EDGEX FOUNDRY™

Certification Program

Proposal

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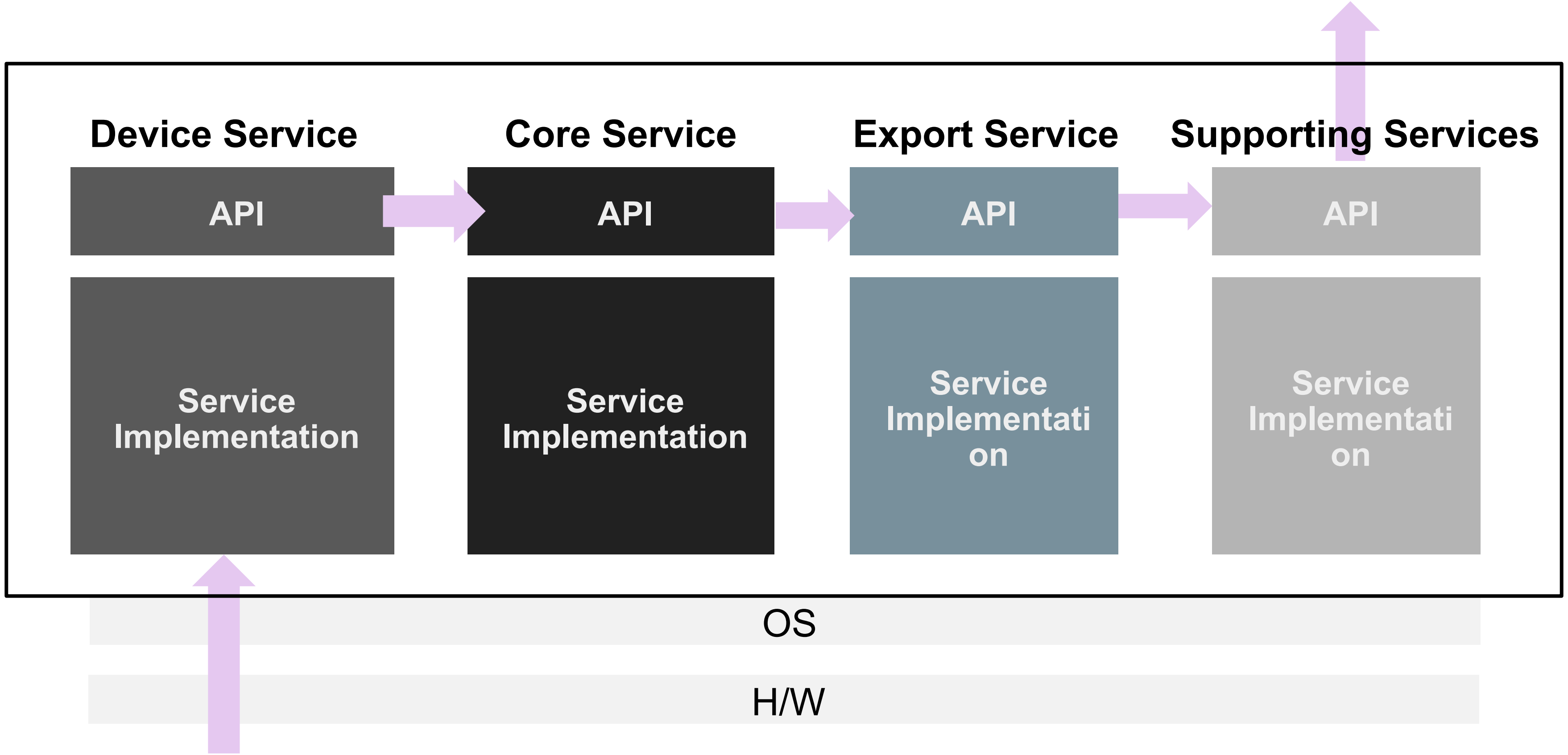
Why is Certification needed?

- EdgeX is based on loosely-coupled microservices bound by common APIs
- Entire subsections can be replaced, combined, etc. with proprietary, differentiated “EdgeX-compliant” offerings, even Core Services
- The community and users need assurance that EdgeX components from LF and third parties will work together
- Goal: To ensure that the services provided by EdgeX ecosystem are
  - API compliant
  - Interoperable
  - Reliable
  - Secure
  - Portable
  - Performant

Certification is critical for multi-vendor ecosystem

By ensuring the services can be easily and reliably integrated to drive an outcome, users have greater choice and confidence



Certification Stakeholders

Users:
Enterprises
OEMs
SI
VAR

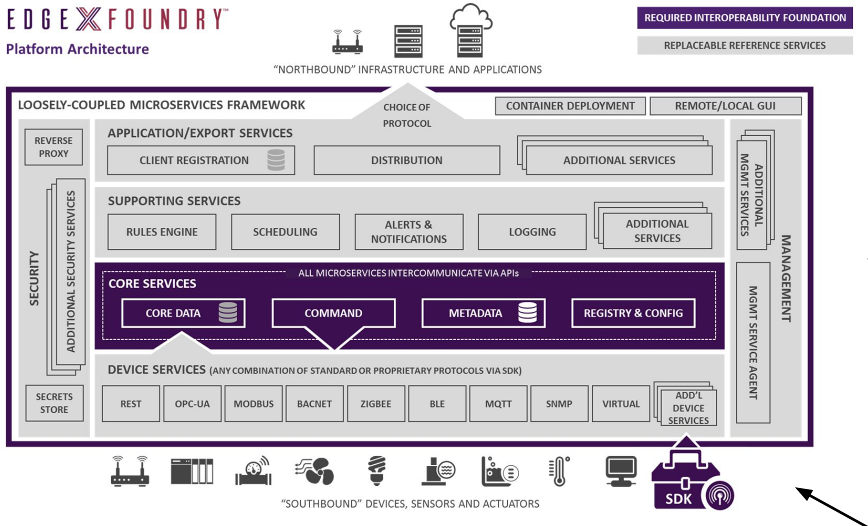
EdgeX Developers

North-bound service providers

Application providers: Management, Analytics

Software infrastructure providers

Security vendors



Hardware Manufacturers – Chip/ board

Device service providers

OS Providers

Benefits of Certification

EdgeX Developer Community

- Defined test and quality standard
- Accelerated market adoption
- Demonstrated commitment to APIs

EdgeX Partners

- Commercial opportunities to leverage EdgeX community
- Proof of compliance for greater acceptance
- Reduced support issues

EdgeX Users

- Confirmed interoperability
- Faster implementation
- Reduced integration risks
- Higher reliability

What is EdgeX certification?

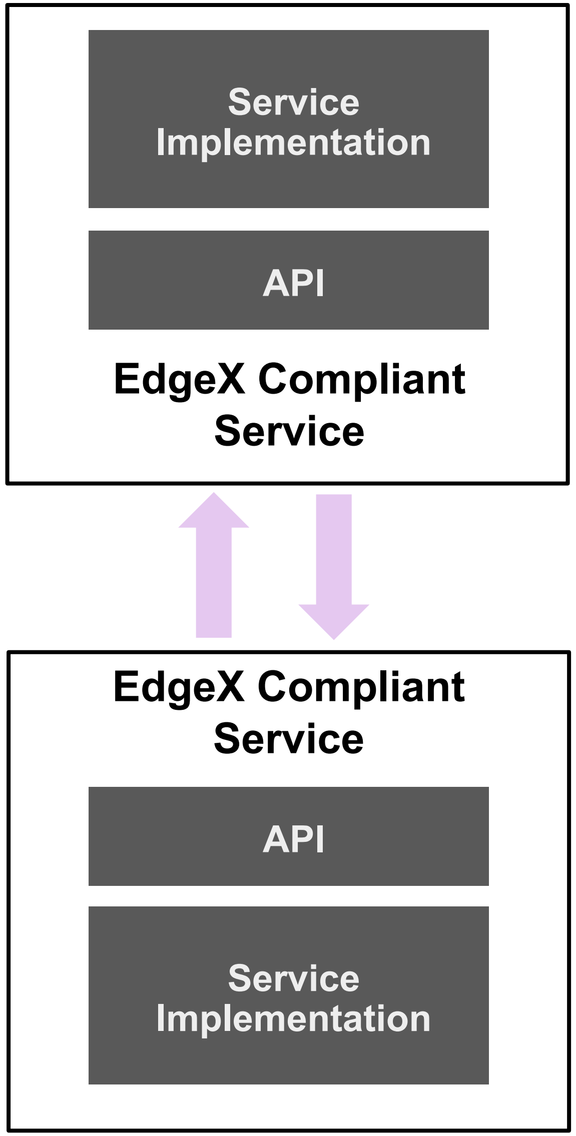
The certification framework defines a comprehensive set of rules, technical requirements, standards and procedures to drive consistency

The framework is used by the EdgeX Foundation or trusted third party to verify the software conforms to specified characteristics

- Certified components must
  - Be compliant with the EdgeX APIs
  - Be interoperable with EdgeX Foundation code
  - Support EdgeX management service (system management agent)
- Certified components should be
  - Robust, reliable and able to recover from faults, e.g., lost communications, etc.
  - Efficient in managing resources
  - Follow accepted engineering best-practices
- Components achieving certification will be able to promote compliance
  - Certificate, Logo
  - Press release

Elements of certification

API	● Compliant with EdgeX Community approved APIs.
Dependencies	● Services should be conforming to EdgeX approved infrastructure.
Security	● Services should conform to EdgeX approved security model for invocation, API access, data storage, and any future network and identify services
Quality	● Coding quality of services have been reviewed to meet industry best practices ● Services were tested in an EdgeX approved test bed with other services
Performance	● Key performance characteristics under expected use are published (compute, memory use, storage, latency, etc) and verified during certification testing ● Service does not block or reduce performance of other services
Version Control	● Services are version compliant. If there API changes, services must be recertified with the newly published APIs
Documentation	● Service details and interactions are published ● Services should provide code samples with documentation
Validation	● Services are tested in recommended/known environments, including, but not limited to: ○ At least one Linux variant of the OS (Recommended by EdgeX community) ○ Hardware (64 bit). Preferably the devkit
Lifecycle	Support App lifecycle ● Services code can be downloaded from a central repository/ Docker Hub/ or some kind of hub that is public ● Service should be deployed to edge as part of other services and can be included in manifest ● Services should support the system management agent ● Services can be upgraded. Process for upgraded Services to replace existing services.
Additional Comments	● EdgeX is orchestration agnostic. Services should be designed that way and should not make any assumption about orchestration/ QoS



Service Implementation

API

EdgeX Compliant Service

EdgeX Compliant Service

API

Service Implementation

Performance Standards - TBD

- Start-up time until service registered and running within EdgeX
- Does not block other services when running
- Memory
  - To load
  - When running
- CPU utilization
- Overall file size
- Response time to requests
- Supports EdgeX management service (system management agent)

Placeholders

Certification Authority

- Conducts the certification process and testing
  - Receive and review request for certification
  - Execute testing/evaluation process
  - Issue certification or report issues back to requestor
- Follows certification procedures as defined by the EdgeX community

- Phase 1 – EdgeX Community
- Future? – Outsource to trusted third party

Commercial Aspects

- Cost of certification based on service type or time/effort required
  - Core service $$$
  - Device service $$
  - Supporting/Other services $
  - No charge for some organization types?
- Certification valid for 2 years, linked to version used for testing
- Renewal process requires going through certification process using current EdgeX release
  - xx% discount from original certification?
- Organization must be member of EdgeX Foundation to request certification

- Certified service allowed to use logo and claim “EdgeX Certified”
- Marketing support
  - List of compliant services on EF web site
- Conditions for reviewing/revoking certification
  - Errors discovered in compliance testing
  - Code changed after certification
  - Complaints about functionality or quality from EdgeX user community

Levels of Engagement

Self assessment

- Developer conducts own tests against provided test tools
- Intended for certification prep – not recognized by EdgeX Foundation

Certification

- Code submitted to EF certification process
- Cost $$$
- Permits use of Certification mark/logo

Self Assessment

- Define a standard EdgeX software test platform that users can download and use to conduct their own certification readiness assessment
- Requesting organization must report assessment results as part of their certification request
- Benefits
  - Promotes a baseline public standard for validation of EdgeX APIs
  - Insures requestor has done their homework and cleared basic issues before entering certification process
  - Demonstrates EdgeX community commitment to standards around certification
- Challenges
  - Need to create and document the test platform
  - Make available for download along with each release
  - Exercise APIs for
    - Device services
    - Replacing core/support services
    - New application/export services

Phased Implementation

- Phase 1 – Basic compatibility
  - Documentation
  - Runs in EdgeX environment
  - API compatibility

Minimal requirements for new service or service replacement

- Phase 2 – Operation and Performance
  - All of phase 1
  - Does service operate as documented
  - Test performance of service, impact on other services

Service does what it says and doesn’t negatively impact overall system

- Phase 3 – Security
  - All of phase 2
  - Security code review
  - Security testing

Service does not introduce security risks

For Discussion

- Should certification of a Device Service include testing the device connection? Or only service API and integration into EdgeX environment?
  - Recommendation: Certification not include testing the interaction with the actual device. Cost, time, and liability concerns.
- Does a service remain compliant if the EdgeX APIs in a new release change?
  - Assumption: REST APIs will be backward compatible
  - Certification will specify the version tested as a way to inform users there may not be support for newer APIs or capabilities
- Should a Device Service that leverages hardware, e.g. TPM, include testing of the hardware interactions as part of the certification?
  - Recommendation: Anything that is related to security deserves a higher level of validation, but without assuming liability.
- Should submitter be required to submit source code for certification testing?
  - Assumption: Some submitters will have proprietary services and do not want to share source

Next steps?

Agreement on the framework

- TSC agreement and commitment on principles and priorities
- Establish a WG to define and document
- Commercial aspects

Process for Validation / Certification

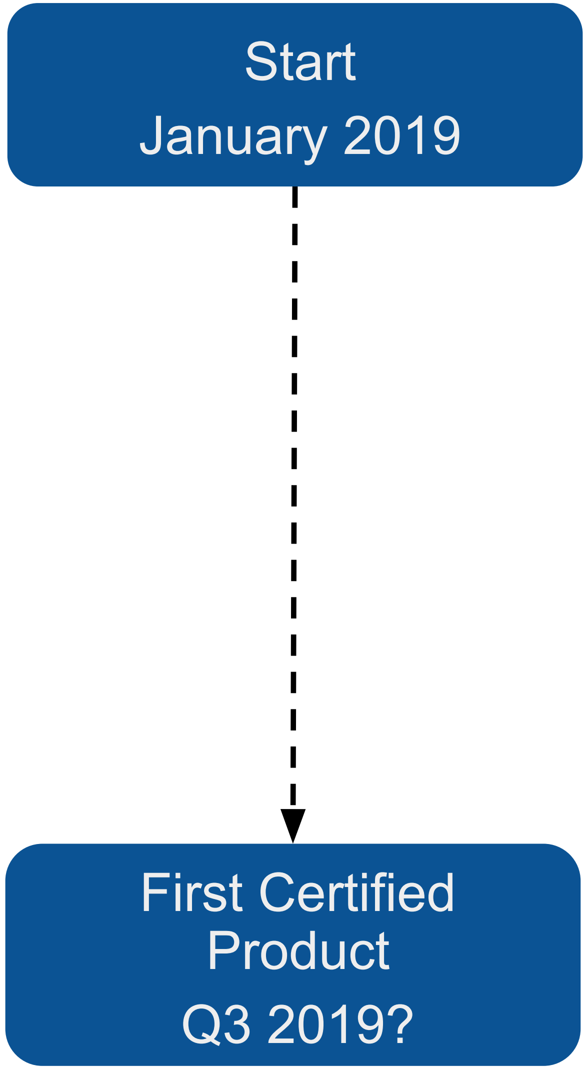
- Who will certify – EF or third party?
- Develop certification process and test fixtures

Marketing / Promotion

- Communication strategy to community, users

Execution

- Certification process in action
- Certified products listed on website



Start

January 2019

First Certified Product

Q3 2019?

EDGEX FOUNDRY™

Conformance Properties

- *Consistency*: do the different (parts of) software artifacts conform to each other?
- *Functional*: does input to the system produce the expected output?
- *Behavioral*: does the system meet general safety and progress properties like absence of deadlocks or are constraints on the specific states of the system met?
- *Quality*: do the artifacts fulfill nonfunctional requirements in the areas of for example performance, security, and usability?
- *Compliance*: do the artifacts conform to standards, guidelines, or legislation?

Source: https://link.springer.com/article/10.1007/s11219-009-9080-0

Process

- Developer follows documented process for certification prep
  - Self test
  - Prepare documentation, sample code, and certification request
- Certification authority receives request
  - Review for completeness and assign to schedule
  - Process purchase order for payment
- Execute certification testing
  - Receive service code (source, executable, container) and any dependency code
  - Configure according to documentation
- Completion
  - Pass – issue certification
  - Fail – reply with notes, wait for resubmission