Channel Configuration Management

Andreas Lüdeke
Swiss Light Source, PSI

- Introduction
- Design
- Implementation & Performance
- Usage & Outlook
Introduction

User Interface

Input / Output Controllers

Actors / Sensors

PC

IOC

IOC

HW

HW

HW
Introduction

- User Interface
  - Input / Output Controllers
    - Actors / Sensors
      - IOC
      - HW
      - IOC
      - HW
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Introduction

User Interface

Input / Output Controllers

Actors / Sensors

PC

IOC

IOC

HW

HW

HW
Introduction

User Interface

Channels

Input / Output Controllers

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PC

IOC

IOC

HW

HW

HW
Introduction

Client Applications

PC

IOC

IOC

HW

HW

HW

Configuration

- Display Configuration
- Machine Model
- ...
- Channels
Introduction

Client
Applications

Server
Applications

Configuration

- Display Configuration
- Machine Model
- ...
- Channels

- Channels
- ...
- Procedures
- Hardware Configuration
Introduction

Configuration

- Display Configuration
- Machine Model
- Channels
- Procedures
- Hardware Configuration

Client Applications
a b c

Server Applications
x y z

Identical?
,,Ideal“ Design

Configuration

Clients

- Display Configuration
- Machine Model
- ...
- Channels

Server

- Channels
- ...
- Procedures
- Hardware Configuration

(a) b c

x y z
„Ideal“ Design

Configuration

- Display Configuration
- Machine Model
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Database

- Channels
- ...
- Procedures
- Hardware Configuration

Clients

Server

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„Ideal“ Design

Configuration

- Display Configuration
- Machine Model
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Server

- Channels
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Database

API

a
b
c
x
y
z
„Ideal“ Design

Configuration

- Display Configuration
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a API
b API
c API
x API
y API
z API
„Ideal“ Design

Configuration

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Database

```
<table>
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<tr>
<th>API</th>
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<tbody>
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</tr>
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„EPICS“ Design

Configuration

Clients

- Display Configuration
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Server

- Channels
- ...
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„EPICS“ Design

**Clients**
- Display Configuration
- Machine Model
- ...
- Channels

**Server**
- Channels
- ...
- Procedures
- Hardware Configuration

**Files**
- a → g.adl
- b → h.alh
- c → i.conf
- x → p.dbd
- y → q.tmpl
- z → r.subs
„EPICS“ Design

Configuration

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Clients
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Server
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- Procedures
- Hardware Configuration
„EPICS“ Design

Config. Files

Clients

Server EPICS IOCs

a ↔ g.adl

b ↔ h.alh

c ↔ i.conf
„EPICS“ Design

Clients

Config. Files

- a <-> g.adl
- b <-> h.alh
- c <-> i.conf

Server

EPICS IOCs

- GUI builder (medm/dm2k, ...)
- Archiver
- Save and Restore
- Alarmhandler
- Striptool
- Inhouse build applications, ...
EPICS Design

Clients

- GUI builder (medm/dm2k, ...)
- Archiver
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- Inhouse build applications, ...

Config. Files

- g.adl
- h.alh
- i.conf

Server

EPICS IOCs

- EPICS „process database“:
  channel = record + `.` + field
- Def. set of fields per record type
- SLS naming convention:
  record = device + `:` + property
„EPICS“ Design

Clients

Server

Config. Files

EPICS IOCs

a ↔ g.adl
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„EPICS“ Design

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EPICS IOCs

Database
„EPICS“ Design

Config. Files

Clients

Server

EPICS IOCs

Database

a ↔ g.adl
b ↔ h.alh
c ↔ i.conf

service
"EPICS" Design

Clients
- a ➔ g.adl
- b ➔ h.alh
- c ➔ i.conf

Server
- EPICS IOCs

Database
- service
- provided channels
- Config. Files
- provided channels
“EPICS” Design

Clients

Config. Files

- a → g.adl
- b → h.alh
- c → i.conf

Server

EPICS IOCs

Database

Parser

Service

Provided channels
„EPICS“ Design

Clients

Config. Files

Server

EPICS IOCs

Database

- a \(\rightarrow\) g.adl
- b \(\rightarrow\) h.alh
- c \(\rightarrow\) i.conf

parser

required channels

service

provided channels
Design Summary

- **Service** to upload record names and record types at boot time from each EPICS IOC to the oracle database. Also upload defined fields for each record type.
- **Parser** to extract required channels from all „used“ configuration files for O(10) types of applications
- **Tables** in the oracle database
- **Queries** for the oracle database
Service Implementation

EPICS IOC               Boot PC               Database

startup.script          p.dbd, q.tmpl, r.subs
Service Implementation

EPICS IOC  Boot PC  Database

startup.script  p.dbd, q.tmpl, r.subs

dbl  Record Files
Service Implementation

EPICS IOC  Boot PC  Database

startup.script  p.dbd, q.tmpl, r.subs

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rcmd
Service Implementation

EPICS IOC  Boot PC  Database

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rcmd  db2odb
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rcmd

Record Files

db2odb

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Service Implementation

EPICS IOC  Boot PC  Database

startup.script  p.dbd, q.tmpl, r.subs

dbl  Record Files

rcmd  dbd2odb

db2odb
Parser Implementation

Config. Files  Parser  Database

Launcher  
Configuration

lcf2odb

command  lines
Parser Implementation

Config. Files

Launcher Configuration

Parser

lcf2odb

command lines

Database

extract channels

g.adl
h.alh
i.conf

xpv

extract channels

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PCaPAC '02
Parser Implementation

Config. Files

Launcher Configuration

Parser

lcf2odb

command lines

Database

xpv

extract channels

Parser Implementation

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Parser Implementation

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g.adl

h.alh

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extract channels
Parser Implementation

Config. Files  Parser  Database

Launcher Configuration  lcf2odb  Command lines

g.adl  h.alh  i.conf

extract channels

xpv
**Tables**

Just four database tables

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<tbody>
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Performance

 Server

- Tested on 2 simulation IOCs, each 16'000 records.
- No boot-delay, dumped to files in 20 sec.
- Upload from boot PC in less then 2 minutes.

 Parser

- Tested on all 592 used configuration files.
- Access of 20660 different channels in total.
- Complete parsing needs 4 minutes, incl. upload.
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Usage: Sample Query

- Detect all files with missing channels

```sql
SELECT filename, macrovar, device, property, field
FROM Application_Config_Channels acc
WHERE not exists (  
    SELECT * FROM IOC_Channels ioc  
    WHERE acc.device = ioc.device and  
    acc.property = ioc.property and acc.field in (  
        SELECT field FROM Record_Type_Definition rt  
        WHERE ioc.record_type = rt.record_type  
    )  
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Usage

• Query which IOCs should provide a channel
• Search for discontinued channels
• Server programmer can search for applications, using his channels
• Check of naming conventions
• Check consistency of configuration files
  – detects non-existing related panels
  – detects faults in macro substitution
• Get statistics for a control system overview
Outlook

- Will be implemented for all SLS IOCs
- Configuration file check required for production release
  - ensures that the database is up-to-date
  - enables early detection of configuration errors
- Offline checks after each shutdown
  - reduces accelerator startup time
  - increases reliability of the control system
- Upload information about server links