

A man in a striped shirt is shown from the chest up, looking down at a laptop he is holding. He is in a modern, brightly lit building with large windows and a blue sky visible in the background. The image is framed by a thin black border.

Mission Critical Solutions go WiFi

*Cutting-Edge Applications Enable
Clinical Care, Patient Safety and
Enhanced Productivity*

Steve Baker Ph.D.
Principal Engineer, Welch Allyn

Tuomo Rutanen, Vice President
Business Development, Ekahau, Inc.



Life-Critical™ Wireless Networks

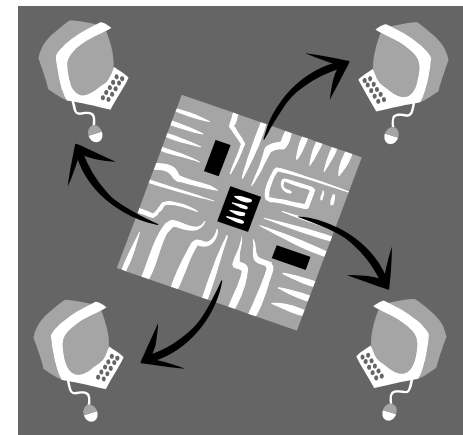
Steven D. Baker, PhD

Principal Engineer
Welch Allyn

WelchAllyn®
Advancing Frontline Care™

What is going on in the market?

- Convergence of IT with medical applications
 - CIS/EMR
 - BCMA, carts
 - Infusion pumps
 - VoIP
 - Telemetry and bedside monitoring
 - Location
- Desire for better network management
- Security concerns



What are the issues?

- Limitations of current solutions (WMTS)
- Cost of isolated networks
- Performance demands for critical applications
 - Latency
 - QoS
 - Fast roaming

Why “Hospital Grade WLAN?”

- The FDA definition of a medical device includes “a component part or accessory”
- Wireless transport reliability requirement depends on safety and efficacy required by the application
 - Continuous Vital Signs Monitoring – High reliability required
 - Alarms – Extremely high reliability required. Interruption not acceptable

Hospital Grade vs. Enterprise Class

- Hospital Grade = Enterprise Class + Validation of proper operation for mission critical applications.
- FDA is concerned with
 - Data Integrity/Security
 - 802.11i, 802.1x, proper design, and testing
 - QoS adequate for the intended use
 - 802.11e, proper design, and testing
 - Co-Existence
 - Addressed by proper design, 802.11a, ARM, testing and controls
 - Electromagnetic Compatibility
 - Addressed by proper design and testing

Source: Draft Guidance for Industry and FDA Staff: <http://www.fda.gov/cdrh/osel/guidance/1618.pdf>

11073 - Responsibility

- *Shared network performance is the responsibility of the end user (hospital)*
- *Hospital must ensure medical and RF wireless devices*
 - *Conform to specifications that satisfy QoS requirements*
 - *Interoperate in a satisfactory way on a shared network*

IEEE 11073.0.1.1, Section 16

11073 – Specific Recommendations

- Separate patient data from general IT traffic
- Consider guest networks
- Design that considers medical data
 - Reliability
 - Priority
 - Latency/Jitter
 - Bandwidth and duty cycle
 - Load limit
- Support multiple authentication protocols

Validation

- Testing the product against the intended use
 - Examples
 - General: Sufficient BW, RF coverage, and S/N ratio to support applications
 - VoIP: Toll quality audio
 - Telemetry: 100% alarm message success, 99.5% or better waveform message success.

Validation

- Testing the product against the intended use
 - Examples
 - General: Sufficient BW, RF coverage, and S/N ratio to support applications
 - VoIP: Latency ≤ 50 ms, RSSI ≥ -65 dBm, SNR ≥ 25 dB
 - Telemetry: Latency ≤ 200 ms, RSSI ≥ -65 dBm, SNR ≥ 15 dB

Medical Wireless Applications: Technical Specs and Data Requirements

- VoIP (802.11b/g, 802.11a)
 - 50 ms, 100 kbps, streaming.
 - 1-3 calls/AP typical
- Patient monitoring (802.11a, 802.11b/g)
 - 200 ms, 30 kbps, streaming to bursting
 - 5 – 10 monitors/AP
- Infusion pumps (802.11b/g)
 - 30 sec, 100-400 kB (formulary), 1 kB (new Rx)
 - 100 ms, 1kB (Alerts)
 - 5-10 pumps/AP
- Carts on Wheels (CoWs) for routine vitals signs (802.11b/g)
 - 1-3 sec, 2-10 kB/patient visit
 - 1-2/AP

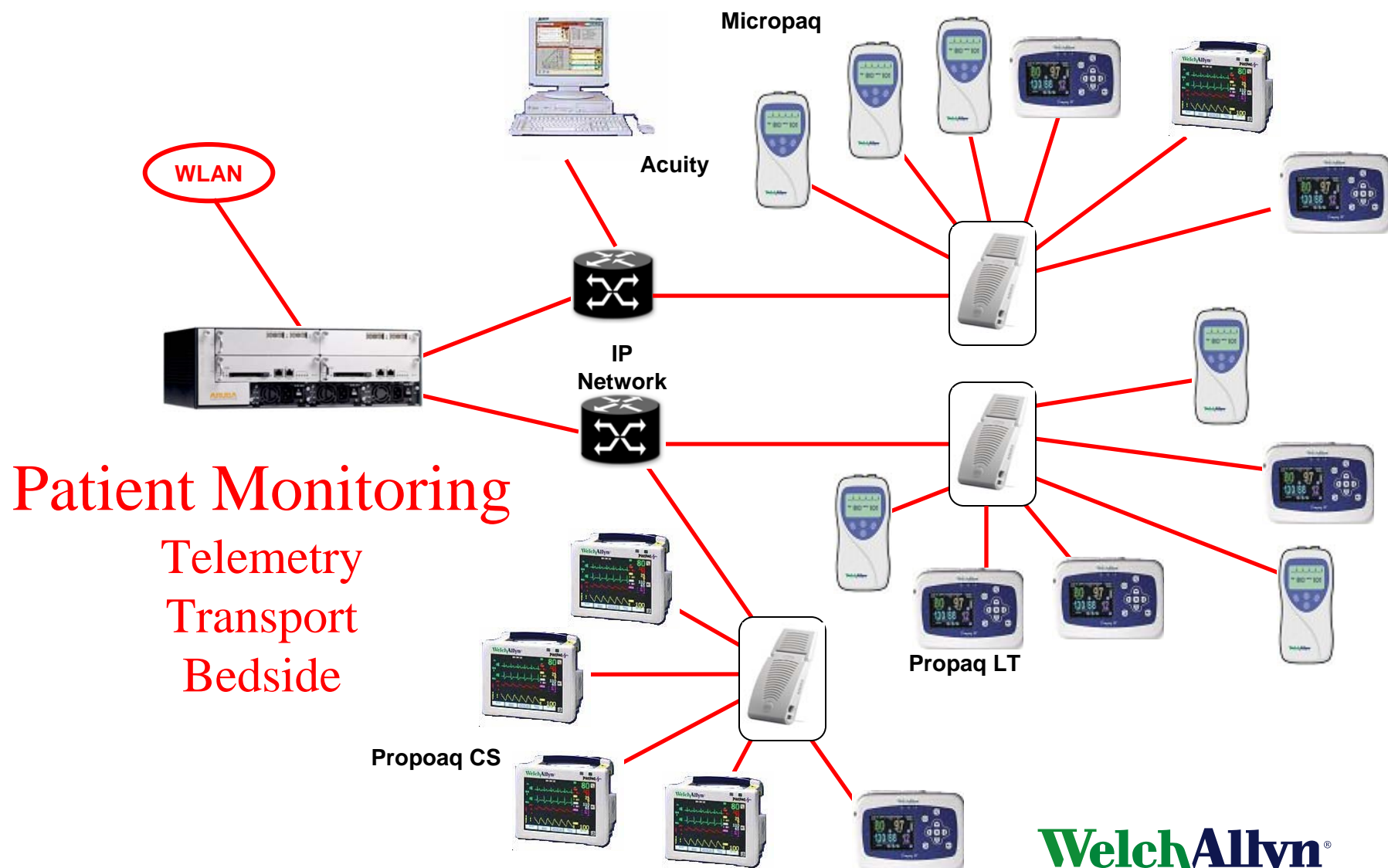
Hospital Use Case Analysis

- Use Case Analysis
 - RF shielding
 - Interesting RF emissions
 - Nurse-shift driven schedules
 - User is unaware of WLAN performance
 - Location of patients and equipment

Hospital Requirements

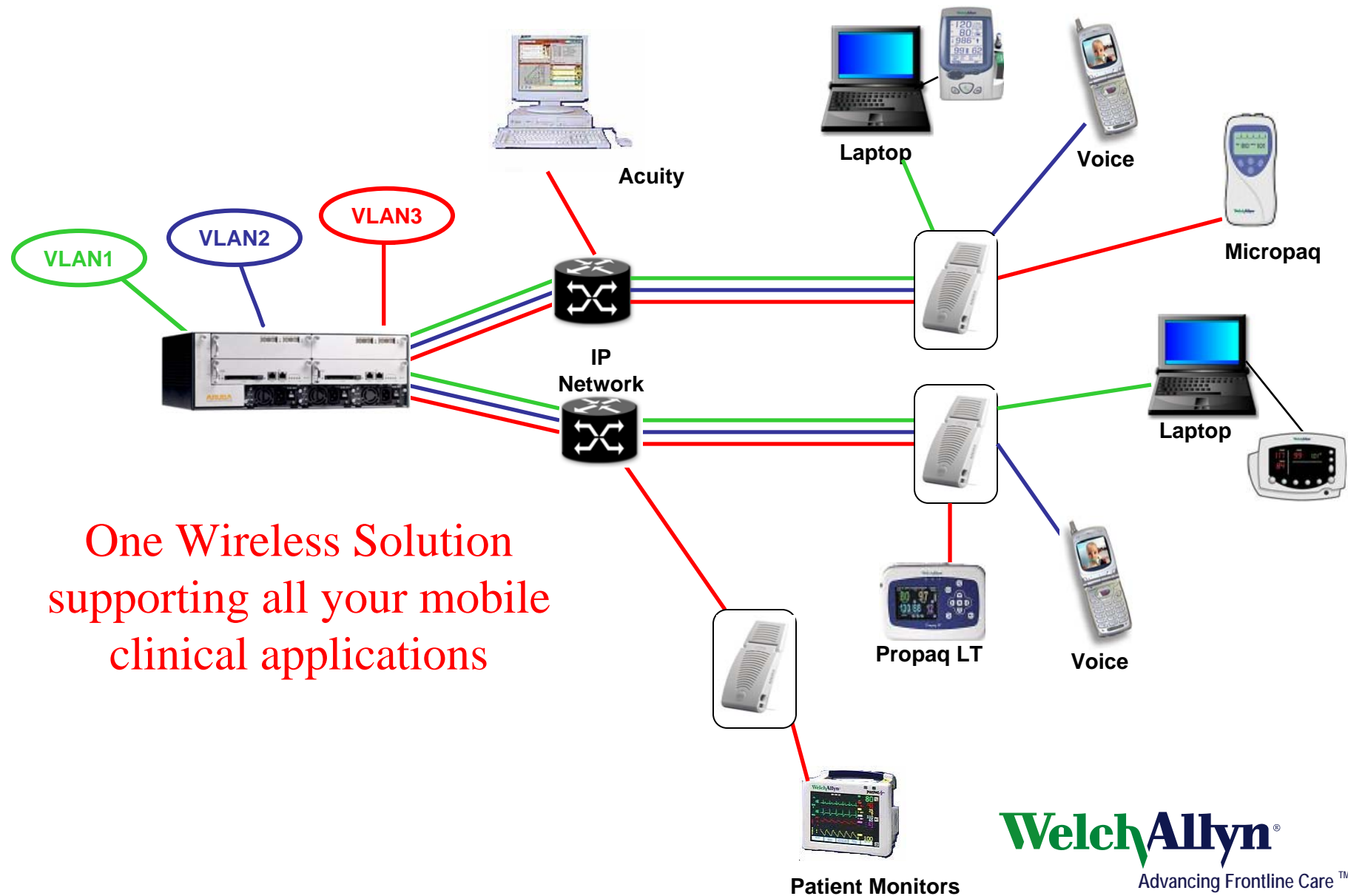
- Active response to changing RF environment
- ARM – must be aware of all life-critical data sources
- Proper use of QoS
- Design for peaks, not average
- Redundant RF coverage and network equipment
- Roaming must be seamless for medical devices
- Early warnings, trends, and application-specific performance measures
- Vendor access to WLAN performance data
- Validation Testing

Standalone Aruba Wireless 802.11a



Patient Monitoring
Telemetry
Transport
Bedside

Leveraging Enterprise 802.11 a/b/g



The Welch Allyn Solution

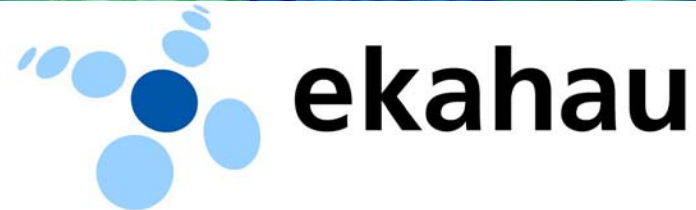
- Secure
 - Designed a medical-grade secure 802.11 wireless adapter for patient monitoring
 - Implements 802.1x, 802.11i, 802.11e
 - Low power
 - Fast roaming while encrypted/authenticated
- Reliable
 - Welch Allyn's 802.11 implementations provide dropout rates as low as 15 ppm
- Lowest Total Cost of Ownership:
 - One enterprise-wide shared network
 - Completely standards-based

Wireless Infrastructure Costs

Network Types	Install cost per Sq Foot	Add VoIP
Shared 802.11 a/b/g Network	\$0.72	1.20
Traditional WMTS (608-614 MHz)	\$2.00	-----
Hybrid WMTS (1.4 GHz)	\$3.00	-----
WMTS Tele on distributed Antennas	\$3.00	-----
Distributed Antenna Systems	\$2.00	\$2.50

Conclusions

- Hospital is responsible for WiLAN performance
 - Medical equipment suppliers should provide information
- Intended use validation for medical grade network
 - If in doubt, run load tests and validate performance
- Risk mitigation
 - Redundant solutions as necessary
 - IT equipment tested against the MDD preferred
 - Test medical equipment for 2.4 GHz and 5 GHz susceptibility if 802.11 radios located within 2-m of transmitters.



***Mission Critical Solutions go WIFI
Cutting-Edge Applications Enable Clinical Care, Patient
Safety and Enhanced Productivity***

***Real Time Location Systems
In
Healthcare
-An Ekahau Perspective –***

***Tuomo Rutanen
VP Business Development / Ekahau Inc.***



Eka-who ?

“Ekahau” is the Mayan God that protects merchants and travelers.

How ?

Ekahau knows where they are !

Ekahau – That’s How !

Ekahau Real-Time Location System



Location Tracking - Why ?

- Where is it now ?
- I need an available wheelchair to transport this patient to radiology...
- We need to re-schedule the OR as we are completely backed up...
- Where was the last location of this ventilator ? Last week ? Has it even been used ?
- I need to do a PM on this pump but cannot find it...
- We are short on COWs in the patient tower...
- Where is patient Simpson ? The doctor is ready to see her..
- The rental company wants their gear back.....hope we can find it so we can return it



\$\$\$ Benefits of Location Tracking

- **Increased staff productivity and incident response time**
- **Increase quality and timing of care**
- **Better management and control of your assets**
- **Reduce physical inventory costs and increase utilization**
- **Reduce equipment purchase and lease costs**
- **Improve equipment maintenance and availability**
- **Regulatory compliance (JCAHO, OSHA, EU etc)**
- **Keep the CFO & Auditors happy for auditing (SOX)**



Location Tracking in Healthcare

1. Asset Tracking

- Clinical equipment
- Wheelchairs
- Beds, Stretchers
- Medical assets
- IT assets, COWs



2. Staff tracking

- Process/workflow improvement
- Scheduling, Patient transports
- Staff safety – alarms



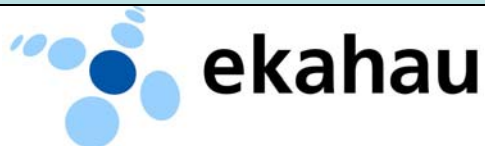
3. Patient tracking

- Process improvement through tracking patient flow
- Wanderers
- Long-term care, elderly care
- Control pandemics
- Manage disaster situations eg triage

Key RTLS Economic Drivers Today

- **Assets** – measurable ROI from reducing hard costs associated with asset **purchases, leases and maintenance**.
- **Patients** – primary drivers today around patient **throughput and safety**.
- **Caregivers** – driven largely by **safety** concerns and improved **work-flow**.

The Ekahau-Aruba partnership can address these drivers to their maximum potential !



ROI Models – Hard vs. Soft

- **Hard Cost Saving ROI Examples**

- Reduce new asset purchases by “x” factor by cutting losses
- Improve utilization level of existing assets – avoid new purchases
- Reduce rental/lease programs



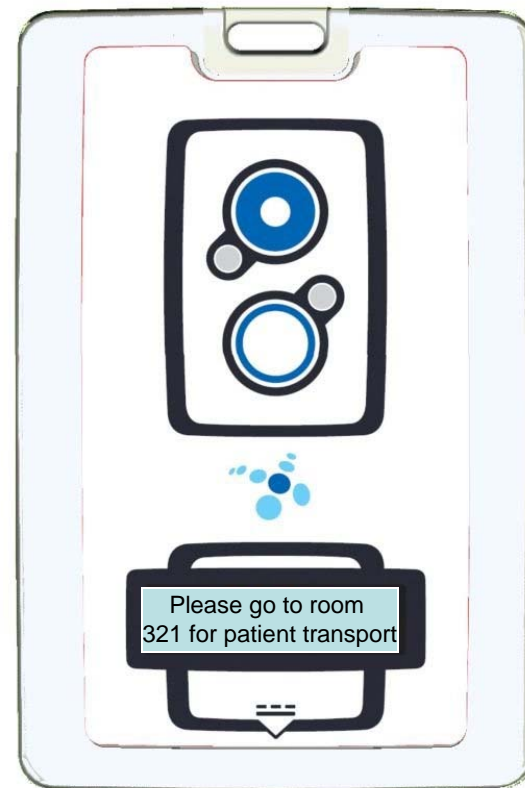
- **Soft Cost Saving ROI Examples**

- Reduce time spent looking for “things” (eg “midnight round-ups”)
- Not always justifiable by some hospitals, but real value can be found easily

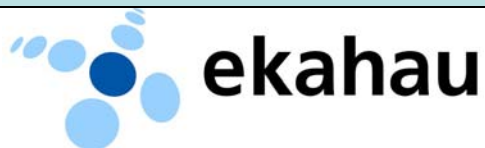


ROI Models Productivity Gains

- **Examples of Productivity/Throughput Gains:**
 - Improve existing bed capacity via more efficient transports, patient flow and status monitoring
 - Increase patient flow in OR, ED and other key revenue producing departments
 - Improve outpatient process flows by reducing wait times and managing the process



**You cannot manage what you cannot measure.
RTLS gives you the ability to measure and manage !**



Why Hospitals need Asset Tracking



ekahau

Identification/Tracking Technologies

- **RFID - Short Read Range Identification Technology**

- Equivalent to “barcode on steroids”
- More data than barcode, easily readable, writable, inexpensive
- Standardized (EPC Global)
- Primarily an identification resource – not for location tracking.

- **Active RFID - Location Tracking**

- Use portals/scanners/radios as overlays to existing LAN/WLAN
- No standards/ All are proprietary systems
- Various frequencies, tags & vendors create incompatibilities
- Varying levels of performance, scalability and accuracy
- Been available for over a decade with poor adoption

- **RTLS - Location Tracking – Leverage 802.11 coverage**

- Real-time enterprise-wide location tracking

Two options:

- 802.11-based that leverage 802.11 infrastructure without the need for proprietary overlay hardware or networks
- Proprietary overlay networks or appliances over vendor specific 802.11 networks



Why does WIFI RTLS make sense ?

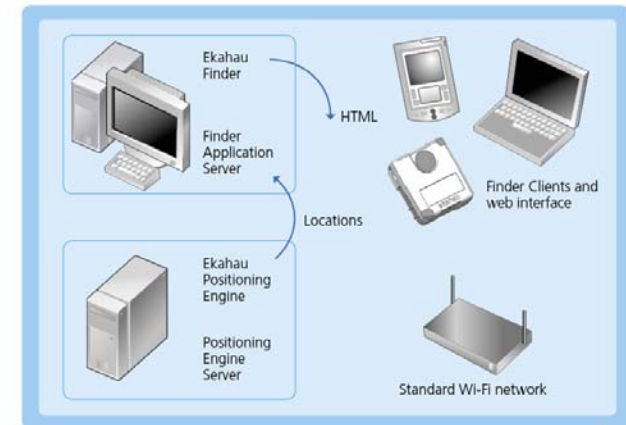
- **Regardless of the type of location tracking technology being used a data back bone (WIFI or Ethernet) network is needed:**
 - For transmitting tag data or information from locating infrastructure
 - To support end-user wireless terminal access for tracking applications
- **WIFI provides a multi-use infrastructure for:**
 - Data
 - Voice
 - Patient monitoring
 - RTLS
 - Telemetry
 - Etc.
- **WIFI RTLS can support multi-facility deployments cost effectively and thus enable large campus or multi-campus rollouts more cost effectively than any other technology**
- **WIFI is standards based, has extensive market presence and is approved for use in many places like hospitals, on airplanes, in power plants, on the manufacturing floor, etc.**



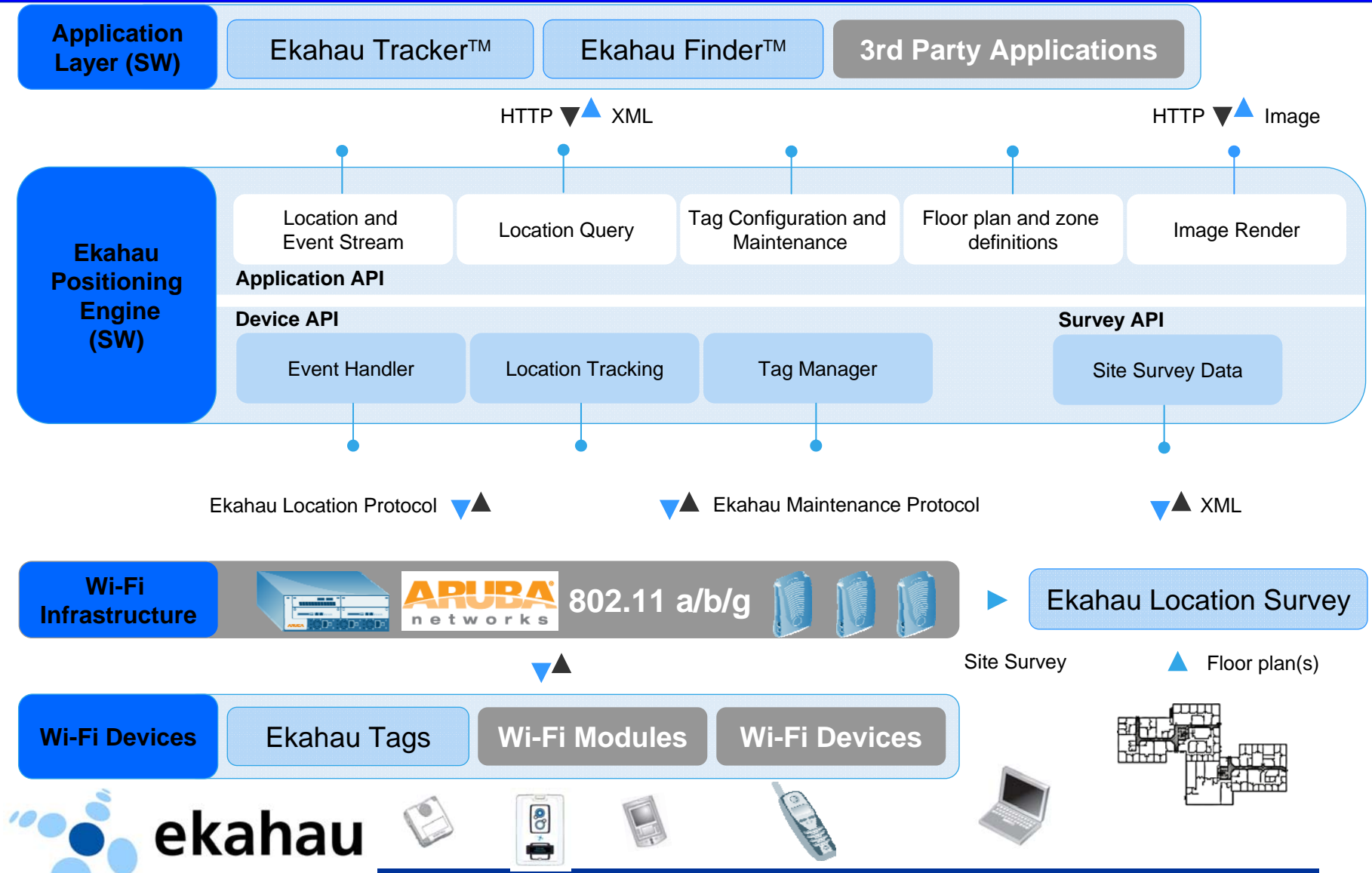
Ekahau RTLS

System components:

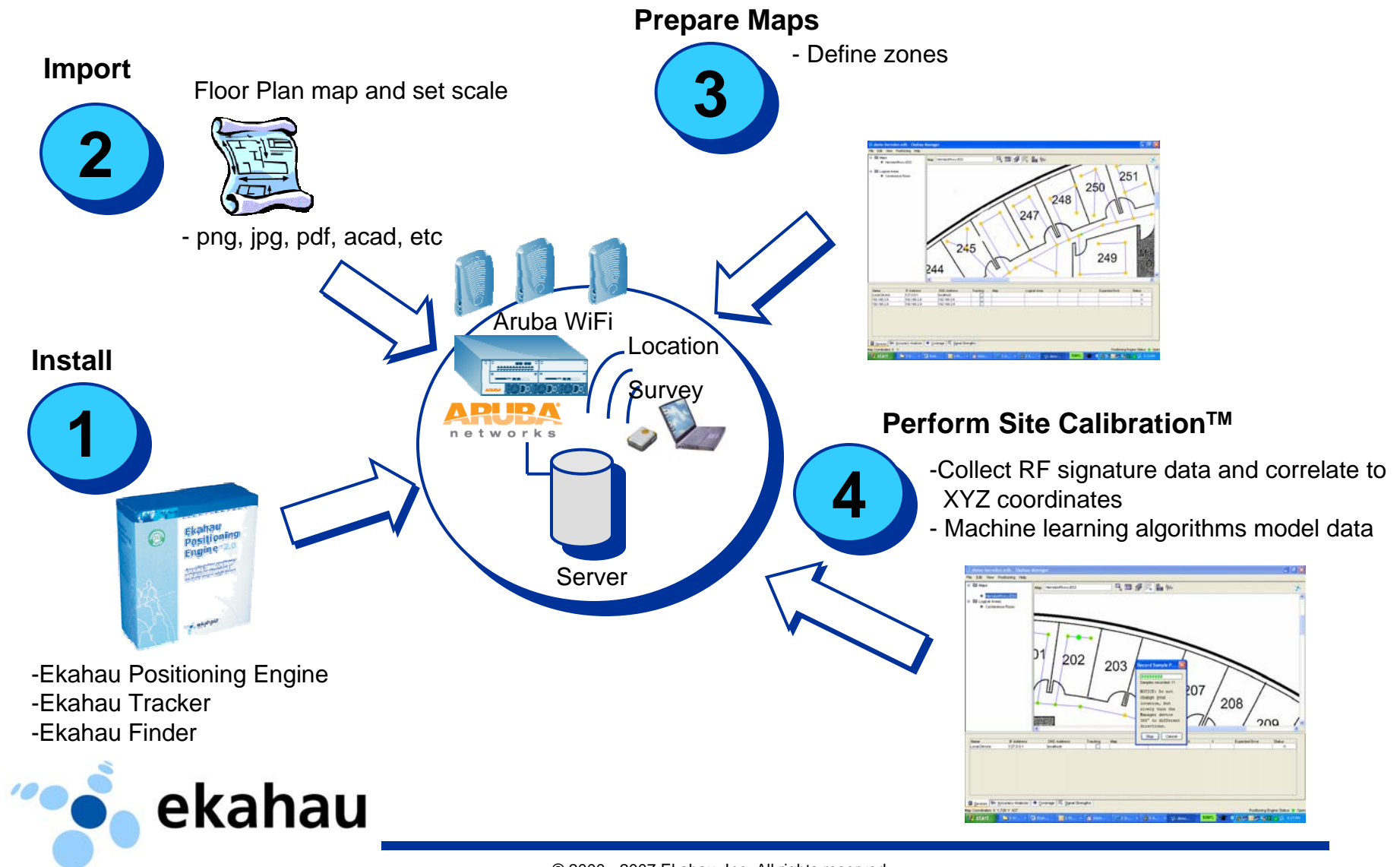
- **Ekahau T-series WiFi Tags**
 - Up to 5+ year battery, 2-way communication, tamper proof, audible and visible alarming, 2-way paging
- **Ekahau Client** – software tag
 - Track computers, VoWiFi, PDAs, barcode/RFID readers with software client
- **Ekahau Positioning Engine**- patented accurate location server and algorithms:
 - 802.11 A/B/G location tracking for up to 1-2 meter resolution.
 - Centralized or distributed support
 - Scalable to tens of thousands of tags
- **Ekahau Finder/Tracker** - enterprise application suites
 - Web-based, real-time, enterprise-wide visibility with full alerting, status and reporting capabilities.
- **Ekahau API:s**
 - XML, Java, Socket-based and SQL options for integration with clinical applications



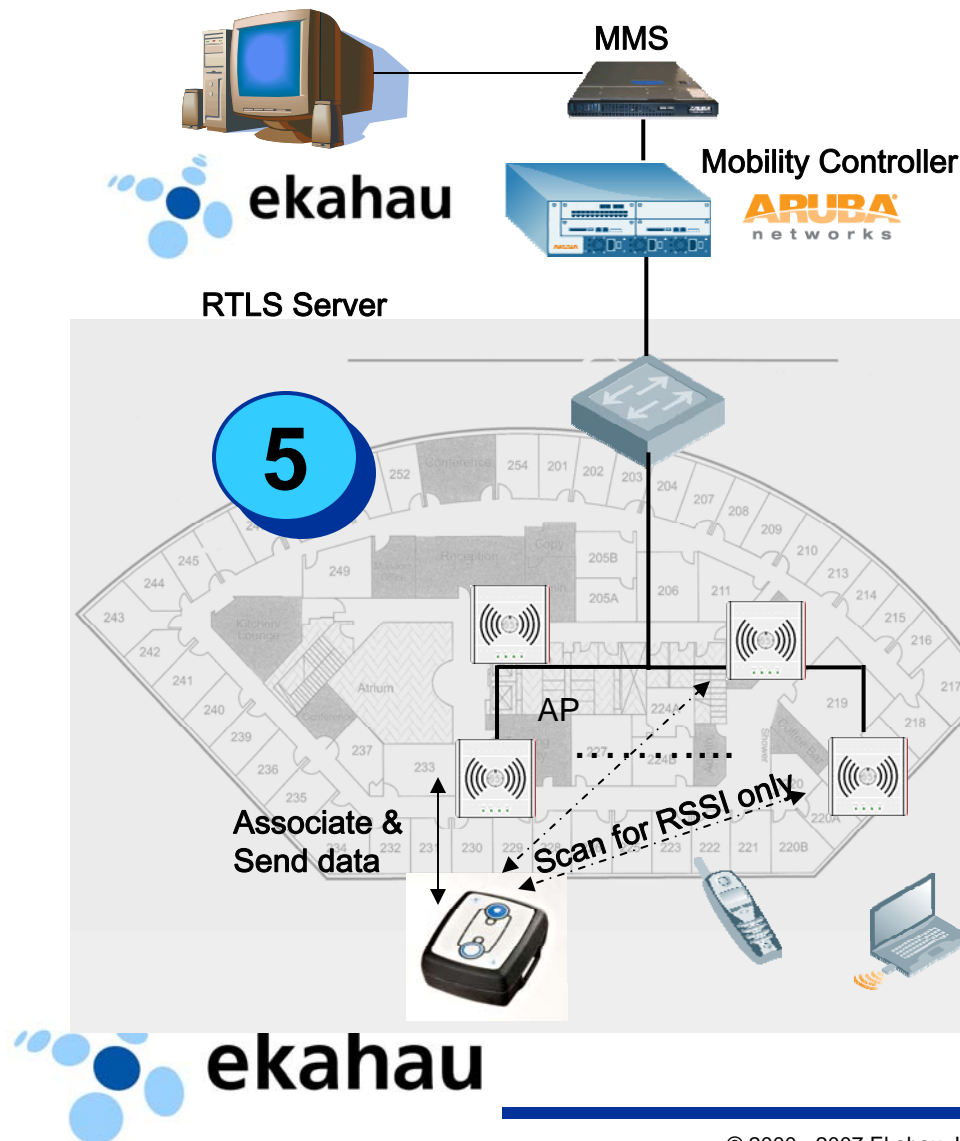
Ekahau RTLS Over Aruba



How Does It Work?



How does it work ?



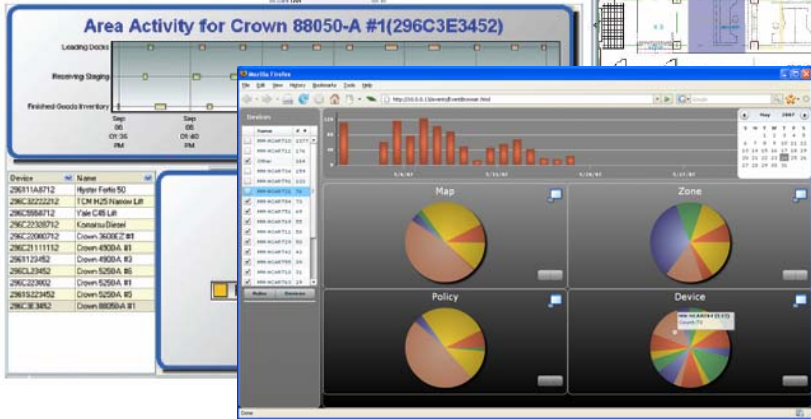
Ekahau RTLS:

- Site calibration factors in the environment such as walls, elevator shafts, etc. to produce better location accuracy than competitive systems.
- Sophisticated algorithms factor in changes in the environment, motion, history etc. and adapt to those changes.
- Tag association to network gives 100% visibility and manageability of 35-40 tag parameters.
- Full WIFI roaming across multiple campuses
- Standard data or voice grade network required

How Does It Work ?



Start Tracking!



TRACK PDAs!



TRACK Laptops!



TRACK Voip Phones!



TRACK Barcode/RFID scanners!



***TRACK WIFI enabled
Clinical equipment!***



TRACK WiFi TAGs!



Why Ekahau RTLS with Aruba?

- **Use the 802.11 network to it's maximum potential**
 - WIFI RTLS does not impact the 802.11 network in any way
 - No sense in building another wireless infrastructure
 - RTLS can be the vehicle to drive funding of a WIFI network or network expansion.
 - Simple facility survey – it's like a “walk in the park”
 - No need to pull cable, drill holes, move ceiling tiles, approvals, permits etc. when compared to Active RFID
- **Attractive payback**
 - Lose and buy less equipment
 - Spend less time looking for equipment and reduce errors
 - Improve workflow
 - Increase patient and staff satisfaction



Ekahau RTLS Differentiators

- ✓ **802.11** - Use 802.11 a/b/g WiFi network as the infrastructure for locating and tracking assets and people.
- ✓ **Accurate, Reliable, Proven** – chosen by many Fortune 500 companies as their basis for location technology. Ekahau has won several bake-offs internationally.
- ✓ **Capabilities/Functionality** – Rails, Zones, Real-time tracking, Heading, Speed, Analysis Tools, Interfaces, Application Layer, etc.
- ✓ **Fully Programmable Tags** - with OTA configuration “on the fly”
- ✓ **Adaptable** – reliable in continuously changing and challenging environments such as manufacturing, hospitals, shipping etc.
- ✓ **Installation** - Quick set-up time for fast rollouts, reduced installation costs and quicker time to ROI. **NO ADDITIONAL HARDWARE INFRASTRUCTURE**
- ✓ **Maintenance** - Minimal on-going maintenance or need for HW spares, etc. Centralized administration and management of all components.
- ✓ **Cost** - Full system cost at a fraction of the cost of infrastructure based systems. Long term ownership cost advantage with software based system.
- ✓ **Future-proof** – Same solution can be used on 802.11 A/B/G/ - XYZ etc.





Thank You !!

Tuomo Rutanen
Vice President Business Development
Ekahau Inc
Reston VA
Tel: + 1 703 860 2850



Q&A