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### PREFACE

A typical IT department handles dozens of support calls from the users related to connectivity issues. Their task is to determine whether the problem is specific to one particular user or whether it is a larger network issue that needs to be addressed by the network operations team.

A network administrator on the other hand must be able to constantly monitor the health of the wireless network and be able to not only resolve issues quickly, but also predict problems and address them before they will cause any negative impact.

The challenge of many networks is lack of proper tools to diagnose a problem. Typically any connectivity issue is escalated to the network team, as support desk is unable to resolve client-related issues by themselves.

This results in the support desk escalation of very simple user issues to the network operations team, often overloading the team. In some cases even these resources require additional support directly from the vendor, further escalating the issue and increasing time to resolution. None of this would have happened if service desk had easy to use tools to monitor and troubleshoot wireless user state or network admin had full visibility and control over their wireless network.

Among the most common issues as reported by users are:

- "I cannot connect to your Wireless Network"
- "Connection keeps dropping when I'm moving"
- "Your Wireless Network is slow"

### **INTRODUCING NSIGHT**

NSight Advanced Management platform from Zebra Technologies provides ability to address customer issues and monitor wireless network health with a variety of easy to use user-centric tools. This paper will address common use-cases and provide generic workflow examples on how NSight can be leveraged for troubleshooting client connectivity and roaming related issues.

### HOW TO USE NSIGHT TO SOLVE CLIENT ISSUES FASTER

NSight is divided in to four functions, each offering tools to help different personnel resolve customer issues. Some tools are designed to help first line support, while some would better suit an experienced network administrator to provide overall view on the network and help predicting and resolving problems before they become urgent.

#### **Custom Dashboards**

NSight offers multi-user multi-screen customizable dashboards. The users can drag-n-drop widgets to their dashboard screens to get information that is most relevant to them instead of searching through multiple screens. It offers more than 20 widgets that can be used to graphically view various trend charts on the network and user statistics, like utilization, security, device inventory, client details, RF health etc. For troubleshooting purposes client details and RF health dashboards will provide

#### **Real-Time Monitoring**

NSight provides an ability to monitor client or Access Point behavior in real time, helping immensely in troubleshooting, while the issue is occurring at the same time.

#### Reporting

Pre-canned Reports and Custom Reports capture key metrics on Usage Trends, Network Health, Security, Compliance and Device Inventory. The reports can be generated on-demand or scheduled to be mailed periodically. Reports are a great tool to provide historic data on issue that was happening in the past, but has been reported only recently.

#### Advanced Live Troubleshooting

NSight offers advanced troubleshooting tools that can be used by the Level 1 or Level 2 Helpdesk for fast and effective troubleshooting, minimizing escalations to the network engineers. Network operations team can leverage remote wireless debug and remote packet capture tools in NSight to dig deeper in diagnosing the issue.

### **CLIENT TROUBLESHOOTING WORKFLOW – EXAMPLE 1**

Problem: Client connectivity issues or "I cannot connect to your Wireless Network"

How to address client association issues using NSight - Flowchart



## HOW TO ADDRESS CLIENT ASSOCIATION ISSUES USING NSIGHT APPROACH

1. Identify location and user MAC address by asking the user and confirm it in NSight. The easiest way to find a client is by searching for its MAC address or part of the Hostname in the upper right corner of the UI:

NSight <	🕈 Map View 🛛 😨 Dashboard 🖵 Monitor 🗈 Reports 🛛 🗶 Tools 🛛 🗮 Event Log	CGJ864 Q admin 👔
🔻 😑 System	<u>System</u> > <u>Monitor</u> > <u>Summary</u> > <u>ZCZ09L01CGJ864</u>	LIENT 8C-70-5A-80-4E-A8
V • Czech Republic	Summany Devices Cliente Poques	<< Provinue Next >>
🔻 🕈 Brno		INGALES INGALES
& EMEATECH	Conline Offline Rogues Sites	
▲ NOC		

2. (In the event the issue is spread across the whole site). Create a custom dashboard and verify RF health, channel utilization at the site (in the widgets below - always set the RFD name as a site identifier). Check if the RF environment is a possible cause of connectivity issues affecting a location:

♥ Map View         ② Dashboard         ➡ Monitor         ■ Reports         ★ Tools         I III         Event Log	search Q A admin
System > Czech Republic > Brno > HOME > LOCAL > Dashboard	
RF HEALTH 🖌 📋 🕂	
RF HEALTH	
& LOCAL - RF Quality [ band: 2g ]	🚨 LOCAL - Channel Utilization [ band: 2g ]
LOCAL Q Band: all  2.4 GHz 5 GHz	LOCAL Q Band: O all O 2.4 GHz 5 GHz
100 100 100 100 100 100 100 100	10 10 1421 1429 1437 1445 1453 1501 1509 1517 1525 1533 1541 1549 1557 1605 1613 Time
& LOCAL - RF Health [ band: 2g ]	1
LOCAL Q Band: all  2.4 GHz 5 GHz	
0 14.21 14.25 14.29 14.33 14.37 14.41 14.45 14.40 14.53 14.57 15.01 15.05 15.09 15.13 15.17 Retries: D	15.21 15.25 15.29 15.33 15.37 15.41 15.45 15.49 15.53 15.57 16.01 16.05 16.09 16.13 16.17 Time

Note: using time-based filter can either provide close to real-time information or a historical snapshot of the environment for the specified time frame.

3. Confirm that client is trying to associate to the correct SSID. Check client current status. If it is having trouble associating you would likely see 'authentication in progress' or 'disassociated' if the client is not currently active. Check which authentication method is in use on this WLAN (i.e. PSK or any of the EAP methods etc). If any of the EAP methods are in use verify that the Username is correct. Verify that the client is assigned a correct VLAN ID based on which SSID it is associating to. It may even happen that client can in fact connect to the wireless network, but failing to get an IPv4 address via DHCP.

Client Details					
Host Name:	(null)		VLAN:	7	
Status:	<ul> <li>Authenticat</li> </ul>	ion In Progess	Device Type:	Zebra T	ech
Access Point:	B4-C7-99-71-	FD-08	Access Point Name:	khepri-e	÷
Radio Mode:	11bg		O\$:	Unknow	/n
Wlan:	EMEATECH		MAC Address:	00-23-6	8-BD-D
IPv4 Address:	0.0.0.0		IPv6 Address:	N/A	
Encryption Method:	ccmp		BSSID:	B4-C7-9	99-7F-CF
Last Transmit Rate:	239 MBps		User Name:		
Last Recieve Rate:	218 MBps		Auth Method:	psk	
Retry:	0		Signal (RSSI):	-70dBm	1
SNR:	22db		Channel:	6	
Error Rate:	0		SSID:	EMEAT	ECH
Client Available Capability:	2.4GHz-wlan		Client Connected Capabil	ity: 11bg	
TX:	17.6 MB		RX:	726 KB	
Noise:	-92dBm				

4. Click on the client's MAC address and then click on Event Log to see logs filtered for this particular user. Event Log will provide historical data for the specified client and time frame.

				EventLog
Client Details				· · ·
Host Name:	(null)	VLAN:	7	
Status:	Disassociated	Device Type:	Zebra Tech	
Access Point:	B4-C7-99-A2-8A-18	Access Point Name:	khepri-m	
Radio Mode:	11bg	OS:	Unknown	
Wlan:	EMEATECH	MAC Address:	00-23-68-BD-DE-74	
IPv4 Address:	0.0.0.0	IPv6 Address:	N/A	
Encryption Method:	ccmp	B\$\$ID:	B4-C7-99-CA-C1-70	

Events Before: 07/29/2	2015 🛗 9:47 AM	✓ Access Point: se	arch	Q Clients: 00-23-	68-BD-DE-74	Q
Clients:	11 Authopticatio	an Rooming				
Cilcitta:	Autientication	i Koanning				
Access Point: 🗹 Sma	irtRF 🔽 WIPS	Adoption	<ul> <li>System</li> </ul>	VPN	DFS	Coverage Hole
						incidents
						Search Reset
Event Logs						<< Newer   Older >>
Time	Event Type	RF Domain	AP MAC	Client MAC	Severity	Event Message
2015-07-29 07:47:29	WPA_WPA2_FAILED	EMEATECH	B4-C7-99-A2-8A-18	00-23-68-BD-DE-74	notice	Client '00-23-68-BD-DE-74' failed WPA2-AES handshake on wlan 'EMEATECH' r
2015-07-29 07:47:29	CLIENT_DISASSOCIA	EMEATECH	B4-C7-99-A2-8A-18	00-23-68-BD-DE-74	info	Client '00-23-68-BD-DE-74' disassociated from wlan 'EMEATECH' radio 'khepri-m
2015-07-29 07:47:28	CLIENT_ASSOCIATED	EMEATECH	B4-C7-99-A2-8A-18	00-23-68-BD-DE-74	info	Client '00-23-68-BD-DE-74' associated to wian 'EMEATECH' ssid 'EMEATECH' on
2015-07-29 07:47:27	WPA_WPA2_FAILED	EMEATECH	B4-C7-99-A2-8A-1C	00-23-68-BD-DE-74	notice	Client '00-23-68-BD-DE-74' failed WPA2-AES handshake on wlan 'EMEATECH' r
2015-07-29 07:47:27	CLIENT_DISASSOCIA	EMEATECH	B4-C7-99-A2-8A-1C	00-23-68-BD-DE-74	info	Client '00-23-68-BD-DE-74' disassociated from wlan 'EMEATECH' radio 'khepri-k:
2015-07-29 07:47:26	CLIENT_ASSOCIATED	EMEATECH	B4-C7-99-A2-8A-1C	00-23-68-BD-DE-74	info	Client '00-23-68-BD-DE-74' associated to wlan 'EMEATECH' ssid 'EMEATECH' on
2015-07-29 07:47:25	WPA_WPA2_FAILED	EMEATECH	B4-C7-99-A2-8A-1C	00-23-68-BD-DE-74	notice	Client '00-23-68-BD-DE-74' failed WPA2-AES handshake on wlan 'EMEATECH' r
2015-07-29 07:47:25	CLIENT_DISASSOCIA	EMEATECH	B4-C7-99-A2-8A-1C	00-23-68-BD-DE-74	info	Client '00-23-68-BD-DE-74' disassociated from wlan 'EMEATECH' radio 'khepri-k:
2015-07-29 07:47:24	CLIENT_ASSOCIATED	EMEATECH	B4-C7-99-A2-8A-1C	00-23-68-BD-DE-74	info	Client '00-23-68-BD-DE-74' associated to wlan 'EMEATECH' ssid 'EMEATECH' on
2015-07-29 07:47:22	WPA_WPA2_FAILED	EMEATECH	84-24-8D-85-CE-80	00-23-68-BD-DE-74	notice	Client '00-23-68-BD-DE-74' failed WPA2-AES handshake on wlan 'EMEATECH' r
2015-07-29 07:47:22	CLIENT_DISASSOCIA	EMEATECH	84-24-8D-85-CE-80	00-23-68-BD-DE-74	info	Client '00-23-68-BD-DE-74' disassociated from wlan 'EMEATECH' radio 'khepri-l:
2015-07-29 07:47:22	CLIENT_ASSOCIATED	EMEATECH	84-24-8D-85-CE-80	00-23-68-BD-DE-74	info	Client '00-23-68-BD-DE-74' associated to wlan 'EMEATECH' ssid 'EMEATECH' on
2015-07-29 07:47:20	WPA_WPA2_FAILED	EMEATECH	B4-C7-99-71-FD-08	00-23-68-BD-DE-74	notice	Client '00-23-68-BD-DE-74' failed WPA2-AES handshake on wlan 'EMEATECH' r
2015-07-29 07:47:20	CLIENT_DISASSOCIA	EMEATECH	B4-C7-99-71-FD-08	00-23-68-BD-DE-74	info	Client '00-23-68-BD-DE-74' disassociated from wlan 'EMEATECH' radio 'khepri-e:
2015-07-29 07:47:20	CLIENT_ASSOCIATED	EMEATECH	B4-C7-99-71-FD-08	00-23-68-BD-DE-74	info	Client '00-23-68-BD-DE-74' associated to wlan 'EMEATECH' ssid 'EMEATECH' on
2015-07-29 07:47:18	WPA_WPA2_FAILED	EMEATECH	B4-C7-99-71-FD-08	00-23-68-BD-DE-74	notice	Client '00-23-68-BD-DE-74' failed WPA2-AES handshake on wlan 'EMEATECH' r
2015-07-29 07:47:18	CLIENT_DISASSOCIA	EMEATECH	B4-C7-99-71-FD-08	00-23-68-BD-DE-74	info	Client '00-23-68-BD-DE-74' disassociated from wlan 'EMEATECH' radio 'khepri-e:
2015-07-29 07:47:18	CLIENT_ASSOCIATED	EMEATECH	B4-C7-99-71-FD-08	00-23-68-BD-DE-74	info	Client '00-23-68-BD-DE-74' associated to wlan 'EMEATECH' ssid 'EMEATECH' on
2015-07-29 07:47:15	WPA_WPA2_FAILED	EMEATECH	B4-C7-99-A2-8A-18	00-23-68-BD-DE-74	notice	Client '00-23-68-BD-DE-74' failed WPA2-AES handshake on wlan 'EMEATECH' r
2015-07-29 07:47:15	CLIENT_DISASSOCIA	EMEATECH	B4-C7-99-A2-8A-18	00-23-68-BD-DE-74	info	Client '00-23-68-BD-DE-74' disassociated from wlan 'EMEATECH' radio 'khepri-m

5. If event logs are not providing enough information and issue appears to be more complicated, leverage advance remote debug and remote packet capture tools in order to get detailed info on what exactly is happening to the particular client while capturing packets / debug logs. This data will be useful for network ops team for deeper investigation on client connectivity issue:

The remote troubleshooting tools in NSight are very powerful and provide in-depth view of the network, enabling the root cause to be identified and the problem resolved.

In order to perform remote debug wireless or remote packet capture specify the RF Domain name where you want to capture information from and filter by the client's MAC address. More detailed description of Remote troubleshooting tools is available in "Remote Debug How To"

🕈 Map View 🛛 🕝 Dashboard 🛛 🖵 Monitor 📄 Reports 🔀	Tools 🛗 Event Log	30-A8-DB-64-25-59 Q A admin 🕐
<u>System</u> > <u>Tools</u> > <u>Wireless Debug Log</u>		
Packet Capture Wireless Debug Log Ping/Traceroute		
RFD Name: EMEATECH Q Include All Devices		
Select Debug Messages	Wireless Clients	Settings
<ul> <li>All Debug Messages</li> </ul>	All Wireless Clients	Duration Of Message Capture: 10 🗘 Minute(s 🗸
<ul> <li>Selected Debug Messages</li> </ul>	<ul> <li>Selected Wireless Clients (up to 3)</li> </ul>	Maximum Events Per Wireless 100 🗘
802.11 Management     RADIUS	Client MAC 1: 30-A8-DB-64-25-59	Cilotta
EAP System Internal	Client MAC 2: XX-XX-XX-XX-XX-XX	
Flow Migration WPA/WPA2	Client MAC 3: XX-XX-XX-XX-XX-XX	
Live Wireless Debug Events		
Start         Stort         Exact To Disk           (Interpret)         0.00 -	status: success (mgmt.c:1299)     status: success (mgmt.c:1299)     on radio khepri-k.C2 signal-terngth is -558Bm (mgmt.c:3775)     Be-42-559 (mgmt.c:2702)     0 00 00 0, supp_cap=00 00 00 00 (mgmt.c:3050)     1o vlan 7 (mgmt.c:278)     So vlan (EMEATECH) (mgmt.c:3345)     state from [Init] to [802.11 k keying] (mgmt.c:609)     42-55-9 (mgmt.c:341)     (05.UnknowNErowser:Unknown7 yee.Unknown) (credcache.c:890)     pt. 1 (802.11 k keying) (mgmt.c:609)     t2 (802.11 k.c:527)     or 30-Ab-B6-44-25-59 Possible key/passphrase mismatch or duplicate     802.11 k:c:527)     or 30-Ab-B6-44-25-59 Possible key/passphrase mismatch or duplicate     802.11 k:c:527)     pt. 3 (802.11 k:c:527)     most in to 730-Ab-B6-44-55-59 (802.11 k:c:1347)     andshake timeout (code:15) to 30-Ab-B6-42-559 (mgmt.c:1846)	Type to filter

Note: It is recommended to save both wireless debug log and packet capture to disk as a file and ask network ops team for data analysis.

🕈 Мар	View 0 Das	shboard   🖵 Monitor   🗋 Re	eports 🔀 Too	ls 🗮 Event L	og					30-A8-DB-64-25-	59 🔍 🗛 admin 👌	
System > Tools > PacketCapture												
Packet	Capture Wire	eless Debug Log Ping/Tracero	ute									
0.50.11	i de ner Capitale i meess Debug Log i ingritaceoute											
RFD Name: EMEATECH Q Z Include All Devices and C Send Packets To: Screen V												
Capture	Capture Locations Filter											
	Vired Packets					Filter By	MAC: 30-A8-E	B-64-25-59				
<ul> <li>Drop</li> </ul>	oped					Filter By	IP:					
<ul> <li>Wire</li> </ul>	d ge ∨ 1	O Packet Direction: Any ~				IP Proto	col: TCP	~				
<ul> <li>Wire</li> </ul>	less All	✓ Packet Direction: Any				Port:	1 0					
Note: Th	e max packet cor	ture data limit is 15MB				Settings	· · ·					
Note. Th	e max packet cap	Aure data IIIIIILIS TOMD.				Maximum Pa	cket Count: 2	0 0				
							-					
Start	Stop Hide Ca	apture Options Save To Disk							Туре	to search		
#	Time	Captured On	Interface	Source	Sport	Destination	DPort	VLAN	Ext-VLAN	Protocol	Info	
2	0.000244	khepri-k	radio 2	b4:c7:99:ca:	N/A	30:a8:db:64	N/A	N/A	N/A	802.11	Probe Response, SSID:EMEA	
3	INVALID DATA	INVALID DATA	INVALID DATA	INVALID DA	INVALID DA	INVALID DA	INVALID DA	INVALID DA	N/A	INVALID DA	INVALID DATA	
4	INVALID DATA	INVALID DATA	INVALID DATA	INVALID DA	INVALID DA	INVALID DA	INVALID DA	INVALID DA	N/A	INVALID DA	INVALID DATA	
5	0.002480	khepri-k	radio 2	30:a8:db:64	N/A	b4:c7:99:ca:	N/A	N/A	N/A	802.11	Association Request, SSID:EM	
6	0.002516	khepri-k	radio 2	b4:c7:99:ca:	N/A	30:a8:db:64	N/A	N/A	N/A	802.11	Association Response, Associ	
7	0.004575	khepri-k	radio 2	b4:c7:99:ca:	N/A	30:a8:db:64	N/A	N/A	N/A	802.11	Data(Frame from the AP), BSSI	
8	0.023669	khepri-k	radio 2	b4:c7:99:ca:	N/A	30:a8:db:64	N/A	N/A	N/A	802.11	Data(Frame from the AP), BSSI	
9	0.024002	khepri-k	radio 2	30:a8:db:64	N/A	b4:c7:99:ca:	N/A	N/A	N/A	802.11	Data(Frame to the AP), BSSID:	
10	0.056761	khepri-k	radio 2	b4:c7:99:ca:	N/A	30:a8:db:64	N/A	N/A	N/A	802.11	Data(Frame from the AP), BSSI	
11	0.056782	khepri-k	radio 2	30:a8:db:64	N/A	b4:c7:99:ca:	N/A	N/A	N/A	802.11	Data(Frame to the AP), BSSID:	
12	0.974623	khepri-k	radio 2	b4:c7:99:ca:	N/A	30:a8:db:64:	N/A	N/A	N/A	802.11	Deauthentication, Reason Cod	
13	2.017694	khepri-k	radio 1	30:a8:db:64:	N/A	ff.ff.ff.ff.ff.ff	N/A	N/A	N/A	802.11	Probe Request, SSID:ZGuest,	
14	2.017758	khepri-k	radio 1	30:a8:db:64:	N/A	ff.ff.ff.ff.ff.ff	N/A	N/A	N/A	802.11	Probe Request, SSID:, BSSID:f	
15	2.020156	khepri-k	radio 1	30:a8:db:64:	N/A	ff.ff.ff.ff.ff.ff	N/A	N/A	N/A	802.11	Probe Request, SSID:ZGuest,	
16	2.020204	khepri-k	radio 1	30:a8:db:64:	N/A	<del>ff.ff.ff.ff.ff.ff</del>	N/A	N/A	N/A	802.11	Probe Request, SSID:, BSSID:f	

### **CLIENT TROUBLESHOOTING WORKFLOW – EXAMPLE 2**

Problem: Roaming issues or "My connection/voice call/video stream keeps dropping when moving"

How to address client roaming issues using NSight - Flowchart



### HOW TO ADDRESS CLIENT ROAMING ISSUES USING NSIGHT APPROACH

1. Identify the location where the problem has been reported, i.e. site, building, floor, etc. Check overall RF performance at the specified location; attempt to find any clues to what might look abnormal. This is needed to isolate the issue to a particular client or location where all clients are experiencing similar issues.

Confirm that users are using correct SSID, are assigned to a correct VLAN, etc (see example #1 for further reference).

- Drill down to the Floor Map view of the second floor and verify that there is enough coverage and SNR level is sufficient (i.e. > 25 dB).
- 3. If overall RF Health at the site looks ok then build customized dashboard that will include Client Timeline and a table showing worst 10 clients by retries and worst 10 APs by retries. This should give you overall idea where you should start looking for potential root cause:

💡 Map View	② Dashboard	🖵 Monitor	Reports	🗶 Tools	🗎 E	vent Log			30-A8-	DB-64-25	-59	Q	🔒 a	dmin 🥐
<u>System</u> > <u>Das</u>	hboard													
CLIENTS 🖌	🛍 Client 🗡	DTILIZAT	TON 🗡 🗎 💼	RF-HEALT	н 🗡	💼 SE	CURITY	🖊 📋 A	pplication	Visibility	/ 📋	+		
Client							ç	30 min	2 hrs	1 day	1 week	1 mo	n 3 m	ion y
😑 System - Wo	st 10 Clients by ref	12	System	n - Worst	10 Clients by	SNR [ wla	n: all   ba	nd: all ]			12			
Client MAC	IP Address	Host name	Retries	State		Client M	AC	IP Address	Host	ame	SNR		State	
9C-F3-87-E	192.168.7.197	iPhone	1.38	Disasso	ci	9C-F3-87	7-E	192.168.7.197	iPhone	9		5.50	Disas	asoci
C4-42-02-8	192.168.95.97	android-d9d	1	<ul> <li>Associa</li> </ul>	ted	1C-7B-2	1-A	192.168.7.254	androi	d-446		7.89	<ul> <li>Asso</li> </ul>	ciated
00-08-22-6	192.168.7.119	android-e03	1	<ul> <li>Disasso</li> </ul>	ci	40-83-D8	E-6	192.168.9.189	androi	d-59b		15.79	<ul> <li>Asso</li> </ul>	ciated
B4-30-52-1	192.168.7.221	android-7ed	0.6	<ul> <li>Associa</li> </ul>	ted	64-9A-B	E-C	192.168.7.196	Gfk			18.27	e Disas	soci
DC-9F-DB	192.168.9.176	DC-9F-DB-8	0.5	<ul> <li>Disasso</li> </ul>	ci	40-83-D8	E-6	192.168.7.105	40-83-	DE-6		19.43	Disas	soci
E8-B1-FC-5	192.168.9.170	ZCZ09L01	0.5	<ul> <li>Disasso</li> </ul>	ci	F8-16-54	I-E	192.168.7.143	ZCZ09	L01J	1	20.14	Disas	soci
F8-16-54-E	192.168.7.143	ZCZ09L01J	0.4	<ul> <li>Disasso</li> </ul>	ci	E8-B1-F	C-5	192.168.9.170	ZCZ09	L01	1	22.11	😑 Disas	soci
40-6F-2A-3	192.168.95.98	BLACKBER	0.4	<ul> <li>Disasso</li> </ul>	ci	24-A2-E	1-4	192.168.9.145	SC-EN	1EA	2	22.90	Disas	soci
28-E1-4C-9	192.168.7.182	Rares	0.4	<ul> <li>Associa</li> </ul>	ted	08-08-C2	2-B	192.168.7.157	androi	d-5d0	1	22.99	<ul> <li>Asso</li> </ul>	ciated
24-A2-E1-4	192.168.9.145	SC-EMEA	0.3	Disasso	ci	C4-D9-8	7-3	192.168.9.184	ZCZ09	L02Q	2	23.07	<ul> <li>Asso</li> </ul>	ciated
00-23-68-BD	DE-74 - Client Time	<b>bline</b> f wlan• all I t	and all 1			System	n - Worst	10 APs by Ret	rios ( wlau	n all I ha	nd: all 1			
< 00-23-6	BBD-DE-74	0	Wlan: al	1	>	AP Nam	e	IP Address	Chann	el	Retries		Clients	
00230	0000214	~	ci			khepri-k		192.168.99	6/108	w		0.3		15
						khepri-m		192.168.99	11/10	0w		0.3		22
						khepri-e		192.168.99	6/132	w		0.2		18
						khepri-l		192.168.99	11/10	8w		0.1		20
	0.77.00.54		1 20 141 10 22 22	1 10.00 00 1.1	-									
9:25 29-Jul	9:55 29-Jul 9:53 29-	Time	1 29-Jul 10:22 29-Ju	n 10:28-29-Jul										
		TIMO												

4. Look for excessive roaming in the client timeline, i.e. if you see that the user is roaming too often or constantly associating / disassociating to the same AP during short time period. Zoom into the client timeline widget. Start typing client's MAC address and use Search button to auto-complete:



5. If the above is confirmed and you have identified trouble client(s) run a remote debug wireless and a packet capture filtering by client's MAC address, then send capture and logs for analysis to the network operations team. Wireless debug log and packet capture with show exactly where communication is failing or what could explain excessive roaming events. This has to be captured live, while the problem is happening in order to obtain relevant data.

### CLIENT TROUBLESHOOTING WORKFLOW – EXAMPLE 3

Problem: Poor network performance or "Your wireless is slow".

How to address network performance issues using NSight – Flowchart



### HOW TO ADDRESS NETWORK PERFORMANCE ISSUES USING NSIGHT APPROACH

1. Identify location and user MAC address by asking the user and confirm it in NSight. The easiest way to find a client is by searching for its MAC address or part of the Hostname in the upper right corner of the UI:

NSight <	የ Map View 🛛 🕝 Dashboard 🖵 Monitor 🗈 Reports 🛛 🛠 Tools 🛛 🗮 Event Log	CGJ864 Q admin ?
👻 🖶 System	System > Monitor > Summary > ZCZ09L01CGJ864	LIENT 8C-70-5A-80-4E-A8
🔻 🕈 Czech Republic	Nummer Devices Official Decuse	er Dravieura   Navtas
🔻 💡 Brno	Summary Devices Clients Rogues	<< Previous Next>>
& EMEATECH	( <sup>w</sup> ) 6 ( <sup>w</sup> ) 0 ▲ 0 ♀ 2 Online Offline Rogues Sites	
A NOC		

2. After finding the client in NSight click on it and you will be redirected to the client view showing you all the details regarding this particular user. This is real-time information. *Confirm that client has sufficient Signal Strength as seen by the Access Point (typically not less than -67dBm), good SNR (>25dB), low retry rate, also check Tx and Rx data rates last achieved by the client.* 



3. If the above checks out and nothing stands out as odd, take a look at the RF Health at the whole site where the issue has been reported. Check specifically the band wireless client was using (i.e. 2.4Ghz or 5Ghz). Create customized dashboard under 'Dashboard' tab for this purpose and make it publicly available. Often over utilized channel (too many APs or too many neighboring networks on the same channel) will result in highly degraded performance. Note: Always use filters to get relevant information based on when the issues has been reported. Available filters are: Time / WLAN / Band

TEALIN							Q	30 min 2 hrs 1 day 1	week 1 mon
System - Top	10 APs by channel utiliza	tion [ wian: ONBOARDING   band:	2g ]		* EMEATECH - C	Channel Utilization [ band: a	п]		
Wia	n: ONBOARDING	✓ Band: ○ all	Iz 🗇 5 Griz	7	EMEATECH	Q Ba	ind: 💿 all 🔘 2.4 GHz 🔘 5	GHz	
AP Name	IP Address	Channel	Channel Utilization	lients	40				1
thepri-k	192.168.99.191	11/52w	53.90		8 35-				
thepri-m	192.168.99.199	11/52w	53.23		9				5 L
hepri-e	192.168.99.200	6 / 100w	51.62		59 5	1 a 1			
hepri-l	192.168.99.185	11/108w	50.83		116		14		
B24-BIRC	192.168.97.150	11/112w	41.95		3 5 20	1 1 1	I AA III		
B4C-BIRC	192.168.97.149	1/112w	38.48		2 90N	MM MM	ON MAN	Ma alma anda	La Mala
580-KHEP	192.168.97.147	6/112w	38.38		W CHa	MANMA. A.	Mall VI. Mall	MAL MAN WANN	M.M. W.No
5BC-KHEP	192.168.97.148	6 / 112w	7.74		0 10-			24 SS 3-89 148	8 K S S
					0 13:23 13:3	10 13:37 13:44 13:31	13-58 14:05 14:12 14:19 Time	14:26 14:33 14:46 14:47 14:5 0	i4 15:01 15:08
System - Wor	st 10 Clients by SNR [ wi	an: ONBOARDING   band: all ]	1-05 CM-	_	• System - Wors	0 13:37 13:44 13:51	13-58 14-65 14-12 14-19 Time n: ONBOARDING   band: all ]	1426 1433 1446 1447 144 e	4 15:01 15:08
System - Wor Wia lient MAC	st 10 Clients by SNR [ will n: ONBOARDING	an: ONBOARDING   band: all ] V Band: (a) all (2.4 GH Host name	tz OF CHL	tate	System - Wors     Wiar     Client MAC	ie 13.37 13.44 13.51 st 10 Clients by retries [ wian n: ONBOARDING IP Address	13.58 14.05 14.12 14.19 Time Time CONBOARDING   band: all ] Band: @ all @ 2.4 GH Host name	1426 1433 1440 1447 145 e	H 15:01 15:06
System - Wor Wia lient MAC 0-6F-2A-39.	st 10 Clients by SNR [ will n: ONBOARDING IP Address 192,168,95,61	an: OHBOARDING   band: all ]	12 05 014 SNR 51 05	tate		10 13:37 13:44 13:51 st 10 Clients by retries [ wian n: ONBOARDING IP Address 192.168.95.59	13:58 14:05 14:12 14:19 Time a: CNBOARDING   band: all ] Band: (a) all (b) 2.4 GH Host name android-b504744d.	14.25 34.33 34.46 34.47 34.5 0 17 0 5 0 14 Retries 193	tate
System - Won Wia lient MAC 0-6F-2A-39 C-11-BE-7	st 10 Clients by SNR [ with n: ONBOARDING IP Address 192.168.95.61 192.168.95.81	an: OHBOARDING   band: all ] V Band: (e) all () 2.4 GH Host name ELACKBERRY-42DB Tra-Hiracie	tz 5505 SNR 5105 4239	State o Disassociated o Associated		10 1337 13:44 13:51 st 10 Clients by retries [ wian n: ONBOARDING IP Address 192.168.95.78	13:59         14:05         14:19         Time           mc:         ONBOARDING   band: all ]         Band: (a) all (b) 24. GH         Host name           android-5804744dandroid-582785dandroid-5827875d         android-5827875d         Android-5827875d	11-26 14:20 14:00 14:07 14:0 0 12 0 5 0 M2 Rotries 1.93 1.63	tate
System - Wor Wia Lient MAC 0-6F-2A-39 C-11-BE-7 .C-7F-3E-5	st 10 Clients by SNR   wil n: ONBOARDING IP Address 192.168.95.61 192.168.95.81 192.168.95.81	an: ONBOARDING   band: all ] V Band: () all () 2.4 GH Host name BLACKBERRY-42DB The-Miracle Eusa-Phone	tz 0.5.0% SNR 51.05 42.39 3652	state o Disassociated o Associated o Disassociated	<ul> <li>System - Wors</li> <li>Wiar</li> <li>Client MAC</li> <li>CC-02-98-6</li> <li>F8-A9-00-2</li> <li>4C-80-79-1</li> </ul>	0         10.37         10.44         10.31           at 10 Clients by retries         value         value           n:         ONBOARDING         UP Address         192.168.95.78           192.168.95.78         192.168.95.53         192.168.95.53	II SO 1465 1412 1419 Time  ac ONBOARDING   band: all ]  Band: (a) all (2.4 GH Host name android-5604744d android-5827a75d Darias-IPad	11.25 34.23 14.46 34.47 14.5 e Retries 1.53 1.63 1.63	tate Disassociated A Sociated
System - Won Wia Client MAC 10-6F-2A-39 (C-11-BE-7 4C-7F-3E-5 24-42-02-8	st 10 Clients by SNR   w/s n: ONBOARDING IP Address 192.168.95.61 192.168.95.81 192.168.95.57	an: ONBOARDING   band: all ] Host name BLACKEERRY-42DB The-Miracle Evas-Phone android-9476870.	tz 5 5 015 SNR 51.05 42.39 36.52 33.575	state o Disassociated o Disassociated o Disassociated o Associated	• System - Worr     • System - Worr     • System - Worr     • Client MAC     C - D2-9B-6     F8-A9-D9-2     4C-8D-79-1     C-407-2F-A	0         13.37         13.44         13.51           st 10 Clients by retries [ winn         ONBOARDING           IP Address         192.168.95.59           192.168.95.55         192.168.95.55	Iss less lets lets lets Time     Time     Time     Band:      android-5604744d     android-5604744d     android-5427875d     Danas-IPad     android-29781643	14.28 14.3 14.40 14.47 14.5 0 S.CMo Retries 1.93 1.63 1.42 1.16	tate Disassociated Associated Disassociated
System - Wor Wia litent MAC 0-6F-2A-39 C-11-BE-7 C-7F-3E-5 :4-42-02-8 :8-B5-B7-E	t 10 Clients by SNR   wh RE ONBOARDING IP Address 192.168.95.61 192.168.95.81 192.168.95.7 192.168.95.7 192.168.95.84	Band: () Band: all ) Band: () all () 2.4 GH Host name BLACKBERRY-420B The-Miracle Evas-Phone android-98/70870 IPhone-Daria	tr 5.0% SNR 51.05 42.39 36.52 35.75 32.15	state • Disassociated • Associated • Associated • Associated	• System - Wors     • System - Wors     • Chent MAC     Chent MAC     Check 0-29-6     F8-A9-0-2     4C-80-79-1     18-FE-34-92.	0         10.37         10.44         10.31           st 10 Clients by retries [ wiss         wiss         10         10           10         Alexa S         10         10         10           19         168 55.69         192.168 55.78         192.168 55.55         192.168 55.55         192.168 55.55	13/58 14:05 14:19 Time     Time     CONBOARDING   band: all ]     ✓     Band: @ all ○ 2.4 GH     Host name     android-5604744d     android-5604744d     Darias-Pad     android-5718(53     android-5718(53	14.36 14.33 14.46 14.47 14.5 e Retries 153 1,63 1,63 1,63 1,63 1,142 1,16 0,8	tate
System - Won Wia lient MAC 0-6F-2A-39 C-11-8E-7 C-11-8E-7 4-42-02-8 8-85-87-E 0-F5-C6-4	st 10 Clients by SNR   w/c IP Address 192.168.95.61 192.168.95.81 192.168.95.81 192.168.95.81 192.168.95.84 192.168.95.51	an: OHBOARDING   band: all ] V Band: (a) all (b) 2.4 GH Host name ELACKBERRY-42DB Tra-Niracie Evas-iPhone android-d9870870 iPhone-Daria IPad-Alina	tr 550% SNR 51.05 42.39 36.52 35.75 32.15 27.62	State Disassociated Disassociated Disassociated Associated Disassociated		0         ID.27         D.44         ID.31           st 10 Clients by retries [ what         what         O.80         RP           mr:         ONBOARDING         IP Address         192.168.95.78         192.168.95.78         192.168.95.78         192.168.95.55         192.168.95.55         192.168.95.55         192.168.95.55         192.168.95.55         192.168.95.55         192.168.95.55         192.168.95.55         192.168.95.51         192	ID 59 14 65 14 12 14 19 Time Time CNBOARDING   band: all ] Band: (a) all () 2.4 GH Host name android-527 a75d Darias-IPad android-52781c93 android-510851 BLACKBERRY-420B	Inter 1420 1446 1447 145 Retries 193 142 142 142 142 142 142 142 142	tate Disassociated Disassociated Disassociated Disassociated Disassociated Disassociated
System - Wor Wia lient MAC 0-6F-2A-39. C-11-8E-7. C-7F-3E-5. 4-42-02-8. 8-85-87-E. 0-675-5C-4. 0-00-DB-2.	st 10 Clients by SNR   wi n: ONBOARDING IP Address 192.168.95.61 192.168.95.81 192.168.95.81 192.168.95.84 192.168.95.84 192.168.95.51 192.168.95.50	an: OKBOARDING   band: all ] V Band: () all () 2.4 GH Host name ELACKBERRY-42DB The-Miracle Evas-Phone android-4987 d870 iPhone-Daria iPhone-Daria iPhote-Jaria android-730ffsc4	z 5505 SNR 5105 4239 3652 3575 3215 2762 2750	State Disassociated Associated Disassociated Associated Associated Disassociated Disassociated Disassociated	<ul> <li>System - Worr</li> <li>Wiar</li> <li>Client MAC</li> <li>CC-02-98-6</li> <li>F8-A9-00-2</li> <li>4C-80-79-1</li> <li>C4-07-2F-A</li> <li>18-FE-34-92</li> <li>40-6F-2A-39</li> <li>44-91-0B-3</li> </ul>	ID:37         D:44         D:31           st 10 Clients by retries [ wila         wila         D:31           n:         ONBOARDING         IP Address         192:168:95:78           192:168:95:78         192:168:95:55         192:168:95:55         192:168:95:55           192:168:95:61         192:168:95:61         192:168:95:62         192:168:95:52	I JSB 1465 14.12 14.19 Time Time Time Band: (*) all (*) 2.4 GH Host name android-56047444 Darias-Ped android-29781c93 android-51a70851 BLACKBERRY-42DB android-344651	In 26 (14.2) (14	A 1501 1500 Late Disassociated Disassociated Disassociated Disassociated Disassociated Disassociated Disassociated Disassociated
System - Wor Wa lient MAC 0.67-2A:39 C-17-3E-5 4:42-02-8 8:85-87-E 0:675-06-4 0:00-DB-2. C-00-0D-2.	t 10 Clients by SNR   wh CONBOARDING IP Address 192.168.95.61 192.168.95.61 192.168.95.61 192.168.95.61 192.168.95.64 192.168.95.64 192.168.95.51 192.168.95.93	Anc:OHBOARDING   band: all ] Band: @ all @ 2.4 GH Host name BLACKERRY-42DB The-Miracle Evas-Phone android-99370870 IPhone-Daria IPad-Alina android-237185 android-23218	tz <b>5 5 0%</b> <b>5 NR</b> 5 1.05 4 2.39 3 6 52 3 5 75 2 7 62 2 7 50 2 7 76	state o Disassociated o Associated o Associated o Associated o Disassociated o Disassociated o Disassociated o Associated	• System - Work     • System - Work     • Clent MAC     C:-CD2-98-6.     F8-A9-D0-2     4C-80-79-1     18-FE-34-92     40-5F-2A-39     BC-38-FF-8     BC-38-FF-8	ID37         D34         D31           st 10 Clients by retries [ winn           IONBOARDING           IP Address         192.168.95.78           192.168.95.78         192.168.95.55           192.168.95.55         192.168.95.55           192.168.95.55         192.168.95.55           192.168.95.55         192.168.95.55           192.168.95.55         192.168.95.55	13:58         14:05         14:19         Time           Time         Time         Time         Time           c: CNBCARCING [ band; all ]         24. GH         Host name         android-5004744d.           android-5004744d.         android-504744d.         android-504744d.           android-5047463         BLACKBERRY-420B         android-5140851           BLACKBERRY-420B         android-5140851         Razberis	14.38 14.3 14.46 14.47 14.5 0  14.38 14.46 14.47 14.5  14.3	tate Disassociated Disassociated Disassociated Disassociated Disassociated Disassociated Disassociated Disassociated Disassociated
System - Wor Wa Client MAC 10-6F-2A-39 C-11-8E-7 X-7F-3E-5 24-20-28. 28-85-87-E 26-F5-C6-4 10-00-DB-2 C-19-10-9 IC-39-AF-8	t 10 Clients by SNR [ wh CNBOARDING IP Address 192.168.95.61 192.168.95.61 192.168.95.61 192.168.95.64 192.168.95.51 192.168.95.51 192.168.95.93 192.168.95.93	an:OHBOARDING   band: all ] Band: all () 2.4 GH Host name BLACKBERY-420B Tm-Miracle EVas-Phone android-99d70870 IPhone-Daria IPad-Alina android-930f8c4 android-832f1a8 Razberis	z 55015 5105 4239 3652 3575 22752 2750 2750 2774 2870	s tate o Disassociated o Associated o Associated o Associated o Associated o Disassociated o Disassociated o Associated		ID37         D.44         D.31           st 10 Clients by retries [ wina         ONBOARDING         IP Adress           192.168.95.61         192.168.95.55         192.168.95.55           192.168.95.55         192.168.95.55         192.168.95.55           192.168.95.55         192.168.95.55         192.168.95.55	Example 1238 1468 1412 1419 Time      CONBOARDING   bandt all ]     Bandt @ all O 2.4 GH     Host name     android-52781c93     Darias-iPad     android-2781c93     BLACKBERRY-42DB     android-3da465f     Razberls     Abdul	Lize 143 1446 1447 1445 Retries Retries 193 144 144 144 145	tate Disassociated Disassociated Disassociated Disassociated Disassociated Disassociated Disassociated Disassociated Disassociated

4. After confirming that RF is not a problem, i.e. client has good SNR, high data-rate, AP is not over utilized etc (or if RF environment is not healthy investigate RF-side issues), create another custom Dashboard showing network utilization and application usage. This will help accessing network side issues that might be the cause of poor performance:



5. Identify if there are any applications that are consuming huge amount of bandwidth. If they are not business critical apps you should make a decision to either block or rate-limit them. Identify which applications should have a priority and create a set of rules in the Application Policy giving a priority to these apps and optionally shape the traffic.

• Brno - All appl	Brno - All applications by usage [ wlan: all ]									
Application	Category	Usage $\downarrow$	Total Clients							
youtube	streaming	155 MB								
HTTP_generic	web	44.8 MB								
SSL_generic	tunnel	30.3 MB								
HTTP_media	web	10.7 MB								
FLASH	streaming	5.44 MB								
IMAP_encry	generic	3.15 MB								
Google_en	web	2.83 MB								
facebook	social networking	1.88 MB								
gmail	mail	1.08 MB								
DNS	network management	723 KB								
Lync_unkn	business	692 KB								
ICMP	network management	322 KB								

<sup>1</sup> Application Visibility and Control is supported only on certain Access Points and Controllers. Please refer to the AVC tech brief for further details.

6. Lastly create a Security dashboard and look for WIPS alerts if any:

የ Map View 🕜 Dashboard 🖵 Monitor   🗈 Reports   🗶 Tools   🗮 Event Log							30-A8-DB-64-25-59 Q admin			nin (		
<u>System</u> > <u>Dasi</u>	hboard											
LIENTS 🖌	🛍 Client 🖌 🏥	UTILIZATION	RF-HEALT	H 🖌 🏦 SECU	JRITY 🖌 📋 🕂							
ECURITY			_			-		C 30 min 2 hr	1 day 1 week	1 mon 3 mon		
2001111											-	
System - Rog	ue APs											
Status	BSSID	Security Type	Vendor	SSID	Channel	Signal Strength	First Seen	Top Reporter	RF Domain	VLAN		
<ul> <li>Unsancti</li> </ul>	FC-0A-81-89-A3	WPA	Zebra Tech	1	132	-46	Tue Jul 28 201	5 RFS4K-EMEAT	EMEATECH	N/A		
<ul> <li>Unsancti</li> </ul>	FC-0A-81-89-A2	WPA	Zebra Tech	1	11	-60	Tue Jul 28 201	5 RFS4K-EMEAT	EMEATECH	N/A		
<ul> <li>Unsancti</li> </ul>	E8-ED-F3-EA-E	WPA	Cisco Systems	802.1X	36	-64	Tue Jul 28 201	5 RFS4K-EMEAT	EMEATECH	N/A		
Unsancti	B4-C7-99-7F-C	WPA	Zebra Tech	EMEATECH	6	-94	Wed Jul 29 201	RFS4K-EMEAT	EMEATECH	N/A		
<ul> <li>Unsancti</li> </ul>	E8-ED-F3-EA-E	WPA	Cisco Systems	CISCO-ROGUE	11	-74	Tue Jul 28 201	5 RFS4K-EMEAT	EMEATECH	N/A		
Unsancti	B4-C7-99-98-42	WEP	Zebra Tech	sds	108	-80	Tue Jul 28 201	5 RFS4K-EMEAT	EMEATECH	N/A		
Unsancti	B4-C7-99-64-6E	WPA	Zebra Tech	danitest	124	-51	Tue Jul 28 201	5 RFS4K-EMEAT	EMEATECH	N/A		
Unsancti	96-24-8D-5C-5F	WEP	96-24-8D	#LANDING	120	-75	Tue Jul 28 201	5 RFS4K-EMEAT	EMEATECH	N/A		
Unsancti	B4-C7-99-7F-D	WPA	Zebra Tech	SC	132	-88	Tue Jul 28 201	5 RFS4K-EMEAT	EMEATECH	N/A		
Unsancti	86-24-8D-5C-5F	WEP	*Zebra Tech	VXE	120	-75	Tue Jul 28 201	5 RFS4K-EMEAT	EMEATECH	N/A		
System - WIP	S Events []											
Time	RF Domain			Severity	Severity				Event			
2015-07-29	EMEATECH			info	info				Unsanctioned AP 1C-E6-C7-F1-03-67 vendor Cisco Systems on cha			
2015-07-29	EMEATECH				info				Unsanctioned AP 1C-E6-C7-F1-03-60 vendor Cisco Systems on cha			
2015-07-29	EMEATECH			info	info				Unsanctioned AP 58-97-1E-57-1D-12 vendor Cisco Systems on chan			
2015-07-29	EMEATECH			info	info				Unsanctioned AP 58-97-1E-57-1D-16 vendor Cisco Systems on chan			
2015-07-29	EMEATECH			info	info				Unsanctioned AP 58-97-1E-57-1D-13 vendor Cisco Systems on chan			
2015-07-29	EMEATECH			info	info				Unsanctioned AP 5C-0E-8B-90-0B-A0 vendor Zebra Tech inactive fro			
2015-07-29	EMEATECH				info				Unsanctioned AP 00-21-29-05-86-C1 vendor Linksys Inc inactive fro			
2015-07-29	EMEATECH				info U				Unsanctioned AP B4-C7-99-98-69-80 vendor Zebra Tech inactive fro			
2015-07-29	EMEATECH			info	info				Unsanctioned AP 00-15-70-AE-5D-1C vendor Zebra Tech inactive fro			
2015-07-29	EMEATECH			info				Unsanctioned AP FC-0A-	31-CF-2B-C0 vendor Zeb	ra Tech inactive fr		