DCN 704 – Collaborative Communications

Assignment 1; Cisco Collaboration Portfolio of Solutions

Weight: 5% (5 marks)

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Introduction:

Cisco Collaboration Portfolio offers solutions in four main areas:

1. Unified Communications,
2. Contact Center,
3. Conferencing, and
4. Collaboration Endpoints.

Industries covered are Education, Energy / Oil / Gas, Financial Services, Government, Healthcare, Manufacturing, Professional Services, Real Estate / Property, Retail, Service Providers, Sports & Entertainment, Technology, and Transportation.

Procedure:

Each student must thoroughly read, understand and investigate one Case Study from Cisco Collaboration website. Select one Case Study browsing the website: https://www.cisco.com/c/en/us/solutions/collaboration/case_studies.html . Announce your selection on the discussion board and wait for approval.

Using the chosen Case Study, the student must answer the following questions:

Case study: Paychex, Inc.

The case studies in the Cisco webpage are a short one-page marketing pitch with links to the general page of Cisco products. Unfortunately, they do not include specific technical details related to the solution adaptation. The solution starting from part 2, is my way of trying to explain an implementation, based on what we have covered so far in the course.

1. **[One mark] Customer Needs:** Identify the customer's specific needs that were satisfied with the Cisco Collaboration Solution (at least 300 words). Research about the customer if needed.

Paychex, Inc. is a recognized leader in offering software solutions for payroll, human resource, and the benefits outsourcing industry. The company has 40.000 employees spread around the country in 100 locations. This includes 5,500 agents supporting the customer base by chat, SMS, e-mail and voice calls.

The company enjoys a record of business achievements that continues a tradition of delivering excellence service to its customers. Now Paychex relies entirely on Cisco Unified Communications platforms to deliver exceptional service to its customers.

Before implementing the Cisco solution, Paychex faced different challenges. First, for a company that bases its reputation to deliver exceptional service to its customers, its legacy communications system was not capable of delivering quantifiable contact metrics. This mean that It was difficult for the company to measure the work that its agents were doing in supporting the 100.000 customer base. Secondly, the company was unable to support customers communications in a variety of mediums such as chat, SMS, email from a single unified platform. These challenges raised increased concerns within Paychex about delivering the service promised to their customers.

The Cisco Unified Communication platform that Paychack adapted, entirely addressed the above challenges. Now, the company can measure the performance of each agent interaction with customers. Customer support is now highly available, servicing customers in any given time. The company now offers omnichannel capabilities including, chat, SMS, e-mail and voice support for customers. The Cisco solution is scalable, allowing the company to quickly adapt for future growth because it's a solution based on an open stack architecture, which allows integration of other solutions when the time is right.

With Cisco Unified Communication solutions, all communications that Paychex delivers can now be placed in the same network, including data, video and voice, fixed and wireless traffic, and all tools used in this regard.

2. **[One mark] Technical Description:** Technically describe the solution (Hardware, software, user interfaces, etc.). Include diagrams, technical specifications from Cisco, and all kind of technical documentation as needed. (At least two pages without counting images).

The solution that PayCeck Inc. implemented, is based on three main Cisco Unified Communication components:

- Cisco Unified Communications Manager
    - Cisco HyperFlex hardware data platform
    - CM Express based on ISRs
- Cisco Unified Contact Center Enterprise
- Cisco IP Endpoints

Cisco Unified Communications Manager

Paychex Inc. is an enterprise with 40.000 employees and 5500 agents. Based on its size and business volume, the best products that would fit Paychex's needs is the Cisco Unified Communications Manager (CallManager or CUCM) for enterprise unified communications and collaboration.

CUCM is an appliance-based solution that offers an integrated collaboration infrastructure for voice and video calling, messaging, and mobility. It enables any type of communication anytime and across any device. This aligns perfectly with Paychex requirements for an omnichannel solution with voice, video, email, chat and sms service.

The key features of CUCM that Paychex can benefit from are:

- Unified communications
- Enhanced business mobility
- Global presence
- Cloud-connected global operations
- Interoperability, Security and Compliance

Unified communications enable Paychex to support all of its communication needs from the Cisco Unified Communications Manager. CUCM offers IP telephony, high-definition video, unified messaging, Instant Message and Presence. With high-definition video, employees can benefit from remote meetings with excellent video quality, removing the need for in-person meetings. CUCM guarantees Enterprise Instant Messaging through the Jabber Extensible Communication Platform (XCP). It offers secure messaging, logging for compliance and auditing, publishes employee's presence status, allow newly joined employees to see older messages and visual voicemail retrieval. Another feature that Paychex will make use of is CUCM LDAP or Active Directory integration, which allows its employees to benefit from single sign-on authentication before using cisco unified communication tools.

The mobility feature of CUCM, enable Paychex to easily support remote employees. Agents can now work from home with a Cisco Softphone extension installed on their device, and still have access to all tools they need to interact with the customer.

CUCM is capable of scaling to Paychex's needs. Cisco Unified Communications Manager supports large enterprises with up to 80,000 users. CUCM is based on a cluster of servers which support up to 40.000 phones. Upscaling with trunk link is possible to enable Paychex to support even more than 40.000 phones. If the business double in size in the future, Paychex can even request a specific tailored mega cluster solution from Cisco to support 80.000 users.

With the Webex Cloud-Connected UC service feature of CUCM, Paychex can centralize control of UCM operations in a single location, including upgrades, analytics, and troubleshooting. This allows easier administration and faster detection of performance issues.

CUCM supports industry standards to allow integration with third-party solutions. This results in easier collaboration with business that relay on non-cisco solution. CUCM also support the latest authentication and encryption protocols, like IPSec or TLS. It complies with government and industry certifications across the globe.

Paychex may choose to implement the latest Cisco Unified Communications Manager Version 12.5, which now offers simple upgrades to the entire Unified CM cluster at once and a simplified way to deploy endpoints by entering a simple 16-digit code or scan a QR code on the device, to securely authenticate and register to Unified Communications Manager.

Cisco HyperFlex

Cisco Unified Communications Manager can be installed on Paychex own hardware infrastructure. Smaller companies could benefit from a subscription cloud-based solution hosted by Cisco.

Paychex could purchase the Cisco HyperFlex hardware data platform to implement the solution. It is based on the Cisco Hyperconverged Infrastructure. Hyperconverged infrastructure (HCI) combines compute, virtualization, storage, and networking in a single cluster. Starting with as few as three nodes, customers like Paychex can easily scale out to match computing and storage resource needs. Hyperconvergence brings cloudlike features to on-premise environments, within a single, easily managed platform.

Cisco products are famous for their endurance, performance and easy scaling to support more users, devices, and applications, thanks to its modular building-block design. Cisco HyperFlex is an on-premises infrastructure solution that combines compute, networking, and storage in one system. HyperFlex's data optimization features provide high performance, low latency, and consistent Input/Output Operations Per Second (IOPS). This will ensure quality performance for our Paychex unified communications solutions. Cisco HyperFlex also provides high availability with built-in data protection and replication.

As described previously, CUCM collaboration capabilities include voice, video, conferencing, messaging, Instant Messaging and Presence (IM&P), mobility, and contact center for every user on any device from any location in the company. The communication and collaboration solution should be optimized for a large organizations like Paychex with around 40.000 users and devices. Running on Cisco HyperFlex, unified communication services can scale to Paychex needs without affecting performance, while HyperFlex can also provide the infrastructure backbone for other mission-critical applications Paychex relies on.

Cisco HyperFlex can easily meet Paychex requirements for growth, thanks to its modular construction which also easy upgrading of CPU, flash memory, graphics acceleration, and disk storage to deliver optimal infrastructure needs. To the benefit of Paychex's IT department, HyperFlex offers centralized management, helping IT staff to configure, deploy, monitor, and manage Paychex's operations from a single interface.

Cisco Hyperflex hardware solution is composed of main components, the HyperFlex Nodes that offer compute and storage, and the Fabric Interconnects switches for networking.

Typical components of a Cisco HyperFlex System

The table below summarizes all Cisco Unified Communications components that a Cisco HyperFlex hardware solution can support. Paychex Inc. doesn't have to implement all of them but might still decide to implement some of these components later, based on evolving business requirements.

Components	Description
Cisco Unified Communications Manager	Voice and video telephony call control and native call queuing
Cisco Prime™ Collaboration	Comprehensive, single-pane-of-glass management toolset for provisioning, service assurance and analytics, and streamlining upgrades and migrations
Cisco Unified Instant Messaging and Presence Cisco Jabber®	Instant messaging, presence, and real-time conferencing
Cisco Unity® Connection	Voicemail and automated attendant
Cisco Expressway™	Secure remote and mobile worker, business-to-business, and cloud-connected collaboration
Cisco TelePresence® Management Suite	Video conferencing management and scheduling
Cisco Unified Attendant Console Standard	Call routing and distribution
Cisco Contact Center Express	Multichannel customer care and efficient call center management and reporting
Cisco Emergency Responder	Enhanced emergency call tracking and notification services
Cisco Webex®	Option to add cloud messaging and meetings with Cisco Webex Hybrid Services

CUCM solution implementation scenario

The solution that Paychex will implement, will consist of deploying CUCM in two separate clusters on two different datacenters, the East and West datacenter or headquarters. These headquarters will support all agents and employs based around the 100 hundred locations (sites). The East HQ will support the location close to the East coast, the West HQ will support the locations close to the West coast. Each HQ will run a separate CUCM cluster consisting of one Publishing server and 19 subscribers, 8 of which will handle call processing.

Since Paychex have an established WAN infrastructure for data communications and have more than 100 office locations all around the US, the CUCM infrastructure will also enable Paychex to save on call costs, by routing voice traffic through its WAN, while using keeping PSTN as a backup choice in case of WAN failures. Each Site office uses a CUCM cluster at the central office through the WAN for call processing.

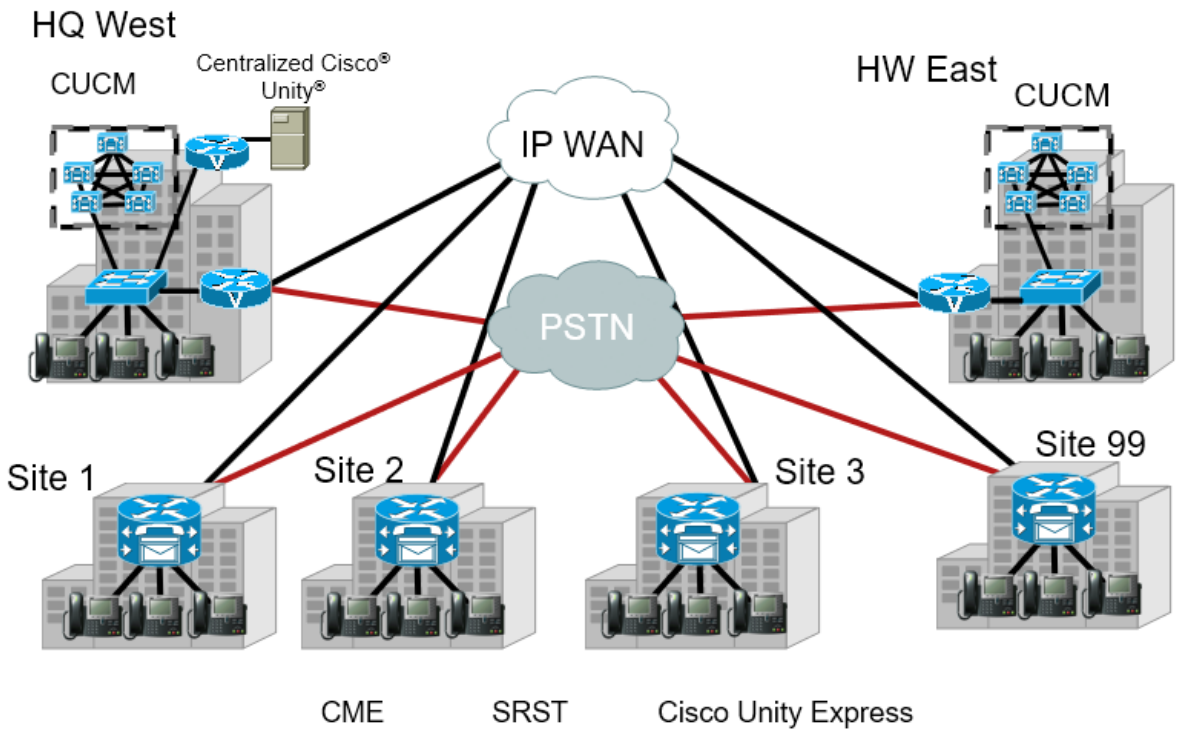


Diagram of the proposed Paychex solution based on CUCM clusters

Since Cisco Unified Communication Manager is built on open stack architecture it allows integration of other solutions like Cisco Unity and Unity Express on sites for voice mail integration. Cisco Unified Survival Remote Site Telephony (SRST) will complement the CUCM solution to provide fallback support to local IP phones at a Site office. When the WAN fails, SRST will establish calls through PSTN.

For the CME used on individual Paychex sites and based on Cisco Integrated Service Routers, like the Cisco 2900 Series to offer voice services in case of CUCM cluster failure. The CM Express will be discussed in part 3 in details.

Cisco Unified Contact Center Enterprise

The Cisco Unified Contact Center Enterprise (CCE) solution is able to deliver personalized customer experiences for contact centers with up to 24,000 agents. Paychex's current call-center includes 5,500 agents which makes this solution perfect for its needs. This solution will enable Paychex to gather feedback from customers interactions with agents, with post-call surveys, email, and web surveys.

Provide actionable insights to supervisors on agent performance and areas in need of improvement. This fulfills one of the main requirements of Paychex discussed in the beginning, prior to implement a Cisco solution. Cisco Unified Contact Center makes it possible to engage with customers on a variety of channels from a single contact center agent desktop extension. Omnichannel presence was one of the other main requirements that Paychex had in the beginning. Paychex agents can now use a rich set of call and customer data, including context from previous customer interactions, to provide highly personal, efficient customer service. Web chat and email are included with every agent license. Distributed fault tolerance helps ensure uninterrupted operation.

Cisco IP Endpoints

Third part of the solution I have implemented, requires Paychex to also update its analog phones to modern Cisco IP Phones. This transition can happen gradually. The IP Phone model chosen is the Cisco IP Phone 7800 Series. Its more affordable to other Cisco IP Phones but offers full-featured VoIP collaboration. Thanks to its integrated mini-switch hardware the IP Phone allows easy connection between the employee PC and the switch, allowing both data and voice traffic from a single cable and can also be powered by a PoE switch, saving on cabling and allowing mobility in installation. The phone offers a rich GUI experience and delivers crystal-clear voice.

Cisco IP Phone 7800 Series

3. **[One mark] Applied Technology:** Select and indicate one specific topic from the ones covered in the course (check the Addendum) and verify how this technology was involved in the particular case study you selected. Explain how it can be implemented in this case.

In the course, we have covered extensively the Cisco Unified Communications Manager Express (CME). As mentioned in part 2, Paychex will implement CME on individual site location. CME is implemented on Cisco Integrated Service Routers, acting as an IP PBX or IP Key System. Based on the Cisco ISR model, CME can support up to 450 phones. Based on the number of employees to be supported on each site, a different router model might be chosen to save on costs. These features can be implemented on existing routers by upgrading the router with DSP (Digital Signal Processing) modules for voice processing and conversion between Voip and PSTN. It will use the G.729 codec by default, which requires less bandwidth to handle voice, because of its compression algorithm. The immediate benefit for Paychex is a reduction in costs, because this solution requires no cabling or separate billing for voice traffic. If some sites are not connected to PSTN at all, they can still benefit from voice communications. Paychex engineers should make sure that the IOS of this Cisco routers is updated to support these VOIP features. CME offers an all-in-one voice solution because it can handle call processing, signaling, registration, call routing and call termination.

CME can act as a signaling gateway (SS7, sigtran signaling), media (voice) gateway (TDM/IP conversion, RTP, RTCP traffic) and media gateway controller (call agent supporting H323 or SIP). It has a CLI and GUI for easy management and different level of access. CME is not involved in the RTP stream when call is established avoiding bottlenecks. CME offers T1 signaling (CSA or CCS) for a digital trunk or acts as an FXO port for an analog trunk. It supports both IP and analog phones (and ATA analog telephony adaptors), allowing each Paychex location to easily transit from analog to IP phones. For signaling with Cisco IP Phones chosen in part2, CME supports SIP or SCCP.

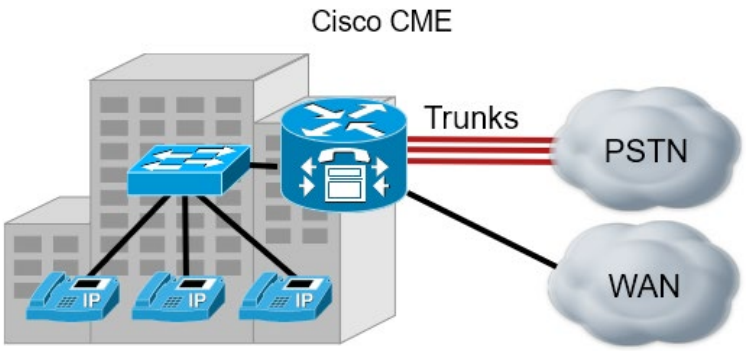
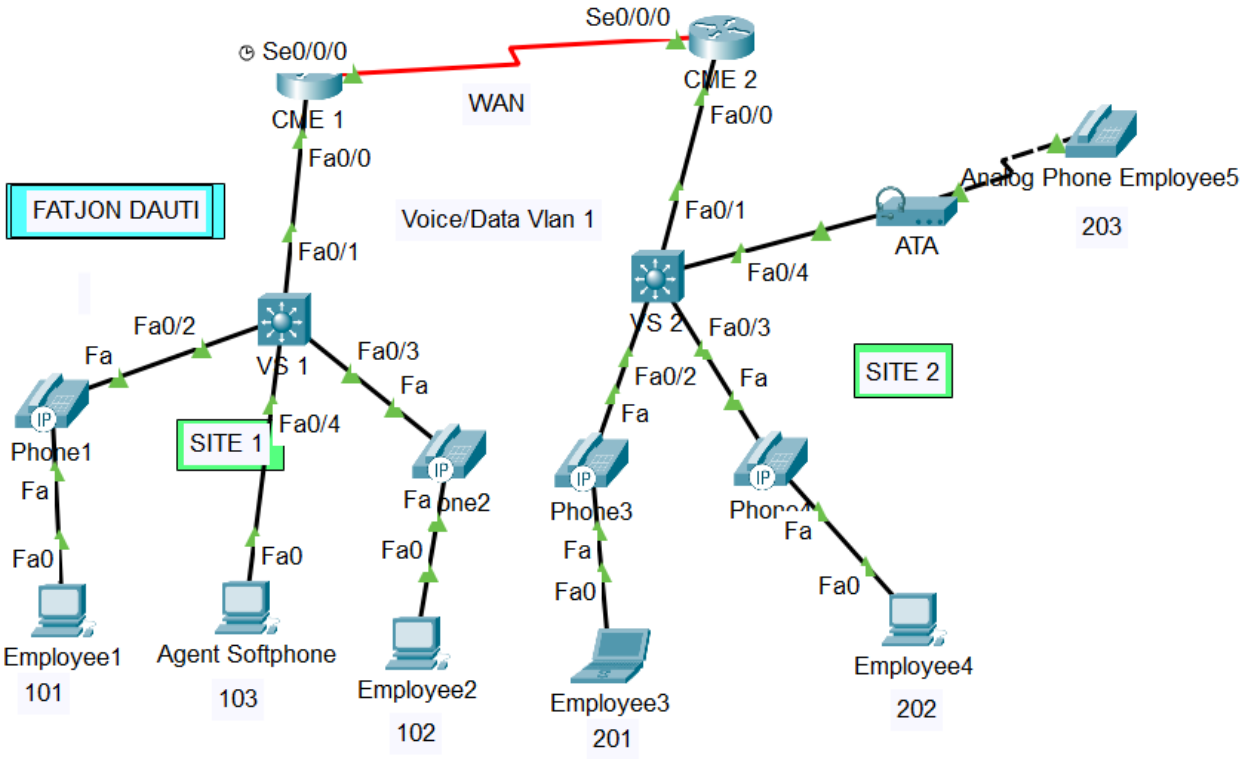


Diagram illustrating CME implementation on a Paychex site location
with WAN and PSTN connectivity

As discussed on the diagram in part 2, CME can also work in SRST mode, to provides more functionality than the stand-alone SRST, such as call park, extension mobility, CUE integration etc., all of which Paychex might benefit from. For instance, when the WAN is disconnected or CUCM servers assigned to local IP phones as call processors fail, SRST allows the local IP phones to still have some level of connectivity with fewer features. In simple terms, If the WAN fails, calls can still be established though PSTN. If WAN is connected but the CUCM cluster is unavailable, connection to a voice gateway at the company HQs through the WAN or the PSTN is still possible.

4. **[One mark] Network Diagram:** Create a network diagram using Packet Tracer or Cisco icons: include the routing, switching and end devices required for this solution; insert it in your report; explain the topology; and, how the networking devices are configured in this particular case (routing, switching, VLANs, end devices).



In the Packet Tracer topology created above, I have tried to emulate a connection between to Paychex site locations, Site 1 and Site 2. On each site a Cisco ISR router (like the 2811 model) will act as a CM Express providing some of the features previously discussed on part 2. As we know, a CME can't support remotely registered phones (phones on the other side of the wan or pstn), so a CME is needed on each site. The switches offer PoE for the IP Phones for easy installation and less cluttering on offices. Different employees have their PC connected to the IP Phone and the Phone connected to the switch ports. An Agent is represented with its PC directly connected on the switch. Agents don’t need to use IP Phones since their work can be done using a cisco provided software that acts as softphone on the PC. On Site 2, and analog phone is still supported by CME, through the use of an ATA (analogue telephony adapter) connected to the switch and registered with CME2.

All switch ports not used are shut down. For easy connectivity, all phones are operating on Voice Vlan 1 and all PC on Data Vlan 1. Phone might operate on different voice vlan and PC on each site on different Data Vlans. In this case, a trunk would need to be configured between the switches and the routers. The router’s interfaces connected to the switches would then need to be configured with sub interfaces to act as gateways for each vlan. A separate pool would be created for each Vlan.

A default static route configured on both CME routers enables connectivity through a serial WAN link to reach each site. Each CME router also works as DHCP server for its network. A dial-peer created on each CME router acts as a route for voice traffic, to reach the destination phones on the other site.

5. **[One mark] Service Provisioning:** Select one specific service to be provisioned in this case and write a complete sequence of IOS commands that allows implementing that particular service. Include all the commands in your report.

The commands to implement voice service between each IP and analog Phone in the packet tracer diagram above and their purpose are provided below:

```
!CME1 as DHCP Server with option 150
ip dhcp pool Left
network 192.168.1.0 255.255.255.0
default-router 192.168.1.1
option 150 ip 192.168.1.1
int fa0/0
ip address 192.168.1.1 255.255.255.0
no shut

!Turn on Voip services on CME1 to support 5 phones
telephony-service
!config-tel
max-ephones 5
max-dn 5
ip source-address 192.168.1.1 port 2000
auto assign 1 to 5

!Create 3 virtual ports to support 3 phones with their specific extension numbers
ephone-dn 1
number 101
ephone-dn 2
number 102
ephone-dn 3
number 103

!Left Switch config
int range fa0/1-5
switchport voice vlan 1

!Connect CME1 with CME2, on a serial link
int s0/0/0
ip address 192.168.2.1 255.255.255.0
no shut
clock rate 64000
exit
ip route 192.168.3.0 255.255.255.0 s0/0/0

!Allow Site1 phones to talk to the other Site phones matching 3-digit numbers starting with 2, by configuring a voip dial peer, and specifying the session target to establish a call leg with CME2
dial-peer voice 1 voip
destination-pattern 2..
session target ipv4:192.168.2.2
end

!CME2
ip dhcp pool Right
network 192.168.3.0 255.255.255.0
default-router 192.168.3.1
option 150 ip 192.168.3.1
int fa0/0
```

```
ip address 192.168.3.1 255.255.255.0
no shut
int s0/0/0
ip address 192.168.2.2 255.255.255.0
no shut
!
ip route 192.168.1.0 255.255.255.0 s0/0/0
!
telephony-service
max-ephones 5
max-dn 5
ip source-address 192.168.3.1 port 2000
auto assign 1 to 5
!
ephone-dn 1
number 201
ephone-dn 2
number 202
ephone-dn 3
number 203
!
!creating a VOIP dial peer and matching destinations starting with 1 on Site 1
dial-peer voice 1 voip
destination-pattern 1..
session target ipv4:192.168.2.1
!
!right switch
int range fa0/1-5
switchport voice vlan 1
```

Deliverable requirements:

- A Word document of 3 to 5 pages (single side, single space, 10pt Arial font), without counting graphs, tables or diagrams. One of those pages must contain standard-cited references that can be verified from a web site (copy the URL) or from the Seneca College Library (use a persistent link).

Cheating and Plagiarism:

Each student should be aware of the College's policy regarding Cheating and Plagiarism. Seneca's Academic Policy will be strictly enforced. To support academic honesty at Seneca College, all work submitted by students may be reviewed for authenticity and originality, utilizing software tools and third party services. Please visit the Academic Honesty site on http://library.senecacollege. ca for further information regarding cheating and plagiarism policies and procedures.

References

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- DCN704 – Collaborative Communications Lab # 2 - VoIP using CME