



> **Five Year forward view**
For XXX NHS Foundation Trust

RE: T20200219.0192
Version 1 | 28 January 2021

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Version Control

Version	Date Issued	Status	Owner	Description
0.1	27/03/2020	Draft	Wayne Martin	Draft Document for Internal Review
0.2	30/3/2020	Draft	Wayne Martin	Adjusted BOM to reflect Timeline
1.0	22/04/2020	Release	Reece Hardstaff	Cisco Confirmation added and Release

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Executive Summary

The Challenge

XXX NHS Foundation Trust have a large and distributed Enterprise network. A large percentage of the equipment has passed the last day of hardware or software support, this presents a risk to application availability for staff and patients. This means that XXX NHS Foundation Trust need to plan to replace the existing network over the coming years.

CAE are acutely aware of the relationship between XXX NHS Foundation Trust and XXX University Hospital NHS Foundation trust. As such, we need to factor in the dependency XXX NHS Foundation trust have on shared infrastructure. Due to the different care and services provided by the two organisations, the obvious scenario which could harbour contention would be the Wireless Infrastructure as the wireless dependencies of an acute hospital differ greatly from a mental and social care provider.

CAE has been asked to produce a high-level five-year strategy and proposal for replacing the network which includes equipment recommendations, indicative costs, including any caveats and a logical order/timeline for the project. This document will form the initial phase of the five-year forward view by identifying the key network components and identifying the End of Life status and proposing possible replacements.

At this time, no technical and functional requirements have been discussed with the Trust. We are also yet to cover business requirements and outcomes, which are fundamental to the construction of a comprehensive network strategy. The view would be for CAE to align this network strategy to the published strategic approach set out by XXX NHS Foundation Trust, with a Key focus on;

- Supporting our leading and develop our culture of continuous innovation and improvement
- To maximise the value of digital and technology that enhance the electronic record and improve our efficiency.

In doing so, we ensure that the business case proposed, has been created with a view to not only improve the networking capability of XXX NHS Foundation Trust, but with a view to help achieve the wider trust objectives.

CAE suggest the following principles be adopted as a foundation to the networking strategy:

- Replace all items that have reached their Last day of Support (LDOS) Milestone;
- Consider replacing all items that will reach their last day of support (LDOS) milestone before end of CY2021;
- Replace all item that have reached their End of Software Maintenance (EOSWM) milestone;
- Consider replacing all items that will reach their last day of Software maintenance before the end of 2021;

Estimated Cost over the 5 Year Replacement Programme

Year 1	£0
Year 2	£0
Year 3	£0
Year 4	£0
Year 5	£0.00 – Subject to change if items go EOL in 2020
Wireless Replacement for EOL Equipment	£0
Wireless for full deployment - Optional	£0

Proposed Solution

CAE have proposed a solution that is based on the latest Cisco Technology as part of this engagement we will:

- Work with the Trust to develop a network strategy for the next five years;
- Agree at what point on the Lifecycle components should be replaced (EoSWM or LDoS);
- Develop a prioritised program of works to provide replacement hardware in line with:
 - EoSWM milestones;
 - LDoS milestones;
- A replacement for all access layer switches based on Cisco 9000 series switches that will offer **improved performance and future support** working towards a software defined network. We have assumed all switches will be 1:1 replaced;
- A like for like replacement for routers based on the ISR1000 series Integrated Services routers;
- A like for like replacement of the ASA firewalls with the Firepower Threat Defence (FTD) appliances;
- High level timeline/priority for technology replacement.

Note: Various options are open to the Trust and CAE would welcome the opportunity to discuss these options in further detail.

Hardware & Software Discovery

Following the latest Agility Intelligence (AI) audit, we have analysed the output and discovered the data presented in the following tables. These tables show the discovered components with an “End of Sales” (EoS) announcement (Table1) and devices that are currently In-Life (Table2). Wireless Access Points are shown in Table 3 and have been separated from the main replacement programme, due to the current shared environment held between XXX NHS Foundation trust and XXX University Hospital, CAE believe a discussion needs to be held to understand how XXX NHS Foundation Trust would like to move forward with this platform.

Cisco have a well-defined end of life policy for their products. Generally, a product will receive an End of Sale (EoS) notification six months prior to Cisco ceasing the sale of the product, several key milestones are then reached through a five-year period until the product reaches the “Last day of Support” (LDoS). Once the product reaches LDoS it is said to be obsolete and support via Cisco or a Cisco Partner is no longer possible.

Other key dates on the Lifecycle milestones include the “End of Software Maintenance” (EoSWM). When this date is reached the production of new software, bug fixes and feature enhancements cease. No further software development is available on the platform following this date.

<https://www.cisco.com/c/en/us/products/eos-eol-policy.html>

Routers, Switches and Firewall devices

Fourteen (14) of the hardware components discovered during the latest Agility Intelligence audit were found to be beyond their LDoS. An additional seventy-one (71) devices have an EoS announcement and have reached or exceeded the EoSWM milestone (Table 1).

We also discovered one hundred and seven (107) in-life components during the AI audit including switches and firewalls. These components (table 2) are all in-life (still purchasable from Cisco systems) with no EoS notifications.

In table 1 below, we have only included major items. Items such as power supplies, SFP’s and sub modules have not been included, a full breakdown is available on request.

Product	Qty	EoSWM	LDOS	Link to EOS Notice
Last Day of Support 2015 - Obsolete				
WS-C3750-24PS-S	2	04/07/2013	31/07/2015	LINK To EOS
WS-C3750-48PS-E	3	05/07/2013	31/07/2015	LINK To EOS
WS-C3750-48PS-S	4	06/07/2013	31/07/2015	LINK To EOS
Last Day of Support 2016 - Obsolete				
CISCO878-K9	1	09/05/2012	31/05/2016	LINK To EOS
CISCO1841	1	31/10/2014	31/10/2016	LINK To EOS
CISCO877W-G-E-K9	1	19/12/2012	31/12/2016	LINK To EOS
Last Day of Support 2018 - Obsolete				
WS-C3750G-12S-E	1	30/01/2014	31/01/2018	LINK To EOS
WS-C3750G-12S-S	1	30/01/2014	31/01/2018	LINK To EOS
Last Day of Support 2021				
WS-C3750V2-24PS-S	2	14/05/2017	31/05/2021	LINK To EOS
WS-C3750V2-48PS-S	7	14/05/2017	31/05/2021	LINK To EOS
WS-C3750X-12S-E	1	30/10/2017	31/10/2021	LINK To EOS
WS-C3750X-48PF-S	27	30/10/2017	31/10/2021	LINK To EOS
WS-C3750X-48PF-E	5	30/10/2017	31/10/2021	LINK To EOS
WS-C3750X-48P-S	17	30/10/2017	31/10/2021	LINK To EOS
WS-C3750X-24P-S	4	30/10/2017	31/10/2021	LINK To EOS
WS-C3750X-48P-E	1	30/10/2017	31/10/2021	LINK To EOS
WS-C3750X-48T-S	2	30/10/2017	31/10/2021	LINK To EOS
WS-C3750X-24P-E	1	30/10/2017	31/10/2021	LINK To EOS
WS-C3750X-48T-E	2	30/10/2017	31/10/2021	LINK To EOS
Last Day of Support 2022				
ASA5512	1	N/A	31/08/2022	LINK To EOS
Last Day of Support 2024				
C897VAW-E-K9	1	19/03/2020	31/03/2024	LINK To EOS

Table 1 - End of Life Components

Product	Qty	EoSWM	LDOS	Link to EOS Notice
In-Life Products – Currently Available				
C9300-24P	9	-	-	-
C9300-48P	14	-	-	-
C9300-48U	2	-	-	-
WS-C2960CX-8PC-L	2	-	-	-
WS-C3850-24P	1	-	-	-
WS-C3850-24P-E	2	-	-	-
WS-C6509-E	1	-	-	-
WS-C3650-48PS-S	8	-	-	-
WS-C3650-48FQM-S	4	-	-	-
WS-C3650-48FS-S	36	-	-	-

WS-C3650-24PS-S	10	-	-	-
WS-C3650-48PS-E	3	-	-	-
ASA5525	2	-	-	-
ASA5506	12	-	-	-
C1117-4P	1	-	-	-

Table 2 – In-Life Components

Wireless Access Points

The Agility Intelligence audit also identified many Access Points that have reached their LDoS (167). A further 259 have gone beyond the EoSWM milestone. The audit also discovered 232 1800 series AP’s. These are all currently available and have no EoS notification at the time of writing.

All wireless Access Points are tethered to the OUH Wireless LAN Controllers (WLC) and are currently running AireOS version 8.3.143.0. As the WLC hosts several different AP Models, the software utilised must be a compromise between the latest functionality and AP’s models deployed. This means that the latest (and CAE Recommended) Access Point models cannot be added to the existing Wireless LAN controller.

For example, if the 9115 Wi-Fi-6 AP’s were added to the current deployment, AireOS version 8.9.100.0 would be required. In this case all the AP’s (418 in total) except for the AIR-OEAP1810-E-K9 and the AIR-AP1832I-E-K9 would need to be replaced. If we were required to purchase a new WLC, there are further complexities as we’d need a WLC capable of running the older AireOS version. We could implement the Cisco 5520 Wireless Controller (support for up to 1500 AP’s). If we want to utilise the latest technology a replacement of the older Access Points would be necessary.

Product	Qty	EoSWM	LDOS	Link to EoS Notice
Last Day of Support 2018 - Obsolete				
AIR-LAP1041N-E-K9	126	01/10/2014	30/09/2018	Link to EoS
AIR-LAP1042N-E-K9	38	01/10/2014	30/09/2018	Link to EoS
AIR-LAP1142N-E-K9	3	02/03/2014	31/03/2018	Link to EoS
Last Day of Support 2021				
AIR-CAP1602E-E-K9	30	29/12/2017	31/12/2021	Link to EoS
AIR-CAP1602I-E-K9	174	29/12/2017	31/12/2021	Link to EoS
AIR-CAP3602I-E-K9	47	29/12/2017	31/12/2021	Link to EoS
AIR-OEAP1810-E-K9	8	29/10/2020	31/10/2024	Link to EoS
In-Life Products – Currently available				
AIR-AP1832I-E-K9	232	-	-	-

Table 3 – Wireless Access Points

The following table illustrates the earliest and latest software required for each access point type deployed with the latest 9100 series and 4800 series AP’s added to the table to illustrate the challenge

Product	Earliest Supported Version	Final Supported version
Deployed Access Points		
AIR-LAP1041N-E-K9	7.0.98.0	8.3.x
AIR-LAP1042N-E-K9	7.0.98.0	8.3.x

AIR-LAP1142N-E-K9	5.2.157.0	8.3.x
AIR-CAP1602E-E-K9	7.4.100.0	8.5.x
AIR-CAP1602I-E-K9	7.4.100.0	8.5.x
AIR-CAP3602I-E-K9	7.1.91.0	8.5.x
AIR-OEAP1810-E-K9	8.2.110.0	-
AIR-AP1832I-E-K9	8.1.122.0	-
Possible New AP models		
Wi-Fi 6 AP's	8.9.100.0	-
4800 Series	8.7.106.0	-

Table 4 –AireOS versions support matrix

Our proposed solution will include Wi-Fi 6 Access Points and a pair of Wireless LAN Controllers (WLC's), this assumes that the older AP's will be replaced with Wi-Fi 6, a second phase will replace the 1800 series AP's (but this has not been included in the initial Bill of materials, instead we have included the DNA License for the new 9800 Wireless LAN Controllers such that the 1800 series AP's can be migrated to the new environment.

Indicative Replacement Products

Until we can discuss in detail the requirements for the future network state, we have assembled a sample bill of materials for a like-for like replacement of the EoL products. For the purposes of this exercise we have proposed a replacement for all items included in table 1 only.

In all cases we will utilise the Cisco Catalyst 9000 series switches and the ISR1000 series routers, it should be noted that minor items such as SFP's secondary PSU's and sub-components have not been included at this time. EoL Access Points will be replaced by the mid-range Wi-Fi 6 AP. We have included a HA pair of Wireless LAN controllers (should this be necessary).

The following table illustrates the replacement hardware timetable and indicative costs. The pricing provided below is based on standard Cisco discounts. Additional discount may be available with the full engagement of your Cisco Account Manager. CAE will work with XXX NHS Foundation Trust, to ensure the best discount possible is achieved to deliver optimal value to the Trust.

EoL Product	Replacement	Quantity	Unit Cost	Total Cost
Phase 1 - Replace - Immediately				
CISCO878-K9	C1101-4P	1	£526.81	£526.81
CISCO1841	ISR4221/K9	1	£659.07	£659.07
CISCO877W-G-E-K9	C1116-4PWE	1	£747.25	£747.25
WS-C3750G-12S-E	C9300-24S-A	1	£9,429.80	£10,890.37
	C9300-DNA-A-24S-5Y	1	£1,460.57	
WS-C3750G-12S-S	C9300-24S-E	1	£9,429.80	£9,873.05
	C9300-DNA-E-24S-5Y	1	£443.25	
WS-C3750-24PS-S	C9300-24P-E	2	£2,429.09	£5,744.68
	C9300-DNA-E-24-5Y	2	£443.25	
WS-C3750-48PS-E	C9300-48P-A	9	£4,183.67	£62,308.89
	C9300-DNA-A-48-5Y	9	£2,739.45	
WS-C3750-48PS-S	C9300-48P-E	6	£4,183.67	£29,985.12
	C9300-DNA-E-48-5Y	6	£813.85	
Total				£120,735.24
Phase 2 - Replace – before end of 2020				

WS-C3750V2-24PS-S	C9300-24P-E C9300-DNA-E-24-5Y	2 2	£2,429.09 £443.25	£5,744.68
WS-C3750V2-48PS-S	C9300-48P-E C9300-DNA-E-48-5Y	8 8	£4,183.68 £813.85	£39,980.24
WS-C3750X-12S-E	C9300-24S-E C9300-DNA-E-24S-5Y	1 1	£9,429.80 £443.25	£9,873.05
WS-C3750X-48PF-S	C9300-48P-E C9300-DNA-E-48-5Y	27 27	£4,183.67 £813.85	£134,933.04
WS-C3750X-48PF-E	C9300-48P-A C9300-DNA-A-48-5Y	5 5	£4,183.67 £2,739.45	£34,615.60
WS-C3750X-48P-S	C9300-48P-E C9300-DNA-E-48-5Y	17 17	£4,183.67 £813.85	£84,957.84
WS-C3750X-24P-S	C9300-24P-E C9300-DNA-E-24-5Y	4 4	£2,429.09 £443.25	£11,489.36
WS-C3750X-48P-E	C9300-48P-A C9300-DNA-E-48-5Y	9 9	£4,183.67 £813.85	£44,977.68
WS-C3750X-48T-S	C9300-48T-E C9300-DNA-E-48-5Y	2 2	£3,509.17 £813.85	£8,646.04
WS-C3750X-24P-E	C9300-24P-A C9300-DNA-A-24-5Y	1 1	£2,429.09 £1,460.57	£3,889.66
WS-C3750X-48T-E	C9300-48T-A C9300-DNA-A-48-3Y	2 2	£3,509.17 £2,739.45	£12,497.24
Total				£391,604.43
Phase 3 Replace – Before End of 2021				
ASA5512	FPWR2110	1	£4,847.16	£4,847.16
Total				£4,847.16
Phase 4 Replace – Before End of 2023				
C897VAW-E-K9	C1116-4PWE	1	£747.25	£747.25
Total				£747.25
Wireless Replacement for EOL Equipment**				
WLC Option 1	C9800-40-K9	2	£17,634.03	£35,268.06
WLC Option 2	AIR-CT5520-K9	2	£8,817.01	£17,634.02
AIR-LAP1041N-E-K9	C9115AXI-E	126	£592.94	£74,710.44
AIR-LAP1042N-E-K9	C9115AXI-E	38	£592.94	£39,098.96
AIR-LAP1142N-E-K9	C9115AXI-E	3	£592.94	£1,778.82
AIR-CAP1602E-E-K9	C9115AXE-E	30	£592.94	£17,788.20
AIR-CAP1602I-E-K9	C9115AXI-E	174	£592.94	£103,171.56
AIR-CAP3602I-E-K9	C9115AXI-E	47	£592.94	£27,868.18
Total				£247,848.92
Option AP Replacement for full Wireless Deployment				
AIR-AP1832I-E-K9	C9115AXI-E	232	£592.94	£137,562.08
AIR-OEAP1810-E-K9	C9115AXI-E	8	£592.94	£4,743.52
Total				£142,305.60

Note: The above table only includes major items only, sub-components such as Fibre optic SFP', secondary PSU's and plug-in modules have not been included.

**Prior to release of this report, wireless was extensively discussed. As XXX NHS Foundation Trust currently have hosted wireless provided by XXX University Hospital NHS Foundation Trust. Confirmation was needed from Cisco regarding the migration of the already purchased C1 Wireless Licences.

Cisco have confirmed that, should As XXX NHS Foundation Trust decided to split from the service provided by XXX University Hospital NHS Foundation, the C1 licences already purchased can be migrated to the newly purchased controllers and be assigned to a new Organisation and the newly purchased access points. This confirmation means that the mandatory Wireless DNA licences normally needed to be purchased with the new 9K series Access points does not need to be purchased when replacing existing hardware.

SUMMARY

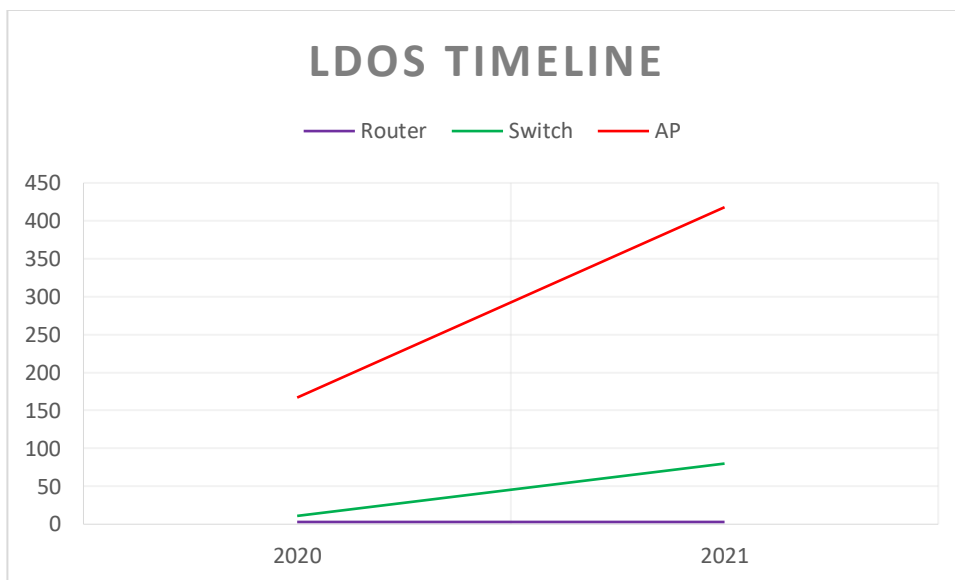
After an initial review of the AIO report, CAE have concluded that now is the time to look at the network strategy for the next five years.

The following number of components have reached LDoS

- > Switches – 17
- > Routers – 3
- > Wireless Access Points – 167

By 2021, the numbers will be as follows:

- > Switches – 89
- > Routers – 3
- > Wireless Access Points – 418



This document currently considers XXX NHS Foundation Trust in Isolation and addresses the minimum requirements to ensure compliance with NHSE and NHSD best-practise. It's an exercise to baseline the as-is, in order to provide a platform to drives digital transformation from a strategic perspective.

Considering the information provided within this report. CAE would recommend that a broader view is taken and as such open a discussion about the whole networking strategy, this would include the exploration of

Software Defined Access, NHS Digital Secure Boundary Solution, Enterprise Agreements and Cloud based Security Camera to name but a few network enhancements.

In taking this holistic approach XXX NHS Foundation Trust would be able to benefit from promotional offer from vendors such as obtaining free DNA Centre Servers from Cisco and additional training credits to ensure staff can be upskilled in the new technology.

TECHNOLOGY ON POINT



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