NEXT STEPS FOR THE WEB OF THINGS: MOVING FROM INNOVATION TO MAINSTREAM

Eric Siow
Michael McCool

– Part 1 – Crossing the Chasm
– Part 2 – Standards Development Prioritization

PART 1
CROSSING THE CHASM

OUTLINE

Part 1

- State of the Union - Internet of Things (IoT)
- What can the W3C and WoT Community Do?

Part 2

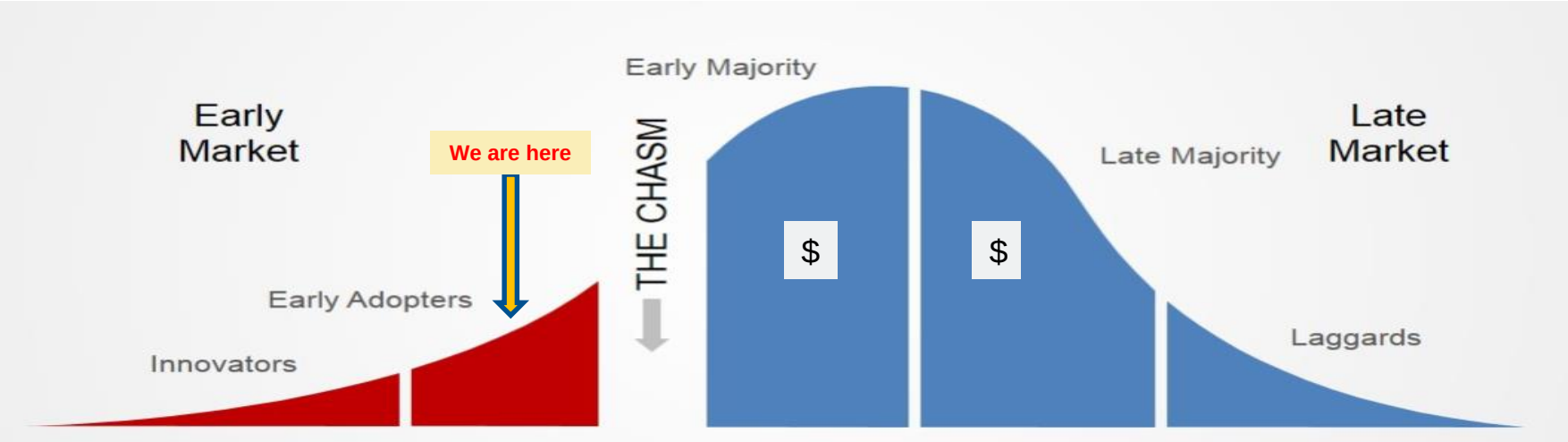
- Outline of plan to converge on data framework and standards
- Discussion and ideas for collaboration

STATE OF THE UNION (IOT)

- IoT is about 10 years old
- Hype has been much greater than present reality
- IoT is “biting off more than it can chew”:
  - Trying to address too many markets
  - Involves too many and mostly uncoordinated SDOs and SIGs

Investments in IoT are at risk

CROSSING THE CHASM (IOT)



Focus on a vertical & address the needs of the Early Majority

1. Simplify technical complexity
2. Lower deployment risk and cost
3. Create customer peer references

ILLUSTRATION:
A LOOK AT SMART CITIES

KEY CHALLENGES FACING SMART CITIES

- **Lack of coalescence around a set of complementary standards**
  - Hinders scalability, interoperability and evolution
  - Need to simplify: prioritize and define requirements
  - Increases cost of deployment

- **Regional regulatory differences adding to confusion**
  - Diverse requirements impede the scalability of the market
  - Need regulatory agencies to participate and help with standardization requirement

- Lack of interoperability wastes up to 40% of IoT value (1)
- Cities and technology partners may waste up to $321 billion by 2025 (2)

(1) https://www.mckinsey.com/business-functions/digital-mckinsey/our-insights/the-internet-of-things-the-value-of-digitizing-the-physical-world
(2) https://machinaresearch.com/news/smart-cities-could-waste-usd341-billion-by-2025-on-non-standardized-iot-deployments/

WHAT CAN W3C AND THE WOT COMMUNITY DO?

1. **Align, unite and cross the chasm together**
   - **Focus on an Application: Vertical Market Segment**
     - Difficult to align given different business priorities & interests
     - May increase fragmentation rather than reduce it
   - **Focus on a Platform: Data Interoperability**
     - Easier to align: Most pressing shared problem
     - Enable different devices and platforms to interoperable
     - Plays to W3C's and WoT's Core competences

WHAT CAN W3C AND THE WOT COMMUNITY DO?

2. **Lead an intentional and concerted drive towards convergence**
   - **Resist doing anything that adds to the existing fragmentation**
     - Work with leading implementers and influencers to drive alignment among different jurisdictions
     - Liaise with other relevant standards & SIGs to drive alignment and convergence
   - **Employ product profiles to define standards requirements**
     - Define based on use cases in target verticals

WoT Charter: Focus on what would be most impactful to ecosystem

PART 2
STANDARDS DEVELOPMENT PRIORITIZATION

STANDARDS DEVELOPMENT PRIORITIZATION

Key to Success: Focus

- However, focusing on just one vertical will just lead to more fragmentation.
- The “platform strategy” is more appropriate: focus on a specific horizontal gap.

Identified gap: Lack of *data interoperability.*

- But we need to be even more precise than that!

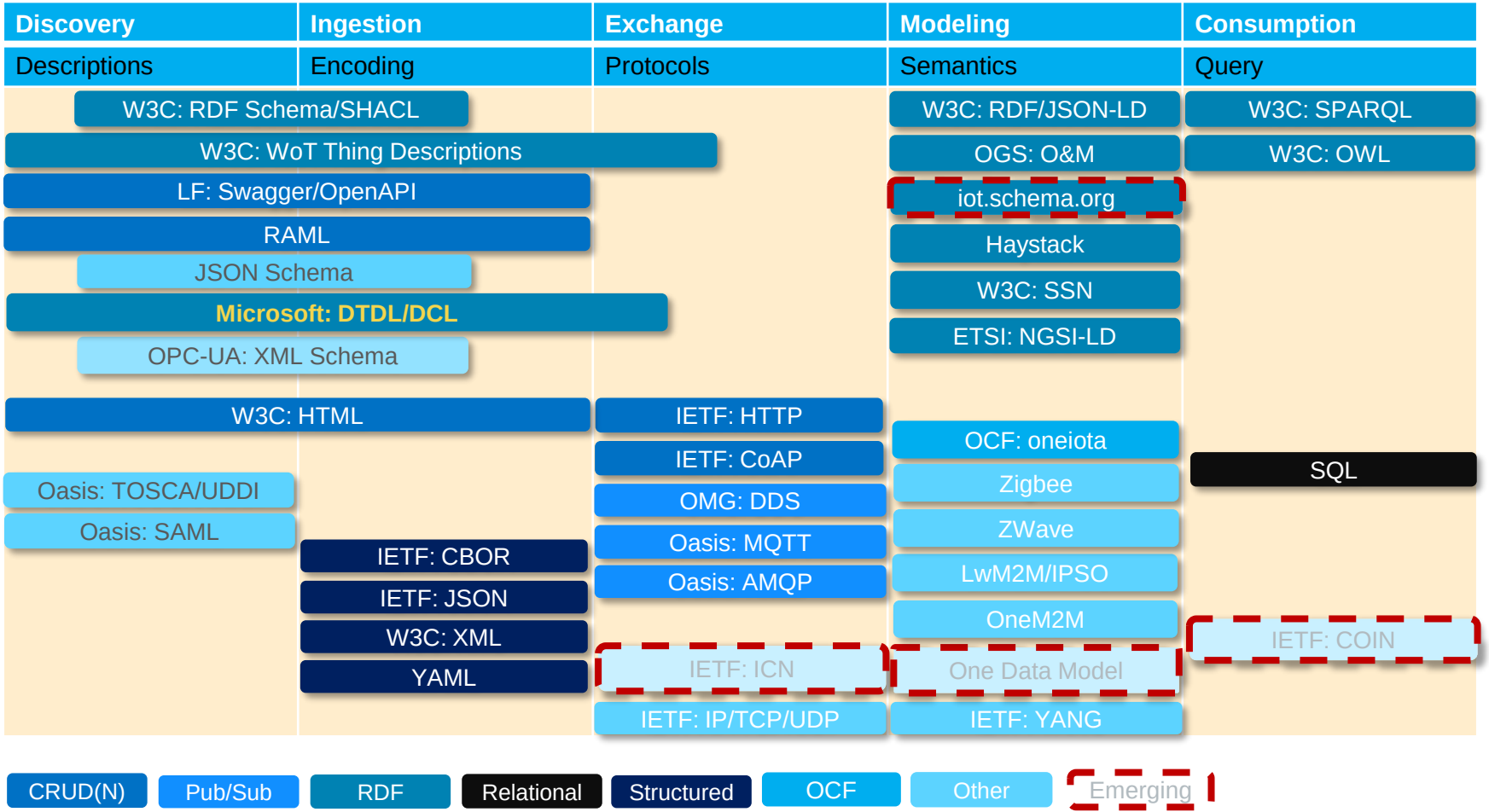
WHAT IS "INTEROPERABILITY"?

1. **Ingestion Interoperability:** Connect Data Sources to Cloud
   - Normalize data using common semantics upon database ingestion.
2. **Cloud Interoperability:** Connect Vertical Silos Cloud-to-Cloud
   - Exchange data between cloud-based systems.
3. **Mesh Interoperability:** Connect Local Devices and Services
   - Exchange data and invoke interactions among local devices
4. **Application Interoperability:** Deploy Code across a Distributed System
   - Support portable runtime and application code.

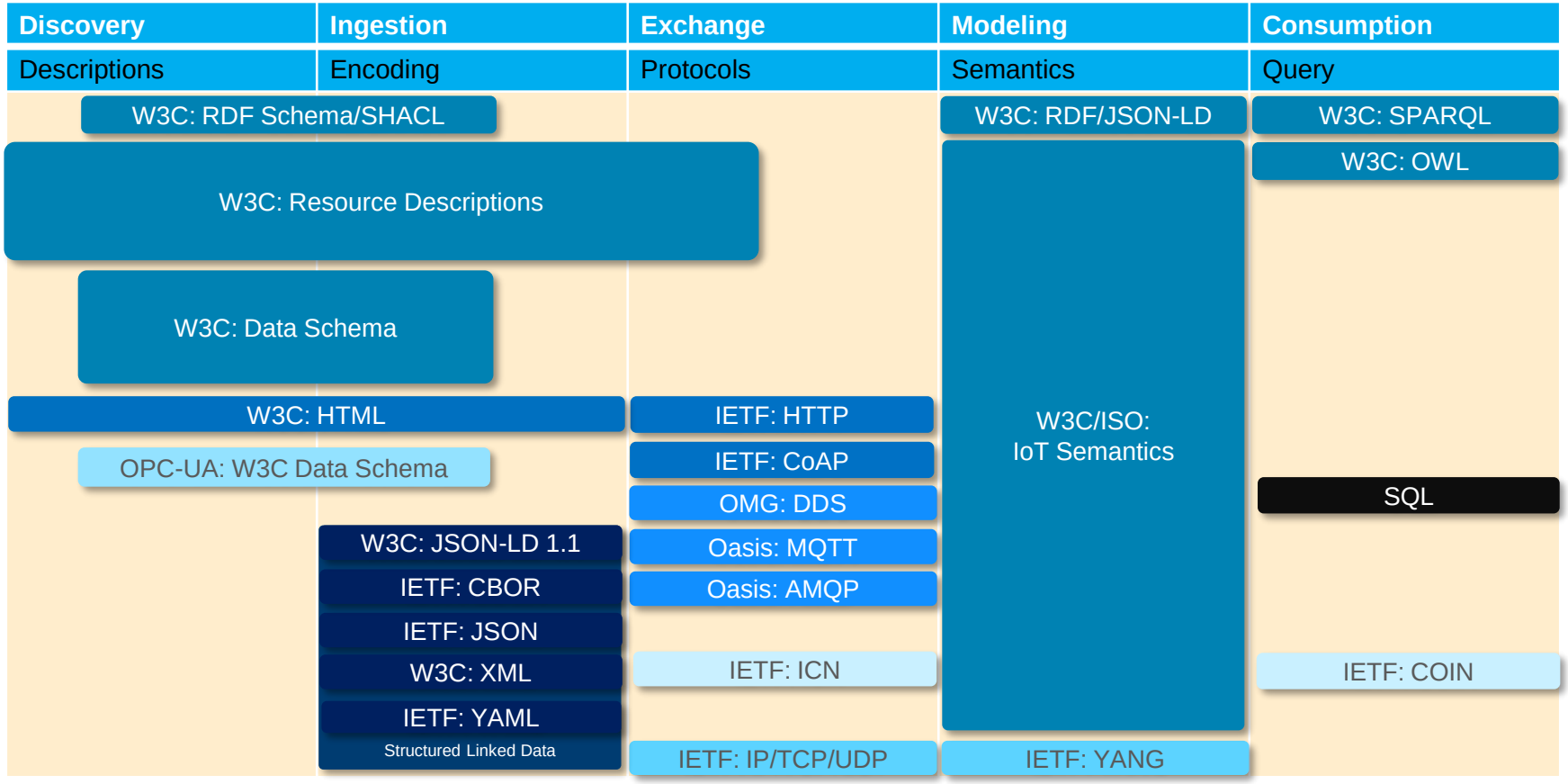
INTEROPERABILITY TYPE VS. TECHNICAL REQUIREMENTS:

Priority	Requirement / Type	Interaction Abstraction	Data Interpretation	Discovery Mechanism	Application Environment
1	Device-to-Cloud Data Ingestion	Description	Data Model		
2	Cloud-to-Cloud Data Transfer	Description	Data Model		
3	Device-to-Device Communication	Description	Data Model	Mechanism, Description	
4	IoT Application Orchestration	API	Data Model	API, Description	Management, API, Runtime

IOT DATA AND METADATA STANDARDS MAP: START STATE

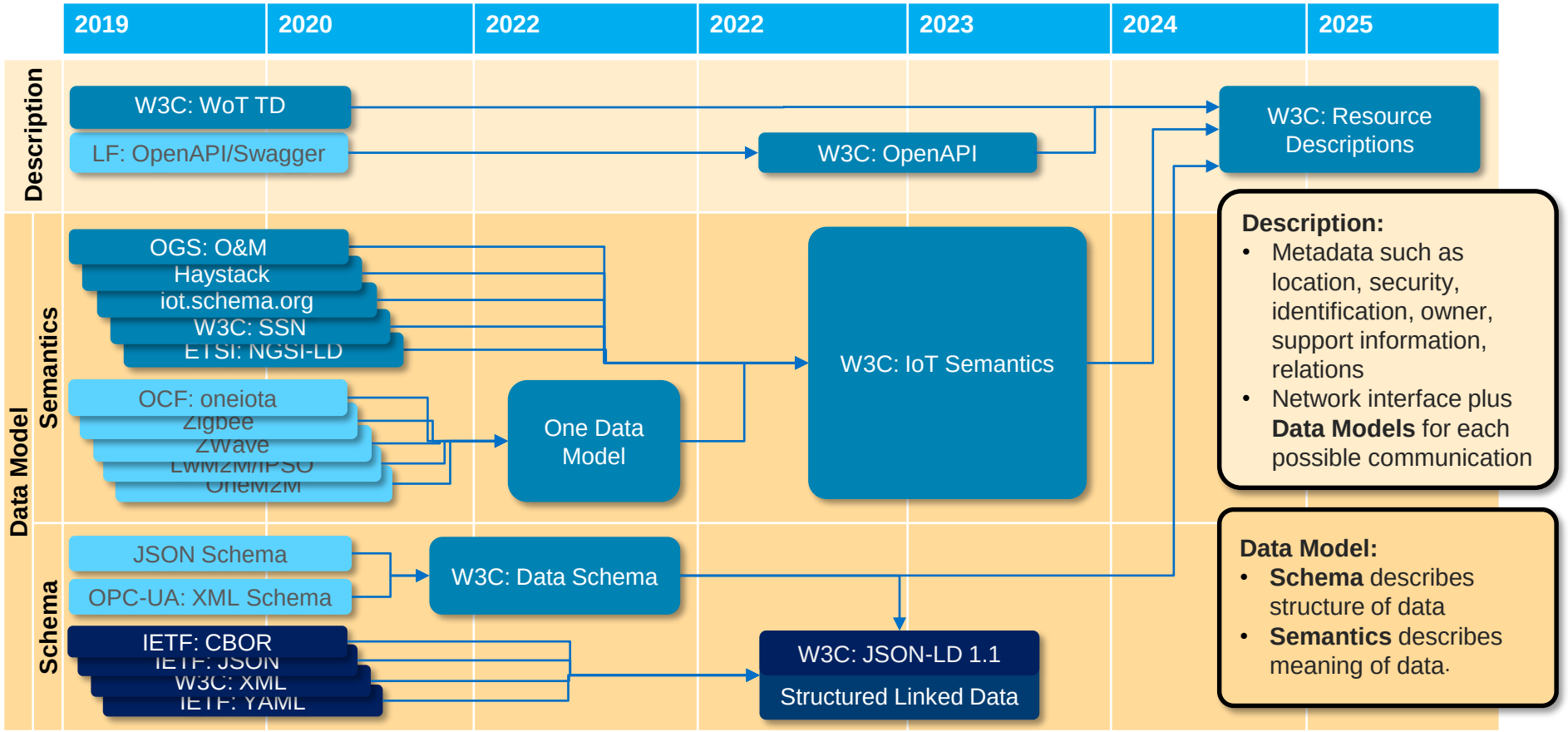


IOT DATA AND METADATA STANDARDS MAP: TARGET STATE



CRUD(N) | Pub/Sub | RDF | Relational | Structured | OCF | Other

STANDARDS CONVERGENCE TIMELINE



KEY SHORT-TERM ACTIONS

1. **Develop unified *Data Schema* for XML, JSON, CBOR, and YAML**
   - Recommend and use JSON Schema as a basis for specifying *structure.*
   - Bring into W3C and officially extend to cover XML, JSON, CBOR, YAML
2. **Recommend and extend JSON-LD semantics to JSON, XML, CBOR, YAML**
   - Data is data; serialization should not matter. All data should be linked data (supporting relations) and should support *semantic annotation*.
3. **Develop common *IoT Semantics* vocabulary ("ontology")**
   - Set of interconvertible IoT-specific vocabulary definitions
   - Converge on a common technology framework (eg RDF), codify existing ontologies, incrementally move to common semantic foundation.

LONG-TERM ACTIONS: CLOUD, MESH, AND APPLICATION INTEROPERABILITY

1. **Develop Management Framework**
   - Application management framework – perhaps based on web apps.
   - Define runtime security requirements for installable applications.
   - Ideally we unify the browser and IoT service models. Somehow.
2. **Develop API supporting Description and Data Model Abstractions**
   - A “dependent” specification
   - Ideally, design is independent of execution context (browser, device, etc).
3. **Define Discovery Mechanism(s)**
   - Need baseline mechanism for bootstrapping.

CONCLUSIONS

1. Focus on key ecosystem challenges for WoT charter
2. Data interoperability is the key focus
3. We need to align and unite as a group
4. We need understand and address user’s problems and priorities