cull data to determine process paths and to ensure that the data required is being analyzed and collected.

4. Virtualization

4.1. Standard VM Resources

4.1.1.   CLOUDSHELL provides management of all virtual resources in the identical manner as physical resources supporting all Hypervisors such as VMware, Hyper-V, KVM, AWS, Azure, Oracle, IBM, Google, and others.

4.1.2.   CLOUDSHELL provides integration to public and private virtual cloud resources from vendors such as AWS, Azure, Oracle, IBM, Google and others

4.1.3.   CLOUDSHELL provides the ability to mix physical and virtual resources within environments.

4.1.4.   CLOUDSHELL provides the ability to quickly create private networks and control routes between networks and then integrate them seamlessly into a physical infrastructure.

4.1.5.   CLOUDSHELL provides the ability to snapshot a complete container environment at a specific time providing easy security analysis, backups, and portability.

4.1.6.   CLOUDSHELL supports the use of hyper-scale architecture where compute, network and storage resources are converged and transparently provisioned entirely in software on commodity x86 hardware, removing the traditional complexity of data center architecture.

4.1.7.   CLOUDSHELL provides the ability to read the contents of the virtual cloud and add the resources of the cloud to the current framework inventory list. These assets can then be managed in the same way as other assets even though they reside in a cloud infrastructure.

4.2. Containers

4.2.1.   CLOUDSHELL supports both Kupernetes and Docker container clusters for both sandbox and cloud support. Customization is supported for other container implementations.

5. **Document Summary**

The goal of this document is to provide the reader with a high-level overview of the technology behind TSI's CLOUDSHELL with the anticipation of a deeper technical dive to follow. TSI's solution is based on 100% COTS products supported by TSI services. Whether the application is network infrastructure, data collection, application migration/integration, demonstration, development, test, pre-production, production, Cyber range or training, CLOUDSHELL will provide significant time and cost savings as well as offering previously unavailable COTS orchestration and automation technology.

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