

Concepts of Digital Twin Network (DTN)

draft-zhou-nmrg-digitaltwin-network-concepts-02

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Major Updates from version -00

Table of Contents

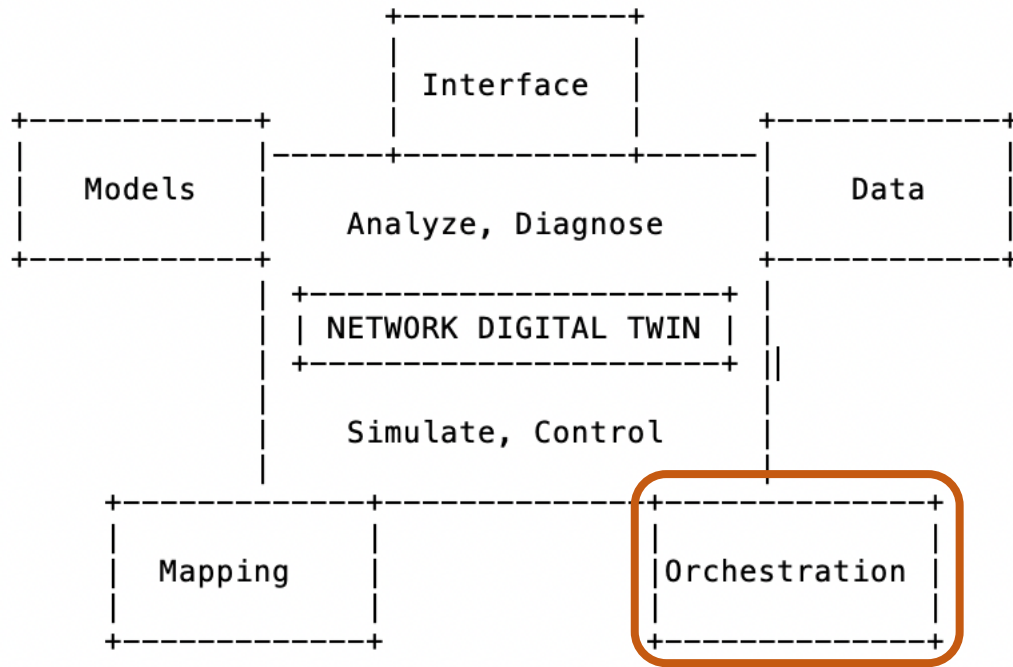
1. Introduction	2
2. Definition of Digital Twin Network	3
3. Benefits of Digital Twin Network	4
3.1. Lower the cost of network optimization	4
3.2. More intelligent for network decision making	5
3.3. High efficient for network innovation	5
3.4. Privacy and Regulatory Compliance	6
3.5. Customize Network Operation Training	6
4. Reference Architecture of Digital Twin Network	6
5. Challenges to build Digital Twin Network	9
6. Summary	10
7. Security Considerations	10
8. IANA Considerations	10
9. References	10
9.1. Normative References	10
9.2. Informative References	10
Authors' Addresses	10

A fifth element added:
Orchestration

Two new benefits
analyzed

New section for
reference architecture
of DTN

The Fifth Element

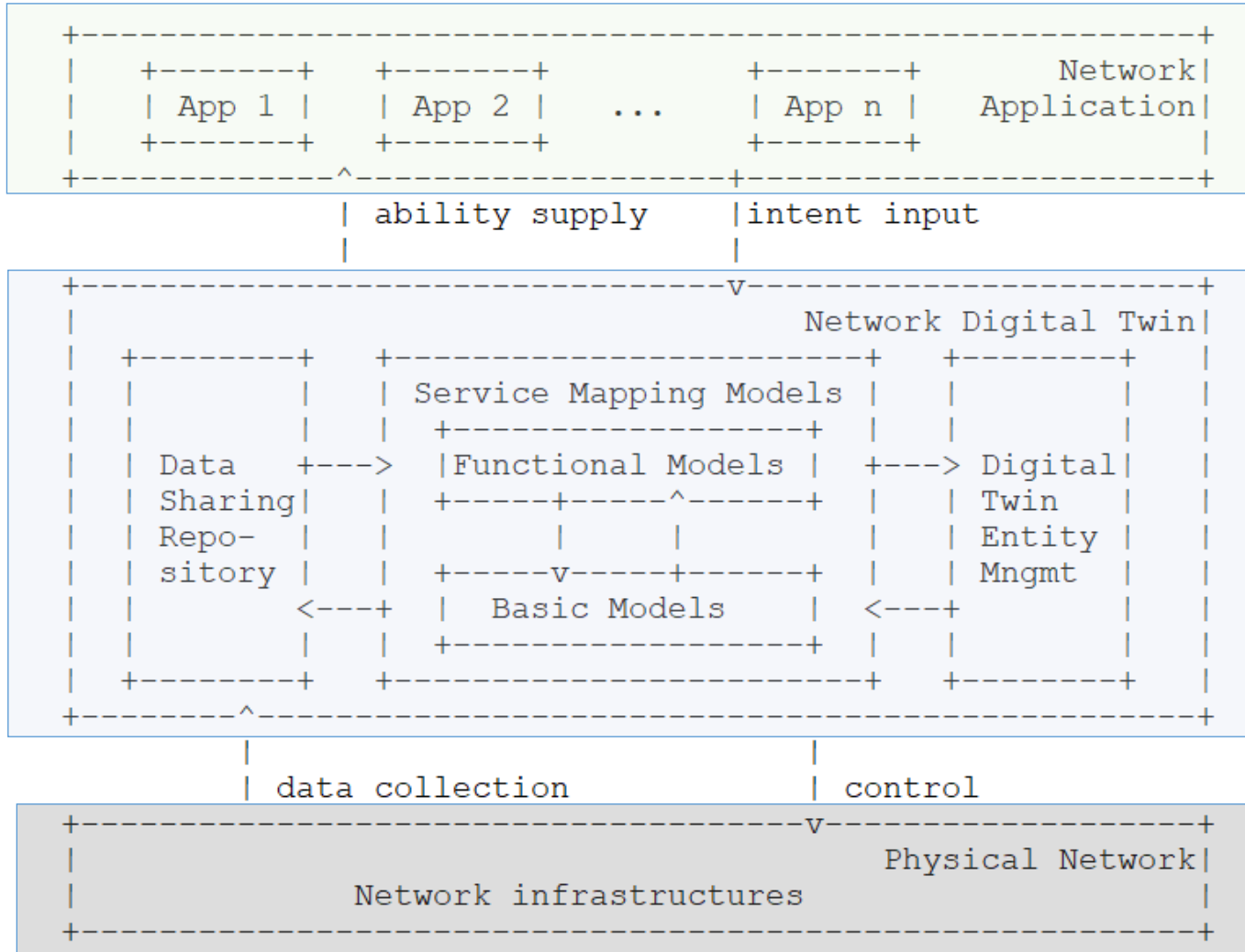


- Orchestration
 - Control the data and action flows
 - Applies dynamic lifecycle management
 - Based on network models
- Supporting
 - Repeatability
 - Replicate network conditions on demand
 - Reproducibility
 - Replay successions of events
 - Controlled variations

Additional Potential Benefits

- Privacy preservation
 - Avoid any use of personal data for management decisions
 - Synthetic and aggregated sources
 - And a better fit to the trend on E2E encryption
- Training
 - Under controlled conditions
 - As close as possible to real operations
 - A/B evaluation
 - Cyber-ranges

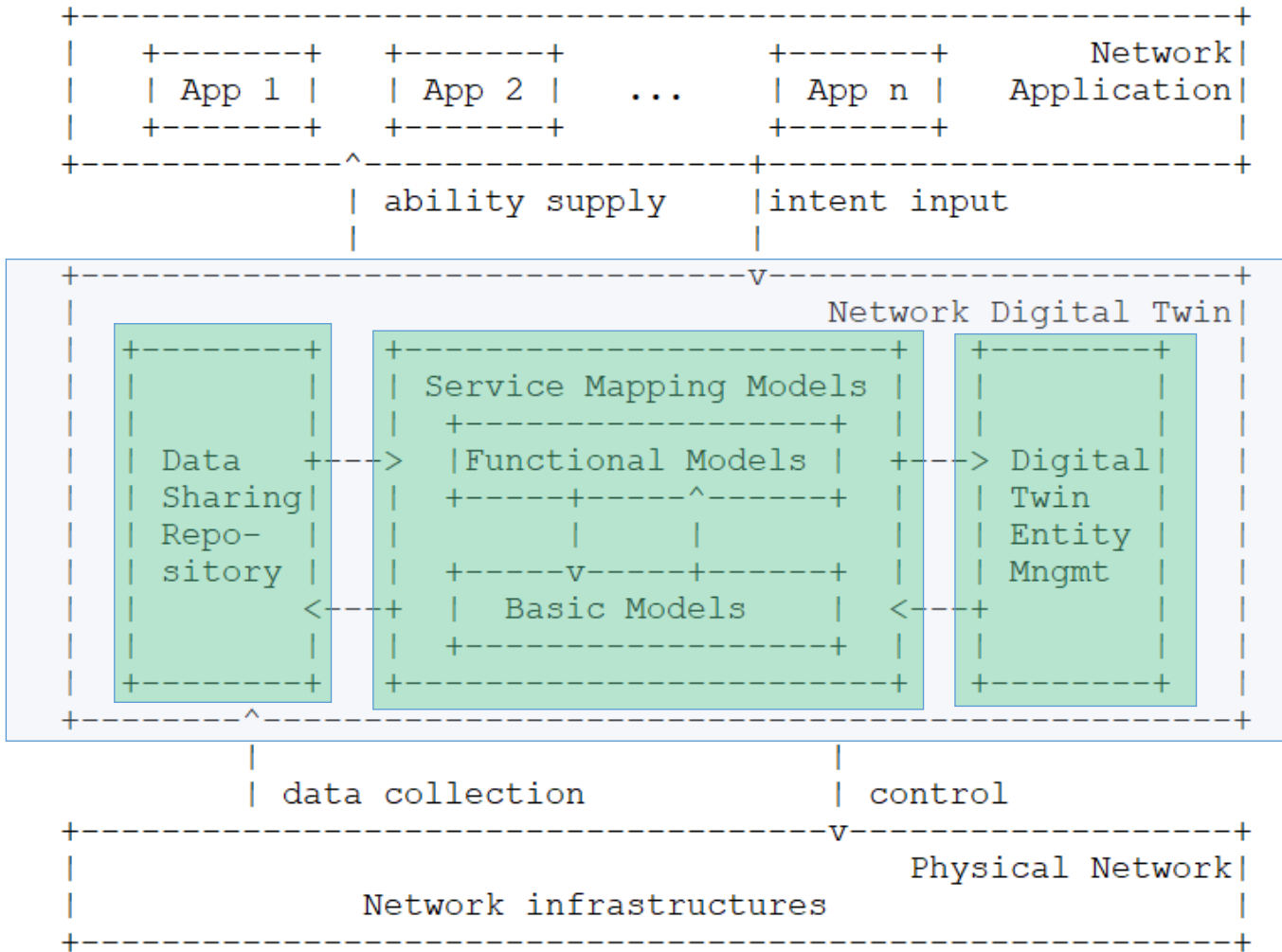
Reference Architecture of DTN



Three-layer DTN system

- **Bottom Layer: Physical Network**
 - Various network domains
 - Exchange data and control with Network Digital Twin
- **Middle Layer: Network Digital Twin**
 - Core layer of DTN system
 - 3 key subsystems;
- **Top Layer: Network Application**
 - Both conventional and innovative applications.
 - Provide requirement to Network Digital Twin entity;

Reference Architecture of DTN (cont.)



Three Sub-systems in Network DT layer

- **Data Sharing Repository**
 - Various network domains
 - Exchange data and control with Network Digital Twin
- **Service Mapping Models**
 - Basic Models: network elements and network topology;
 - Functional Models: various data models such as network analysis, simulation, diagnosis, prediction, assurance, etc.
- **Digital Twin Entity Management**
 - Life-cycle management entity;
 - Visualizes and controls various elements, including topology, model, security, etc.

Next Steps

- To consider dynamic data collection through day-N orchestration
 - SPIDER project: <https://spider-h2020.eu>
- To analyze requirements on flow provenance
 - INSPIRE-5Gplus project: <https://spider-h2020.eu>
- To investigate more use cases and requirements of DTN.
- To define basic southbound and northbound interfaces of DTN system.

- **Welcome to join our work, and any comments are welcome!**