Basic Information

- **Project Info.**
  - Future Internet Architecture and Innovation Environment (FINE)
  - Supported by China MOST High-tech Research and Development Program (‘863’ Program)
  - Approved in 2012, officially funded in 2013

- **Project Members**
  - Universities/National Research Institutes: Tsinghua Univ., ICT Chinese Academy of Science (CAS), BUPT, SEU, PKU, China Academy of Telecommunication Research (CRTR), PLAIEU, NUDT, XJTU, IOA of CAS, NIC of CAS, etc.
  - Service Providers: CERNET, China Mobile, B-STAR (Broadcasting)
  - Vendors: ZTE, H3C, Huawei, DCN, etc.

Recent Publications

**FINE Network Architecture**

- Proposed a Four-layer FINE (Future Internet Innovation Environment) Network Architecture
- AS-1 (Domain 1)
  - APP-1
  - APP-2
  - APP-n
  - Logical View API
  - VCP-1 IDN
  - IDN
  - Global Physical View API
  - W-Cast
  - Local View API
  - IDN
  - NOS-2
  - DPA1
  - DPA2
  - DPAn
  - Open Data Plane Devices

- AS-2 (Domain 2)
  - APP-1
  - APP-2
  - APP-n
  - Logical View API
  - VCP-2 IDN
  - IDN
  - Global Physical View API
  - W-Cast
  - Local View API
  - IDN
  - NOS-2
  - DPA1
  - DPA2
  - DPAn
  - Open Data Plane Devices

**FINE Project Architecture**

- New Architectures
  - New IP Protocols
  - Typical new network architectures
    - NDN/ICN, PTDN (New ITU-T standards), Content Distribution
  - Typical new IP protocols
    - Intra/Inter Domain SAV, ILNP, Next Generation Broadcasting, Two-dimensional Routing

- Tsinghua University NOS (TUNOS)
- Virtualization Cloud Platform (VCP)
- Data Plane Abstraction (DPA)
- New Architectures
- Content Distribution
- Dual-architecture for Content Distribution
- Content Addressing Protocols
- Future Network Management
- Programmable Virtualization Routers
- Open Network Devices
- Open Distribution Devices
- Content Routers
- Management Plane
- Application Plane

**FINE Project APPs for Experiments**

- Typical new network architectures
  - NDN/ICN, PTDN (New ITU-T standards), Content Distribution
- Typical new IP protocols
  - Intra/Inter Domain SAV, ILNP, Next Generation Broadcasting, Two-dimensional Routing

**Outline**

- Project Overview
- Project Research Progress
- Conclusion
**FINE Network Architecture**

**SFA: Stateful Forwarding Abstraction**

**Evaluation**

**Research on Network Operating System**

Proposed TUNOS (Tsinghua University NOS)
- Provide uniform resource management for Apps, including forwarding, storage, compute resources.
- Provide uniform management interface and uniform global view for new Apps
- Provide coexistence of distribution and centralized to improve scalability.

**TUNOS Demonstrated on ONS 2013**

**Evaluation**
WE-Bridge: Inter-domain SDN

Virtual View for Inter-domain Negotiation

CANS13/SuperComputing13/INFOCOM14 Demos

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Conclusions
- FINE is the R&D project in China to support a nationwide open environment for future network innovation
- In this project, we proposed and designed
  - FINE architecture
  - Multiple data plan abstractions and open devices
  - NOS, VP, and Management System prototypes
  - Selected applications started to run on the testbed