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Cisco Expo 2010

24.-26. ožujka 2010.

Hotel Le Méridien Lav Split

Kolaboracija -
nova snaga poslovne suradnje



welcome to the human network. CISCO

An orange arrow pointing downwards, starting from the top left and ending near the title.

Intelligent Network Automation

Damir Bacalja | IBM Hrvatska | baci@hr.ibm.com

Cisco Expo 2010, 25.03.2010, Split

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Increasing Network Complexity

Explosive Complexity, Growth in Devices...

- 200% device growth
- Proliferating network heterogeneity
- Config size up to length of a dictionary

... And Information About Network

- Increasingly complicated to blueprint network
- Unknown state of devices, services
- “Temporary” accuracy

Increasing Compliance Burden

- Growing compliance costs
- Failed audits (PCI-DSS, SOX, HIPAA)
- Inconsistent policy enforcement

Accelerating Change Frequency

- Thousands of device changes / shortening maintenance windows
- Multiple OS & patches upgrades

Workload, Outpacing Personnel

- Flat to moderate IT & network budget growth
- Avg. 1 tech per 250 branch routers
- ~20K CCIEs worldwide

Heightened Security Needs

- Decentralized network access
- Limited management visibility
- Ad-hoc security

Sources: Cisco, EMA, Gartner, Juniper Networks, Network World

Cost of Network Complexity



Errors largest cause of network outages

60% caused by manual configuration errors

Increasing impact on service revenue

4% of revenue lost to network problems

Network complexity outpacing scripting

30 configuration errors per device (U.S. avg.)

Routine tasks consuming resources

45% of engineering time spent on manual config

Incorrect provisioning and excess inventory

35% of network assets lost or deployed erroneously

Inconsistent security posture open to threat

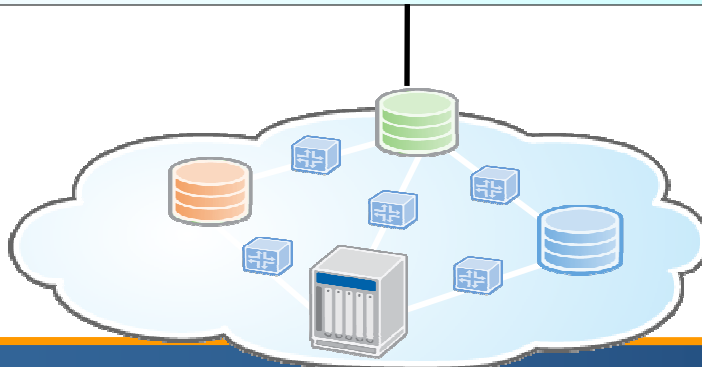
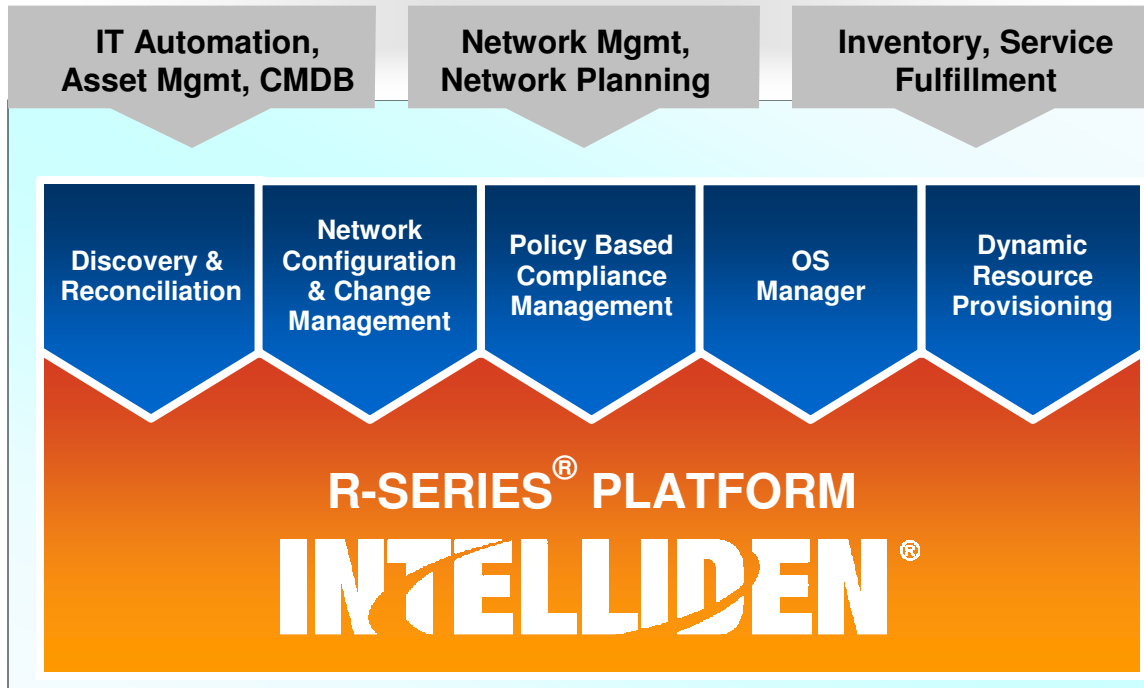
80% of security breaches from non-compliant devices

Sources: Dataquest, EMA, Yankee, Infonetics Research



Intelligent Network Automation Solutions

3rd PARTY APPLICATIONS



- Open APIs for standards-based integration

- Targeted apps for network engineering, operations and OSS
- Built upon a common platform
- Long innovation runway with ability to add new apps rapidly

- Standardized device configs as XML schemas and SmartModels™
- Real-time awareness of physical & logical device state
- Persistent store for network configs, resources and policies
- Intelligent change automation
- Scalable, high performance architecture

- Multi-vendor, multi-service converged network including core, edge, access and CPE devices



Organization Advantages

Unified solution for Executives, Network Management and IT



Executives

- Contain cost of increasing network complexity
- Centralize control of configuration, compliance & provisioning
- Increase visibility into network security & performance



Network Engineering

- Re-allocate time away from routine tasks
- Standardize policies & processes
- Accurate Network Database of Record (DBoR)



Network Operations

- Reduce risk with “always accurate,” re-useable commands
- Speed implementation with “point-and-click” ease-of-use
- Improve Audit



IT / OSS

- Create a standardized network provisioning solution
- Improve provisioning accuracy & service agility
- Provide accurate network resource information to OSS applications

↓ Award Winning Solutions



THE AMERICAN
BUSINESS AWARDS™
2008 Finalist





What the analysts say about us

Gartner

“Intelliden has sophisticated functionality, such as the ability to roll back a device to a previous configuration without having to reboot the device if a configuration change fails halfway during the process.”



“The success of its solutions in the network compliance domain indicates the degree to which Intelliden recognizes the unique challenges of demanding network environments, and has been proven in some of the world's most complex networks.”



“Our studies show that a typical Tier 1 CSP operates with up to 35 percent of its network assets and components stranded - either lost or deployed erroneously...Intelliden's Discovery and Reconciliation application will help companies to more efficiently deploy their existing network infrastructure and improve overall integrity and management of critical network data.”



What the customers says about us



“BT requires standards-based solutions that enable us to cost-effectively ensure compliance with thousands of regulatory, security and operational policies.... Intelliden has demonstrated a unique understanding of the challenges and complexities associated with managing mission critical network environments.”

Matt Bross, CTO

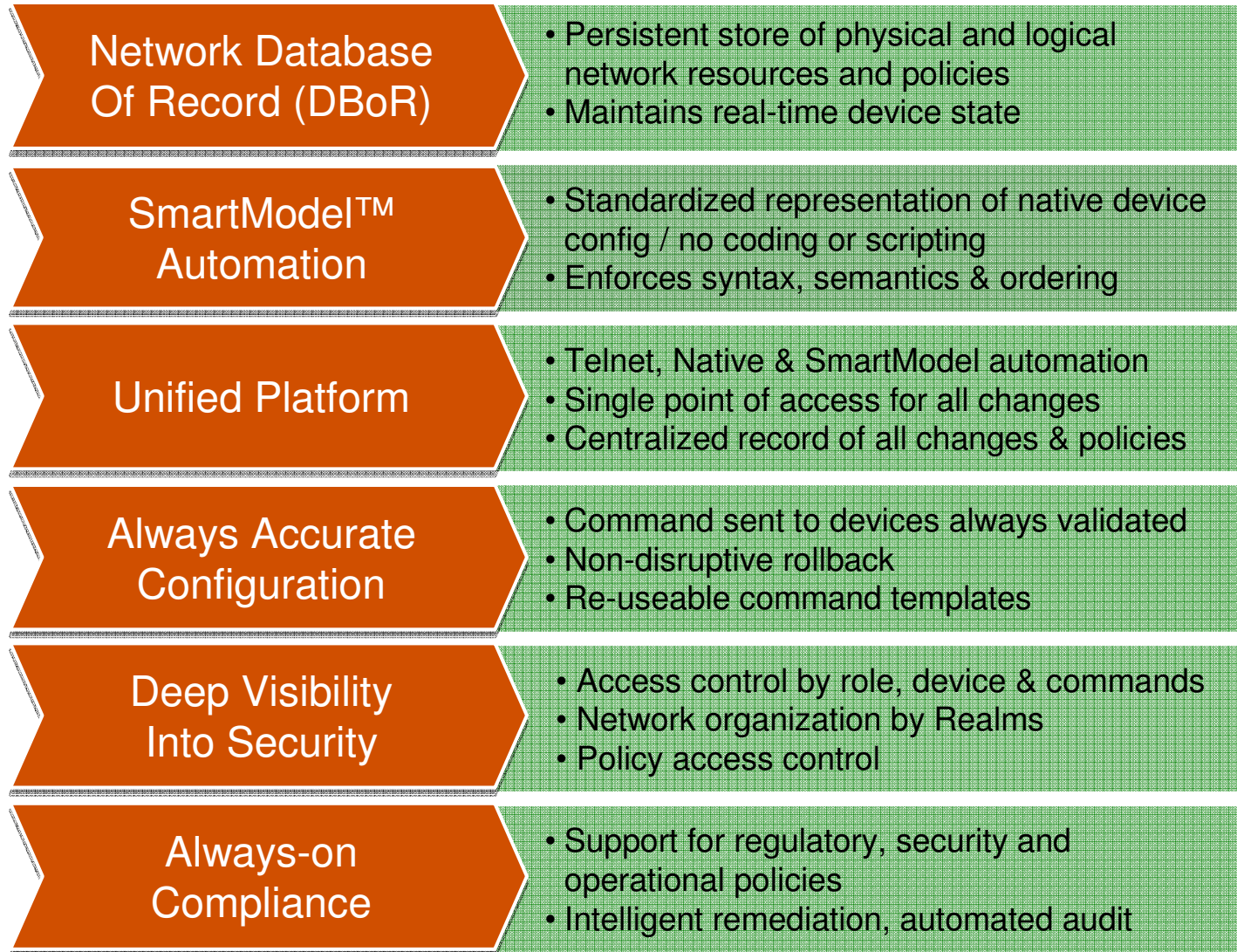


“By leveraging Intelliden, we have added a critical layer of automation to the activation and configuration of our new service offerings. Intelliden gives us a common data plane and complete understanding and control of device configuration. This allows TELUS to roll out new services, improve standardization and ultimately customer satisfaction, as well as reduce operating expenses and errors.”

Ibrahim Gedeon, CTO



Unique Intelliden Advantages





Trusted Source of Network Truth™

*Database Of Record For Network Devices,
Configurations & Policies*





Intelliden Solution Map

Discovery	Security & Administration	Configuration & Change Management	Compliance & Audit	Resource Reconciliation	Network Provisioning
Real-Time Discovery	Fine-Grained Security Control	Always Accurate Configuration	Always-on Compliance	Standards-Based Reconciliation	'No-Scripts' Network Activation
Scheduled & Ad-Hoc Discovery	Granular Control of Device Access - by Role & Config Command	State-Aware Configuration	Operational, Security & Regulatory Policies	Non-Discoverable Data Augmentation	State-Aware Provisioning
Bulk Device Upload		Syntax, Semantics Validation of Changes	Always-On Compliance	Device Data Normalization	Pre-Provisioning Validation
In-Band & Out-of-Band Config Synch	Network Organization By Device Realms	Telnet / Native Command Support	Centralized Policy Repository	Discrepancy Analytics	Reusable Provisioning Templates
Physical & Logical Device Inventory	Centralized Security Control	Ad-hoc, Scheduled and Recurring	Reusable Policy Framework	Rules-Based Notification	Support for Run-Time Parameters
Multi-Protocol Support	Policy Access Control By Groups and Users	Backup & Restore	Drag-and-Drop Rules Design	Synchronous & Asynchronous Reconciliation	Full MACD Lifecycle Support
Multi-Threaded Non-Blocking Architecture	Command Level Parameter Control	Non-Disruptive Rollback	Intelligent Remediation	TMF MTOSI 2.0 Support	Exception Handling
In-The-Field Extensions for New Devices		Out-of-Band Change Detection	Telnet Terminal Keystroke Logging	Integration with Inventory and CMDB Apps	Integration with Service Provisioning & Inventory Apps
		Configuration Search & Comparisons	Full Configuration History		
		ACL Management			
		OS & Patch Management	Out-Of-The-Box Policies		

Intelliden SmartModels™ 

Robust Workflow | Flexible Reporting | Open APIs | Scalable Platform | Multi-vendor Device Support

Network Database Of Record (DBoR)



Intelliden SmartModels™

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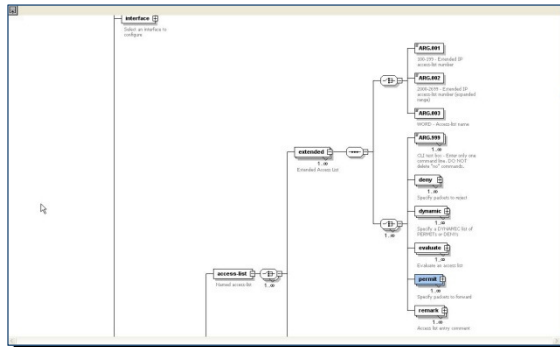
no ip http server
no ip http secure-server
!
ip forward-protocol nd
ip route 0.0.0.0 0.0.0.0 10.216.1.254
!
!
ip access-list extended WORDExtended
permit tcp host 1.1.1.1 host 2.2.2.2 eq domain
ip access-list extended enable
translate ruleset RULES from pad to telnet
translate ruleset ee from pad to telnet
translate ruleset test1 from pad to telnet
translate ruleset week from pad to telnet
translate ruleset word from pad to telnet
description word
match cud word xot-source-addr word dest-addr word window-size word dcli word ma
s word
match cud word dest-addr word window-size word mac word
match packet-size word reversed word cud word dest-addr-ext word dcli word xot-s
source-addr word
match cud word

```

CLI

Native Configuration

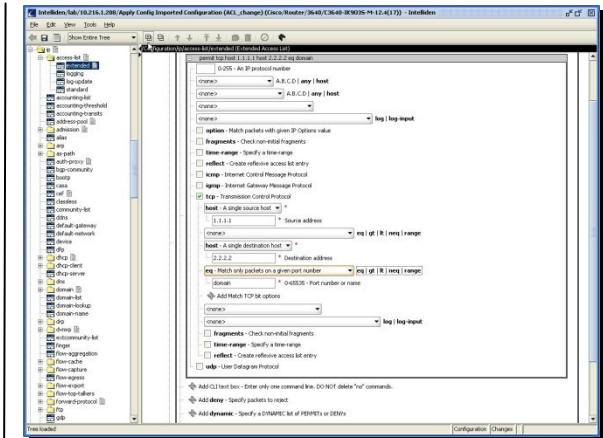
- Varies by vendor, type, model, operating system (VTMOS)
- Stored in DBoR for Native Command access



XML Schema

Converted to XML Schema

- XML schema contains all configuration commands, relevant parameters, allowed parameter ranges, inter-relationships, logic
- Constructs for device configuration settings
- Stored in DBoR for SmartModel access



SmartModel

XML schema generates UI

- UI standardizes syntax, automates command order
- “Child attributes” of parameters automatically set
- “Illegal” commands not allowed
- Automated add, modify, delete error flags for command reliability



Intelliden Device Catalog



Alcatel-Lucent



ARRIS



BROCADE



NORTEL



ciena. : the network specialist

- ▶ More than 12,000 VT MOS SmartModel™ combinations supported
- ▶ Cisco
 - ~90% of routers, switches, firewalls, access points, CMTS, SCA, content switches and hubs
 - 50K IOS images
- ▶ Juniper Networks
 - ~95% of routers, switches, firewalls, and WAN acceleration devices
 - JUNOS, JUNOSe, ScreenOS
 - Award-winning solution for real-time network configuration and policy control
- ▶ Other Vendors
 - Arris & Motorola: CMTS
 - Alcatel-Lucent: DSLAM
 - Acme Packet: SBC
- ▶ Protocols
 - All CLI-based devices supported
 - TL1 / SNMP – *limited support*

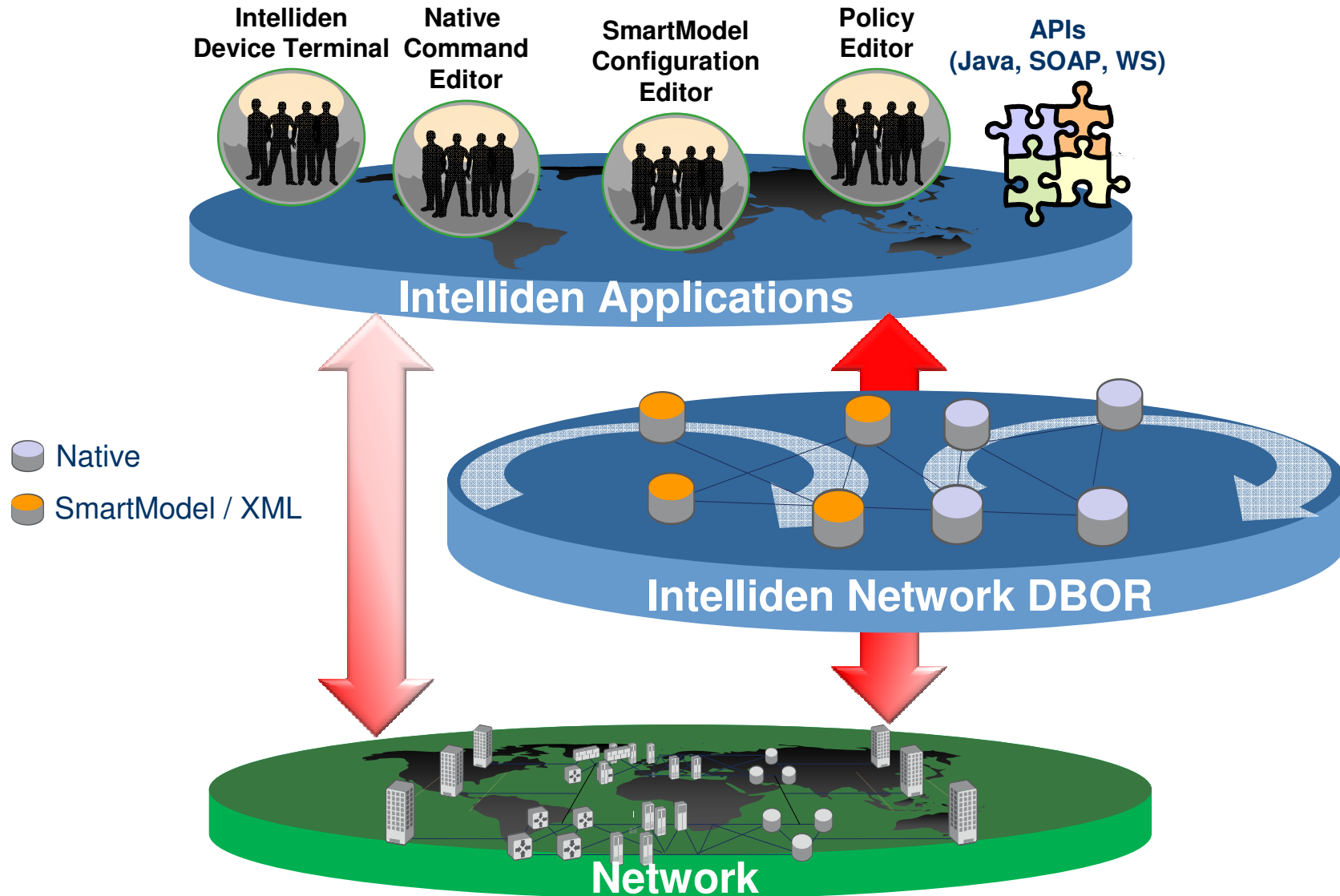


ALL CLI-BASED DEVICES SUPPORTED

- ▶ Users can quickly add devices to network and update DBoR



Network Database of Record



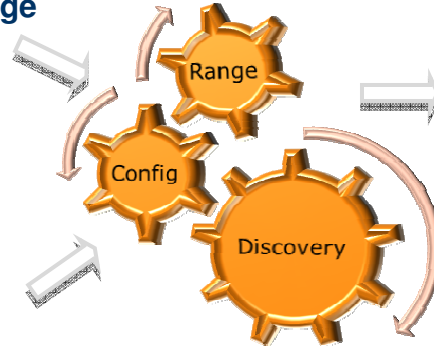
Device Discovery

Range Input

- ▶ Target IP Address Range

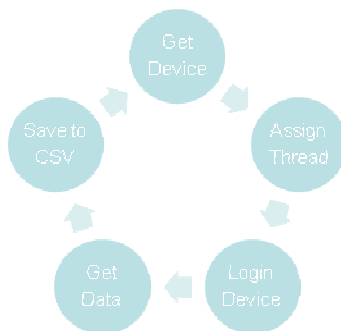
Configuration Input

- ▶ Device discovery files
 - Used to identify devices
- ▶ Login credential combinations
 - User Name / Password
 - Enable Password
- ▶ Target location for output files



Discovery Output

- ▶ Bulk Import File
 - Hostnames
 - VTOS
 - Target Realm
 - Custom RAD information (optional)
 - Com-type, SSH type, Streaming, User name, Password, Enable password, Alt-hostname, Port
- ▶ Log files for troubleshooting unidentified devices



Technical Characteristics

- ▶ Multi-threaded operations
- ▶ Attempts all login credentials provided
- ▶ Supports Telnet and SSH Discovery
- ▶ Allows new device support to be added in the field

Discovery

Scans the network to find devices and uploads devices into R-Series® platform



- ▶ Multi-threaded solution that scans large networks quickly
- ▶ Allows new devices to be added in the field; no dependency on product releases



Security & Administration

1. Group Devices

- Multiple options for grouping devices (e.g. by device type, location, customer)
- Read / write / execute commands assigned to group

2. Assign Privileges

- Individuals assigned to user groups
- Each group given any combination of read / write / execute privileges
- Group assigned permissions
- Define approval process (work not executed unless approved; all approvals logged)

3. Assign Access

- User groups assigned access to specific device groups
- User groups assigned access to specific command sets
- User groups granted access to entire configuration, or part of configuration

Security & Administration



Example:

A Managed Service Provider can restrict network engineer to only:

- ▶ Access selected devices
- ▶ View subset of device configuration
- ▶ Execute only specific types of configuration changes



Configuration & Change Management

▶ Real-Time / State-Aware Configuration Management

- Configuration back-up and restore
- Multiple modes of automation
 - Telnet (Intelliden Device Terminal)
 - CLI (Native Commands)
 - Modeled through Intelliden SmartModels™
- User-defined realms for network organization
- Command sets for flexible reuse
- Non-disruptive rollback
- Out-of-band change management (OOBC)
- Configuration comparisons
- Configuration search

▶ Change Management

- Customizable workflow with multiple approval levels

▶ OS & Patch Management

- Automated upgrade, customize to business needs

▶ Audit tracking / Flexible reporting / Open APIs

Configuration/ Change Mgmt.

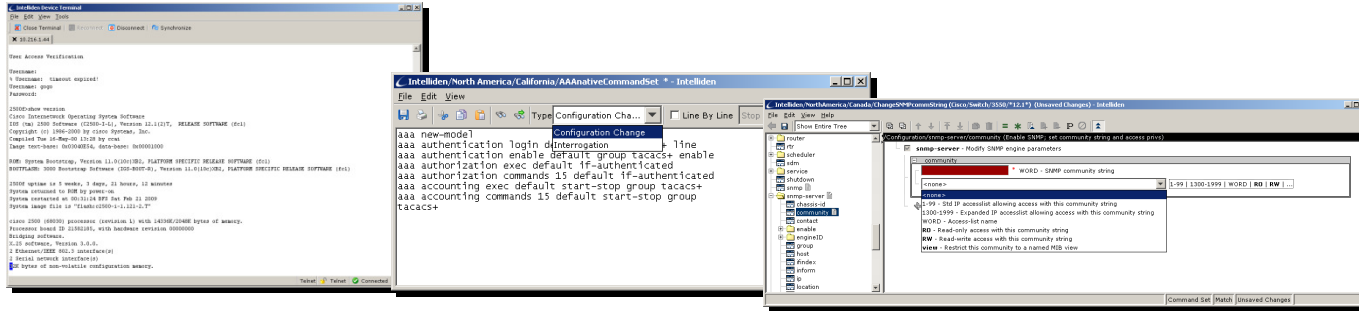
Automates device configuration changes across end-to-end network with unprecedented levels of standardization, accuracy, control



Unlike script-based solutions, Intelliden SmartModels ensure that every device change is syntactically and semantically correct, and is based on the real-time configuration state of the device



Multiple Management Modes – for different skills & needs



Configuration/Change Mgmt.



Telnet (driven by IDT)

- Telnet/SSH device access to device configuration
- Comprehensive, bi-directional logging
- Improved access and control
- Automated keystroke logging
- Automatic configuration backup after changes
- All commands failed and successful to a device in both directions are logged

Native Commands

- Support for interrogation and change commands for one or more devices
- Command sets can be saved for future reuse
- Command sets support parameters
- Access can be controlled by user, device and command set
- All transactions logged

SmartModel™ Commands

- Can modify single device or multiple device configs through templates (command sets)
- Standardized syntax, automated command order
- No coding, no scripting
- SmartModel contains all configuration logic, parameter relationships
- SmartModel generates UI (SmartModel also accessible via API)
- Key input fields auto-filled with correct value

- ▶ All launched from Intelliden

- ▶ All commands executed via platform

SmartModels™:

- ▶ Users can't make device changes not supported by manufacturer
- ▶ Commands validated against current configuration to ensure configuration data integrity



Compliance and Audit

- ▶ **Closed-Loop Process**
 - Supports entire compliance lifecycle
- ▶ **Central Policy Repository, Sophisticated Policy Engine**
 - Supports unlimited policy & device combinations
 - Provides continual policy validation
- ▶ **Intelligent Remediation**
 - Resolves non-compliant conditions
- ▶ **Comprehensive Reports**
 - Audit information for technical and business audiences
- ▶ **Easy to Use**
 - Drag-and-drop interface
- ▶ **Built For Scalability**
 - > 1,000,000 validations/hour
- ▶ **Out-Of-The box Policies**
 - NSA Router guidelines; Operational Policies

Compliance & Audit

Automated, comprehensive
Total Network Compliance
solution



- ▶ Continually validates device configurations against regulatory, security and operational policies, and intelligently resolve non-compliant conditions
- ▶ Allow specific devices to be exempt from policy checks (e.g. those under maintenance)



Resource Reconciliation

- ▶ **Built on R-Series® Platform**
 - Access to state aware device information via Intelliden Network DBoR
 - Efficient and accurate device protocols
 - Scalable
- ▶ **Comprehensive device information**
 - Discovered data augmented with non-discoverable device information
- ▶ **Normalized data presentation**
 - Supports MTOSI 2.0 Standard
- ▶ **Real time data access by OSS Systems**
 - JMS notifications of network changes
- ▶ **Extensible**
 - Data model and interface support for new objects and attributes to be added

Resource Reconciliation

Provides standards-based reconciliation of normalized network resource information network



- ▶ Provides real-time access to network information via DBoR
- ▶ Augments non-discoverable device data
- ▶ Supports MTOSI 2.0



Network Provisioning

- ▶ Delivered via Intelliden R-Series platform
- ▶ Decouples service and network provisioning layers
- ▶ Supports highly customizable network provisioning definitions via modular command sets
- ▶ Ensures integrity of transactions sent to the device
 - Can perform network resource provisioning based on real-time state
 - Dedicated *Add / Modify / Delete* transactions avoid overwriting pre-configured settings
 - Smart *Delete* function
- ▶ Multi-vendor device support, Core, Edge, Access and CPE
- ▶ Rapid introduction of new devices or OS versions
- ▶ Shared platform with NCCM for ad-hoc transactions
- ▶ Closed loop resource reconciliation via D&R
- ▶ Full audit trail of all device interactions
- ▶ Open APIs

Network Provisioning

Real-time, template-based, resource provisioning application for carrier grade IP networks



- ▶ Agility & flexibility to eliminate OSS lag
- ▶ Abstracts multi-vendor network complexity from service management layer
- ▶ Shares provisioning templates and transaction audit trail with network management and support organizations



Customer Case Studies



Why Customers Choose Intelliden

▶ Scalability

- Production proven Carrier size scalability into the 100Ks of heterogeneous devices

▶ Fully Integrated Network Automation Solution

- Network discovery & reconciliation, configuration management, compliance and provisioning

▶ Revolutionary Platform

- Network Database of Record (DBoR) - real-time view of network devices, configurations and policies
- State-aware device changes - ensures 100% accuracy
- Fine-grained security – provides granular access control by user, device and command
- Extensible - supports additional applications leveraging common network DBoR and device access

▶ Open APIs

- Extensive granular, open APIs for rapid integration with 3rd party applications and portals
- Open database view-tables and schemas enable use of 3rd party reporting tools

▶ Multiple Automation Modes

- Serve different market needs and skill levels, and enable rapid insertion and user adoption

▶ Total Network Compliance

- Supports regulatory, security and operational policies and intelligent remediation

▶ Standards-based

- Provides a normalized view of network resources to 3rd party applications



Configuration Store & Compliance Mgmt Tier 1 Service Provider in Europe

BACKGROUND

Managed Services
Provider to enterprises -
One of the world's most
advanced MPLS
networks with 28,000
ports in 170 countries

CHALLENGES

- Provide an IP network with scale, resilience and security
- Accurately bid for new outsourcing contracts
- Meet stringent network availability & performance SLAs
- Ensure customer's network compliance obligations
- Reduce headcount to maintain multiple customer networks
- Reduce OPEX

Intelliden Solution

- ▶ Multi-tenancy - serves multiple Enterprise customers
- ▶ Configuration management
 - Service assurance (part of "trouble-to-resolve" process)
 - Accuracy - "Getting things done right the first time"
 - Business practices - "Single and consistent way of operating globally"
 - System of record for all network changes
- ▶ Compliance & Security
 - Meet customer's network security & compliance obligations
- ▶ OS Upgrade Manager
 - Ensures all devices within the networks meet's corporate OS specifications
 - Eliminates security threats posed by older OS releases
- ▶ *Plans to use Intelliden D&R for improved bid management for new customer networks*

Deployment

- ▶ Devices: ~55K deployed; target >1M devices
- ▶ Users: ~130 network engineers and support personnel
- ▶ Supported customers: >300 managed services enterprise customers

Results

- ▶ OPEX reduction
- ▶ Prevention of multiple SLA violations resulting in penalty reductions in the 100Ks GBP
- ▶ Prevention of customer down time
- ▶ Compliance remediation resulted in 10Ks of network changes to meet policy mandates



**300 Enterprises & 54K devices
operational in 6 months**



Faster Time to Market, Lower OPEX

BACKGROUND

Leading Canadian provider of data, IP, voice and wireless communications services

CHALLENGES

- Aggressively roll out new IPTV and Metro Gigabit Ethernet services
- Error-prone configurations, inconsistent activations, no automation, poor coordination of operational changes, device and configuration conflicts
- Very large-scale deployments, limited time and ability to ensure conformance

Intelliden Solution

- ▶ Intelliden is the key application for ensuring accurate device changes across the network
- ▶ Network configuration management and compliance
- ▶ All network users accessing devices required to use Intelliden to ensure network integrity via user control and network device change logging
- ▶ Full backup and recovery provided for network recovery and security
- ▶ Automated network activation of Juniper ERXs for TELUS IPTV (TTV) services

Deployment

- ▶ Devices: ~40K (mostly Cisco and Juniper)
- ▶ Users: ~50 Systems Engineers
- ▶ Supported Customers: Commercial / TTV Customers

Results

- Reduced conformance implementation timeframes from 3 weeks to 2 days
- Improved customer satisfaction, reduction of trouble-shooting timeframes



Implementation time reduced from 21 days to 2 days



Network Compliance Via Policies

One of the largest cable providers in NA

BACKGROUND

One of the largest U.S. broadband service provider focused on cable video, VOD, VoIP, and data services to consumers and small businesses

CHALLENGES

- Very large number (+100K) of devices from multiple vendors, and of multiple types (IP, HFC, Optical, VoIP, DOCSIS, WiMax, etc.) supporting 15 million customers
- Homegrown point solutions difficult to maintain
- Regional, National engineering organizations with very different requirements for security, access

Intelliden Solution

- ▶ Automated device discovery with physical and logical device configuration support
- ▶ Automated configuration management, policy compliance and OS Upgrades across the National IP service delivery network
 - Bulk and ad-hoc changes to thousands of devices nightly to ensure compliance with engineering standards
 - Integration with internal configuration warehouse
 - Executive level dashboard for network changes and custom reports

Deployment

- ▶ Devices: ~15K (Cisco, Arris, Motorola)
- ▶ Users: National NOC and all LMCs
- ▶ Supported Customers: All 15M residential and commercial customers

Results

- ▶ Elimination of error-prone manual compliance processes
- ▶ Basis for a single enterprise wide platform for network configuration, compliance and activation
- ▶ Increased reliability and security due to compliance with corporate engineering standards



50% time reduction for service ticket logging

Automating Network Operations and Provisioning

BACKGROUND

Leading US-based
Managed Services
Provider with ~42K SMB
Customers

CHALLENGES

- Support aggressive growth plans – 3 new markets and 12K new customers per year
- Eliminate need for manual provisioning
- All-IP Cisco network
- Unlimited, carrier-class scalability not possible with existing internal solution
- ‘No-touch’ new service turn-up needed

Intelliden Solution

- ▶ Network Provisioning, Configuration and Policy Management
- ▶ Unified solution for network engineering, operations and services teams

Deployment

- ▶ Devices: ~45K
 - Cisco IAD2400 Series (CPE) and 10,000 Series (aggregation) devices
- ▶ Users: ~160 Systems Engineers
- ▶ Supported Customers: 13 markets representing ~42K SMBs

Expected Results

- ▶ Minimize need to send installation technicians for CPE provisioning
- ▶ Shield CLI complexities from services / OSS teams
- ▶ Reduce ‘fat-finger’ configuration errors
- ▶ Control access i.e. who can do what and when
- ▶ Test provisioning changes before they are implemented
- ▶ Greater standardization
- ▶ Meet Customer SLAs



**First-time ‘right’ provisioning
and minimized truck-roll**

Enhanced Automation, Accuracy and Audit Large NA Financial Service Company

BACKGROUND

Leading International
Credit Card Services
Provider

CHALLENGES

- Highly visible, rapidly growing mission-critical financial network with 4000 Devices (95% Cisco)
- Prevent outages due to manual errors
- Reduce network OPEX growing linearly
- Scale the network engineering expertise (“tribal knowledge” syndrome)
- Consolidation of historically separate networks and management systems

Intelliden Solution

- ▶ Configuration & Change Management and reporting for IT audit group
 - IDT for unified access and control
 - Automated procedures for repetitive changes
 - Self-documenting workflow
 - OS Upgrades
- ▶ Integration with internal management web portal and inventory
- ▶ *Planning to integrate with Runbook automation and trouble ticketing applications*

Deployment

- ▶ Devices: ~4,000 (Cisco)
- ▶ Users: ~30 Systems Engineers
- ▶ Supported Customers: Internal IT Users across NA, LA, and Asia

Results

- ▶ Improved network reliability, greater automation, accuracy and audit
 - 50-60% changes automated with 75% time savings
 - ▶ 300 – 400 devices upgraded automatically saving two weeks’ effort
- ▶ Lower TCO through reduced need for internal development and reduced hardware maintenance costs



**75% time savings
through automation**



Benefits Summary

1 Control: Manage Network Complexity With Trusted Source of Network Truth™
Unified platform/DBoR give full visibility and control of all changes, policies, access, security and information

2 Accuracy: Enhance Service Availability By Preventing Outages, Errors
Prevent outages, errors, and reduce failures with SmartModel accurate configuration, compliance management

3 Access: Same Network Data Available To All Upstream Applications
Solution built from ground up with full, open API for network management, provisioning, trouble ticket, etc.

4 Scalability: Support Expanding, Heterogeneous Networks Of Any Size
Meet scalability, performance requirements of the largest and most complex networks

5 Cost: Slow Rising Costs As Demands On Engineering, Operations Escalate
Automation improves operational efficiencies, productivity to increase effectiveness of existing resources



INTELLIDEN®

*For more information, please visit
www.intelliden.com*