



**ALLION**<sup>®</sup>

An ISO/IEC 17025  
Qualified Test Laboratory

*Wi-Fi CERTIFIED n*

**Kevin Lu**

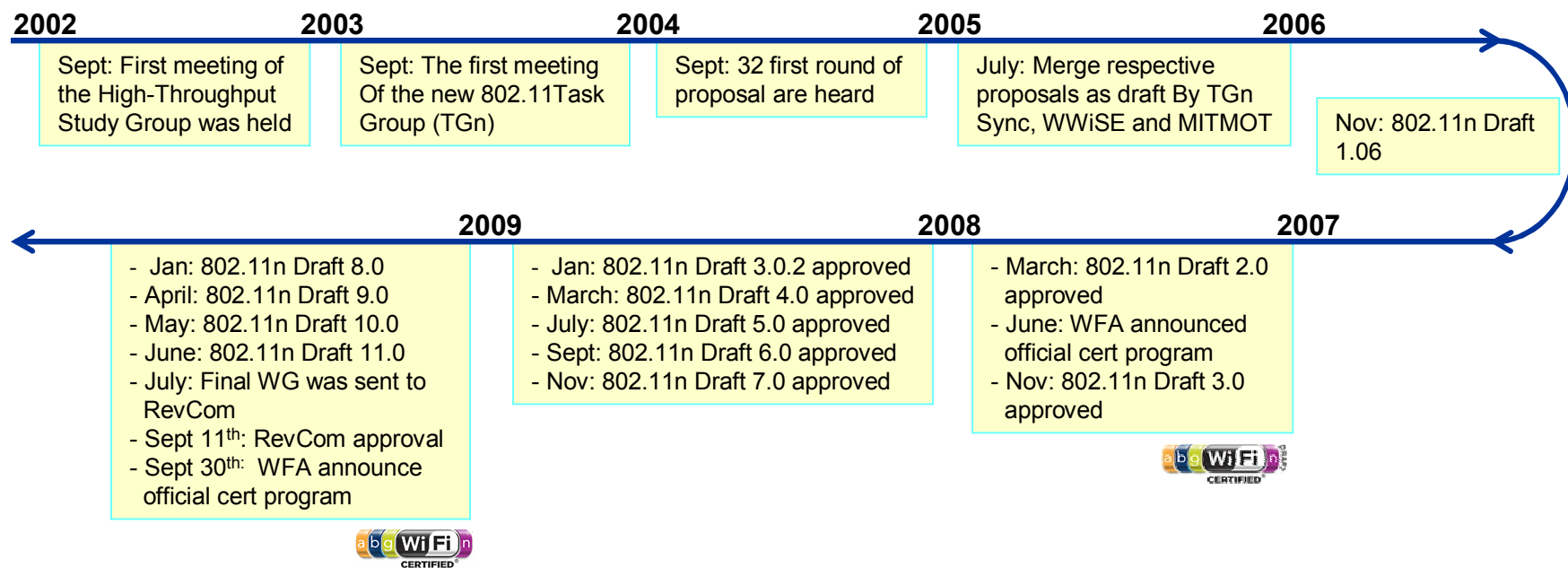
[www.allion.com](http://www.allion.com)

# *Agenda*


- Overview
- New Test Plan & Test Items
- Wi-Fi Testbeds
- Sigma\_11n
- Schedule
- Q & A

# Overview

- Milestones in the development of 802.11n

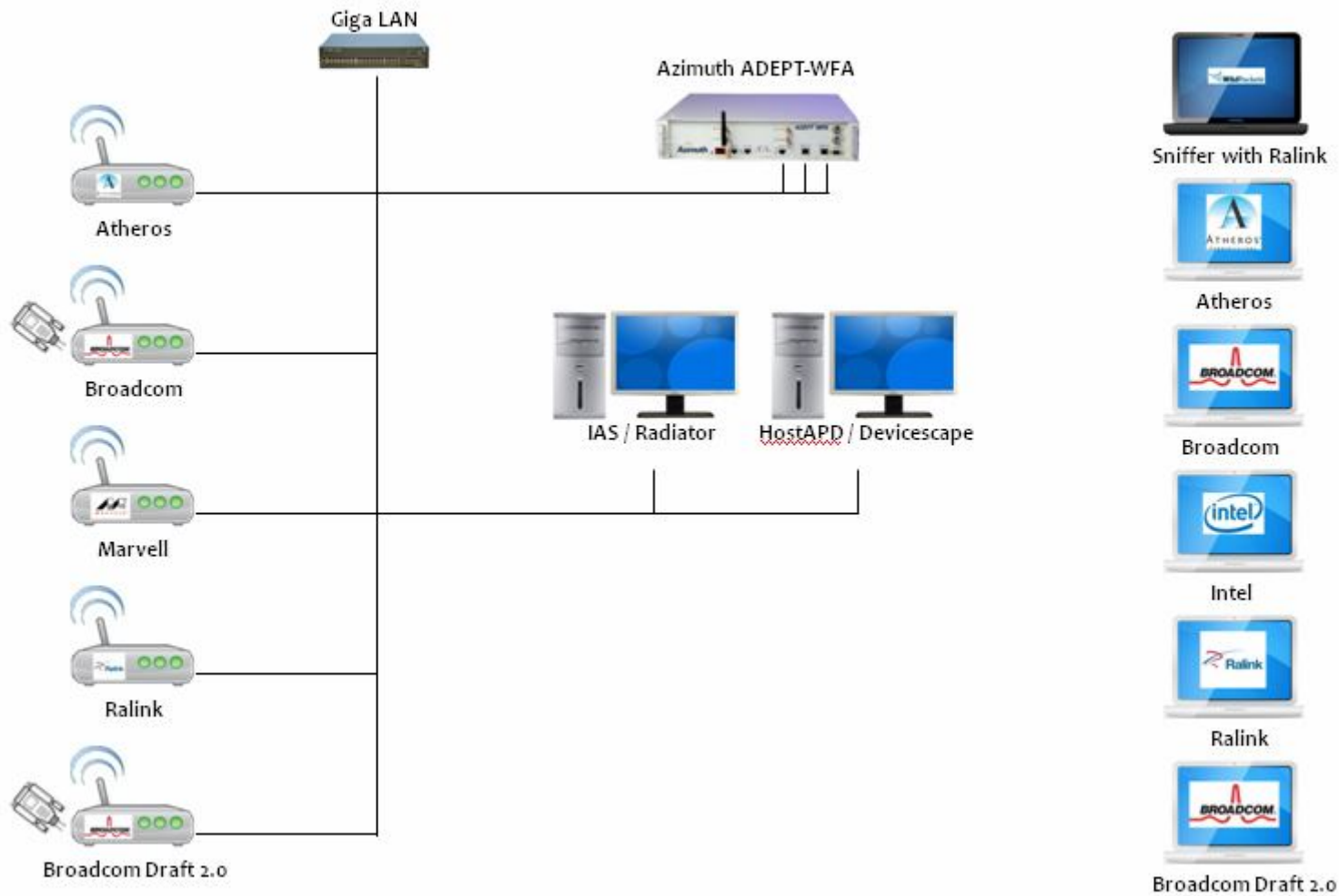


# Overview

- Launch time: Sept. 30<sup>th</sup> 2009
- New CERTIFIED n logo: The logo consists of the letters 'a', 'b', and 'g' in colored circles (orange, blue, green) followed by 'Wi-Fi' in a black rounded rectangle, and 'n' in a purple circle. Below this is the word 'CERTIFIED' in a black rounded rectangle.
- All product which passes draft 2.0 test may use CERTIFIED n logo.
- 2.4 GHz is allowed to support 20/40 MHz, but default channel bandwidth must be 20 MHz
- New testbed APs and STAs (except Broadcom draft 2.0)
- 802.11n draft 2.0 test plan can be used until Dec. 28<sup>th</sup> 2009
- 1 x 1 STAs can be certified, but 1 x 1 APs still go for ASD
- 2 methods for testing CERTIFIED n: manual & Sigma\_11n

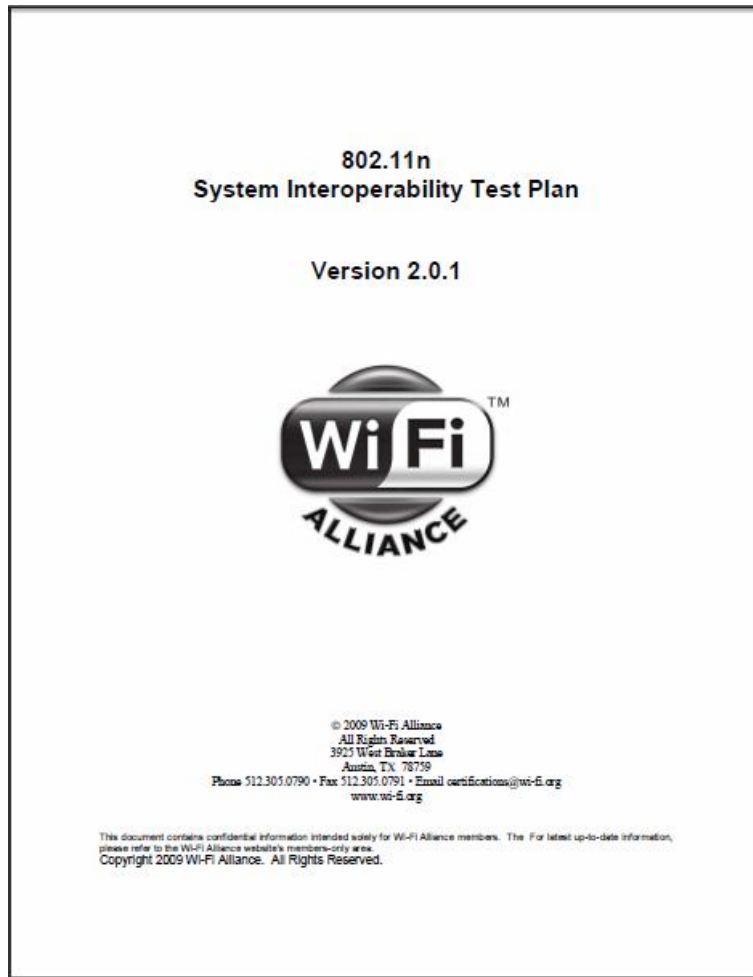
# Overview

## CERTIFIED 11n Test Environment



# *New Test Plan and Test Items*

- 802.11n System Interoperability Test Plan version 2.0.1

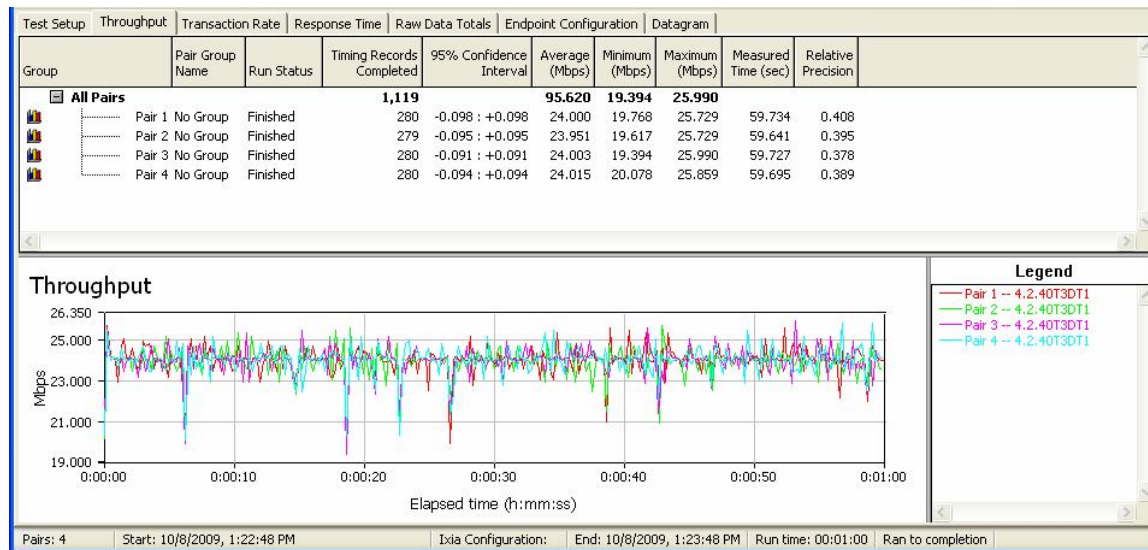


# New Test Plan and Test Items

- New test item (1):
  - STBC: Space Time Block Code:
    - Optional test
    - Normal MIMO (2 x 2) band sends (e.g. HELLO ALLION):
      - ➔ H L O L I N  
↓ ↘ ↓ ↘ ↓ ↘ ↓ ↘ ↓ ↘
      - ➔ E L A L O
    - STBC MIMO (2 x 2) band sends:
      - ➔ HELLO ALLION
      - ➔ H\*L\*L\*O\*A\*L\*L\*I\*O\*N
    - Guarantee receiver can receive complete data

# New Test Plan and Test Items

- New test item (2):
  - TX A-MPDU:
    - Optional test
    - Ability to transmit A-MPDU from AP to STA
    - Increases data throughput
    - 4 pairs are configured in Chariot for throughput



## *New Test Plan and Test Items*

- New test item (3):
  - 20 / 40 MHz Coexistence
    - Optional test
    - Mandatory if the feature is implemented
    - In 2.4 GHz band
    - Ability to combine 2 adjacent 20 MHz into one 40 MHz channel
    - Must sniff the second channel before or after enabling the mode
    - Double data rates

# New Test Plan and Test Items

- New test item (4 & 5):
  - Three Spatial Streams:
    - Optional test
    - Increases data rates

Three Spatial Streams			20 MHz Bandwidth		40 MHz Bandwidth	
			Data Rate Mbps		Data Rate Mbps	
MCS Index	Modulation	R	800 ns GI	400 ns GI	800 ns GI	400 ns GI
16	BPSK	1/2	19.5	21.7	40.5	45.0
17	QPSK	1/2	39.0	43.3	81.0	90.0
18	QPSK	3/4	58.5	65.0	121.5	135.0
19	16-QAM	1/2	78.0	86.7	162.0	180.0
20	16-QAM	3/4	117.0	130.0	243.0	270.0
21	64-QAM	2/3	156.0	173.3	324.0	360.0
22	64-QAM	3/4	175.5	195.0	364.0	405.0
23	64-QAM	5/6	195.0	216.7	405.0	450.0

- Supported Number of Spatial Streams:
  - Optional test

# Wi-Fi Testbed APs and STAs

- APs:

- Atheros (2 x 2)



Model #: AR5KAP-0096WFA  
FW: 7.3.0.385

- Broadcom (2 x 2)



Model #: BCM94718NR  
FW: 5.10.128.0

- Marvell (3 x 3)



Model #: CD-88W-AP95-A0  
FW: 5.0.6.p2-W8366

- Ralink (3 x 3)

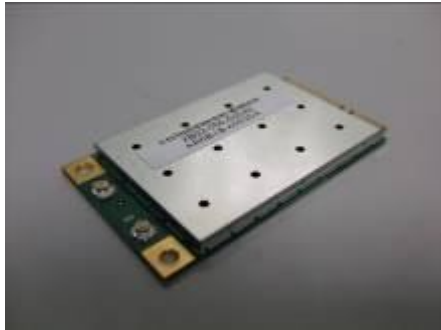


Model #: RT3800PDAP  
FW: 2.2.2.5

# Wi-Fi Testbed APs and STAs

- STAs:

- Atheros (2 x 2 Mini-PCle)



**Model #: AR5KXB-0092DA**  
**FW: 7.7.0.400**

- Broadcom (2 x 2 Half Mini-PCle)



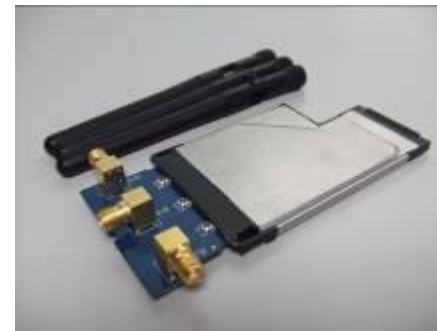
**Model #: BCM943224HMS**  
**FW: 5.10.112.2**

- Intel (3 x 3 Mini-PCle)



**Model #: Wi-Fi Link 5300**  
**FW: 13.0.0.72**

- Ralink (3 x 3 ExpressCard 54)



**Model #: RT3800PD**  
**FW: 1.0.2.14-v01**

# *Sigma\_11n*

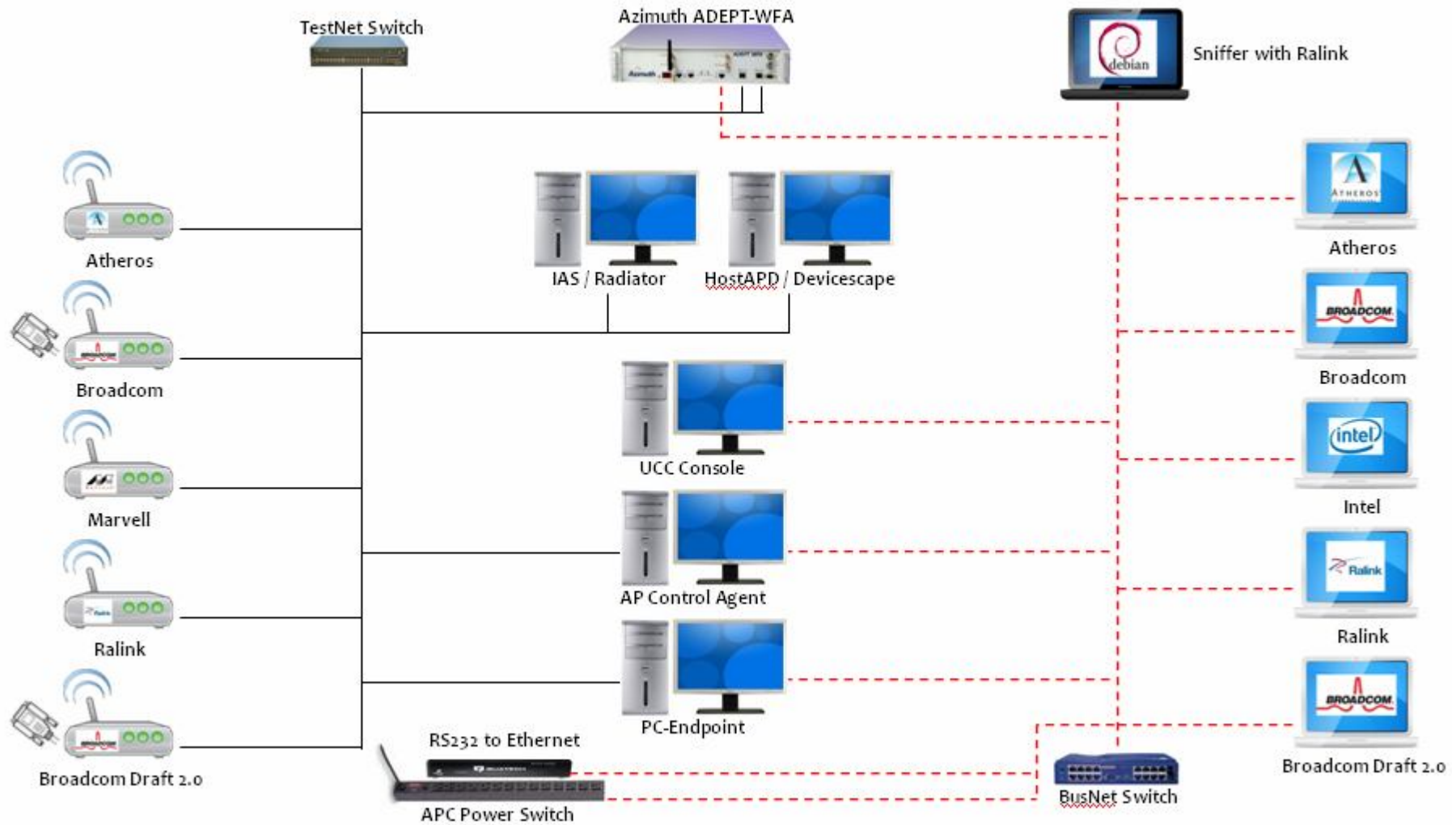
- 2 methods to run CERTIFIED n test:
  - Manual
  - Sigma
- Sigma:
  - IBSS of WPA2
  - WMM-PS
  - WMM
  - WPA2
  - 11n

# *Sigma\_11n*

- Sigma\_11n:
  - Automation tool
  - Free to download from Wi-Fi website
  - Similar to WTE, but more automate than WTE
  - 90% automation for APUT
  - 95% automation for STAUT
  - Platform:
    - Windows XP Professional
    - Linux

# Sigma\_11n

## Sigma 11n Test Environment

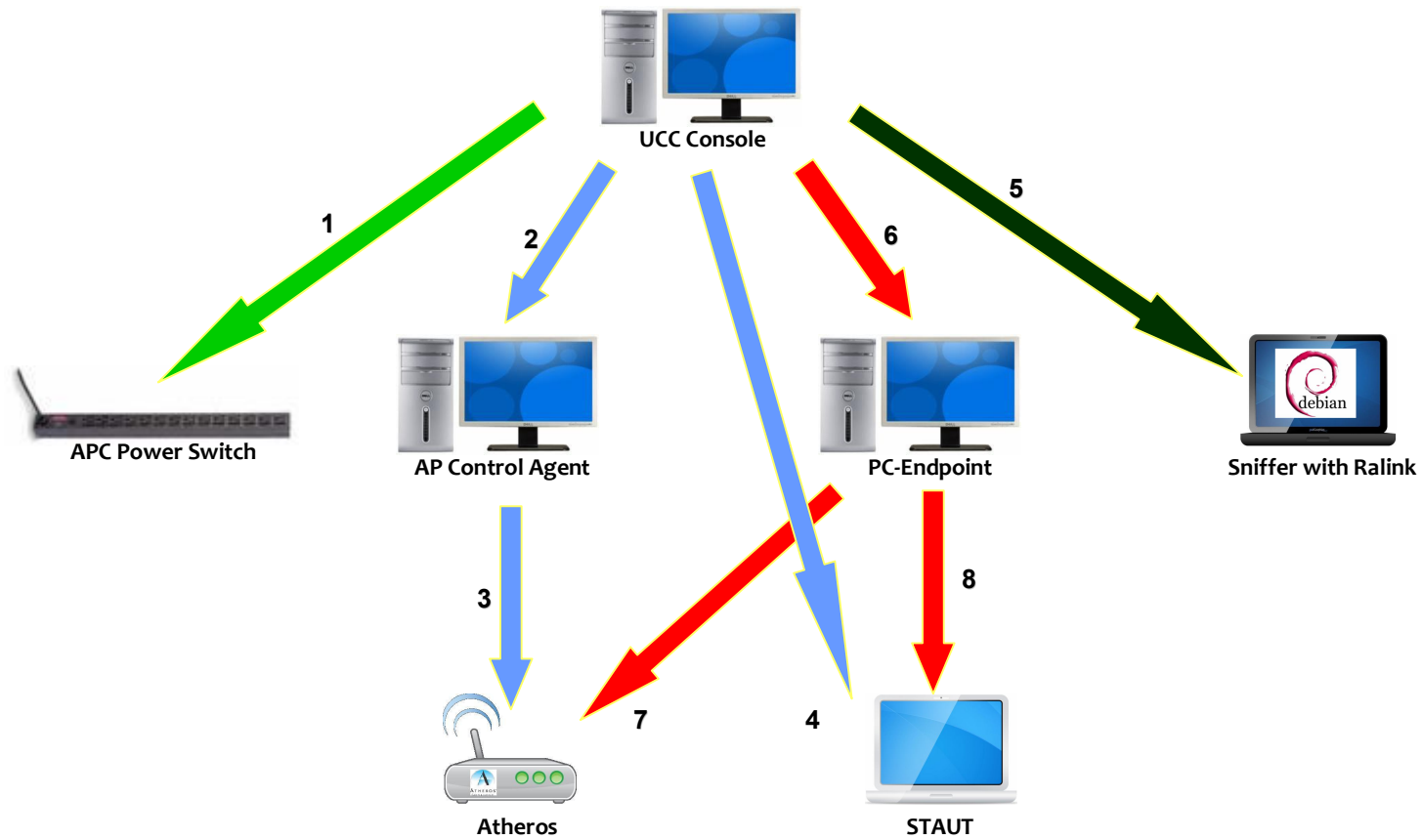


# *Sigma\_11n*

- Main elements:
  - DUT (Windows / Linux)
  - UCC Console (Windows)
  - AP Control Agent (Windows)
    - AP Configuration
    - ADEPT Control
  - PC-Endpoint (Debian Linux)
  - Wi-Fi Testbed STAs (Windows)
  - Sniffer (Debian Linux)

# Sigma\_11n

- How to process...



# *Sigma\_11n*

- Compare Sigma and WTE:

	Sigma	WTE
Platforms	Windows / Linux	Windows / Linux
Product Types	Standard & ASD	ASD
AP or STA	AP & STA	STA
Categories	1, 2 & 3	1
DUTs Configured	Auto	Auto
Testbed APs Configured	Auto	Manual
Testbed STAs Configured	Auto	Manual
APs Power On & Off	Auto	Manual

# *Schedule*

- **CERTIFIED 11n:**
  - Category 1 / 3
    - 2 days
  - Category 2
    - 2 ~ 3 days

# Q&A

# *Thank You*

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