2nd Annual
MidPoint Community Meetup

Let's together
SAY GOODBYE TO "SCRAPPYCODE"

Evolveum

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NextGenerationEU

RECOVERY AND RESILIENCE PLAN

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Current Situation

- Configuration = XML + **scripts**
  - short or long / simple or complex
- Development and **maintenance** burden
  - take time to create and debug
  - then to (re)**understand** and **adapt** (business/technical reasons)
- Our goal: **reduce the effort!**

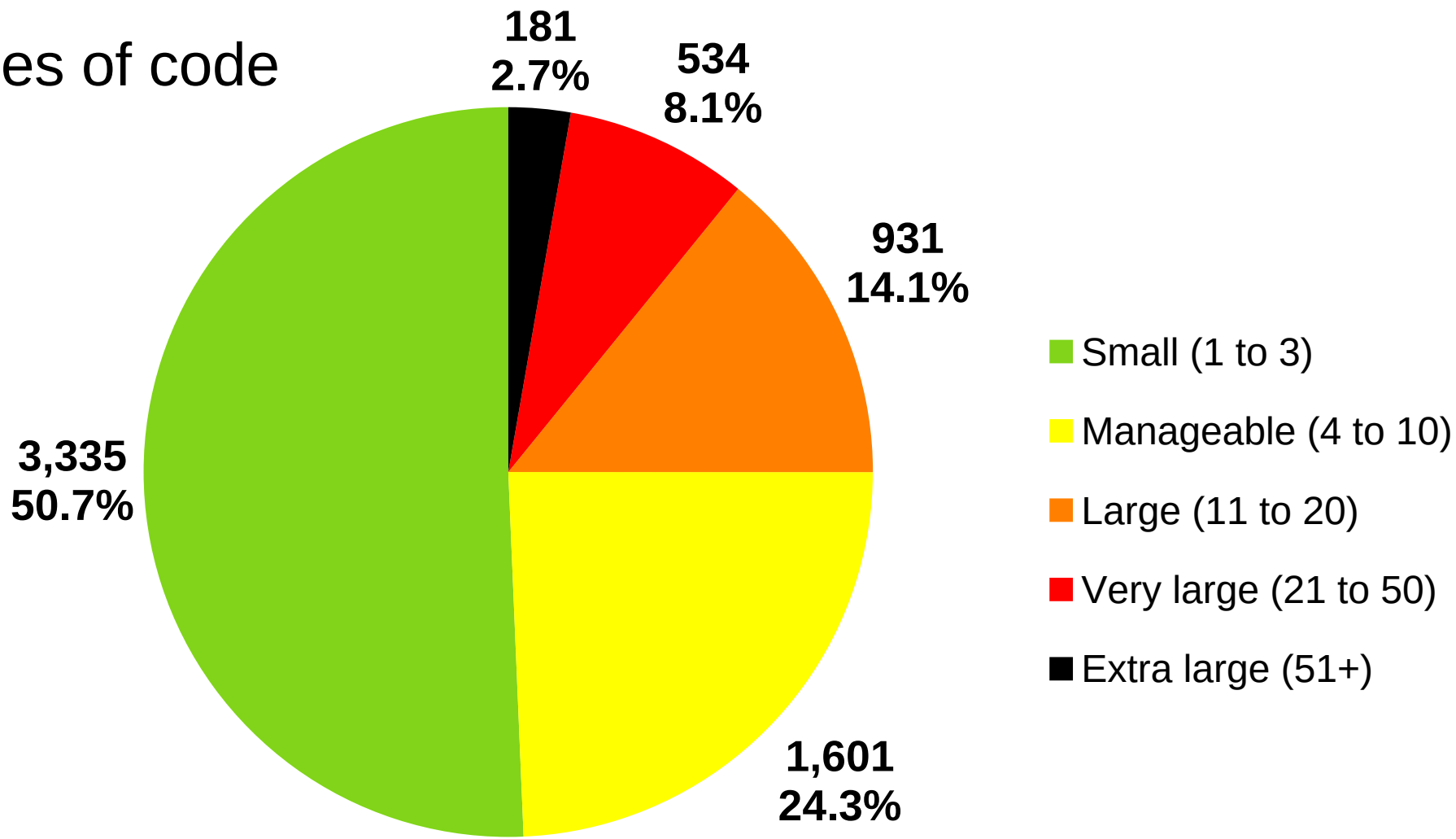
Analysis Done

- Informal knowledge
  - decades of experience
  - supported by 50 years of software engineering knowledge
  - and discussions within the community
- Hard data from **10 deployments**
  - **6821 scripts** from 1174 files
  - analyzed manually and by LLM
  - using 50 tags

Looking for...

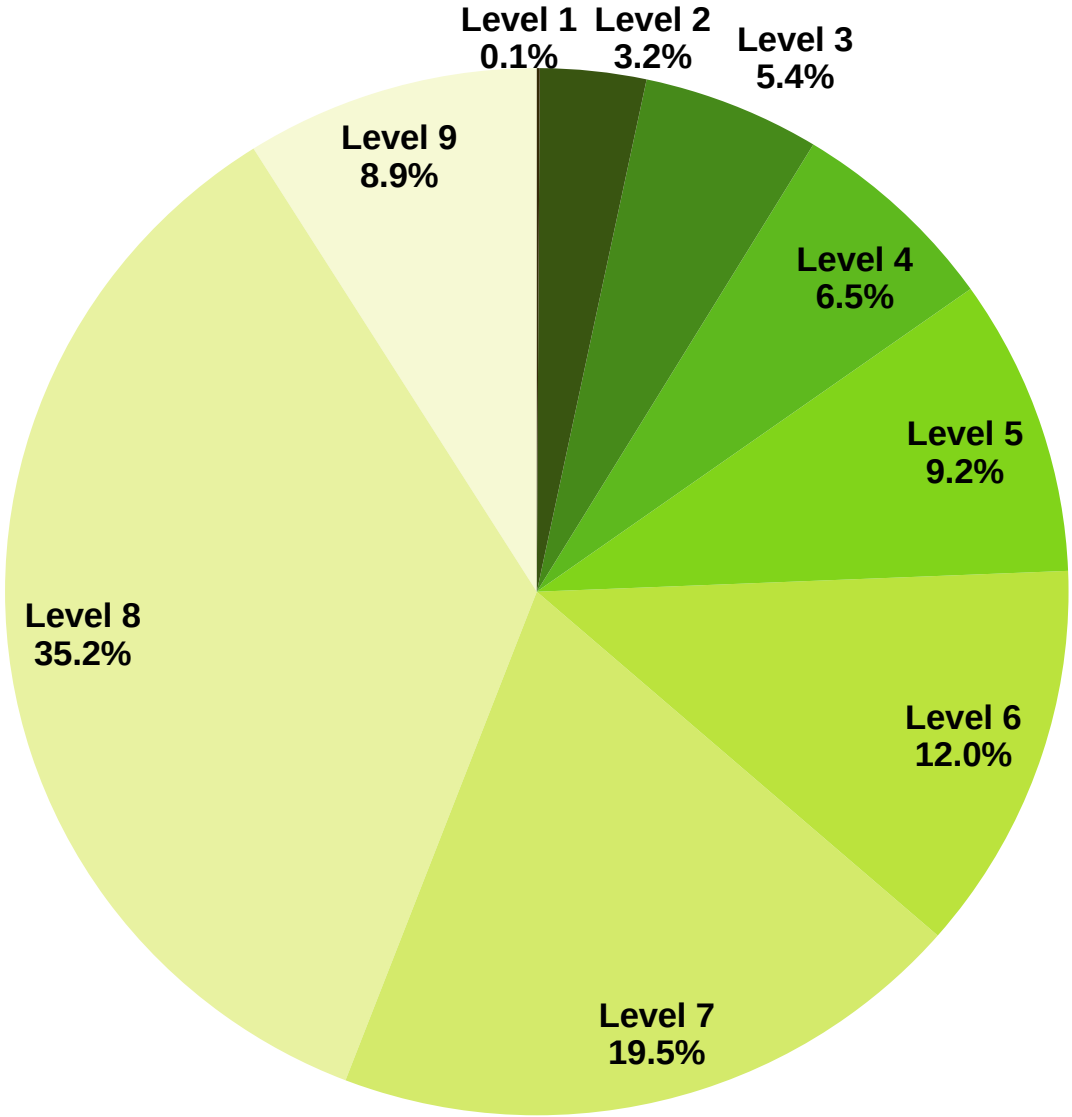
- New midPoint features → to **remove** the scripts
  - new expression evaluators (like `assignmentTargetSearch`)
  - new features (like “complex attributes”)
- New API methods → to **simplify** the scripts

Lines of code



Maintainability (estimated)

- L9: simple string concatenation; a static value; null-check expression; simple checks combined by logical AND; …
- L8: simple conditional with a clear intent; single, clear method call; …
- L7: straightforward code but with unnecessary steps; short script with a logic that is a bit opaque; …
- …
- **L3:** dense, nested boolean expressions with magic strings and undocumented variables; …
- **L2:** many magic strings, nested and compound conditionals, and unclear variable names; …
- **L1:** extensive duplicated logic for multiple regexps, deep nesting, inconsistent naming, and no abstraction; ...



Suggestions: Areas of Improvement

- Making business logic explicit
- Constants for OIDs and other strings
- Assignment processing
- Archetype matching
- Date/time manipulation
- Text normalization
- Notification text formatting
- Delta analysis
- Creating objects
- Manipulating names, emails, phone numbers, LDAP DNs
- Complex attributes
- Easier getting extension items and attributes + calling function libraries
- Handling owners, managers, approvers
- Decision trees and mapping tables
- Pretty-printing and diagnostics
- Organizational tree walking

Making Business Logic Explicit

- Instead of writing **technical code** dealing with archetypes, extension properties, ...
  - `midpoint.hasArchetype(focus, 'f309eb68-2a78-44bd-aaa8-085fbc49ef9c')`
  - `basic.getExtensionPropertyValue(focus, new QName("http://example.com/", "studentId")`
- ...we can define **custom business-oriented functions** for given object type (or even archetype) or assignment like:
  - `focus.isEmployee()`
  - `focus.getStudentId()`
  - `assignment.getDepartmentName()`
  - `assignment.getStudyProgramId()`
- This feature alone will lead to **significant simplification of scripting code**
- Applicable to MEL and Groovy

Assignment Processing (100+ cases)

```
focus.assignment?.findAll { it.targetRef?.type?.localPart == "ServiceType" }?.each { assignment ->
    def service = midpoint.getObject(ServiceType.class, assignment.targetRef.oid)
    if (midpoint.hasArchetype(service, "********-****-****-****-************")) {
        def activation = service.activation
        def status = activation?.effectiveStatus
        if (status == ActivationStatusType.ENABLED) {
            activeServices << service.oid
        } else {
            inactiveServices << service.oid
        }
    }
}
```

- `targetsRole(), targetsOrg(), targetsService(), targetsArchetype(), ...`
- `targetsObjectWithArchetype(Archetype.STUDY_PROGRAM)`
- `hasDefaultRelation(), hasManagerRelation(), hasOwnerRelation(), ...`
- `targets(Role.ACCOUNTANT)`
- `targets { it.name == 'Accountant' }`
- `targets { it.costCenter == '123456' }`
- `target()`

- ```
  focus.directAssignments
    .findAll { it.targetsRoleWithArchetype(Archetype.SYSTEM_ROLE) }
  ```
- ```
  focus.indirectAssignments
    .findAll { it.targetsRole() && it.hasManagerRelation() }
  ```
- `focus.directAssignments.any { it.targets(Role.ACCOUNTANT) }`
- `focus.directAssignments.any { it.targets(Role.ACCOUNTANT) && it.hasManagerRelation() }`

Assignment Processing: A Real Example

```
focus.assignment?.findAll { it.targetRef?.type?.localPart == "ServiceType" }?.each { assignment ->
    def service = midpoint.getObject(ServiceType.class, assignment.targetRef.oid)
    if (midpoint.hasArchetype(service, "********-****-****-****-************")) {
        def activation = service.activation
        def status = activation?.effectiveStatus
        if (status == ActivationStatusType.ENABLED) {
            activeServices << service.oid
        } else {
            inactiveServices << service.oid
        }
    }
}
```

```
focus.directAssignments
    .findAll { it.targetsServiceWithArchetype(Archetype.APPLICATION) }
    .each {
        if (it.target().isEnabled) {
            activeServices << it.oid
        } else {
            inactiveServices << it.oid
        }
    }
```

Archetype Matching

- Focus (or other object) has given archetype or archetypes
  - by OID, by name, or by other criteria
- Considering
  - `focus.hasArchetype(Archetype.EMPLOYEE)`
  - `focus.hasAnyArchetype(Archetype.EMPLOYEE, Archetype.STUDENT)`
  - `focus.hasAllArchetypes(Archetype.EMPLOYEE, Archetype.INTERNAL)`
- ...but generally this is better:
  - `focus.isEmployee() || focus.isStudent()`
  - `focus.isInternalEmployee()`

Date/Time Manipulation (450+ cases)

- date/time conversion: strings + other formats; including Unix/AD timestamps
- date/time comparison
- duration arithmetic
- rounding: end of day, week, month, …

```
if (statusOverride) {
    return 122891712000000000
} else {
    time = MiscUtil.asDate(validTo)?.getTime()
    return time * 10000 + 116444736000000000
}
```

```
statusOverride ? basic.farAhead() : validTo
```

```
if (validFrom) {
    DateFormat fmt = new SimpleDateFormat( pattern: 'YYYY-MM-dd HH:mm:ss')
    return fmt.format(validFrom.toGregorianCalendar().getTime()) + '.0'
} else {
    return null;
}
```

```
basic.formatTime(validFrom, 'YYYY-MM-dd HH:mm:ss.0')
```

Text Normalization

- MidPoint has built-in mechanisms for text normalization
- … but custom algorithms seem to be present in every deployment!
- We consider improving the built-in configurable normalizer based on what we saw in the projects

```
def map = [ 'À' : 'A',
            'Á' : 'A',
            'Â' : 'A',
            'Ã' : 'A',
            'Ä' : 'Ae',
            'Å' : 'Aa',
            'Æ' : 'AE',
            'Ç' : 'C',
            'È' : 'E',
            'É' : 'E',
            'Ê' : 'E',
            'Ë' : 'E',
```

```
def charMap = [
        "ß": "ss",
        "Ä": "Ae",
        "Ö": "Oe",
        "Ü": "Ue",
        "ä": "ae",
        "ö": "oe",
        "ü": "ue",
        "Å": "A",
        "å": "a",
        "Ç": "C",
        "ç": "c",
        "Ñ": "N",
        "ñ": "n"]
```

Notification Text Formatting (ASCII/HTML) (200+ cases)

- MidPoint supports Apache Velocity as an expression language
- … yet a lot of custom code is usually present to generate notifications
- It seems that we need a simple way of integrating templates with the custom Groovy/MEL code
- Including configurable/extensible delta and object data formatters

```
import java.text.SimpleDateFormat
import java.text.DateFormat
String fileName
fileName = "/opt/midpoint/var/source/my-task-notification-template.html"
File file = new File(fileName)
String template = file.getText( charset: "UTF-8")
template=template.replaceAll("#taskName", taskName);
template=template.replaceAll("#runResultStatus", runResultStatus);
template=template.replaceAll("#status", status);
template=template.replaceAll("#message", message);
template=template.replaceAll("#progress", progress);
template=template.replaceAll("#taskOwner", taskOwner);
template=template.replaceAll("#channel", channel);
template=template.replaceAll("#handlerURI", handlerURI);
DateFormat dateFormat = new SimpleDateFormat( pattern: "dd-MMMM-yyyy");
Date date = new Date();
template=template.replaceAll( regex: "#dateShort", dateFormat.format(date));
return template
```

```
fileName = "/opt/midpoint/var/source/my-task-notification-template.html"
basic.expandTemplate(
        fileName,
        binding.variables + [dateShort:basic.formatTime(basic.now(), 'dd-MMMM-yyyy')])
```

Delta Analysis (150+ cases)

- Trying to find changes related to specific items (e.g. assignment activation) and the values being set
- Usually tens of Groovy lines because the data structures are inherently complex
- We plan to provide powerful and extensible mechanism that would contain the complexity

```
for (def delta : deltaList) {
    statusPath = ItemPath.create(UserType.F_EXTENSION, "status")
    if (delta.hasItemDelta(statusPath)) {
        propertyDelta = delta.findPropertyDelta(statusPath)
        realValue = propertyDelta?.anyValue?.value
        if (realValue == "x") {
            return "disabled"
        }
        // ...
    }
}
```

```
for (delta in deltaList) {
    if (delta.newValuesFor('extension/status').contains('x')) {
        return 'disabled'
    }
    // ...
}
```

Creating objects (250+ cases)

- Creating whole objects, assignments, inducements, references, polystrings, …
- Currently not very programmer-friendly
- Considering the builder pattern

```
AssignmentType a = new AssignmentType()
a.getSubtype().add('abc-token')
ObjectReferenceType o = new ObjectReferenceType()
o.setOid('********-****-****-****-************')
o.setType(RoleType.COMPLEX_TYPE)
a.setTargetRef(o)
```

```
basic.createRoleAssignment('********-****-****-****-************')
    .subtype('abc-token')
```

Manipulating names (150+), emails (200+), phone numbers (40+), DNs (200+ cases)

- constructing, parsing, matching, normalizing and converting these kinds of data
- e.g. person name ↔ given name, family name, title(s)
- email ↔ local part + domain
- phone # ↔ country code, area, number, extension
- DN ↔ RDNs

```
if (telephoneNumber) {
    if (telephoneNumber.startsWith('+421')) {
        return telephoneNumber.replaceFirst(/^\+421/, '0')
    } else if (telephoneNumber.length() < 10) {
        return '0' + telephoneNumber
    } else {
        return telephoneNumber
    }
}
```

```
phone.formatShort(telephoneNumber)
```

Complex Attributes

- Many resources expect and provide attributes having some internal structure
- Workarounds include passing data as JSON, XML, CSV, etc
- In 4.11 we plan to support these **complex attributes** natively, at least on a basic level

```
"{\"address\"=\""+emailAddress+"\",\"primary\"=\"true\"}"
```

Complex Attributes: An Example

```
<attribute>
    <ref>ri:address</ref> <!-- complex -->
    <inbound>
        <target>
            <path>physicalAddress</path> <!-- complex -->
        </target>
    </inbound>
</attribute>
```

```
<complexAttributeType>
    <name>ri:address</name>
    <delineation>
        <objectClass>ri:address</objectClass>
    </delineation>
    <focus>
        <type>PhysicalMailingAddressType</type>
    </focus>
    <attribute>
        <ref>ri:street</ref>
        <inbound>
            <target>
                <path>streetAddress</path>
            </target>
        </inbound>
    </attribute>
    <attribute>
        <ref>ri:city</ref>
        <inbound>
            <target>
                <path>locality</path>
            </target>
        </inbound>
    </attribute>
    <!-- ... -->
</complexAttributeType>
```

Unnecessarily complex APIs (extension items, attributes, function libraries, ...)

- `basic.getAttributeValues(shadow, [namespace], attrName)`
- `basic.getExtensionPropertyValues(object, [namespace], extItemName)`
- `myLib.execute('getAccessIdentity', [focus: focus, type: identityType])`

- `shadow.attributes.attrName`
- `object.extension.extItemName`
- `mylib.getAccessIdentity(focus, identityType)`
- `focus.getAccessIdentity(identityType)`

Querying Objects

```
def query = prismContext.queryFor(UserType)
        .item(FocusType.F_ACTIVATION, ActivationType.F_EFFECTIVE_STATUS).eq(ActivationStatusType.F_ENABLED)
        .and().item(FocusType.F_ACTIVATION, ActivationType.F_ENABLED_TIMESTAMP).gt(basic.fromNow('-P1D'))
        .build()
def result = midpoint.searchObjects(UserType, query)
```

```
def prepared = midpoint.preparedQueryFor(UserType,
        "activation matches (effectiveStatus = 'enabled' and enableTimestamp > ?)")
def query = prepared.bind(basic.fromNow("-P1D"))
def result = midpoint.searchObjects(query)
```

https://docs.evolveum.com/midpoint/reference/concepts/query/midpoint-query-language/query-language-in-groovy/

Other Areas of Improvement

- Approver, owner, manager handling (100+)
- Decision trees and mapping tables (300+)
- Pretty-printing and diagnostics (40+)
- Organization tree walking

Don’t forget to vote!
&
Send us some data :)

- Explicit business logic
- Constants
- Assignment processing
- Archetype matching
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- Easier getting extension items and attributes, calling function libraries
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Evolveum
Thank you for your attention
Feel free to ask your questions now!
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