



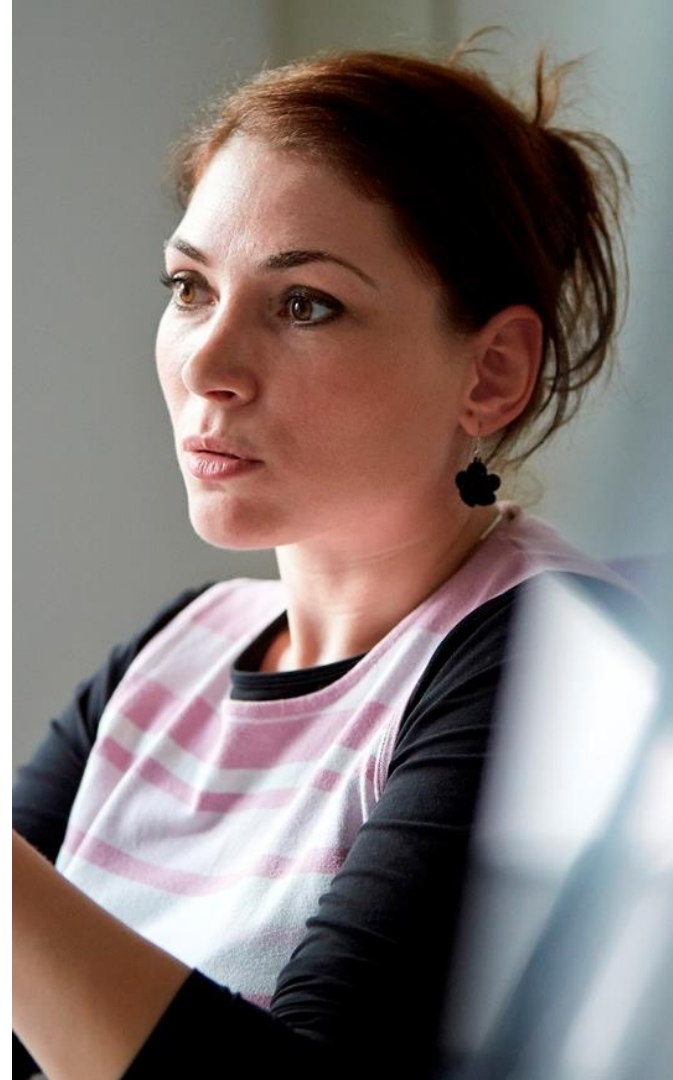
Enhancing everyday products with NFC – Welcome to the Internet of Things



www.nxp.com/nfc

Index

- ▶ The Internet of Things and NFC
- ▶ NFC tagged products
 - What they are
 - How they work
 - Typical applications
 - ❖ Brand engagement
 - ❖ Brand protection
 - Some real use cases
- ▶ NXP solutions
 - The NTAG family
 - Other NXP NFC tags



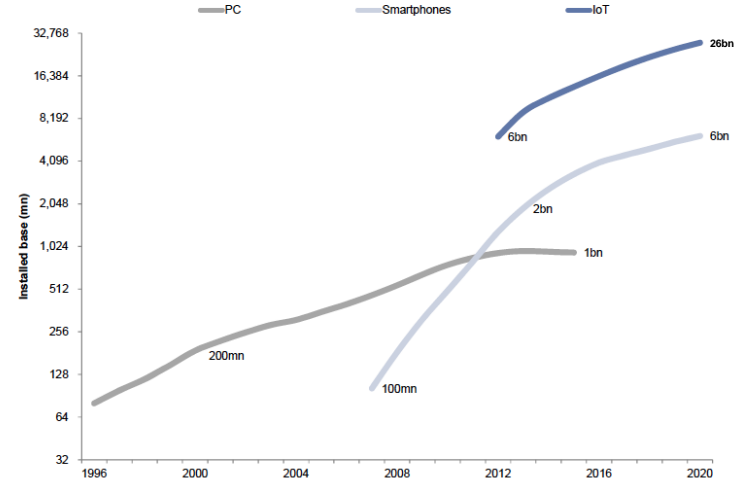
The Internet of Things

From the Internet of Devices to the Internet of Everyday Things



Exhibit 4: IoT emerging as the next mega-trend
Internet subscribers over time

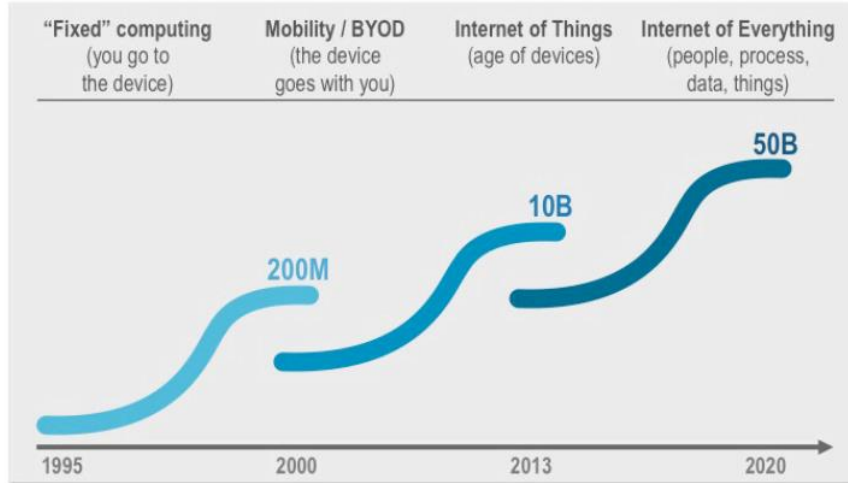
Note: y-axis is on a logarithmic scale



Source: IDC, Ericsson, Goldman Sachs Global Investment Research.

The Internet of Things

The next mega-trend – Internet of Everyday Things



Source: Cisco IBSG, 2013

- ▶ 3 trillion products sold per year
- ▶ 99.4% of physical objects still unconnected
- ▶ 50 billion things expected to be connected by 2020
- ▶ The Internet of Things will create \$14.4 trillion from 2013 to 2022

NFC: The critical link to the Internet of Things

Home automation

Tap your phone to adjust settings, or for commissioning



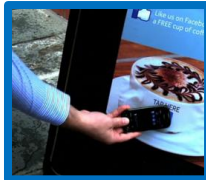
NFC Accessories

Tap your phone to configure or retrieve personal data



Smart media

Tap your phone for further information



Smart Meters

Tap your phone to read out consumption data



Consumer Electronics

Tap your phone to stream media, or to set the programming



Tagged products

Tap your phone to get information on the object



Why NFC?



Plenty of connectable products

3 trillion products per year waiting to be connected



NFC in your smartphone

1.1 billion NFC handsets in market globally



Smartphone availability

2.6 billion smartphone users globally



Connected consumers

Smartphones increasingly important in shoppers' lives



Worldwide connectivity

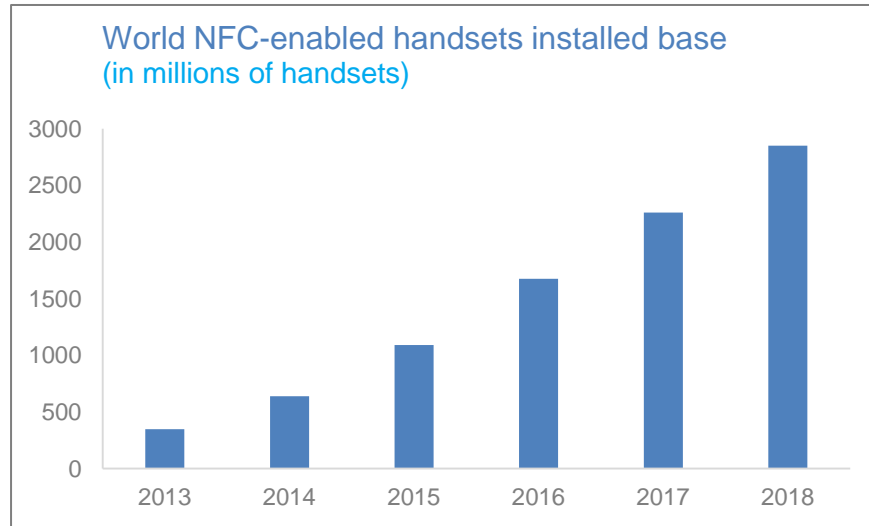
95% of the World's population covered by mobile networks



NFC technology uniqueness

NFC offers distinct advantages over other technologies

Smartphone NFC connectivity becoming ubiquitous



Source: ABI 2014

- ▶ Global smartphone sales of 1.5 billion units in 2013
 - Just 18.2% with NFC
- ▶ NFC-enabled mobile phone installed base more than 8 times higher in 2018 than in 2013
- ▶ 2 in 3 mobile phones to come with NFC by 2018
- ▶ “The majority of smartphone makers are adopting the NFC wireless communications and payment technology in their products as a de facto standard” *IHS*

NFC Technology

Read/Write mode

Card Emulation



Peer to Peer



Illustration of various NFC-enabled items and logos within a red dashed rounded rectangle:

- Wine bottle and box
- Facebook logo
- Starbucks logo
- Shopping bag
- ntag logo
- MIFARE logo
- ICODE logo

Read/Write
Reads / Writes data from any tag or contactless card

The ultimate in consumer experience: Just tap!

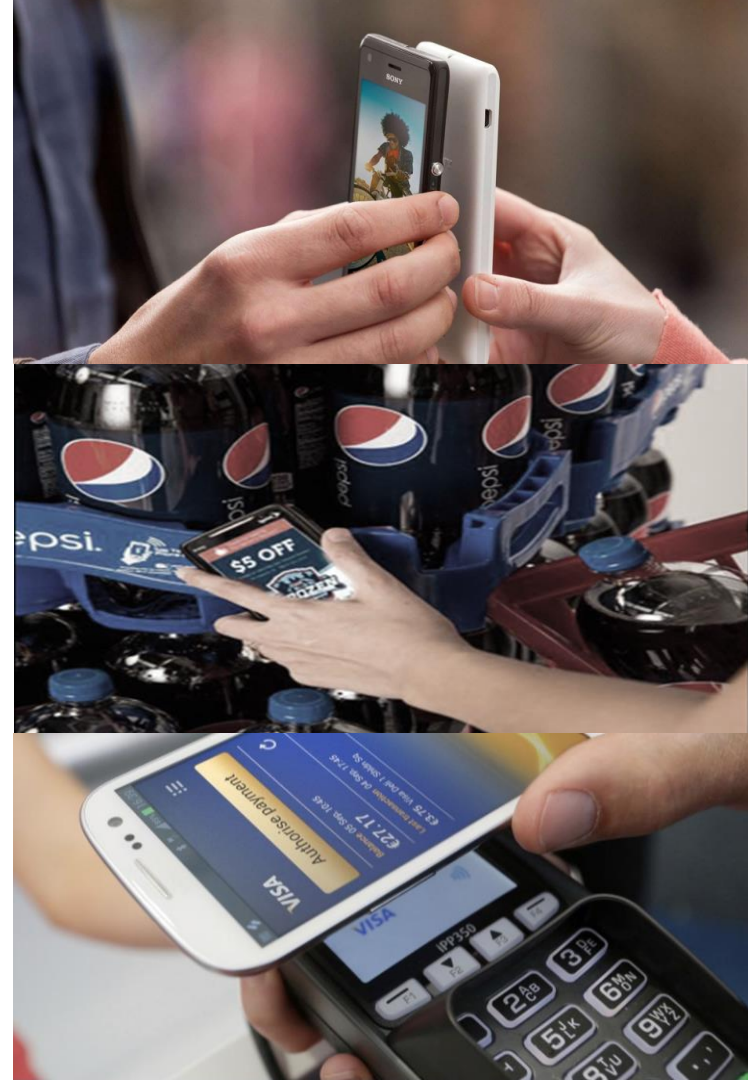
Convenient: Just tap - no app required

Fast: Fast one-tap data transfer

User-controlled: Pull approach

Secure: Short range point-to-point communication, tag features such as originality checker

Power saving: Only one device powered to drive the interaction – “battery-less tag”



NXP provides end-to-end solutions for NFC applications

Contactless readers

MFRC630

PR533

MFRC631

PN533

CLRC663

PR601

PN512

PN7120



Mobile NFC controllers



Smart tags and cards

n tag

ICODE

MIFARE

SmartMX2



NFC TAGGED PRODUCTS

NFC tagged products

What they are

- ▶ Regular product with an NFC tag on it
- ▶ Each tag contains an ID that uniquely identifies the product
- ▶ By just tapping with one's NFC phone, the user can interact with the tag
 - He can get additional information about the product
 - He can get customized information from the cloud
 - E.g., get vouchers, verify authenticity, redeem loyalty points...
- ▶ The retailer/brand owner can track these interactions in real-time by a cloud service to generate valuable data and insights
- ▶ Depending on the application, the tag can be overt or covertly embedded; it can also be on-pack, on-case, on-shelf...



How they work

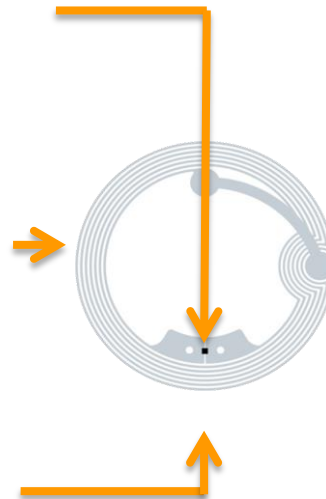
NFC tags

- ▶ Usually ISO/IEC 14443 (proximity) or ISO/IEC 15693 (vicinity) compliant
- ▶ Usually NFC Forum compliant
- ▶ Composed of
 - Chip
 - ❖ Characterized by a unique ID
 - ❖ Contains information stored in a standard way, according to NFC Forum
 - May also contain other proprietary information
 - ❖ E.g., NXP NTAG family
 - Antenna
 - ❖ Allows the chip to communicate with NFC devices through wireless communication
 - Packaging
 - ❖ E.g., a sticker containing the chip and the antenna

Chip: Holds information about the physical object to which the tag is attached

Antenna: Receiving energy (radio waves) and data from the reader (e.g.: handheld, professional reader) and transmits information back

Packaging: Encases the chip and antenna so that the tag can be attached to physical object.



How they work

Tag-phone interaction

- ▶ Most usual data elements stored in the NFC tag:

URL



http://www.

- The NFC tag contains a URL leading to a cloud-based content platform (CMS)
- This URL may be unique, based, e.g., on the UID of the tag
- All the information related to the product is available in the cloud and can be easily managed and updated

APP



- The NFC tag contains the identifier of a certain app
- E.g., in Android:
 - If the app is installed, it launches it
 - If it is not, it launches Google Play to download it
- Advantage: enables a higher control over the handset
- Disadvantage: Dependent on the operating system

The NXP NTAG



NXP NFC tag ICs
NTAG21x

2nd generation NTAG enables mass-market NFC applications

NTAG21x paves the way to mass-market applications in retail, brand engagement and brand authentication. In addition to increasing radio sensitivity even further, the NTAG family delivers additional memory options and a number of new key features, including UID mirror, originality signature, and password protection.

Key features

- Passive, NFC Forum type 2 tag
- Unique 7-byte serial number
- Read-only locking function
- Password authentication
- Originality signature
- UID mirror



How they work

Usual system architecture



The tag has a unique identifier

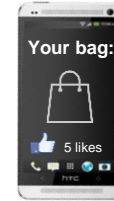


The product is uniquely identified in the cloud

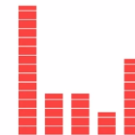


All product digital information tied to this ID

By tapping the tag, the phone interacts with the cloud



Directs the phone to specific content



Captures information about each interaction

How they work

Usual system architecture

NFC connectivity together with a **unique tag ID** and cloud service enables this whole system



Both **environment** and **custom variables** can be used for content triggers

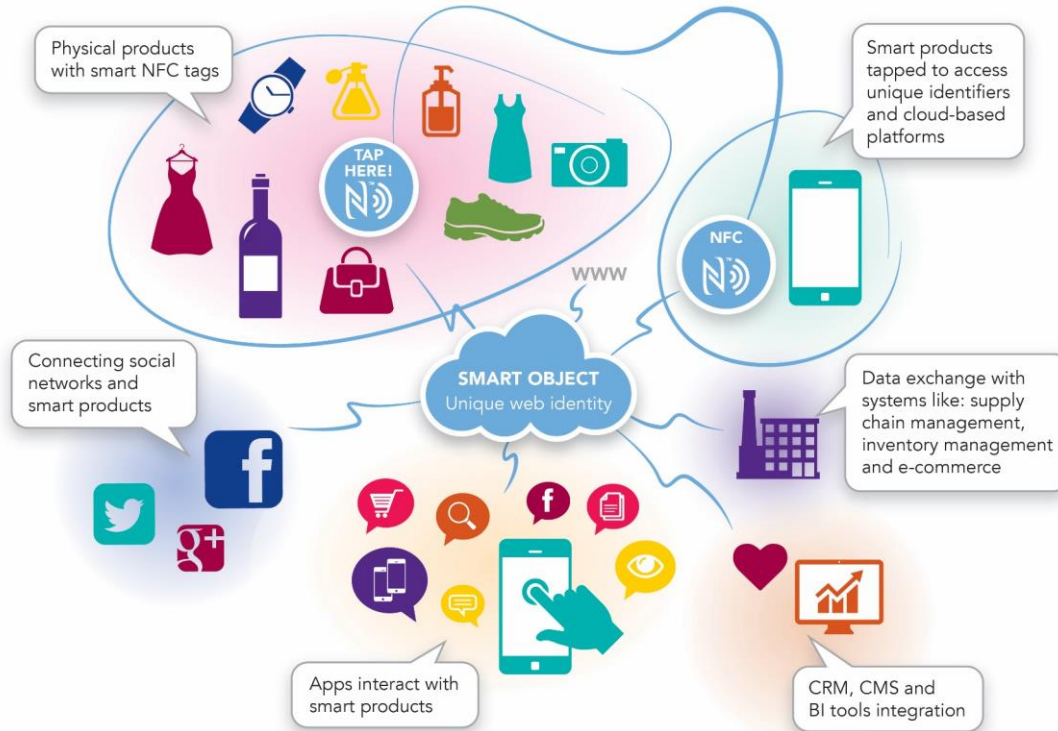
Each product interaction can be **captured in real time** and generate **valuable data** (analytics)



The **UID mirroring** functionality from the NXP NTAG enables automatic unique cloud address, e.g., www.brand.com/04E141118C



Cloud NFC – making products smart



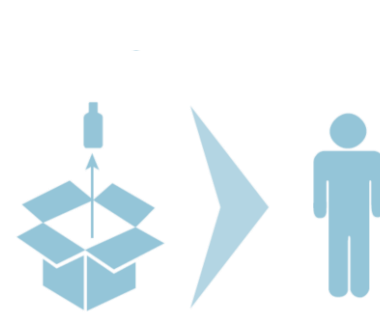
Every object uniquely identified in the cloud

Contextual information allows customized experiences

NFC and cloud make products smart and trackable

Typical application: brand engagement

- ▶ Deeper **brand engagement** between a brand and its consumers/prospects is a **key objective** for brand owners
- ▶ Nowadays, in purchase decisions, brand name and advertising still matter, but what matters even more are things such as people's **experiences** with a product and **social media**, which are becoming the **key elements** (Ipsos)
- ▶ **NFC tagging** is a great opportunity for brand owners to **address** these **new trends**
 - Through a **one-to-one relationship** with the consumer, it allows brand owners to be more **customer-oriented**
 - At the **point of purchase**, it provides potential customers with **useful information**
 - At the **point of usage**, it allows brand owners to offer **enhanced services** and **loyalty** programs
- ▶ **Data** can be captured about each transaction – this becomes a valuable **source of insight into consumer behavior**



Typical application: brand engagement

Possibilities at the point of purchase



Discover product information




Find offers



Receive customized information



Check product ratings/reviews



Find complementary items



Location-based services



Verify product authenticity



Add to the shopping cart



Check other colors/sizes in-stock

Some of them, e.g., authenticity checking or product tracing, also relevant in the **B2B supply chain**

Typical application: brand engagement

Possibilities post-purchase/at point of usage

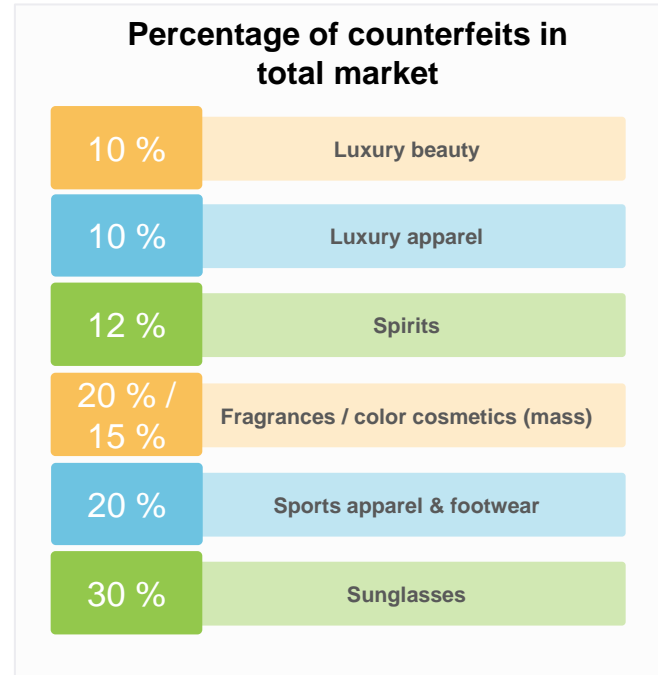


Also permits **accessory configuration**, e.g., electronic tooth or skin brush

Typical application: brand protection

The rising cost of counterfeiting

- ▶ By 2013 global financial losses from counterfeiting and piracy had soared to \$1 trillion - forecast to jump to \$2.3 trillion by 2018
 - Global counterfeiting growing at 15.6% p.a. 2013-2018
 - The global solutions market is running at only 0.52% of financial losses from product crime
- ▶ Counterfeits are big brand value detractors:
 - Direct financial costs: lower revenues, eroded market share, stolen know-how, fraudulent returns ...
 - Brand image at risk: less value seen in authentic products vs look-alikes, injured brand reputation as customers are let down by low-quality counterfeits; suffering relationships with distribution partners ...

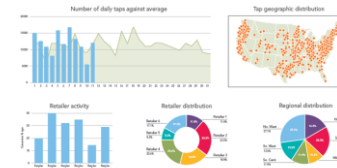
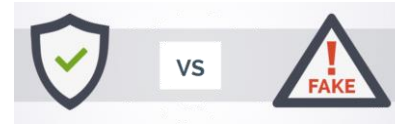


Typical application: brand protection

NFC as the next step in brand protection

- ▶ **Brand authentication:** Brands can empower their customers to know they are buying an authentic product, anywhere at any time
- ▶ **Anti-counterfeiting:** Shoppers can now become partners in the battle against counterfeits
- ▶ **Data capture & channel control:** Data can be captured through a cloud-based platform and location-based service: location of tap, distribution channel, time of product authentication etc.

NFC gives each product its own unique identity - and forms the base to which all other information is tied



Typical application: brand protection

NFC allows brand authentication and traceability

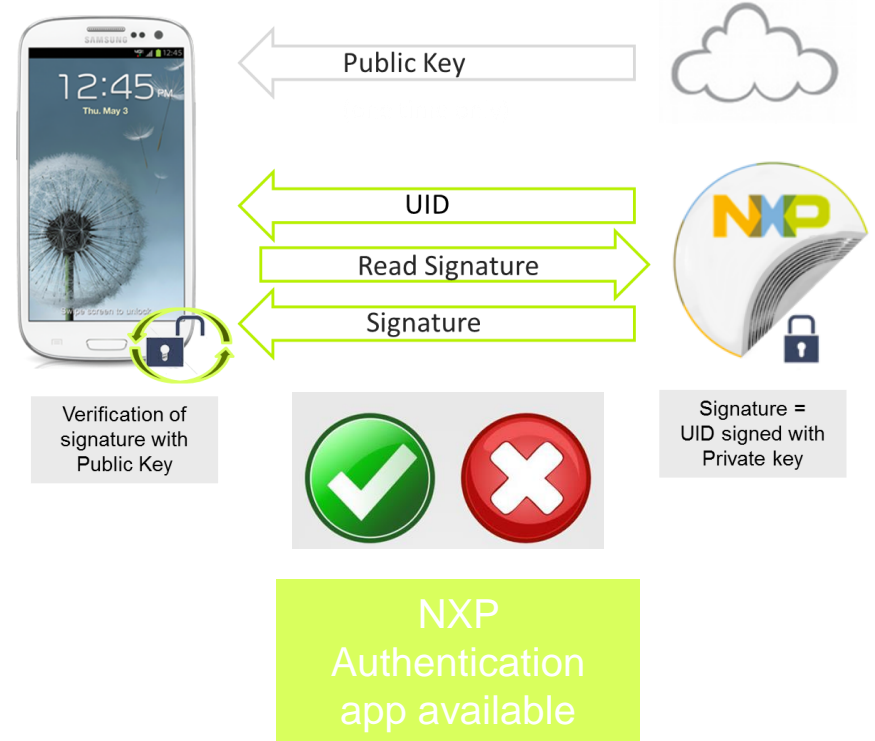


- ▶ A brand authentication app – such as the NXP Auth Checker – functions in conjunction with an NFC tag carried on the product
- ▶ Authentication can be configured to work standalone (via phone app), or with a cloud-based service
- ▶ For added levels of assurance, secure NXP cryptography can be integrated into the tag

Typical application: brand protection

NXP Auth Checker

- ▶ Standards based private / public key cryptography
- ▶ The user's smartphone becomes an authentication terminal, running a verification app
- ▶ A digital signature is stored in the NFC tag
- ▶ A public key is used to authenticate information in the tag
- ▶ Enables detection of unauthorized tags (and hence a first alert on unauthorized products they're attached to)
- ▶ + Can be combined with an online ID check to further raise the level of protection



Some real use cases

Aki Choklat bags



- ▶ Aki Choklat's bags are equipped with NFC tags that work with an app and a cloud-based service
- ▶ By tapping, consumers can verify authenticity, displaying when and where the bags were made
- ▶ The app also works with GPS data, creating a digital diary that logs the bag's whereabouts, complete with updates to social media
- ▶ GPS can also be used to trace the bag if it's ever lost or stolen

Some real use cases

Duclot wines



- ▶ Users can tap their mobile phone against Duclot's NFC-tagged Bordeaux collection cases to verify their authenticity via a cloud-based solution
- ▶ It also offers integrated traceability all the way from the wineries to the point of sale
- ▶ Consumers can gain access to extra information, such as cellar location, serving tips etc.

Some real use cases

Adidas shoes



- ▶ Adidas featured NFC embedded shoe laces (2013)
- ▶ Customers tapped in-store for product info, reviews and social feeds
- ▶ Sales associates tapped upon purchase, linking to inventory and CRM systems
- ▶ At home, customers tapped to register the shoe under their names, when linking to the myCoach running app
- ▶ Reference: <http://www.nfcworld.com/2013/06/19/324726/adidas-adds-nfc-to-running-shoes/>
<http://www.thedrum.com/news/2015/03/15/adidas-digitise-trainers-and-footballs-create-over-billion-consumer-touchpoints>

Some real use cases

Pepsi at PoS



- ▶ US shoppers could tap NFC tagged plastic bottles to access Pepsi promotional information (2014)
- ▶ They linked to a URL with a 'What's your flavor?' choice menu to access product info and coupons. They also had a chance to win a \$5 coupon for National Hockey League tournament tickets
- ▶ They were invited to share e-mail details, providing Pepsi with the option to re-contact them again
- ▶ Result - Sales increased about 2 percent, and 48% clicked through to Pepsi media
- ▶ Reference: <http://www.rfidjournal.com/articles/view?11972/2>

NFC vs QR vs BLE vs Web Browser



NFC



QR code



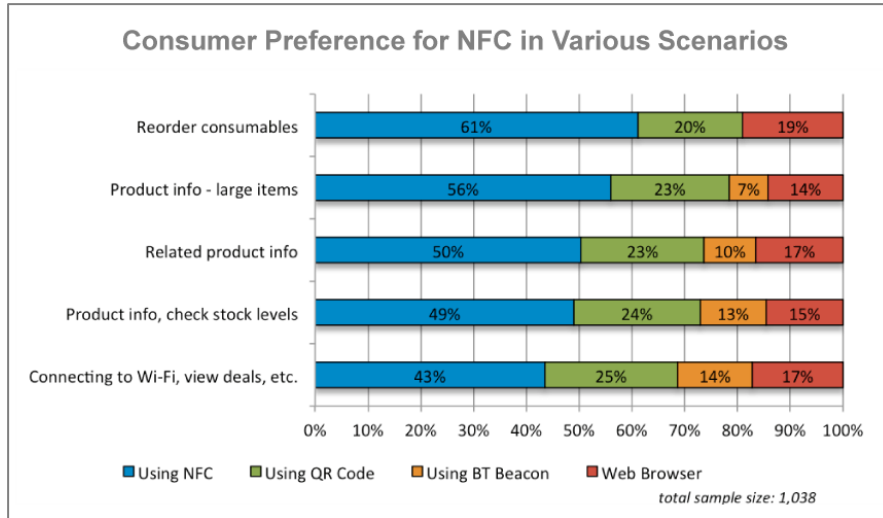
BLE



Web browser

	NFC	Static	Serialized	BLE	Web browser
Ease of use	Simple, instant	Reader app required		App required	User typing required
Communication	Point to point	-		Point to many points	-
Range	4-5 cm	Middle (line of sight)		Up to 150 m	Middle (line of sight)
Price	Min. cost of tags	Printing	Backend code management	Higher hardware / maintenance costs	Printing URL
Energy	Battery-less	Battery-less		Battery-powered	Battery-less
Security	High	Low		High	Low
Line of sight required	No	Yes		No	Yes
User experience	Pull	Pull		Push	Pull
Includes product ID	Yes (serialization by default)	No	Yes (cost, complexity)	No	Possible
Can be attached to sensor	Yes	No		Yes	No

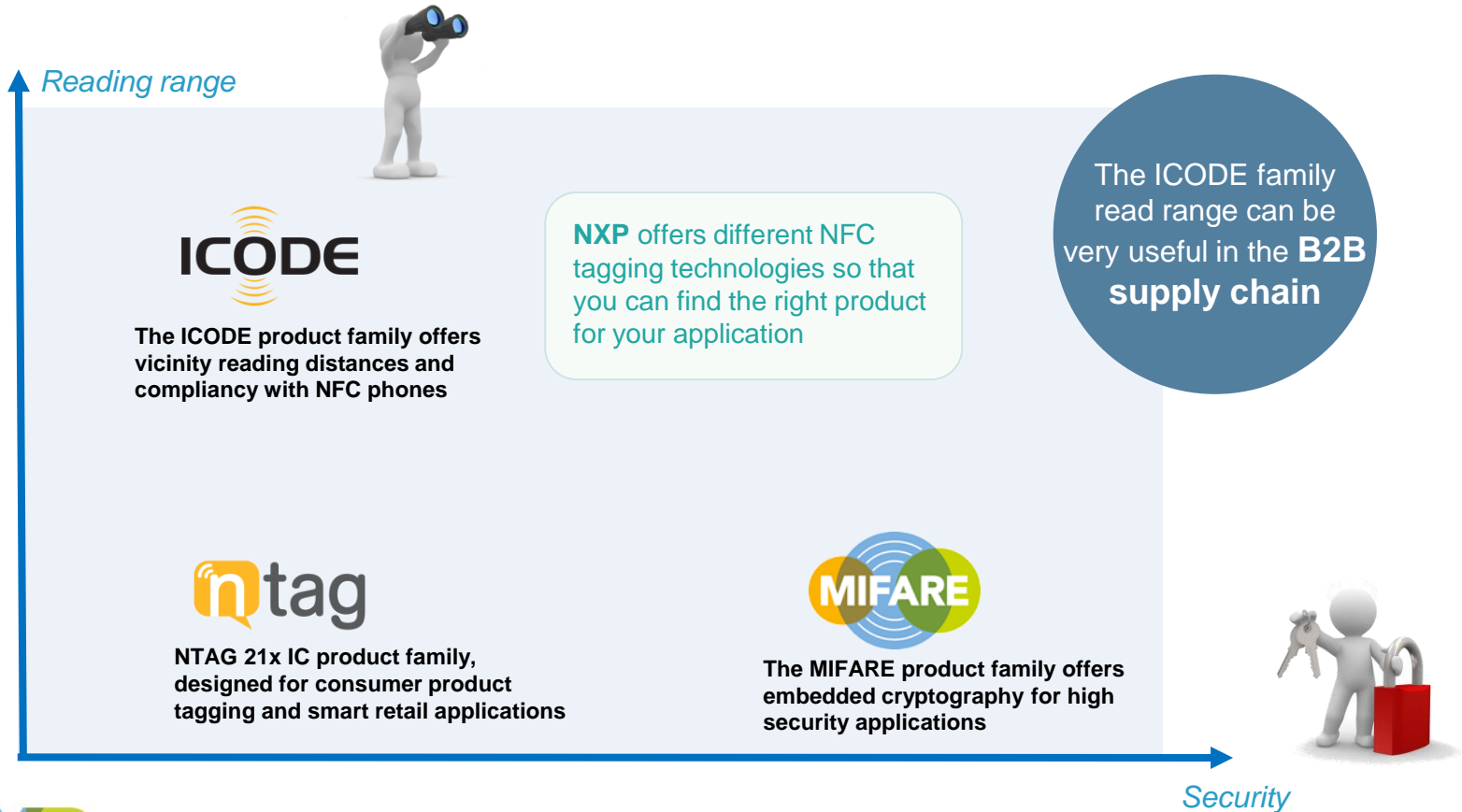
NFC is the preferred technology for retail applications



- ▶ Study conducted by **Strategy Analytics** on consumer preferences in retail technology
- ▶ Consumers evaluated NFC, QR code, Bluetooth beacon and web browser to 6 different in-store retail scenarios
- ▶ NFC was the preferred option in the 6 scenarios
 - In 5 of them, more than twice as many consumers preferred NFC to the leading alternative
- ▶ Three user benefits of NFC technology were highlighted: speed, convenience and control
- ▶ Reference: <http://nfc-forum.org/retail-study/>

NXP SOLUTIONS

NXP Solutions



NXP NTAG as the solution for NFC consumer product tagging



Unique identifier for each product

- Unique 7-byte serial number
- UID ASCII mirror, e.g., www.brand.com/04E141118C

Security features

- Read-only lock function
- 32-bit password protection
- ECC based originality signature

Different memory sizes for different needs

- From 48 to 888 bytes

Compliant with standards

- Fully ISO/IEC 14443A 2-3 compliant
- Fully NFC Forum Type 2 Tag compliant

Other special unique features

- 24-bit NFC counter + mirror
- FAST_READ command
- GET_VERSION command



UID mirror



Originality signature



Password protection



Fast read

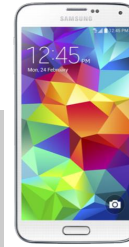
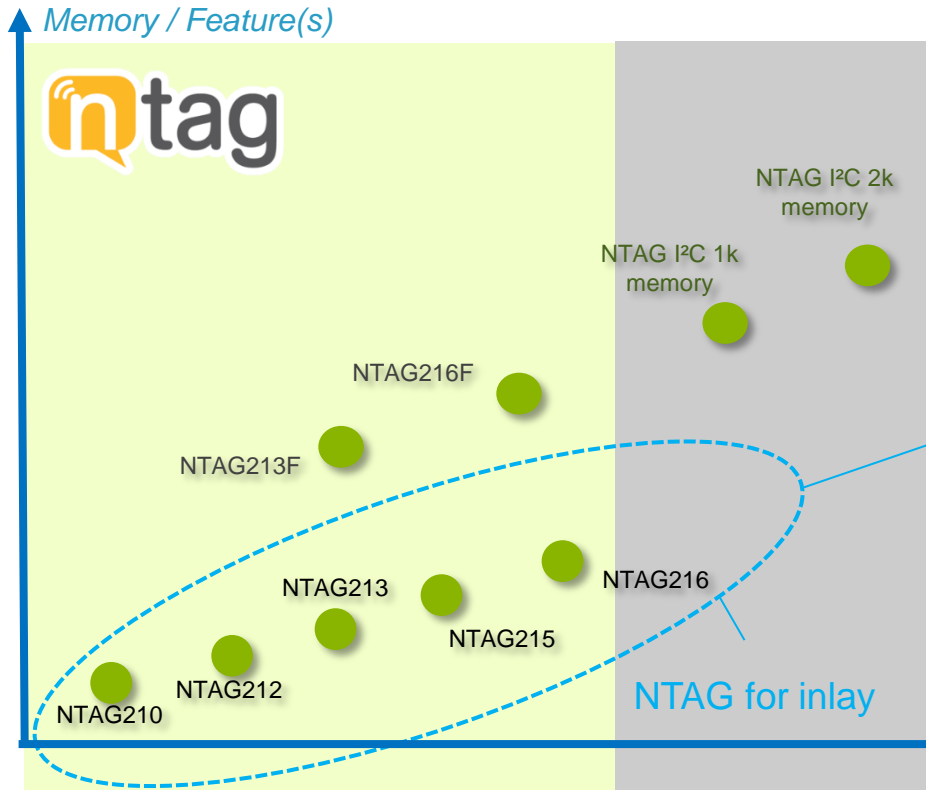


NFC counter



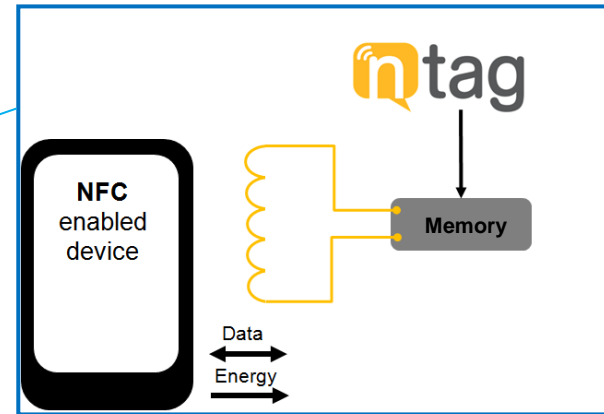
NFC counter mirror

The NTAG family












NTAG

Smart products, smart retail....



NTAG 21x family features

	210	212	213	215	216
 memory	48 bytes	128 bytes	144 bytes	504 bytes	888 bytes
 input cap	17 pF	17 pF	50 pF	50 pF	50 pF
 UID mirror	✓	✓	✓	✓	✓
 originality signature	✓	✓	✓	✓	✓
 password protection	✓	✓	✓	✓	✓
 fast read	✓	✓	✓	✓	✓
 NFC counter			✓	✓	✓
 NFC counter mirror			✓	✓	✓

Leveraging the NXP NFC portfolio for advanced security / reading range needs



	21x	Ultralight C	DESFire EV1	SLIX	SLIX2
Standard	ISO/IEC 14443-A	ISO/IEC 14443-A	ISO/IEC 14443-A, ISO/IEC 7816-4	ISO/IEC 15693, ISO/IEC 18000-3	
Frequency	13.56 MHz		13.56 MHz	13.56 MHz	
Reading range	4-5 cm (proximity)		4-5 cm (proximity)	Up to 1.5 m (vicinity)	
Bit rate	106 kbps	106 kbps	106 – 848 kbps	Up to 53 kbps	
User memory	48 – 888 Bytes	144 Bytes	2k, 4k, 8k Bytes	112 Bytes	316 Bytes
NFC compatibility	Yes (NFC tag type 2)	Yes (NFC tag type 2)	Yes (NFC tag type 4)	Pending (NFC tag type 5)	
Security	Password protection, originality signature	Embedded crypto (TDES)	Embedded crypto (TDES/AES), tamper resistance, CC certification	-	Password protection, originality signature
Typical applications	Authentication, consumer interaction...	Authentication, high-value asset tagging...	High-value asset tagging, loyalty credit, micropayment...	Authentication, supply chain logistics, consumer interaction...	

NXP is the right choice

- ▶ NXP is the **best choice** when talking about **NFC**-related ICs
 - Offers the best **performance** at a competitive price
- ▶ NXP is the global **#1** NFC chip **supplier** in the identification, tags and mobile industries
- ▶ NXP is the **co-inventor of NFC** and **founding member of NFC Forum**
- ▶ NXP **NTAG** offers plenty of special **features** for consumer product tagging
 - E.g., read/write, UID mirror, password protection, signature, counter...
- ▶ NXP offers other smart NFC chip solutions for enhanced security (MIFARE) and reading range (ICODE) needs
- ▶ NXP considers **silicon** as the best present-day technology for electronics
 - NXP silicon tags outperform tags from other technologies, e.g., printed electronics
 - Silicon is the proven cost-efficient solution for mass production



**FOURTEEN NXP EUROPEAN
INVENTOR AWARD WINNERS!**

es
SECURE CONNECTIONS
FOR A SMARTER WORLD

Wrap up

- ▶ The **Internet of everyday Things** is THE mega-trend, with 3 trillion products sold per year waiting to be connected
- ▶ **NFC** technology is the key enabler for the Internet of Things
 - Each object contains an NFC tag
 - The tag has an ID that uniquely identifies the object and is linkable to a cloud address and object
- ▶ **NFC together with phone connectivity** enables a whole new scenario where every object has its digital identity
 - This gives the consumer the opportunity to interact in complete new ways with the product
 - It also gives the opportunity to the retailer/brand owner to gather real-time data about the consumer-product interactions
- ▶ **Brand engagement** and **brand authentication** are examples of applications where NFC tagging can be the right solution
- ▶ In this scenario, NXP offers the **NTAG** family products, which offer several unique features. It also offers MIFARE for advanced security, ICODE for vicinity reading range needs



Further material

Articles

- ▶ It's personal: deeper brand relationships with NFC and cloud – Part 1
<http://blog.nxp.com/its-personal-deeper-brand-relationships-with-nfc-and-cloud-part-1/>
- ▶ It's personal: deeper brand relationships with NFC and cloud – Part 2
<http://blog.nxp.com/its-personal-deeper-brand-relationships-with-nfc-and-cloud-part-2/>
- ▶ 10 creative uses for Near Field Communication... Smartly connecting everything
<http://blog.nxp.com/10-creative-uses-for-near-field-communicationsmartly-connecting-everything-part-one/>
- ▶ The digitally enhanced shopper journey: NFC and BLE
<http://blog.nxp.com/the-digitally-enhanced-shopper-journey-nfc-and-ble/>

Videos

- ▶ NFC connects everyday products to the Internet of Things
<https://www.youtube.com/watch?v=cFU-6UkGLw8>
- ▶ The power of NFC connectivity for brands and retail
<https://www.youtube.com/watch?v=gCZfdckjk4>

NXP solutions

- ▶ NTAG 21x leaflet
https://nxp-rfid.com/wp-content/uploads/2013/07/NTAG_210_212_low.pdf
- ▶ NTAG 21x website
http://www.nxp.com/products/identification_and_security/smart_label_and_tag_ics/ntag/#overview

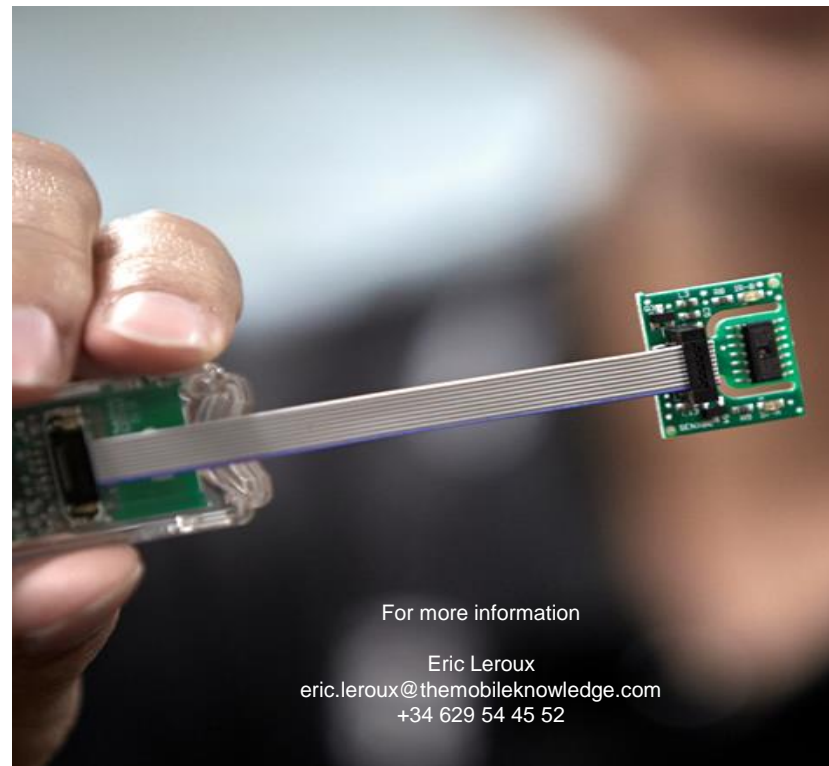
Other references

- ▶ RFID/NFC for brand protection brochure
https://nxp-rfid.com/wp-content/uploads/2014/12/RFID_Brand_Protection_brochure_LR.pdf
- ▶ NFC Everywhere
<http://www.nxp.com/techzones/nfc-zone/overview.html>

MobileKnowledge

Thank you for your attention

- ▶ We are a global competence team of hardware and software technical experts in all areas related to contactless technologies and applications.
- ▶ Our services include:
 - Application and system Design Engineering support
 - Project Management
 - Technological Consulting
 - Advanced Technical Training services
- ▶ We address all the exploding identification technologies that include NFC, secure micro-controllers for smart cards and mobile applications, reader ICs, smart tags and labels, MIFARE family and authentication devices.



For more information

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Enhancing everyday products with NFC – Welcome to the Internet of Things

Franz Van-Horenbeke (Speaker) / Eric Leroux (Host)

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- ▶ Please check NXP and MobileKnowledge websites for [upcoming webinars](#) and [training sessions](#)

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www.themobileknowledge.com/content/knowledge-catalog-0





SECURE CONNECTIONS
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