

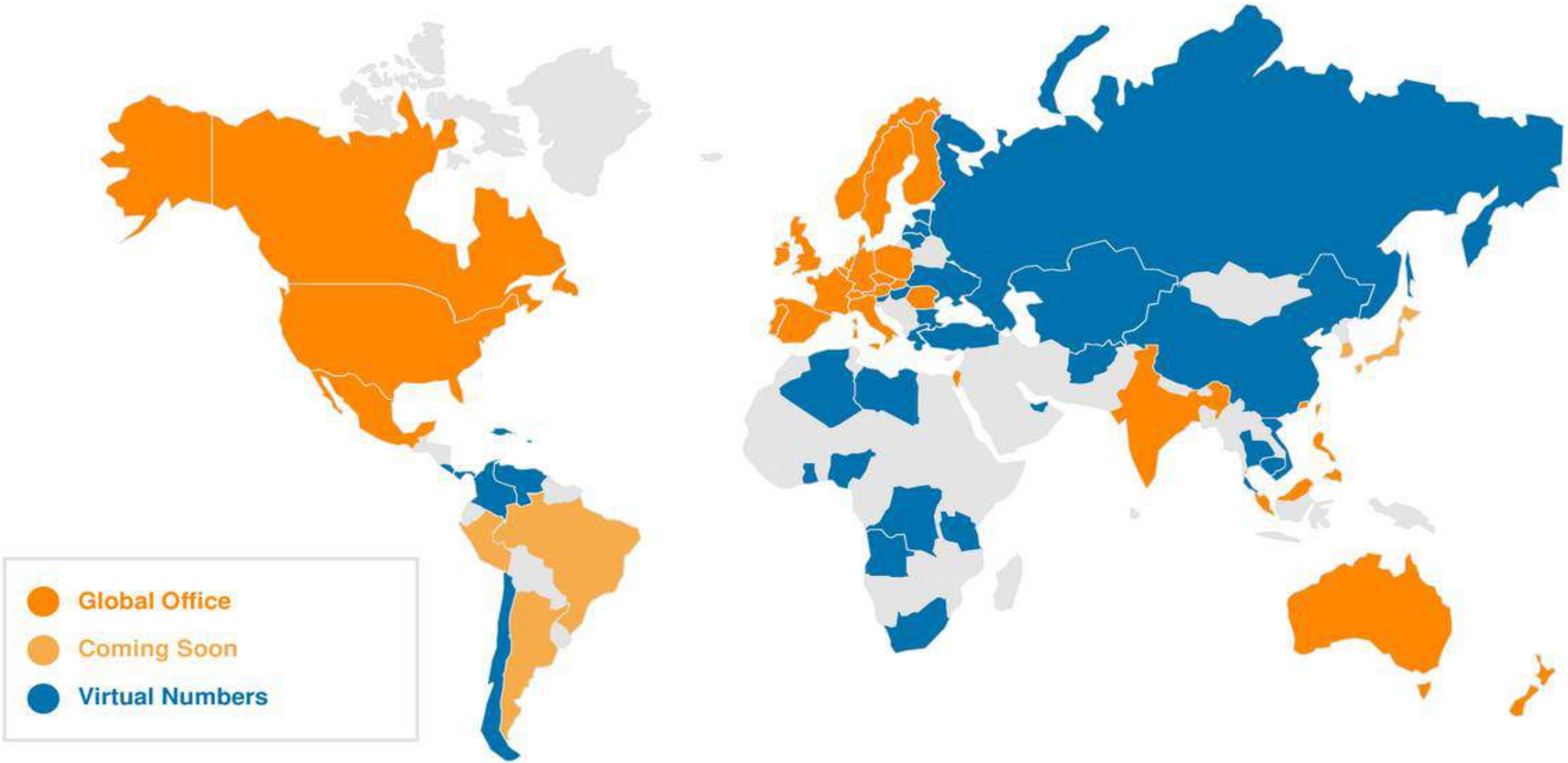


# When the trees grow to the sky

Stanislav Mushkat

DINS

# About us



13 locations, 40K Ongoing calls/s, 300M Calls/month



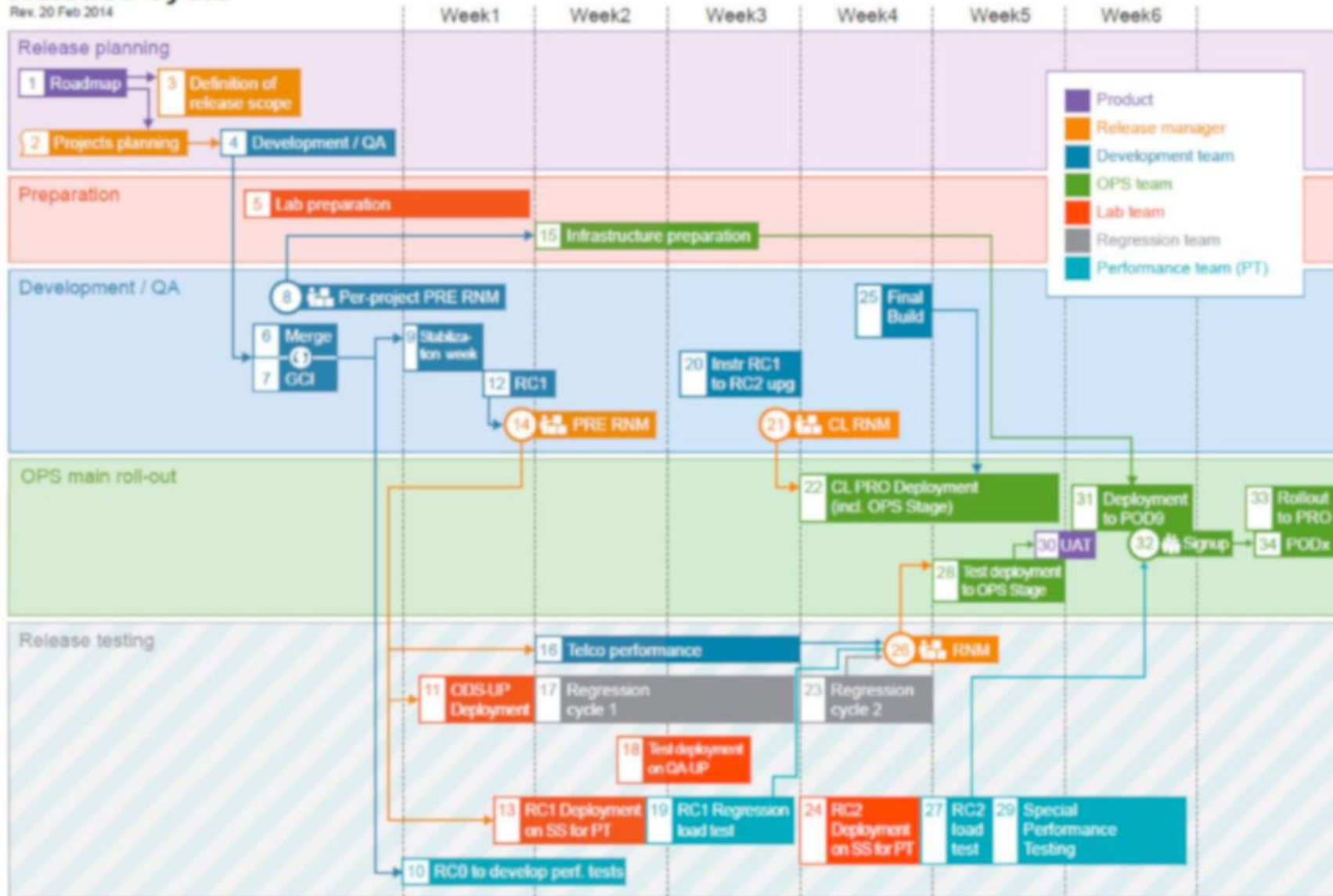


# System overview



## Release cycle

Rev. 20 Feb 2014



40+ Dev Teams,  
6 Releases/year  
~90 projects/release

# Approach to scale

## Engineering

- System decomposition : components, [sub]systems, services
- Org chart: independent development teams and decision makers

## Operations

- Scaling up
- Partitioning (user-data, compliance, special contracts)
- Geo distribution

# Challenges (Some ;-)

## Engineering

- Team and process synchronization (weeks->month)
- Regular release cycle -> Delivery time fold to release cycle (months->years)

## Operations

- Increasing system and infrastructure size & complexity
- Product and infra deployment & update takes more time (weeks->months)
- Change management becomes risky & less predictable

# Solutions

**Operations Specification**

**Service Discovery Interface**

**Automated Change Management**

# Operations specification



Component name	LB/FW required *	Connect directions		Protocol	Port(s)/range	Description	Done	Comments
		Accepts connections from (Inbound)	Initiate connections to (Outbound)					
ADB		<input type="checkbox"/> Yes/No	<input checked="" type="checkbox"/> Yes/No	JDBC	1521	Accounts information, etc.	<input checked="" type="checkbox"/> Y	Direct connection
JWS	<input type="checkbox"/> LB	<input type="checkbox"/> Yes/No	<input checked="" type="checkbox"/> Yes/No	HTTP	80	PAS requests JWS for not migrated APIs (RingOut, Number Porting, etc)	<input checked="" type="checkbox"/> Y	VSP configured on FS. All request are forwarded to first JWS if it's broken then use second server etc.
JWS		<input checked="" type="checkbox"/> Yes/No	<input type="checkbox"/> Yes/No	HTTP	8080	JWS requests PAS in scope of WebPhone functionality. All JWS servers use one PAS server pas01	<input checked="" type="checkbox"/> Y	All JWS are going to pas01
PWR		<input checked="" type="checkbox"/> Yes/No	<input type="checkbox"/> Yes/No	HTTP	8080	Platform Proxy Router balances load on PAS servers	<input checked="" type="checkbox"/> Y	PWR - nginx-based router
VSP		<input checked="" type="checkbox"/> Yes/No	<input checked="" type="checkbox"/> Yes/No	SIP / UDP	8060	SIP registration requests	<input checked="" type="checkbox"/> Y	
CSG	<input type="checkbox"/> LB	<input type="checkbox"/> Yes/No	<input checked="" type="checkbox"/> Yes/No	Thrft	5555	Subscription requests	<input checked="" type="checkbox"/> Y	LB on FS
MQS	<input type="checkbox"/> LB	<input type="checkbox"/> Yes/No	<input checked="" type="checkbox"/> Yes/No	AMQP	5670	Requests for ADT events	<input checked="" type="checkbox"/> Y	LB on FS
LDS	<input type="checkbox"/> LB	<input type="checkbox"/> Yes/No	<input checked="" type="checkbox"/> Yes/No	HTTP	8080	Call logs requests	<input type="checkbox"/> Y	LB on FS
APG		<input type="checkbox"/> Yes/No	<input checked="" type="checkbox"/> Yes/No	TCP	11211	PAS Uses APG-Client to communicate with the APG Data Grid	<input checked="" type="checkbox"/> Y	PAS connects to list of nodes.
TPG		<input type="checkbox"/> Yes/No	<input checked="" type="checkbox"/> Yes/No	TCP	11211	PAS Uses TPG-Client (TPG client node) to communicate with the TPG Data Grid	<input checked="" type="checkbox"/> Y	PAS connects to list of nodes
CPS		<input type="checkbox"/> Yes/No	<input checked="" type="checkbox"/> Yes/No	TCP	17010	Presence requests	<input checked="" type="checkbox"/> Y	PAS connects to list of nodes.
MDS	<input type="checkbox"/> LB	<input type="checkbox"/> Yes/No	<input checked="" type="checkbox"/> Yes/No	HTTP	8080	Messages meta-information	<input checked="" type="checkbox"/> Y	LB on FS
BL		<input type="checkbox"/> Yes/No	<input checked="" type="checkbox"/> Yes/No	TCP	2100	Billing transactions requests	<input checked="" type="checkbox"/> Y	Direct connection
GLS	<input checked="" type="checkbox"/> LB	<input type="checkbox"/> Yes/No	<input checked="" type="checkbox"/> Yes/No	HTTP	8080	Geolocation requests (retrieving of country by IP address)	<input checked="" type="checkbox"/> Y	
MAL		<input type="checkbox"/> Yes/No	<input checked="" type="checkbox"/> Yes/No	SMTP	25	E-mail services	<input checked="" type="checkbox"/> Y	Direct connection
MSS	<input type="checkbox"/> LB	<input type="checkbox"/> Yes/No	<input checked="" type="checkbox"/> Yes/No	HTTP	80	Messages content (Voice Mail, Fax, Call Recording)	<input checked="" type="checkbox"/> Y	PAS connects to list of LB.
Dash		<input type="checkbox"/> Yes/No	<input checked="" type="checkbox"/> Yes/No	HTTP	80	ES11 related requests	<input checked="" type="checkbox"/> Y	External service
Neemo		<input checked="" type="checkbox"/> Yes/No	<input checked="" type="checkbox"/> Yes/No	HTTP	80	SMS related requests	<input checked="" type="checkbox"/> Y	External service. Connects to PAS call-back api through PWR.
SMS		<input type="checkbox"/> Yes/No	<input checked="" type="checkbox"/> Yes/No	HTTP	80	Phone numbers lookup	<input checked="" type="checkbox"/> Y	External service
FCC		<input type="checkbox"/> Yes/No	<input checked="" type="checkbox"/> Yes/No	HTTP	80	Free Conference Call service	<input checked="" type="checkbox"/> Y	External service
Mutars		<input checked="" type="checkbox"/> Yes/No	<input checked="" type="checkbox"/> Yes/No	HTTP	80	Voice to text	<input checked="" type="checkbox"/> Y	External service. Connects to PAS call-back api through PWR.
ADG		<input checked="" type="checkbox"/> Yes/No	<input type="checkbox"/> Yes/No	HTTP	80	Requests from ADG to get account, extension, role, device, phonenumbr info	<input checked="" type="checkbox"/> Y	Internal service. Connects to PAS Internal API through PWR.
SMG	<input checked="" type="checkbox"/> LB	<input checked="" type="checkbox"/> Yes/No	<input checked="" type="checkbox"/> Yes/No	HTTP	80	SMS related requests	<input checked="" type="checkbox"/> Y	Gateway for SMS requests. Working through HLB (rtapi.ngcentral.com)



# Operations specification

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Foto: Wei& | 20. Oktober 1955

Days

# Operations specification

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**More days after**

# OPS Specification. Executable

- **Interfaces** : What our service is exposing
- **Backends** : What our service is depends on
- **Compute, Load-balancing** : How run & scale
- **Tick (Monitoring data)** : Data collection, measurements & thresholds



# OPS Specification. Executable

## Interfaces

```
{
  "version": "...",           // See above
  "interfaces": {
    "@default": {
      "port": "{empty_nix_port}"
    },
    "@secure": {
      "port": 443
    },
    "@management": {
      "port": 8085
    },
    "@jmx": {
      "port": 0
    }
  }
}
```

# OPS Specification. Executable

## Backends

```
{
  "version": ...,           // See above
  "interfaces": ...,
  "backends": {
    "#empty_nix": {
      "description": "List of empty_nix all servers",
      "query": {
        "select": ["fqdn", "port"], // array of empty_nix @default interface fields
        "from": "empty_nix"        // requested service type
        "where": {
          "interface": "@default", // requested interface of empty_nix service type
          "pop": "all",
          "pod": "all"
        }
      }
    }
  }
}
```



# OPS Specification. Executable

## Tick (Monitoring Data)

```

"tick": {
  "telegraf": {
    "outputs": {
      "influx_system": { "type": "influx",
      "config": { "urls": [ "{./influx_url}" ], "database": "system_stats", "retention_policy": "autogen", "write_consistency": "any", "timeout": "5s" }
    },

    "inputs": {
      "*": { "custom_tags": {} },
      "cpu": { "plugin_name": "inputs.cpu",
      "outputs": [ "influx_system" ], "config": { "name_override": "cpu", "percpu": true, "totalcpu": true, "collect_cpu_time": false } },
      "disk": { "plugin_name": "inputs.disk",
      "outputs": [ "influx_system" ], "config": { "ignore_if": ["tmpfs", "devtmpfs"] } },
      "kernel": { "plugin_name": "inputs.kernel",
      "outputs": [ "influx_system" ], "config": {}
    },
  },

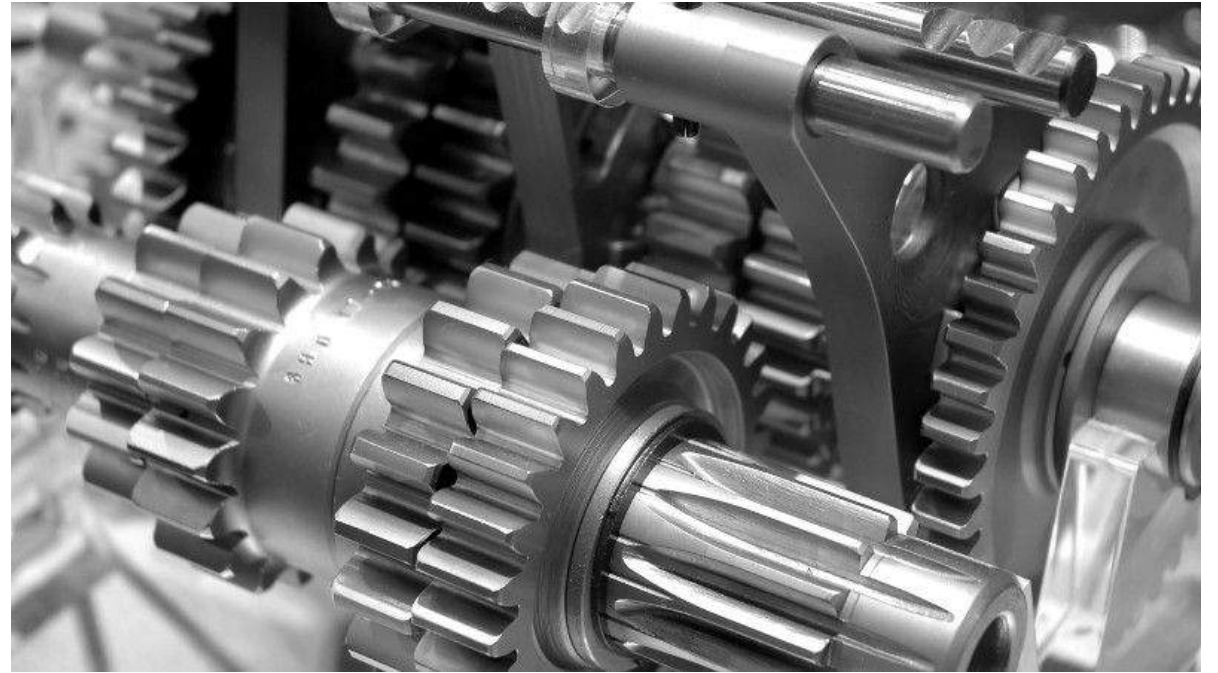
  "measurements": {
    "cpu": { "telegraf_input": "cpu",
    "declaration": { "tags": [ "cpu" ], "values": [ "usage_iowait", "usage_user", "usage_system" ] },
    "triggers": { "cpu_crit": { "level": "critical", "period": "2m", "value": [ "max", [ "usage_system" ] ], "threshold": [ ">=", 90 ], "message": "Check cpu
usage" },
    }
  }
}

```

# OPS Specification. Executable



**Hours**



# Service Discovery Interface



**Months**

# Service Discovery Interface



```
swagger: '2.0'
basePath: /restapi
info:
  version: 0.0.0
  title: Simple API
  x-service-name: pas
paths:
  '/v1.0/account/{accountId}/extension/{extensionId}':
    get:
      produces:
        - application/json
      parameters:
        - name: accountId
          in: path
          required: true
          type: string
          format: string
        - name: extensionId
          in: path
          required: true
          type: string
          format: string
      responses:
        '200':
          description: OK
      x-api-group: "account"
      x-throttling-group: "Light"
      x-app-permission: "ReadAccounts"
      x-user-permission: "ReadCompanyInfo"
```

```
  '/v1.0/account/{accountId}/extension/{extensionId}/presence':
    get:
      produces:
        - application/json
      parameters:
        - name: accountId
          in: path
          required: true
          type: string
          format: string
        - name: extensionId
          in: path
          required: true
          type: string
          format: string
      responses:
        '200':
          description: OK
      x-service-name: cpx
      x-api-group: "extension/presence"
      x-throttling-group: "Light"
      x-app-permission: "ReadPresence"
      x-user-permission: "ReadPresenceStatus"
      x-balancing-method: "ConsistentHashByHeader"
```



# Service Discovery Interface



Standard for API specification

Metadata and Service Catalog

Service Publishing on readiness

Service Consuming on-demand

Public/Private API conversion

Per-account roll-out

**Weeks**





# Change Management

- Scheduling conflicts
- System conflicts
- Slippage on schedule & rush
- Rollbacks
- Service Outages



# Change Management. Automated



- Change catalog
- Score-based approvals
- Risk-based scheduling
- Impact-based management involvement
- Type & scope-based peer review
- Auto-calculated everything

**4hrs MW**  
**50+ CMRs/day,**  
**Uptime: 99,995%**



# Recommended reading

**Gene Kim, Kevin Ber, George Spafford**

The Phoenix Project

**E. Goldratt**

The Goal

Critical Chain

Theory of constraints

**Г.П. Щедровицкий**

Оргуправленческое мышление: идеология, методология, технология. Курс лекций





# Thank you!

[Stanislav.mushkat@nordigy.ru](mailto:Stanislav.mushkat@nordigy.ru)

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