



1st Invitational Workshop on
Body Area Network Technology and Applications
Future Directions, Technologies, Standards and Applications
June 19-20, 2011
Worcester Polytechnic Institute

THE EVOLUTION OF MEDICAL IMPLANT TELEMETRY AND BODY AREA NETWORK

HARDWARE TECHNOLOGY: HAKAN OHLGREN
2011-06-15



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Presentation overview

- Overview
- St.Jude Medical at a glance
- IMD telemetry of today
- Future IMD telemetry
- Why BAN?
- Standards, standards, standards...



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St. Jude Medical at a Glance

Founded: 1976

Global Headquarters: St. Paul, Minnesota, USA

First Product: Mechanical Heart Valve

Global Reach: Products sold in 100+ countries

More than 20 principal operations
and manufacturing facilities worldwide

Employees: 16,000+

2010 Net Sales: \$5.165 billion

Technology Platforms: Atrial Fibrillation
Cardiac Rhythm Management
Cardiovascular
Neuromodulation



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IMD telemetry of today: In clinics



Used during follow up:

- Read out stored data (IEGM, events, alarms etc)
- Re-programming parameters (if required)
- Configuring functionality (if required)

Radio standard: MedRadio

- MICS band: 402-405MHz
- 10 channels @ 300kHz bw.
- Data rates: \approx 400kbps

Used during implantation:

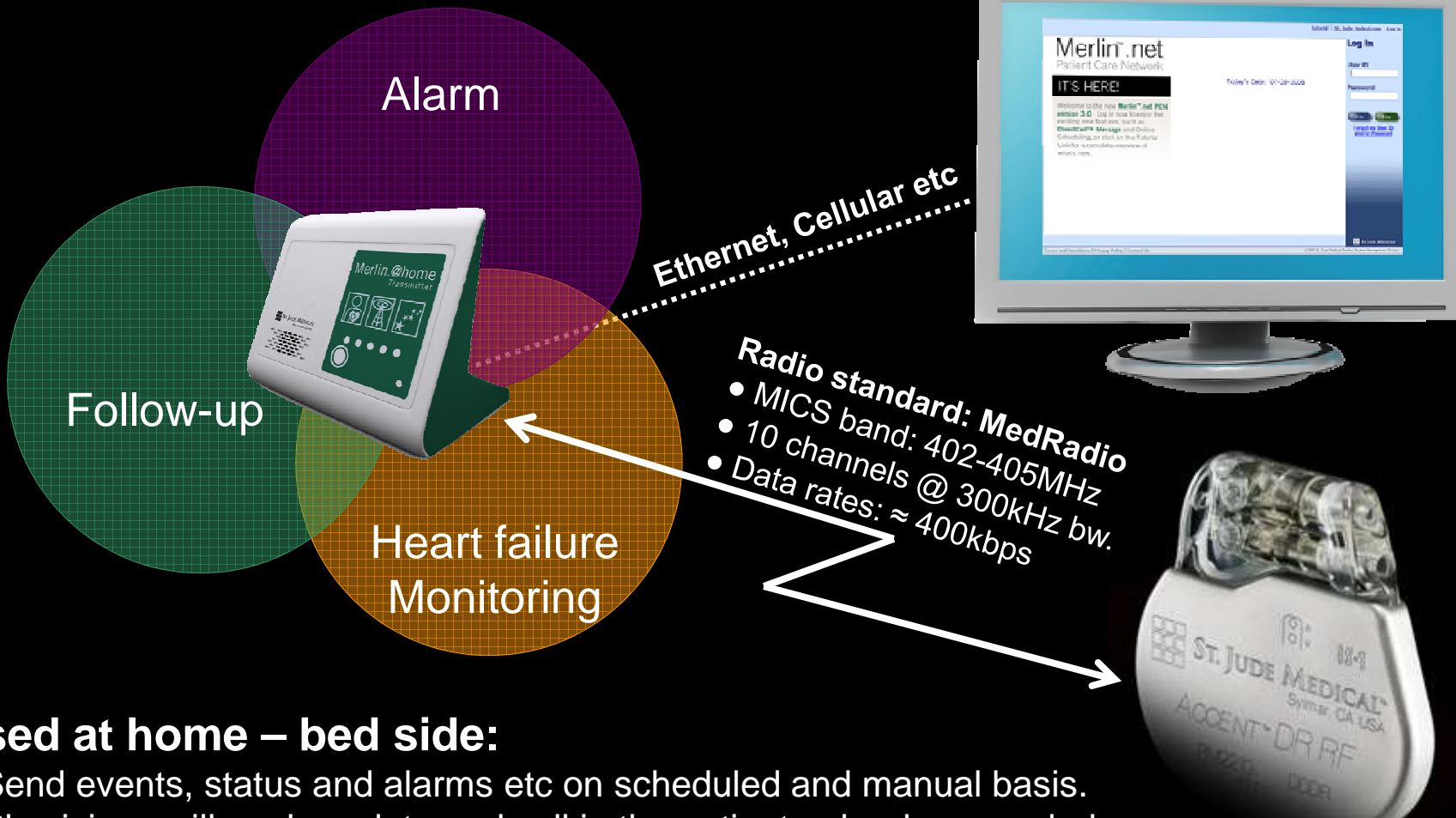
- Programming parameters
- Configuring functionality
- In case of ICD: Trigger tachycardia in order to find and program proper shock energy.



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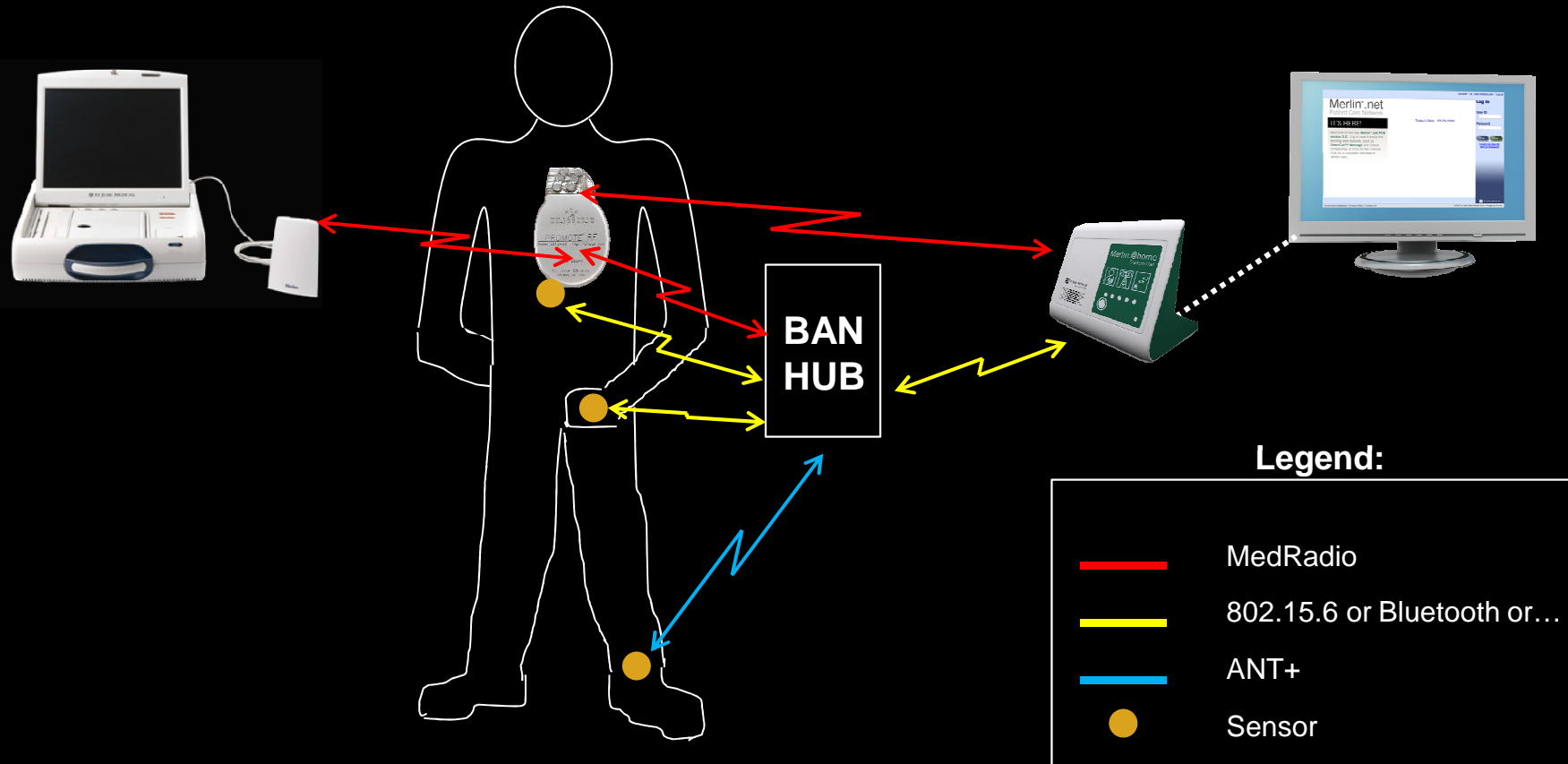
IMD telemetry of today: Remote Monitoring



Used at home – bed side:

- Send events, status and alarms etc on scheduled and manual basis.
- Physicians will analyze data and call in the patient only when needed.
- The data base holds statistics that can be used for trends etc.

BAN topology using multiple RF standards



Useful in different use cases:

- Legacy support during implantation and follow up in hospitals – backwards compatibility!
- Legacy support and new technology used in Remote Monitoring.
- Use of adequate RF technology for different purposes.



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Radio communication with Implanted devices:

Body attenuation is a significant parameter in the RF-link budget.

- Implantation depth differs between physicians.
- Attenuation differs significantly (5-6dB) between patients.
- Higher frequency => Higher attenuation.

Free space path loss is even more significant parameter:

Distance [m]:	Path loss @ 400MHz [dB]	Path loss @ 2.4GHz [dB]
1	Near field (low loss)	40
2	30.5	46.1
4	36.5	52.1
8	42.5	58.1
10	44.5	60

c1

$$\text{Pathloss} = 20 \log[4\pi d/\lambda]$$

Battery longevity in IMD:

- Power consumption from IMD battery need to be kept as low as possible.
- Higher frequency => need for higher RF output power => lower battery longevity.



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Slide 7

c1

If these numbers are decimals (e.g., 30.5) for US audience I would suggest changing the "," to "."

chestk01, 6/19/2011

Why BAN?

Problems to address:

- Health care costs are rapidly growing due to multiple factors.
- Increased demands from patients
- Lifestyle related issues – traveling, use of high tech equipment...

What can BAN do to help:

- Remote care with more data from multiple sensors, will improve trend analysis
 - Less frequent hospital visits
 - High quality & reliable "automatic" indications.
 - Early warnings of negative health trends.
- Integrating remote care into every day life – Cellular phone applications etc



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Standards, standards, standards...:

It is essential to standardize BAN with frequency bands that works worldwide!

Situation today is very fragmented:

IEEE 802.15.6

MedRadio - MEDS

ETSI TR 101 557 V1.1.1_1.0.7

Bluetooth

MedWin

Zigbee

ANT+



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Thank you!



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Global Presence

