All Your Parcel Are Belong To Us

Dennis Kniel

Klaus Kiehne

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Who we are

Dennis Kniel

- Former incident responder, pentester
- Student
- Searches and catches bugs

Florian Bausch

- Incident responder, pentester
- Searches and finds bugs
- Speaker @ Troopers
  (Forensic Examination of Ceph)

Klaus Kiehne

- IT systems architect @ DHL
- Fixes bugs
- Improves processes

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How we got started

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How we got started

- 4XXXXXXX0344
- 4XXXXXXX0350
- 4XXXXXXX0366
- 4XXXXXXX0372
- 4XXXXXXX0388
- 4XXXXXXX0394
- 4XXXXXXX0401
- 4XXXXXXX0417
- 4XXXXXXX0423

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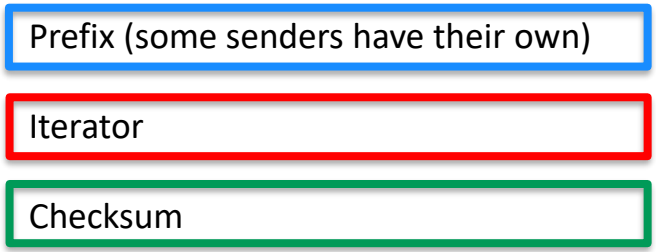
How we got started

- 4XXXXXXX 034 4
- 4XXXXXXX 035 0
- 4XXXXXXX 036 6
- 4XXXXXXX 037 2
- 4XXXXXXX 038 8
- 4XXXXXXX 039 4
- 4XXXXXXX 040 1
- 4XXXXXXX 041 7
- 4XXXXXXX 042 3



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Tracking Numbers

- Used for shipment tracking
- Different formats etc.
- Status
  - On the way
  - Delivered
  - Delivery failed
  - Many more……
- Destination / destination address / recipient’s name

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Tracking Numbers

- Convenience features
  - Live tracking during delivery
  - Preferred neighbors
  - Drop-location
  - Redirection to Packstation / parcel shop
  - Decline acceptance
  - …

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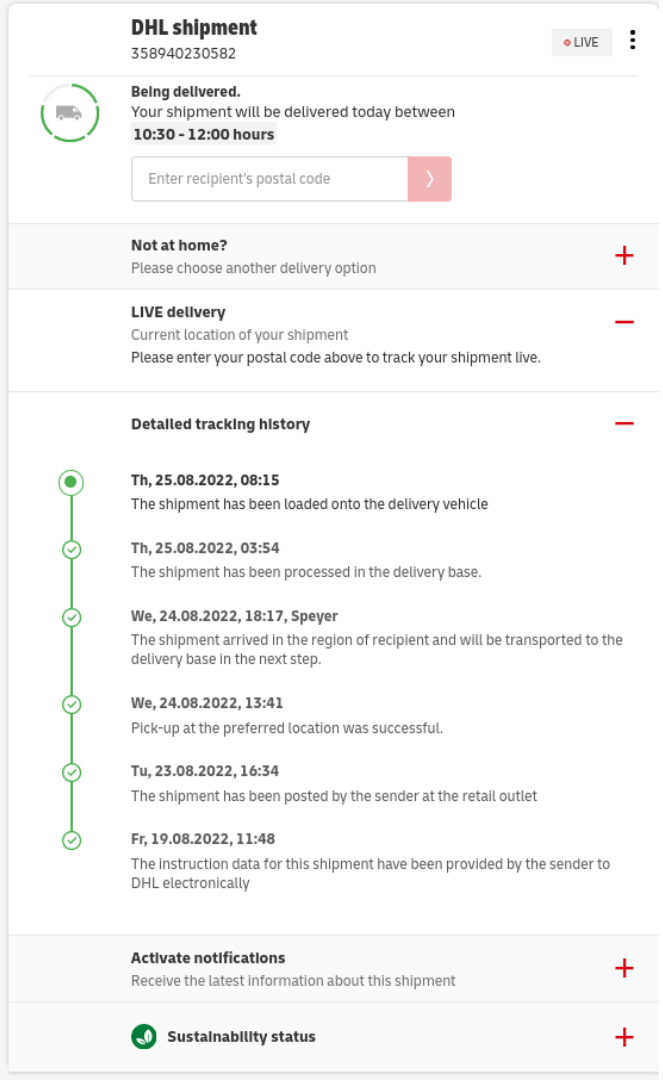

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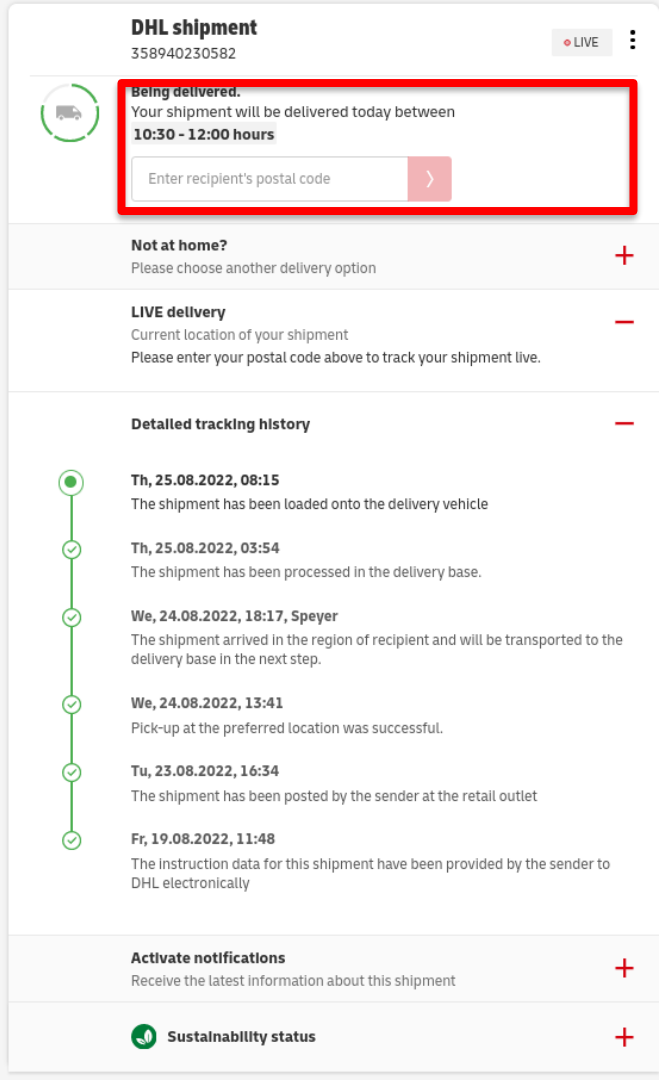

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ZIP code unlocks everything

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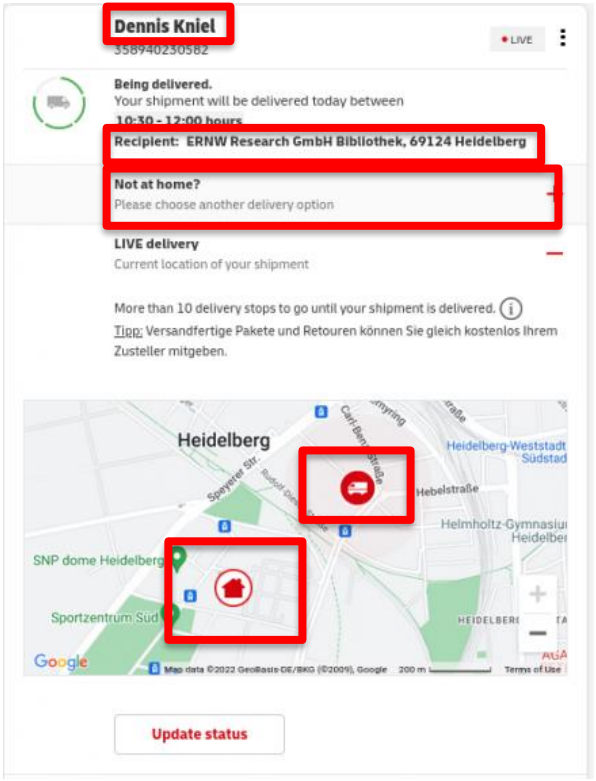

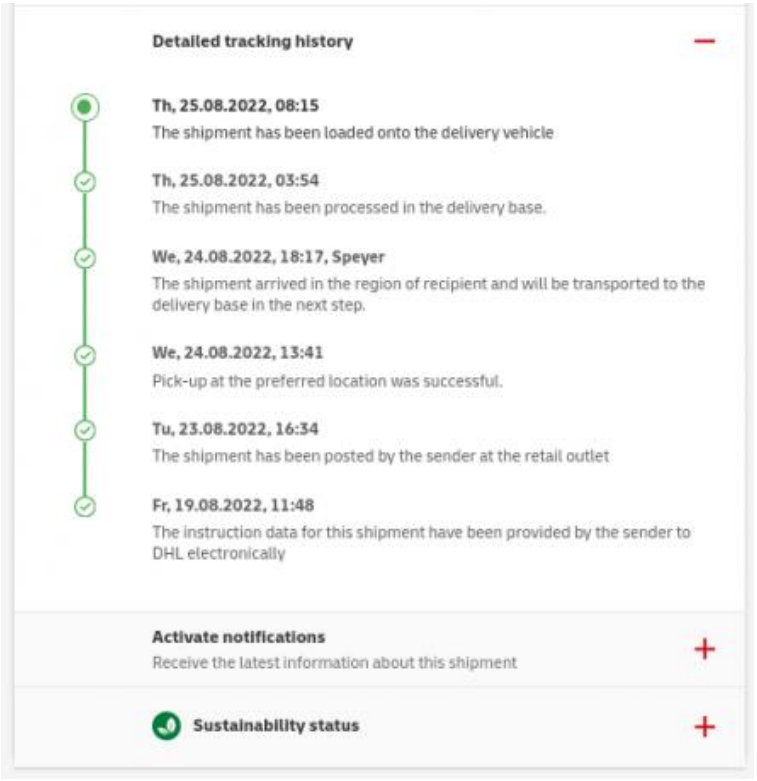

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100.000

Combinations for ZIPs

~28.000

ZIPs in use

~8.000

ZIPs in use for cities etc.

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Can we narrow it down even more?

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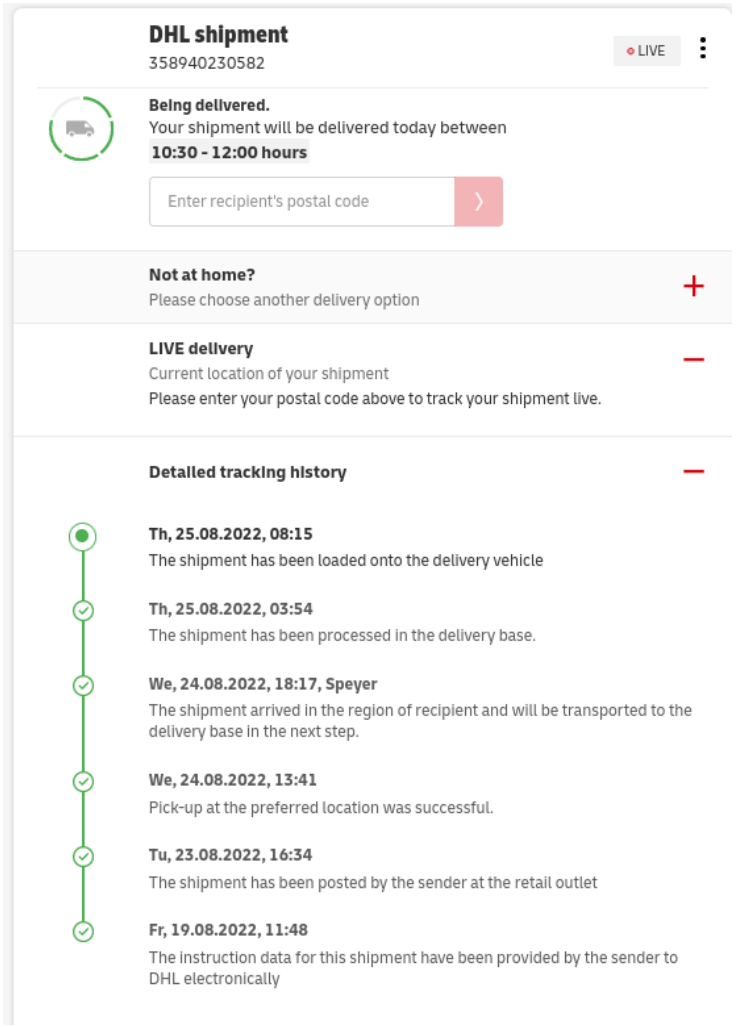

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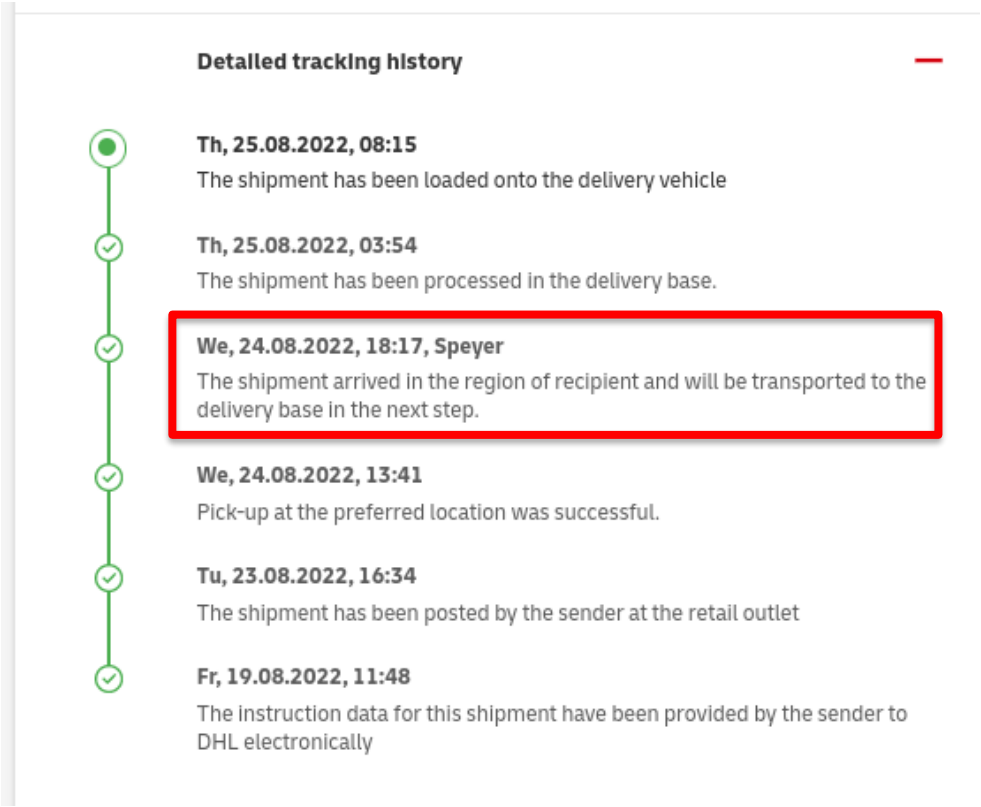

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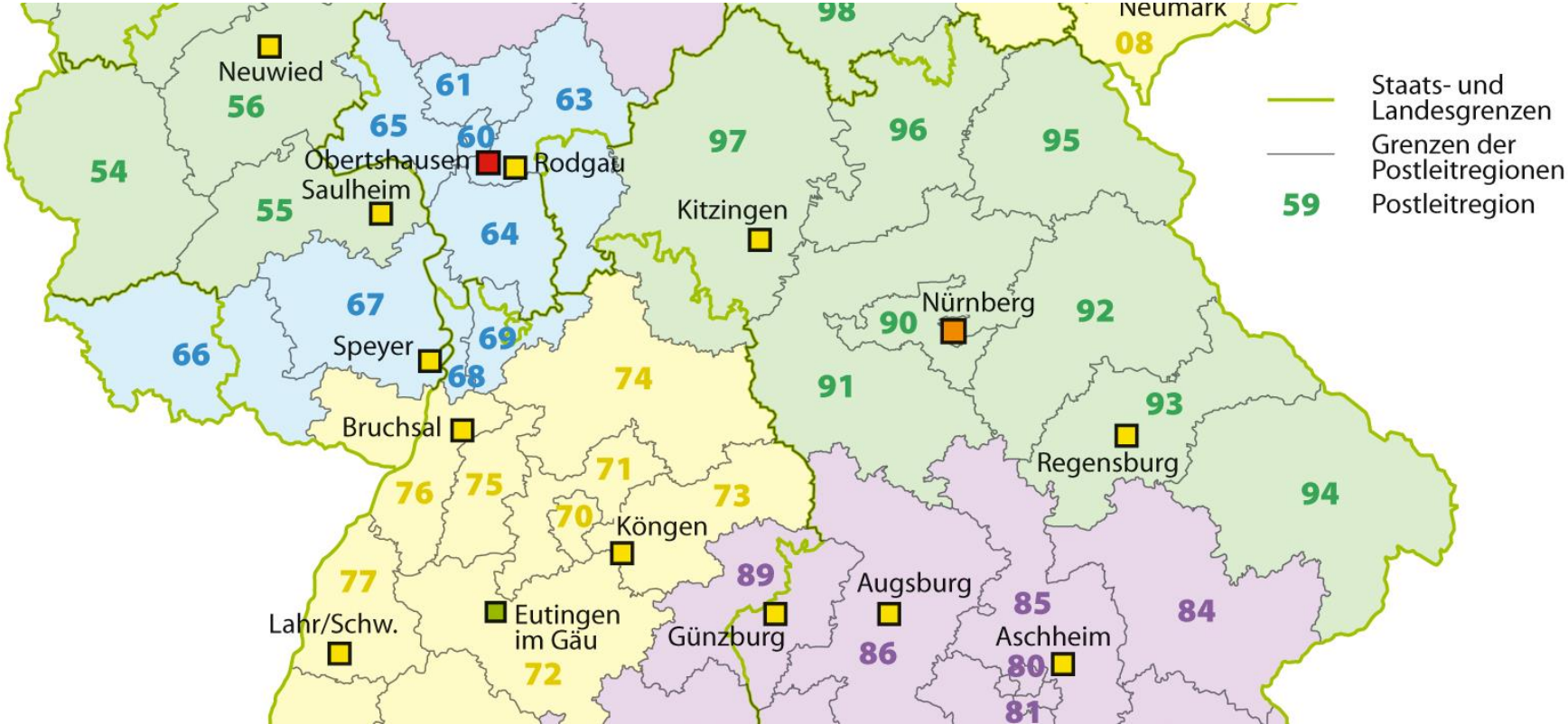
https://commons.wikimedia.org/wiki/File:Karte_Paketzentren_Deutsche_Post_AG.png, NordNordWest, CC-BY-SA 3.0



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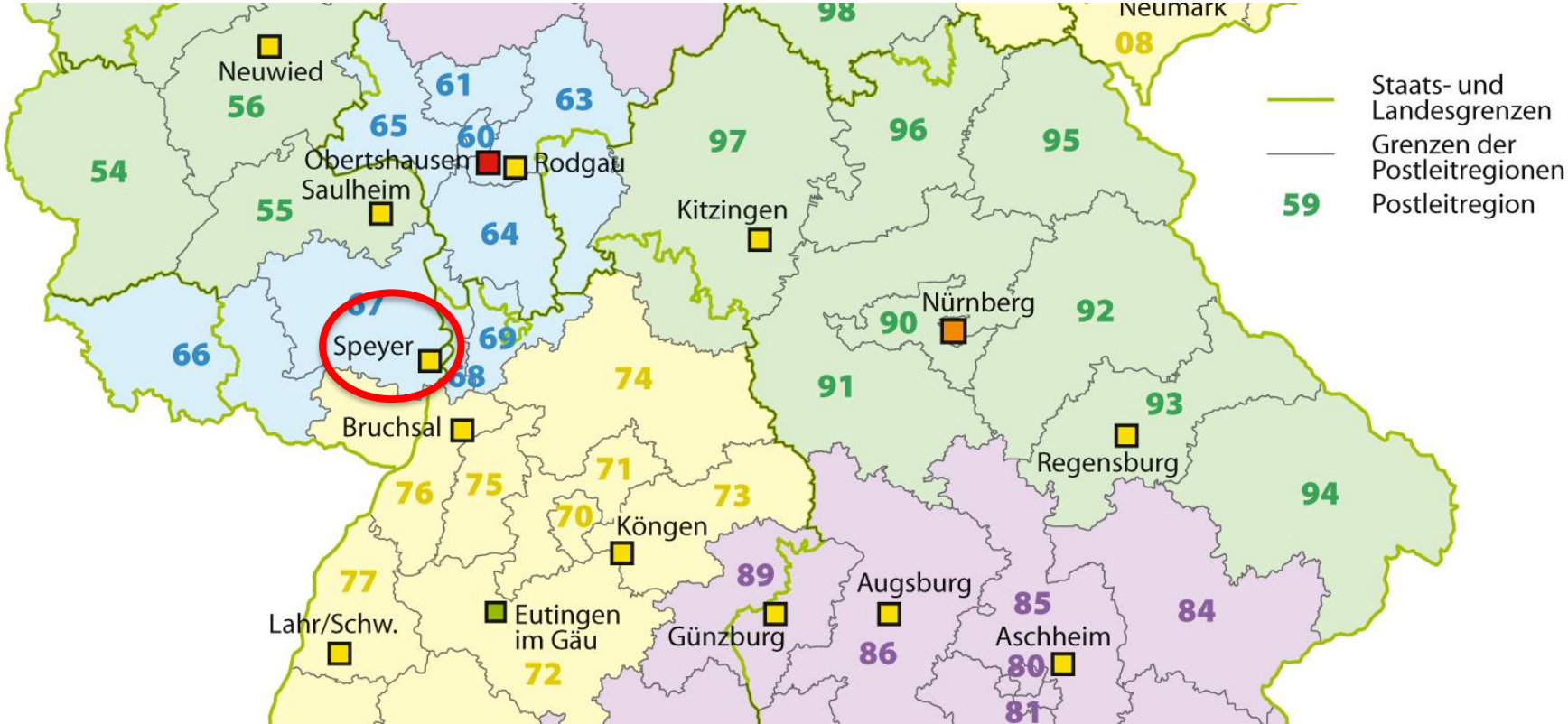

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https://www.paketda.de

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ZIPs in use for cities etc.

227

ZIPs per parcel center on average

128

ZIPs for parcel center Speyer

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Gives us residents in a raster

https://de.wikipedia.org/wiki/Datei:Zensus2011.svg

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Some more OSINT

(or suche-postleitzahl.org)

Gives us residents per ZIP

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50% ≈ 50 ZIPs

50% of the population of a parcel center service area is covered by approx. 50 ZIPs

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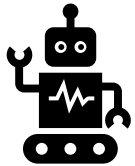
Bot Detection



- DHL tracking site uses Akamai
- Bot detection / brute-force detection does not really help
- OSINT allows for efficient guessing
- Fewer tries combined with short sleep()-calls and “undetectable” selenium driver circumvent detection

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How did we get here?

- Iterable tracking numbers (allow targeting)
- ZIPs as secrets (already low security)
- Hints on ZIPs
- Infinite tries
- Reliance on bot detection

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Potential impact

- Data gathering (sender specific or just randomly)
  - Estimation of sales numbers
  - Estimation of shopping behavior
  - Estimation of customer demographics
  - …..
- Manipulation of delivery
  - Preferred location
  - Preferred neighbor
  - Decline acceptance
  - ….

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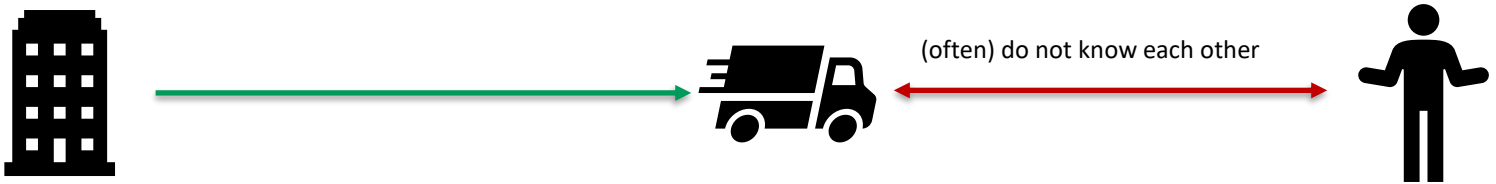
The Problem of the Shared Secret



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Is a ZIP as a shared secret a bad idea?

- Yes, if:
  - You give hints on the destination
  - It unlocks sensitive information
  - It unlocks delivery options

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DHL's Reaction

- Contact person hard to find (except if you search for a job ☺)
- First referred to "technical measures"
- After video-POC positive reaction and quick first measures
- Since then, fairly limited attack surface
- Very good cooperation (as you might have guessed)
- Some problems left

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~~227~~

~~ZIPs per parcel center on average~~

~~128~~

~~ZIPs for parcel center Speyer~~

* if destination area != source area

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A secure process

- Uses secure secrets
- Shows only information which is needed
- Does not need bot detections for security

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A good disclosure process

- Gives a contact person (in a security.txt)
- Gives feedback
- Fixes issues quickly
- Joins you on talks about the issue ☺

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A perfect bot detection

- Does not exist
- Is not needed
- Just hides problems without preventing them
- However, can be used to limit spam, scraping, etc.

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How about others?

Stay tuned!

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Let‘s see the blue side!

www.ernw.de

www.insinuator.net

DP DHL @ TROOPERS 23

OUR RESPONSE TO THE ERNW FINDING

Post & Paket Deutschland

Deutsche Post DHL Group

Who we are? THE NETWORK OF POST & PARCEL GERMANY

~190,000 Employees
of which ~116,500 staff in delivery

Shipments per business day:
~48 Mio. letters
~6.2 Mio. parcels

82 Mail centers
38 Parcel centers

~11,300 Packstations

~2,600 Delivery bases
mail and composite delivery

~300 Delivery bases
parcel delivery

71,500 Delivery districts
of which ...
~55,700 *mail and composite delivery*
~15,800 *parcel delivery*

~34,600 Parcel receiving points
~25,000 Outlets

~108,400 Mail boxes
~610,000 Post office boxes

Post & Paket Deutschland – IT and IT Security

IT Organisation

- Focus on demand IT, i.e. Build and Run mostly together with external suppliers
- ~ 700 internal employees
- ~ 400 IT applications with many interfaces to provide a seemless integration
- Offering a lot of data to customers and partners via APIs and web-based portals

IT Security

- One CISO for DHL Group and one CISO per each corporate division
- Groupwide mandatory Information Security Policy framework, based on ISO 27000 ff, three levels: why, what, how
- Information Security Management System with defined processes and responsibilities
- Strong focus on availability of IT applications and protection of customer data
- Mandatory Security analysis for each IT application, e.g. threats – risks – mitigation measures
- Mandatory Security checks for go-live of IT applications, e.g. source code checks, penetration tests

Affected Use Case: public shipment tracking

- Services provided for customers
  - shipment tracking
  - preferred delivery location and timeframe
  - live tracking via Post & DHL App
- Publicly available via two different IT applications and multiple domains
  - mostly accessed via www.dhl.de
  - identically available via mobile Post & DHL App
- Data to all shipments of last 3 month accessible
- Up to 80 Mio calls per day
- Shipment details and services should be provided only to legitimate parties
- Data are confidential, e.g. falls under GDPR and partially german postal law

Public shipment tracking: challenge for dealing with recipients of shipments

Interest to get status about shipment delivery

- Sender and delivery location of shipment
- Expected date and time of delivery
- Current location to follow progress
- Final recipient of shipment

Opportunity to modify delivery

- Alternative delivery date
- Alternative delivery drop off point
- Alternative recipient in case of unavailibility

Challenge

- Data is confidential and data access has to be restricted
- We don't have a contract with the recipient and hence no credentials to validate against
- Authorisation can only be granted based on shipment details
- Only shipment recipients address is available
- Tracking IDs are unique only for a limited time and have to be reused depending on customer size

Security measures

General measures for Post & Paket Deutschland

- Communication always encrypted and authenticated
- Static and dynamic source code checks
  - Automated checks via CI/CD pipelines preferred
- Automated and manual penetration tests
- Agent based monitoring in run phase
  - Checks for newly published vulnerabilities
  - Detection of unexpected / unusual behavior
- Network segmentation and monitoring on different levels

Specific measures for public shipment tracking

- Access only via external CDN
- DDoS und DoS recognition active
- Web Application Firewall (WAF)
- Bot recognition, always passive, active in critical cases/situations
- Firewalls and DMZ to secure backend
- No information provided for non-unique tracking Ids
- Limitation to shipment data of last 3 months
- Further organizational and technical protection measures

Our reaction to the finding of ERNW

Approach for Tracking IDs

- Validated: They have to stay as is
- Required due to overarching dependencies and standards;
  e.g. by Universal Postal Union (UPU)
- Aligned procedure within logistics industry
- Agreed with several customers to self-assign shipment numbers within given ranges

Measures taken

- Immediate response (10 days after first contact from ERNW)
  - No hub names for public tracking provided anymore, so guessing of valid recipient zip code/ranges is impossible
- Further activities
  - Time lock after exceeding threshold of non-matching requests per tracking ID
  - Additional measures implemented (restricted)

Security input @ DHL Group

- **We welcome a responsible disclosure!**

- /.well-known/security.txt is available for main domains :

  Contact: mailto:cybersecurity@dpdhl.com
  Encryption: https://keyserver.deutschepost.de/download.php?id=eds-cybersecurity@dpdhl.com
  Policy: https://www.dpdhl.com/en/sustainability/governance/cyber-security/vulnerability-disclosure-policy.html
  Hiring: https://careers.dhl.com/

- Private Bug Bounty Program has been started
  ... more to come – stay tuned!

@Dennis Kniel and ERNW team :

- Thank you for “Responsible Disclosure“!
- Thank you for the open and constructive discussions
- Thank you for the opportunity having me here today on stage

THANK YOU

Deutsche Post AG

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k.kiehne@deutschepost.de