



Raising the on the Wi-Fi Experience

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WLANs, a Part Of a Larger Ecosystem

” Ecosystem Defined:

” a complex network or interconnected system (Source: <https://google.com>)

” Many things contribute to end-user WLAN performance perceptions:

” Layer 1: RF Components [Channels, Interference, Noise, Signal Strength]

” Layer 2: Airtime Utilization, Client / AP MCS Rates, Retransmissions, 802.1X

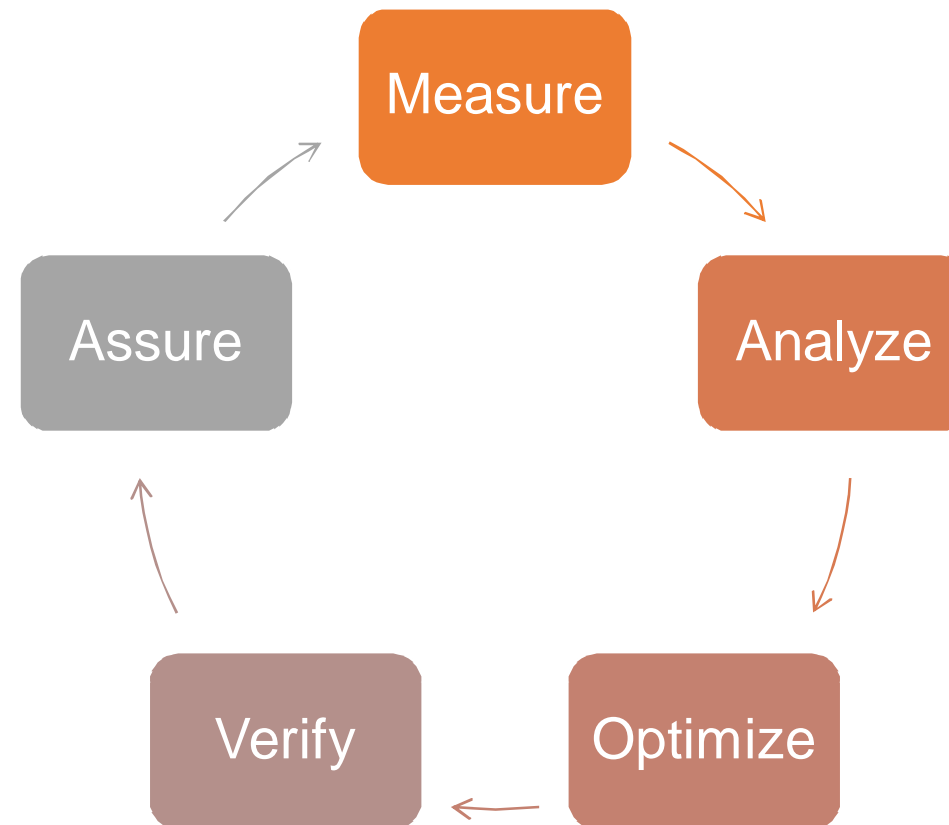
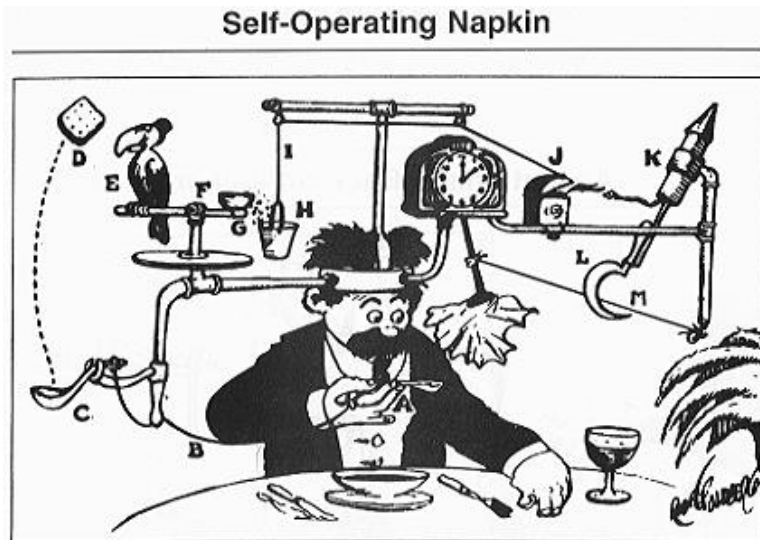
” Layer 3: DHCP, IP Fragmentation, IP Routing

” Layer 4: TCP Exponential Back-off, UDP (Jitter, Latency, Packet Loss)

” Layer 7: HTTP, HTTPS, SSH, Mean Opinion Score (MOS) Scoring

What are some other complex ecosystems?

- ” Automobiles?
- ” Human Beings?



If you can't measure it, you can't manage it!

- Peter Drucker

Automobiles?

- “ Purchase a new car (~ < 50 Miles on the Odometer)
 - “ WLAN: Predictive, Physical, Post Site Survey / WLAN Infrastructure Installed!
- “ Dealer Recommended Maintenance Requirements (Proactive)
 - “ WLAN: What is the equivalent here?
 - “ “A Post-Deployment Site Survey should be completed **every year or two** in order to ensure that no coverage holes have developed in the wireless network and that the wireless network **continues to meet your requirements.**”
 - “ <http://www.rhowireless.com/sitesurvey/default.aspx> (good whitepaper)

The WLAN Check Engine Light?

- “ Unscheduled Maintenance Events (Reactive)
 - “ Check Engine Light (or other warning light) / Degraded Performance
 - “ Maybe Complete Breakdown (very unpleasant experience)
 - “ WLAN: The WLAN Infrastructures “inside-out” view of the world
 - “ Alarms
 - “ First Responder WLAN Troubleshooting Tools



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*****  
B DIAG CHECK ENGINE LIGHT  
RPE REPAIR PER ESTIMATE  
521 CP 197.98 197.98  
1 90919-A2007 COIL, IGNITION 109.76 109.76  
94870 2.20 DIAG CHECK ENGINE LIGHT, PULLED 17 CODES - NARROWED DOWN  
TO 2 KNOWN SOURCES. IGNITION COIL CIRCUIT F, AND RR SPEED SENSOR. DIAG  
COIL CODE TEST DRIVE VEHICLE, AFTER SWAPPING COIL, MONITOR DATA LIST -  
FOUND COIL FOR CYL 6 REQUIRES REPLACEMENT. DIAG RR SPEED SENSOR - TEST  
DRIVE VEHICLE, MONITOR DATA LIST FOUND NO SIGNAL BEING SENT TO ECU FROM  
SENSOR. CHECK WIRE HARNESS CONNECTION AT RR WHEEL BEARING - FOUND  
CURROSION AT HARNESS AND IN SENSOR (WHEEL BEARING. RR WHEEL BEARING AND  
RR VSC SUB HARNESS REQUIRE REPLACEMENT. REPLACE CYL 6 COIL TO CURE  
ENGINE MALFUNCTION. WHEEL BEARING AND SUB HARNESS ARE SOP + 2.5 HRS  
LABOR  
*****
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WLAN Check Engine Light?

“ Unscheduled Maintenance Events (Reactive)

“ For those curious what it was???

“ The humans troubleshooting efforts based on engine light codes

LINE	OPCODE	TECH	TYPE	HOURS	LIST	NET	TOTAL
A	REPLACE RR WHEEL BEARING AND SUB HARNESS TO CURE	/521					
	RPE REPAIR PER ESTIMATE						
	521	CP				224.98	224.98
1	42450-0R010	HUB & BRG ASSY, RR A			506.98	506.98	506.98
1	89516-0R010	WIRE, SKID CONTROL S			79.13	79.13	79.13
95218	2.50	REPLACE RR WHEEL BEARING AND SKID CONTROL SUB HARNESS TO CURE.					
		NOTE SEEDS/CHEWAGE FOUND BEHIND RR INTERIOR PANEL. REMOVED					
		DRIVERS FLOOR MAT - CODES CLEARED					

BONUS: “Seeds / Chewage Found Behind RR Interior Panel!”

Human Beings?



Human Beings?

WLAN: Pro-active



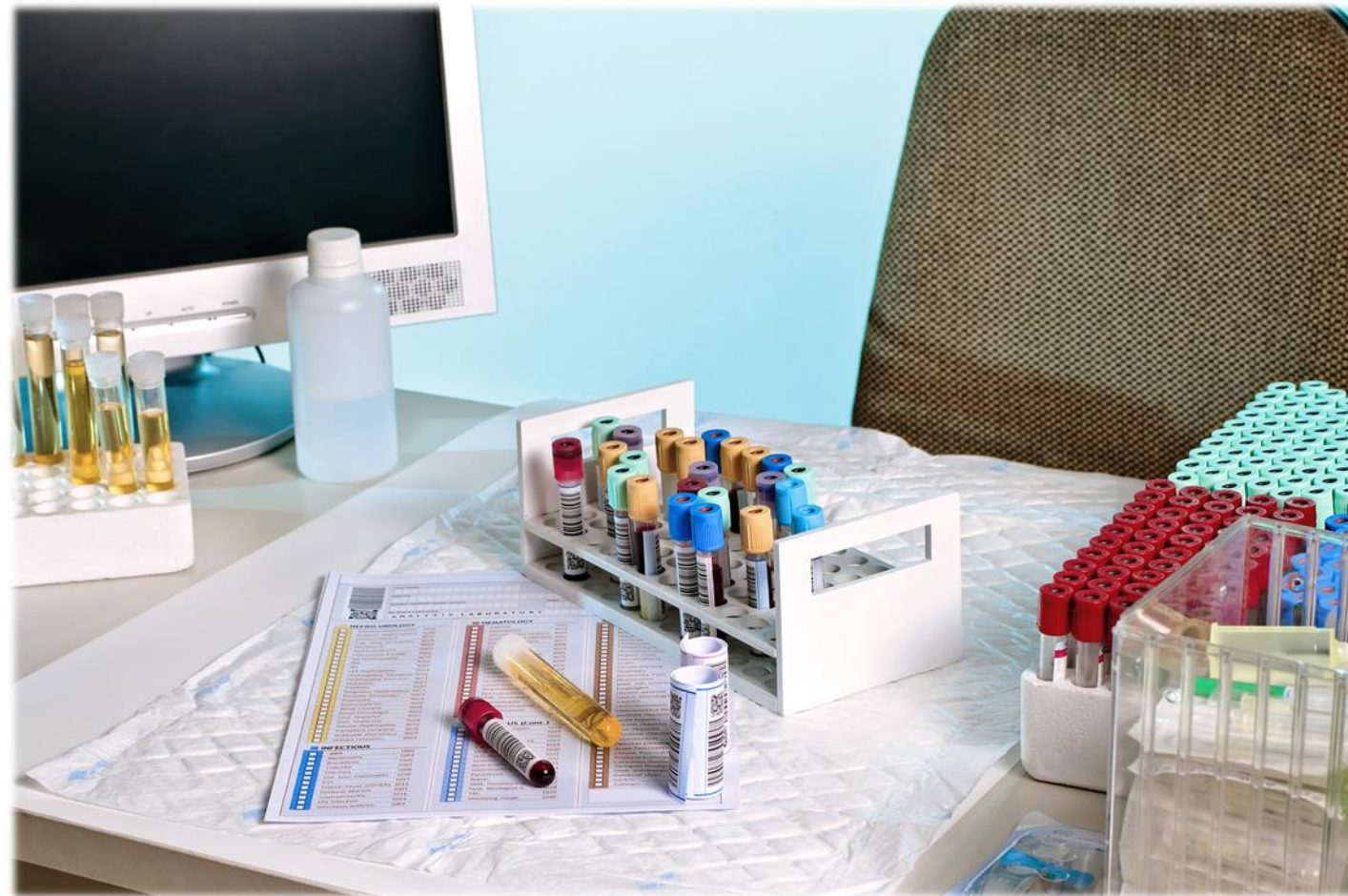
Human Beings?

WLAN: Proactive or Reactive



Human Beings?

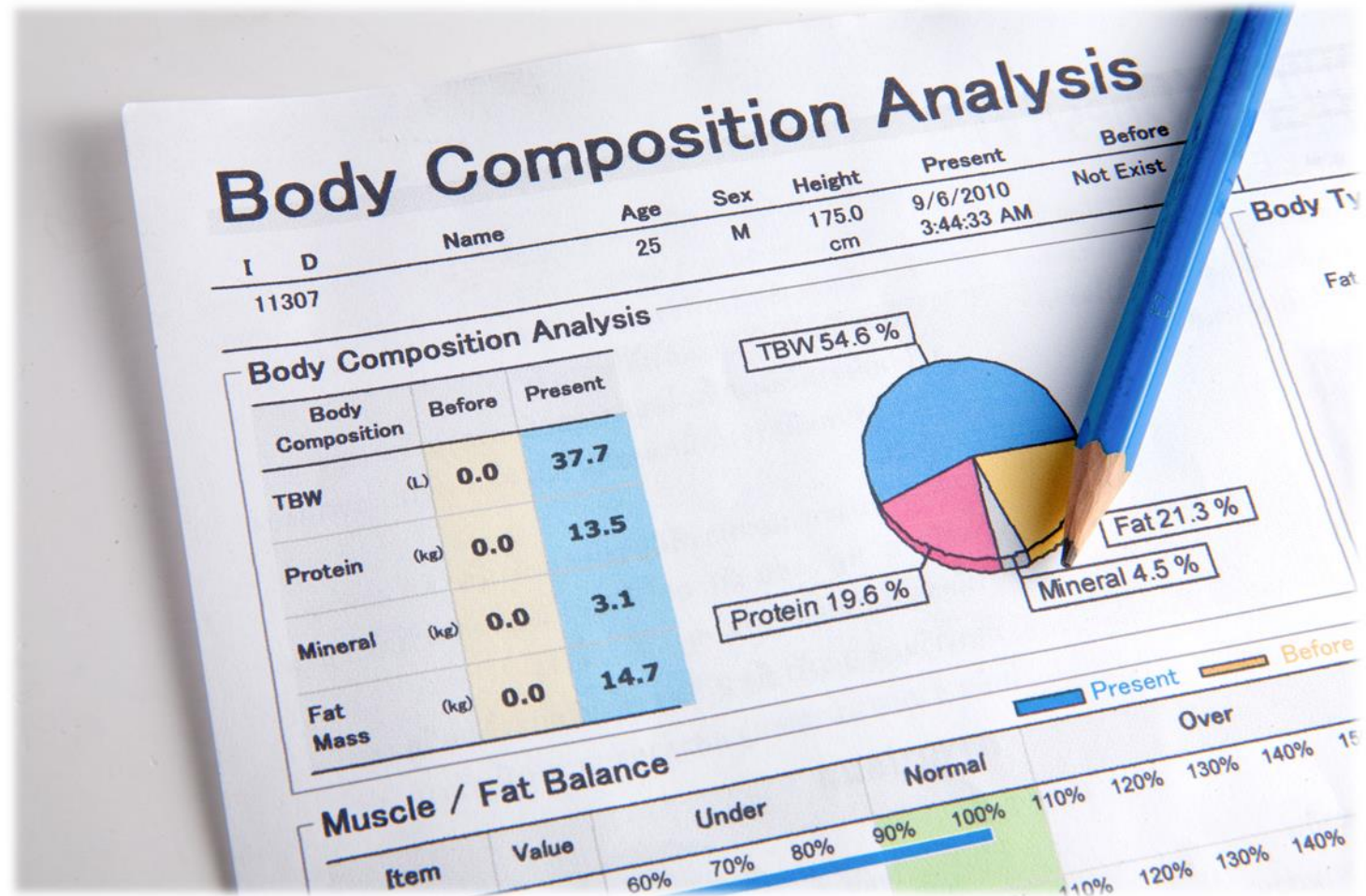
WLAN: Proactive or Reactive



Human Beings?

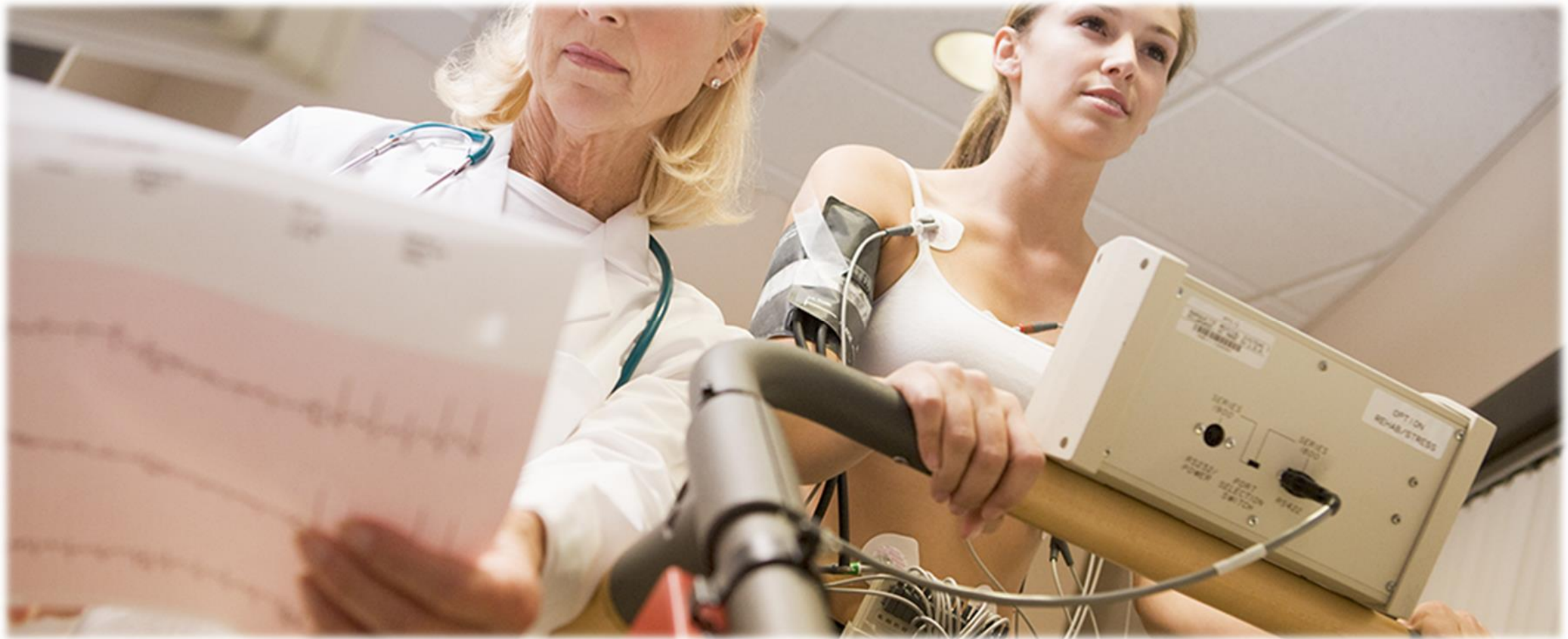
Reviewing Human Being KPIs

- “ Key Performance Indicator (KPI)
 - “ Objective measurements of our Human
- “ Service Level Agreement (SLA)
 - “ What is considered a “normal” range for our Human?



Human Beings?

WLAN: Proactive – troubleshoot / remediate identified problem (> or < SLA)



Human Beings?

WLAN: Reactive aka UH-OH!!! (in censored form)
Is this where you start from today?



157	130/65	99	RR/CO2
HR/ECG	Art mmHg sys/dia	SpO2 %	1/min
97	82/60	99	RR/CO2
HR/ECG	Art mmHg sys/dia	SpO2 %	1/min
152/79	152/79	95	RR/CO2
Art mmHg sys/dia	Art mmHg sys/dia	SpO2 %	RR/CO2 1/min
93/55	93/55	99	RR/Imp
HR/ECG 1/min	mmHg sys/dia	SpO2 %	RR/Imp

Objective End-User Feedback is Invaluable

- “ Watch a violinist play through his brain surgery
 - “ <http://www.theverge.com/2014/8/18/6030579/watch-a-violinist-play-through-his-brain-surgery>
 - “ Doctors kept Roger Frisch awake during brain surgery, inserting electrodes deep into his brain until the trembling appeared to stop.
 - “ An accelerometer at the tip of the bow measured Frisch’s trembling, allowing doctors to fine-tune the placement of their electrodes.
 - “ It is a Team Effort!

The most important KPIs?



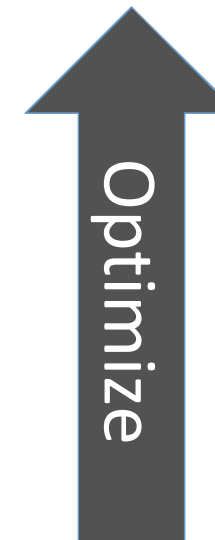
-> User -> Your Job Is Simple
Is it really?

IT: End user metrics (active tests)

- " Connection Success
- " Throughput
- " Packet Loss
- Latency
- Jitter
- Voice quality (MOS)

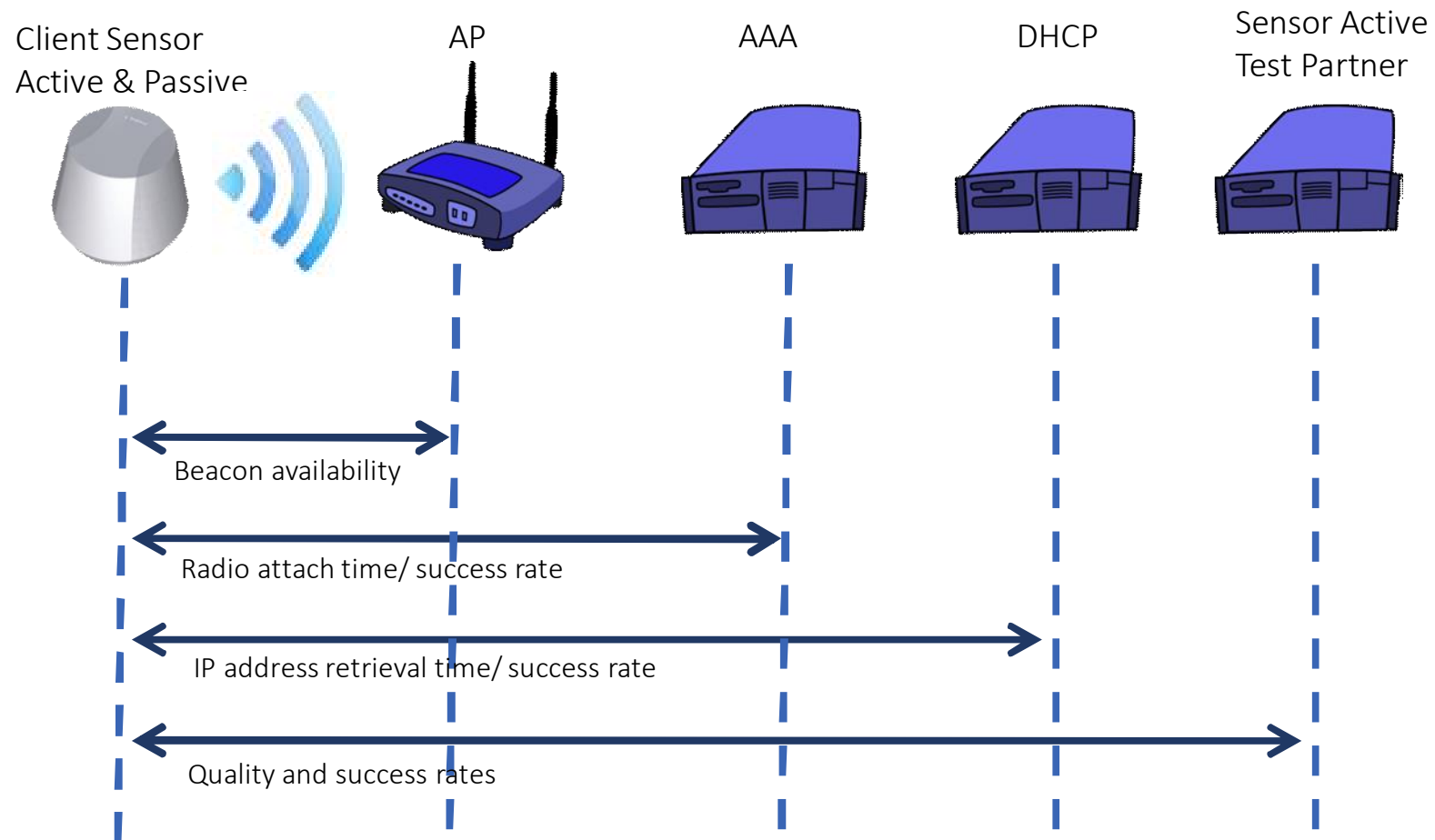
IT: WLAN L1 / L2 metrics (passive tests)

- Data rates
- Retry rates
- Utilization
- Traffic volume
- Channels
- Signal level
- Spectrum data



Key Performance Indicators (KPIs)

” Objective measurements of an ecosystem



Why not just “follow” (baaaa!)

Best Practices Sheeple?

- ” Defined: Sheeple (a portmanteau of "sheep" and "people") is a term that highlights the herd behavior of people by likening them to sheep, a herd animal.
- ” Good to be aware of and why they are considered best practices but...

Introduction

This document offers short configuration tips that cover several Wireless Unified Infrastructure issues commonly seen in the Technical Assistance Center (TAC). The objective is to provide important notes that you can apply on most network implementations in order to minimize possible problems.

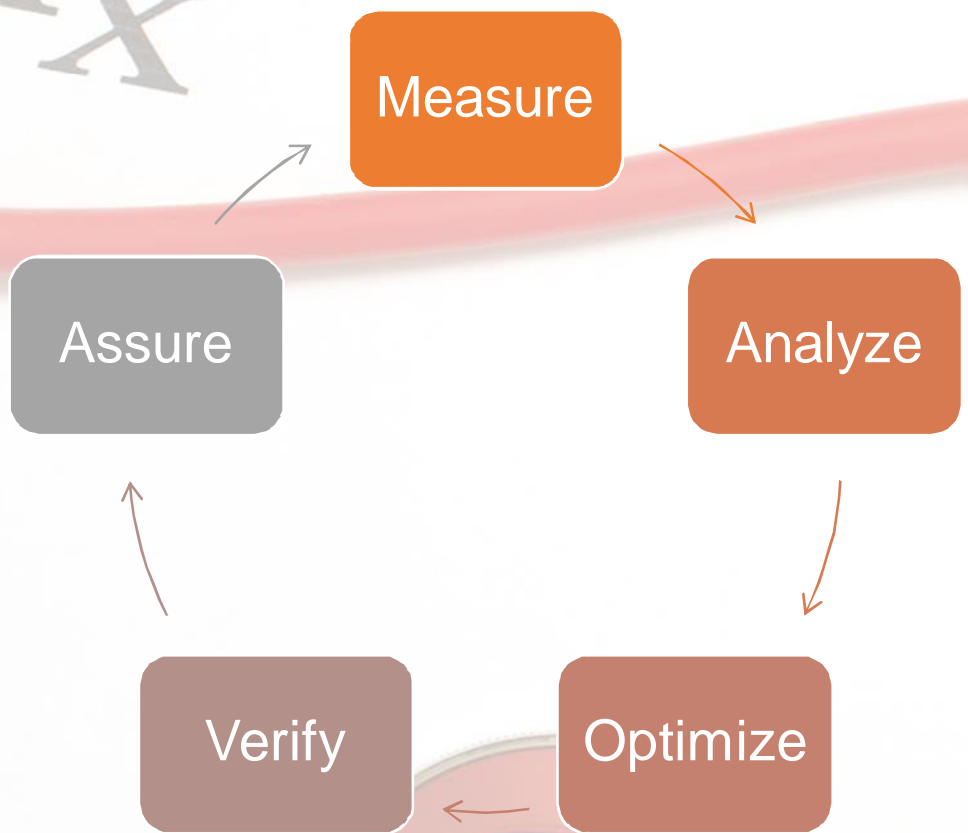


Note: Not all networks are equal, therefore some tips might not be applicable on your installation. Always verify them before you perform any changes on a live network.

- ” Caveat from all vendors.
 - ” Source: [Wireless LAN Controller \(WLC\) Configuration Best Practices](#)

Name: _____
Address: _____
Date: _____

Rx



Thank You!