

Certification: Wingspan Assessments is a division of Fireowls Corporation, an All-CCIE Team. This was an assessment performed by a Certified CCIE in Collaboration/Voice.

***All client-identifying information has been anonymized.**

Objective

WingSpan's Certified CCIE team has reviewed the Cisco environment from a provisioned and operational perspective. Below are the findings and suggestions based on the analysis, as well as current settings.

1. Observation of Current Network

1.1 Current Network

- **Application Redundancy:** Applications are correctly configured for geographic redundancy in that there are VMs for each application in each of the primary locations.
- **Voice Service Redundancy:** In order to make the Voice Service as a whole redundant across locations I would be recommending another 4331 ISR at the San Diego location.
- **Versions Recommendation:** Specified version recommendations in the spreadsheet. The recommended versions are specified for all UC Applications, relevant Routers, relevant Switches, and BIOS. This would involve minor upgrades for all the UC applications.
- **Quality of Service:** The QoS configured across the routers and switches is correctly configured.

2. Assessment and Recommendations

2.1 Recommendations

Based on our CCIE engineer's observations, here are Wingspan's Best Practice recommendations to optimize the current network.

- **Phone Loads:** This is in addition to the version upgrades. It would also be the recommendation to install the latest device pack updates. This would make the security and features on the phones current.
- **SCCP/SIP Phone loads:** Energix Corp. has a mix of their phones on SIP and SCCP phone loads. My recommendation will be to push as many phones to SIP as possible. There are a number of phone models such as 7942 and 7962 that compose a large percentage of Energix's phones that support SIP and are still on SCCP loads. The benefits of using SIP are ease of troubleshooting and up to date features/security on the phones themselves. Using end-to-end SIP just makes everything with troubleshooting simpler. Most importantly, Cisco has actually stopped development on their SCCP phone loads so all the new features and new security comes on the SIP loads. All the new phone models support SIP so it is simply the future direction and it is best to go to it sooner rather than later. While there are some older phone models in the environment that do not support SIP my recommendation is to push all possible models to SIP.
- **CM Groups:** Right now there is 4 CUCMs in each of the CM Groups. While this appears to allow for the most possible redundancy the vast majority of phones only support two devices. I don't have the official list of devices that do support a tertiary CM (and I did look for it unsuccessfully) but the only thing I have

known to support the tertiary is trunks sometimes. There really is not much gained from the tertiary CM. For this reason it is generally considered best practice to have only two CMs in each group, in Energix's case this would be the call-processing subscribers. Doing this would allow the CUCM Publisher to not have any call-processing duties (which is generally best-practice) and allow us to change the Service Parameters as shown in the spreadsheet.

- **CUCM Service Parameters:** Below is a table that shows recommendations for changes to the Service Parameters. The main idea driving the suggested changes is allowing the Subscribers to do call-processing and allowing the Publisher to be dedicated to it's traditional database publisher role. This is contingent on the above suggested changes to the CM Groups.
- **Chicago Gateway Redundancy:** At current state the 4331 at the Chicago location is a single point of failure for both voice and routing. Right now if there was a failure with the physical router both WAN and voice would be hard down until the router could be replaced. In order to make that redundant I would recommend adding a second 4331 and configuring redundancy groups with a Virtual IP (VIP) address. This addition would make the voice service fully redundant for the Denver location.
- **Atlanta and Denver Gateway Redundancy:** In an ideal world the best architecture would be to have redundant gateways configured with redundancy groups at both the Atlanta and Denver locations as well. However, I can certainly understand why Energix is not anxious to do that as the 4451 routers are significantly more costly when compared to the 4331 at the Denver location. Assuming that the other Layer 3 devices at the Chicago and Boise locations are configured to provide backup WAN, these two sites could survive a total failure of the gateway device for however long it takes to replace the device. I am still bringing it up as an option just because there are a lot of users at each of these locations and Energix seems interested in maximum redundancy. Additionally, redundancy groups would give another benefit. As currently configured if the 4451 at either of these locations did go down or reboot all active calls would be dropped. In redundancy groups all voice traffic is check-pointed through the standby router and active calls are preserved if the primary goes down.
- **Outbound Call-flow Redundancy:** While all the 'Run on All Nodes' boxes are checked at the Route-List level there is definitely a change recommendation for how the call routing is configured. In Energix's outbound design the redundancy is essentially at the Route-List (RL) level where each RL contains multiple Route Groups (RG); with each RG then containing the one local SIP trunk. The proper design for this would be to have the redundancy at the RG level. This would include one RG in each of the RLs and multiple SIP trunks within each RG. The reason this is better is because the RG is designed to handle this and has the logic to deterministically set the call distribution algorithm (i.e. top-down, or round-robin) whereas the RL does not. It would definitely be best practice to make this change.
- **DNS Unreachable Error:** Upon login to the CUCM admin page there is a DNS unreachable error. Energix resources are aware of this and believe the underlying issue has been resolved. I would still recommend working on getting the error to clear just to be sure it is fixed and engage TAC if necessary.
- **Redundant Switch to Router Uplinks:** Upon researching the LAN networks at the relevant voice sites it appears that there is a single uplink from the head-end switches that link to the router. My recommendation would be to have dual links especially because there are available ports on the routers.
- **UCS BIOS Version Recommendation:** I definitely recommend upgrading the BIOS on the BE8K servers. The version currently installed was put out in mid-2016 and is missing all the important security and feature updates since then. This would include security patches for all the things issues like Spectre and Meltdown. There has also been a lot of updates to things like the NICs on the physical boxes.

2.2 Versioning

Based on our CCIE engineer's observations, here are Wingspan's Best Practice recommendations to optimize improve the Voice network.

UC Application Version Recommendations:

Server Type	IP Address	Current Version	Recommended Version
CUCM	172.16.148.20	11.5.1.10000-6	11.5(1)SU4 (11.5.1.14900-11)
CUCM	172.16.148.21	11.5.1.10000-6	11.5(1)SU4 (11.5.1.14900-11)
CUCM	192.168.190.20	11.5.1.10000-6	11.5(1)SU4 (11.5.1.14900-11)
IM & Presence	172.16.148.26	11.5.1.10000-4	11.5 SU4 (11.5.1.5000-1)
IM & Presence	192.168.190.26	11.5.1.10000-4	11.5 SU4 (11.5.1.5000-1)
CUC	172.16.148.22	11.5.1.10000-6	11.5(1)SU4 (11.5.1.14900-11)
CUC	192.168.190.22	11.5.1.10000-6	11.5(1)SU4 (11.5.1.14900-11)
UCCX	172.16.148.24	11.0.1.10000-75	11.0(1)SU1 (11.0.1.11001-43)
UCCX	192.168.190.24	11.0.1.10000-75	11.0(1)SU1 (11.0.1.11001-43)

UC Application Geographic Redundancy

Server Type	IP Address	Hostname	Geographically Redundant
CUCM	172.16.148.20	myworkphone.ttcEnergix.Energix.com	YES
CUCM	172.16.148.21	cypucm02.ttcEnergix.Energix.com	YES
CUCM	192.168.190.20	ontucm01.ttcEnergix.Energix.com	YES
IM & Presence	172.16.148.26	cypcup01.ttcEnergix.Energix.com	YES
IM & Presence	192.168.190.26	ontcup01.ttcEnergix.Energix.com	YES
CUC	172.16.148.22	cypcuc01.ttcEnergix.Energix.com	YES
CUC	192.168.190.22	ontcuc01.ttcEnergix.Energix.com	YES
UCCX	172.16.148.24	cypccx01.ttcEnergix.Energix.com	YES
UCCX	192.168.190.24	ontccx01.ttcEnergix.Energixs.com	YES

CUCM Publisher Service Activation

SERVICE NAME	SERVER & ACTIVATION STATUS
	CUCM Pub - Chicago - 172.16.148.20
Cisco CallManager	Activated
Cisco IP Voice Media Streaming App	Deactivated
Cisco CTIManager	Activated

Cisco Extension Mobility	Activated
Cisco Extended Functions	Activated
Cisco DHCP Monitor Service	Deactivated
Cisco Location Bandwidth Manager	Deactivated
Cisco Directory Number Alias Lookup	Deactivated
Cisco Dialed Number Analyzer Server	Activated
Cisco Dialed Number Analyzer	Activated
Cisco Tftp	Activated
Cisco IP Manager Assistant	Deactivated
Cisco WebDialer Web Service	Deactivated
Self Provisioning IVR	Deactivated
Cisco AXL Web Service	Activated
Cisco UXL Web Service	Activated
Cisco Serviceability Reporter	Activated
Cisco CallManager SNMP Service	Activated
Cisco CTL Provider	Activated

Recommend Turning Service OFF
Recommend Turning ON

CUCM Publisher Service Activation

SERVICE NAME	SERVER & ACTIVATION STATUS	
	CUCM Sub - Chicago - 172.16.148.21	CUCM Sub - Den - 192.168.190.20
Cisco CallManager	Activated	Activated
Cisco IP Voice Media Streaming App	Activated	Activated
Cisco CTIManager	Activated	Activated
Cisco Extension Mobility	Activated	Activated
Cisco Extended Functions	Activated	Activated
Cisco DHCP Monitor Service	Deactivated	Deactivated
Cisco Location Bandwidth Manager	Deactivated	Deactivated
Cisco Directory Number Alias Lookup	Activated	Activated
Cisco Dialed Number Analyzer Server	Activated	Activated
Cisco Dialed Number Analyzer	Activated	Activated
Cisco Tftp	Activated	Activated
Cisco IP Manager Assistant	Deactivated	Deactivated
Cisco WebDialer Web Service	Deactivated	Deactivated
Self Provisioning IVR	N/A	N/A
Cisco AXL Web Service	Activated	Activated

Cisco UXL Web Service	Activated	Activated
Cisco Serviceability Reporter	Activated	Activated
Cisco CallManager SNMP Service	Activated	Activated
Cisco CTL Provider	Activated	Activated

Recommend Turning Service OFF
Recommend Turning ON

Voice Gateway Version Recommendations:

Description	IP Address	Model	IOS-XE Version	Rec. Version IOS-XE Version
Chicago voice gateway 4451x	172.16.148.2	4451	03.13.02.S	3.13.9S
Vintage Dallas 4331 Voice Gateway	192.168.0.1	4331	03.16.02.S	3.16.7bS
Denver 4451	172.19.50.20	4451	03.12.00.S	3.13.9S

Description	IP Address	Model	IOS Version	Rec. IOS Version
Chicago voice gateway 4451x	172.16.148.2	4451	Version 15.4(3)S2	Denali-16.3.6 MD
Vintage Dallas 4331 Voice Gateway	192.168.0.1	4331	Version 15.5(3)S2	Denali-16.3.6 MD
Denver 4451	172.19.50.20	4451	Version 15.4(2)S	Denali-16.3.6 MD

Access Switch Version Recommendations:

Description	Hostname	IP Address	Model	IOS Version	Recommended Version
Denver - Stack Sw	VINMAINSW01	192.168.10.239	C2960X	Version 15.2(2)E5	15.2.2E7 MD
Denver - Access Sw	VINCHIIF6	192.168.1.125	C3560X		15.0.2-SE11 MD
Denver - Access Sw	VINCHIIF19	192.168.1.122	C3560X		15.0.2-SE11 MD
Denver - Access Sw	VINCHIW01	192.168.10.243	C2960	Version 12.2(44)SE6	12.2.55-SE12 MD
Denver - Access Sw	VINCHIW02		C2960	Version 12.2(44)SE6	12.2.55-SE12 MD
Chicago - Core Sw	CHI-CORE	200.102.14.1	C4500X	Version 03.06.00.E	Release 3.8.6E MD
Chicago - Stack Sw	CHI-User-Sw-01	200.102.14.6	C2960X	Version 15.0(2)EX5	15.2.2E7 MD

UCS BIOS Version Recommendation:

Current BIOS Version	Recommended BIOS Version
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2.0.10e.0.0620162114

3.0(4d)

3. Diagrams

3.1 Diagrams – Not published for confidentiality