



ESnet

ENERGY SCIENCES NETWORK

ESnet6 - Update

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FERMI



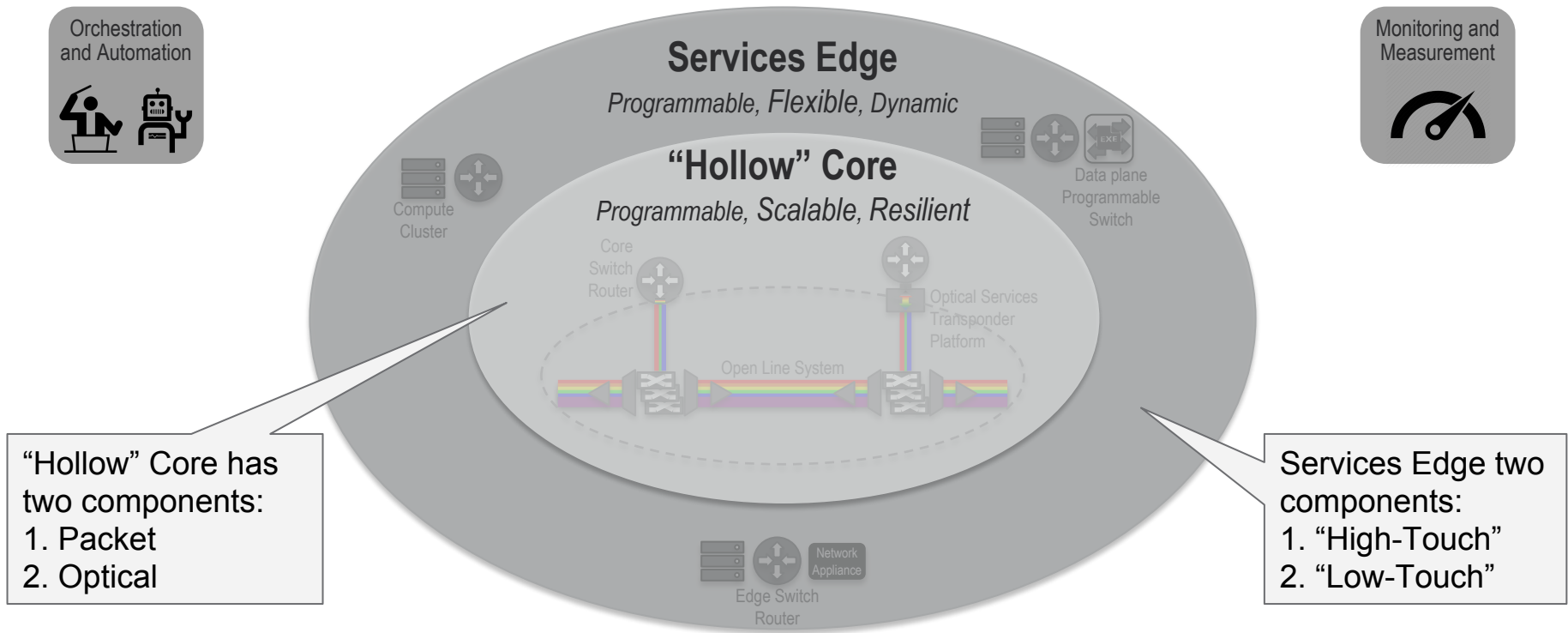
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ENERGY
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ESnet6: Level 1 Milestones (Critical Decision)

| Level 1 Milestone | Date |
|--|--------------------------|
| CD0: Approve Mission Need | 5-December-2016 (Actual) |
| CD1: Approve Alternative selection, Conceptual Design and Cost Range | 3-August 2018 (Actual) |
| CD3a: Approve Long Lead Procurement Authority | 3-August 2018 (Actual) |
| CD2/3: Approve Performance Baseline/Start of Construction | 4QFY2019 |
| CD4: Approve Project Completion (includes 12 month schedule float) | 1QFY2024 |

ESnet6 (“Hollow-Core”) Conceptual Architecture Overview



“Hollow” Core

- **Programmable** – Software driven APIs to allocate core bandwidth as needed, and monitor status and performance.
- **Scalable** – Increased capacity scale and flexibility by leveraging latest technology (e.g. FlexGrid spectral partitioning, tunable wave modulation).
- **Resilient** – Protection and restoration functions using next generation Traffic Engineering (TE) protocols (e.g. Segment Routing (SR)).

Services Edge

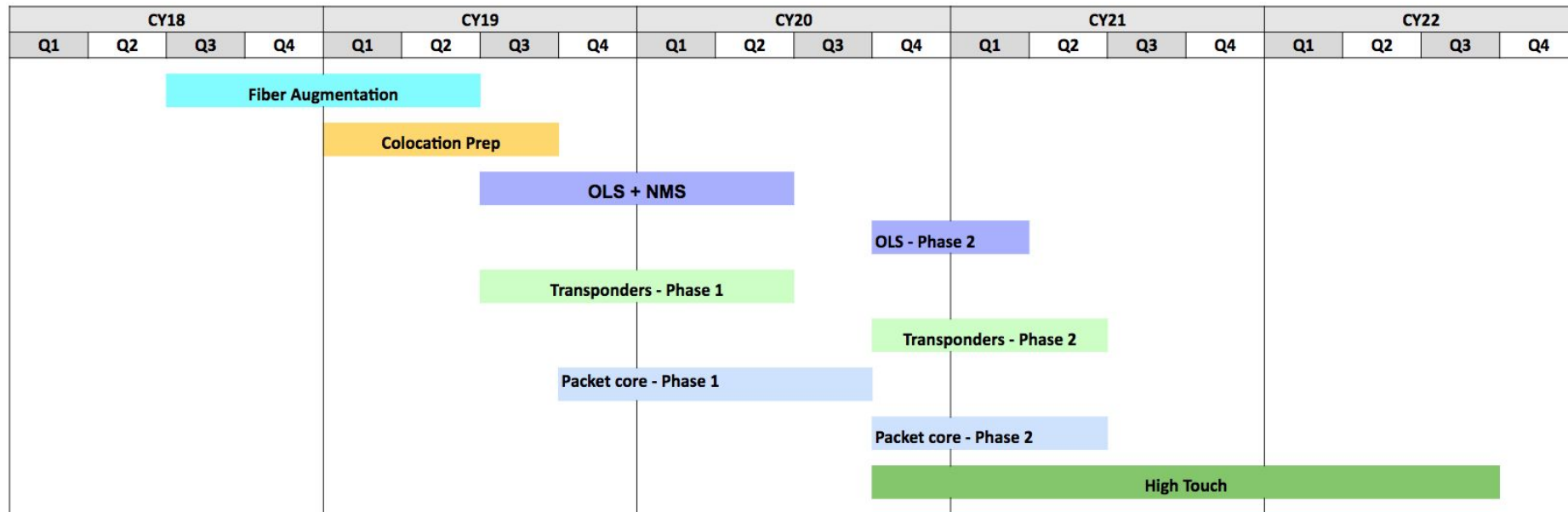
- **Programmable** – Software driven APIs to manage edge router/switch and retrieve telemetry information.
- **Flexible** - Data plane programmable switches (e.g. FPGA, NPU) in conjunction with compute resources to prototype new services (driven by Software Defined Networks (SDN))
- **Dynamic** – Dynamic instantiation of services using SDN paradigms (e.g. Network Function Virtualization (NFV, Virtual Network Functions (VNF), service chaining).

From Conceptual to Final Design

- Vendor technology deep-dives
- Vendor and in-house prototyping
- (Preliminary) design assessment and refinement
- Final design documentation



Draft High-Level ESnet6 Implementation Schedule



Production Network Environment

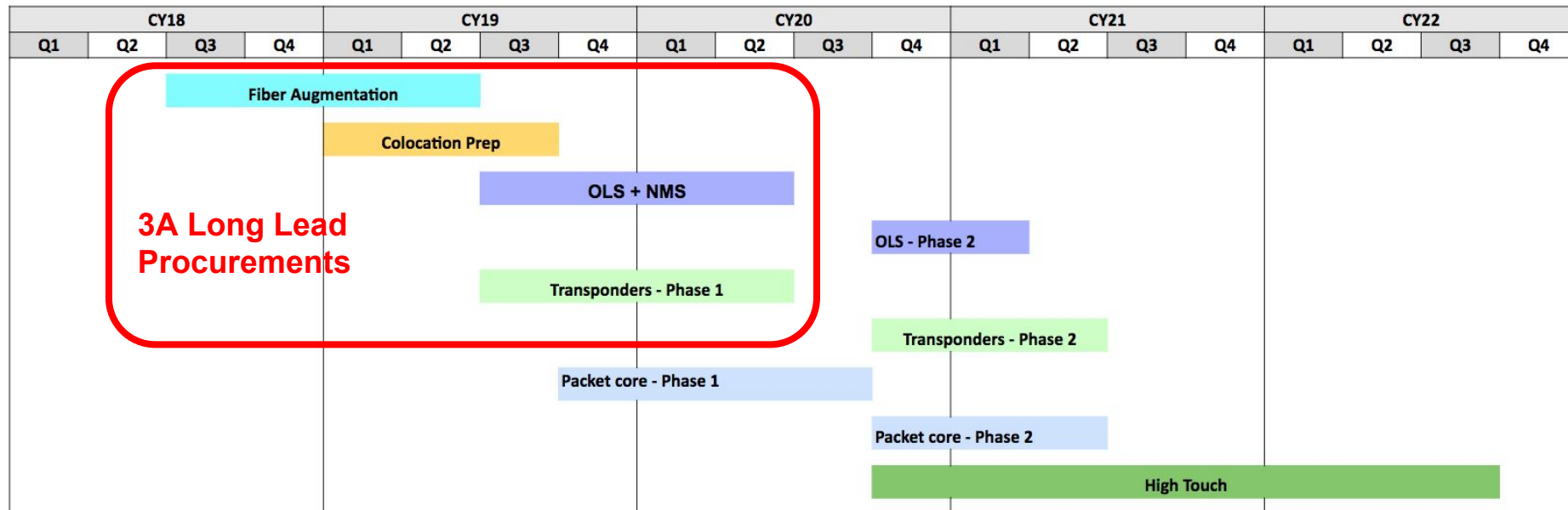
| ESnet5 | ESnet5½ | ESnet6 |
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- Nokia & Juniper Routers
- Ciena & Infinera Optical

- Nokia & Juniper Routers
- ESnet6 Optical Core

- ESnet6 Packet Edge
- ESnet6 Optical Core

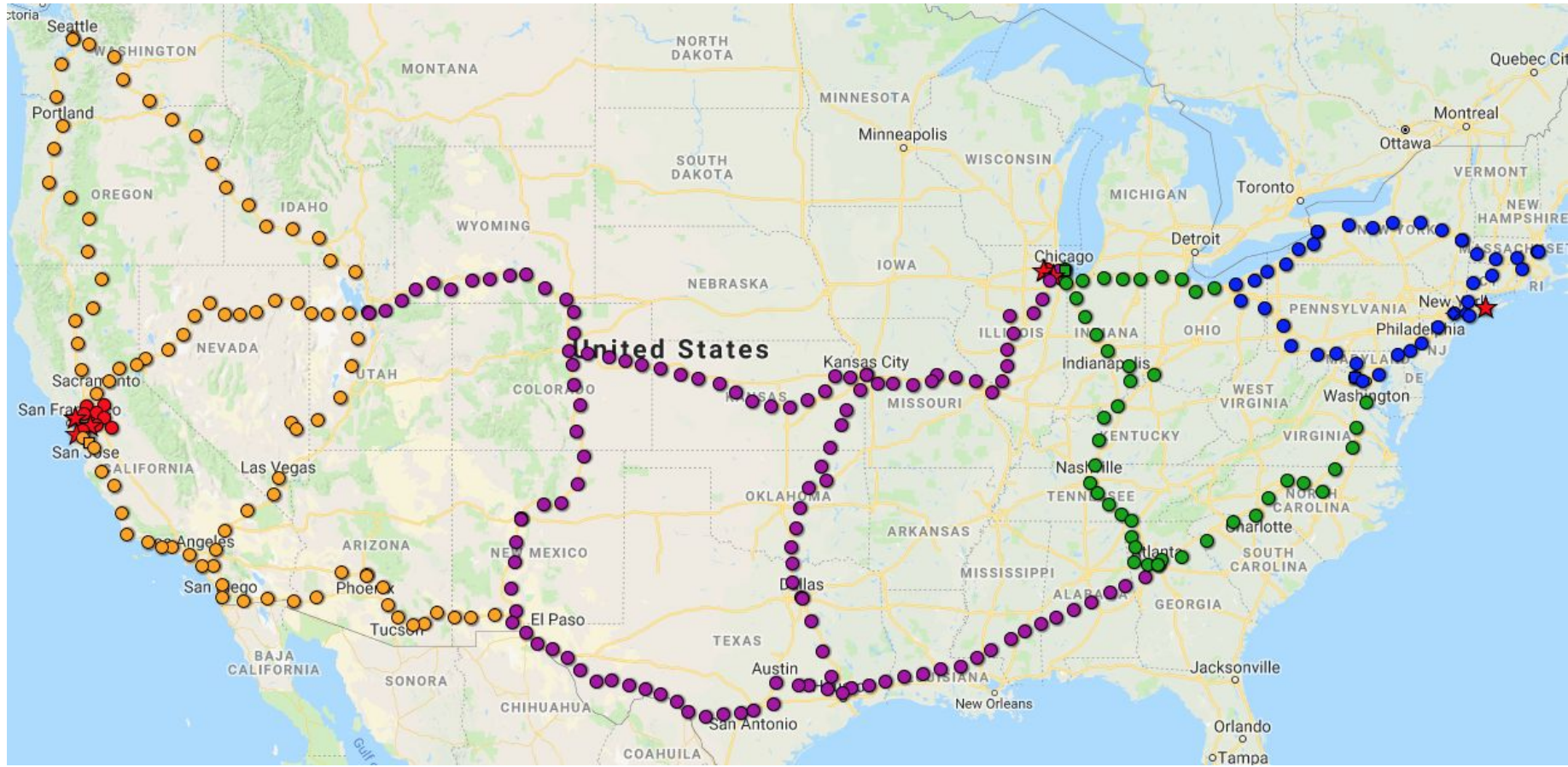
Draft High-Level ESnet6 Implementation Schedule



Production Network Environment

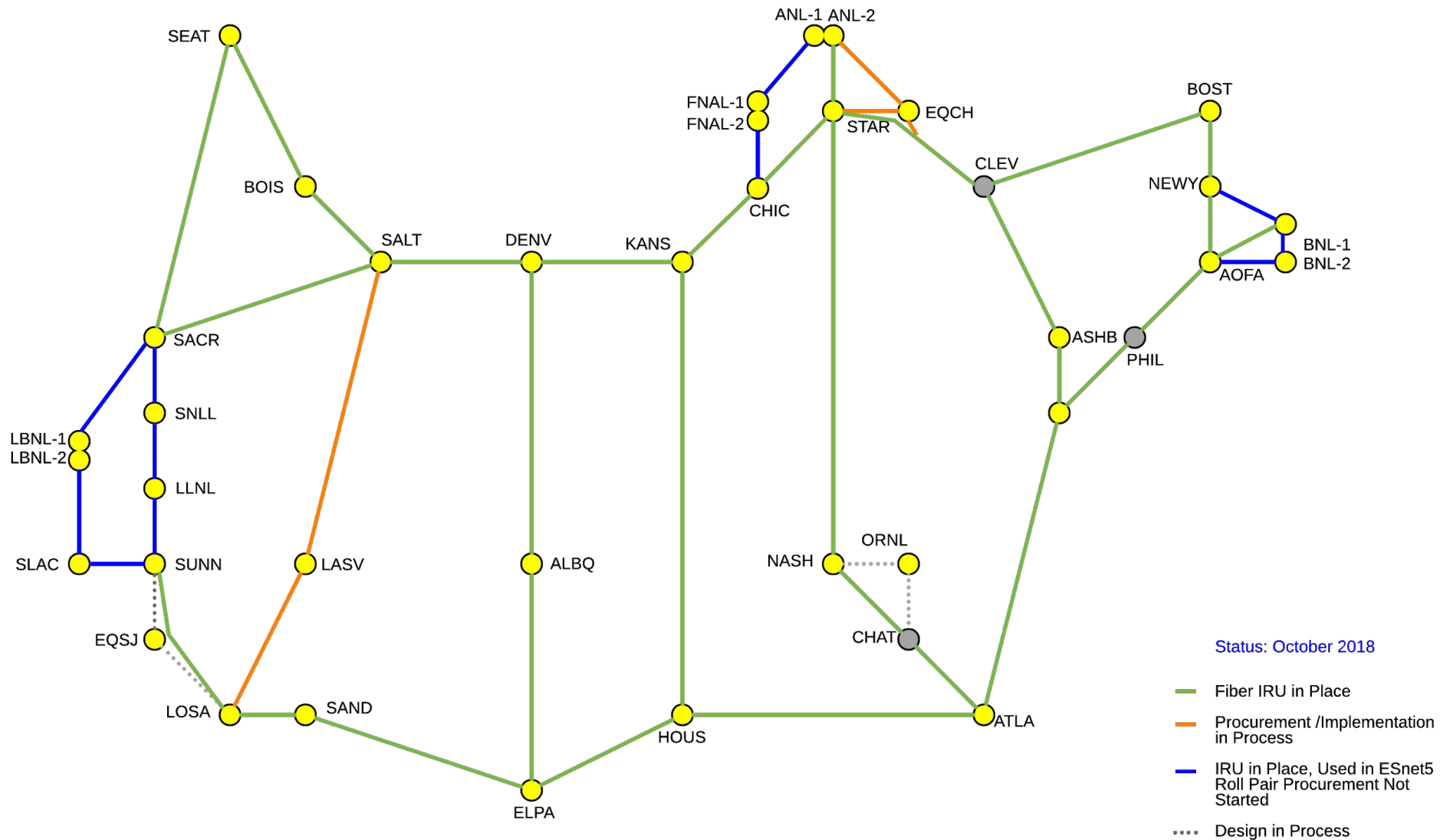
| ESnet5 | ESnet5½ | ESnet6 |
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Draft Colo Phasing Plan



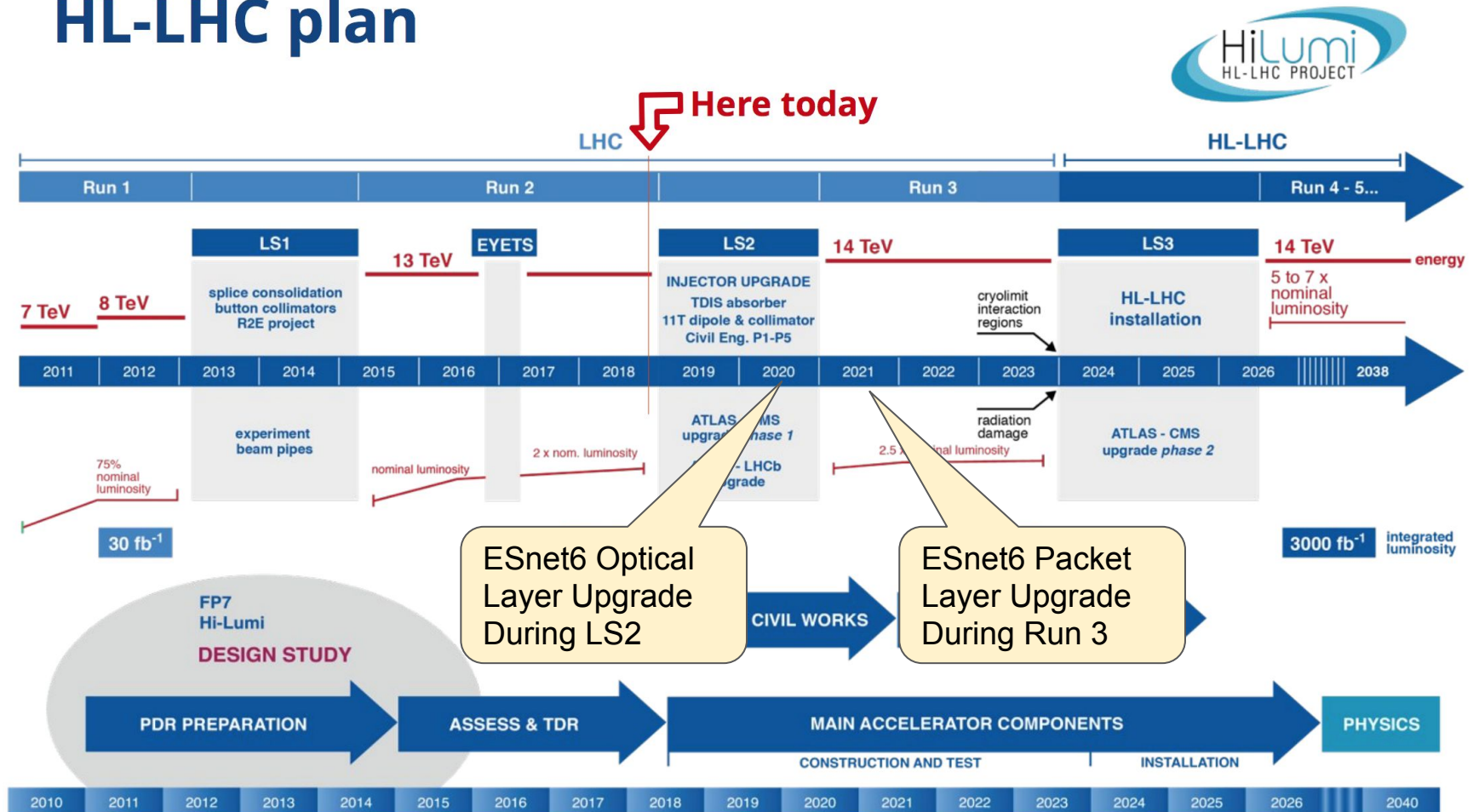
Blue - Phase1, Green - Phase2, Purple - Phase 3, Orange - Phase 4, Red - Phase 5

October 2018 Fiber Status



ESnet6 Deployment in LHC Context

HL-LHC plan



The End