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WS4D-JMEDS Addons

Jannis Müthing

jannis.muething@materna.de
MATERNA GmbH



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## Contents

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## Introduction

- JMEDS modularity enables:
  - Staying lightweight
  - Going beyond DPWS
  - Extensibility
- This presentation:
  - from improvements of the current (EXI)
  - over additions (Communication Managers)
  - to solutions for more specific challenges



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## Efficient XML Interchange (EXI)

# EXI

- Compression of XML encoded content
- Binary representation; similar to a Huffmann encoding
- Every DPWS message consists of XML content
- Reduction in size leads to
  - Less congestion of the network
  - Better performance esp. for low end devices

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## Efficient XML Interchange (EXI)

- Which parts does JMEDS implement?
  - Schema less
  - Byte-Alignment (EXI compression)
  - Schema informed
  - Bit-Alignment

  } Performance improvements
- "EXI Compression" has not been implemented (yet)

- Results:
  - Great!
  - Byte-Aligned/Schema less EXI better than GZIP
  - Bit-Aligned/Schema informed EXI performed best
- Problematic: Schema informed EXI + dynamically generated schemas



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## Efficient XML Interchange (EXI)

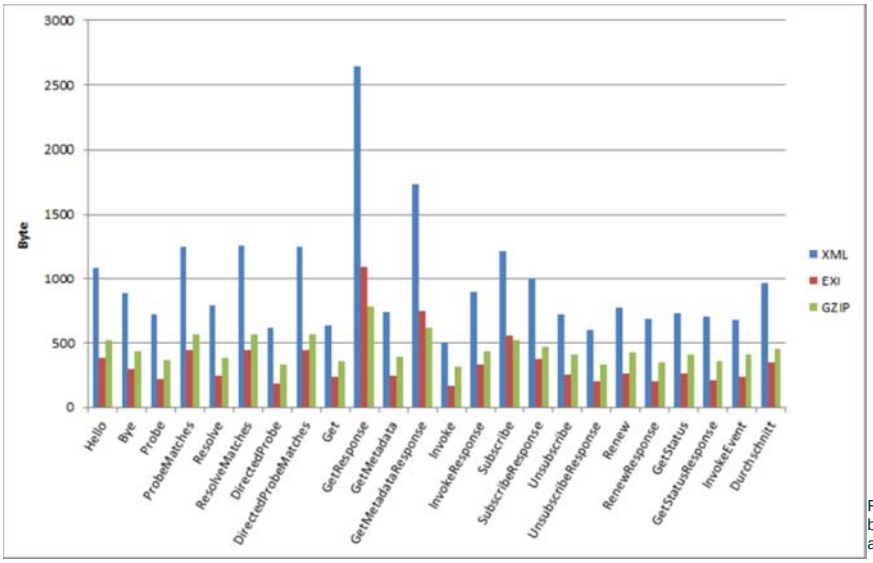


Fig.: Comparison between EXI, GZIP and untouched XML

## Communication Managers: UPNP

# UPNP

- Differences to DPWS and highlights
  - Not everything is XML
  - Discovery relies on HTTP over UDP
  - Eventing based on variables and per service
  - Multicast eventing





## Communication Managers: UPNP

- How to teach a DPWS stack to speak UPNP
  - Receiving UPNP messages
  - Translating into an internal representation
- Target: hiding underlying technology as best as possible
- Users of the API see devices/services not technologies

| | DPWS | UPNP |
|---|---|---|
| Discovery | Probe<br>ProbeMatches | M_SEARCH<br>HTTP OK |
| | Bye/Hello | Notify |
| Metadata exchange | Get/GetMetadata | Accessing resources via HTTP |

Fig.: Examples of messages that serve similar needs

## Communication Managers: Bluetooth

# Bluetooth

- Similar tasks as the UPNP communication manager
- Hiding the technology etc.
- No eventing at all

- Using BlueCove (open source/multiplatform http://bluecove.org/)





## Communication Managers: Bluetooth

| | DPWS | Bluetooth |
|---|---|---|
| Discovery | Probe<br><br>ProbeMatches | **Inquiry** (answered only by configured devices)<br><br>**Inquiry-Response** |
| | Bye/Hello | **Inquiry** (passive)<br>An Inquiry from a device tells other devices about that device |
| | Resolve | **Inquiry** when answered generating internal ResolveMatches |
| Metadata exchange | Get<br><br><br>GetMetadata | LMP_name_req<br>SDP_SearchServiceAttributeReq<br><br>No similar message<br>BT is based on fix profiles |

Fig.: Examples of messages that serve similar needs

# Presentation URL

- Web interface for DPWS devices/services
  - Modern web technology:
  - Client/Browser side styling (XSLT/CSS/JS)
  - Device supplies dynamic XML, static XSLT





- Displays metadata e.g.: name, vendor etc.
- Displaying input and output of operations (even complex types)
- Eventing support utilizing AJAX
- Support for attachments (receiving/sending)
  - No real support for streaming
- WSDL inspection

## Presentation URL

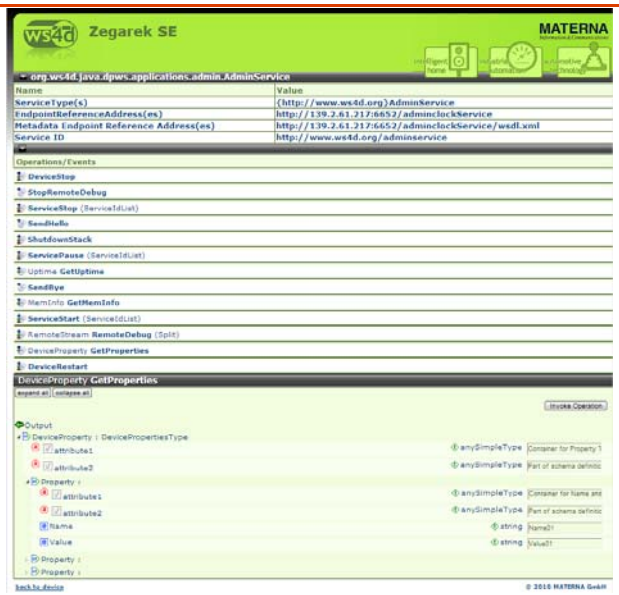


Fig.: Screenshot: Presentation URL





## Authorization

# Authorization

- Authorization addon support enables fine grained security
- Implementations are asked when receiving messages
- User credentials (username/password) are sent with the messages
- Raising an AuthorizationException when credentials are
  - not recognized or
  - operation was not permitted for that user

## Authorization: Default implementation

- The default authorization manager implementation
  - Separating only between services and devices
  - Operations are authorized with the service‘s credentials
    - Setup via XML file (“encryption.xml“)
      - Device EPR and Service Id for identification

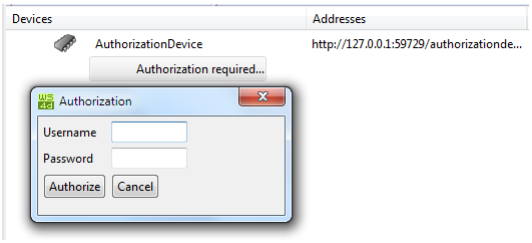


Fig.: Screenshot: JMEDS Explorer 3‘s new authentication dialog





## DPWS Subnetproxy

# Subnetproxy

- Connecting remote private networks via a common internet
- Enabling DPWS communication through a single tunnel
- Designed to work in real world restricted network environments:
  - Allowing only incoming connections (firewalls…)
  - Networks might use proxy server for all outgoing connections
- **It‘s not a discovery proxy!**

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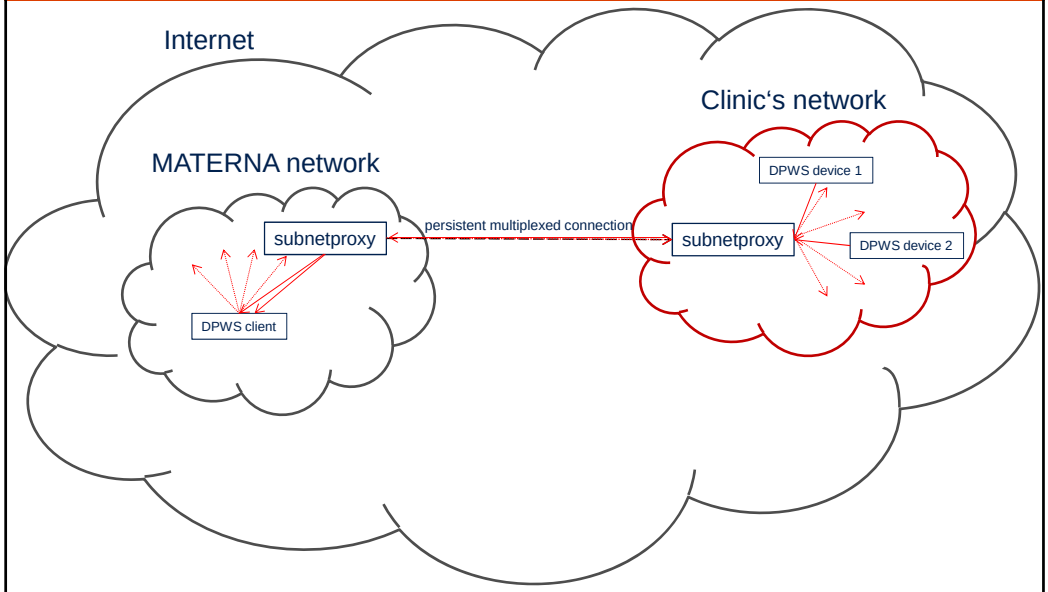
## DPWS Subnetproxy example: discovery process



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## DPWS Subnetproxy

- Discovery messages are forwarded/broadcasted in both subnets
- On the destination subnetproxy’s side:
  - Exchanging relevant device/service addresses
  - with addresses registered with that proxy‘s HTTP server
- Incoming connection requests are handled by so called Proxy Entries
  - Proxy Entry ←→ original url
- HTTP connections are made through a multiplexer
- Get/GetMetadata-Response messages are relocalized
- Invocations or simple HTTP GET requests stay untouched