



FTF 2016
TECHNOLOGY FORUM

SMART PHARMA SOLUTIONS FOR DRUG DELIVERY EFFECTIVENESS

FTF-MHW-N1978

BART DE LOORE
GM PRODUCT LINE PERSONAL HEALTH
FTF-MHW-N1978
MAY 18, 2016



AGENDA

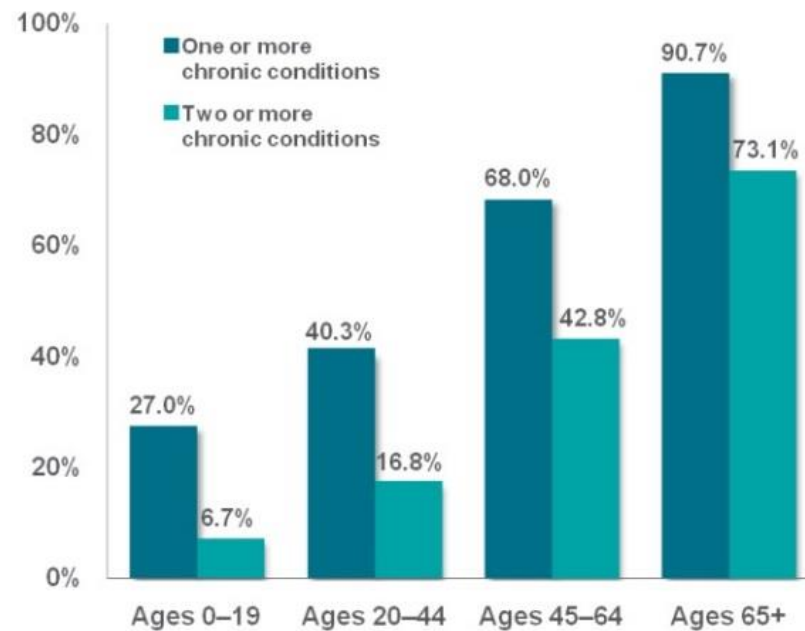
- Introduction – Problem Statement
- Cold Chain Monitoring
- Improving Therapy Adherence
- Conclusion



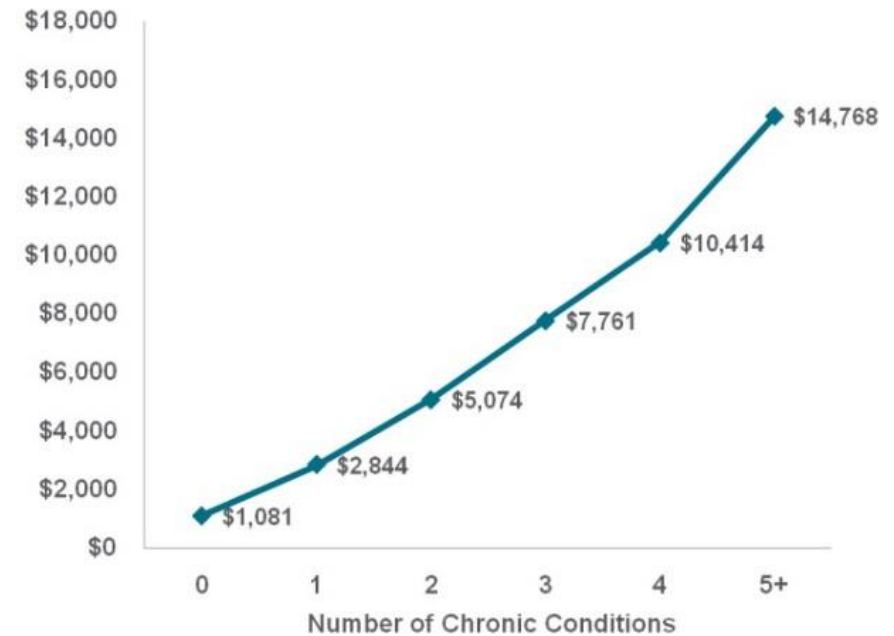
INTRODUCTION – PROBLEM STATEMENT

Epidemiological Shift in Disease Burden From Acute to Chronic Diseases

Percentage of Population with Chronic Conditions



Average Per Capita Health Care Spending



Source: Medical Expenditure Panel Survey, 2006

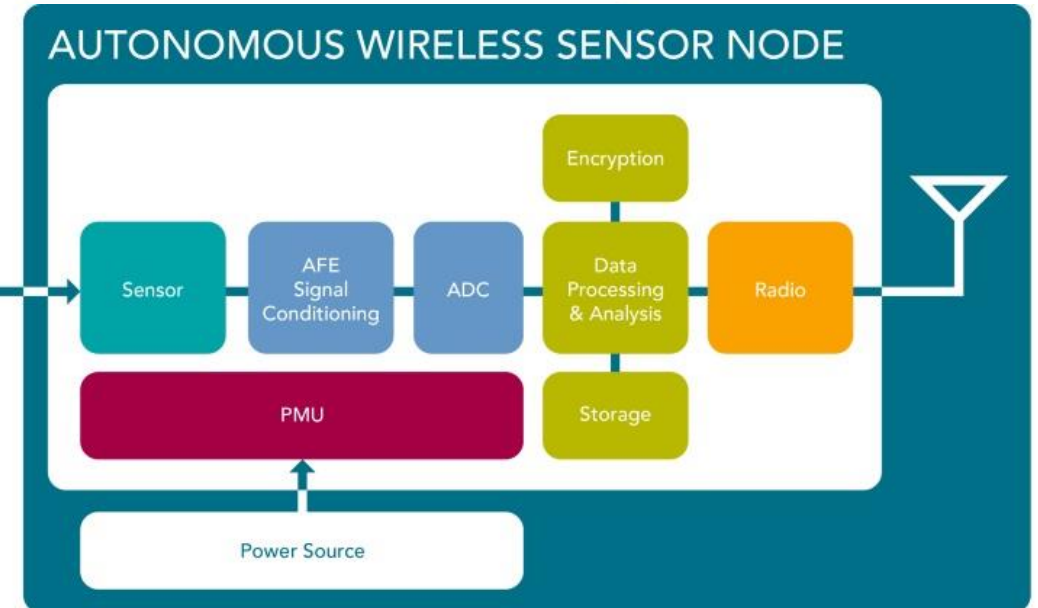
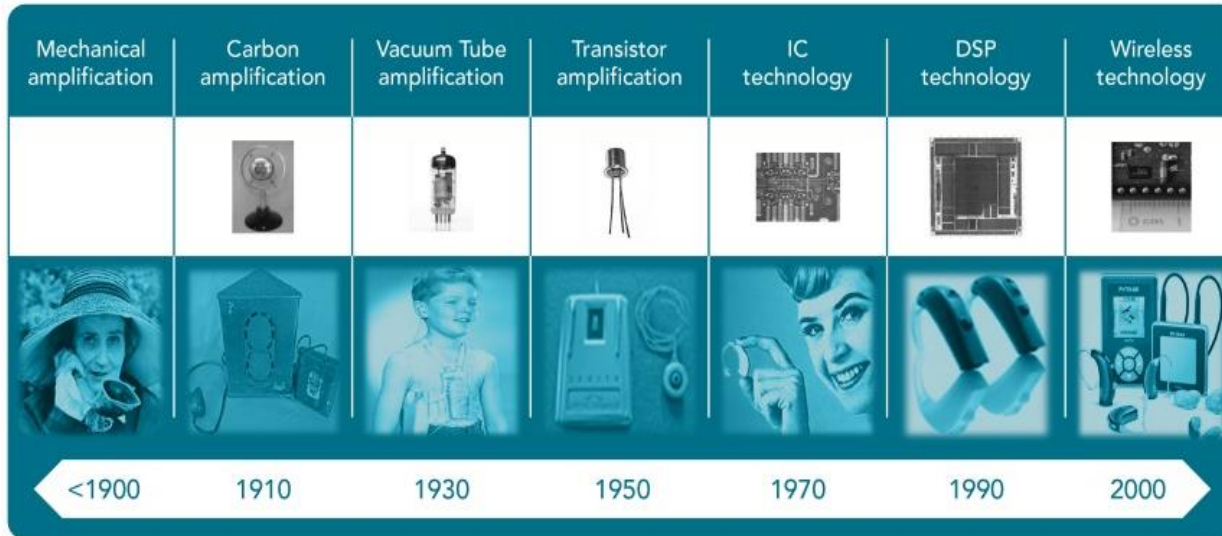
Strong Need to Affordably Increase

Long-term Therapy Patient Outcomes

- Trend For Patient Outcomes To Drive New Therapy Approval And Reimbursement
- First And Foremost Requirements For Good Patient Outcomes
 - Drug Efficacy Is Guaranteed At Time Of Administration
 - Patients Take Drugs As Prescribed
- World Health Organization “Adherence To Long-term Therapies: Evidence For Action”
 - Poor adherence to treatment of chronic diseases is a worldwide problem of striking magnitude
 - The consequences of poor adherence to long-term therapies are poor health outcomes and increased health care costs
- “Increasing the effectiveness of adherence interventions may have a far greater impact on the health of the population than any improvement in specific medical treatments”

Smart Solutions for Healthier Living

Leading Supplier to Hearing Instruments Industry

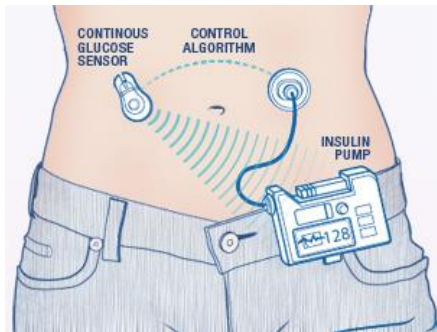
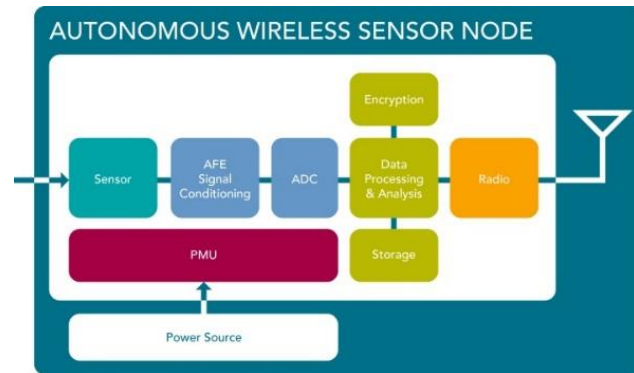


Smart Solutions for Healthier Living

Leveraging Know-how and IP Across Applications



Caution: Research prototype of a smart pharmaceutical blister package.



COLD CHAIN MONITORING

Increasing Portion of Drugs are Temperature Sensitive

- Temperature Sensitive Pharmaceutical Products
 - Vaccines
 - Insulin
 - Biologically Engineered Drugs (Biologicals, Biosimilars)
- “Room Temperature” Is Not Everywhere The Same
 - “Temperature Controlled Environments”
- In 2011, Eighteen Of The Top 50 Best-selling Global Drug Products Require “2 - 8°C” Cold-chain Storage And Handling
- In 2014, Almost A Third Of Newly Approved Drugs Are Cold Chain Products

Why Should We Be Concerned

- Temperature Excursions Beyond Limits
- Lower The Efficacy And The Stability Of The Drug
- Can Be Life Threatening

- “In Order To Maintain The Original Quality Every Activity In The Distribution Of Pharmaceutical Products Should Be Carried Out According To The Principles Of Gmp, Good Storage Practice (Gsp) And Good Distribution Practice (Gdp)”

- Gdp Is Covered From Manufacturer To Pharmacy
Last Mile From Pharmacy To Patients Is Not
- Many Incidents Occur In The “Last Mile”
 - “7% Compliance Only From Pharmacy To Administration *

http://www.nytimes.com/2011/08/16/health/16consumer.html?_r=0

<http://www.theatlantic.com/health/archive/2011/09/why-you-should-never-store-medications-at-high-temperatures/245011/>

* UMC Utrecht, University of Utrecht

NXP Cold Chain Solution

- Quality control over the complete logistic chain
- The quality and efficacy of the temperature sensitive product can be controlled at the point of administration
- History is logged, allowing identification when a cold chain excursion occurred



Other Features

- Product authenticity check
- Traceability e.g. Manufacturing batch
- Check against expiry date
- Big data
- Communication channel pharma company - patient

NXP Cold Chain Solution – How Does It Work

Live Demonstration of End-2-End Solution



More Cold Chain Applications



IMPROVING THERAPY ADHERENCE

Therapy Adherence: The Problem

Less Than 50% Of Patients With A Chronic Condition Take Their Drugs As Prescribed

- Disease May Recur, With Severe Knock-on Effects
- 125,000 Deaths Per Year (US)
- Costs Up To \$289 Billion (US)

Reasons For Poor Adherence

- Complex Therapy Regimen
- Poor Quality Of Instructions
- Forgetfulness
- Symptoms Disappear – Side Effects

Improving Adherence – All Win

- Patient: Improved Health
- Payor: Less Cost
- Pharma: Improved Patient Outcomes

<http://www.theatlantic.com/health/archive/2012/09/the-289-billion-cost-of-medication-noncompliance-and-what-to-do-about-it/262222/>

WHO “adherence to long-term therapies: evidence for action”



NXP Therapy Adherence Solution

NFC Enabled Sensor in Drug Package Communicates Over Nfc With Smartphone App

- Sensor Registers Drug Intake Events (If, When)
- App Records And Transfers Data To Cloud And Offers GUI
- Cloud Services Will Initiate Appropriate Action
- Patient Can Check Intake Versus Prescription Anytime
- Patient Or Care-giver Receives Reminder Or Motivation Messages

The Smartphone Sends Event Records to the Cloud

- Option To Deliver Therapy Specific And Personalized Services To Patient, Caregiver Or Healthcare Professional
- Medical Staff May Adjust Therapy Based On Reliable Data
- Big Data - Can Help Pharma Company To Improve Delivery Process
- Store History In Electronic Patient Record



Testimonial Relevance Therapy Adherence

Johnson & Johnson



Example Smart Drug Delivery

J&J – Smart Blister

Smart Drug Delivery Example – Smart Pens

- NXP is cooperating with the NFC biomedical sensing experts from AIT (Austrian Institute of Technology) to build Smart connected health care devices



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Therapeutic Relevance of Smart Pen Solutions

- taking the prescribed medication in pens, auto-injectors or syringes at the right time with the correct dosage is vital for the therapy outcome of patients.



Features of AIT`s smart pen solutions:

- Very easy and precise documentation of injections
- Automatic check if the medication is out of date and/or if it is the correct medication
- Blocked needle detection
- Automatic check of the liquid temperature before injection
- Easy integration into reusable and disposable pen`s
- No battery necessary
- Automatic pairing and app start via NFC



© Image: AIT

Application Example

Axis-d Connect

- NFC link initiates app – easy to use
- Instruction for Use OFFERING Guidance for every single step of the injection process, for patients safety
- easy to read Display of the next injection and overview for the next days (different character sizes and/or colors are possible)
- Reminder MESSAGES TO PATIENTS
- PATIENT feedback CHANNEL
- MONITORING if dose was injected completely
- Application for different therapies such as Fertility Treatment, Diabetes, Human Growth Hormone etc.



© Image: AIT & Haselmeier

Example Smart Drug Delivery

Smart Inhaler

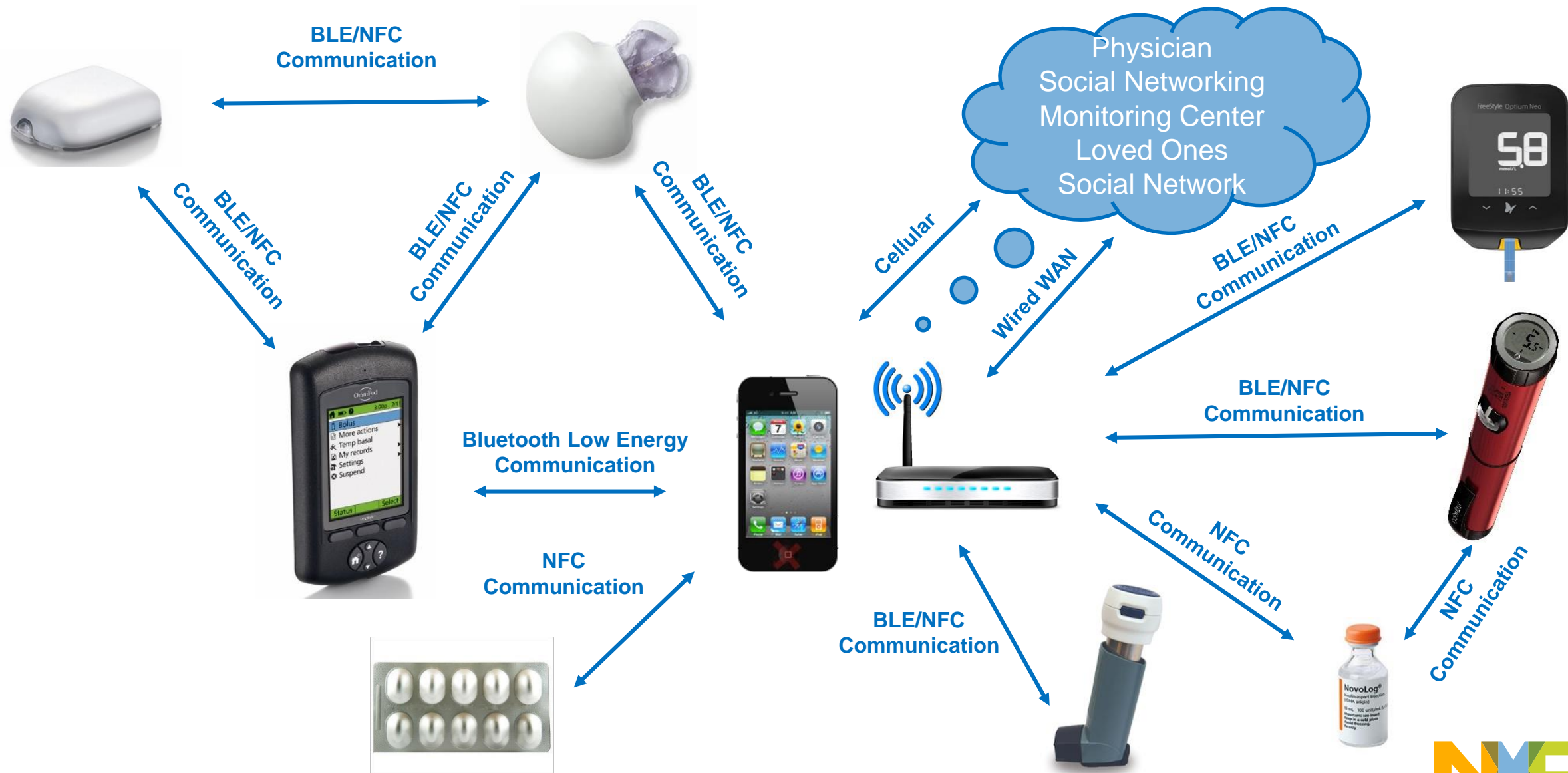
Example Smart Drug Delivery

Wearable Pump



CONCLUSION

NXP Smart Pharma / Therapy Adherence Solutions



All-Inclusive Combined Portfolio for Therapy Adherence Solutions



Microcontrollers
High Performance
Low-Power
Bluetooth Low Energy SoC
NFMI Radio/Cold Chain Tracking

Applications Processors
Multimedia Applications (i.MX)

Security/Authentication
Secure Element
NFC, HF, UHF Tags/Readers

Sensors
Accelerometers/Gyros/Touch/Pressure
Temperature/Magnetometer

Protection, Connectivity & Power
ESD/Filters USB-C/Wireless Charging/PMU

General Applications & Logic
Transistors/Diodes/Logic Functions/I2C Devices/Load Switches



Conclusion

- Significant Headroom In Drug Delivery Effectiveness
 - Addressing This Gap May Be More Impactful Than Specific Treatment Improvements
 - Cold Chain, Therapy Adherence, Anti-counterfeiting
- NXP's "Internet Of Things" Solutions Help Improve Patient Outcomes
 - Easy To Use
 - Can Be Tailored To Specific Therapy And Individual Patient
 - All Win – Patient, Payor, Pharma
- NXP Is Working With Ecosystem Partners
 - Inlay/Label Producers
 - Independent Design Houses
 - Application & Cloud Service Platform Providers
- To Provide End-to-end Solutions to Brand Owners and Logistics Companies



SECURE CONNECTIONS
FOR A SMARTER WORLD

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